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INTRODUCTION

In July 1995, the U.S. Department of Health and Human Services, U.S. Public Health Service (PHS), Office of Emergency Preparedness (OEP), sponsored a first-of-its-kind seminar, titled "Responding to the Consequences of Chemical and Biological Terrorism." Open seminar activities were conducted from July 11 to 13, 1995, at the Uniformed Services University of Health Sciences, Bethesda, MD. A special, by invitation, closed seminar session was held on July 14 for selected national and international representatives.

The seminar program focused on health and medical services requirements in response to the consequences of chemical and biological (C/B) terrorism. Individual seminar sessions addressed the entire spectrum of crisis management and consequence management actions associated with a response to C/B terrorism. Seminar session speakers included key governmental and disciplinary field experts at the national (U.S.) and international levels (Canada, Japan, United Kingdom).

Seminar sessions addressed general counterterrorism policy topics by the National Security Council, Department of State (DOS), Department of Defense, Federal Bureau of Investigation, and Central Intelligence Agency and specific topics covering biological agents, chemical agents, and surveillance systems. Special C/B case studies discussed chemical agent incidents at Matsumoto, Japan (June 1994), and the Tokyo, Japan, Subway System (March 1995). Biological agent incident cases included the Ebola virus incidents at Reston, VA (December 1989), and Zaire, Africa (1995). Special seminar sessions featured panels composed of disciplinary field experts who addressed crisis management and consequence management C/B terrorism response requirements.

The seminar proceedings that follow are a verbatim transcription of the 3-day open seminar sessions. These proceedings constitute a significant contribution to national and international efforts to effectively respond to the challenges of C/B terrorism. The conception and current development of a specialized medical and health services team (Metropolitan Medical Strike Team [MMST]) to respond to the medical and health services consequences of C/B terrorism are early outgrowths of the seminar program.

The planning, organization, administration, and conduct of the 4-day seminar were enormous efforts that included more than 40 seminar speakers or leaders and more than 400 participants representing Federal, State, and local C/B terrorism response levels. The strength of the seminar was the extraordinary faculty and the equally extraordinary participants who filled the auditorium to capacity. The resultant exchange of knowledge and ideas was unprecedented. Michael Jakub, DOS, envisioned the need for a major conference and challenged PHS to plan and conduct this international seminar. Vice Admiral James Zimble and his staff provided an outstanding seminar venue and excellent support. Rear Admiral

Frank Young and the entire OEP dedicated their personal energy and group efforts to the success of the seminar. They succeeded in an admirable manner.

William E. Clark
Seminar Coordinator
Deputy Director, OEP
U.S. Public Health Service

CHAPTER 1

DAY 1: TUESDAY, JULY 11

1.0 WELCOME

1.1 RADM Frank Young, M.D., Ph.D.
Director, Office of Emergency Preparedness
U.S. Public Health Service

Good morning, my name is Frank Young, Director of the Office of Emergency Preparedness. I am delighted to welcome you to this seminar. As I begin, I want to particularly thank my deputy Bill Clark for the outstanding work that he has done in putting this entire program together and inviting those of you that are here to participate. I would also like to take this opportunity to tell you that I am going to keep the introductions very brief so that we will have maximum time for the speakers and for the discussion afterwards. We are honored to be able to be at the facility of the Uniformed Services that focuses on Health Education. I am particularly pleased that Dr. Zimble, Retired Admiral, is here to introduce and to describe some of the activities related to terrorism but, most significantly, to welcome him as the leader of health on this great campus.

1.2 VADM (Ret) James Zimble, M.D.
President, Uniformed Services University for Health Services (USUHS)

I feel very privileged and honored that Dr. Young would select the Uniformed Services University for this forum. I cannot think of a more important issue than what we face today in terms of terrorism and the use of not necessarily new weapons, but weapons that are readily available and extremely dangerous. I think this is a long time coming, and I compliment Admiral Young for his zeal in bringing together this group. It is an urgent situation as you have seen in the headlines. By serendipity, I received in my in basket, just yesterday, a communication from the Chairman of the Department of Psychiatry who wanted to share with me a communication that he had just received from a Major in the Japanese Defense Force (JDF) who is a physician. The Major's name is Dr. Sinji, and he has written an article. The article will soon be published in *Chemical Weapons and Science Conscience*, and I will read you a little bit of it. This is from the Department of Hygiene at Shinshu University School of Medicine.

> On Monday, March 20, 1995, Japan was unexpectedly assailed by a serious manmade disaster. Plastic bags containing the nerve gas called sarin, which was discovered by German chemists in seeking for effective insecticides in 1930 and said to be actually used by the Nazis, were placed simultaneously in five subway cars in the morning rush in Tokyo. Twelve people were killed and more than 5,500 were then treated for toxic symptoms. This

> cruel crime was carefully coordinated and planned. The metropolitan police department found and seized many tons of chemical compounds usable for synthesizing sarin from a new religion group. Whoever staged the attack aimed to strike down a large number of national public servants. Several able scientists, medical doctors, organic chemists, engineers, etc., must have participated in the terror by making the sarin gas. Whoever produced sarin, the damage was horrific and deeply shocking. We cannot forgive these "mad scientists."

I do not think these are mad scientists. I think these are people with different values, and these people exist not just in Japan but everywhere around this globe including this country, as we witnessed in Oklahoma City. I think this is a very relevant topic. It is right on center stage; it is in focus; and I would invoke the Zimble rule, "If it is possible, it is inevitable." I think that meetings like this where we can get people together to begin the process of awareness and coming up with the appropriate strategy and planning necessary to defend ourselves against such weapons. I will promise you that the American public, if faced with such a disaster, is going to turn to Federal medicine for appropriate response and we in Federal medicine had better be ready.

Admiral Young: It is my pleasure to introduce one of our strongest leaders in the United States Public Health Service, Dr. Audrey Manley. Dr. Manley is serving as Acting Surgeon General, but it is important for me to share with you that it was on Dr. Manley's watch and through her leadership during her tenure as Deputy Assistant Secretary for Health that the program of the Federal Response Plan leading to health and medical was clearly established. She led in the development of the emergency programs which she oversaw for 4 years. Audrey, it is a pleasure to welcome you in your role as Surgeon General and leader of our commission corp.

1.3 RADM Audrey F. Manley, M.D., M.P.H.
Acting Surgeon General
U.S. Public Health Service

I am sure that most of us during our educational processes, whether it be biomedical research or otherwise, never conceived of the day when we would be attending a course such as this. Chemicals and biologicals were things to be used to study diseases, to develop vaccines, therapies, and cures, and to relieve pain and suffering. Now we must accept the fact that they can be used to inflict pain and suffering on innocent men, women, and children. We must be aware too that, based on their innate characteristics, they can be used virtually anywhere at any time. Even worse, once the chemicals and biological genies are released from their bottles, it can be very difficult to get them back in. The world has indeed changed dramatically, particularly over the past decade. When Thoreau had a bone to pick with civilization, or civil authorities, he withdrew to the pastoral confines of Walden Pond to cool off. Now, when some individuals have a bone to pick with other individuals, institutions, or society at large, they resort to much more dramatic and destructive means, as we have seen in

both Tokyo and Oklahoma City. What we at one time could barely imagine, we must now prepare for as likelihoods. We cannot afford to do otherwise.

I wish to personally thank Admiral Young for his continuing strong leadership in emergency preparedness and response. When I served as Deputy Assistant Secretary for Health, I became acutely aware that the field of emergency preparedness in the Federal sector needed strong leadership and some commitment of resources. We have realized that leadership in Admiral Young, and we have secured some resources. Not all of the resources that we require, but we are still working at that, too. Additionally, I wish to thank RADM James Zimble for permitting us to use this wonderful facility. It is a real asset to us that the USUHS is so close to the Department of Health and Human Services and the Public Health Service Headquarters. I wish you good luck in your sessions over these next 4 days. We are indeed depending on your expertise and your leadership in the coming years to help restore some of the confidence that has been so sorely shaken by these most recent events of terrorism. You have an outstanding and an impressive agenda before you. Though the task before you this week is not a pleasant one, it is indeed a vital one. It is of vital importance to the peoples of our nations and the peoples of our world. Again, I wish you the best of luck and Godspeed in your endeavors.

1.4 Opening Remarks
Admiral Young

As you are about to see, the consequences of terrorism are health and medical. We have a video film for you that will capture some of the anguish that we all saw following the Oklahoma City bombing.

Video - Music playing.
CNN Video - No speaking. Oklahoma City aftermath pictures.
Video End.

I would like to spend the next very few minutes showing you some of the differences that we feel exist between the natural disasters that we have focused on and the tragic type of action that we saw here. If one focuses on the public, who are whom we serve, the most critical difference that we will have here is public panic due to unfamiliar accidents. As we look at risk communication, the single greatest problem that the public faces is dealing with something unfamiliar. Public panic and good communication to overcome will be key for the health professional and for our colleagues in crisis management. Our role is support through rapid assessment and technical consultation. We know what occurs in an earthquake, in a flood, in a hurricane, but the rapid assessment is key. Our close coordination in a seamless fashion between the Department of State, as we will soon hear from Ambassador Wilcox, and the FBI, as we will hear from Mr. O'Neill, is essential. There must be a seamless interaction and transfer in lead responsibility. Law enforcement concerns, unlike after hurricanes and floods, are key issues.

Another key issue that we have to focus our attention on is the demand for health information. Shortly following the terrible sarin attack that we will hear about from our colleagues in Japan, we were flooded in the Office of Emergency Preparedness with requests for information. In the middle of the night we spoke with many of the individuals in the local communities that were concerned about this. The need to have prepared in advance precleared health messages, so that the media will not get conflicting thought is key. For those of us who were in the Midwest flood, you will remember that there was a controversy as to whether you should boil water for 1 minute, 3 minutes, or 5 minutes. When the public brought up the concern of what should we do with the vaccine for hepatitis, an interesting comment was made that if they, "Cannot even tell us how long to boil water, how can we trust them on vaccination." There is an absolute need to have prepared messages. Rapid response is required to save lives. I thought when we were first dealing with California and looking at the response to an earthquake and focusing on the first 12 hours, we were really looking at and getting the timeframes correct. Now we are focusing on the first 30 to 90 minutes. Different challenges. The first responders have limited knowledge and experience with the NBC agents. I am particularly pleased that within the audience there are so many from local communities; fire rescue, EMS, and other programs. The integrated response of health, medical, fire rescue, and local law enforcement organizations is absolutely key.

In the final slide there are a few more points that I would like to bring for your consideration. We need to focus on the ability to decontaminate patients. Bringing contaminated patients into hospitals is a problem. We must look for mixed agents. It is unlike the problem we face when a HAZMAT truck goes over that is clearly on the manifest or on the back of the truck, "Truck loaded with chlorine." It is not a question of what we deal with, but here there is a problem of worker safety: to be able to protect those that respond. That is absolutely key. Off course, as we will hear today from our next speaker, national security concerns are also significant. So these are the differences that I would submit are important as we look towards an analysis during this 3-day period of time of the programs dealing with improvised nuclear devices and terrorism, chemical agents and terrorism, and the biological agents that you could even see on the second page of USA Today as we look towards the sale and movement of these organisms. So, as we focus our attention on these differences and we prepare as Dr. Manley said for the challenges of the future, I would urge that we all work together in the most integrated response. I thank you all again for participating.

It is now my pleasure to introduce by videotape Mr. Richard Clarke. Mr. Clarke is Assistant to the President. He coordinates the various agencies in dealing with the crisis and the consequence actions that are required as an integral part of our nation's well-being. Mr. Clarke wanted to be here today, but he had an assignment from the President that took him out of town. I am very pleased that the Food and Drug Administration was able to provide the crew for us to get down to his office so that we could welcome Mr. Clarke from his office as recorded last Friday; Mr. Clarke.

1.5 Terrorism: A Threat to National Security

The Honorable Richard Clarke (on videotape)
Special Assistant to the President
Senior Director for Global Issues and Multilateral Programs
The White House

Admiral Young, thank you for an opportunity to address your important conference here today. I thought it was a good idea that you have the White House perspective, the President's perspective, on the work that you are doing. The best way to convey that is to quote from the President's most recent address on the subject. Two weeks ago, speaking in San Francisco to the United Nations about the challenges that the UN and this country will face in the next 50 years, he said the following:

> New technologies and greater openness make borders more vulnerable to terrorists and to dangerous weapons. Newly independent nations offer ripe targets for international criminals and nuclear smugglers. Today, to be sure, we face no Hitler, no Stalin, but we do have enemies; enemies who share their contempt for human life and human dignity and the rule of law. Enemies who put lethal technology to lethal use. Our generation's enemies are the terrorists and their outlaw nation sponsors. People who kill children or turn them into orphans. Their reach is increased by technology. Today the threat to our security is not from enemy's missile silo but from a briefcase or a car bomb in the hands of a terrorist. The bombing in Oklahoma City, the deadly gas attack in Tokyo, all of these things remind us that we must stand against terror and support those who move away from it. The recent discoveries of laboratories working to produce biological weapons for terrorists demonstrate the dangerous link between terrorism and weapons of mass destruction.

The President's remarks in San Francisco make it clear how important this issue is to him. I hope we never have a recurrence of the incident in Oklahoma City or a recurrence of what happened in Tokyo. We are working hard to ensure that sort of attack never occurs again; never occurs in the United States. But we cannot ensure with 100-percent confidence. We need to be ready in case it does happen, while at the same time making every effort to prevent it from happening. The consequence management of these incidents is what we are here to talk about today. The President has also addressed those issues recently. He signed Presidential Decision Directive 39 (PDD 39), and although the overall document is classified, there are sections of it that are unclassified which speak to your conference today. So let me again quote from the President, not this time from his speech but from his Decision Directive. He began by saying, "It is the policy of the United States to deter and defeat and respond vigorously to all terrorist attacks on our territory and against our citizens. The United States shall reduce its vulnerabilities to terrorism at home and abroad." And then, speaking to the

issue of the connection between terrorism and weapons of mass destruction, he said, "The United States shall give the highest priority to developing effective capabilities to detect, prevent, defeat, and manage the consequence of nuclear, biological, and chemical materials for weapons use by terrorists." With regard to the specific issue of consequence management, he directed:

> The Federal Emergency Management Agency, with appropriate support from other agencies, shall review the accuracy of the Federal Response Plan to deal with a nuclear, biological, or chemical-related terrorist incident. The ability to implement these plans shall be reviewed on an urgent basis, and any shortfalls in stockpiles, capabilities, or training shall be identified and remedied. This review shall assess the adequacy of (a) stockpiles of antidotes and other special medicines, (b) the National Disaster Medical System, and (c) procedures for direct DoD support, including support with medical facilities and decontamination.

What you are doing today is part of the implementation of this Presidential Directive, and I look forward to the results of your effort. What you all can do, each of you individually, is ensure that the United States is ready in case one of these terrible incidents does occur again. If we are not ready, tell us through this conference and through your agencies what we need to do to get ready. The U.S. Government has no greater responsibility to its citizens than to protect them from these sorts of disasters and, if it fails to do that, to work with them to recover from those disasters. Your conference today, your mission, is of the utmost importance to the President, and you should know you have his complete support in whatever you need to get the job done.

Admiral Young: I feel pleased that Mr. Clarke made the tape for us. While he was not here to respond and be part of the conference, it shows the President's and his commitment to this endeavor. It is now my great pleasure to introduce Ambassador Philip C. Wilcox. Ambassador Wilcox has the grave responsibility of internationally coordinating our crisis response to terrorism. Phil, thank you so much for being part of this meeting.

1.6 Combating Terrorism

Ambassador Philip C. Wilcox, Jr.
Coordinator for Counterterrorism
Department of State

Thanks to Admiral Zimble, Acting Surgeon General Manley, and to all of those who have organized this very important conference. You are doing a great service to the United States, and this meeting, indeed is the first of its kind to bring together such a wide variety of experts from the Federal Government, from State and local administrations, and to invite experts from allied nations abroad to address what is a very critical threat, and one that has

lacked attention in the past. As Admiral Manley just told me, it is time to get serious because this is a grave threat. It is one for which we need to be ready if we cannot deter it. I would like to discuss, as a background to this conference, the threat of international terrorism and what the United States Government is doing to deter this threat worldwide.

The threat of terrorism is transnational, it knows no borders. The problems which face us in international terrorism are similar to those that face us in preventing and dealing with such incidents as the World Trade Center Bombing and the Oklahoma City crisis in the United States. Terrorism, which we define as the use of violence against noncombatants for political purposes, is an age-old threat. It has been with mankind forever, and it is with us today. In large measure and for that reason, President Clinton, Secretary Christopher, and this administration have given top priority to doing everything this nation can to deter the threat, and, if incidents occur, to minimize the harm. It is a top foreign policy priority for the Department of State. The vivid images that you have just seen from the Oklahoma City bombing, like those from countless terrorist incidents around the world, bring home to us our sense of collective vulnerability to terrorism and the urgent need to do more to deal with it. The Tokyo attack was another reminder and a warning to us all. It demonstrates that terrorists are now more innovative, bold, and technologically sophisticated. Who would have imagined 35 years ago, for example, that terrorists would have hijacked aircraft or bombed aircraft? Who would have imagined outside the pages of science fiction that sophisticated, scientifically trained terrorists would place packets of sarin gas in the subway of a major metropolitan city?

Traditionally, terrorists with political causes, in order to appeal to the public, have limited the casualties they have inflicted in their acts of terrorism. Regrettably, now there is a pattern towards seeking mass casualties. We saw this in the World Trade Center bombing. It was the case in the bombing in Buenos Aires of the Jewish Cultural Center in July 1994. It was the intent of the Tokyo terrorists to kill thousands and thousands of people. Fortunately they failed, although they inflicted major injuries and killed a dozen people. Another new phenomenon in this dynamic, evolving phenomenon of terrorism is religiously based terrorism. Now, there has always been religiously based terrorism; but it takes a particularly virulent form today as groups who deviate from the teachings of their faiths exploit religion and emotion to justify acts of terrorism and to pursue their grievances. The kind of terrorism carried out by cult groups like the Aum Shinrikyo group in Tokyo is another, newer phenomenon and a particularly difficult one to deal with. Like religiously motivated terrorism, it is more difficult to understand; it is more difficult to deter than terrorism carried out by more traditional, well-organized groups or terrorism that is sponsored by states. We are also facing the threat of terrorism by desperate, often psychotic people who live on the fringes of society. These elements are particularly difficult to fathom, to discover, and to deter.

Finally, and most relevant to the work of this council, is this phenomenon of the use of materials of mass destruction for terrorism. As I said, we used to read about it in the pages of fiction. It was something we worried about, but we thought that it was somehow too horrible to occur. It has occurred. As Admiral Zimble said, those terrorists have proved that it is possible, and, if it is possible, it is likely to occur again. This adds a new and major dimension to the terrorists' threat; substances of mass destruction can be unleashed on society killing hundreds of thousands of people. The copycat phenomenon, which we worry about a great

deal in counterterrorism, is also a real risk here. Once it has happened, others will take their cue and try it again. Once the barrier has been breached, what was originally unthinkable now becomes more likely.

I would like to talk a moment about U.S. counterterrorism policy which applies not only to traditional forms of terrorism, but to that kind of terrorism which we are worried about and planning to counter in this conference. Traditionally, the United States Government has made no concessions to terrorists to discourage them from committing terrorist acts; we make it clear in advance that we are not going to bow to their demands. We are also emphasizing increasingly that terrorism is a crime for which there could be no political justification. Now I am happy to say that more and more nations around the world are enforcing the rule of law in pursuing terrorism. Ten years ago, 20 years ago, there was great ambivalence about terrorism that was motivated by political causes. Today there is much less of that, and nations are using the law much more rigorously to go after terrorists. We are also keeping up and increasing the pressure against governments which sponsor terrorism by harboring terrorists or giving them material support. There are seven of them which we have designated on our list of state sponsors: Iran, which is the most notorious and active state sponsor; Libya; Iraq; Syria; Sudan; Cuba; and North Korea. By bringing U.S. sanctions to bear on these nations and mobilizing international sanctions, sometimes in the UN, we have succeeded in curbing terrorism sponsored by these seven nations. Yet today there is a growing threat of terrorists who have nothing to do with state sponsors: terrorists like the Aum Shinrikyo group: and terrorists like the Ramzi Ahmed Yousef gang who evidently have had no state sponsorship but were capable of attempting to blow up the World Trade Center and who launched a major terrorist plot against U.S. aircraft in the Pacific a few months ago. Because terrorism is both a domestic and international phenomenon, we have forged very strong cooperative links with other governments around the world to combat it. This cooperative, international approach is vital. It is vital to deterrence; it is vital to consequence management.

The collection of intelligence is also critical. Our government is investing increasing resources in intelligence collection and analysis against the terrorist target. Terrorism, by definition, operates clandestinely, and you need good intelligence to go after, to identify terrorists. When there are calls for slashing our intelligence budget, remember we cannot fight terrorism worldwide without a strong and vital U.S. intelligence community. We are doing much more to strengthen our borders to prevent terrorists from entering our country and, in this as well, we must have intelligence. We have a vigorous and well-supported research and development program within the U.S. Government to identify counterterrorism technologies in areas such as explosives detection. This is an area where there is scope for doing even more, and we are working closely with other nations in this area as well. We also have superb U.S. military counterterrorism assets to use in emergency situations where other means of resolution fail. We are very proud of these. Fortunately, we do not have to use them very often. Because terrorists rely on money, we have taken two initiatives recently to try to stem the flow of funds to terrorists. An Executive Order issued by the President in January is designed to cut off contributions to designated Middle East terrorist organizations by U.S. donors, and in the omnibus counterterrorism bill, which the President has submitted to the Congress, there is a section to strengthen our power worldwide to stop the funding of

terrorism. We are using these initiatives to encourage our allies abroad to undertake similar measures, and there is real interest.

The counterterrorism legislation which others may describe in detail during this conference is a very important initiative. It has wide bipartisan support in the Congress, and I believe it will probably be adopted sometime late this summer or in the fall. The need for greater international attention to counterterrorism was addressed at the recent conference of leaders of the Group of Eight nations in Halifax. It will be of interest to this group that they specifically identified the need for greater cooperation in addressing terrorism using biological, chemical, and nuclear substances and in dealing with the consequences of such attacks as a major agenda item for international cooperation. There is going to be a follow-up ministerial conference in November on ways to enhance real, practical, international cooperation against terrorism. We are also looking at ways to strengthen international legal regimes against chemical and biological weapons to see if those regimes can be used to address the problem of terrorism: those are the chemical weapons convention and the biological weapons convention. We have discussed this with many governments including the Government of Japan. We have discussed with the Government of Australia the possibility of using the Australia group, which is a very youthful and effective forum for reducing the threat of proliferation of chemical weapons, to look at ways to reduce the terrorist threat. There is much that can be done also by nations in their domestic legislation to control the substances and reduce the threat that they will fall into the hands of terrorists.

Finally, and most relevant to the work of this conference, the President, in demonstrating the high priority of this subject to him and to this administration, has issued a new Presidential Directive with a work agenda for the Federal Government. It is very heartening that you all have responded so quickly to that Presidential Directive to deal with the pressing issue of consequence management. This is an area where a great deal more work must be done. As we work to identify and deter we must be ready, more ready than we are now. So I am very grateful and impressed by the initiative that you have taken, and by the willingness of all of your organizations to participate.

Question: First, I am impressed with your description of the importance of the problem and what the Government has done. As a former Cold Warrior, [I think] it was important to have a statement of the threat so that one could decide what resources could be put against the threat. I realize this is early in the game, but I would be interested in knowing your view as to how one may get a more quantitative or specific statement of how seriously we take this problem, and therefore, what resources we might put against consequence management.

Answer: The threat is real, it is palpable; however, it is difficult to quantify. In the realm of international terrorism, there has been a decline in the number of incidents of international terrorism in the last 3 years. From the peak year in 1987 when there were over 600 incidents, there were only 200 and some incidents in 1994. But that is deceptive because there is also at the same time a trend toward inflicting mass casualties and the specter of the use of materials of mass destruction. We take that trend and that threat very seriously indeed.

Terrorists are more sophisticated; they are more mobile; they have greater access to weapons and technology, and they are using it. They know much more about explosives and how to evade explosive detection. I believe that the threat of international terrorism, if anything, is growing. I think the same threat has to be considered real in domestic terms because, as I mentioned, terrorists know no borders. They can go anywhere and they have proved that they can carry out major terrorist acts on our shores, whether they are foreigners or Americans.

Question: The counterterrorism bill currently has no funding to do anything for local emergency responders and the emergency medical service and fire arena. Is there anything in Presidential Directive 39 that would address this?

Answer: The President has asked that we identify areas where there is a lack of resources and more resources are needed. He is determined to find ways to get those resources. Though that is not easy, I think it is a vital challenge. We need to mobilize ourselves, our communities, and our organizations to do everything we can to encourage that. At a time when the U.S. Government is reducing its budgets in every area, that is tough. We need to understand what our priorities are, and there should be no higher priority than this one, given the dire consequences.

Let me also mention that we cannot combat terrorism abroad through all of the programs and policies that I have mentioned unless we have a vital, well-funded, active U.S. foreign policy supported by U.S. resources. Withdrawal from the international arena or the starvation of U.S. funding for international programs can only hurt our counterterrorism effort because the relationships that we developed, the confidence that we gained, the kind of engagement that we have had for many years as the leader of the free world have made it easy for us to take the lead in counterterrorism. If we retreat, if we starve our foreign policy enterprise, our counterterrorism effort is also going to atrophy.

Admiral Young: It is now my great pleasure and privilege to introduce Secretary Danzig, Undersecretary of the Navy. In the very earliest days of this administration and through his lead role in the Department of Defense, Mr. Danzig has brought his efforts to bear on bioterrorism, chemical terrorism, and improvised nuclear terrorism. Through his efforts, we were able to see the amalgamation of many of the activities that have borne fruit today.

1.7 Biowarfare: Making a Big Problem Smaller

The Honorable Richard Danzig
Under Secretary of the Navy

I came to this administration knowing very little about biological warfare. What I know has been taught to me by Frank and several other people in this room. One of the key points in this arena is that we share and pool our knowledge. I am very aware of that fact and have no pretension to some exceptional depth of knowledge. Insofar as I have any pretension to success in this arena, it is from trying to fit together the whole range of concerns that we have got so that we do not become mired by our expertise in one particular area at the expense

of an overview of how all the pieces fit together. I think that should be of particular concern to us. One of the difficulties associated with dealing with biological warfare especially, and to a lesser extent chemical warfare, is that medical experts immediately begin to speak in convoluted terms involving Latin names of agents with widely varying symptoms and fair amounts of intricacy. Policy makers start talking about all the other things that are put off by that. Acquisition types have whole other sets of concerns. People concerned with training, doctrine, and intelligence have different sets of concerns, and we do not put the pieces together. Putting the pieces together is terribly important.

I would like to talk this morning about ways in which we have tried within the Department of Defense to put the pieces together in the context of biological warfare. I focus predominantly on biological warfare because I view it as a yet more serious problem than chemical kinds of issues and concerns, terrorists or warfare, which is not to denigrate the significance of the chemical concerns. My observation has been that the biological case tends to be more ignored, less attended to than the chemical, and that coming to grips with the biological is more complicated, more challenging. Therefore, I have tried to put more focus on it.

Our title is "Making a Big Problem Smaller." I would like to spend a couple of minutes talking about why I think this is a big problem, and then tell you a little bit about the strategies within the Department of Defense for making the problem smaller. I will offer some suggestions on route about ways in which analogously those of you who are invested in the civilian side of these kinds of issues might emulate these strategies vested by analogy or, in some instances, connect up with what we are doing in the Department of Defense.

Why is this a big problem? I think that you probably would not be here if you did not think that this was significant. Though I recognize that the really massive response to the invitations for this conference is triggered in some measure by the experience of chemicals: sarin in Tokyo in March, was an obviously dramatic event. I am struck, though, with how more ferocious and more dramatic that kind of event would be if we were dealing with biological weaponry. Consider difficulties associated here underscoring why this is a big problem.

First, we are dealing with potentially, in context of the biological agent, a weapon of mass destruction of remarkable potency. A number of you will be familiar with the particulars with respect to particular agents. Let me only say that it is evident that even a gram of anthrax has the capacity to kill at lethality rates measured in millions. It is also the case that other agents have remarkably intense lethality rates for very small weight, and, therefore, we have a level of potency that is unusual in the history of weapons of destruction. It is also the case that, unfortunately, access to this kind of weapon is much easier than for comparable methods of destruction; one does not need remarkable sophistication. Widespread biological pharmaceutical industry capacities in a number of nations permit people to have an understanding of what is involved with this weaponry and how to formulate it. Unfortunately, also, this weaponry lends itself to a certain attractiveness in the context of the work of drug lords because, in fact, the technologies are widely dissimilar. We also all know that this is a remarkably cheap technology as weapons of destruction go. Some 25 years ago a United

Nations scientist, attempting to quantify this, looked at the relative cost of killing people per square kilometer. Notions like this may not have occurred to many of you, but it is part of the art. The observation that he made was that conventional weaponry would effect lethality over a square kilometer measured in a fairly intricate way. He priced conventional weaponry at some $2,000 per killing in that range. In order of magnitude, nuclear weaponry at some $800, chemical weaponry at $600, biological weaponry at $1. This is per head. We have a weapon that is potent; we have a weapon that is accessible; we have a weapon that is cheap.

I think I am most disturbed by a fourth attribute, which is delivery mechanisms. By and large, if you want to deliver a conventional ordnance, we know how to do it, but it has a fair level of visibility. If you want to deliver nuclear ordnance, the methods of doing it require a high degree of sophistication in the normal context. If you want to deliver chemicals, things are a lot simpler. Delivering biological weapons is exceedingly simple. Basically, a crop sprayer (a backpack kind of spray mechanism) will achieve significant, dramatic, potent effects. If used particularly in situations like dusk, where you are not concerned with the attrition of the agent as a result of sunlight, or if you use anthrax, which is relatively resistant to that kind of attrition, the effects you achieve can be dramatic simply by dispersing. Ballpark areas of concern for us run up to 80 to 100 miles downwind from whatever cloud you generate via aerosol dispersion, the preferred method of distribution. Very simple, homely methods of dispersion are also cheap.

To these four attributes I would add a fifth: ambiguity. I am struck with the ability to disguise. In some respects that is a problem for biological warfare proponents. But in some respects it is an advantage. Since symptoms do not show up typically until the day after attack and dispersion, there is an opportunity to mask what has occurred and who did it. That gives rise to greater detection problems, obviously, but also to opportunities for manipulation of this weapon which are different from in other circumstances. For example, one of the kinds of war games we played out within the Pentagon involved a third party who do not like two first parties. They release a biological weapon in context that lead to first party's uncertainty as to which of them might have done it to the other and thereby intensify the difficulty. You can imagine, for example, if you did not like the Palestine Liberation Organization and the Israelis coming together, or a group within, say, Great Britain – take Northern Ireland and the British – you could use weapons of this kind as terrorist kinds of weapons and achieve very substantial effects while giving them considerable uncertainties about their relations with one another. Another aspect of the ambiguity is the very striking difficulty that people have as a result in tracking down the perpetrators and, therefore, a greater degree of insulation and opportunity in that regard.

Finally, I mentioned that the nature of our targets – that is to say of things the terrorists or other states might want to target – enhances my sense of worry about biological weaponry. We are remarkably masked, as a military. We are masked in the sense that, if you think for example about Desert Storm, the effects of the buildup there were to bring together very large numbers of troops, 500,000 to 600,000, in very confined areas. Extremely vulnerable in the sense that they are within the 80- to 100-mile range of their opponents; very vulnerable by virtue of their centralization. Moreover, in the military context, those buildups are slow and therefore responsive to vulnerabilities of a biological sort, and they have got significant

problems as a result of the presence and dependence on large numbers of civilians. The panic effects, as well, induced by mass exposure, or even the suggestion that there was such exposure, complicate our problems. In the civilian context, as the sarin in Tokyo suggests, we have significant problems associated with the mass nature of urban society. The targets become very fruitful and rich in that regard.

If my list has not already sufficiently succeeded in depressing you, there is the additional difficulty in the biological arena in that we deal with weapons for which we do not have sophisticated detector technology or broadly distributed technology that will allow us to know when it is that people have been exposed. Typically, we have to look to the symptoms. We do not achieve good warning in these circumstances. We do not have an infrastructure that is equipped or prepared to deal with mass casualties of these kinds. For example, in the Pentagon, from a quite sophisticated study of our medical needs in the event of warfare came some very detailed analyses of how many doctors, hospital beds, etc., we needed. When they were done briefing the study, I asked them how they had dealt with a biological case: what assumptions did they make about casualties, demands, etc.? The answer was, "Biological case? We did not even consider that; too difficult." That is not uncommon, and one of the areas that we are struck by is that there is not a rich history of gaming in the Pentagon of biological incidents. Very striking. The Pentagon is remarkably good at working out war games against a whole lot of contingencies, but the answer in the biological arena tended to be historically again and again, we do not understand it enough; it is too difficult to model; and it would disrupt the war game. I have a lot of sympathy with the difficulties associated with disrupting war games, but I am more concerned, as I think you are, as I think many of the people at the Pentagon are, with getting this one right. Bottom line, I have suggested a whole cluster of issues which should suggest to all of us that these are significant problems. I think it is a big problem.

One of the things that people tend to say after they have first been immersed in it, is, "If it is such a big problem, why have not we had incidents of biological warfare or biological terrorism up to now?" In my experience, they say this somewhat less after the bombing of the World Trade Center, a lot less after the sarin attack in the Tokyo subway system, and still less after the Oklahoma City bombing. But it is an appropriate question. It is nice to think about a world in which biological warfare does not occur, and has never occurred. In fact, if you do a sort of mental clearance sale and say to yourself, "Gee, I am going to wipe my mind clean and ask myself afresh, has this ever occurred?" incidents start popping up all over the place. Think about the medieval practice of catapulting cadavers over the walls of cities under siege in order to spread plague within those cities. Think about the British infesting blankets with smallpox and giving them to the Indians. Think about the poisoning of wells to impede Sherman's march through the South. Think about the Japanese activities in Manchuria, now well documented: testing biological weapons on populations of Chinese, both individuals and larger populations. It is very unclear how many people died, but it is clear that those deaths probably reached four figures. Think about the fact that Churchill approved a biological attack using anthrax on cattle on the continent of Europe as a standby mechanism but then did not need to use it because of the success of D-Day. Think about the investments that the United States made in biological warfare in the 1950s and 1960s on the fear that it might be an offensive weapon and we needed to understand it. Think about the Iraqi program now so

recently publicized, but that has been evident for a number of years. Think about the Russian program, also recently conceded to exist by the Russians, that ran for a number of years. It is difficult to believe that these kinds of programs exist and these kinds of past activities exist, without any possibility to speak of or any serious likelihood that they would all be used. To the contrary, the evidence is significant that there have been such activities, that they have been used, and, in my opinion, any weapon, every weapon that has ever come into existence has been used. I cannot think of an exception. Why would we think biological weapons would be such an exception in the future. Let me stop trying to impress you here and offer you a list of remedies, though I have to say quickly I do not have any proposals that offer cures. These are things mitigating the effects, and I am only going to try to offer some palliative to your depression if you have got it, not some effective cure.

Square one. Within the Pentagon world we have come to the conclusion that there is an education process, a process of purely conceptual coming to grips with the questions at hand, that is fundamental to being able to deal with biological threats. One manifestation of this is the need to desegregate the notion of weapons of mass destruction. Within the Department of Defense there is a tendency to make that a kind of total concept and then say, "Well, if we have dealt with nuclear problems," or, very ambitiously, "if we have addressed nuclear and chemical problems, then by inference, we have addressed biological problems." In fact, the biological problems are very different. You do not deal with the arms control kinds of issues in biology as you might in the nuclear arena. You do not deal with them by counting warheads. You do not have the same telltale signs or the ability to restrict proliferation. It is different. The protective mode is different. When you disaggregate chemical and biological as areas of concern, you come to the recognition that biological threats may be dealt with by substantial masking ability – and masks may be a lot simpler than are required in the chemical area. Therefore, we ought to have a significantly different set of equipment associated with defense in the biological area. You come to the observation that we are not investing adequately in biological detectors. That is the key to the whole area, that we have the technologies at hand to be able to deal with it. My point is you need to disaggregate the notion of weapons of mass destruction and start to focus on the individual attributes of the individual types of weaponry.

In the civilian context, I think that point is very important. It is pretty clear that more thought in this area will yield some relatively rich rewards right away because the area has been so underdeveloped in terms of attention. Even though, in my opinion, the threats are so potent, some relatively simple conceptual brush clearing leads to some potentially useful observations. I will try to give you some examples of that line of thought. Distinguish and get educated on biological warfare is lesson one. Proposition two relates to intelligence. We need to do things differently in the military in this regard. We need to put more emphasis on human intelligence because we cannot to such a great job from satellite observation. We need to understand the pharmaceutical industry better and connect up in a variety of ways with what is happening out there. We need to think about sting operations. We need to be involved in more undercover and perceptual kind of work in order to understand what is happening. We need to connect better with the scientific community in this regard. It is not common fare within the DoD world.

In the civilian world, one of the big problems with biological threat in that it is not clear that most of your agencies would recognize it if they banged into it. We recently had an example where a State highway patrol system is reported to have encountered ricin. Ricin, as you know, is an extremely potent toxin. It can be distributed in a variety of ways. Its most notorious method of use was in the 1978 assassination of a Bulgarian defector by stabbing him with an umbrella in the thigh. He died, as I recollect, 3 days later. Ricin is extraordinarily potent, not at the kinds of levels I have described for anthrax, but the amount you could hold in a small packet of the kind that has got your Equal in it, or whatever you put in your coffee, would kill several hundred people. We know that this was found by a highway patrol, and they had no idea what they had. Extremely potent when absorbed through the skin or otherwise, it was carried around in the back of a police car, as I understand it, for a couple of days before it was brought in and a fairly elaborate chain led to its analysis. Recently, this last year in Minnesota, there was a case in which ricin was produced and brought into a local police department in a coffee can: seven-tenths of a gram. The FBI chemist who analyzed it said that he thought it would kill 129 people. Ricin is extraordinarily easily produced from castor oil beans; five will produce a potent amount. The recipe for production is well known. If you have not had occasion to see it, *Soldier of Fortune* magazine will provide you that formula. We tracked it down to see how it was patented. The formula is available from the U.S. Patent Office; it was filed by the United States Army in 1962. It is not difficult to produce ricin. In Minnesota it was brought into the police department, and again, with no sense whatsoever of what they had. Some rudimentary education in that regard is important, particularly for those of you are dealing all the time with the drug world and where, as I have suggested, the possibility of this arising is not insignificant. The State highway patrol case was associated with a warfare between two drug gangs. One of them was producing this as a weapon to be used in that context. You need also, I think, in the intelligence area to get closer to the laws of distribution, to be engaged in the use of informants. Because, in fact, the objects themselves are extraordinarily difficult to detect and may often not be realized when you do detect them.

A third area that we have concentrated on depends on the notion of trying to develop a small collection of people who have particular expertise and familiarity in this area. Small may mean big to the rest of you, but in the Department of Defense, for example, we are now in the process of standing off a Marine expeditionary unit, some 2,000 people, in 1996 that will be especially equipped to deal with biological warfare. We are giving them the key technology, the education, and a panel of experts to work with so that they will know what they are dealing with in these contingencies. We will have a force specially prepared when these contingencies arise. I would suggest that model is applicable in the civilian mode as well.

To make a big problem smaller, some small steps are useful. It is very difficult to educate to a substantial measure your entire force, whether you are a police department, a fire department, or part of FEMA. It is very difficult to educate everybody with respect to this. If you can give some people some general education and then some obvious center of expertise, and you have a crisis response unit that has some deeper level of expertise, some substantial knowledge proportionate to your resources and that circumstance and that group in turn

connects to people like the Marine expedition, the Centers for Disease Control, and the expertise generally available and know where to look; that is a very big help.

Fourth, we are quite concentrated within the Department of Defense on the notion that we need to establish a linkage between civilian resources and military resources in this arena. You are going to hear later in the course of this conference from one of the great figures in this field, Josh Lederberg, who has done a lot to educate a lot of people with respect to these risks. Josh's main theme is that the natural risks from biological agents, from viruses, are substantial. That creates a number of normally arising problems before you ever get to the issues of terrorism and of military use. I think that is a sound proposition, but it underscores that we need a normal network of medical contingencies: medical experts for dealing with the contingencies of this sort, that is to say, outbreaks even akin to the influenza epidemic in the wake of World War I. From the standpoint of national security concerns, we need to encourage that network. We need to do it in terms of political talk, in terms of investment of funds, and it is warranted simply on its own public health terms. In the end it is also the crucial resource in terms of its analytic capabilities for dealing with issues associated with terrorism and military threats.

This brings me to an underlying point that I think is very important. One of the reasons I am concerned with biological warfare is that I believe that the notion of a division of national security between what happens abroad and what happens at home is not likely to continue to be viable in the 21st century. It is a wonderful but unfortunately anachronistic notion that national defense is what the Defense Department does and it happens off our shores, and that domestic things are what a variety of domestic agencies do and that is different. I think there is a substantial risk that terrorists or states may in the future target our civilian populations and try to hold them hostage. If that is the circumstance, this bifurcation breaks down. One of the implications of the breakdown in that bifurcation is that we need to be aware of the resources we all present for one another. The Department of Defense is not, it seems to me, appropriately going to get into searches and seizures and arrests. Quite apart from the existence of legislation that forbids that, it is not appropriate business for us. We do have very substantial resources in this area and conversely so does the Public Health System and so does the Centers for Disease Control, etc. We need to connect to those across that bridge. A major suggestion for you all is that you need to be aware of the public health resources and the national security resources that are available for you because, in a variety of ways, we need to work together in regard to that.

Now the Defense program includes a number of other areas of activity. Antibiotic efforts, for example, are a very substantial potential area of investment because we know we can in some instances achieve prophylaxis by creating antibiotic cocktails that people can take in advance of situations where they may be threatened, and we know that in a number of circumstances antibiotics provide a measure of cure. We also know that vaccination offers some substantial opportunities against some agents for us. We are investing in that with our standby production capacities. We have major efforts ongoing with respect to the development of detector technology in a number of different areas. Several of us are arguing for larger investments in that regard. We are likely to get considerable clarity over the course of the next 12 months in a competition that is going to be conducted within the Department of

Defense about which areas of detection we want particularly to invest in. We are also looking at training mechanisms, at alternative suits, and decontaminants with a particular emphasis on masking, and what might be done in that regard because the threat is essentially an aerosol threat. Those are things that provide a backdrop to your efforts. The first items that I have mentioned are the ones that I think you can most readily emulate because I do not imagine most of you are in circumstances to invest in detector equipment and the like.

Bottom line, it is a big problem. It is a problem that I think we can substantially diminish by some organized work precisely because relatively little organized work has been invested in it except by a lonely few like Admiral Frank Young and Josh Lederberg toiling over a number of years. I believe we have got rich potential in this area. None of that potential offers a cure-all. This is an area in which the offense is too cheap, too prevalent, too potent for us to ever be entirely comfortable. But we can diminish the temptation to use that offense if we are smart about it. We can manage the consequences associated with that offense a lot better through some fairly rudimentary steps. Seems to me absolutely imperative to undertake those steps, and I must say I applaud this conference and all of you for your interest because the area that is the most difficult to deal with is the civilian side. The fact that so many of you are concerned with dealing with it is a source of really great encouragement.

Question: Sir, you mentioned about the Marine Corps being given the lead in this and in the *Baltimore Sun* and the *Washington Post* after the Tokyo incident quoted administrative sources as stating that the 6th Army EOD units would be given the lead in domestic response. Are the Marine Corps resources going to be focused on external or internal activities?

Answer: The Marine Corps efforts are focused on external activity. A Marine expeditionary unit deploys for 6 months, in this instance, probably to the Mediterranean area and maybe an area in the Middle East, and is focused abroad. Our hope is that generating some areas of expertise will have spillover effects for a lot of other activities in other circumstances. There is no reason why the panel of experts cannot be available to others should the contingency arise. We are going to test a variety of kinds of equipment; the lessons from that obviously will be used by others. I did not mean to imply that the Marine circumstance is exclusive; there are a number of other entities doing this. One of the things that I have preached is that we do not need to be assigned a lead in order to do something. This is true for you all as well, and, moreover, the uncertainties in this area are substantial enough that it is quite good, I think, for a number of different entities to go down somewhat different paths. No one has a monopoly here on how to do this, and we may find that the way the Marines do it may be different from the way the Army does it, etc. That is fine. We will experiment a bit and see where we go. I believe in sort of market competition even in the context of the Pentagon.

Question: I am sure often the first person to see a biological threat would be an emergency room nurse or someone like that who may not recognize something that is new. Will there be provision to put information out as to what kind of threat might be contemplated by different terrorist groups?

Answer: Yes. I am sure that as we grow more sophisticated, we will increase this, but even now we have within the military and within a variety of security agencies a threat list of the nature of the threats that are abroad. We are also, I think, going to be investing more in the intelligence efforts to clarify that. So I think we will get better at that.

Question: One of the distinctions that was made was between naturally occurring incidents and manmade incidents. Another distinction could be made, I guess, as to defending against warfare and defending against terrorism. Based on the relative merits of different agents' chemical, biological, nuclear and so forth, does that in your mind increase the importance of knowing and defending against biological agent's unique role in terrorism?

Answer: Yes. I am concerned about the role of biological agents, particularly in the terrorist context, because I think they lend themselves more readily than nuclear and chemical to non-state activity. On top of that there is a significant risk associated with the dispersion and the ease of access as the ricin examples suggest. You referred to Admiral Young's reference to the natural background and the naturally occurring events on one hand and terrorist events and warfare events on the other. Let me note, for example, it underscores the ambiguity point. When the Russians in Sverdlovskaya had the accident in which anthrax was released in what we now know to be a biological weapons laboratory, there was a debate for 15 years about whether people who had died in Sverdlovskaya died from anthrax. A lot of very smart, well-known people took different sides to that debate. It did not really get resolved definitively until some 15 years after the event when Professor Matthew Meselson, a Harvard biochemist known to many of you, who had argued that this was not necessarily a weapons related event, went out and did a wonderful epidemiological analysis of the pattern of the deaths and showed that they were all downwind from the factory and that this was not explainable as a natural phenomenon. Very compelling evidence but it took 15 years and going back later and doing the research. So there is this ambiguity here that frequently makes it difficult to discern what is going on.

Question: It was interesting to note that given DoD policy, DoD chose not to be totally immunized. I was wondering if you will be immunized, and, secondly do you think that we could make those vaccines that we are developing available to the civilian world.

Answer: The question of immunization is one that is important for the MU to come to grips with, along with the questions that we are debating now. The question for us is exactly what you say. Should they immunize as a matter of course against those known risks out there where in fact we have the vaccines. As you well know, we do not have vaccines against a number of risks. I am going to be interested to see how they resolve that as part of the inter-action between the panel of experts and the leadership in the MU. There are some obvious tradeoffs. In terms of the access for the civilian world, my own sense is that at a minimum we need standby vaccination capacity, and how far we go down that path I have remained fairly agnostic about. There are people who are deeply involved in that debate, the Defense Acquisition Board and others, who have more expertise than I do. My push, in general, has been to try to focus on the areas that are least developed with respect to biological warfare. The vaccination debate is the most richly ongoing debate.

Question: I am posted to the U.S. Embassy in Tokyo, and I have dealt with the medical after-effects of the Tokyo and Matsumoto gas attacks. I would like to bring up two things. One, I think it is necessary to take an even longer-term look than you are mentioning now. For example, when the team from the CDC came out right after the Tokyo attack, they felt that one of the most important things that could be done would be to set up a patient registry, because the secondary and tertiary effects might not become known for 15 or 20 years. I am finding out that there is no basis to establish something like this in the international arena, and I think we have to work on trying to do bilateral or multilateral agreements to try to work on something like this.

Another thing that I feel is that each incident has Andy Warhol's 15 seconds of fame or 15 minutes of fame, and I notice that once Oklahoma City occurred, the attention given to the gas attacks in Tokyo dropped precipitously and really has not risen even after last week's attempts. There is the feeling that (1) domestic is more important than international no matter what the nature of the situation and that you have to deal with the latest, and you do not see it in a time perspective of things. I think this is an area where people involved in the field are going to have change their mode of thinking.

Answer: I think those are real good points. On the second, the question of the enduring significance of these things, there is no question, when an incident occurs, there is a lot of excitement. We get Congressional and press attention and the like, and then it has a rather short half life. I think there is a lot in this context that suggests that we need to take advantage of those spikes of interest. We also obviously need to continue working during the intervals. I would note that there is a kind of collective consciousness, and over time society becomes educated to those risks. You have heard about a Presidential Decision Directive. We are getting a lot more attention; these issues are crystallizing in a variety of ways. Witness this conference. In that sense, if I look at where we are now as compared with where we were 2 years ago, I would say, "Gee, we really are making progress here." Should it be faster and more substantial? Yes.

Let me note before passing from the Japanese context that I was very pleased to see on the program here in the present session that you have got some discussion of the Matsumoto incident as well as the Tokyo incident. In my comments, I suggested one of the problems for you all is intelligence: knowing what you have; recognizing it when you see it even, not just the more difficult case; being able to predict it. It is striking that in June of 1994 we had this incident in Matsumoto that you are going to hear about, and yet the sensitivity that arose for that, even from the Japanese, was less than clearly in the retrospect it should have been. I think that there are a number of lessons in the incident that are suggestive about how, hopefully, we would like to see things be different in the future. On your long-term point, I agree with you. I think it is a very good idea on the register. We are also finding, if you look at the public health today over the effects on American military who deployed in Desert Storm, the long-term health effects of that. I think we are beginning to come to the realization that as a practical matter, in major incidents, whether they are unplanned attacks like we experienced in Tokyo or whether there are circumstances that are structured like Desert Storm, we need a

public health baseline that is more richly established, and we need follow-up as a routine matter, because we are going to have these kinds of problems.

Admiral Young: It gives me great pleasure to introduce to you a friend, colleague, and outstanding law enforcement individual. Mr. John O'Neill has unique capabilities and qualifications and is responsible for the crisis management in the United States under the lead effort of the Federal Bureau of Investigation of the Department of Justice. I want you to know that we are indeed fortunate as a nation to have someone as qualified as John to lead these very important efforts.

1.8 Terrorism Briefing

Special Supervisory Agent John P. O'Neill
Chief, Counterterrorism Section
Federal Bureau of Investigation HQ

One of the difficulties for me today is that I have to give this as an unclassified briefing because there are a number of people here who do not have security clearances, but there is a need for me to try to do a little bit more. Normally we will give Top Secret or Secret briefings, or we will speak to public groups; there is a great variance between what we can talk about between those two fields. What I am going to try to do, and bear with me today, is marry up somewhere between the middle there and not cross the line where we are talking about classified material but try to give you an overview or some sense of both the terrorist threat, our role in the FBI, and then what we are doing particularly with the biochem arena.

Although we are going to talk about biochem terrorist activities in this conference, I thought it would at least be good to give you a real quick background of the FBI and our role in the terrorism arena. Back in 1982, former President Ronald Reagan designated the FBI as the lead agency within the Federal Government to deal with terrorism in the United States. That role was then expanded again with the passage of some laws by Congress in 1984 and 1986 which gave the FBI what we refer to as extraterritorial jurisdiction. What that means is that if there are American interests or American citizens that are attacked overseas by terrorist groups, the FBI, by statute, will travel overseas under the lead of the United States Department of State, and with the concurrence of the host government, and conduct a criminal investigation in furtherance of protecting our citizens and protecting our interests overseas. So we not only operate domestically, we have an international role as well. The FBI defines terrorism as an act or threat of violence in furtherance of a political or a social agenda. It is a pretty broad definition. It is not someone who is operating out of particular hatred in a domestic-type love triangle. It is not someone that is doing an act for profit, but it generally involves some type of political or social agenda.

We categorize our terrorism breakdown in the FBI under two sides. We talk about domestic terrorism, although most of us look at that to say that is terrorism within the United States as opposed to terrorists attacks against U.S. interests internationally. The way the FBI views domestic terrorism is those groups or those individuals who are indigenous to the United

States and who are not controlled in any way by a foreign power. International terrorism we define as those groups or organizations or individuals who are controlled by a foreign power or who come from a foreign land to affect us through terrorist acts domestically or internationally.

Some examples of our international work in the last few months. These past 5 months have been an extraordinarily busy time in the terrorism business. We had on March 8 two U.S. consulate employees killed in a machine gun attack in Karachi, Pakistan. Some of the reasons that you are all here today is the March 20 subway attack by the Aum Shinrikyo in Tokyo; the bus bomb attack on the West Bank in Israel, which killed an American citizen; the plane that blew up in Romania but was later found not to be involved in a terrorist act; and American hostages that are held or have been taken at various locations around the world in the past 5 months. These are some examples of the type of work that we are confronted with on an international basis, and we deploy FBI personnel throughout the world to handle these particular cases.

The FBI's mission in the terrorism field is relatively simple to define, but it is very difficult to execute. Our first role is to prevent acts of terrorism before they occur. We do that through a robust intelligence base, through technical coverage, through human intelligence, and through surveillance activities. The second role that we have in attempting to prevent terrorist activities is to try to strengthen the soft targets of terrorists. We try to work with a program that we call our Key Asset Program to work with the more logical targets of terrorism. Public transportation systems, the banking industry, our utilities, our phone lines, our computers, our financial institutions, nuclear facilities, and our civilian aircraft population are all areas that we are working hard and continue to need to strengthen our role in while working with the public and private sector security personnel to strengthen these soft targets.

The second point of the FBI's mission is that should an incident occur, we have a swift, a robust, a determined reaction to that incident, to identify the suspects, to collect physical evidence, to seek prosecution, and to obtain justice. One of the areas that we are proud of is our kind of internal motto of "You can run but you cannot hide." Terrorist acts that have been committed against Americans in the seventies and eighties continue to be actively investigated on a daily basis by FBI agents around the world. You can take a look at our more recent successes, an individual by the name of Ramzi Ahmed Yousef. He was one of the leaders of the group that was responsible for the explosion in February of 1993 at the World Trade Center in New York City. Along with the other intelligence services of the U.S. Government, we tracked Ramzi Yousef around the world. He was extraordinarily active in January in the Philippines. His attempted plots included an attempt of assassination of the Pope and an attempt and planned assassination against the President of the United States. There was the bombing in December of 1994 of a Philippine airliner flight that originated in Manila, stopped in Sabu, and was en route to Tokyo when a bomb exploded killing one Japanese national and injuring several others. He also had a plan to bring down a number of U.S. air carriers all at the same time. The estimates of the plans ranged from 5 to 11 U.S. air carriers that were to be brought down through a series of bombs placed to explode simultaneously. The plan included that those bombs on those aircraft would explode over U.S. cities to maximize the damage.

This is a theme that we see around the world in terrorism. Terrorists are no longer interested in small terrorist activities; they are much more interested in bringing down large numbers of casualties. The plans for the World Trade Center were much more grandiose. The bomb in the World Trade Center was approximately a 1,200-pound bomb. Had the bomb in Oklahoma City, which was approximately a 5,000-pound bomb, been used in the World Trade Center, it would have brought down one or both towers. Ramzi Yousef's plan for the World Trade Center was to bring down one tower and topple it into the second tower. We look at the plans for the Aum Shinrikyo and the amount of damage that they had planned for and the chemicals that they had stockpiled, planning for enormous casualties. We look at the events of Oklahoma City, and we see massive numbers of casualties. No longer are terrorists interested in small, non-newsworthy events that will only get a small amount of play. In terms of getting significant news coverage, the Oklahoma City bombing is probably the only event in the last year that has knocked the O.J. Simpson trial off of the daily coverage of CNN. Another individual that we were successful at returning was an individual by the name of Hakim Murad from the Philippines. He also was involved with Ramzi Yousef in his activities.

As a result of the World Trade Center bombing, we have taken a strong look and have found that we not only have to deal with the state sponsors of terrorism that we have been active with over the past several years: Iran, Iraq, Sudan, Libya, Syria, North Korea, and Cuba – but we also have to worry about a new phenomenon of transnational terrorists. These are individuals who are engaged in extremist or radical religious fundamentalism. When we look at organizations like Ramzi Yousef's and his activities, we see South Africans, we see Kuwaitis, we see Palestinians, we see Pakistanis, all operating together. It is much more complicated now. No longer can we turn to the military as the result of a terrorist act and take action against the state through a bombing run or other covert activity. A lot of the organizations that are operating internationally are part of this transnational movement.

Since the World Trade Center, we have identified what we believe is a significant and extensive infrastructure of terrorist groups within the United States. The vast majority of their activities currently involve fund-raising in support of operations in Israel, Northern Ireland, and other locations around the world. Several of these organizations are actively opposed to the Middle East peace process and are raising funds in furtherance of both humanitarian and terrorist activities. On the domestic terrorism side we see an increase in our indigenous terrorist problems. We break these down into a number of different categories. There are the left-wing groups, which are interested in revolution or the overthrow of our government; examples would be the United Freedom Front, the Macho Terrorists, or the Puerto Rican Armed Forces of National Liberation. There are right-wing groups which are characterized as anti-Semitic with a philosophy of racism. They advocate white supremacy; examples of these groups would be the Aryan Nation or Brotherhood and The Order. We have a new series of groups that have increased their activities. These would be specialized interest groups such as abortion activities. It is interesting to note that in the abortion arena alone, in tracking incidents of butyric acid attacks, bombings, arson, and shootings since January of 1990 to the present, there have been over 400 incidents of terrorist-type activities against abortion clinics and abortion facilities in the United States. There are also animal rights groups and environmentalist groups who are engaged in acts of violence in furtherance of their political or social agenda.

Coupled with all of these activities in the United States, we are responsible for managing from a security standpoint most of the special events that occur, and this again, is our attempt to strengthen those soft targets of terrorism. Take a look at what we are confronted with in the imminent future. We are looking at the upcoming 50th anniversary of the United Nations in New York with the heads of most of the nations of the world visiting New York at that time to include people like Hasni Mubarak, who was the subject of an assassination attempt. We not only look at the international threat to a conference such as the 50th anniversary of the United Nations, but we also have great concerns about our domestic terrorism threat. The militia groups that are springing up around the country that are engaged in criminal activity. It is not to say that all militia groups are actively investigated by the FBI. We are only interested in those that are engaged in criminal activity. But they have certainly expressed a hatred for the United Nations and a one-world concept. I can give you examples. At the time of the Oklahoma City bombing, most of us remember those vivid photographs 2 or 3 days after of the burnt out shell of the Murrah Federal Building in Oklahoma City and someone with a great degree of patriotism placing an American flag to fly from the roof of the bombed-out building. A day or two later, someone placed the blue Oklahoma State flag at the top of the Federal building. In one of the interviews that was conducted of a militia member, the agent spent approximately 1 hour trying to convince this individual that it was not the United Nations flag flying from the top of the building, but that it was the State of Oklahoma's flag. We have had situations where militia members believed that Russian tanks that were housed at a National Guard Armory were there along with Russian troops to take over the United States as part of a UN mission. We have engaged through our behavioral science components a lot of the militia groups around the country in an outreach program, trying to convince them that if they see blue bonneted soldiers dropping out of the sky from Belgium to call the FBI because we will stand there and protect them.

Other special events that are upcoming that we have concerns about: the visit of the Pope to New York City; to Newark, New Jersey; and to Baltimore. The Pope is an extraordinarily high-level target, particularly for the radical extremist religious groups in the world. We track text where these groups quote from the Crusades. They quote letters from 1099 where the Crusaders would write to the Pope and tell him that they had rode through the blood of the Muslims. This is a lot of rhetoric that we see in terms of hatred for the Pope. We also factor in that this is the first visit to the United States by the Pope since the Vatican has reestablished diplomatic relations with Israel, another significant event. When we look at the events that have effected this radical extremist movement, we look at events such as the fall of the Shah of Iran and the Islamic revolution in Iran. We look at the killing of Anwar Sadat in 1981 by Islamic extremists. We look at a number of events such as the defeat by the Mujahadin rebels in Afghanistan of a very large standing army, the Soviet army. We look at the events that are ongoing in Bosnia; the events that are ongoing in Chechnya; events that are ongoing in Algeria and Sudan and Kashmir and other places around the world, all of which is effecting this radical extremist movement.

Other special events management that we have concerns about would include the Democratic and Republican conventions that are upcoming, and, of course, the 1996 Olympics in Atlanta. The Olympics pose particular problems for us because, unlike our last Olympics that we sponsored in Los Angeles, there is a significant difference in size in the law

enforcement components. The Los Angeles Police Department in 1984 was approximately 7,500 members; the Atlanta Police Department today is 1,900 sworn personnel. There are more countries, there are more athletes, there are more events scheduled. Another thing that you may find of interest is that the main Olympic Village in Atlanta is housed at Georgia Tech, and in the center of the Olympic Village, where the athletes will be housed, is a working nuclear reactor which is presenting unique problems for us that we continue to deal with in our planning posture.

Let us talk for a moment about biological and chemical. Several people have been working a very long and hard time at trying to convince our government and their State and local governments that this is something that we need to plan for. I salute people like Frank Young, Bill Clark, Jim Genovese, the military personnel, Phil Wilcox from the Department of State, and certainly all of our brethren at State and local levels in the fire departments, emergency response teams, State planning, National Guard, and those people that have had the vision for a much longer period of time than some of the rest of us of a need to address this problem and deal with it effectively. I congratulate you on this conference, and I congratulate you on finally getting some recognition that this is a problem that we will be dealing with for years to come.

The FBI has been designated, at least at the Federal level, to be the lead crisis management agency. We have had for a long period of time standing response plans for our crisis management capabilities. They were recently updated in February of 1995 rather fortuitously before the Tokyo attacks. Since the Tokyo attack we have continued to go back and rework those plans. We issued new plans to all of our field offices in June of 1995 taking the lessons learned from Tokyo, incorporating them, and trying to incorporate our other Federal consequence management components into our plan. We have had a few past experiences. We had the Bagwanishi group in Oregon who were engaged in a botulism poisoning episode several years ago. We had a quasi-militia group called the Patriots Council out of Minneapolis that was engaged; two individuals were convicted. They were the first people convicted under the new Federal biological/chemical terrorism act of a ricin attempt at poisoning. We obviously had the Aum Shinrikyo concerns here in the United States because of their office in New York City. We have received threatening letters of biological/chemical attacks; we have received phone calls; we have received videotapes; we have received just about everything you can imagine in terms of threats and hoaxes since the subway attacks; and certainly we have had bubonic plague mailed in the mail from certain research facilities to try to address.

We have a plan to deal with these crises prior to their occurring: if we have a threat, if we have an extortion, if we have some indication in advance of the event taking place. One of the cornerstones of that is our threat assessment component, which is in essence a grouping of our experts in the military, EPA, Public Health Service, and FEMA. There are also behavioral science people at Quantico who not only engage in how a message is written or how words are spoken, but also do linguistics and other behavioral-type analyses. Our FBI laboratory is a player in this threat assessment, as is the counterterrorism section of the FBI. For example, without going into great detail, we had a threat not too long ago where we received a videotape that indicated that there would be a threat to a large public facility over a

particularly difficult period of time when that facility was expecting large crowds. The videotape had been received by the facility on the West Coast, and we mustered up. I think we called those of you in the room who got the call at about 1:00 in the morning for the first assessment. What we had at that point in time was merely the representation from security personnel of this facility who had viewed the videotape. FBI personnel had not yet reviewed it. We had an initial assessment. We had a second assessment once FBI personnel were able to visually review this tape and describe it over the telephone to our teleconference group in the threat assessment. We placed the videotape on an airplane with an FBI agent, and flew it back from the West Coast. We mustered again early the next morning when the plane came in, and after all of that we had the assessment that there was enough there for us to dispatch our personnel to the scene and to take certain actions. Fortunately, nothing happened. But we took it as a very serious threat, and a number of components of our government responded.

Once we decide to do that deployment, we have a couple of options. We can send a group of experts to do an initial analysis, or we can send a full response team, which would include all of the components that the FBI would send, along with various components of consequence management. We deal with crisis on a regular basis in all of our field offices, and we work very closely with our police counterparts at the local, county, and State levels. We deal with our Federal law enforcement counterparts on a regular or routine level. We have a Joint Command Center that we normally operate for any type of crisis, which would include additional side components for intelligence and an operation side that includes tactical/technical. Then we would have other components as necessary. We have hostage rescue capabilities at Quantico. A 100-person hostage rescue team, which is our premiere anti-terrorist team, has been trained and suited to deal in the chemical or biological environment or a hostile environment. They can clear rooms and make it safe to do the law enforcement aspects before we call on our military colleagues to come in and help us deal with this particular biological or chemical crisis. If there is an area that we need to strengthen it is the area of dealing with our State and local counterparts, dealing with fire, rescue, and recovery. The FBI traditionally does not have a regular routine training exercise with these groups; it is left on an ad hoc basis depending on crises that the local field office has handled in the past. This is an area that we will attempt to strengthen, and I ask all of you in that area to work with us in strengthening it. We certainly have worked with arson units in the past, but we rarely work, train, and exercise with those components at the State and local levels.

We have updated our plans as of June of this year. We have given instructions at the end of June to all of our Special Agents in Charge (SAC) of our 56 field offices to review these new plans, and to contact all of the significant players that are listed in these plans. This includes all of the Federal agencies that I have mentioned, and the military components, along with the representatives at the State and local levels who would be responsible for both crisis and consequence management. We have instructed that those SACs contact their colleagues within the next 2-month period. Those of you in this industry or this business who do not get contacted, please give us a call or contact your local FBI field office. We have asked that at least a command post exercise be conducted within the next 2 months including everybody in a tabletop-type exercise and that within a 6-month period an actual field training exercise take place through the FBI's offices in conjunction with the consequence management personnel to try to exercise these plans and to ensure that these plans are coordinated with your standing

command post structure. We all have excellent command post structures; it is a question of how do we integrate in a crisis.

The second situation would be if we were operating in a crisis mode trying to manage this crisis, trying to prevent the release of a biological or chemical agent from occurring, and we reached a threshold where we could not stop it from happening or it was actually happening. The crisis management phase would begin and the SAC, the senior On-Scene Commander for the Federal Government, would shift that responsibility to FEMA. FEMA would then be the Federal coordinating official on scene. The FBI would continue its law enforcement role of collection and preservation of evidence and the attempt at identification of subjects and their apprehension, but that would become a secondary role to the consequence management phase. I usually get asked how that pass-off would occur and what the rules are for it. Because that is such difficult period of time and each individual situation is different, what we have structured is that in our command center would not just be the law enforcement components that are dealing with the crisis at the front end, but the consequence management leadership would be in that command post with us. If we have a bad guy who says, "I want to move this chemical or biological device four blocks from where I am sitting now as part of my negotiations," the SAC can look to his colleagues to give him the best advice. "Should I let him move that device four blocks away? Is that putting the public at a greater risk by moving it four blocks away or keeping it where it is?" Also, his decision as to when to make the pass needs to be an informed decision, so we seek the input of our FEMA, Public Health, and State and local colleagues who can tell us and advise the SAC as to at what point this pass-off needs to be made. So it is a combined decision. We run into situations, such as Oklahoma City, where we have a consequence from a terrorist act where we are really playing both roles at the same time. You have enormous consequence management that is going on, and you have a law enforcement role and that will always take a back seat to rescue operations, to safety, to public health. It may be debated vigorously in a command post structure, but the instructions from our headquarters are that it should always take a back seat.

One of the things I think that we need to strengthen is our ability to get the message out as to the complexities of trying to deal with these crises for those of you who deal with it from a military standpoint where there is not a testimony, there is not that much public review, or those of you in fire and rescue operations on the consequence management side. There are enormous consequences from actions that are taken by people on the consequence management side and we need to work towards a better understanding. We need to help educate you to these problems, and we need to be better educated as to the consequence management role that is so critical that you play. For example, every time something is documented in a case that has an impact criminally, we have the problem of all of that material being discoverable. So all of the Federal officials that may be there – the military personnel, the people from FEMA who are taking notes, who are taking certain actions – all of this material is part of the government's record, and all of that material is subject to disclosure if we bring a case to trial; it is all discoverable. Any of you that have channel surfed and saw at least a portion of the O.J. Simpson trial have at least some sense of what cross-examination can be. We run into problems if we are doing a joint investigation and an ATF agent interviews somebody and an FBI agent interviews somebody; it can be the same interview. But if they both produce a document that records the results of that testimony, you will have the ATF agent hearing or

interpreting something that was said that will be different from the way the FBI agent said it. You can have two FBI agents that do it. We overcome that because we do one composite result of the interview. But someone will say that it was a spotted tie, and the other person will say that it was a striped tie. Although that is an insignificant discrepancy for most of us, it is those things that make defense attorneys get cases turned out because they impeach a witness; they discredit him because of the inconsistencies that may be presented. So I would caution you all and ask you to work with us in this area to learn a little bit of the problems that we confront from a law enforcement or testimonial standpoint. All of those acts that take place – the recording of information, the acts that you take at a crime scene – all potentially will fall into the hands of defense counsel, will be disclosed, and will be the subject of debate. If FEMA does an after-action report of an incident and it puts forth certain facts, those facts are discoverable in a criminal case or potentially discoverable.

Let me leave you with our feelings. We want to work much closer with you on these actions. Certainly the events of recent history – the World Trade Center bombing, the Oklahoma City bombing, the gas attacks – all point the FBI in a direction that we have great robust relationships with most of our colleagues at the law enforcement level, at the State police level, at the county sheriffs level, at the local police department level. We feel that we need to strengthen those relationships in the consequence management side because of the size and the concerns that we have as to terrorist activities. All of you have worked very hard, and we need to continue to work hard in planning, exercising, and preparing. If there is a positive side to these critical events that have occurred, it is that we will strengthen our resolve against terrorist activity. The work that you do, the work that you have done, is an enormously high calling. You are unsung heroes. You do this every day, and I salute you for that work and your diligence over the years at trying to bring this subject matter to the forefront and for putting our government and our citizens in a posture where they are protected. Most of them do not know how well they are protected, but some of us fear that they are not protected enough.

Question: Could you comment on the legal authority for handling possession of small quantities of biological and chemical agents by private citizens?

Answer: There is not a well-founded series of statutes that protect, at least at the Federal level, a lot of those chemical and biological agents. There are individual statutes that are broken down, there are certain State statutes that prohibit it. I must comment, also, that our government does not have one statute per se that makes terrorism illegal. There is no law that says if you are a terrorist, that is illegal, or if you commit a terrorist act, that is illegal. For example, the shipment of biological agents across State lines per se is not a crime. Look at the situation that we have with the bubonic plague being shipped. The charges that the FBI were able to bring were mail fraud charges: white-collar-crime type charges in the establishment of the account, the false use of a VISA credit card, those kinds of things. At the Federal level, we take laws that are on the books for other types of criminal activity. We are trying to strengthen that through legislation. Consider, for example, the World Trade Center bombing, to digress for a second. Had the players in the World Trade Center not had significant cross-state transportation in a lot of their activities – the Ryder truck was rented in New Jersey and

transported into New York State; the chemicals were mixed in New Jersey and brought into New York – if a lot of that activity had not occurred, the number of charges that we were able to bring against those individuals, who have been convicted and all sentenced to 240 years each for that bombing, would not have been there for us. So it is a unique situation. We are trying to strengthen those laws, but there is no law that says that terrorism is a crime in the United States.

Admiral Young: If, as you are probably aware, when we had the tampering outbreaks a number of years ago, we had the FBI, the Public Health Service, and the Food and Drug Administration working very closely together. The passing of the antitampering law, which I believe is $100,000 penalty and 5 years incarceration, was a great help in our mutual efforts.

Question: I was intrigued when you said you thought that certain environmental groups were involved in terrorism. Would you expand on that?

Answer: There are a number of environmental groups in the Northwest region, logging. We see a lot of explosions and a lot of terrorist-type activities in the Northwest portion of the United States. Animal rights groups are another example. In 1993 we had nine incendiary devices go off in department stores in Chicago by people against the fur trade. There are a number of people that we deal with in these particular arenas. There are Sikh terrorists, there are all types of people whom we find in the United States that we have a grave concern about. The threat of terrorism in the United States is real and one only needs to look at those special events that are upcoming. One only needs to look at anniversary dates such as the Oklahoma City bombing. One only needs to take a look at the end of the terrorism, what we call our terror-stop investigation, which trial is ongoing in New York City. We estimate that trial will end in 3 to 4 weeks. That is the trial of Abdul Rockman, the Blind Sheik. We are very concerned about retaliatory acts should the Blind Sheik be convicted.

Question: I was most heartened to hear you talk about moving the relationship beyond the law enforcement community into other parts of consequence management. I think it is important to recognize that many of the resources in the medical and health world are in the private sector. Therefore, it takes us a lot of time to gin up and get those people there to respond to thousands of casualties. The earlier we can figure out how to work together and still keep the jobs of crisis management and security people who need to know as soon as possible. Get private sector involved early with the crisis management sector.

Answer: I do not know that we have done a really good job in that. The first "big one," so to speak, was the World Trade Center. The capabilities of the New York City Police Department, Fire Department, their Emergency Service personnel, are spectacular and you rely on them. I think we, like the rest of the citizenry, know that you are there. We know that you do a great job and that you can respond, but we haven't exercised with you because up until recently there's never really been that need. The relationships with fire departments have normally been through arson investigations or individual bombings. We have not prepared for mass casualties except with some special events management stuff that we have

done in the past. Our normal liaison is with the police departments, and we need to do a better job.

Admiral Young: It is now my pleasure to introduce to you Robert Walpole who is currently Deputy Director of the Non-Proliferation Center at the Central Intelligence Agency. He is a long-standing warrior in the non-proliferation field; he has worked very closely with the Presidential assistant who spoke earlier and has now, as I understand it, been relegated to bugs and gas. So we look forward to hearing your comments, particularly as the intelligence community looks at these particular issues of ill-used technology.

1.9 Concerns Over Chemical and Biological Dual Use Technology

Robert D. Walpole
Deputy Director, Non-Proliferation Center
Central Intelligence Agency

The comment about bugs and gas: he was asking what I had done before. I said I was Deputy Assistant Secretary to Dick Clark for arms control and had spent most of my career staying away from bugs and gas, but when I came over to the Non-Proliferation Center, I got saddled with that one.

Obviously, you are aware that proliferation of weapons of mass destruction and particularly chemical and biological weapons is of significant concern to the United States and others in the world. There are over 20 countries that have programs to develop, or have developed, weapons of mass destruction, and at least half of these are in the Middle East or South Asia. Several of these countries – and I am going to focus a lot of my remarks on three of these: Iran, Iraq, and Libya – have particularly aggressive programs. In addition, these are countries that support terrorist groups or terrorist activity abroad. For example, throughout 1994 Tripoli demonstrated a willingness to support groups that oppose Western interests through terrorist activity.

Let me mention a little bit about what we mean by non-proliferation because I think that fits into this and actually makes this particular forum very important. There are four aspects to the U.S. strategy supporting non-proliferation efforts. The first is preventing acquisition; the second is rolling back existing programs or parts of those programs; the third is deterring use; and the fourth is adapting military forces or emergency assets to deal with the consequences of the developing weapons. Traditionally, people thought of non-proliferation as the first aspect, preventing acquisition. But, obviously, if you are not successful in preventing others from acquiring the materials, the technology, or the weapons themselves, you have got to deal with the second phase or the second aspect, which is trying to roll back that program. Now if you are not successful in doing that, and you have to assume that you are not going to get 100 percent of that, you want to try to deter use of those systems. You can see that, as Dick Clark said, in PDD 39 they talk about deterring the use of these systems. Finally, you have got to deal with the consequences. Even traditionally there, we saw a lot of focus on adapting the military forces to deal with them; in other words, break things and kill people.

We have not seen the focus that we are seeing here in dealing with the consequences of terrorist use or some other type of use of these system, and that is part of what we see as our job in the intelligence community: to supply the information to all the groups that are responsible for that aspect in this regard.

The United States has assigned an extremely high-level priority to this issue to detect, prevent, defeat, and manage the consequences of any terrorist use of nuclear, biological, chemical materials, weapons, what have you. If the terrorist wants to create a weapon of mass destruction, a chemical or biological weapon are very likely candidates because they are relatively cheap, and, depending on which type of weapon you are looking at, do not necessarily require a lot of material. The use of the nerve gas in the Japanese attacks heightened peoples' concerns there. While this conference focuses on chemical/biological, I do not think we want to completely ignore the potential terrorist use of something to do with nuclear. Let us focus, for example, on radiological weapons. Putting radiological material into an air ventilation system can mess up a building a lot, and depending on the terrorists' intent, could be something they would select. In the speakers' room, I was listening to a discussion between some of the speakers about whether it would be chemical or biological that a terrorist group would go after. I think it really depends on the intent they are trying to accomplish. Most of the people in this room know a whole lot more about bugs and gas than I do, but, obviously, the effects that biological weapons or biological agents would have are different from those of chemical; different in terms of timing, different in terms of how much, different in terms of release mechanisms, and those are going to affect what the terrorist wants to get out of it. So I am not sure that you can simply dismiss one type of weapon or another. We are certainly not going to on the intelligence side.

Let me talk about these three countries I mentioned earlier. I am going to break it down in terms of their chemical weapons programs and their biological weapons programs. Both Libya and Iraq have refused to sign the chemical weapons convention (CWC). Iran has signed it but has not shown any interest in taking efforts to get rid of their programs. Let me focus on Iran first. It began the production of chemical weapons agents because of what was going on in the Iran/Iraq war. They have a chemical weapons production facility in the vicinity of Tehran. They are capable of producing mustard, blood agents, and choking agents and have a stockpile of bombs and artillery shells with these agents. Now, as I said before, even though they signed the CWC, they are continuing efforts to maintain their infrastructure to produce these weapons. They are spending large sums of money on long-term capital improvements to the infrastructure and it appears they intend to maintain this capability well into the future. Iraq began its production of chemical agents in the early 1980s and at the onset of the Persian War had several thousand tons of CW agents. These agents included mustard, tabun, sarin, and GF. UN inspectors and documents provided by the Iraqis indicate that they had aerial bombs, artillery shells, artillery rockets, and missile warheads filled with the chemical agents. Iraq's chemical weapons infrastructure was severely damaged during the Gulf War, but most of the hard-to-find equipment was hidden away. If the UN sanctions are relaxed, and the inspectors are gone, it would not take long to reconstitute that capability. Libya has a CW agent production facility called Farmer 150 at Rabta, and although that is currently inactive, the facility produced 100 metric tons of the agent, mostly mustard and smaller amounts of sarin in the 1980s. The complex was built with a lot of foreign assistance,

including assistance from Germany, Japan, and Thailand. Support facilities of the Rabta complex include a metal fabrication for making missile warheads, bombs, and artillery shells. Some are possibly for CW purposes. Since 1990, Tripoli has concentrated on a new project, an underground CW facility near Tarhunah. Excavation began in 1992, and the new project is now near completion. It is in the configuration of the Rabta facility and the same Libyan purchasing officers that were involved with the Rabta plant area now are working on duplicating the equipment orders for this new Tarhunah facility.

Let me shift to biological weapons. Many developing countries see biological weapons, like chemical weapons, as having a two-fold utility. It is the poor man's nuclear weapon, and it is a relatively cheap force multiplier to compensate for their shortcomings in conventional arsenals. For the intelligence community, one of the biggest challenges of biological, and this is also true of chemical as well, is the dual use nature of the equipment involved. Biological warfare agents can be easily manufactured. A bacterial agent, for example, can be grown in a kitchen laboratory. Only small amounts are needed, and that would make that ideal for certain terrorist types of use. The manufacturer of vaccines for human or veterinary use can camouflage the production of large quantities of BW agents. Biotechnology equipment employed by modern pharmaceutical programs, or laboratories associated with modern hospitals, can be used to foster a BW program. A supply of standard biological, agents for covert sabotage or attacks against broad-area targets would be relatively easy to produce and disseminate using commercially available equipment such as agricultural sprayers. Iran has had a biological weapons program since the early 1980s. The program is currently in the late stages of what we would call research and development. It has a technical infrastructure to support such a program, and it conducts top-notch legitimate biomedical research at various institutes. Because Iran can also produce a number of veterinary and human vaccines, it also has the capability to produce biological warfare agents. Iraq recently disclosed its biological weapon program to Rolf Ekeus who is chairman of the United Nations Special Commission on Iraq. This came after 4 years of continuous denial that they even had an offensive biological weapon program. In the past they only acknowledged that they were doing some research on countermeasures. Iraq has maintained an aggressive BW program prior to the Gulf War. Although Operation Desert Storm did significant damage to the programs, enough production components in this case were hidden so that they are able to refabricate this capability. In fact, biological production is one that is so easy to camouflage and hide that you can hide it right under the noses of the inspectors and claim that it is totally something else. Because it does not require a large infrastructure, they could begin producing biological agents in a matter of weeks after inspectors of the UN sanctions leaving.

Libya's offensive BW program is in the early research and development stage and has been largely unsuccessful because of an inadequate biotechnical foundation and the slow rate of acquisition of foreign technology. A number of Libyan universities are being used for basic research of common BW agents. The Libya BW program is an example of what I mentioned earlier, the four aspects of non-proliferation. If we can prevent the foreign acquisition, slow down the program acquisition there, then you can get a better handle on that particular program and focus on the other two countries in areas of rollback such as the inspectors were doing in eliminating the CW munitions. Deter use may or may not apply in these particular

cases and then we turn to this latter category of adapting U.S. military forces or emergency assets to deal with the consequences of the use.

Because we see all four of these aspects playing in the non-proliferation arena, we see that whatever we can do to slow down the programs in these various countries will also help address, at least indirectly, some of the terrorist problem. We can reduce the incentives for these states to develop such systems, prevent nationals from acquiring the technology necessary to support the types of systems or the missiles to deliver them, and establish binding agreements in which states can express their non-proliferation views and standards. Although this is one that we have to watch as well. Two of the countries I mentioned did not sign the CWC, and the one that did does not appear to be taking any steps to roll back its programs. Some of the things that we are trying to do in the Non-Proliferation Center to address this is to get better access so that we are able to better assess the plans and intentions of these countries. One of the biggest struggles we have had in the arms control side of the BW and the CW arena is defensive versus offensive programs. These conventions allow development of countermeasures and allow defensive use research and development. But the offensive side is relatively hard to prove unless you have information on the plans and intentions of the countries. That said, if we do not start to collect that information and a better assessment of those plans and intentions, we are not able to work with policy makers in such a way as to be effective in preventing the acquisition. We had an example with the Tarhunah facility I mentioned earlier, where Iraq was trying to get excavation equipment from a Western European country. We were using intelligence to work with that Western ally to convince them that Iraq was not going to use this excavation equipment for tunnels for water uses; irrigation, what have you. It was actually going to use this equipment for this Tarhunah facility. Understanding the plans and intentions is critical in getting those kinds of things turned around. We want to be able to identify the programs early on and identify the networks that the countries are using to acquire the technology and the materials necessary to foster the program. As an intelligence community, we want to support diplomatic, law enforcement, and military efforts to counter these programs; provide direct support to multilateral initiatives and security regimes; and overcome denial and deception practices set up by proliferators to conceal their programs. This is one where if someone is concealing a program as pharmaceutical research, as bio pesticide production, that makes it extremely difficult, and you have got to have very intrusive information to be able to pin down the problem. We are working closely with the Counterterrorism Center, which is another Center housed at CIA, to make sure that any efforts that terrorists would make to try to acquire weapons of mass destruction or the technology that would support those weapons of mass destruction, can be detected early on and addressed before we have to get into the later aspects of non-proliferation I described before.

The Non-Proliferation Center is relatively small, slightly over 100 people. Obviously a group that small is not going to be able to tackle this problem alone. In fact, it was by design to be small. The whole intent is for the Non-Proliferation Center to be able to draw on the expertise, talents, and capabilities of CIA, DIA, the State Department's Bureau of Intelligence and Research, NSA, Department of Energy's Intelligence Unit, and the intelligence units of all the military services. By doing that, there is a force multiplier there and we can draw on a lot of expertise. There is no way you could put it all into one center.

You would have hundreds, perhaps thousands of people, in one center. Our job is primarily one of orchestration and coordination and making sure that we are not duplicating efforts while leaving other efforts uncovered.

Question: You gave us this little book on the CIA on what to do in a chemical/ biological incident, and in there it says "call 911. " We are dealing on a big scale. We are getting the same information from intelligence bases on, for example, the 48,000 tons of chemicals that are over in the former Soviet Union. Has there been any indication of small quantities of that coming over here? I think the first responder does have the need to know that kind of information if it is available.

Does it really say "call 911?" That was a joke, right?

No, it really does.

We are going to change that phone number.

That is why we are working with the Counterterrorism Center.

Answer: In answer to the question. The focus has been the transfer or the attempted transfer of nuclear materials out of Russia. We have implemented collection and analytical efforts to try to tackle the very problem you have discussed because if it has not happened yet, we figure it is only a matter of time before someone starts trying to get at that as well. We want to make sure that we have a handle on that. So I guess the answer is not a very clear no, but I am not aware of any that has been reported like we have in the nuclear smuggling problem.

Question: In the Sunday *New York Times*, I ran into a page that was a disclaimer that they were sponsoring anything or making any type of biological weapon, and I was wondering what your read was on their reason for taking out the page in the *New York Times* in which they essentially invited a dialogue with the U.S.

Answer: I did not see that. I do not know what the rationale would be other than – and I guess it is certainly not unexpected – continued disinformation on these fronts. Even for example, with the Iraqi's admission of Rolf Ekeus that they had an offensive BW program after 4 years of denial. It was, "We did not have any plans for using of all this stuff we have been stockpiling." It does not always make sense.

Question: Could you explain the work that you are doing with the Counterterrorism Center, in a little more detail, regarding chem/bio.

Answer: In the Non-Proliferation Center our concern is, as I explained before, in addressing these four aspects. What we want to do is make sure that we are doing as aggressive an approach in terms of collection and analysis as possible to detect very early on efforts by terrorist groups to try to acquire technology related to weapons of mass destruction.

We can then pass the information on to the appropriate people, whether it is CTC, FBI, or whatever, that we have got some indication that this particular terrorist group seems to be interested in doing something in that vein. Once we start to get that moving, I think we are going to see other activities spread from that. It is starting. This gets to the point I made earlier about transfer networks and getting a real handle on the networks people are using.

Admiral Young: I would like to now invite Lieutenant Colonel Ed Eitzen to the podium to focus on the overview of human exposure and the clinical aspects of a variety of infectious agents. Ed has been one of the leaders in providing course work and instruction both to DoD and to the civilian sector in the whole field of infectious agents as applied to biological diseases in general and in biological warfare in particular.

1.10 Biological Agents – Overview (Human Exposure/Clinical Aspects)

LTC Edward Eitzen, M.D., U.S. Army
U.S. Army Medical Research Institute of Infectious Diseases

My task today is to acquaint the people in the audience, and many of you are already acquainted with the subject matter, with the medical effects of biological agents (visual 1, page 1-47). You heard Special Agent O'Neill mention several of the agents that I am going to talk about this morning and this afternoon already. The really surprising thing is that none of these have yet been used on a large scale. After I show you some of this material, you will understand why I feel that way.

Biological warfare is defined as the intentional use of microorganisms or toxins derived from living organisms to produce death or disease in humans, animals, or plants (visual 2, page 1-47). We have to start out with the definition. One of the things that is important about this definition is to note that the agents have to come from a living organism. If we start talking about a synthesized toxin, then that, in our mind becomes a chemical agent; it is not what we consider to be a biological threat agent.

The agents that we talk about fall into three basic categories. The first is bacteria. Bacteria can vary in size and in shape; they can be spherical or rod shaped; they can be very different from each other. Some types of bacteria have the capability of forming spores, and spores are a much hardier form of bacteria. One example is anthrax. They are able to have a longer shelf life and withstand environmental stresses for a longer period of time. That is a favorable aspect of bacteria, making them better biological threat agents. They can cause disease by two mechanisms: either by direct invasion of parts of our bodies or by producing toxins themselves. Some bacteria produce their disease mainly by elaborating toxins which then cause the medical effects. The good thing about bacteria, although this is come into question in recent years, is that most of them respond quite well to antibiotic therapy, so we have some ways to treat infections caused by these particular agents.

Viruses are the simplest type of microorganism. They are either pieces of DNA or RNA, nucleocapsid, protein-coated material. They are generally much smaller than bacteria,

and they can also vary somewhat in size. Unlike bacteria, they require a host cell to do their dirty work. They have to have an interaction with the host cell in order to grow, multiply, and cause their effects. The diseases that they produce are sometimes treatable by antiviral agents – although we do not have as many of those as we do antibacterial drugs – or by use of immune serum globulins.

Toxins are products of living organisms which produce adverse clinical effects on humans and other animals and, potentially, even on plants. They are different from chemical agents in that they are manmade. They are also not volatile and that is one of the key differences between toxins and chemical threat agents. Once they are deposited in the environment, they do not tend to cause a persistent hazard as some of the chemical agents do. Intoxications from these agents often will respond to specific antitoxins or antibodies.

These bacteria, viruses, or toxins can be used in a number of ways by an aggressor. They can be used as a strategic weapon by a state against our country; that threat seems to have lessened in the last few years (visual 3, page 1-47). They could be used as a tactical weapon, although they are not a very good tactical weapon because they take a long time usually to cause their adverse effects. They can be used as a terrorist weapon. Of these three types of use, probably the greatest threat at this point is the terrorist use of biological agents (visual 4, page 1-47).

What are the characteristics of these agents that make them good terrorist weapons or potentially good terrorist weapons (visual 16, page 1-49)? They can be dispersed by aerosol. These are very small particle aerosols in the range of 1 to 5 microns in size. They are so small that they are not visible. A cloud of agent could be floating through this facility right now, and we would not even know it. They are solid, odorless, and tasteless. They are relatively inexpensive to produce, and they may be unpredictable because they are dependent on weather conditions. The wind can shift. This may be one reason why terrorists would choose not to use biological agents. The technology for their delivery is very simple and readily available. They could be used from just about any conveyance; a sprayer could be attached to an airplane, a boat, or a car. They could be used in a civilian setting without much of a signature. The user could tailor the choice of agent to fit his needs. The choice of agent may be different if he wants to strike a building or a certain governmental agency. Or the agent might be another type of agent if he wants to cause more wide-scale damage by using an agent as an open-air weapon. They can be used in combination with other agents. You might have an attack where mixed chemical and biological agents are used to confuse the people on the receiving end and confuse personnel responding to the attack. These have very large-area coverage capabilities; under the right weather conditions, potentially in the range of hundreds of kilometers or miles is possible. They can create fear, terror, and panic in the receiving population. That is one of the terrorist's greatest aims when he chooses a weapon to use.

When we think about biological agents, we also think about them in terms of, "Is this a lethal agent or is it an incapacitating agent?" There are many that are lethal, that can cause death, including some of the ones that you see on the left side of this slide (visual 14, page 1-49): anthrax, botulinum toxins, tularemia, yersinia pestis (the causative organism of plague), smallpox, or ricin. There are also incapacitating agents which generally do not cause

death but can cause a great deal of illness. Even if the agent is not lethal, it may produce the aims that the terrorist is after. If you do not remember anything else I say today, I would like you to remember this slide (visual 21, page 1-50). If you look at the last line on this slide, this is a hypothetical release of anthrax from an airplane, 50 kilograms of agent along a 2-kilometer line upwind of a major population center of 500,000 people. The downwind reach of the agent is considerably greater than 20 kilometers. The number of people who might die, unprotected people in that area, would be in the range of 100,000 over the first 3 days, and the number of people who would be incapacitated over that period of time would be well over 100,000. Most of the people in the incapacitated column because anthrax has such a high mortality rate, would be likely to move into the dead column. What you are looking at is an agent that, if it is disseminated by an airplane, may not even be known until the first casualties start to occur 2 or 3 days later; you may have half the people in that city of 500,000 people dead within a week. That is a fairly sobering thought and makes us have pause in the military (visual 22, page 1-50). I think it should make the civilian community also take pause when considering the possible use of this agent as a terrorist weapon (visual 24, page 1-50).

As you already know, there are people out there who know about this threat. There is an incident that occurred back in March of 1993 when a gentlemen, and I use the term loosely, walked into the dining room of a home in Fairfax, VA, just down the road and threw a vial of amber-colored liquid into an ashtray in the center of the table, breaking the vial and spattering the contents around the table on many of his neighbors. As he did this, he said, "This is anthrax. You're all going to die." Well, that kind of got their attention. The police and the HAZMAT teams were called in and about 30 to 40 individuals who either had been exposed or exposed to someone who had been exposed were presented to the emergency department of Fairfax Hospital. We got a call out at USAMRIID in the middle of the night saying (1) could we tell them if this really was anthrax and (2) could we help them manage these patients. We said, "Yes, we can do both of those things." It turned out that this was a vial of ginseng oil. It turned out to be a hoax. But the point was driven home by the response to even this very small-scale incident. There was a great deal of fear and not really panic, but very close to that, in the local environment and in the hospital (visual 23, page 1-50). It taught us a lesson that a larger-scale incident would be even more likely to cause a bigger uproar. There are people out there who are aware of the agents that could be threats.

What are the routes of exposure for humans? Primarily, we talk about inhalation because inhalation is more likely to be the way that large numbers of people would be exposed through the use of some sort of a spray device. To a lesser extent, we talk about oral or dermal exposures. Aerosols are probably the most significant route of exposure for these weapons. They are invisible, small particulate clouds. The droplets that are less than 5 microns. The reason they are engineered by an adversary to be that size is because if they are much bigger than 5 microns, they either settle out of the air onto the ground or they are taken out of the air stream by the upper airway protective mechanisms in our nose and throat. If they are smaller than 5 microns, they go straight into the lung, straight into the small air pockets where we breathe. Then they are picked up in the lung and do the damage in our systems. Most of the aerosols of the agents that we are going to talk about produce the same disease when they are taken in through the lung as they do when they are ingested or otherwise contracted. There are a couple of exceptions to that which I will mention.

This is a spray device that is available commercially. It is an agricultural sprayer that can be used to spray about anything. This device can be bought off the shelf, and attached to an airplane. I will show you this slide to show you that this thing has 62 nozzles which produce a particle size in the range of 2 to 6 microns. That is perfect for biological agents. There are no controls on the sales of such sprayers because they are sold widely for use in agriculture.

The oral route is also potentially significant. Someone could contaminate our food or water supplies with toxins or other agents, and it does represent somewhat of a hazard. It would have to be done right, however, because when you are trying to contaminate a water supply, if you go close to the sources, like in a small volume, say a building water supply or a water tank, then you could potentially put enough toxin in to cause adverse effects, to cause the problem that the terrorist is trying to produce. However, most of the toxins, if they are put in a reservoir, would be so much diluted or potentially inactivated by chlorination methods that they would not represent a great hazard. So the terrorist would have to know what he is doing in order to use the oral route as a route of exposure. There have been times when the oral route has been used already historically. We know about the salmonella incident where terrorists put salmonella on a salad bar up in the Northwest and caused a number of people to become ill with that bacteria. Of course, you do not have to get that from a terrorist; you can get that from one of the food handlers. It can happen. Generally, oral is a lesser important route of exposure.

Dermal is also a possible route of exposures. You could potentially put bacteria, viruses, or toxins on someone's skin and deliver them in that regard, but most of these things do not penetrate intact skin very well. Our skin is an excellent barrier against most infections and intoxications. However, if you have abraded skin, if you already have an abrasion and someone puts one of these agents into the environment, then you do have a potential locus of infection. Anthrax, for instance, can cause cutaneous disease which, if not treated properly, can go on to systemic disease. Also, the conjunctivae of the eye is a potential route of exposure. In thinking about protecting individuals who might be exposed to these agents, we not only think about protecting the respiratory tract, but we also think about protecting the eyes as well.

The interdermal route, or the intentional injection of a biological agent into someone, is also possible, and this had been done in the past (visual 6, page 1-47). Georgi Markov who was a Bulgarian defector in London back in the late seventies was a victim of this little platinum iridium pellet the size of the head of a pin which was injected into him by means of an umbrella device while he was standing at a bus stop. He died several days later from ricin poisoning. The ricin was in these little wells in this little pellet that was injected into his body. It was later shown that the Bulgarian government was implicated in this attack which killed Georgi Markov. So that is possible, too, although really only useful as a small number of assassination-type weapons.

With that as sort of a backdrop, how do we prevent disease in people who are exposed to biological or potentially exposed to biological agents? There are four major ways that we can prevent people from becoming ill if they are exposed, or potentially exposed; there is

physical protection, decontamination to prevent others from being exposed, and vaccines and other drugs which may prevent the symptoms of the biological exposure. Physical protection is very important, especially for first responders to an incident (visual 26, page 1-51). You would have to prevent exposure of the respiratory tract and also the mucus membranes, including the conjunctivae, by use of a full-face respirator. The currently fielded chemical masks that the Army has are effective against these agents if they are worn at the time of the attack and if they are properly fitted. Those are two very big ifs. Surgical masks are not effective, generally, due to difficulty obtaining an adequate seal. Decontamination may be important, especially if the casualties are very close to the site of dissemination. If you are far away from the site of dissemination, you are not likely to have very much residual agent on your skin or clothes. This is the Army's chemical suit. It is cut off at the top, but he is wearing the Army protective mask along with the MOP gear and this is pretty effective. You can see that this is pretty cumbersome. I mean, you cannot do a whole lot in this. We have other types of suits that we use that are better in terms of being able to do your job. These suits do what they need to do in such an environment and yet allow you to be a little more comfortable and capable. You will see some of those suits on Thursday afternoon when you see our Air Medical Isolation team in the demonstrations. You do not need that level of protection. Generally, all you need is to protect your respiratory tract, your nose, and eyes. This type of commercial mask, filtered respirator, in combination with eye protection would be a very adequate protection against most biological agents.

Decontamination for biological agents is fairly simple: soap and water works against most stuff. If soap and water are not adequate, then diluted chlorine bleach is certainly adequate against almost all of the agents with very few exceptions. You can take Chlorox and dilute 1 to 10 and apply it to skin. That is safe for skin, and it decontaminates just about any agent that we know of. There are commercially available decon solutions like EXPOR which are also good against most of the agents.

The third leg is vaccines. We also have a number of vaccines that are very effective against many of these agents. The problem is that in the terrorist scenario, most of our civilian populations are not going to be vaccinated against things like anthrax and botulinum toxin. We are left then with medical management after exposure, which is not the optimum but still quite possible.

Prophylaxis and treatment should always be viewed with biological agents as a secondary measure behind physical protection. Because any agent, if it is in high enough concentration, can overwhelm a vaccine or can overwhelm our body's immune systems. You have to think in terms of multilayered protection as opposed to using one mode of protection or treatment.

If we are not vaccinated and we are exposed, there are good ways to prevent illness even after the fact, even after the first casualties have occurred, because many of these agents have variable incubation periods. So you may see your first casualties early, but if you jump on the rest of the exposed people using drugs, antibiotics, for example, or other post-exposure means, then you may mitigate some of the medical effects of the attack. Anthrax is a good

example. We can use antibiotics like ciprofloxacin or doxycycline (visuals 35 and 36, page 1-52) post-exposure to prevent occurrence of symptoms or to decrease the level of symptoms if symptoms have already begun to occur. At a certain point we get to where the patient is already too sick. Then we are behind the eight ball, but generally we can help in that regard.

Let us talk very briefly in the next 5 minutes before lunch break about anthrax, which is probably the prototype biological agent. I am going too show you a little bit about anthrax, then we are going to break for lunch (visual 29, page 1-51). We are going to come back and talk about some of the toxins that can cause biological effects.

Anthrax is normally a disease of animals. The epidemiology of the disease is it primarily occurs in animals. Humans are only infected as they come in contact with infected animals or animal products. The reservoir is in the soil, generally, and animals become exposed in that way. Anthrax is a problem throughout the world. It is not just a problem in the countries listed here; it is even a problem in certain parts of the United States in the animal population. It is out there, it is all over the place. Wool Sorters disease, which is inhalation anthrax and the one we worry about most, is quite rare in nature. It very rarely occurs in occupational workers who handle animal hides that are contaminated with anthrax spores. When a person is infected by anthrax by the inhalation route, generally person-to-person transmission does not occur. So we are not so much worried about the patient with anthrax giving someone else the disease unless it is by body fluids that are handled improperly. Anthrax was blamed in 1979 for the Soviet deaths that occurred in Sverdlovskaya. This was an incident which occurred in a military facility in Sverdlovskaya. For years our intelligence community said that this was a release of anthrax from a military facility. Many people in the civilian community said, "Oh no, no, this was a natural epidemic that occurred from ingestion of animal products." Back in 1992, Mr. Yeltsin finally admitted that yes, in fact, this was an accidental release in a military research facility and about 42 people died of inhalation anthrax in this town in Russia. What makes anthrax a good BW agent (visuals 27 and 28, page 1-51)? It is easy to make in large quantities; it has got a short incubation period and fairly lethal effects, about an 85 percent case fatality rate. The spores are infectious by aerosol; and it does not take that much to cause infection. The mean lethal dose for man is about 8,000 to 20,000 spores, roughly, in that range. That can be as little as one good breath in a fairly concentrated anthrax cloud. So we are not talking about a whole lot of air. Spore concentration near the source can be as high as 100,000 spores per liter. The spores can be very hardy; they are not broken down very easily in the environment, though they are broken down if they are exposed to strong UV light. This is what the organism looks like in its vegetative form. It is a gram positive rod. It also produces some toxins, and that is what produces many of its lethal effects. It has a protective antigen, edema factor which produces a lot of swelling as well as a lethal toxin, and these are probably only some of the toxins that this organism actually produces. It occurs in three clinical forms (visual 30, page 1-51): cutaneous or skin form, gastrointestinal form, and inhalation form. Cutaneous causes most of the endemic or natural cases. It starts out with a small pruritic papule on the skin which is very nondescript, but over the next couple of days it becomes a larger ulcer surrounded by vesicles. Then this third stage occurs which is a necrotic eschar in the center of the lesion, also often surrounded by vesicles or little blebs. There can be some swelling associated with the lesion, and in some cases, a great deal of swelling associated with a cutaneous lesion. That form is fairly treatable

as long as it is treated early with antibiotics. If it is untreated, about 10 to 20 percent of people will die of systemic anthrax, but if it is caught early and treated, it is not usually fatal. Gastrointestinal anthrax is caused by ingestion of contaminated meats or other animal products, and it causes a severe gastroenteritis and bloody diarrhea, effecting the entire GI tract with an eschar like the cutaneous lesion causes. It has, as you might imagine, a fairly high mortality rate: up to 50, sometimes even 100, percent, even with aggressive treatment. The form that we are most worried about has been called pulmonary anthrax. Actually, pulmonary anthrax is a misnomer. This disease does not primarily effect the lung itself. It goes into the lung but it is picked up by our immune system and ends up in our lymph nodes in our mediastinum, the area between our lungs which surrounds our heart and great vessels and other critical organs in the middle of the chest (visual 31, page 1-52). The organisms in this moist environment will then germinate and cause a severe infection, a mediastinitis, in that area of the central chest which then starts to break down the vessel. The heart and the other organs that are there, as you might imagine, have a really high mortality rate. The symptoms of inhalation anthrax initially are very nondescript: 2 to 5 days of malaise, fever, cough, and then abruptly on day 2 or 3, the patients will start getting very sick. They will have shortness of breath, they can have a lack of oxygen and turn blue. Their heart rate will increase, and they will rapidly progress to shock and death. Sometimes they even bleed into the center of their chest with a hemorrhagic mediastinitis. The chest x-ray can be fairly typical in these patients. This shadow in the center of the chest normally is very narrow, and you can normally see the heart very clearly on a chest x-ray. With inhalation anthrax, the mediastinum widens. You get this pronounced widening of this central structure, and that is one of the clinical hallmarks of this disease. Very few things cause that sort of appearance on a chest x-ray.

To give you an idea of how a case might go, here is a lady who worked in a wool mill (visual 32, page 1-52). She was a secretary, and she was not supposed to go into the area where people were exposed to the hides. She did, inadvertently, and on the first day she went to the company doctor saying, "I've got a weakness. I feel a little feverish, chills, have a little bit of a cough." The company doctor, as you might expect, said, "Well, you have got a viral illness, like we all often get." He told her to take Tylenol and come see him the next day if she was not better. The next day she was hospitalized with worsening symptoms, and on day 3 she went into shock and died. On autopsy, she had a hemorrhagic mediastinitis and several other findings consistent with inhalation anthrax (visuals 33 and 34, page 1-52). So it is a very rapidly progressive, severe disease.

To finish up, how do we protect against this disease? We have a good vaccine (visual 35, page 1-52). The anthrax vaccine has been licensed since 1972, and it is made by the Michigan State Department of Public Health. It is demonstrated to be safe and effective both in lab workers and in service men, and the side effects are very minor. The dosage schedule is three doses given over 4 weeks initially, and we know from animal experiments that two doses are probably protective against aerosol exposure 2 weeks after the second dose. The side effects are minor local discomfort and swelling. Less than 1 percent will have a more severe local reaction, and systemic reactions are quite uncommon. There are no long-term sequelae or problems demonstrated as a result of this vaccine. We not only can prophylaxis against this disease, but we can treat it with antibiotics. We also have to add vaccine at the

time we are treating because the disease itself, if it is treated with antibiotics, may not cause natural immunity. So we have to add vaccine to the patient's treatment regimen. This is one of the antibiotics that can be used, ciprofloxacin (visual 36, page 1-52), very effective against this organism. Our troops even carried blister packs of this antibiotic in their protective mask covers in the Gulf because of the threat of the use of anthrax by the Iraqis.

I want to talk a little bit about a couple of the toxins that can be used as biological agents as opposed to the bacteria and the viruses (visual 37, page 1-53). Botulinum is the prototype biological toxin agent. It really is a group of seven related neurotoxins, sera types A to G which are produced by a bacteria clostridium botulinum. The toxins are really very close to the most potent toxins known to man. If you look at any chart of LD 50, they are really at the top of the page (visual 38, page 1-53). They produce their effects at very low dosages. The syndrome they produce is a life-threatening neuromuscular paralysis. The clinical syndrome is known as botulism (visual 39, page 1-53). The mechanism is very interesting. What these toxins do is they are absorbed into the presynaptic nerve terminal, and then once they are absorbed into the presynaptic terminal, they inhibit the release of acetylcholine from that presynapse into the nerve-end space, so there is no action of the acetylcholine on the receptor. It inhibits the impulse and so you get neuromuscular paralysis. This is very different from the situation with nerve agent where you have too much acetylcholine in the synapse because the nerve agent is binding to the enzyme that breaks the acetylcholine down. This is kind of the opposite of nerve agent poisoning. The epidemiology of botulism in nature is that it occurs in four basic types – actually three basic types in nature because inhalation really only occurs either as a lab accident or in a biowarfare-type or terrorist-type setting. Food-borne botulism occurs due to improperly prepared or foods. It usually results in multiple individuals being intoxicated at once, and it usually is caused by types A, B, and E with type A causing the highest mortality. Wound botulism is very rare, it usually occurs with a dirty wound that is not well cared for. Exposed to clostridium botulinum organisms in the environment, the wound becomes infected, and the toxin is elaborated in the wound by the organism. Again, wound botulism is very rare; only a few cases in the last 30 or 40 years. It is caused mainly by types A and B and tends to occur in active young males. Infant botulism has only been recognized since 1975. It is now the most common form of botulism that occurs in this country statistically There are a couple of hundred cases a year, usually from infants who are fed preparations like honey, or something like that, which is contaminated with the organism. The toxin is released in the gut of the infant. The infant's gut cannot break down the organism like an adult's gut can. That is different than food-borne botulism because with adult, food-borne botulism, the toxin is already formed in the food. Then you ingest the preformed toxin and become ill. This is a case of infant botulism. Notice how floppy the baby is, cannot even hold his head up. This is a very characteristic clinical picture. Food-borne botulism, as I said, occurs from improperly canned foods, often vegetables. I do not know why anybody would want to eat this anyway, but I guess somebody did and came down with food-borne botulism. Botulism also tends to occur in Alaskan Eskimo populations from improperly cured meats. This is a case of wound botulism. Again it is from a very poorly cared for wound, usually an open compound fracture where the organism has a chance to get into the wound and cause elaboration of toxin. Clinical features of botulism (visual 40, page 1-53): it is predominantly a motor paralysis. Generally the onset of symptoms occurs around 24 to 36 hours after exposure. The interesting thing about inhalation botulism is that when the

toxin is inhaled, as would occur in a biowarfare attack or a terrorist attack, the onset time which you would expect to be shorter from inhaled toxins turns out in animals to be longer. Usually with experimental animals that inhale bot toxin, the onset time tends to be 3 to 4 days for severe symptoms. That is different from food-borne human cases where what you get is a symmetrical descending flaccid paralysis where the first nerves that are affected are the cranial nerves. The initial symptoms you get involve those nerves. You get things like ptosis of the eyelids, drooping of the eyelids. You get a dilation of the pupils. You get problems with speaking or swallowing. It is sort of a descending syndrome with the last symptoms being the muscular paralysis. Ultimately, if the patient is not supported and treated, you will get respiratory paralysis and death. Inhalation disease is very similar to the food-borne syndrome. On physical examination the patient is alert and oriented. The sensory system is not affected, so this person is becoming paralyzed but is very aware of what is going on. The mucus membranes may be dry and crusted because of the effects on salivation, and the patient may have difficulty speaking and swallowing. The ocular findings are those that I mentioned; ptosis, extraocular muscle paralysis, and sometimes fixed and dilated pupils. On neuro-muscular exam, you see the flaccid paralysis-type syndrome. The deep tendon reflexes are usually intact, and the sensory examination is normal.

This is a teenager. Most of you sitting in the audience will probably say, "Well, that looks like a normal teenager." If some of you have teenage kids, you probably might even think he looks like your child, but this is a case of botulism. Notice the drooping eyelids. This is not out of lack of interest. He cannot raise his eyelids by himself, and this is the telltale picture that gives it away. You can see the tracheotomy tube down below. He is on a ventilator. You see these fixed dilated pupils, crusted lips: very characteristic signs.

Now there are other diseases that can mimic botulism or botulinum intoxication, but these diseases tend to be relatively rare (visual 41, page 1-53): things like myasthenia gravis; Eaton Lambert syndrome, which is a paralysis that is associated with certain types of tumors; Guillain-Barre Syndrome which tends to be an ascending rather than a descending paralysis; or tick paralysis. Some ticks can produce toxins which will produce a very similar syndrome to this. That is one of the few medical types of situations where you can really be a super hero. You go and take the tick off, and the patient's paralytic symptoms will go away. But, again, this is pretty rare and not usually considered. Now it is interesting that I have got nerve agent on here. You are going to say, "You just said that nerve agent was the opposite of botulinum in terms of the pathophysiology." I am not so much talking about the nerve agent. But if you give too much atropine to a nerve agent casualty, if you over atropinize, then you can produce some of the symptoms that are similar to botulinum intoxication.

We have a vaccine that works fairly well against this organism or against this toxin (visual 43, page 1-54): the botulinum toxoid vaccine, pentavalent vaccine. It is still an IND vaccine. In this case IND does not mean improvised nuclear device, it means investigational new drug. This vaccine is investigational still because it really cannot be tested in humans for efficacy. We know from animal studies that it is a very effective vaccine. It has been given to several thousand humans in laboratory-type situations, occupational situations, and has been shown to be very safe and effective. It induces antitoxin levels that correspond to protective levels in animals. The immunization schedule is a three-dose schedule: 0, 2, and 12 weeks

followed by boosters at 1 year. After the 12-week dose, you see protective titers in upwards of 80 to 90 percent of vaccine recipients.

Medical management of botulinum intoxication involves intensive supportive care (visual 42, page 1-53). Before the onset of ICU-type care, there was about a 60 percent mortality rate with botulism cases, endemic cases. However, that has dropped to less than 5 percent with normal good quality ICU-type care. There are antitoxins available for these toxins (visual 44, page 1-54). There is an equine antitoxin that is available from the CDC which is a licensed product, trivalent product. It does work against the three types that it is made for. However, it does have a fairly high incidence of side effects because it is a horse product, and the incidence of anaphylaxis and serum sickness is certainly there. The human product has only been made in very small quantities, and really we should not even consider it as widely available. The Army, during the process of gearing up for Desert Shield and Desert Storm, produced what we call a despeciated equine antitoxin which is good against all seven types of botulinum toxin. By "despeciated" I mean that the antibody was produced in the horses, then harvested from the horses. The FC portion of the antibody was then cleaved off by an enzymatic method, leaving only the fab fragments which bind to the toxin and deactivate it but do not cause the human to recognize this as a horse product. So, theoretically, this product has a much lower incidence of anaphylaxis or serum sickness than the licensed CDC product. This is the Army antitoxin; again, good against all seven sera types of botulinum.

Before we go on to ricin let me say that botulinum antitoxin is good against the toxins that it is made for, but the problem is that you have to get it into the person very early. If you do not get it into the patient before the toxins have been taken up into the nerve terminus, then it is probably too late to help. So you have to treat fairly early with this product.

Ricin is another toxin that we talk about; it is a plant toxin (visual 49, page 1-55). It comes from a plant that grows ubiquitously in the world, the castor bean plant, so it is readily available worldwide to a lot of people. The castor beans look like this. Ingestion of a few of these beans can produce severe symptoms (visual 50, page 1-55). But when you process these beans, the residue of that process of making castor oil is about 5 percent pure ricin toxin. So it is pretty easy to get. As you recall, this was the toxin that was used to kill Georgi Markov with the umbrella gun. It produces its effects because it is cytotoxic. The toxin on any cell that it comes in contact with, if the attendant chain of the toxin is internalized, that is enough to kill the cell. Any cell that this toxin comes in contact with, it will kill. If it is inhaled, it causes a severe necrotizing process of the entire lining of the airway and the lungs. If it is ingested or injected, it causes toxic effects in all the organs that it comes to; the liver, the kidneys, the lung, all the organs that this toxin comes in contact within the body. If it is inhaled, as opposed to if it is ingested or injected, it ultimately causes the same effect which is usually death in an unprotected person. Pathologic features (visual 51, page 1-55): necrotizing lesions of the airway can cause pulmonary edema, and after oral ingestion or IM injection, can cause gastrointestinal hemorrhage, diffuse nephritis, or kidney damage, liver necrosis, splenitis, pulmonary congestion, and ascites.

Ingestion in humans orally also causes severe symptoms. The latent period is about 8 to 10 hours; then you get the nausea, vomiting, abdominal cramps, and severe diarrhea.

Death usually occurs after day 3. You find hemorrhagic processes going on in the mucus membranes, in the gut, and in the intestines. After inhalation, what you might expect to see is fever, chest tightness, and nausea, followed by hypothermia, and, ultimately, pulmonary edema or severe congestion of the lungs and impairment of air exchange because of the fluid in the lungs. Medical management: there is no specific medical therapy. The management is mainly supportive (visual 52, page 1-55), providing good oxygenation, good maintenance of intervascular volume, and good standard ICU-type care. If it is a gastrointestinal exposure, you can use activated charcoal early to try to absorb the toxin before the toxin is absorbed. Charcoal will work if it is given very early.

Question: Very early? What is your timeframe on that?

Probably within the first hour or two, because most of the gut studies have shown that the toxins are ingested within that timeframe. Prophylaxis is really limited to physical protection (visual 53, page 1-55). We do not have a vaccine currently available for human use, but I am happy to tell you that the experimental vaccine that was in advanced development is now being transitioned to phase two testing. Hopefully, in the very near future we are going to have a licensed vaccine against ricin.

Staph enterotoxins are the final toxins I want to mention (visual 45, page 1-54). These are the same toxins that cause staph food poisoning when they are ingested, but when they are inhaled they cause a spectrum of illness that is different from staph enterotoxin ingestion. These are not lethal, but they produce a severe enough illness that they are very usable as a biological weapon. The mechanism of toxicity is very complex. These enterotoxins produce toxicity by a complex interaction with our immune systems. They are what are known as super antigens. They interact with a variety of mechanisms in our immune systems to produce their clinical effects. There is a good *Scientific American* article from a couple of years ago that goes into this in great detail. Clinical features (visual 46, page 1-54): about 3 to 12 hours after inhalation of the toxin you get onset of fever, headache, chills, myalgias, high heart rates, and a non-productive cough. There is a very high fever, 103 to 105 degrees F. The patients have chest pain, they are short of breath, and they are very ill. If they also ingest the toxin when they breath it in, they can have some of the nausea, vomiting, and diarrhea that occurs when staph toxin in ingested. In severe cases (visual 47, page 1-54), they can have pulmonary edema and adult respiratory distress syndrome. Diagnosis really is epidemiologic, seeing this syndrome in a large number of people, rapid progression of signs and symptoms but to a stable clinical state. These people do not usually die. It is a fairly low mortality illness, but they are sick for a couple of weeks. Laboratory findings are not that helpful. We do have a license for these toxins. But the lab findings are really non-specific, and the specific identifying assays are only really available in a research mode. Medical management for this toxin is also supportive. We do not have a specific antitoxin (visual 48, page 1-54), and we do not have a licensed vaccine for this disease yet. There is a vaccine that is being tested in monkeys. It shows some promise, but it is not ready for prime time yet.

To finish up, here are a couple of slides (visuals 55 and 56, page 1-56). It is very important to look at the epidemiologic setting when you are considering a biowarfare or a

terrorist attack with biological agents. Is it a natural epidemic or is it a biowarfare incident? What is the agent or agents? Is it a BW incident or is it an endemic incident? What therapeutic and prophylactic measures can be taken? How do we know it is a biological attack? What are the clues? Some of the clues are large numbers of ill and dying people, high casualty numbers, higher than usual respiratory route of exposure, an unprecedented mortality rate, and the spectrum of disease generally skewed towards more severe cases. Also, unusual or impossible agents for a given geographic area. You know, if you see anthrax in Boston, inhalation anthrax in Boston, in a non-occupational setting, that is a clue that something is going on. Also, multiple simultaneous epidemics or outbreaks of disease or even mixed attacks using different agents, dead animals, identification of delivery vehicles, claims by terrorists or aggressors, or prior intelligence that something is going to occur. This is really not rocket science. This is good, basic epidemiology. It is like this slide says, "And now Edgar's gone, something's going on around here."

What is the impact of BW on the medical care system (visuals 57 and 58, page 1-56)? Terror in the affected population as well as in the healthcare providers. We saw this in the Gulf: overwhelming numbers of casualties and demand for ICU-type care and need for special protection of some of your healthcare providers. These types of situations. What is the danger to the respiratory tract of your healthcare providers (visual 59, page 1-56)? With most the agents, it is not very great. Occasionally with agents like plague or smallpox, you are going to have to upgrade your protection to full respiratory protection. This is very agent dependent. In most cases, barrier nursing is enough to provide protection for your healthcare providers.

So is BW the ultimate weapon? You have heard a lot the last hour about why it might be the things you see on this slide (visual 60, page 1-56). I ask the rhetorical question, "Could it be the ultimate terrorist weapon?" and, in fact, it could be. It produces large numbers of casualties with severe effects. The good news is that we do have some ways to either prevent or treat these casualties once they occur and that these are widely available, at least some of the measure are widely available, even in the civilian community.

I will leave you with the thought that for a large-scale operation against a civilian population, the cost of biological weapons is $1.00 per square kilometer for a terrorist as opposed to $2,000 per square kilometer with conventional weapons; about $800 per square kilometer with nuclear weapons, and $600 for nerve agents. So BW is much less costly and potentially easier to do. I think Colin Powell said it best in 1993 when he was speaking to the Joint Chiefs. He said, "I'm confident that we can defend against chemical warfare. The one that really scares me to death is biological warfare."

Question: I have a question about vaccination. I always heard that with disasters vaccinations do not seem to help because it takes a while before the body develops immunity. Is that still the case with biological warfare?

Answer: In certain cases the answer is yes. Obviously, it is preferable to have the people protected before the incident, but, in terms of a terrorist attack, that is stretching it

quite a bit. However, with an agent like anthrax, the spore load in the lung may be so great that even after 30 days of antibiotic treatment of people who are exposed, they can still come down with clinical illness after the antibiotics are withdrawn. You have to add vaccine to the treatment regimen to engender their bodies' own immunity against the agent so that at the time the antibiotic is withdrawn, they have enough immunity to fight off the residual spores in their lungs. So in certain cases, like with anthrax, that would be part of the post-exposure strategy.

Question: What is the likelihood that a potential enemy could discover a BW agent that we knew nothing about?

Admiral Young: I guess I would enlarge it or modify it: an existing organism through recombinant DNA technology?

Answer: I think Admiral Young's point is probably the more likely of the two. It is much more likely that it would be an existing agent that we know about that has been engineered for resistance or has been selected for resistance against certain antibiotics. I think that although that has been talked about quite a bit, it is a little more difficult than what is within the average terrorist group's capability. I think when you get into the area of DNA recombinant techniques on the level of a state-sponsored BW program similar to the one in the old Soviet Union; in that case, yes, we know that type of work has probably been done. In a terrorist scenario, however, I think we are less likely to face that particular problem than we are in a wartime scenario.

Medical Implications of the Biological Warfare Threat

July 1995
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Chief, Operational Medicine Department
U.S. Army Medical Research Institute
of Infectious Diseases

Visual 1

Definition of Biological Warfare

The use of microorganisms or toxins derived from living organisms to produce death, disease, or toxicity in humans, animals, or plants.

Visual 2

International Biological Warfare Agreements

- **1925 Geneva Protocol**
- **1972 Biological Weapons Convention**

Visual 3

Current Biological Warfare Threats to the United States?

- **Iraq has admitted to working on Anthrax, Botulinum toxin, and Clostridium perfringens**
- **Other Countries**
- **Russian program: potential for proliferation?**
- **Threat of Biological Terrorism**

Visual 4

Differences Between Defensive and Offensive BW Research

In general, defensive programs do not include research programs on:

- **Mass-producing very large quantities of microorganisms**
- **Methods for storing very large quantities**
- **Stabilization in aerosol**
- **Improving virulence**
- **Improving persistence**
- **Methods for dissemination**
- **Weaponization**

Visual 5

History of Biological Warfare

- **14th Century: Use of Plague-infected corpses by Tatar Army at Kaffa**
- **18th Century: British "gifts" of Smallpox-laden blankets to Native Americans**
- **WWII: Infamous Japanese Unit 731**
- **1979: Sverdlovsk Anthrax release incident**
- **Assassinations by injection of ricin in Paris, London, and Tyson's Corner, Virginia**

Visual 6

History of United States Biological Weapons and Biological Defense Programs

- 1943 Weapons program established at Fort Detrick
- 1953 Medical defense program established
- 1969 – 70 Weapons program disestablished; all weapons destroyed
- 1972 Biological Weapons Convention
- 1979 to present: New threats identified
  - Sverdlovsk accident
  - Yellow rain in southeast Asia
  - Iraqi Kurds attacked
  - Biotechnology

Visual 7

Destroyed U.S. Biological Warfare Agents

Lethal Agents

- Bacillus Anthracis
- Botulinum Toxin
- Francisella tularensis

Anticrop Agents

- Wheat stem rust spores
- Rye stem rust spores
- Rice blast spores

Incapacitating Agents

- Brucella suis
- VEE virus
- Q Fever
- Staph Enterotoxin B (SEB)

Visual 8

We Have No Biological Weapons

All biological weapons in the U.S. arsenal were destroyed following National Security Decision 35 (1969) and 44 (1970), in the presence of monitors representing USDA, the Department of Health, Education and Welfare, and the Departments of Natural Resources of the states of Arkansas, Colorado, and Maryland.

Visual 9

Present Concerns for Biological Warfare

- Convention difficult to enforce
- Admission by Iraqis of research in Biological Warfare
- Knowledge of other state-supported programs
- Potential for production and weaponization by developing countries is high
- Potential for production of mass casualties

Visual 10

Department of Defense Does Defensive Biological Research Because:

- Biological weapons are potential threats to the U.S. Armed Forces
- Evidence of noncompliance with the Convention
- Nonverifiable nature of the Convention
- Potential use of BW agents by terrorists
- A defensive program may serve as a deterrent

Visual 11

Biological Defense Research includes products, procedures, and information

- Medical prophylaxis and therapy: vaccines, drugs, and antisera
- Early detection and identification
- Protective clothing and shelter

Visual 12

USAMRIID MISSION
"Research for the Soldier"

Develop strategies, products, information, procedures, and training for medical defense against biological warfare and naturally occurring agents of military importance that require special containment

Visual 13

Agents Often Mentioned in Biowarfare Context

- **Bacteria and Rickettsiae:**
  - **Anthrax spores**
  - **Tularemia**
  - **Plague**
  - **Q Fever**
- **Toxins**
  - **Botulinum toxins**
  - **SEB**
  - **Ricin**
  - **Saxitoxin**
- **Viruses**
  - **Smallpox**
  - **Vee**
  - **Hemorrhagic fevers**

Visual 14

Acquisition of Etiologic Agents

- **Multiple culture collections**
- **Universities**
- **Commercial chemical and biologics supply houses**
- **Foreign laboratories**
- **Field samples of clinical specimens**

Visual 15

Biological Warfare Characteristics

- **Dispersed by aerosols and not visible**
- **Simple technology for delivery readily available (airplane, artillery, boat, car)**
- **Difficult to detect and mass casualties days later may be first signal**
- **Use in military combat zone as well as in terrorism or assassination possible**

Visual 16

Routes of Exposure

- **Inhalation of Aerosols: Point or Line Source**
- **Oral: Contamination of Food or Water**
- **Dermal: Mucous Membranes or Abrasions**
- **Percutaneous: Intentional or Accidental Penetration**

Visual 17

Aerosol Delivery of Biowarfare Agents

- **"Weapons of Mass Destruction"**
- **Dissemination Pattern is predictable: weather less so**
- **Downwind Spread of 1 to 5 micron particles**
- **Particles deposited in terminal bronchioles and alveoli**
- **Only minor amounts in URT or swallowed**
- **Importance of protective mask or respirator**
- **Problem is detection**

Visual 18

Slide showing deposition of smaller particles in lower respiratory tract

Visual 19

Hypothetical Dissemination by Airplane of 50 kg of Agent along a 2 km line Upwind of a Population Center of 500,000*

Agent	Downwind Reach (km)	Dead	Incapaci-tated
Rift Valley Fever	1	400	35,000
Tick-Borne Enceph	1	9,500	35,000
Typhus	5	19,000	85,000
Brucellosis	10	500	100,000
Q Fever	> 20	150	125,000
Tularemia	> 20	30,000	125,000
Anthrax	>> 20	95,000	125,000

*Health Aspects of Chemical and Biological Weapons, WHO, 1970.

Visual 21

Impact of Biological Warfare on the Medical Care System

- **Terror in the affected population and in the medical care system as well**
- **Overwhelming numbers, ICU demands, or special medication needs**
- **Need for protection personnel in medical care, clinical laboratory, and autopsy areas**
- **Problems with handling of remains**

Visual 23

Disease from Aerosolized BW Agents

- **Lethal or incapacitating effects may be sought**
- **Aerosols of some agents produce pulmonary syndromes (plague, Q fever, SEB)**
- **Aerosols of most agents produce typical systemic disease (botulinum toxin, most viral agents)**
- **Person-to-person spread occasionally important (smallpox, pneumonic plague)**
- **Local disease cycles may occur if vector present (plague, VEE)**

Visual 20

Slide showing example from Anthrax modeling project

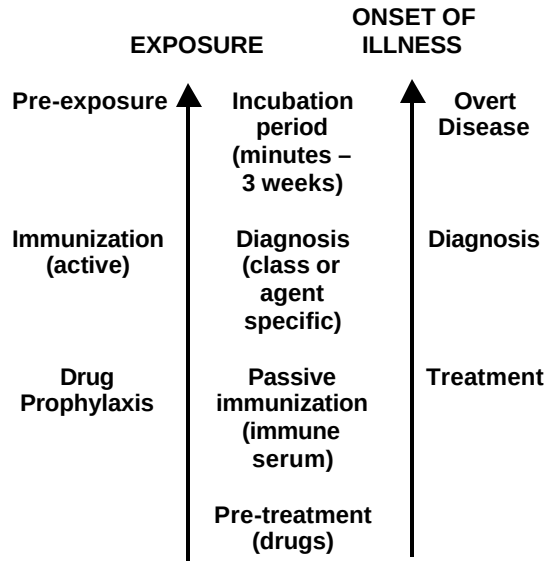
Visual 22

Is BW the Ultimate Weapon?

- **Agents easy to obtain**
- **Relatively easy and inexpensive to produce**
- **Numerous, easily available delivery modes**
- **Disseminated over tremendous areas**
- **From long distances away**
- **Agent clouds are invisible to human eye**
- **Detection is a problem**
- **Great numbers of casualties possible**
- **First sign may be large numbers of dying or ill**
- **May rapidly overwhelm medical resources**
- **Even threat of use would create fear, panic**
- **Potentially an ideal terrorist weapon**
- **Perpetrators could escape days before effects**

Visual 24

Medical Response to BW Threats



Visual 25

Anthrax

- Delivered as spore form of organism
- Can be easily produced from culture
- Small volumes (several grams) contain tens of thousands of human lethal doses
- Can be effectively spread over hundreds of square miles

Visual 27

Some Biological Properties of Bacillus anthracis

- Stability of spores
- Sporulation occurs when vegetative organisms are exposed to air
- Spores may persist for decades in soil and require high temperature or direct exposure to disinfectant for killing
- Spores are infectious when delivered by aerosol

Visual 29

Physical Protection

- Only reliable means of protection
- Present equipment is effective
- Problem is knowing when to put protective mask on
- No protection for civilian populations

Visual 26

Pathogenic Factors: Bacillus Anthracis

- Lethal Factor
- Edema Factor
- Capsule
- Other Virulence Factors

Visual 28

Typical Human Anthrax

- Exposure
  - Endemic: Contact with infected animals, contaminated products (hides, wool, bone meal), mechanical insect vectors
  - Inhalational: Occupational (very rare) or biowarfare attack
- Cutaneous
  - Pruritic papule, vesicle, "charbon" eschar with ring of vesicles
  - Septicemia and death in 5 to 20 percent untreated
- Inhalation
  - Spores carried from alveoli to local lymphatics by macrophages
  - Spores germinate: 2 to 5 days of nonspecific symptoms
  - Then abrupt deterioration with mediastinitis, toxemia, and death
- Gastrointestinal
  - Ingestion of contaminated meat
  - Vomiting, bloody diarrhea, high case fatality rate
- Oropharyngeal

Visual 30

Clinical Features: Inhalation Anthrax

- **Incubation Period 1 to 6 days**
- **Initial Symptoms: Malaise, fever, fatigue, nonproductive cough, chest discomfort**
- **Terminal Phase: Dyspnea, stridor, cyanosis, shock, chest wall edema, meningitis, widened mediastinum with effusion but characteristically no pulmonary infiltrates**

Visual 31

Inhalation Anthrax: 51-year-old Woman in Good Health

Exposure: Worked as a secretary in a wool mill; visited carding room on Day 0.

Day 1: Weakness, chills, nonproductive cough, dull retrosternal chest pain.
Diagnosis: "viral illness"

Day 2: Hospitalized with generalized myalgia abdominal pain, fever to 102 °F,
WBC 13,100
Bilateral wheezes on chest exam
CXR shows obliterated left hemidiaphragm and CP angle; moderate prominence left hilum

Course: Cyanosis develops

Day 3: Shock and death

Autopsy: Hemorrhagic mediastinitis and pleural effusion, acute splenitis

Visual 32

Laboratory Findings in Inhalation Anthrax

- **Positive Blood and CSF cultures**
- **Gram Stains may be positive late in course**
- **Toxemia detectable in serum late in illness**
- **At post-mortem, lymph node and spleen impression smears are positive**

Visual 33

Slide showing Anthrax toxin, CFU/ml, and total WBC versus time in Inhalation Anthrax

Visual 34

Prophylaxis of Inhalation Anthrax

- **Aluminum hydroxide adsorbed vaccine**
- **Doses at 0, 2, 4 weeks**
- **Protective in animal challenges and wool sorters**
- **Ciprofloxacin 500 mg po bid**
- **Doxycycline 100 mg po bid**

  (If confirmed exposure, continue antibiotics for at least 4 weeks during vaccination series)

Visual 35

Treatment of Inhalation Anthrax

- **Ciprofloxacin 1000 mg po then 750 mg po bid or Doxycycline 200 mg IV then 100 mg IV q 12 hrs**
- **Add vaccine if available**
- **Continue antibiotic treatment until at least 3 doses of vaccine given**
- **Intensive supportive care as needed**

Visual 36

Classification of Potential Biothreat Toxins by Mode of Action

Class	Example	Effect on Humans
Ion channel Blocker	saxitoxin (marine toxin)	muscular paralysis resp. arrest, death in minutes
Presynaptic	botulinum (bacterium)	muscular paralysis, resp. arrest, death in hours
Postsynaptic	conotoxin (snail)	muscular paralysis, resp. arrest, death in hours
Protein Synthesis Inhibitors	mycotoxins (yellow rain)	skin blisters, inhalation leads to shock and heart failure
Hybrids	Insulin and fragment of ricin	destruction of Insulin – responsive cells
Membrane active compounds	lysins (snake venom components)	massive tissue destruction

Visual 37

Botulinum Intoxication

Toxin

- **Protein 150,000 MW**
- **Blocks neurotransmission by binding to presynaptic membrane**
- **Dominant effects at cholinergic autonomic sites and neuromuscular junction**
- **Relatively unstable in light**
- **Human lethal dose < 5 µ / kg**

Visual 39

Botulinum Intoxication: Laboratory Diagnosis

- **No routine findings**
- **Toxin detection possible in mouse assay**
- **Antibody formation not usually present**

Visual 41

Lethality of Various Toxins

Toxin	MLD µg / kg Mouse	# Molecules Causing Death	Molecular Weight	Factor Increases Re Botulinum
Botulinum	0.0003	2.00E +07	150,000	1
Tetanus	0.001	8.00E + 07	150,000	4
Diphtheria	0.03	6.00E + 09	60,000	300
Batrachotoxin	2	5.00E + 13	538	2,500,000
Talpoxin	2	6.00E + 11	40,000	30,000
Ricin	3	6.00E + 11	60,000	30,000
Conotoxin	4	4.00E + 13	1,500	2,000,000
Tetrodotoxin	8	3.00E + 14	319	15,000,000
Saxitoxin	9	3.00E + 14	354	15,000,000
Alpha Latrotoxin	10	9.00E + 11	130,000	45,000
Beta Bungarotoxin	14	8.00E + 12	20,000	400,000
Cobrotoxin	75	1.00E + 14	7,000	5,000,000
Curare	500	2.00E + 16	334	1,000,000,000
DFP	1,000	7.00E + 16	184	3,500,000,000
Sodium Cyanide	10,000	2.00E + 18	49	100,000,000,000

Visual 38

Inhalation Botulism

- **First symptoms 18 to 36 hours postexposure**
- **Weakness, lassitude, dizziness**
- **Decreased salivation, dry or sore throat**
- **Diplopia, ptosis, blurred vision, photophobia**
- **Bulbar symptoms: dysarthria, dysphagia, dysphonia**
- **Postural hypotension may be seen**
- **Symmetrical descending flaccid paralysis**
- **Respiratory paralysis terminally**
- **Alert, oriented, with normal sensory exam**

Visual 40

Botulinum Intoxication: Treatment

- **Ventilatory assistance and supportive care have reduced CFR in foodborne cases to < 5 percent.**
- **Use of Botulinum antitoxin may shorten the course, stop progression, and prevent death. The earlier antitoxin is given, the better. Antitoxin may prevent clinical intoxication if given before onset of symptoms.**
- **Recovery may be very prolonged with supportive care only or if antitoxin given late.**

Visual 42

Botulinum Intoxication: Prophylaxis

- Pentavalent toxoid types A through E is available under IND status (protocol)
- Schedule: 0, 2, 12 weeks, then yearly booster
- 80 percent have antibody titer after 3 doses, but levels declined by one year
- After one year booster, 100 percent have detectable antibody
- Local reactions increase with subsequent injections

Visual 43

Botulism Antitoxins

- Despeciated equine heptavalent antitoxin (types A through G) – prepared by cleavage of Fc fragments from horse IgG and leaving F(ab)2 fragments. Currently available under protocol.
- Human pentavalent antitoxin produced by plasmapheresis of toxoid vaccines. Only in very limited quantities as IND product. Should not be considered as available.
- Trivalent equine product currently available from CDC against types A, B, and E.

Visual 44

Staphylococcal Enterotoxin B

- Protein toxin 28,500 molecular weight
- Water soluble
- Relatively stable in air

Visual 45

Clinical Picture in SEB Intoxication

- Initial signs 1 to 6 hours post inhalation
- Abrupt onset of fever, chills, myalgias, headache, and nonproductive cough; WBF and ESR
- Severe dyspnea and retrosternal chest pain
- Nausea and vomiting if toxin swallowed
- Fever may reach 103 to 105 ^{o}F and last 2 to 5 days
- Cough persists 1 to 4 weeks
- RTD in about 2 weeks

Visual 46

SEB Intoxication: Clinical Features

- Neutrophilic Leukocytosis
- Increased parenchymal markings on CXR
- May have hypoxemia and/or pulmonary edema

Visual 47

SEB Intoxication: Prophylaxis and Therapy

- Prophylaxis: No currently available human vaccine; microencapsulated toxoid looks promising in animal studies against high dose aerosol exposure
- Treatment: Will be testing passive antibody as treatment modality soon in animals
- Supportive: Includes treatment of shock and hypoxemia

Visual 48

Ricin

- Glycoprotein toxin from castor beans
- Toxin blocks protein synthesis
- Plant is ubiquitous worldwide
- Fairly easy to produce
- Extreme pulmonary toxicity when inhaled

Visual 49

Ricin – Clinical Features

- Weakness, fever, cough, and hypothermia initially following inhalation
- Followed by hypotension and cardiac arrest
- Death in 36 to 72 hours in rhesus monkeys, sooner with higher dose
- Oral poisonings cause nausea, vomiting, abdominal cramps, severe diarrhea with vascular collapse

Visual 50

Ricin: Pathophysiology

- Necrotizing, suppurative lesions of the entire airway
- Histopathology of airways seen as early as 3 hours post-exposure
- Interstitial pneumonia with alveolar and perivascular edema
- Ingestion causes GI hemorrhage with necrosis of liver, spleen, and kidneys

Visual 51

Ricin – Treatment

- Supportive Care
- Maintenance of intravascular volume
- Pulmonary support
- Charcoal/lavage/catharsis if oral ingestion
- These measures may not be effective

Visual 52

Ricin: Prophylaxis

- Airway protection most effective prevention strategy
- No vaccine or other prophylaxis available yet for human use
- Ricin toxoid looks promising as prophylaxis in animal studies; protects against death and may prevent pulmonary damage

Visual 53

Biological Effectiveness of Disinfectant Groups

- Standard disinfectant concentrations of iodophor or chlorine are effective against almost all classes of agents, including spores
- T2 Mycotoxin requires the addition of 1 Normal Sodium Hydroxide to be inactivated
- Soap and Water works well to wash off most toxins, including mycotoxins

Visual 54

Rapid Diagnosis of BW Casualties

- Epidemiologic pattern
- Suspicious clinical or pathologic findings
- Classical microbiology: Gram stain, impression smears, culture
- Antigen detection: blood, tissues, cultures
- Newer techniques for some agents: PCR

Visual 55

Rapid Identification and Diagnosis

- Capability to detect antigen, antibody, or both for many agents
- Reagents:
  Monoclonal antibodies
  Clonal protein antigens
  Nucleus acid probes
- Methodologies implemented for both threat agents and naturally occurring diseases important in differential identification and diagnosis

Visual 56

Decontamination of Casualties and HCW Protection

- Important to decontaminate exposed patients for protection of health care personnel
- Body fluids are not a risk for toxins
- Anthrax vegetative forms in blood or other body fluids can convert to spores when exposed to air – can cause cutaneous anthrax

Visual 57

Health Care Worker Precautions with Biowarfare Casualties

- Mask/gown/gloves (barrier nursing) provides adequate field expedient protection in most cases
- Upgrade of respiratory protection: If passive primary contamination present, patient has extensive respiratory involvement, or procedures which generate aerosols employed
- Agent dependent
- Special impermeable suits with filtered air not feasible for mass casualty setting

Visual 58

Risks to Medical Personnel

- Residual BW Agent on clothing or skin: Only important near site of dissemination – secondary aerosols not efficiently generated
- Aerosols, droplets, or fomites from infected patient – agent dependent
- Infectious blood – potential hazard in critical care setting or in laboratory
- Cadaver: risks in necropsy, embalming

Visual 59

Summary

- Biological Warfare is a very real threat to U.S. military forces and could also be a potent terrorist weapon employed against civilian targets.
- Massive Casualties could be produced.
- Protective Masks provide respiratory protection.
- Medical defenses are available against several threat agents.
- Suspect a biological attack in setting of mass casualties with a similar clinical syndrome.

Visual 60

Operational Medicine at USAMRIID

- **Department within Medical Division**
- **Interface between USAMRIID and BW Defense "users"**
- **Deployable BW Defense Consultation Capability**
- **BW Defense Education and Training**
- **Assist in Development of Up-to-Date Doctrine**
- **Travel Medicine Service at USAMRIID**
- **Staffing for BW Defense-related Operational Missions**

Visual 61

Preventive Medicine Department Points of Contact

- **LTC Edward Eitzen, MC**
  CPT(P) Julie Pavlin, MC

- **Address:**
  Commander
  U.S. Army Medicine Research Institute of Infectious Diseases (USAMRIID)
  Attn: MCMR-UIE-E
  Fort Detrick
  Frederick, Maryland 21702-5011

- **Phone:**
  301-619-7655, DSN 343-7655,
  FAX 343-2312

Visual 62

Admiral Young: There are experts and there are experts. I have a privilege of introducing one the true experts in the field of biological warfare and the defense thereof. Bill Patrick served as Chief of Product Development Division and subsequently as Plans and Program Officer at USAMRIID. For over a quarter of a century, Bill has been an expert and taught many of us in this field.

1.11 Potential Incident Scenarios

William C. Patrick III
President, BioThreats Assessment

Ladies and gentlemen, we do not think biological warfare and certainly do not think BW terrorism. I have been all over the country carrying two samples of bacillus anthraces, the causative agent of anthrax. There is enough agent here to infect every man, woman, and child, not only in this room. Those of you who wanted to see an honest-to-God BW agent, here it is. About 35 years ago this agent was produced in my lab, very concentrated, composed of small particles. If you think I am going to pass this stuff around you are crazy. You do not give me credit for enough intelligence. But this is really bacillus globigii, the simulant for anthrax that we used in the old days. It looks exactly like anthrax. I have been through all sorts of airports. I have been through the checkpoints at the State Department, through the Pentagon, and nobody has ever questioned me as to what these materials were. I have often wondered what I would do if they said, "What is that stuff?"

In order to get you thinking the way I want you to think, I have a vial containing 150 mosquitoes that are infected with Venezuelan equine encephalomyelitis (VEE) virus, or better yet, perhaps yellow fever virus, and I am going to take a trip to Heathrow Airport, through London. Midway in the flight, when everybody is asleep, I am going to release 150 mosquitoes and let nature take its course. We have a worldwide and renown BW entomologist sitting with us today, Dr. Charles Bailey. He tells me that we could get 20,000 transorally infected eggs with yellow fever and that as you went through Heathrow Airport, you simply tear off little pieces of paper and let these mosquitoes germinate and do their damage.

In recent years I have increased the number of visual aids. This last addition includes these little metal devices for disseminating a dry powder composed of small particles. I thought certainly somebody at a security point would question me, so that last trip that I took I had about 16 names of people and their phone numbers in case they stopped me. I hoped that somebody would be home. This is a little sample of VEE virus, freeze dried. We have lots more of this stuff so if you want to come up afterwards and look at some of these powders, it will give you a feel for what we have here.

Before we get into the act of terrorism, I would like to provide you with some of the principles which we learned that are central for biological warfare. They are true whether you are a sophisticated country like the United States where we have overt, open-air targets, large-

scale areas or a state-supported terrorist, or a sole individual working in his laboratory at home. We will start with the first slide.

The four components of a successful biological attack are as follows: you have got to have the right agent, the right physical and biological aerosol properties. You must have a munition that will disseminate that material relatively efficiently; you have got to have a means of delivering it whether it is by high-performance aircraft, or by missile, or a person walking along a driveway or a path. Finally, the largely overlooked component of this is the meteorological conditions on that target.

Let us look at meteorology first. Here is a typical day in Frederick, Maryland. Smoke goes from those stacks straight up in the air. If a terrorist, uneducated as he is, decided to use BW in an open-air setting with the net condition like that, it is going to be absolutely non-effective. For an aerosol to be effective, and this is what we are going to concentrate on today, it has got to remain at ground level. This is a type of situation that you want; you want an inversion where a cold layer of air keeps that aerosol on the ground. Since inversions occur most readily early in the morning, just before sunset, and at night, these are the times where you are most apt to have your biological warfare attack. That is independent of the fact that where we have two agents, anthrax and bacilli Burnetii (the causative agent of Q fever), which are perfectly refractory to sunlight. But even anthrax or Coxiella Burnetii are not going to do anything if they do not remain on the ground. Meteorological conditions are very important in open-air situations. I happen to believe that our biggest threat today is from terrorists attacking a building where we have a closed system. We will get to that later. I want to define what I refer to as munition efficiency because I will be using it hereafter; it is the same thing as aerosol recovery. It is defined as the number of infectious units rendered airborne of the 1- to 5-micron particle size mass median diameter. For example, if you have 100 infectious units available, and you have a 1 percent munition efficiency, it means that you get only one infectious unit airborne. The other 99 are either destroyed by the act of dissemination, or are larger than 5 microns and they are going to fall out of that aerosol like rocks. We are going to go through, very quickly, a 30-year program on munition development of which Dr. Robert Boyle was a most important component. Right after World War II, we used explosive energy. I might add that our munition development engineers blasted the hell out of our agents for years and years before they finally realized that explosive energy is not a very effective way of generating a small particle aerosol. Three points here. First, a significant advancement was made in munition development when we went from a single-fluid nozzle to a two-fluid system. This two-fluid system is represented by this old flit gun that I got from a hardware store. The principle is the same, and you are going to see that material is not falling out quite as well. A terrorist would be well advised to use a two-fluid system nozzle. The granddaddy of all these things was, of course, when we developed munitions with a dry powder that is presized like the material I just showed you. Look at the difference in the qualitative character of that aerosol. Notice that it is not dropping out like liquid is. It will probably go up to the lights. Now I hope all of you are immunized against this stuff. It is a little simulant that I prepared that contains a little lactose, etc., a little thiourea, and equal parts of M50, 5100, phobic silica. Anyway, we have made some tremendous advances in this program. By the end of our program we were experimenting with experimental rockets and getting about 70 percent of our materials airborne, much different from our original explosive-

charged munitions. This is the old pipe bomb. All this stuff is now non-classified, I am surprised to say. This is the M143 munition, an explosive bomblet, the fuze, the black powder, the black powder explosive in the agent cavity, and the plastic coating. This is the flettner rotor, probably one of the better devices for disseminating microorganisms. It is hard to believe, but we exposed volunteers from the Seventh Day Adventist Church to three of our agents that were being developed. We exposed them to tularemia, to bacilli Burnetii or Q fever, and staphylococcaline enterotoxin B. We have in this picture an array of man, monkey, guinea pig, and the impingent samples. Based on experiments like this, we determine what the infectious dose for man was with these three agents. It is unbelievable that we did that back then; certainly not today.

We referenced particle size. I want to explain the impact of particle size on aerosol recovery in infectivity. We have the number of cells required for a guinea pig respiratory LD 50, a monkey respiratory LD 50, and man has a respiratory infecting dose, not LD 50 but infecting, dose. If that aerosol is composed of 1-micron particles, it takes 2 1/2 cells of tularemia to infect the guinea pig; 14 for the monkey; and between 10 and 52 for man. Note what happens to the aerosol and infectivity when the aerosol particle size increases to 6 1/2 microns. It now takes 4,700 cells for that guinea pig respiratory LD 50, 178 for the monkey, and certainly the trend is in this direction. If you have a 22-micron particle, and if you keep it aerosolized long enough to test it, the number of cells jump tremendously. When we talk in terms of an intelligent terrorist, he is aware of what particle size means to his aerosol.

This happens to be a picture of a Venezuelan equine encephalomyelitis slurry produced in chicken eggs, the red material, the slurry to its left is bacilli Burnetii or Q fever. We are going to look at some unique targets like buildings, subway systems, airports, etc. This happens to be a lone terrorist working in his basement; that is me. Several years ago, Dr. Barry Erlich of AFMIC asked me to prepare some films that would bring back some of the old aerosol field-test data that we had collected and had filmed. I was going to try to duplicate one of the most famous of all of our vulnerability tests that was ever conducted. Everybody is aware of the New York subway system whereby light bulbs containing bacillus globigii, very similar to what you saw a minute ago, were thrown from the back of trains. Had that material been tularemia, we would have infected 3 million people in Manhattan; based on actual recoveries with sampling devices. I was going to duplicate it so I went down to Shady Grove to get on the Metro system and took along with me two photographers who had all this equipment slung over their shoulders. One was bearded and looked terrible like most photographers. We were immediately surrounded by the Metro security police, and I thought, "Holy goodness, here I am a contractor working for AFMIC, and we are being held incognito." The point is, the five security police were interested in only one thing: did we have a permit to film the subway system? So here, again, you see we do not think biological warfare.

Here is a little test that is no longer classified. The Chemical Corps and the Air Force had an agreement by which we were going to attack an Air Force base in Florida and the general Air Force officer said that, no, it could not be done. So he increased his security, dogs, and sentries, around its perimeter, and all we did was to disseminate about 400 grams of bacillus globigii upwind of the base, about 400 grams, not even a pound. That aerosol went

11 miles downwind, infected all the planes that had impinges sampling the aerosol as it passed over, including the housing area. Another important fact emerged from this situation. We had a very heavily forested area with scrubby pine. Our mathematical genius, Kent Calder, had predicted that an aerosol of 1- to 5-micron particles behaves as a gas and that it will not be hindered or adversely affected by something like a heavily forested area. In fact, he was proved correct on many, many occasions. That aerosol passed through that pine forest without any degradation.

Here is a viewgraph out of position. It should not be in here, but this table simply demonstrates a calculation regarding the number of kilograms of agent biological versus chemical versus the fission bomb using the M55 howitzer, which is a terrible way of disseminating a BW agent. You can see that there are three groups; the anthrax, NBC, and botulinum are in one category followed by the nerve agents and the fission bomb.

In the following scenario, terrorists will attack the World Trade Center with BW agents. This scenario follows the general pattern of a field test conducted by the United States in 1963 to demonstrate the viability of buildings to BW attack. There are 69 other studies that are still classified in which we tested vulnerability under all sorts of conditions. If you are interested in developing scenarios, you do not have to take facts out of thin air. You can rely on field-test data that will give you greater validity of perhaps being correct. The attack that I have selected is a 14-story building. We attacked it with 8 grams of bacillus globigii; 8 grams is nothing more than the material in this little bottle. The take-home point here is that BP spores, when introduced into the ventilation system, penetrated all the floors of the building within 15 minutes and persisted at high concentration for 2 hours. That is a remarkable test. We are going to attack the World Trade Center. An intelligent terrorist will be able to sit down before he does his dirty job, calculate the size of the building and the number of organisms that he has, and be able to determine in advance whether this will be a successful attack or not. Success or failure is determined by two equations: the number of human infectious doses available to the terrorist and the size of the building in liters. So we convert cubic feet of the building in terms of liters because man breaths in, at rest, about 10 liters per minute. In this equation we determine the number of organisms he has that is going to be effective in the 1- to 5-micron particle size as follows: you take your agent concentration per milliliter or gram and you multiply it by the volume of the agent that you have on hand times the disseminating efficiency of your device, divided by the human dose. By use of this equation, you can determine the number of human respiratory LD 50s that are available to you. The size of the building is also very important. The World Trade Center, a heck of a big building, contains 10 billion liters of air, huge building. We are going to grow bacillum toxin in garbage cans and we are going to assume that we get good growth of the toxin. We get five gut doses per milliliter, the mouse gut dose. We are going to assume that human respiratory LD 50 dose is 4.8 micrograms or 14,000 mouse gut doses. I produce 264 gallons of toxin. Already you can see that this is getting out of hand. We are going to disseminate this amount of material in a 2-gallon garden sprayer. Can you imagine spraying 264 gallons by means of a garden sprayer in a building intake? It does not make any sense. Anyway, using the number of human doses we have available, it did not work. You got 0.00002 human doses per liter of air so you would have to be in that building for several years before you could accumulate that level of dose. Why did botulinum toxin fail? We all know that

botulinum toxin is the most toxic substance known to mankind. It is highly effective when you go around shooting into the gut or giving it by the oral route, but it is significantly less effective by the aerosol route. Let me give you an example. It takes 1,500 mouse gut doses to give you one mouse aerosol dose, over three logs difference. You see that limits the effectiveness of botulinum toxin on an open-air target. We are going to attack the World Trade Center with the old U.S. spray-dried botulinum toxin. Notice that our concentration is much higher, that we have a very small particle size; the dose per man is the same. This time we are going to use a disseminator, the ADC fire extinguisher using $C0_2$. It makes a beautiful disseminator. You get about 40 percent of your material up as an aerosol, and it only takes one kilogram. That is what we are going to disseminate, one kilogram, and I can hide one kilogram on my person and not be obvious. If people are in the building for one minute, they do not, of course, get sufficient material, but if they are in the building for 20 minutes, we reach our first LD 50. Of course, most people are in the building where they work for more than 20 minutes. You multiply that dosage per liter times whatever the time they are in the building. I used our old botulinum spray-dried product because I was privileged to join Colonel David Fran's United Nations Inspection Team in June of last year. I was amazed and also very dismayed at the level of sophistication that the Iraqis had in terms of their fermentation, centrifugation, and drying capability, first class stuff. Based on what I saw, I feel that the Iraqis could very easily meet the product and its characteristics that we produced 30 years before. It is very discouraging.

In this next situation, we are going to attack the World Trade Center with crude tularemia; francisella tularensis. I want to use 1,000 blood auger plates that you can buy practically anywhere: hospital supply houses, for instance. I can scrape 1,000 of these plates in 2 hours without a problem. I am going to scrape with a cotton swap so that I get confluent growth. In about 36 hours I am going to wash off the material that has grown there. I am going to wash it off with saline. If the terrorist is wise he is going to add a little sugar to maintain isotensity of the cell wall, cell membrane. I am going to Waring-blend this mixture and then I am going to filter it through cheese cloth. I am going to use a garden sprayer to disseminate the material. The critical point here, in addition to the agent, is that the garden sprayer has got to develop 90 psi; if it is less than that, you can forget it. One thousand plates with this little scheme will yield 5 liters of product or 1.32 gallons of material. Trust me on this. The agent concentration is not like a sophisticated production facility, but we have five times 108 of these cells per milliliter. The dose for man is a very conservative 50 cells; I could as easily have used 10 cells if it is fresh material. The garden sprayer has a 2-gallon capacity, 90 psi, one split orifice. I am going to disseminate at the rate of 1 gallon per 10 minutes, and I am going to use a very low disseminating efficiency because garden sprayers are not very efficient. I am going to get 0.001 percent of the material that I have. Attacking the World Trade Center with your good friend tularemia! Once we are exposed in that building for 20 minutes, we get full infectious doses. We are going to infect half of the people, whatever number is in that building at the time. As all of you know, modern buildings require that a building undergo between four and five air changes per hour. The terrorist must consider the air changes because if he is not careful, he is going to spray at such a slow rate that he is not going to build up the concentration necessary to do the dirty work. We have a very sophisticated computer model here, the Stella II. You can forget about flow rate, delivery time, dispersal rate, etc., if you give a big bolus of your agent within 15 or 20

minutes and you let the air system take care of it. If I wanted to disrupt the Mideast peace process between Israel and the PLO, I would infect one small, young lamb with Rift Valley fever virus. I would hold that lamb in a confined area for about 48 hours; at that point in time the lamb is very sick. I bleed 200 milliliters from his heart; I keep that blood from clotting my means of heparin. If the heparin is not available to me, I have picked up some small stones, and I have sterilized them in boiling water. I add those stones to the fluid, and I shake it up, and I prevent clotting. Then I harvest the lung and the liver and get 600 milliliters of blood and organs. I add 5,400 milliliters of a 5-percent skim milk solution, homogenize again in a Waring blender, filter, filter, filter. I filter it through several layers of gauze, and I get 5,900 milliliters containing 1 x 1010, 10,000,000,000 units of virus. Using my old pal Calder's mathematical model, if I disseminate that as a line source, perpendicular to the wind, 2 milliliters per meter, and I walk along for 2,950 meters, I will infect 50 percent of the population 0.4 of a kilometer downwind; 30 percent of the population at 1.5 kilometers downwind; and 10 percent of the population 3 kilometers downwind. I have hedged here. I have used very good meteorological conditions. The ridge height, or course I am walking along spraying, is zero feet. The transport wind is 5 miles per hour, which is very good for transport of a BW agent. Your diffusion parameter is $n = 0.4$, the beta factor is 0.8, and I have selected deliberately to bias the thing in my favor, a stability condition of a very strong inversion.

Finally, I believe that a dedicated terrorist group can produce crude BW agents with simple procedures, with readily available equipment. I think they can jerry rig disseminating devices from equipment that can be purchased from a local hardware store. They can infect and kill large numbers of people in confined areas like buildings. The Pennsylvania Turnpike tunnel was a very interesting study, classified, of course. The subway systems in New York, Chicago, and Washington. They will certainly produce panic and hysteria. They are certainly going to stress our hospital capabilities, and they are going to produce buildings which people will not enter for weeks or perhaps never, depending on the psychological attitude toward the attack. That is in spite of the fact that we know how to sterilize large buildings and did so with formaldehyde and paraformaldehyde when we were taking care of destroying our stocks and sterilizing our large production facility at Pine Bluff. So, my conclusion today is not if terrorists will use biological warfare, but when and where.

Question: Following extensive flooding in the Midwest and out in the West, there were a lot of dead farm animals. After several days they had to be removed and disposed of. What are the possibilities of anthrax or some other sort of a biological contamination as a result of that kind of event?

Answer: You could grind up these dead animals. We don't get more infections from dead animals than what we do because in the natural order of things there is not enough energy around in the atmosphere to give you that 1 to 5 micro particle size.

Question: Why does the spray have to be 90 psi?

Answer: When you are dealing with a liquid, it requires a great deal of energy to break up that liquid into that 1- to 5-micron particle size that is so important to get you infected through the respiratory route. For example, if you used 60 psi, the recovery rate that you would get instead of 0.001 percent would go down by a factor of three logs. You might have the organism, but you are not getting it in aerosol in the particle size that you want.

Question: You paint a very discouraging picture. Our local response teams, by my assessment, are incapable of dealing with something like this. Short of preventing it in the beginning, we are probably powerless to do anything about it. Is that what you are saying? How do we react to something like this when and if an event occurs?

Answer: If it is an honest to goodness terrorist who knows what he is doing, your probability of defeating him is very slim. We have got a lot of hotheads out there who claim to be terrorists. But if you ask them specific questions, it would not take very long to determine whether they are full of hot air or whether they really have something, provided they answered reasonably correctly and honestly.

Question: It seems like we had a very good offensive biological warfare agent program. Why did we not have a concurrent biodetection program?

Answer: Biodetection has been on the front burner for 45 years. Ever since I have known the program. It is a big problem. I think today, with emerging technology, we are beginning to see light at the end of the tunnel, maybe. The technology simply has not been there. It is not that the program lacked priority. Whatever BW program that we had, the rapid identification by means of machine was always on the top burner, a very high priority.

Question: I work in a civilian hospital, and I can assure no one in our emergency department is going to think about anything like this. I do not know of any textbook or guidebook to go to that would provide the kind of information on symptomatology that you spoke about and that Dr. Eitzen spoke about. I think the civilian community is very unaware. What do we do to understand this and be better prepared?

Following up on that point, gentlemen, what can we do to get better prepared in the civilian community since the hospital and medical professional will be one of the first lines of defense?

Answer: I defer that question to Admiral Young.

Admiral Young: You can see why he is the expert of experts. What we will do is describe for you at the third day some of the activities that are going on in integrated planning between local, State, and Federal programs under the lead charge that the PHS has been given to develop the plans and training to deal with this. We have got a long way to go, it is getting on the radar screen. I think we have got the capability of doing this, particularly as Mr. Clark described today, with Presidential Decision Directive 39; that does task the government to do some things that it had not been tasked to do before.

Comment: The United States Army Medical Department has a very fine handbook available now for medical officers. There is an FM called 3-9 which discusses chemical and biological warfare and gives you all the symptomatology that you will need to note: the blue handbook. You can get those from the Department of Army.

The inventory of course materials is being developed and will be part of the total training package.

Admiral Young: The next focus will be now to move from bugs to gas. We have an expert with us, Dr. Fred Sidell, who has written many of the review chapters, developed some of the programs, and was kind enough to be part of our team that went over to Tokyo for the Public Health Service.

1.12 Chemical Agents – Overview

Dr. Fred Sidell, U.S. Army
Medical Research Institute for Chemical Defense

I am from the Institute of Chemical Defense, which is up at Aberdeen Proving Ground, Maryland. We work to provide better defense against chemicals. We develop antidotes and other therapeutics and so on. We are going to talk for a bit about chemical agents. Chemical agents are not new. The first alleged attack by chemical warfare was in 423 B.C. when one of the Spartan allies attacked the Athenian city of Delphi during the Peloponnesian wars. They hollowed out a log, put some toxic chemicals in it, set fire to it, punched a whole in the wall, and sent smoke in. The smoke was asphyxiating and it also caused burns. About 1,000 years later the Greeks developed another sort of fire, which they would call Greek fire. It was mixture of naphtha, pitch, sulfur, and a few other things. It was particularly effective at sea because it floated on water and was very good for attacking other ships. Chemical warfare very slowly developed in the mid-1800s. During a war with Russia, Sierra Leone, to play fairer, suggested the use of cyanide in shells. That is almost 150 years ago, and people were suggesting cyanide. During our own Civil War, a man from New York suggested to Mr. Stanton, who was Lincoln's Secretary of War, that we use chlorine-filled shells against the South. These were rather primitive chemicals, rather primitive devices. The first large-scale use of chemical warfare began in World War I when on a nice day in June 1915, a yellowish cloud developed above the battlefield causing asphyxiation in the English and French troops: the German use of chlorine, the first modern-day chemical attack. This caused hundreds of thousands of casualties. It broke a hole in the allied line, and the Germans probably could have marched clear to the English Channel had they been prepared to take advantage of this. They were not, so they really gained very little by this attack. Chemicals were used extensively in World War I. About one-third of the shells and one-third of the casualties contained chemical agents: primarily, at first, chlorine, phosgene, a little bit of cyanide which was not too successful, and finally, the agent mustard. We got into the war in 1917, and we found out that it was no fun to fight a war on a chemical battlefield. You had to wear a mask and other protection. It made life in general rather difficult.

We also made chemicals during World War I. This is a place up at the Edge of the Woods, Maryland, which became Edgewood Arsenal in October 1917. This is the same place 4 or 5 months later. Can you imagine building an industrial complex like that today in the Government in 4 months? You could not even get a contract written in 4 months. Nonetheless, large amounts of chemicals were made. But by the time they were sent to Europe in bulk containers, the war was over so they were never used in World War I.

What were some of the chemicals that were considered in World War I? Some of these you might recognize: CN, or tear gas, that is still with us today. It is called mace; you can buy it at a drugstore. Chlorine: chlorine is a very old chemical. It was used in World War I quite extensively before mustard came into play; it is still around and widely used in industry. Phosgene was first synthesized in 1812. It was not new either and it is still with us: 200,000 to 300,000 tons a year are made in this country. Cyanide: we all know how lethal and deadly cyanide is. It was not too good as a chemical warfare agent, but it is still here. It goes by on the Beltway and on I-95. There are 200,000 to 300,000 tons a year that are manufactured for industrial uses. Mustard was first synthesized in the early 1800s. It proved to be a very effective chemical agent and is still around. Note the lethalities, the LCT 50s. The lower this number, the more toxic the chemical. Mustard is more toxic than cyanide by inhalation. The nerve agents which were developed after World War I are by far the most toxic agents. Chemical agents of World War I are still in our backyard, in our neighborhood, and possibly in the hands of terrorists. They are still around. This is what they look like. This is nerve agent in U.S. Government-approved shipping containers. This is the way chemical agents should be kept: in a locked area, underground, in steel containers.

Let us talk for a minute about physical forms. This morning, Dr. Eitzen said that biologic agents, except for toxins, are solid particles. They are viruses and bacteria. Chemical agents can be in any form; most are liquid, a few are solid. Riot control agents and incapacitating agents are solid materials that are put up in a suspension as an aerosol. The rest of them are in liquid form in munitions. When that munition is detonated or exploded, the liquid changes to aerosol which may change to a vapor and we are dealing with exposure to a liquid chemical agent or vapor or gaseous form of a chemical agent.

Another term that we have to think about is persistency of an agent. It refers to how long an agent is going to remain on terrain, vegetation, or things. Chemical agents are like other types of liquids: some evaporate quickly, some do not. Motor oil will stay for a week or two on your driveway unless it is an extremely hot day. Gasoline, on the other hand, will evaporate pretty quickly. Some chemical agents are like motor oil; they remain on things longer than 1 day. Some chemical agents evaporate very quickly; they are said to be non-persistent because they are gone in hours. In the military there are uses for non-persistent agents, and there are uses for persistent agents.

Agents of concern: these are mostly the agents that we have already mentioned. I am not really going to talk about the riot control agents very seriously; we all know what they are. They are used by law enforcement officials. Anybody who has been in the military has been exposed to a riot control agent, or most people have, as part of their training, except for Dr. Eitzen. He gets exposed to anthrax as part of his training. Phosgene and related materials

such as PFIB (perfluoro isobutylene) could be used as terrorist weapons. They have only one activity, and that is to cause pulmonary edema which comes on in a period of some hours after exposure. Whether or not terrorists would consider that an advantage I do not know.

One type of compound that is not on this list is the incapacitating agents. They might be used as a terrorist weapon, or actually they might be used as an antiterrorist weapon. By definition, an incapacitating agent is an agent that makes one unable to function normally for a period of time with full recovery. Dr. Eitzen gave three examples this morning, three types of bacterial things, that might be considered incapacitating. Staph enterotoxin causes severe vomiting and diarrhea for a period of time. Transiently, two others cause severe febrile illnesses which would make you unable or not want to do whatever it is you are supposed to do. There are chemical incapacitating agents as well, and there may be some we would like to have but we do not, for example, something that would cause loss of vision for a period of time with full recovery or something that would cause persistent dizziness. You would not be able to stand up and do anything. You can think of other ways to incapacitate somebody. For example, you have all seen pictures of dart guns and a tiger in a tree. The people come along and shoot the tiger; the tiger falls out of the tree; they band it and measure it; and a little while later the tiger gets up and runs away, perfectly healthy. That is a tranquilizer in that dart gun or a narcotic congener that causes temporary loss of consciousness. That would be a very good way to incapacitate somebody. A number of years ago, the U.S. military had a large program to study incapacitating agents. After spending about a decade studying LSD they finally decided to use a compound called BZ, as a military incapacitant. BZ caused confusion, disorientation, and inability to function appropriately. We had it in weapons for about a decade or so and finally destroyed them all. But it still could be useful as an antiterrorist agent. For example, think of the 1972 Olympics in Munich. Remember the terrorists there, the kidnapping? What would have happened if you had been able to put an agent in the air supply of that room where everybody was held, have everybody lose consciousness. You go in sort out the bad guys and the good guys and take care of them from there. It might be useful. A knock-down agent might be useful. BZ might be useful: something that causes confusion, inability to behave appropriately. In fact, one of my favorite novels has to do with the use of BZ. It seems that terrorists got a large amount of it. They picked a night when the weather conditions and the wind were just right. They drove back and forth on the Beltway spraying BZ over downtown Washington. The next morning, or the next day, they found that many people in government, including Congress and many people in higher positions in the Executive Branch, were confused, disoriented, and unable to function appropriately. Do not laugh, this is serious stuff. The response team went in, and they were unable to determine which people had been gassed and which had not. As I said, that is one my favorite novels.

Three agents I am going to spend a few minutes discussing are cyanide, the vesicants, and the nerve agents. They are different. The nerve agents and cyanide cause immediate effects; the vesicants cause effects that do not come on for a period of many hours. I am going to start with the vesicants. The major vesicant is mustard, which was a big chemical agent in World War I. A second one is lewisite; this actually belongs over here. The third one is phosgene oxime, which I am not going to discuss.

Two types of mustard: sulfur mustard is a biggie. It caused huge numbers of casualties in World War I. It caused a lot of casualties during the Iran/Iraq conflict and has probably been used other places in the world throughout the years. Nitrogen mustard was first synthesized in the late 1930s. It was found that it was good for cancer chemotherapy, and it became the standard compound for cancer chemotherapy. It has been phased out of it now, but nonetheless, it was used for many years. This is sulfur mustard; this is the structure of it. It is a very simple structure. I am told by chemists that you can make it in the bathtub; the problem is getting the precursors. If you remember a number of years ago when Iran was making a lot of chemicals, or Iraq was, there was a worldwide embargo on precursors. That stopped production of some of these things. It is a very simple molecule; it is not too volatile. Mustard is a good example of a persistent agent. Unless it is extremely warm, it will remain on terrain and other things from a period of day to weeks. It is called a vesicant because its best-known action is to cause vesicles or blisters. You can get it into the body through the skin or by inhalation or through the eyes. It was synthesized 170 years ago, so it is not a new chemical. It has been used on the battlefield in a number of instances. It is in the U.S. stockpile; it is probably in the stockpiles of other countries. All these places it has been used. The death rate from mustard has been quite low; under 5 percent of mustard casualties die. It causes a lot of casualties but very little lethality.

Toxicity: I pointed out that the LCT 50, or the aerosol vapor amount of mustard times concentration times time is 1,500. But even at a small fraction of that amount, mustard causes effects and can cause casualties. Little more than one-hundredth of the lethal amount will cause eye damage. So it is very effective in very small doses. A lethal dose on the skin is about 7 grams, or a teaspoon and a half of this material spread over your skin will be lethal in 50 percent of the population. Yet 10 micrograms will cause a blister. Again, it is very effective in very small amounts. This is what it looks like in its natural habitat. This is HD gas; it is not a gas, it is liquid. People in the Army do not always label things correctly. Major effects of mustard are on the skin, the eyes, and the airways, primarily because they are the three places where you contact mustard. Liquid mustard gets on the skin; mustard vapor gets in the eyes, gets in the airways, and gets on the skin. Again, I would point out the lethality of mustard was very low in World War I and very low during the Iraq/Iran conflict. It also causes damage in bone marrow, in the gastrointestinal tract, and some problems in the central nervous system.

This is the important thing about mustard: Once mustard contacts skin or mucus membranes, it is absorbed within seconds to minutes. It causes biochemical changes within that tissue within a couple of minutes. You have to take action within a minute or two to prevent action from mustard. That action is irreversible. However, it causes no clinical effects: no burning, no stinging, no skin turning green, nothing until hours later. This is one of the reasons mustard is such an effective chemical warfare agent: people get mustard on them; there are no effects. They figure, well, this is just oil I got on me, and so they do nothing about it. The only way to prevent damage from this is to decontaminate within seconds to minutes after exposure. Clinical effects, that is redness of the skin, irritation in the eye, come on 2 to 24 hours after exposure. There is a long latent period with mustard; it is a long time before you start getting effects like that, or if you are lucky like that. Instead, this is a more typical mustard blister, or like that, or like this, which is a cross-section of the lung

showing an airway in which the ephyllum and muscular coating have been completely destroyed by the necrotic action of mustard. The airway is filled with necrotic tissue and inflammatory cells with a little bit of hemorrhage around the airway. I am not going to mention therapy mustard because it is it pretty symptomatic and can be quite complex. I am going to go on to other things. Mustard causes delayed effects, there is no therapy for it. It effects the eyes, the skin and the airways, but the effects come on much later.

The next compound is another vesicant, lewisite. The toxicity is very similar to that of mustard, both by vapor and on the skin, but the major difference is the fact that lewisite causes pain immediately. If you get a drop of lewisite on the skin, you know it is there because it burns, and you decontaminate immediately, because you do not want it on there. Vapor is very irritating to the eyes and airways immediately and you get out of the vapor. You are not as likely to get a severe exposure to lewisite because you want to get yourself out of it. Lewisite may cause more severe effects than mustard, but, on the other hand, you are not likely to stay in it or around it as long.

The next type of compound is cyanide. We have all heard of cyanide: a very deadly, very toxic material. There is more than one type of cyanide. There are those that were used in warfare in World War I, hydrocyanic acid or hydrogen cyanide, and cyanogen chloride. Both of those are liquids, but they are extremely volatile. On a day like this they would be in their vapor or gaseous phase. Then there are a number of cyanide salts which are widely used in industry. These are the things that you heard of in conjunction with Tylenol, in conjunction with Reverend Jim Jones and his cult in Guyana, and in laetrile, which breaks down to a form of cyanide in the gastrointestinal tract. Cyanide salts were used in executions for many years. To change a cyanide salt, which is a crystal, a solid, into the vapor form, you just add acid, most commonly sulfuric acid, I believe. In execution chambers they would take some cyanide salt and drop acid on it, and a cyanide gas would appear. It causes effects within seconds. Hydrocyanic acid has a very simple formula, it causes effects within seconds, as I will show you in a minute, but the LCT 50 is quite high. This is 50 times higher than the nerve agents; 50 to 100 times. Cyanogen chloride, the LCT 50, again, is extremely high, but it causes effects within seconds. Cyanide is around us; it is used in manufacturing; it is in foodstuffs; it is used in products of combustion. Burning plastics always contain cyanide. Cigarette smoke contains cyanide; an average cigarette smoker will inhale at least one lethal dose of cyanide a day. All you nonsmokers say, "Well, it does not work then because they are not all dead." But we can detoxify a small amount of cyanide. The body can live with and detoxify small amounts of cyanide. It is when that detoxification mechanism gets overwhelmed that we get into trouble.

Cyanide was not a military success. Cyanide is extremely volatile, and as soon as the shell landed, that liquid went up in vapor. Cyanide itself is lighter than air, so it went up here. Some of the other agents that are heavier than air would sink down into the trenches and stay there for a long period of time, but not cyanide. It takes a large amount for lethality, and there are no effects at lower doses. You either have a lethal dose, or you do not. It is not like mustard. It is not like nerve agents where a small fraction can produce effects and cause casualties, not so with cyanide.

Cyanide works by inhibiting intracellular enzyme, cytochromoxidase, which helps the cell utilize oxygen and, therefore, form energy and live. When this enzyme is blocked by cyanide, the cell cannot use oxygen, and it very quickly dies. It is a very simple process. A lot of people drink cyanide; it is one of the favorite things people use who wish to kill themselves. There have been a lot of instances of this sort of thing. The people have effects of giddiness and vertigo, followed by nausea, vomiting, weakness, loss of consciousness, finally convulsions, cessation of respiration, and death. Depending on the amounts and concentration that they have drunk, this may occur within minutes, or it may take half an hour or longer. In that time rescuers can come, administer the antidote, and save an individual who has drunk cyanide. The antidotes are very effective if given in time. By inhalation: if one inhales a lethal dose (keep in mind that is quite high, at least in comparison with nerve agents), effects come on within seconds. Within 15 seconds there is a stimulation of respiration. The individual takes 3 or 4 very deep, very rapid breaths and 30 seconds after inhalation, there are seizures or convulsions. Two to 3 minutes later, breathing stops, and a few minutes later the heart stops. Death occurs within 5 to 10 minutes after inhalation of a large amount of cyanide. Is cyanide effective? Outside on a battlefield cyanide is probably not an effective agent for the simple reason you cannot put enough of it in one spot. Inside, where cyanide cannot rise or drift away or be blown away, cyanide is probably a very effective way of producing death within a very short period of time. Antidotes: methemoglobin, which is an abnormal form of hemoglobin, can pull cyanide off of that enzyme and out of the cell, and the cell goes on to live. So, the goal of therapy is to produce methemoglobin and that is done by giving a nitrite, either amylnitrite or sodium nitrite. Then that is supplemented with a thiosulfate, which combines with cyanide to detoxify it. It is a very effective therapy if given in time.

The final topic is nerve agents. Nerve agents are substances that produce biologic activity by inhibiting an enzyme called cholinesterase. Normally, the function of cholinesterase is to break down a normal neurotransmitter called acetylcholine. Acetylcholine is released by nerves in the cholinergic nervous system to stimulate glands and muscles. After they stimulate those gland and muscles, they are broken down by cholinesterase so they do not continue that stimulation. When that enzyme is blocked, the acetylcholine continues its activity and there is abnormal functioning of glands and muscles, primarily, and a few other things. There is a lot of stuff around us that can be classified as nerve agents. Here are some drugs in common use in medicine that do the same thing as nerve agents. Here is an insecticide which many of you might have used; there are dozens of other carbamate insecticides that are nerve agents. Here is another insecticide, malathion, which many of you may have used. Again, there are dozens of other organophosphate insecticides that are nerve agents. Finally, we get down here to what we commonly call nerve agents. Now what is the difference between this nerve agent and this nerve agent? The difference is primarily one of potency. These are anywhere from 50 to 500 times more toxic than the commonly used insecticides. These are the nerve agents that we know about: GA, GB, GD, GF, and VX. The first ones were synthesized in Germany starting in 1936. The Germans had them in World War II; we did not have them. If they had used them at the invasion of Normandy, the outcome of that invasion might have been different. Nerve agents are clear, colorless liquids; they are also tasteless and odorless. These are the estimated toxicities of the four major nerve agents in man. These are pretty toxic things, not nearly as toxic as botulinum and some of those other bad agents that we heard about, but, nonetheless, they are much more toxic than any of the

other commonly used chemical agents. Clear, colorless, tasteless, most of them are odorless, and all of them will penetrate the skin and clothing. You are not safe walking around with a gas mask on with nerve agents. There is a liquid agent. You can get it on your skin or clothing, and it will penetrate skin and clothing. The G-type nerve agents are somewhat volatile in contrast to VX, which is more like motor oil to the gasoline of the V agents. However, even the most volatile, which is GB, is less volatile than water; that means it does not evaporate as fast. That probably is one reason why during the Tokyo subway incident there were not a lot more casualties. I realize there were many casualties over there, but there were a lot of people in those subway cars who were unaffected because it was deposited as a liquid, and it evaporated. But it evaporated rather slowly, and only those people in the immediate area, as near as we could tell, anyway, had effects from it. If it had gone poof! and evaporated all at once, and filled the whole car up with vapor, there would have been many more casualties from it.

To show you the structures, I know you are fascinated by that, this is GB. Again, it has a very rapid onset time as a vapor. This is soman, a little more complex molecule, but a very rapid onset time. By that I mean seconds to a minute. This is VX; VX is a different type structure. It is not particularly volatile. It is more effective as a liquid, and the onset time is a lot longer because it takes a few minutes for it to penetrate skin. A lethal dose of VX LD 50 is 10 milligrams. If that amount were on your skin, in about 5 to 10 to 15 minutes you would be unconscious and convulsing and die if nothing were done about it. Nerve agents affect skeletal muscles because they do not stop the stimulation of the skeletal muscle. You develop vesiculations and twitching. Finally, the muscle fatigues and goes completely flaccid or limp. It affects smooth muscle; the major areas of smooth muscle that it affects are in the gut. A lot of hyperactivity of the smooth muscle causing nausea, vomiting, diarrhea, cramps, and that sort of thing. It also affects the smooth muscles of the airways and can cause constriction of the airways and difficulty with breathing. It causes stimulation of glands, and they hypersecrete. Lachrymal glands, nasal glands, salivary glands, sweat glands, glands in the bronchi, and glands in the gut, all these hyper secrete resulting in a lot of runny nose and slobbering. Muscarinic effects: the effects of nerve agents can be subdivided into muscarinic and nicotinic, because part can be duplicated by muscarine and part by nicotine. Now the practical importance of that is that atropine, which is a key antidote, is effective only against the muscarinic effects; it will dry secretions and so on but will not affect the skeletal muscle. Some of the muscarinic effects are contraction of the smooth muscle, most importantly in the airways and in the gut, and stimulation of glands. The nicotinic effects are stimulation of the skeletal muscles to cause vesiculations, twitching, fatigue, and paralysis. Both types of effects show up in the central nervous system. Upon a very large exposure, the effects come on within seconds; they are loss of consciousness, seizures, cessation of respiration, cessation of cardiac action, and death. This can happen after a vapor exposure very quickly: 5 to 10 to 15 minutes. There have been stories about people taking one breath of nerve agent, falling over, twitching, convulsing. A few minutes later, respiration stopped, and they went completely flaccid. They would have died had there not been help available. Any amount of nerve agent can cause minor psychological problems, and these may linger 6 to 8 weeks after exposure. Irritability, forgetfulness, sleep disturbances, emotional instability, slowed thinking, inability to concentrate, and this sort of thing can go on for a long period of time. It is like passing 50, you know, as you get older you get most of these things. Only with nerve agents it is

reversible. Death is caused by respiratory arrest brought about by constriction and secretions in the bronchi, muscular weakness, inability to move the lungs, and depression in the central nervous system. The effects from a vapor exposure depend on the amount of exposure and the route of exposure, primarily the amount of exposure. A very small exposure causes a local response in the organs which are exposed to the vapor, namely the eye, the nose, and the airways, and it causes myosis, injection or redness in the eyes, maybe pain in the eyes, and maybe visual complaints like blurring or dim vision. Rhinorrhea, runny nose, is quite frequent, and some degree of shortness of the breath is fairly frequent. Back many years ago at Edgewood when they were doing open-air testing and working a lot more with agents than they are now, we used to see a lot of casualties or people exposed to nerve agents. About 95 percent of them had one or more of these three effects. Somebody exposed to a large amount of vapor will have loss of consciousness, copious secretions, twitching, seizure activity, apnea within a couple minutes, and death in a few more minutes; that is if there is no intervention by this time. Vapor exposure effects begin within seconds to a minute or two, and they usually maximize within minutes after you are out of the vapor. They are not delayed in onset; they are not going to occur an hour later. Low concentration: eyes, nose, and airways. High concentration: CNS effects.

Now that's a guy who was exposed to something. Do you think he was exposed to nerve agents? Does he have myosis? This guy was exposed to something that probably all of us are exposed to every day, and that is darkness. He sat in a dark room for 5 minutes. This is a normal response because his eyes respond to the dark by dilating. This is a guy who sat in a dark room for the same period of time; his eyes did nothing. He had been exposed, accidentally, to nerve agent vapor the day before. He came in with dim vision, myosis, and a slight runny nose, and he told us, "Man, when I first got hit with that vapor I was short of breath and they put me in the back of the pickup and brought me over to the aid station and I am breathing a heck of a lot better now. I am about normal." So he was breathing all right. His nose was not bothering him. We did not treat him with anything because atropine in the arm will not help nerve agent effects in the eye. We followed this guy for a long time taking pictures of his eyes. This is what nerve agent myosis looks like. The pupil is hardly larger than the flash. He has some redness left. He had a little discomfort but no real pain in his eyes when he first reported to the aid station.

Skin exposure, tiny droplet on the skin. Onset time maybe anywhere from 2 minutes after that drop hits the skin up to 18 hours later. Obviously, the larger the drop, the sooner the effects. A very small tiny droplet will cause some sweating and vesiculations around the drop. A little bit bigger drop will cause gastrointestinal effects, and a lethal-size drop, remember that drop on the penny, will cause loss of consciousness, seizures, cessation of respiration, cessation of cardiac activity, all within a few minutes. Skin exposure: the first effects are local; a little larger drop, GI effects; little larger drop, loss of consciousness and seizures.

Management: decontamination, ventilation, atropine, oximes, other things. But there is something more important than any of those things in managing someone exposed to a chemical agent. Does anybody know what it is? What is the most important thing? This is something everybody knows. It is common sense, but I do not hear very many people saying

it. You must protect yourself. You do that by dressing in appropriate gear or by ensuring that the casualty is clean.

Decontamination: decontamination, I think, is over emphasized. By the time the casualty hits a medical response station, you are not going to do the casualty one bit of good by decontaminating the casualty's skin. You are decontaminating the casualty at that point in time to protect yourself and to protect your medical facility I think we all understand that. But you are not going to do the casualty any good. After 30 minutes, that agent is in the skin; mustard is in the skin. The nerve agent has either killed the casualty, or else there has not been enough on the skin to do any harm. Decontamination from liquid has to be done before that casualty enters your medical facility. You remember the story I told you a little bit ago about the guy who got exposed. He was short of breath and they threw him in the back of the pickup truck and brought him to the aid station. He's feeling much better. He was not decontaminated. I have seen probably hundreds of casualties, and I do not recall a single one that we ever decontaminated. That is because all that I remember was the vapor. All of them had taken a ride to come to the aid station and by the time they got there there was no more vapor around. I think we learned that. Maybe there will be some comment on this tomorrow, in Japan. They varied from what I understand. I do not claim to have gotten the full story, but some hospitals said we decontaminated by removing the patient's clothing. I know one hospital where they did not even remove the clothing and I do not think any medical personnel, except maybe two got very minor effects. But it was the same thing; it was from vapor. Nobody that we heard of at least got exposed to liquid. Casualties have to be decontaminated if they are exposed to liquid to prevent damage to medical people and their medical facility.

Ventilation: an obvious need. If the casualty is not breathing, you must ventilate. Nerve agents cause very high resistance in the airway, and it remains high until atropine is given. The major lesion is too much acetylcholine. The way to stop its activity is to give a drug that blocks it. A cholinergic blocking drug, or an anticholinergic. Many years ago, the late forties when the allies discovered the German nerve agents, they looked at a large number of drugs to use as an antidote. They soon found that atropine was extremely good. There were many other compounds, and there are today many other compounds, that are extremely good antidotes. Atropine was chosen because of a relative lack of side effects. That is not to say atropine does not have side effects, but in comparison to other good antidotes, it has very few. The major, potentially harmful side effect from atropine is giving it to someone who does not have nerve agent poisoning in a hot environment because it inhibits sweating. Now, a second thing they studied back in those days was how much atropine to give as a single dose. This was a military study. They studied efficacy in different species of animals, and they studied side effects in people. They finally decided that 2 milligrams was quite an effective dose. A soldier could function normally after having received that if he took that dose by mistake. We are talking self-help soldiers, initial dose, and so on, but for that reason – relative lack of side effects, yet large enough to be effective in mild to moderate symptoms – 2 milligrams was chosen as the standard dose of atropine. That is what the military uses today. Atropine dries secretions; it reverses the bronchial constriction, the secretions; makes you breath better; relieves the gut problems; it does not affect the skeletal muscle twitching and vesiculation. Atropine intermuscularly or intravenously does not affect myosis unless you give a very large amount of it. This was reaffirmed a couple of months ago. A report in

Lancet said they gave atropine to reverse myosis, and they found out that atropine caused too many effects in too many other organ systems to do that. Nerve agent intoxications have required up to 15 or 20 milligrams; insecticide intoxications require much more: 1 or 2 grams a day. Atropine should be given until secretions are drying or secretions are dry and until the casualty is breathing better or until his airway resistance has decreased significantly. Then, and only then, should one stop giving atropine.

Another major function of the nerve agent is to tie up the enzyme. A second antidote is one that removes the nerve agent. An oxime will remove the nerve agent from the enzyme, and the enzyme then returns to normal. Oximes cause no real antidotal effects at the muscarinic sites. They do not dry secretions or anything like that; they do help muscle strength. The oxime that we use is pralidoxime chloride. Other countries use different forms of pralidoxime or different oximes all together. The standard dose here is 1 to 2 grams given very slowly intravenously and then not repeating it for an hour or so because the half time of the oxime is about 60 to 90 minutes. In the military they have oximes in an autoinjector, 600 milligrams per injector. The standard dose is three of those given about once an hour for about two doses.

Finally, convulsions: convulsions occur. The military recommendation is that a casualty who is severe, that is a casualty who is unable to walk and talk, should be given three of the Mark 1 antidote kits which contain atropine and oxime plus diazepam whether the casualty is convulsing or not.

Question: Are there any oximes that could be used other than 2 PAM chloride? I did a study in Cincinnati, and there are very small supplies of it in the civilian hospitals. If you had a terrorist incident with a chemical agent, we do not have big supplies of atropine either, but 2 PAM chloride is very expensive and in very short supply.

Answer: Atropine was quite an effective therapy before oximes came along. The fact is, several very severe casualties were treated quite effectively with atropine alone in the 1950s before oximes came into being. But oximes are synergistic with atropine, and therapy is much better. There are no other oximes in this country. They say other countries have different salts. Now the fact that there is short supply of atropine in city hospitals is a great concern that I have voiced talking to Admiral Young a number of times, particularly a few months ago. That is not the manufacturer's fault. I am sure they would be happy to sell you more oxime and more atropine if you wanted to order it.

Question: We checked, and for 6 grams, our present price is $139. For 6 grams of protopine.

Admiral Young: Two things that might help. First, in PDD 39 there was a charge to us to determine the availability of stocks of medicines and vaccines. So that is a very active part of the planning process that you will hear on Thursday. The other portion of which is that Retired Major General Gray in VA has enabled us to get some of the materials very expeditiously. We are developing plans by which we can stockpile in and through rotational

stocks and get these requirements met. But it is an extremely important area and I am pleased to see that the President has focused and required effort on it.

I would suggest that maybe one reason an oxime is so expensive is that it is like an orphan drug; it is not worthwhile making because no one uses it. But if, on the other hand, somebody wanted to order 100,000 or 1,000,000 grams, I will bet its price per gram would drop considerably. I think that they do not make enough, that they have to price it high.

Question: Could you comment on the variety of agents such as the aflatoxins, the mycotoxins and phentonols?

Answer: I will not comment on the toxins because that is Dr. Eitzen's bailiwick. I think he will be back tomorrow. Phentonol and suphentonol are what I was referring to when I talked about the dart guns. There is a congener of suphen, and maybe it is suphentonol itself, that is in the dart gun and is a very effective incapacitant. The problem is that it does not have a very high safety ratio; if you overdose a little bit with that, you cause respiratory arrest. On the other hand, if you are in a situation where you can immediately rush in and rescue everybody, there is a very effective antidote to it. So you can antidote it real quick.

Admiral Young: I want to take this opportunity to introduce my good friend Jim Genovese. There is a need over the nation to have individuals of high quality who are capable to move in, as you heard in Fred Sidell's presentation and now in the forthcoming presentation by Jim, to be able to serve as experts, technical resources with the ability to deal with research and capability to handle crises.

1.13 Potential Incident Scenarios

James A. Genovese
U.S. Army Edgewood Research and Development Engineering Center

I am from Aberdeen Proving at the Edgewood Research and Development and Engineering Center (visual 1, page 1-85). I am Chief of the Chemical/Biological Counter-terrorism Team, and our mission has evolved over the years. We started out and we continue to work rapid prototyping under the auspices of the Technical Support Working Group, specifically, for prototypes that counter chemical and biological terrorism. Over the recent years, working proactively with the responders, FBI, technical escort unit, and our special forces, we have found that my team has grown in its responsibilities and that our mission has broadened (visual 2, page 1-86). We work directly with the responders; we provide those responders with technical contingencies. While those responders have basic technical contingencies to respond to chemical and biological terrorism incidents, we then go further and we redevelop and further develop those technologies so that they are even more effective in the next coming years. One of the things I think you need to know – and this really is kind of a prelude to how we approach incident response, how we would approach scenarios – is that we have to bite off problems in bite-size chunks. I think one of the things we have typically done in the Federal Government is that we have identified problem areas, and then we tend to grab

too much of the problem too soon. Because of that you end up (1) not defining the problem very well and (2) not doing a very good job as far as how you technically can respond to that problem. What I would like to do today instead of working out specific scenarios is kind of bind the problem as I see it from a technical response perspective and give you some of my insights – and these are certainly not U.S. Army's opinions, these are Jim Genovese's opinions – on how I see chemical terrorism right now and in the future.

This is a Shop Vac.

Vacuuming noises.

There are some important things you need to consider when you look at something as simple as a Hechinger-bought Shop Vac, especially the terrorism variety as I have here. This looks like a very simple apparatus, and it works fine for household use. Can anybody tell me what was wrong with this picture?

Audience: Dispersing!

I accidentally, or maybe not so accidentally, had the aspirator plugged into the wrong hole. What we found, just with some basic studies that we have done, is that a Shop Vac, a $30 Shop Vac, is not so bad a disseminator of chemical agents, especially volatile chemical agents. It works quite well. We bought a 1500-watt hair dryer, and we are going to configure that here to heat up the source. We will configure this system with four jet nebulizers that use the aspirated air and drive it down into the liquid pool that is in the bottom.

Audience: Are you going to put this on the Internet?

Here is a good example of a basic, bare-bones piece of equipment. What I am going to do here today is target volatile chemical agents. You put that volatile chemical agent in there, and it is a good disseminator for chemical vapor. It is not very good, although it will work, for biologicals, although the MMVs are not very tight for a system of this sort and the efficiencies are not all that good. Here you have a system, very basic, very bare-bones, but one thing was obvious. You saw me vacuuming the floor with a suit coat and tie; that is not an obvious situation. You can take this same Shop Vac and park it next to a maid's cart or a maintenance man's cart, taking it in any building, and you can test this out. Plug the Shop Vac in and play it out so that you are using it is a disseminator. See how many people go up and turn your Shop Vac off. They just let it go; it looks like it is part of the system. It is very simple; very non-obvious method. In this configuration as I had it here, you cannot only use it to disseminate, but you have got a tortuous path here for any aerosols that are generated in the mixing process. You can then direct the gas wherever you want it to go. If you want to put it into a ventilation shaft, you can direct it forthright and keep the thing on and no one notices it.

Audience: Aren't you going to kill yourself?

If you turn it in, you are back here, you plug it in and then you leave. By the time you get the material out there, you can be well away from the device. What you would probably want to do is give yourself enough tether so you don't have a problem in that respect. The other way you could do it is you could do an RF turning on of the electric to make that happen. But it is to show you that chemical vapors are very well behaved. As a matter of fact, they are extremely well behaved. They are more docile than some of Bill Patrick's biological materials. As Bill mentioned, you have got to get in that 3- to 10-micron range to get a respirable aerosol. It is hard to keep those aerosols up, hard to disseminate those. This is not so for the chemicals, especially the volatile chemicals. They are quite easy to get up. The other advantage you have with chemical vapors is that they are all in the respirable range. You do not have this little fraction that are the only ones that get into the deep lung. For chemical vapors, they all get into the deep lung. If you breath them in, they are molecular moieties. They get into the deep lung, and it is a dose phenomenon.

What I would like to do today is to redefine chemical terrorism (visual 3, page 1-87). This is my definition. I am sure that Mike Jakub has a better State Department definition, and I know the FBI has a better definition, but it calls to mind the basic points of terrorism. It is a systematic use of violence for intense fear or intimidation. There are some other points I think we need to mention here when you are looking at a weapon of mass destruction. It is used against noncombatants. These are guys not in the military. They are not out there doing battle, and the physiological and psychological effects that you get against noncombatants, against civilians, are quite interesting and quite extreme.

My focus today (visual 4, page 1-88) is to look at chemical incidents especially volatile chemical agents that are in close quarters, in let us say a subway. I will give you my rationale as to why I think this is a big area to consider. Obviously, we have visitors from Japan. They understand that problem very well. I am going to explain to you today how I see it and also to empathize with them, in fact, the volatile chemical agents are a real concern. They are easy to do, and they will make your life very difficult because the sky is the limit as to how the bad guy can use those particular materials.

One thing before I get into how we find the problem is that we need to look at the distinguishing characteristics between chemical/biological defense for the military (visual 5, page 1-89) and how we handle chemical/biological incidents in a terrorism situation; they are different. There are some similarities, but in many cases, they are definitely different. First, the terrorism targets are noncombatants. For the most part, civilians are not even aware that they are a target or that they are in a hostile environment, whereas the typical military understand that. They sign up to that, they are aware of it, and they are trained for it. There is minimal civilian training in preparedness. This is something that I have seen in the CIVEX '93 exercises. When we played out the anthrax scenario in the New York subway, it became very apparent to me that the civilian community needs help. I will tell you, from my own personnel perspective as a member of the U.S. Army. My team is part of Edgewood Research, Development and Engineer Center. Other speakers today are from the Medical

Research Institute of Infectious Diseases and the Medical Research for the Institute of Chemical Defense, and in the audience we have members from our U.S. Army Technical Escort unit. That group of U.S. Army people are a fund of expertise, and we are committed not only to confronting CB on the battlefield but also to this new arena for countering CB terrorism events. Another difference is open-field engagement versus covert, close-quarters deployment. You will hear the joint program bio people say, "Well after you have disseminated this line source for the cruise missile of 100 kilograms of anthrax, after so many minutes or hours the line source dissipates because you have got all this atmospheric dilution and diffusion and wind transport." My focus today will be to look at it because I firmly believe in compartmentalizing the problem, biting off just a little bit. One of the things that I think we need to look at is (1) the nice characteristics of volatile chemical agents and the fact that they do extremely well inside closed containers like this auditorium. On the battlefield, I will give you the benefit of the doubt. When we had the M687 projectiles, which is a binary projectile, and we disseminate the chemical agent, that is intended on the battlefield to button up the soldier, put him in MOP posture, slow down his logistics; it is really not meant for him to get lots of high, lethal dosage of GB out there. That is not really the game, and that is really not how it would be deployed. However, for terrorism in close quarters – in buildings, in subway tunnels, in aircraft, in cruise ships – then you have got a different scenario. You then have to consider the characteristics of the chemical agents and how they function within a closed environment. Also, when you are on the battlefield, and even when you are on the CB battlefield, you pretty much know what the bad guy has. You know what kind of delivery systems, you know roughly his battlefield doctrine. I am not saying that the scenarios are not large, but you can anticipate some of them. For terrorism there is an infinite number of scenarios, an infinite number of targets, a large choice of materials that can be used. This poses the crux of the technology response for CB terrorism: it is tough because there are so many things we have to think about. The response to a terrorist in a CB incident is different from what it is on the battlefield (visual 6, page 1-90).

My next comment is, why chemical terrorism (visual 7, page 1-91)? I have seen that phrase before, and it calls to mind that this is exactly what it says; it is easy to do. I will show you with some technical descriptions why I think that is so (visual 8, page 1-92). You can make binary nerve agents very well. As a matter of fact, the Army did have, when they had the retaliatory chemical munitions program, a system which was the XM (visual 9, page 1-93). Now it is the M687 projectile, and this projectile made GB in flight so had to get these two species; the OPA which is the isopropylamine and an alcohol with the DF to form the sarin in flight. It has got to do it within seconds to a minute if it is going to satisfy 155-millimeter projectile flight characteristics and flight duration. The 687 has two components; there is an M20 and an M21 canister to house the two components, and you upload those. You fire it out of a howitzer. There is a rupture disk that mixes the two in flight, and you make nerve agent on the battlefield. There is what they call a super-quick, point-detonating fuse that hits the deck, and you disseminate the material. It works fairly well; it is a good yield. Again, that is more of a system for challenging the enemy through his logistics. There are other ways of making a nerve agent. And, by the way, these precursors, the first two, the binary precursors, are kind of hard to get. They are controlled and getting these two components – would say at least the DF part of that binary component – is a little difficult. This is a little bit easier (visual 10, page 1-94): a three-component system using sodium fluoride DC, which is

the dichlor, which is the chlorine analog of the dichlor which is the DF, and isopropyl alcohol, and you can make the sarin. It is actually a two-step process, although I have seen some systems where they shake the thing up and heat it a little bit. Activation energy is increased, and they can make some reasonable quantities and some fairly good yields of sarin. By the way, you do not have to dig into the literature too hard to get some of the basic cookbook procedures on how to make sarin. This is *Silent Death* by Uncle Fester. It is a great book, good reading for those of you who enjoy this kind of thing. I read it all in one sitting; it was great. There are a lot of different types of processes here for how to make chemical agent materials. There is also some basic toxin materials in here as well, on how to make ricin and some other things. Other books out there are the *Anarchist Cookbook*, the *Poisoners Handbook*, and the *Poor Man's Atomic Bomb*. As someone just mentioned, there is a lot on the Internet. So it is not even difficult for the bad guy to figure out what the mechanisms are when it is written right there in black-and-white.

You can also get nerve-agent type properties from one component system (visual 11, page 1-95). I have here a bottle from which I ripped the label while trying to put the toxic label on over the top of it. I bought this from Hechinger. This one is about 60 percent malathion and 40 percent xylene. You could take this liquid, do a simple distillation, distill off the xylene and get higher quantities of the malathion and it is not so bad a nerve agent. It is about 1/10 to 1/15 the toxicity of GB. Does it have anti-cholinesterase properties? It sure does. Will it produce some sublethal effects if ingested or inhaled in reasonable quantities? It, in fact, will: I think that is part of where I see the problem differently maybe than some who want to do mass casualties for terrorism. Because of the psychological factor, I think we also need to look at this. You know if some people come in and all their cholinesterase levels are depressed, that diagnosis is hard to do if you do not have the baseline. But sometimes you can take an average and notice that these people have symptoms and that they have a cholinesterase depression. Immediately the flag goes up: they have been hit with a nerve agent. So even in 55-gallon quantities, you can buy this at Southern States, malathion or parathion. You can get it in large quantities, and you can do whatever you want with it. If used in a reasonable dispersion mechanism, this is a legitimate agent source in a terrorism situation.

Why chemical terrorism (visual 12, page 1-96)? Well, the nerve agents are not the only ones. There are all kinds of other industrial materials out there that will give you toxic effects and physiological effects. These things are readily, commercially available. They are easy to disseminate, and in close quarters, confined areas, they are quite effective. If you want to check out chlorine, take some household ammonia and some household bleach, lock yourself in the bathroom, turn off the ventilator fan, and put both in a bucket. Shake it up and let it sit a little. What you will produce is chlorine gas. You will see green gas come off of that mixture, and it will burn out your larynx. It will blind you, and it has some reasonable toxic effects. Not hard to make. Phosgene: you can heat up some carbon tetrachloride in your bathroom and try that one out. Methyl isocyanate is the material which was used in Bhopal. Again, if you remember from that incident that one had some heavy gas effects and was very effective in producing a lot of casualties. Hydrogen cyanide is a very simple molecule and a very well-behaved molecule. It is a nice one to use in closed areas and in close quarters.

Why chemical terrorism (visual 13, page 1-97)? It is the easiest cloud to generate. I did this one time 2 years ago teaching a course in CB terrorism for the FBI. I went to the FBI and here it is. There are 35 armed FBI agents in the room. I shook the bottle up and I sprayed it right in their faces and told them they have been hit with a lethal dose of nerve agents. Well, it was not a pretty sight. They did get the picture. Bill Patrick showed you that these kinds of aerosolizers do not give you very good MMD for respirable aerosol. Most of the particles are large; they drop right out. However, when you have highly volatile chemicals in these kinds of systems, this not so bad a disseminator. Like the Shop Vac, it works quite well. Envision this. Put a cap on it so that this top is depressed. Put your agent inside the spray bottle; stick it up inside the cold air return; let the thing go. You could do it RF or you could do it mechanical or with a little timed mechanical setter; you are in business. These are not rocket science processes by a long shot.

Let me give you the reason why I say that the gas vapors are well behaved. First, it is all based on molecular diffusion. When you are down in 0.01 micron and 0.001 micron, these things behave like van der waals gases; they follow the ideal gas law. When you are making them from a vapor or you are making them from a droplet, the things that help you out are some tricks. This is what we are going to be doing with the Shop Vac, to get this thing to work better. There are a couple of molecular diffusion theory processes we can do to make this work better. You can increase the number density, which means you make a lot more particles. You can increase the temperature. Okay, so you increase the vapor pressure, and those two processes will get your system and produce kinetically the vapor in a reasonable period of time so you can customize your systems. It does not take a lot of thought. I think leaking an agent out on the floor is probably a rudimentary way. However, even leaking an agent from a lunch box in a subway had some toxic effects. Look at this lunch box. Talk about some simple dispersion systems. I am going to redo this and I wanted to show you the concept. I put an oil canister in here to show you a system where you put an agent in a bottle. We have bought an ultrasonic nebulizer. These little cubicles – I do not know what the kids put in these things – they worked great for two D-cell batteries. So what we do is put our positive and negative electrodes in here. We have got a power supply. We already checked and the boards needed for an RF transceiver go right in here. We have a small squirrel cage fan that can go over here, so all we have got to do is punch holes in the back of this, and close this up. Now you have got the next generation Tokyo lunch box. That is going to be high quality, because it is going to give you thermal and the high number density and the fan driving characteristics that are going to give you more toxic effects. Most guys can do this without a problem.

I have been arguing this and now I am going to prove it to you (visual 14, page 1-98). This is a military scenario, environmental mixing outside. When you detonate a couple kilograms of a volatile agent outside on a military battlefield, you have a lot of things going on. You have an extremely large amount of air that can diffuse and transport and move out those particles. From the outside scenario, volatile agents do not seem as though they work all that well because of the atmospheric mixing, the constant diffusion, and the wind transport. You have got volumes and volumes of air. As a matter of fact, when we do the models, and the nuclear guys do the same thing even with their aerosols, you use columns. You use 800 meters of ceilings to do the dilutions to actually work that out. You play that same game

inside in this room, and now you have barriers on the side (visual 15, page 1-99). You have got a ceiling barrier and also very low wind speeds for the most part. Now you have a situation where this is starting to look interesting. Do you know that even a lunch box, dripping, if you have enough material, is really not going to do that bad a job. I am not looking for mass casualties. I am looking for some deaths and a little sublethal effect: not too much to ask for if you are a reasonable terrorist. I am going to get what I want. This is a real issue when you look at how you deploy inside a closed area. Here are two plots that we did. This is what our DB new C4 model does when transporting and diffusing. We use the source of a little bit more than a kilogram, maybe 2 kilograms. Notice here we use the mixing height, which is typical in a battlefield of 800 meters. This is what you see on the battlefield; this is total dosage. To give you an idea for GB, this is a GB plot, roughly 50- to 100-milligram minutes per cubic meter is lethal, is LCT 50. What do we have here? We are down here and even over to 5 kilometers; we are seeing this level which is not necessarily a lethal dosage. But you are going to get some sublethal effects. That is playing it outside at 800 meters. Played out inside, same situation. Now you hold your level at 6.2 meters, and I haven't even done the wall effects. The wall effects do whatever they want because the wall effects will make it even worse. Now what do you see? There is your 100-milligram per minute per cubic meter that you need for your lethal LCT 50. You have that lethal dosage throughout a 5-kilometer distance. So what does that mean now? You have to understand that this a logarithmic scale, so let us look at the two on top of each other. Here is the dosage outside; here is the dosage inside. You take the same device, you do it on the inside, you have got problems. I will argue one other point, and it is a technical point with the way the military defines their terminology. Where you do not have active HVAC transport, you are doing a small area like this, high dosage of volatile chemical agents and you know what you have? You don't have a non-persistent agent any more; you have a persistent agent. It is still there; it is still causing lethality; it is causing casualties. This is where I see the crux of the technology is for terrorism. The guy can pick a lot of close-quarters targets, and with a little bit of ingenuity and the right vapor chemistry, he has himself a fairly effective system. My conclusion on at least this part is that leaky lunch boxes really do not do that badly in a closed area. The subway in Tokyo proved that (visual 16, page 1-100).

Some other concerns for me. I had a person come back, Hugh Carlin, who has an office next to me. Hugh is not really an excitable guy. He is very relaxed. He came back to me and said, "I really had the gee willies on my Caribbean cruise." I said, "What was your problem?" He said, "I was down in this restaurant area, and all of a sudden I thought about what the hell would happen if there were a chemical agent disseminated on this cruise ship. We are out in the middle of the ocean; what would happen?" He has got a legitimate point. Where do you evacuate? You have got a closed-area situation here, and maybe you cannot even turn off the source. Those are situations where you look and you say, "You know, we have got to seriously look at what things are out there." What could we do? Maybe there is nothing we can do. We just have to accept the conditions.

Another way of getting things out: we have a trilateral interaction with U.K. and Canada. One of the things we are looking at – and this is kind of debunking an old wives' tale – is explosively disseminating chemical agents (visual 17, page 1-101). Some people say, "You put the chemical agent in there with a high-order explosive, and you are going to burn it

up. It will burn up with the fireball." Well, it does not burn up with the fireball. As a matter of fact, you will only get a small amount consumed and the rest of that will go out with the blast wave. If you take a bottle like this – this is basically our fuse – fill it with some liquid agent, put some C4 in the center, pop that in there, put a little detonating cap on it, you can function it remotely via RF or you can do it hard wired. It is not a bad system. We did it with bio, and I will show you some interesting results. The bio did not do well with explosives. Here is what we saw. When we did that device, we used a liter of biological materials. We used BT, bacillus thuringiensis, and the other was a methyl salicylate, which is a wintergreen. We put the same amount of central bursting, high explosive in that system. We accepted the fact, and we know this because I used to work in a munitions directorate for 10 years, that explosives are not a very good way for disseminating materials of any sort. However, when you do it with the biologicals, and this is mass concentration, the biologicals drop right off and most of that results in large diameter particles dropping right off. However, with the chemicals, they actually have a certain baseline they start with, they increase in concentration because of the fact that those chemical molecules are so well behaved they do evaporate and you do get a continuous source. One of the things we are doing with explosive devices that are CB is putting some foam layers around these explosive devices. They worked well for the biologicals because it pulls them out of the air. The bio sits there in the foam and is not a problem. However, when we do it with the chemical, the foam knocks out the chemical aerosols. Then the vapors from those chemical aerosols come back out again, and we have still got a problem. We have to look at foam that will do in situ degradation of the chemical at the same time that it is grabbing out the aerosol. So it is more of a difficult problem.

Pyrogenic agent generation: I know you cannot smoke in here, and I was not planning on doing it. I was planning on simulating it. These are Dutch Master Corona Deluxe. What can you do with a quality cigar? Well, I will tell you some interesting things we have learned over the course of doing pyrotechnics. You can take a cigar, light it up, dip it in a little bit of Teflon, and make some interesting species out of that. That is a fun way to go. Light up one of these in the bar for your buddy; tip it into the Teflon ashtray; and then tell him to light it up. Here are the goodies that you get out of this. There is carbon monoxide, carbon neo-fluoron, which is the fluorine analog of phosgene, hydrogen fluoride, perfluoride isobutylene, which is one of the compounds that Fred Sidell talked about. It is a toxic material, that also goes right through charcoal filters. One other thing which I think is extremely interesting is what happens when you fume polymeric materials, especially Teflon. If you do it right, you get the submicron polymeric fumes. We have found that if you inhale enough submicron polymeric fumes, half of the cigar probably, you will get 0.01 micron particles. What they have found is that those particles are not recognized by the alveolar macrophages which are the good things that swim around and engulf all the bad stuff in your lungs. They get passed in the alveolar epithelium and into the lymph nodes. Not only that, but in the process of making these things with this cigar, they entrap free radicals which stay, this is surprising, for days to weeks trapped inside the submicron particle. It is very basic chemistry here, very interesting physiology and toxicology because it involves basic lung overload like we see with nuisance particle like titanium dioxide or carbon black or even chemotactic things like asbestos. These particles work because the body does not recognize, so it overreacts, and you get lung morphology that is strange and lung physiology that they cannot figure out. It is a

number density phenomenon. They have found that you do not even get LCT 50s. If you reach a certain number density, the lung overload is so bad that you go right to LCT 100s. You are either at a low state of 12 or 25, and you go up to 100. It is an amazing phenomenon. You can take pyrogenic materials, not just the Teflon, but other polymeric materials and do the same thing. As a matter of fact, in the seventies, the National Fire Prevention Board was scratching its head. They said why are there more fire-related casualties, 30 to 40 percent more, with fires than there were in the sixties? They scratched their head and they said, "Are fires different now from what they were before?" They went to NBS and NBS went to DuPont and DuPont said, "Yeah, it is different because now most of the materials, building materials, materials on aircraft, materials in other types of transport vehicles, are polymeric." They said that the fume polymers are an extremely toxic material. They have all kinds of interesting byproducts, and the lung does not deal with it. Now there is an interesting one for you, a very simple Teflon. You are getting toxic agents out of this material. How are you going to control that? If a guy wants to fume it, you take a thermal device, put a little Teflon or a little polymer in there, cook it up, and oh, well.

What do we need to cover a chemical incident? We need reliable early warning and detection. These are the kinds of things we work on in the Technical Support Working Group to help out the user. We need respiratory protection. Let me go back to this one in a minute. The Israelis put 5,000,000 masks on people in Desert Storm. Out of all these toxic effects you can have with mustard-percutaneous effects and transdermal effects-the one that scares us, the one we think is the biggest hazard, is inhalation dosage. The bottom line for chemical terrorism is absolutely that and really nothing else, except if you want to look at the mustard and percutaneous effects. The bottom line is our public: do we have the capability to even do this? The Israelis made that commitment. They put them on kids, they put them on children, then put them on the elderly. They even put them on infants. My point is that maybe from a contingency perspective we ought to look at respiratory protection in general. Maybe that is not so unrealistic a thing to do considering some of the consequences. In some cases, we may not be able to get out of the situation and evacuation is the only result. If we evacuate and we do not have the respiratory protection for the people we evacuate, there is not going to be any excuse; I do not want to be there when it happens. I really want to have some contingency capability. Consequence management, education, I mentioned that before, is still a real issue and how that consequence management ties in with crisis management. We net that and make that work very well for us: responsive medical treatment, hazard prediction, and analysis. What I am saying by that is, a week after an incident you have a source. What is it? Where was it? Where is it going? How bad is it? Can we at least get those answers, because those questions are going to be asked.

In summary, chemical incidents are relatively easy to accomplish. They are an effective, lethal alternative to conventional terrorism; that is quite obvious. We need better technical response systems, better coordination, both interagency and internationally. Training and exercises are absolutely critical. We need to play the game. Finally, I think as a measure for inhalation dosage is the key. We need to work on systems that will do that for us.

Question: I would like to ask one question about your demonstration. I spent a lot of my time at a State Department Annex. Would you tell me how I can get them to change the sign that says, at street level, "Please do not block air conditioning inlet."

Answer: That is a good point. As a matter of fact, there are some air intakes. This is of concern. In most households, the fresh air intake is based on diffusion, it is whatever leaks through the house. There is no rule nor code that basically states that. However, for the commercial buildings and for schools, there are mandates for how much fresh air you have got to move into that building. If someone knows that kind of an intake system, that is a perfect place to put your device. It could be very covert or surreptitious. So it is a very good point.

Question: Did your organization evaluate these Israeli protective masks, and if so, what is your opinion of them?

Answer: We are procuring some, and we are looking at them. They have the data; they spent almost a year in these things. These are not mockups. They were real people, kids playing basketball for 8 to 9 hours in that mask. That data is precious to us, because they are looking at it from a consequence management and a civilian health perspective. The Israelis are a smart people and I think, as a first approximation, that is an excellent place to go to at least look at that and evaluate it. We are going to be looking at the qualities of those things and comparing them to what we have. But I will tell you one other thing, if I could mention, sir, one of the things we need to do. I am even trying to convert our special operations forces, even our military, in this. This is my own personal opinion based on what I saw over in Israel when we were looking at some of these systems. This one is basically a negative pressure mask, but this one that the boy has on, is a neck seal with a blown system. I would guess, for most civilian applications, and in some cases where the guy cannot handle the delta P that a military guy can handle, you probably want to put him in that positive pressure environment. Number one, it is less stressful, and number two, and a most important thing, especially for you bio guys in the audience, is that a neck seal with that kind of a system will preclude any breaching of the mask from the negative pressure mask. So, even in a highly toxic viral environment, you will give yourself protection factors of 1,000 or more. We think that blown masks, neck seal masks, are the way to go. They are also a lot easier to put on. You can get one size or three sizes fit all. That is the approach we are taking. Let us relook this problem. The M40 may be fine for the military, but I do not think it is going to be fine for our civilians.

CHEMICAL INCIDENTS ISSUES AND CONCERNS

11 JULY 1995

JAMES A. GENOVESE

CBCT

U.S. ARMY CHEMICAL BIOLOGICAL DEFENSE COMMAND

Visual 1

NOT SPECIFIC SCENARIOS

BUT

REDEFINE THE PROBLEM

Visual 2

- **TERRORISM**
  - **SYSTEMATIC USE OF VIOLENCE, INTENSE FEAR, AND INTIMIDATION TO ACHIEVE AN END**

- **WEAPONS OF MASS DESTRUCTION**
  - **CHEMICAL**
  - **BIOLOGICAL**
  - **NUCLEAR**

Visual 3

FOCUS

CHEMICAL INCIDENTS INVOLVING VOLATILE CHEMICAL HAZARDS, e.g., SARIN (GB) IN A SUBWAY

Visual 4

CHEMICAL INCIDENT ISSUES VS MILITARY OPERATIONS

- **TERRORISM TARGETS NON-COMBATANTS**
- **MINIMAL CIVILIAN TRAINING AND PREPAREDNESS**
- **OPEN FIELD ENGAGEMENT VS COVERT, CLOSE QUARTERS DEPLOYMENT**
- **TERRORISM EVOKES PSYCHOLOGICAL AND PHYSICAL RESPONSE FROM ITS VICTIMS**
- **INFINITE NUMBER OF SCENARIOS (TARGETS) POSSIBLE**

Visual 5

CLARIFICATION

RESPONSE TO TERRORIST'S CHEMICAL INCIDENT CAN BE DRASTICALLY DIFFERENT THAN THE MANNER IN WHICH THE MILITARY RESPONDS ON THE BATTLEFIELD.

Visual 6

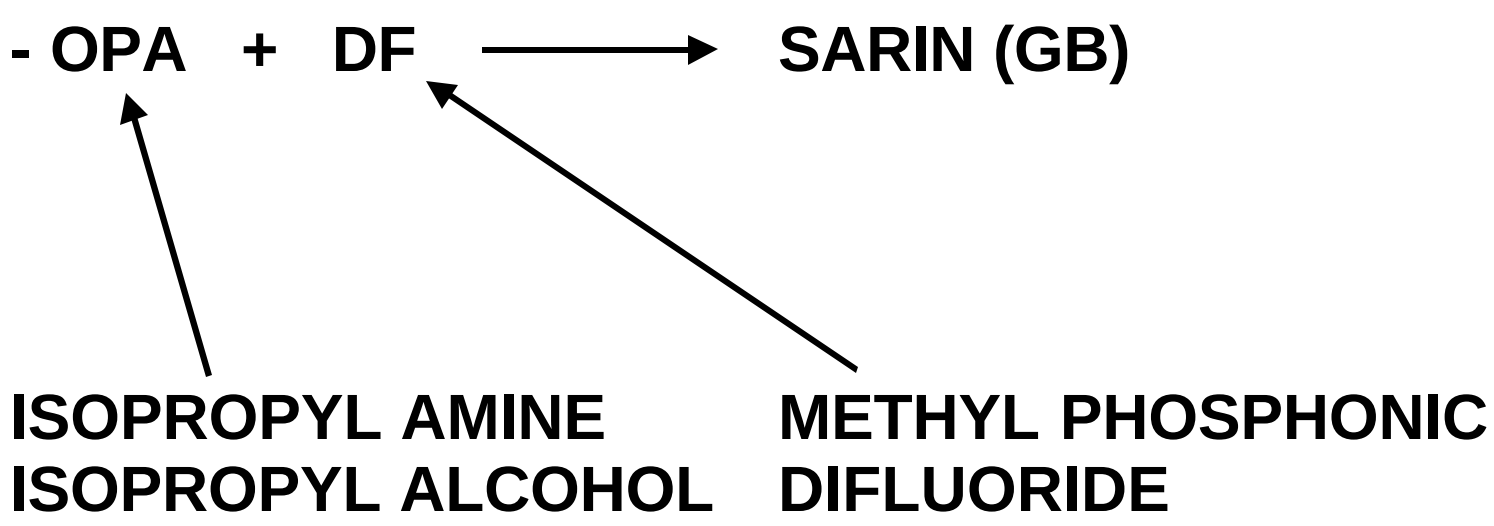
WHY CHEMICAL TERRORISM?

IT'S EASY TO DO!!!!

Visual 7

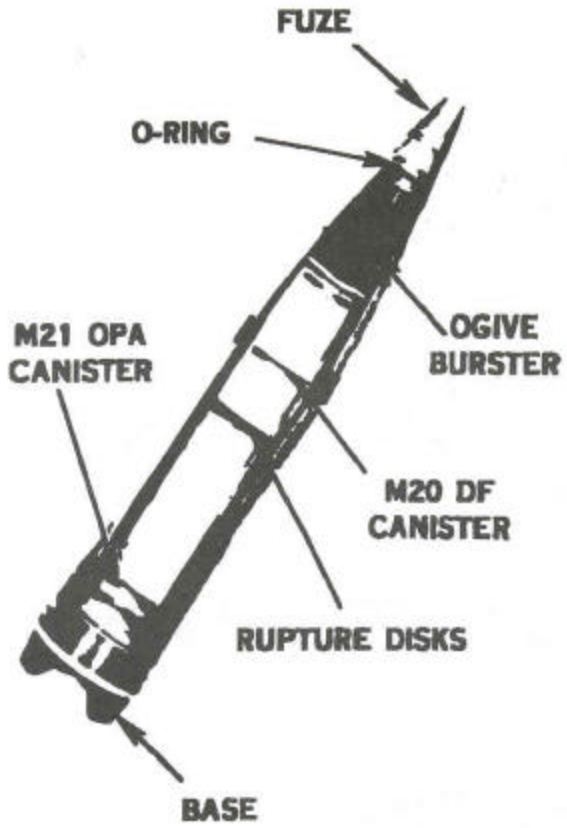
NERVE AGENTS

- **BINARY SYSTEM (M687 PROJECTILE)**



Visual 8

PROJECTILE, 155MM, GB-2, M687



NOMENCLATURE:

- **PROJECTILE, M155MM, GB-2, M687**

DESCRIPTION USE:

- **PROVIDES A GB AGENT BINARY CHEMICAL RETALIATORY CAPABILITY FOR THE 155MM GUN**
- **FIRST APPLICATION OF BINARY AGENT TECHNOLOGY FOR CHEMICAL MUNITIONS**
- **PROVIDES NUMEROUS LOGISTICAL AND SURETY ADVANTAGES OVER UNITARY CHEMICAL MUNITIONS**
  - **TWO CANISTERS, EACH FILLED WITH A RELATIVELY NONHAZARDOUS INTERMEDIATE**
  - **IN STORAGE THE FORWARD CANISTER AND FUZE ARE PACKAGED SEPARATELY FROM THE PROJECTILE WITH THE REAR CANISTER INSTALLED**

Visual 9

NERVE AGENTS

- **THREE COMPONENT SYSTEM**

  - **NaF + DC + $C_3H_8O_2$ → SARIN**

  - **COMMERCIALLY AVAILABLE**

  - **RECIPE IN UNCLE FESTER'S "SILENT DEATH"**

Visual 10

NERVE AGENTS

- **ONE COMPONENT SYSTEM**
  - **MALATHION**
  - **PARATHION**

Visual 11

WHY CHEMICAL TERRORISM?

IT'S EASY TO DO!!!

- **INDUSTRIAL HAZARDS COMMERCIALLY AVAILABLE**
  - **CHLORINE**
  - **PHOSGENE**
  - **METHYL ISOCYANATE**
  - **HYDROGEN CYANIDE**

Visual 12

WHY CHEMICAL TERRORISM?

EASIEST CLOUD TO GENERATE

- **ALMOST INDEPENDENT OF DISPERSION METHOD**
- **GASEOUS MOLECULES, WELL BEHAVED, HIGH RATE OF DIFFUSION**
- **RATES OF DROPLET EVAPORATION**
  - **PARTICLE SIZE**
  - **NUMBER DENSITY**
  - **HEAT OF VAPORIZATION**
- **ALREADY IN RESPIRABLE RANGE**

Visual 13

ENVIRONMENTAL MIXING - OUTSIDE

- **WINDS**
- **SOLAR HEATING**
- **LARGE "ATMOSPHERIC" MIXING BOWL**
- **HENCE:**
  - **CONCENTRATION RAPIDLY DECREASES**
  - **LETHALITY EFFICIENCY LOW**

Visual 14

ENVIRONMENTAL MIXING – INSIDE

- PHYSICAL BARRIERS
- FORCED AIR CURRENTS
- NO WIND AND NO INFINITE SOURCE OF AIR
- COMPARATIVELY LITTLE DILUTION
- HENCE:
  - CONCENTRATION REMAINS LETHAL LONGER
  - ACCUMULATIVE DOSAGE INCREASES
  - LETHALITY EFFICIENCY INCREASES

Visual 15

THEREFORE, A LEAKY LUNCH BOX WOULD BE A GOOD IMPROVISED DISSEMINATION DEVICE IN A SUBWAY

Visual 16

WHY EXPLOSIVE DISSEMINATION?

- **"WHAT THE TERRORIST KNOWS"**
- **OLD WIVES' TALES OF C/B MATERIAL CONSUMED IN FIREBALL NOT TRUE**
- **C/B MATERIAL RIDES THE SHOCK WAVE AHEAD OF THE FIREBALL**
- **INSTANT GRATIFICATION FOR THE TERRORIST**
- **FOR A GIVEN CHEMICAL AGENT WITH A REASONABLE VAPOR PRESSURE, VERY EFFECTIVE METHOD TO ENLARGE SOURCE AND ENHANCE EVAPORATION**

Visual 17

Admiral Young: I would like to invite the next group up as a panel. Scott Wetterhall from the Centers for Disease Control is Acting Director of the Division of Surveillance. We also have Remle Grove, from FDA, and Ken Stroech. Ken is the Director for Special Preparedness Programs and has been in a number of these deployments. Steve Clark is the Chief of the Drinking Water Policy Technical Branch at EPA. There is also Robert Southall who is joining us from the U.S. Department of Agriculture. What I would like to do is to have each of you introduce yourselves in order, and then we will answer questions as a panel.

1.14 Surveillance Systems

1.14.1 Scott F. Wetterhall, M.D., M.P.H.

Acting Director
Division of Surveillance and Epidemiology
Centers for Disease Control and Prevention

What I am going to do today is give a very brief overview of public health surveillance from the perspective of the Centers for Disease Control and Prevention (CDC). The importance of surveillance systems is that they may identify persons who have become ill from intentional use of a biological or chemical agent.

Many of the speakers today have discussed sprays – their properties and characteristics – and I would like this audience to know that CDC has also used sprays in its past. In the early years of the agency, CDC personnel used sprays for controlling mosquitoes. The CDC began spraying during World War II as Malaria Control in War Areas, in part because of the large number of troops that were being trained in the South, an area where malaria was still endemic. Those malaria control efforts were quite successful. This figure (visual 1, page 1-108) shows the reported number of cases per 100,000 population from 1930 to 1993. Following the end of World War II, there was a precipitous drop in the number of cases of malaria. Subsequent increases were noted as relapse cases among Korean veterans and returning Vietnam veterans, and subsequently among foreign immigrants from malaria-endemic countries.

I want to define public health surveillance from CDC's perspective because I suspect that my colleagues from the CIA and the FBI would probably use a slightly different one. When we talk about surveillance (visual 2, page 1-109), we refer to the systematic and ongoing collection, analysis, interpretation, and dissemination of information that is linked to public health practice. One major pitfall that must be avoided is that sometimes systems are established, data are collected, and yet the data are never acted upon. The use of data for public health practice is an essential linkage.

What are the prerequisites for public health surveillance (visual 3, page 1-110)? You need an organized healthcare system, a classification system of disease and injury, and measurement techniques. These may seem like platitudes to some, but when you consider doing surveillance in situations such as refugee camps in Rwanda or Somalia, or you take a hit

and your healthcare system is knocked out, then you need trained people who can measure, collect information, and analyze it.

There are many uses for surveillance data, and since this is a conference on biological and chemical agents, I am going to focus on only a few. The first is that the surveillance data can be used to detect epidemics. This figure (visual 4, page 1-111) shows the incidence of paralytic polio in the United States from 1951 to 1993. As you may have noted, Jonas Salk recently passed away. During the 1950s, he developed an inactivated polio vaccine that underwent clinical field trials. Its success was viewed as a tremendous medical discovery that would protect millions of children from a crippling scourge. Widespread distribution of the vaccine began in 1955. Soon after its introduction, reports of cases of polio in children who had received the vaccine began to appear. CDC began to conduct surveillance and initiate several epidemiologic studies. Cases were detected among persons who had received the inactivated vaccine, as well as among family contacts of persons who had been vaccinated. Using epidemiologic methods, CDC was able to determine that all of the cases in vaccinated persons had received vaccine from a single manufacturer, Cutter Laboratories. Subsequently, the virus was cultured from the implicated lots, which had been pulled from the market. Vaccination with vaccine from other manufacturers continued. As a result, we were able to avert what otherwise would have been a public health and public relations disaster. The public would have abandoned the polio vaccine if they felt there was danger from widespread contamination.

Botulism is a disease that has been mentioned several times at this conference. This figure (visual 5, page 1-112) shows that number of cases of foodborne botulism in the United States from 1975 to 1993. We have a simple but sensitive surveillance system for botulism. Botulism antitoxin is only available from CDC. Medical personnel seeking the antitoxin must contact the CDC person on call. Thus, when there is a request for this substance, we get a very early warning that there may be something going on.

Surveillance data can be used for tracking mortality trends. For many years we have operated the CDC 121 Cities Surveillance System. This is a voluntary reporting system. The reporting sites are health departments in 121 cities, representing about 20 percent of the U.S. population, located throughout the country. Each week a clerk in each health department reviews the death certificates received, counts the number of deaths, categorizes them by age, and determines the proportion that were caused by pneumonia or influenza. This information is faxed to CDC, where it is reviewed and published the following week in the *Morbidity Mortality Weekly Report* (MMWR). Here (visual 6, page 1-113) we have done some mathematical modeling with these data. We show that in the 1989-1990 season there was an increase in deaths due to pneumonia and influenza beyond the "epidemic threshold." Such a finding would make us wonder, "Are we using the wrong vaccine? Are enough people being vaccinated?" The 121 Cities System is very simple yet extremely timely. The system is particularly useful for monitoring influenza, but it would also likely identify other unexpected increases in mortality.

We can also use surveillance data to evaluate control measures. This (visual 7, page 1-114) is the reported number of cases of tuberculosis in the United States during the past

20 years. During the early 1980s, rates were still falling during a time when we envisioned total elimination of the disease from the United States. Beginning about 1984, however, the rate leveled and subsequently began to rise. There were three reasons for these increasing rates: (1) larger numbers of HIV-infected persons, (2) a increasing number of homeless people, and (3) greater immigration from countries where tuberculosis is indigenous. Because of these findings, resources were redirected and programmatic efforts modified. As a result, during the past 2 years we have seen a decline in tuberculosis.

You may also use surveillance data to monitor changes in infectious agents. This figure (visual 8, page 1-115) shows data from a laboratory-based surveillance system that monitors antibiotic-resistant gonorrhea. As you can see, since 1980 the proportion of cases with antibiotic resistance has increased dramatically. These surveillance data have altered clinical practice. On the basis of these findings, the treatment guidelines for gonorrhea have been modified and revised.

What are the different types of disease surveillance systems in the U.S. (visual 9, page 1-116)? There is a notifiable disease reporting system, which I will describe further. There are laboratory-based systems-that is, State health laboratories send information on bacterial and viral isolates to CDC. The hospital-based system examines information on hospital discharges. Population-based surveillance can be conducted using data from the National Health Interview Survey and other ongoing surveys. Vital records – birth and death certificates – are frequently used for following trends. Similarly, registries, particularly those for cancer and diabetes, can be used to determine the incidence of these conditions in selected geographic areas.

I want to focus now on what is called the national notifiable disease surveillance system. Operation of this system serves as the backbone for both formal and informal reporting procedures among clinicians, local and State health departments, and CDC. Because of Federal/State relations established in the U.S. Constitution, the power to decide what diseases are notifiable is an authority that resides with the States. Federal agencies cannot dictate to States or municipalities that certain diseases be reported. However, CDC collaborates with the State epidemiologists to decide which diseases (currently 52) are reportable on a national basis. Each of the 50 States, the District of Columbia, and the territories decides who is required to report these diseases. Traditionally, physicians, dentists, and other medical personnel are required, but hospitals and laboratories also may be. These reports are typically submitted to the local health department. The local health department acts on this information, implementing control measures. It also transmits this information to the State level. In turn, each State transmits data to CDC electronically every week.

Dissemination of data is a critical step in the surveillance process. The notifiable disease surveillance system is a useful one because CDC has a popular vehicle for dissemination. Less than one week after the disease data are received by CDC, they are published in the MMWR, along with articles of public health interest. This figure (visual 10, page 1-117) is from the first published article on the Hantavirus outbreak that appeared in the June 11, 1993, issue of the MMWR. The Hantavirus outbreak first came to the attention of public health

officials only several weeks earlier. The MMWR is a excellent mechanism for disseminating important public health information quickly.

I have highlighted several of the strengths of the notifiable disease surveillance system, its timeliness and linkage to State and local health departments. However, there are several limitations that need comment (visual 11, page 1-118). First, as with any system, there is underreporting. As noted earlier, physicians are required by law (or regulation) to report certain diseases within their respective states. These laws are rarely, if ever, enforced. For some diseases, we may receive reports on only 20 percent of the cases. Second, the reported cases may lack representativeness. That is, people who have more severe symptoms of a disease are more likely to seek medical care; thus, they are more likely to be reported. Finally, there may be inconsistency in use of case definitions. For example, what one physician diagnoses as influenza another may call mycoplasma pneumonia. Such inconsistencies make interpretation of the data more difficult.

As I have described, we have a notifiable disease surveillance system comprising 52 diseases routinely reported by the States on a weekly basis. What do you do, however, when you have a disease that is not a reportable one? Or one that has not been previously described? The Bellevue-Stratford Hotel in Philadelphia was where the infamous Legionnaires outbreak occurred in 1976. That outbreak was solved using one of the most important resources CDC (and the Public Health Service) has at its disposal, the Epidemic Intelligence Service.

The Epidemic Intelligence Service, or EIS, was the inspiration of Alex Langmuir, who created it in 1951 (visual 12, page 1-119). The EIS was founded at the height of the Cold War, when we were engaged in the Korean conflict and concerns about biological and chemical warfare were running high. Many public health officials were concerned about capacity at the local level to respond quickly to disease outbreaks. Personnel in the EIS were trained to fill that void. The EIS is a 2-year training program primarily for physicians, veterinarians, and epidemiologists. There are about 2,100 graduates: 40 percent are in government service (primarily State and Federal agencies); 15 percent are in academia. This is a large group of professionals who have been trained through this system and who serve as resources.

Currently, we have a new class of EIS Officers in Atlanta who are learning the practical steps of field epidemiology and outbreak investigation (visual 13, page 1-120). These are the steps of an outbreak investigation. This may look like a simple cookbook approach, but these methods have been successfully used to investigate the first cases of AIDS, to find the cause of Legionnaires disease, to study the Hantavirus outbreak, and to explore many other new or emerging infections.

First you have to establish the existence of an outbreak. You have to verify the diagnosis: sometimes you must rely upon a clinical diagnosis for which there is no confirmatory laboratory test. Then you look for cases. You look everywhere, you look under every rock. You characterized these cases by time, person, and place. Although quite simple, this characterization can yield rich information. You develop hypotheses, then you evaluate these hypotheses. In an iterative process, you refine your hypotheses. You may begin to conduct

laboratory and environmental studies. Then, once you have characterized the outbreak, you implement control measures, and you communicate your findings to others.

A previous speaker described characteristics of some of the BW agents. Identifying the causative agent, even on a provisional basis, provides a large amount of useful information for identifying its origin as well as assessing its potential threat to the population (visual 14, page 1-121). Sometimes you may only have clinical characteristics that suggest a particular agent; other times you may have laboratory confirmation. If you have identified the agent, you know its natural prevalence, reservoirs, presumed modes of transmission, incubation period, period of communicability, and patterns of susceptibility and resistance. This information can be used in epidemic investigations to lead you to its source. Often, if you know the agent's source, you can control its spread or prevent further exposure. This approach may not seem particularly technical or sophisticated, but the method has been used to control some major public health problems that have emerged over the past 3 decades.

CDC currently operates a large number of public health surveillance and health information systems. At last count, there were over 150 systems that range in content from infectious diseases, to behavioral risk factors (such as physical inactivity), to chronic diseases. Although we have this large number of existing systems, more importantly our operating them provides and supports a critical infrastructure and network that permits the rapid exchange of information through less formal channels of communication.

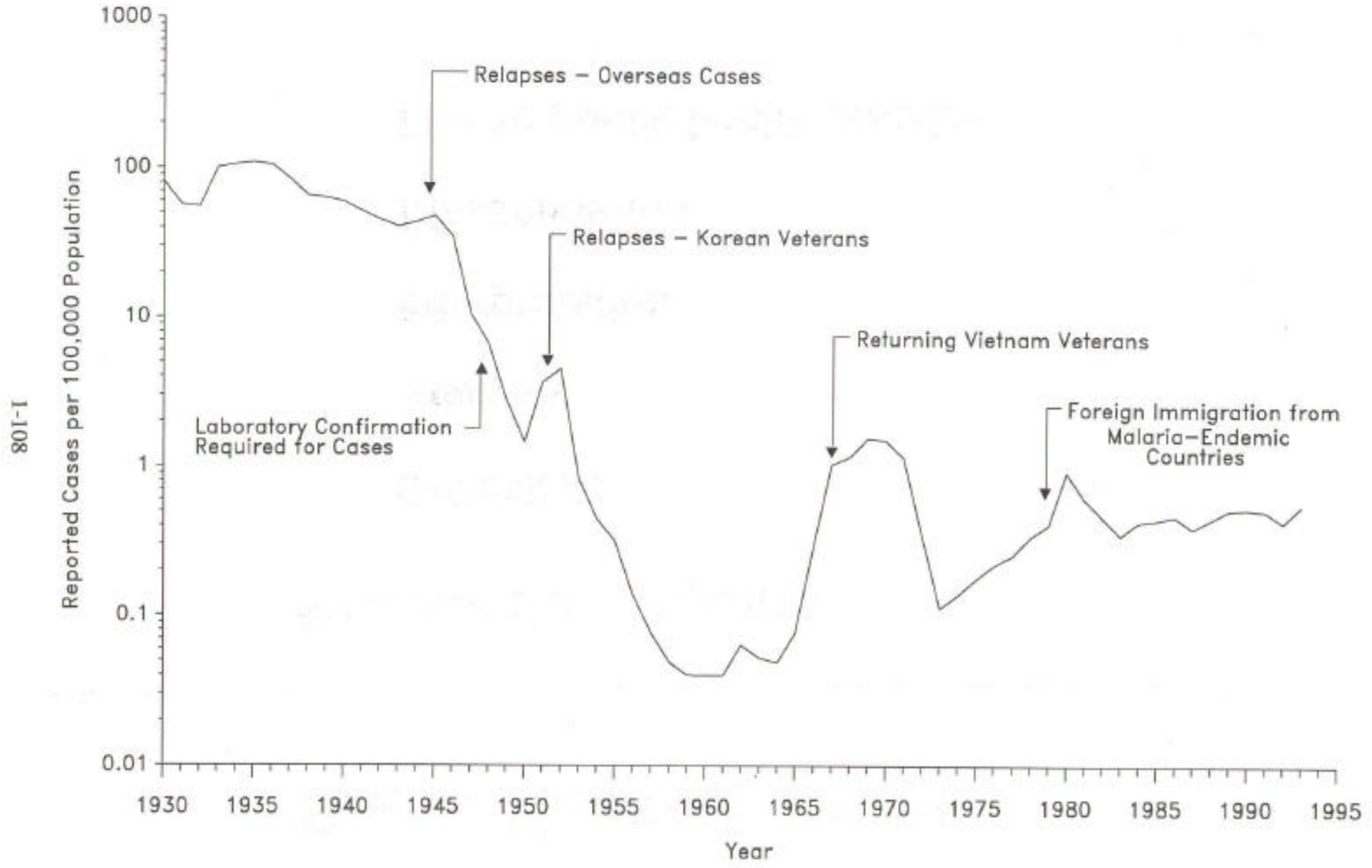
To illustrate this point, I reviewed how several major outbreaks were first detected or brought to the attention of CDC (visual 15, page 1-122). With Legionnaires' disease, a VA pathologist called CDC after returning from a weekend to find three elderly men in his morgue, all of whom had died from pneumonia. With AIDS, there was an alert physician who saw several cases of Pneumocystis carinii pneumonia, normally an opportunistic infection, in a group of young men. Simultaneously, an employee at CDC noted an increase in the number of requests for pentamidine, a medication used to treat this type of pneumonia. With the Hantavirus outbreak, a medical examiner called a colleague at CDC after seeing several cases of unexplained Adult Respiratory Distress Syndrome. The recent E. coli 0157117 outbreak that occurred in Washington and California was caused by eating hamburger meat from a restaurant chain. This outbreak was brought to the attention of health officials by a pediatric gastroenterologist who treated several cases of hemolytic uremic syndrome. He called the health department; the investigation began. In the multistate Schwan ice cream outbreak that affected thousands last year, State laboratory personnel alerted the Minnesota State epidemiologist that they were receiving an increased number of positive cultures for a particular Salmonella serotype. Thus, although existing surveillance systems serve many purposes and provide important information, we often have to rely upon the observant person on the front lines of clinical care to detect outbreaks and alert health officials.

CDC's own intelligence network reflects the fact that we have 50 EIS officers assigned to 26 States (visual 16, page 1-123). We have developed a training program, the Field Epidemiology Training Program, patterned after CDC's EIS program in 19 countries. At present we have 387 graduates of these programs. Among alumni of the EIS program, we have over 2,100 graduates in all 50 states and 37 foreign countries. This group of pro-

fessionals represents an informal but efficient network for public health surveillance and outbreak detection. Each year we update our directory of EIS alumni with phone and fax numbers and other information to facilitate communications.

In conclusion, why do we do surveillance? It is a mechanism to provide information to the decision makers to make rational decisions. In the context of this conference, public health surveillance serves as a front-line system for detecting events that may represent the intentional use of biologic or chemical agents.

MALARIA – By year, United States, 1930 – 1993



Y – AXIS IS LOG SCALE

Visual 1

Public Health Surveillance

Systematic, ongoing

- Collection
- Analysis
- Interpretation
- Dissemination
- Link to public health practice

CDC

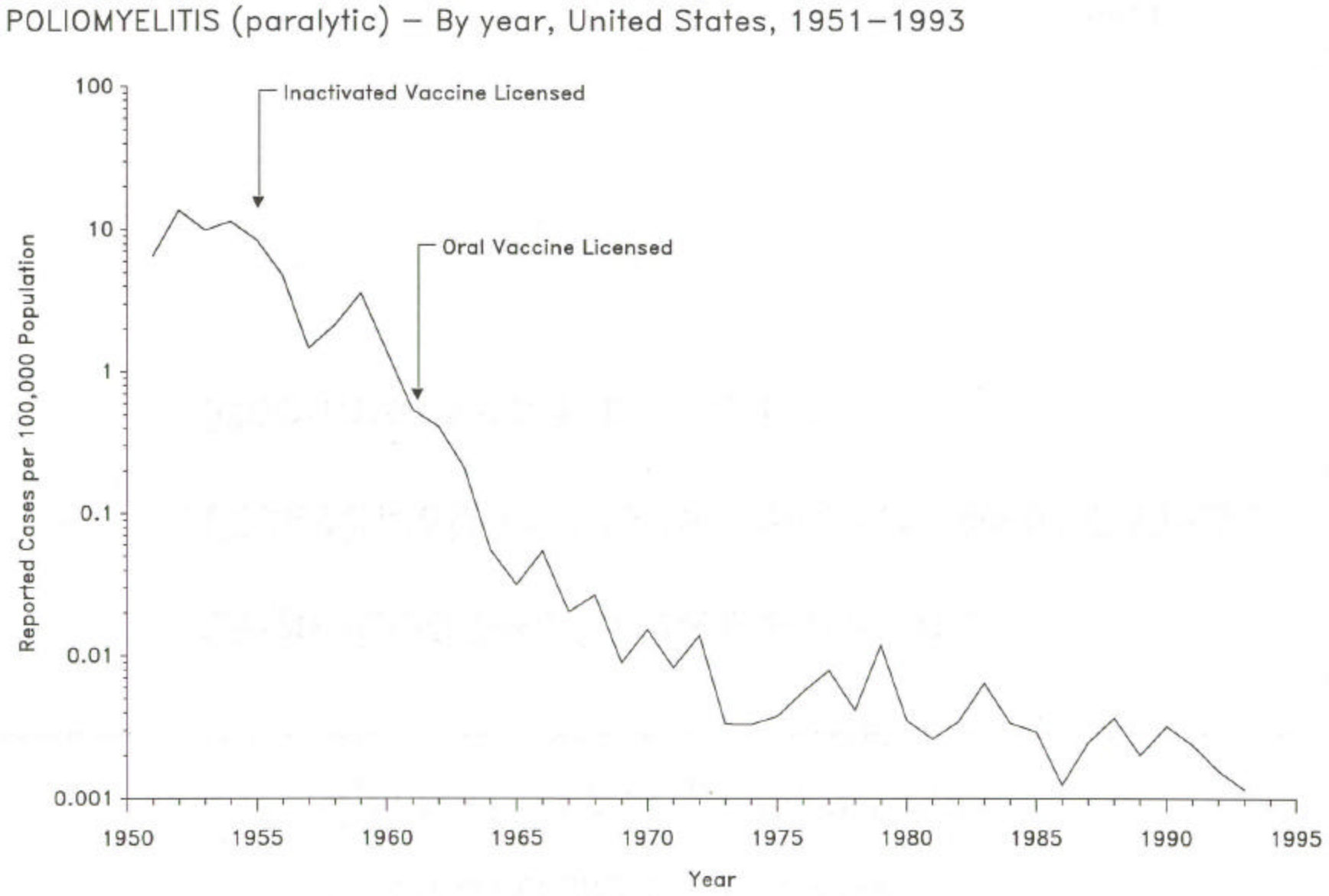
Visual 2

Prerequisites for Public Health Surveillance

- **Organized healthcare system**
- **Classification system of disease and injury**
- **Measurement techniques**

CDC

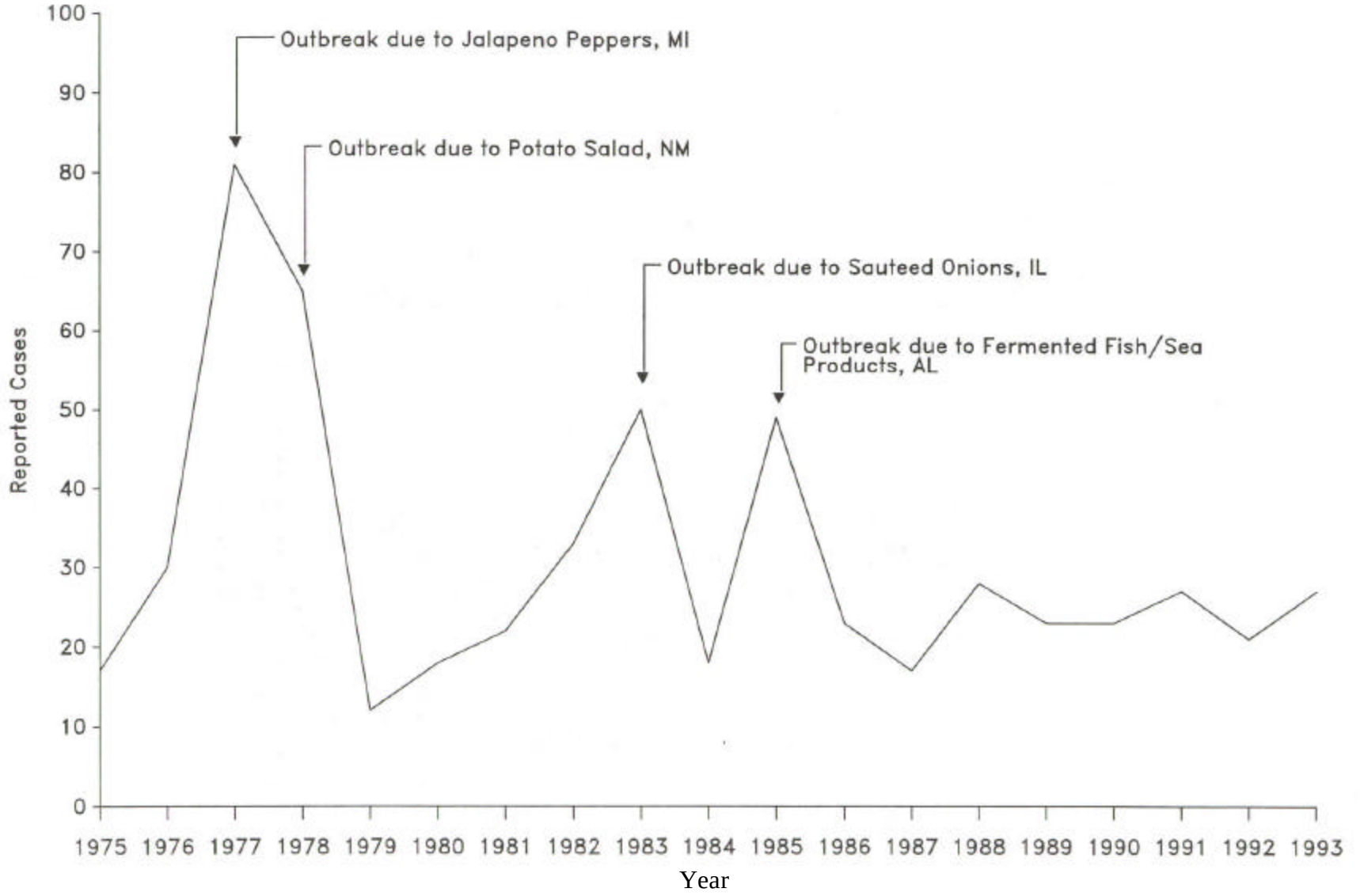
Visual 3



Y – AXIS IS LOG SCALE

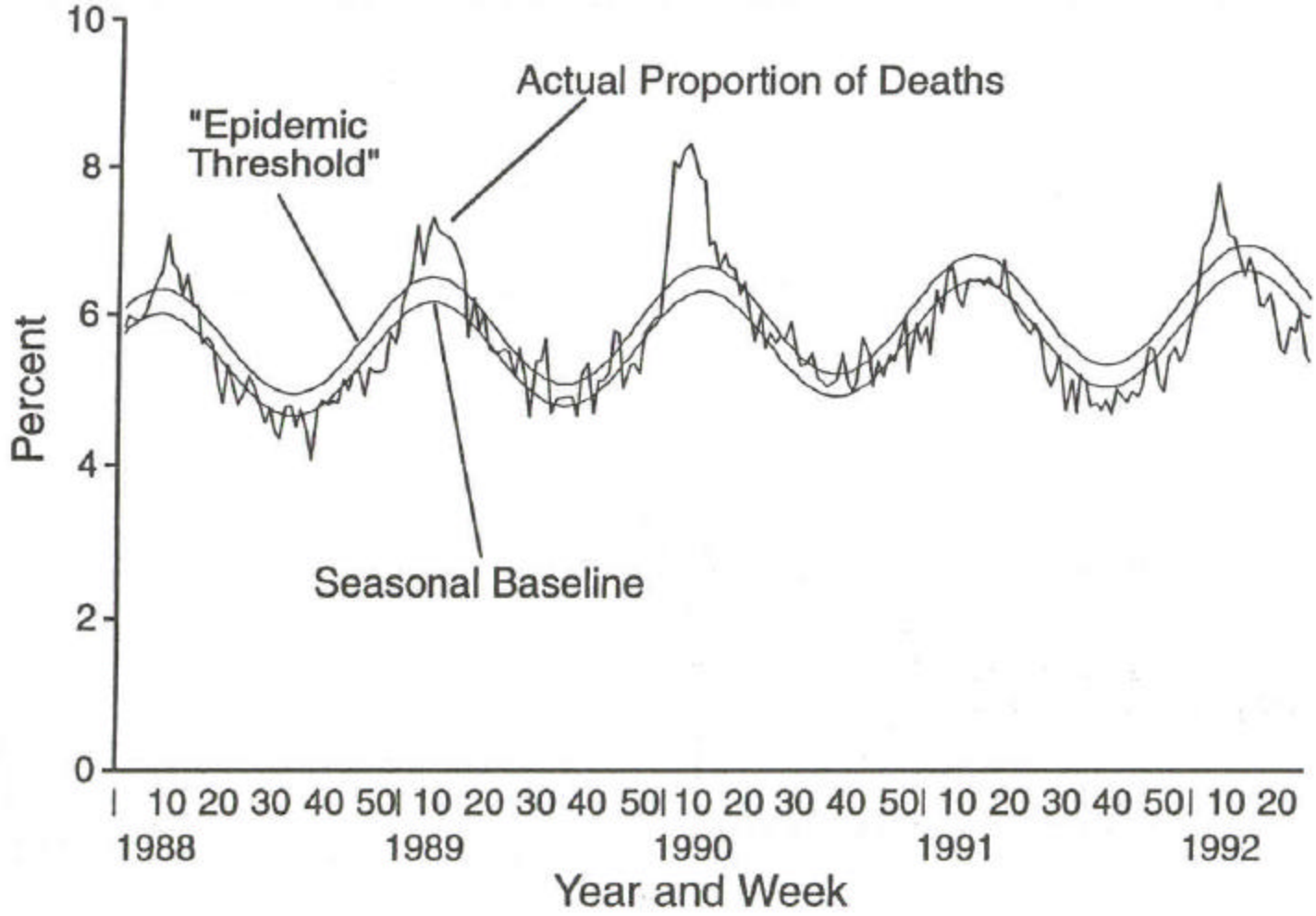
Visual 4

BOTULISM (foodborne) – By year, United States, 1975–1993



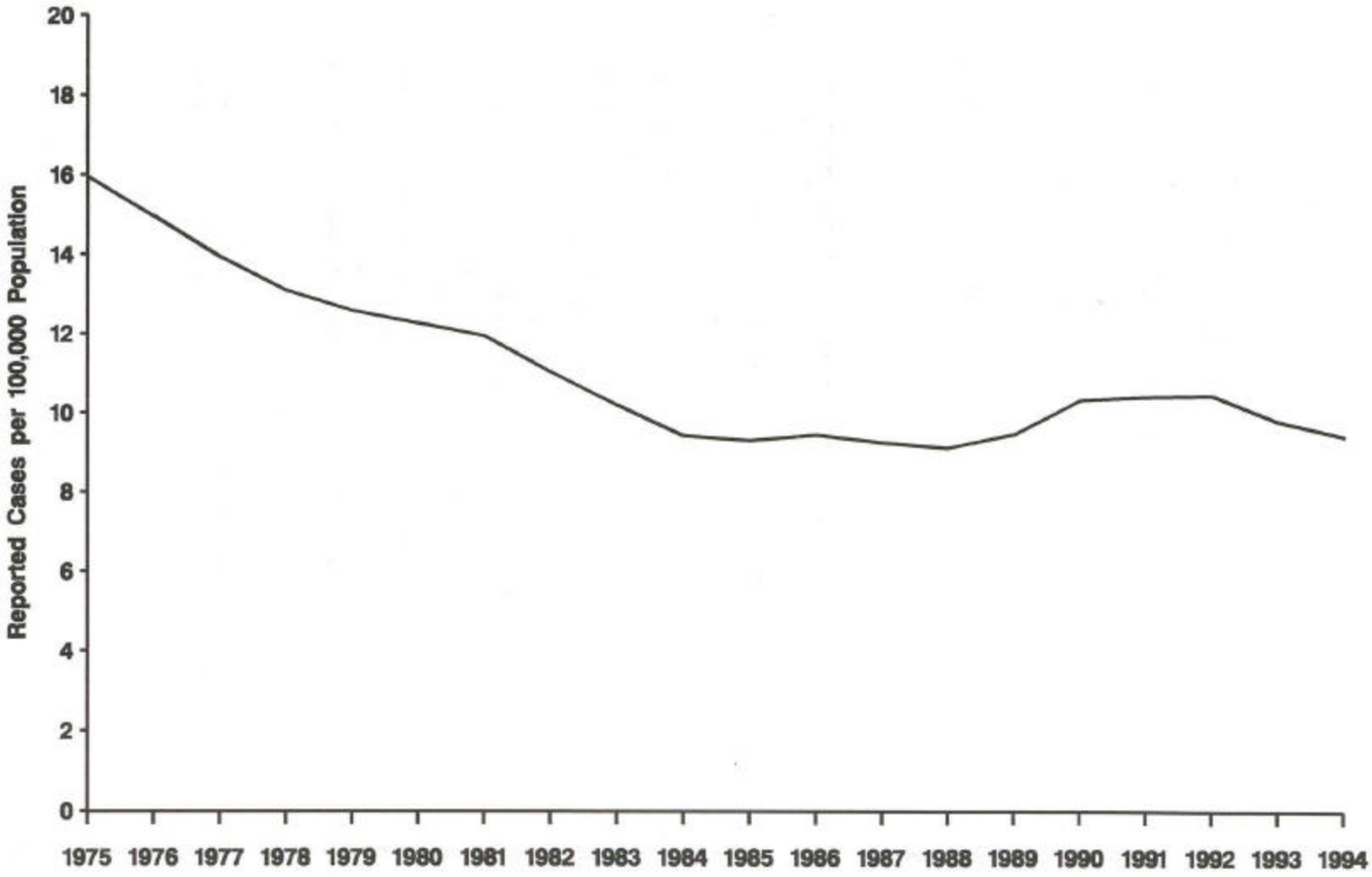
Visual 5

FIGURE 7. Percentage of deaths due to pneumonia or influenza, CDC 121 Cities Surveillance System — United States, January 1, 1988–May 15, 1992



Visual 6

TUBERCULOSIS – by year, United States, 1975–1994



Visual 7

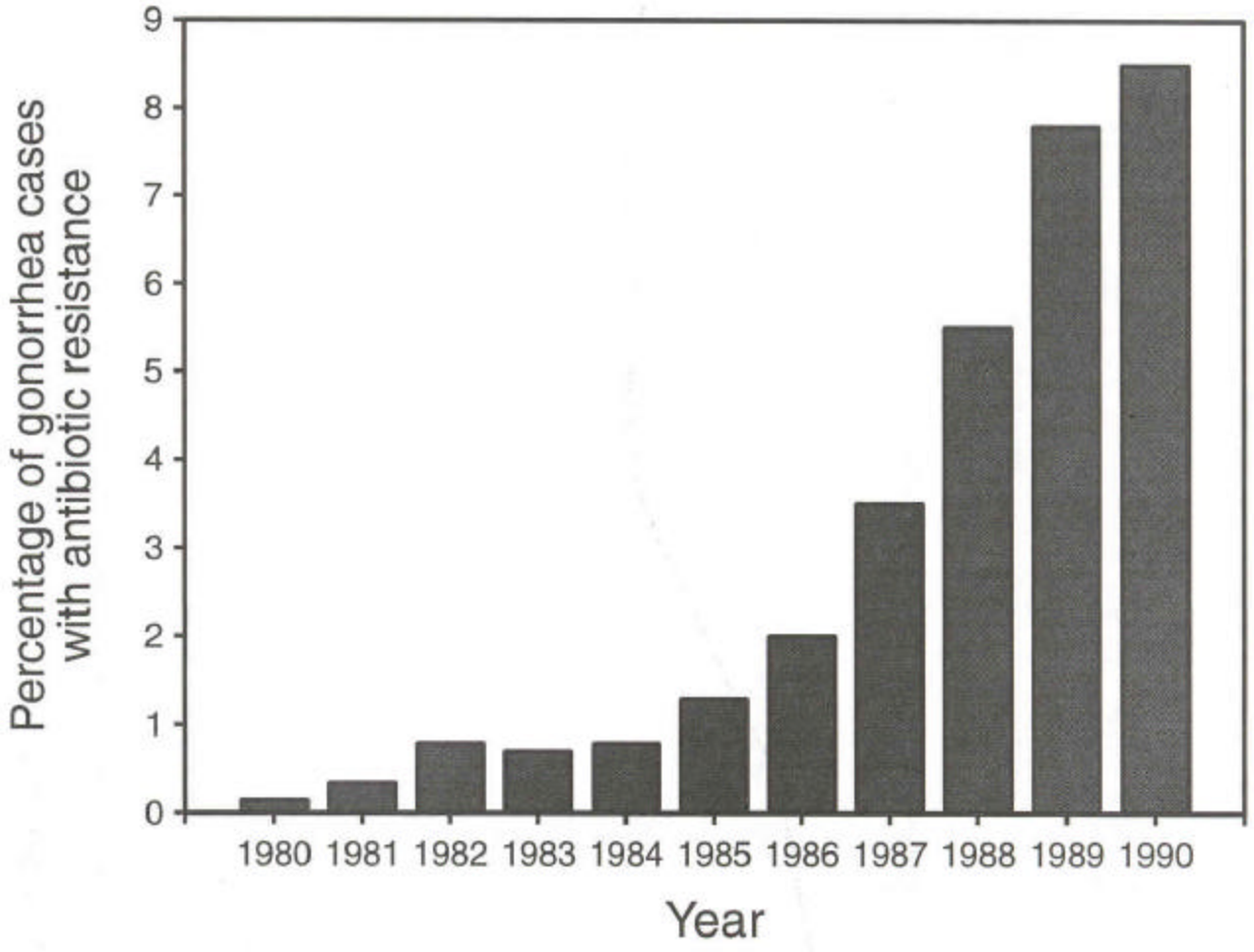


Figure 1-7. Percentages of reported cases of gonorrhea caused by antibiotic-resistant strains --- United States, 1980-1990

Visual 8

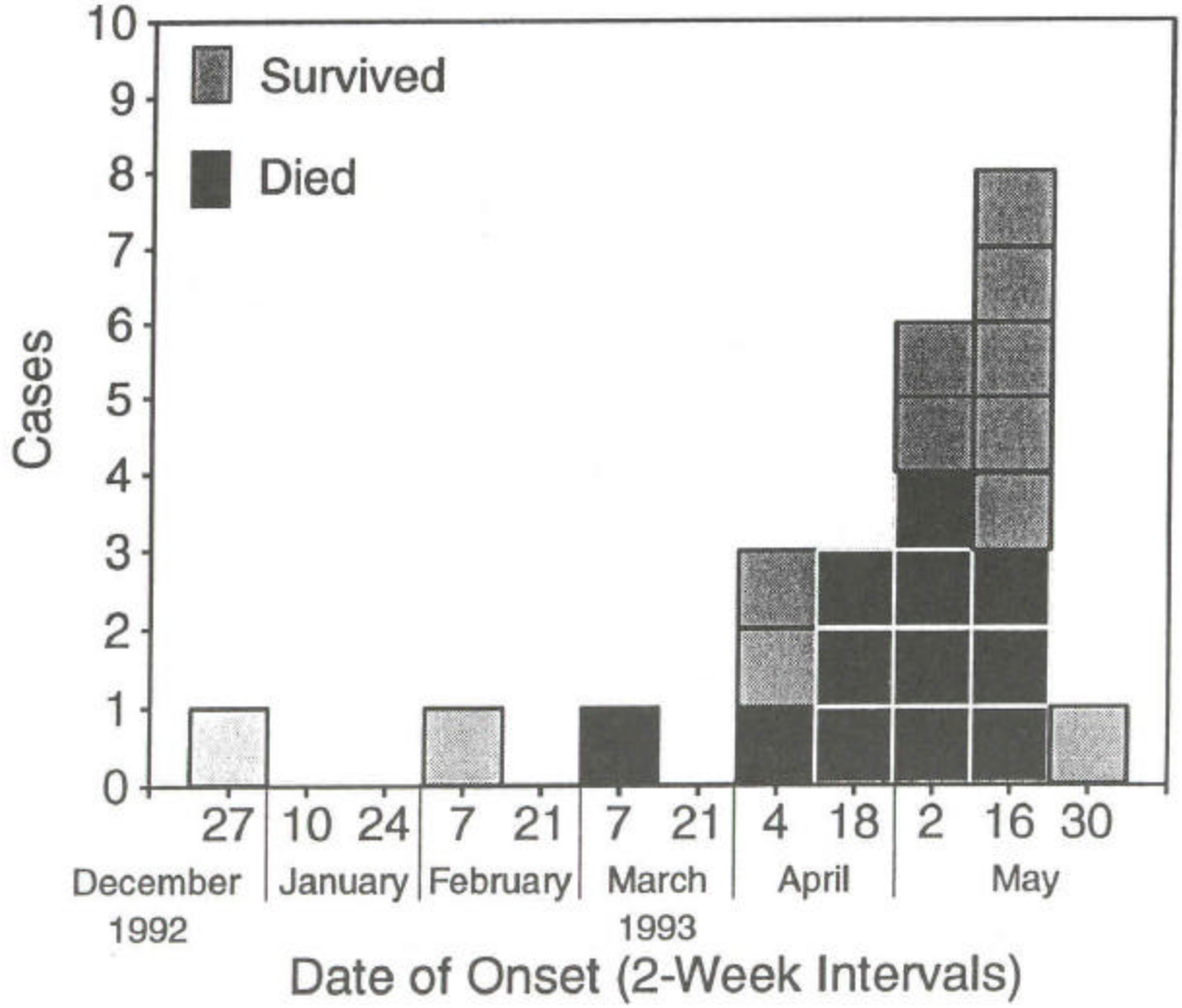
Systems of Disease Surveillance in the United States

- Notifiable disease-reporting systems
- Laboratory-based surveillance
- Hospital-based surveillance
- Population-based surveillance
- Vital records
- Registries

CDC

Visual 9

FIGURE 1. Cases of acute illness, by 2–week interval of onset — Arizona, Colorado, New Mexico, and Utah, December 27, 1992–June 5, 1993



Visual 10

Common Limitations of Surveillance Systems

- Underreporting of diseases
- Nonrepresentativeness
- Inconsistent case definitions

CDC

Visual 11

CDC's Epidemic Intelligence Service

- **Founded in 1951**
- **2-year training for 50-70 MDs, DVMs, PhDs**
- **2,129 graduates since inception**
  - **40% in government service**
  - **15% in academia**
  - **34% in private practice or industry**

CDC

Visual 12

Steps of an Outbreak Investigation

1. Establish existence of outbreak
2. Verify diagnosis
3. Define and identify cases
4. Characterize by time/person/place
5. Develop and evaluate hypotheses
6. Refine hypotheses, conduct additional lab and environmental studies
7. Implement control measures
8. Communicate findings

CDC

Visual 13

Outbreak Investigations: What the Causative Agent Tells You

- Clinical characteristics
- Laboratory confirmation
- Known occurrence
- Reservoirs
- Modes of transmission
- Incubation period
- Period of communicability
- Susceptibility and resistance

CDC

Visual 14

Examples of Outbreak Detection

Outbreak	Source of Detection
• Legionnaires'	VA Pathologist
• AIDS	Physician, increased med use
• Hantavirus	Medical examiner
• E. coli 0157	Pediatric gastroenterologist
• Schwan ice cream	State lab serotyping

CDC

Visual 15

Epidemic Intelligence Network

- **50 EIS Officers assigned to 26 States**
- **387 graduates of Field Epidemiology Training Programs in 19 countries**
- **2,100 EIS graduates in 50 States and 37 countries**

CDC

Visual 16

Admiral Young: I would like to call next on Remle Grove to talk about the other types of surveillance systems. Remle is from the Food and Drug Administration, which over the years, has similarly developed detection systems to pick up a variety of actions in your regulated products.

1.14.2 Remle Grove, Chief
Division of Emergency and Epidemiological Operations
Food and Drug Administration

I am Chief of the Emergency Operations for FDA, and our division is called Emergency and Epidemiological Operations. We are the Dr. Doom-type people. We are always running around telling the other people in the agency that it can happen, that it will happen. They gave us a statue of Darth Vader the other day, and we have it placed prominently in our office to remind everyone that it will not go away. "It" being terrorism; "it" being the use of chemicals, biologicals, etc. Congress told us, has mandated, that we enforce the Food, Drug and Cosmetic Act: radiation health, medical device, infant formula acts, and biologics, in essence, the blood supplies. I am coming at it than something different from most of the PHS agencies. We are looking at the products. Something that you people out there do at least two or three times a day, maybe four or five, depending upon your appetite. You take drugs, you eat food, you figure your food is safe. You have nothing to worry about because it all has been inspected. It is covered whether it is FDA, USDA, or whatever; you have nothing to fear. A couple days ago, we had a situation with one of our major canners. I am going to indicate to you that this canner runs plastic bottles, 20-ounce plastic bottles, roughly 2,400 bottles a minute. There was an employee who was somewhat discouraged and disgruntled with the organization. In this particular case, it was a small quantity of diesel fuel. One drop entered into the bottles running by there makes that bottle taste rotten. Consumer complaints started to come back in to us from people such as yourself. The product was bad, the people were becoming sick, etc. The company that puts out this product started a full-fledged investigation; this was a Saturday. The complaints started at about four, I believe, in number, in Pennsylvania. It escalated. I think the last time we counted it was some 28 that had come in from Pennsylvania, Maryland, New Jersey, etc. Ultimately we ended up with some 60,000 cases of material that had to be recalled voluntarily by the company because it was "off order," did not taste good. If a terrorist wants to do something and puts his mind to it, somewhere along the line in the food production area, it can be done.

I have heard today several examples referring back to Tylenol. In this particular case, it happened to be one individual who had a vendetta. He was going to take care of some people, friends, and relatives. In order to confuse the issue, you take that small little capsule, you go out and shop around, you buy the bottles, in this case it was Tylenol. He took the capsules, pulled them apart, put cyanide inside, put them back together, kept the bottle at home. Unfortunately, the family involved did not make it. To cover up the tracks he went out and put bottles in three or four other stores. People went in, bought it, took it, and assuming that it was safe. He had sealed it down and it looked good. They took the product; they also died. That was the beginning of the Anti-Tampering Act. It was also the beginning of a new organization within the Food and Drug Administration which is called OCI, our

Office of Criminal Investigations. They, like some of the individuals I have seen around here today, carry weapons. Our investigators do not, but they do because they have the authority to arrest. They work with the U.S. Department of Justice, and they have gotten any number of convictions. For instance, the Pepsi situation not too long ago. In this case, it was not a chemical; it was not a biological that was put into the can. If you remember, it was syringes, allegedly. All of a sudden we had one report that came in on a Saturday. Before we got to Monday or Tuesday, we were up over 50 and 60 reports of syringes coming in cans. It is impossible to put a syringe in a can when it is running through a canning line. OCI got into the act. As a matter of fact, they had been born so to speak. They did not have everybody on board. They went out and did their job. Most of the people confessed that they were submitting false reports. The problem is that if someone wants to do something, whether it is a terrorist or an individual, they can do it.

I am concerned because I have heard people running out today saying, "Be aware of the clouds, be aware of chemicals, be aware of biologics." I am more concerned with a group of Montgomery County response team members up on this side that I was sitting beside. I was thinking they are going to go out, and if there is a cloud of a chemical or a biological release by terrorism, they are going to out to wherever these people are sick, throwing up, etc. They are going to be reaching into their kit, and they are going to pull out a syrette, or they are going to pull out some type of a drug that they hope will help whoever is in trouble. Well, it is our job to make sure that the product that they use is what it is. We make sure it is "wholesome and effective." Is it intact? The devices that they are going to use: can they use it one time? Do they clean it off? The next person will get the same contamination; where do we end? We have a facility out in Cincinnati called our Forensic Laboratory. We have been doing testing for some time now on contaminates and their effects on devices, drugs, foods. Is there a degradation involved. Is there a change of color? What happens to the packaging? It is all being looked at very carefully.

I talked to an individual down in what we call our Center for Foods. He came back from a trip overseas working with the Canadians, English, etc. There is a massive exchange of this type of information going on; more out there than people are realizing. It is a shame that it has not been thought of before. I think it is great idea that Admiral Young had us get together for at least this first conference. We in Food and Drug are worried about the product. The surveillance that comes in usually comes in several ways. I will have to say that we get a lot of our information from CDC because of the reporting system that you were shown. We get a lot of information from the consumers themselves. We call that our last line of defense. If the manufacturer does not catch it, it goes to a warehouse. You people are the ones that call in, give us the complaints, we check it out. There are other forms of reporting: medical forms, and doctors that report to us on the reporting forms. There are a number of thoughts being expressed right now that we should have a mass number of 800 numbers for everybody: for foods, for fish, for drugs, for devices. In light of the Federal downsizing, the cutting of funds and the cutting of people, I doubt if we will see all of these 800 numbers because there will not be anybody there to answer the telephone. However, there are still reporting systems that do come in. We look at them; we computerize them as fast as we can. The doctors who are involved, the medical techs, the response teams, if they find anything that

is unusual, out of line, a cluster of cases, they should be reporting to someone to get the information around so that people can respond.

1.14.3 Ken Stroech
Director, Special Preparedness Programs
Environmental Protection Agency

EPA's role and responsibilities in this area are tied in with several things, particularly in the area that my office is involved with: response coordination and preparedness for the consequence of these events. We have been working quite regularly with the Admiral's staff and FEMA and the other Department agencies who have responsibilities in this area. We will be hearing more about that on Thursday. As far as surveillance systems are concerned, and what Bill Clark asked us to talk about today, I would like to be able to sit here and say that for all the exotic things that we heard about today on the chemical and biological side that EPA either is involved with or has responsibilities for or is aware of, there are systems out there that would let us all know in advance that these things have happened or are about to happen. Of course, that is not the case. But we will talk a little bit about a couple of surveillance systems that EPA has some responsibilities for. I am going to talk a little bit about the ERAM System, and then Steve Clark, my colleague, will talk about some of the potable water concerns that take place.

ERAM stands for Environmental Radiation Ambient Monitoring System. EPA operates this principally for measuring radioactivity, but it can be used for other contaminates in various environmental media. There are 67 monitoring stations throughout the United States that collect samples of air, precipitation, drinking water, surface water, and pasteurized milk. Although its principal purpose is for ambient levels of radioactivity in the environment, it can also be used to collect samples on other chemical agents. But these are routinely only checked and monitored on a monthly basis. However, EPA can increase that level of monitoring and it has been for some specific instances. For example, when the Chernobyl incident took place, there was a significant increase in the monitoring and frequency level of that system. So that is one of the things that EPA is involved in.

A couple of things I would like to emphasize: once there is an incident and there is a particular point source or potential point source identified, EPA does have other assets that they can bring to bear. Our environmental response team up in Edison, New Jersey, has about 25 specialists who can deploy, who have access to over 100 contract support personnel who can deploy, who can do some specific kinds of monitoring in the area or areas that seem to have been affected. Some of those folks and I and others spent some long hours during the incident that John O'Neill was talking about earlier on the West Coast here a few months ago in response to a potential situation. We were part of the operation that had some advance folks involved in that. With that, I will ask Steve to talk about some of the potable water concerns.

1.14.4 Steve Clark
Chief, Drinking Water Policy Technical Branch
Environmental Protection Agency

Being in the business I am in, drinking water, a lot of people come to me and say, is the water safe? They are traveling to various parts of the world, and many parts of the world do not have safe water. In South America, Africa, Eastern Europe, Russia, most of Asia with the exception of Japan, the water is not safe. It is a given that the water is not safe. In this country, most people presume that the water is safe. I think that we get the general impression that we have good systems. We have overall good water quality in the United States. We have good technical systems to treat the water, a relatively good system to monitor the water. Over the past 7 or 8 hours you have heard a lot of talk about contamination of the air, which is relatively easy in terms of a terrorist attack. People have come to me, people in law enforcement, intelligence agencies, and asked me the question, "Is it conceivable, is it possible that someone could purposely contaminate the water with a substance and cause some distress or harm to people?" The honest answer is yes. Given the short period of time, I am not going to go into the technical details. In certain circumstances, neither our treatment systems nor our current monitoring systems would inactivate nor would they detect the kinds of agents that you have seen presented here in passing. This raises the concern of is the water safe? Could there conceivably be an incident involving drinking water? I would say that it is possible. It is possible that our current systems of monitoring might pick it up. For instance, chlorine is a very effective countermeasure against many of the agents that I would suspect would be used. Absence of chlorine would be a prerequisite. The terrorist would have to get rid of the chlorine. This is something that is routinely monitored, but it is not monitored continuously in these whole huge networks that you see out here in Bethesda, Washington, DC, etc. So there are ways of getting into the water systems. During the L.A. Olympics, one of the methods that they had to resort to because they have open reservoirs that look like lakes throughout the community, was posting the Los Angeles Police Department around the reservoirs during the time of the Olympics. In fact, people live next to Silver Lake, which is actually potable water. Joggers can go right by it and toss something into the water, literally. There are water tanks that may be accessible to people who would like to do that. There are different ways of accessing water and contaminating it. Given the timeframes of water transit, a few days, a few hours, and the typical monitoring patterns, there is the possibility that people would begin to get sick before we could detect this using our current monitoring system. So although I think it is a very unlikely event, very low probability, it could have a very high impact under the right circumstances in terms of a terrorist's political or social objectives.

1.14.5 Robert E. Southall, D.V.M.
Animal and Plant Health Inspection Service
Veterinary Service, Emergency Programs
U.S. Department of Agriculture

I am Rob Southall with USDA. I have a little bit different twist on my perspective of dealing with various disease surveillance activities. We have talked about a number of things with people outbreaks; all of mine deal with livestock outbreaks. We talked about subway

stations; I talk about stockyards. My critters move as fast as an 18-wheeler will take them down the highway, can load them on a ship or a plane, and fly them all over the world. We in Agriculture are very similar to CDC. In fact, we use some of CDC's information and technology in our surveillance activities. Currently we are redesigning our whole surveillance database using CDC's epi information. If you are not familiar with it, it is a very good statistical analysis program to look at epidemiological factors. We have two types of surveillance activities. I will first talk about our active surveillance. Primarily we are concerned with two disease types. We have domestic diseases that are endemic; we are trying to eradicate them. A couple of those diseases might be brucellas abortus in cattle, brucellosis, which should be eradicated this year except for the feral swine. We are worried about tuberculosis, especially the current outbreaks. In captive farm-rearing conditions apparently tuberculosis is breaking out. That also will spill over to the human population. We have some zoonotic diseases. Our biggest concern deals with the economic impact that a disease would have on agriculture. One example is Rift Valley fever. In the last outbreak that occurred in Egypt, over 3,000 people in Egypt died. We would not see that many die here in the country. If you do a risk assessment, we do not have a lot of the environmental conditions necessary to really maintain that disease for a long period of time. If the circumstances hit right and it went to Florida, fine, but if they came in through Bangor, Maine, it may be a different story. What we are really looking at are diseases like foot-and-mouth disease. This is the type of disease that, if brought into this country as an act of terrorism, could literally wreak havoc on our economic structure.

I will talk briefly about a current outbreak that is going on involving a disease called vesicular stomatitis. It is endemic down in the Southwest, New Mexico. We have periodic outbreaks every 10 years or so, and right now we cannot export any horses to the European Community whatsoever. You get a disease, and then you watch the fallout happen.

Active surveillance: in the slaughter plants we do actively and routinely collect blood samples which are screened for a variety of tests, primarily cow cholera, brucella, foot-and-mouth disease, African swine fever, the major diseases that could cause devastating impact on our economy here. The other part of the problem we deal with is what we call passing. This can come from a farmer who is having problems, who is having excessive death loss in his herd, whatever might be his problem. We could have a private practitioner out there who says, "I have an unusual disease condition; I have treated it; it is not responding. Can you help us?" Actually, industry will call, primarily the poultry industry. They are concerned about laryngeal tracheitis outbreaking in North Carolina or Georgia into the grower operations, and they want to know if USDA can come and help. Again, we do not go out looking for it, but as it is reported to us, then we try to respond. We do have a group of individuals classified as foreign animal disease diagnosticians. These are veterinarians who go through additional education to recognize foreign animal diseases, what they look like clinically. There is a lab in Plum Island, New York, that is a biosecurity lab where they actually see these diseases demonstrated in animals. They do the post, and we routinely send them back for continuing education. They pretty much have an idea of what they are looking for. They are also trained in epidemiological techniques because the sooner we find out what is going on, the faster we can possibly contain the disease. You are dealing with foot-and-mouth, which is transmitted through the air. If you put it in a pig and you give the pig enough infective doses,

by the end of the day he could contaminate about 10,000 head of livestock in a 10-mile radius. That is how fast the viremia spreads and the virus moves right with the wind. So it does not take long.

Because many of our foreign animal diseases mimic domestic diseases, clinically you probably cannot tell foot-and-mouth disease from vesicular stomatitis from certain lesions of infectious bovine rhinal tracheitis or bovine viral diarrhea; they all look the same. The last two that I mentioned are domestic diseases, are garden variety. You go to any stockyard any day of the week, and they are there. The first two, vesicular stomatitis and foot-and-mouth disease, are exotic diseases that in this country, have devastating economic impact. We do record them and this is usually how they come in. A farmer calls in and says, "I am having a lot of abortions in my livestock. Can you come and see what is going on?" There is a certain foreign animal disease that is called lumpy skin. Israel and that part of the world tends to have some goat and sheep pox problems, again, exotic diseases. Septicemia: a swine producer calls up and says, "I am having excessive death loss; there is bloody diarrhea," and so forth. Again we look at the different conditions. We do not even classify the diseases when they come in to us because we can not differentiate them clinically from many of our domestic diseases. It is only through laboratory analysis do we actually find what we have got.

This is an actual report. As I said, we currently have a vesicular stomatitis going on in New Mexico as we speak. This is actually our report that comes in. Everything that we get from the field is sent in electronically. Most of our field diagnosticians are equipped with cellular telephones and can lap-link directly to us either through FTS 2000 (CDC has a program called Wonder which is wonderful for getting large database files around), or we can actually jump into Internet and move these things through. Anyway, you can get an idea of the types of information that we will be recording. This is part of the form that came in. This particular animal was field diagnosed as suspect for the condition, but they really did not know. They may not have found good lesions, but it was virus isolation. You see the cause right down there. They actually isolated the virus. This animal was a llama which is an unusual species to see VS in. In this particular case, it either had to have virus isolation or be serologically positive for VS along with clinical signs. You punch it into a little program at the CDC. We have done 225 investigations in less than a month. We started in on this problem about the end of June and today is the eleventh of July. We are up to 225 cases. We have got 94 positive cases with 17 virus isolation cases, so a total of 111 positive cases right now. The EU has completely cut off our horse market. Kentucky is sweating because of the thoroughbred population. This is where we are.

The other part is we have to be adaptable as we change from species to species. I understand that a contingency of our groups is now investigating, starting tomorrow, a virus in shrimp in aquaculture that came in from Ecuador. Apparently some migrant farm laborers brought this particular virus with them. Now in farm-raised shrimp we have some problems. So we move very fast from species to species in our surveillance programs. We respond through different levels (visual 1, page 1-131). Just as a golfer has many clubs to make the shot (visual 2, page 1-132), we try to decide which level of response because we tend to go out quite often. We have our foreign animal disease diagnosticians who are usually the first on the place. We can usually have them on a problem site within a couple of hours. We have

about 400 trained individuals, and they are scattered throughout the United States. Then we have what we call our ERTs, our emergency response teams (visual 3, page 1-133). These consists of an epidemiologist, two foreign animal disease diagnosticians, generally a pathologist or virologist from one of our two laboratories, and, if the group is in need, administrative support (visual 4, page 1-134 and visual 5, page 1-135). This group is self-contained. They can do adjacent premise surveys. They have the authority to quarantine the premises, to do all stock movements, etc. We had a trace back from some blood samples positive on hog cholera a little over a year ago in Texas. From the time we got the call until they got there was 24 hours. We traced pigs from that premise that had gone through slaughter the day that we got the call to eight different States; the farthest away was California. That is what we are contending with. We also have a task force which we have now going on with DS; generally it is about 20 to 30 people. Then we have a full READEO structure which is a complement of about 100 people (visual 6, page 1-136). The last time the READEO was fully used was in 1983 and 1984 during an avian influenza outbreak. We spent 63 million in 18 months. The cost to the consumer was about 350 million in 1983 dollars: Canadian influenza virus in broiler and chicken shipments. These things do cost and can get quite devastating. That 300 and some million would not include the foreign aspect from embargoes. So we give you an idea of where we are at with USDA.

Admiral Young: Thank you very much, it is particularly interesting to hear the potential problems of animals and the reagents going between the multiple types of jurisdiction and biological species that you deal with. I would like to open now the panel to discussion and raise any questions that you wish.

Question: Are there plans that the agencies have for feedback to the public and others interested in knowing about the diseases?

With USDA I guess the best example I have is when the vesicular stomatitis started breaking out, we produced factsheets. We get with industry representatives National Milk Producers, Cattlemen's Association, and make sure they have access to the factsheets. We provide them to the general public. If anybody goes on the gopher and browses, we have a special box that we update to let the public know what is going on the best that we can. So we try to let them know what is happening.

The CDC's MMWR is currently on the Internet and it is available. It is embargoed until 6:00 on Thursday to the news organizations, but it is then basically available to the public through the Internet.

FDA: We also follow USDA, basically. We have talk papers, news releases. We are also on the Internet, and you will find the documents there that can be perused on a daily basis.

ATSDR, which is a Public Health Service agency, Agency for Toxic Substances Disease Registry, has a number of factsheets. They also have a hotline for 24-hour turnaround.

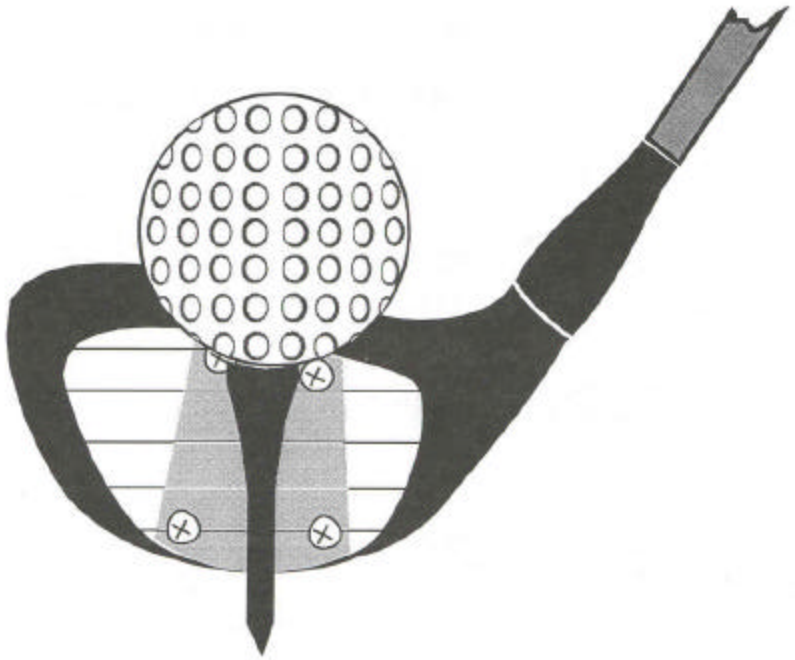
READEO
Regional Emergency Animal Disease Eradication Organization

Proposed Restructuring

- **Downsize overall READEO structure from 4 units to 2 units**
  - **Eastern Division and Western Division**
- **Move the Epidemiology section into Field Operation from Technical Support**
  - **Improve communication and information between Field Operation and the EPI section**
- **Consolidation of all Information Management in Technical Support**
- **Development of the Emergency Response Team (ERT)**

Visual 1

READEO
Levels of Available Response



- **FADD**
- **ERT**
- **EXPANDED ERT**
- **READEO**

Visual 2

Emergency Response Team

A small, highly trained and mobile group of individuals who can respond to a limited outbreak situation or be able to begin the initial setup of the READEO prior to full mobilization of a task force or READEO

FUNCTION: (when deployed and under what guidelines)

- **Serves as Fact Finders/Technical Support: In certain situations, the team may only be required to validate information from field sources and/or provide technical support.**
- **Contain/Control/Eradicate a Limited Outbreak: The group would serve as the Federal response necessary to control/eradicate a limited outbreak situation.**
- **Full Outbreak Situation: The group under a full outbreak situation contains all the complements of the READEO that they could be deployed to begin the process of setting up for the full READEO complement and provide initial data concerning the scope and magnitude of the outbreak.**

Visual 3

Emergency Response Team

Core Team:

- **Epidemiology (1)**
- **Foreign Animal Disease Diagnostician (2)**
- **Disposal and Biosecurity Officer (1)**
- **Administrative Officer (1)**

Additional Support Personnel:

- **Disease Specialist**
- **Laboratory**
- **Staff**
- **Center of Epidemiology and Animal Health**

Visual 4

Emergency Response Team

Core Team Member Functions:

- **Epidemiology: Will be responsible for reviewing the data collected concerning the disease situation, collecting additional data, if required, and providing overall direction to the team concerning matters of disease progression and additional investigation needed. The EPI member will serve as the disease reporting officer for the team and is responsible for reporting disease information and data to the Region and staff.**

- **Foreign Animal Disease Diagnostician: Will be responsible for premises surveillance activities, sample collection, laboratory submissions, and clinical diagnosis. The FADD will report findings to the EPI for further analysis. The FADD will also assist the Biosecurity/Disposal Officer when needed.**

- **Disposal and Biosecurity Officer: Will be responsible for all biosecurity efforts of the team (personnel, equipment, and premises). This individual will be responsible for assuring that humane euthanasia methods are used and carcasses are disposed of in the proper and appropriate manner.**

- **Administrative Officer: Will be responsible for handling the administrative needs of the team (housing, transportation, purchase of equipment, and supplies, etc.). Along with the basic administrative functions, the administrative officer will also have collateral duties as the Appraisal/Indemnity Officer.**

Visual 5

READEO

Maintenance of the READEO:

- **READEO roster will be available on the wide area network (similar to the READEO Guidelines).**
- **As READEO personnel change, the READEO roster will be updated by the Regional Administrative Officer after the approval of the Regional Director and Emergency Programs.**
- **Training**

  Emergency Response Team Training

  Begin intense training in investigation methods, disposal technique, epidemiology, and use of the new READI system.

  READEO Workshops

  Bring together the new READEO structure, begin to redefine the roles of the READEO personnel, and develop the necessary roster and equipment lists to fill the needs of the various aspects of the READEO.

  READEO Mobilization Drills

  Propose two basic drills: (1) strictly to a telephone notification drill that would test our alert notification ability and (2) an unannounced mobilization in conjunction with a limited test exercise to assess our response capability.

  Test Exercise

  Design a full test exercise to test both readiness capability and the READI system. This should only be done after the above-mentioned training and the completion of the redesign of the READI system.

Visual 6

CHAPTER 2

DAY 2: WEDNESDAY, JULY 12

2.0 WELCOME

Admiral Young: I would like to welcome you to the second day of our seminar. In this day we transition into some of the real incidents that we have had and our concerns for how we begin to synthesize the most prompt and appropriate reaction in consequence management. It is indeed my great pleasure and privilege to introduce the Honorable Allen Holmes, who is the Assistant Secretary of Defense for Special Operations. Mr. Holmes has had a number of responsibilities during his career. We have had the privilege of working together in a group on the National Security Council. Mr. Richard Clarke, who addressed our meeting on Tuesday, is the Chair of that council. It is Allen Holmes's responsibility to lead our efforts in combatting terrorism, and it is from this perspective that he will be focusing his remarks this morning.

2.1 Special Challenges in Planning and Reacting to Terrorism

The Honorable H. Allen Holmes
Assistant Secretary of Defense for Special Operations and Low Intensity Conflict

You give me too much credit. I am really not the guy that leads on combatting terrorism. I really do want to emphasize this because I think it is essential that we recognize the fact that this really is an interagency; it is a collective effort. The problem is so awesome there is no single agency or group that could possibly take on this responsibility alone. I have to tell you that one of the strongest additions to our group has been Frank Young. All of us that have been working the combatting terrorism problem with Dick Clarke over the years could not be happier or feel more fortunate to have Dr. Frank Young with us. I would just like to add that over the years of my own career – Marine Corps, Foreign Service, working on arms control in the Reagan administration – in the early days we were almost dismissive about this field: gas and bugs. Going back, I remember 1972 when President Nixon cut off all the research on biological warfare; that was to be the end of it. Then we signed a toothless convention in 1972 that had absolutely no enforcement procedures. Now we are really into it, and I am happy to say that I believe our government is really getting serious, organized, and increasingly effective in confronting this problem.

In his recent report to Congress, Secretary William Perry wrote, "Weapons of mass destruction pose a large and growing threat to U.S. interests and security around the world." In fact, in most areas where U.S. forces could potentially be engaged on a large scale, many of the most likely adversaries already possess chemical or biological weapons. Many of them, I might add, are also reaching for nuclear weapons. Our worst fear, a nuclear, chemically, or biologically capable terrorist, is no longer beyond the realm of the possible. A critical post-reemergence of the nuclear danger that characterized the Cold War. The demise of the Soviet

Union greatly reduced the nuclear threat to the United States. Nevertheless, the proliferation of nuclear and other weapons of mass destruction poses a growing threat to U.S. and global security. Beyond the five declared nuclear weapon states, at least 20 other nations have acquired, or are attempting to acquire, weapons of mass destruction and the means to deliver them. North Korea, Iran, Iraq, Libya, and Syria pose the greatest threats because of the aggressive nature of their weapons of mass destruction programs. Among the serious trends in international dangers, and in the military technical revolution, is the production of chemical and biological weapons. These weapons raise the lethality of destructive capabilities to unparalleled heights. Chemical weapons are an attractive pursuit for many states because of their relatively low cost and low technology requirements. At least 15 countries are known to have offensive chemical weapons programs, the most aggressive being in Iran, Libya, and Syria. Even developing countries are among potential proliferators of weapons of mass destruction as many pursue the poor man's atomic bomb: biological weapons. Often bio-technical technology equipment used in pharmaceutical programs or hospital laboratories can facilitate the production of biological weapons agents. Weapons of mass destruction provide terrorists distinct advantages over traditional bombing campaigns or hostage taking. First, by definition, a weapon of mass destruction is the ideal device of terror. The widespread death and destruction inherent in its use can be attractive to terrorists leveraging to meet their political goals. Second, weapons of mass destruction have a built-in hostage scenario; greater than we have ever known. Third, media coverage is a given. For most terrorists, riveting and massive news coverage is a primary motivation for terrorist acts. Fourth, biological agents permit covert acts which make it exceedingly difficult to apprehend the perpetrators. The ease with which biological agents cause death hours after an exposure and the misidentification of an attack as a natural disaster are distinct advantages over the use of a nuclear or a chemical weapon. Fifth, terrorists using biological agents recognize that the probability of a response in kind, retaliation, is low. Knowing that he controls the more lethal action, a terrorist may become emboldened in his demands and actions. When a foreign terrorist threatens to use a weapon of mass destruction against the United States or any one of our allies, several challenges arise. Most of the challenges center on cooperation, preemption, and retaliation.

First, cooperation. It may be difficult for other nations to cooperate if they fear retaliation from the terrorist. They may not be as forthcoming or willing to cooperate because they fear the consequences. Even our staunchest allies may have deep reservations. If a device were found in Europe, Asia, or Africa, the United States might be willing to wait and intercept it at sea. However, if the device were found in Mexico or Canada, its proximity to the U.S. would make timely cooperation between neighbors critical. For example, the U.S. has worked closely with Canada on contingency planning for a terrorist incident involving weapons of mass destruction. For that reason, we know how our governments would work together, for example, in response to a chemical attack in the Great Lakes area.

Preemption. While the United States always reserves the right to act unilaterally, opposing the wishes of another sovereign nation could be tantamount to an act of war. Yet preemption remains a key policy option because it is in our vital interest to limit early any major threat to our national security. States that sponsor terrorism or allow terrorists to accumulate weapons of mass destruction within their borders may be subject to preemption.

Retaliation. They are few state-sponsored terrorists, and retaliation has little impact on the scattered groups or individuals committing the crimes. Even when state-sponsorship is suspected, it is often difficult to prove. What obligations do we have for consequence management to nations that assist in the apprehension of terrorists using weapons of mass destruction, nations which consequently suffer retaliation in the form of another attack? This may very well be the first question posed by nations from whom we seek assistance.

Many of the challenges we face in the international arena will confront us here at home as well. On American soil we are less worried about preemption and retaliation. It is cooperation among Federal, State, and local authorities that is the most critical. It is just as important as the cooperation among nations in the international arena. In the United States we are constrained by domestic laws. *Posse comitatus*, for example; I am sure that you are all familiar with this legislation prohibiting the use of military personnel to enforce civil laws. The dilemma we face is this: some of our best chemical and chemical antiterrorist capabilities are in the military. Yet we are constrained by law from allowing the use of these military forces when attempting to apprehend terrorists. In response to the tragedy in Oklahoma City, President Clinton and the Congress have put forth legislation to address the broad problem of combatting terrorism. It is our intent to provide our government with a rapid response capability within Constitutional guidelines.

The most critical element of the response environment will be the involvement of the national command authorities. The President and the Secretary of Defense would be closely involved in coordinating the response to terrorist incidents involving weapons of mass destruction. The Clinton Administration has already taken an active lead in providing top-level direction here at home and abroad. This conference is one of many ongoing efforts to increase our response capability to terrorist incidents involving weapons of mass destruction. The second critical change in response planning has been the realization among Federal agencies and State and local authorities that any effort to counteract, contain, resolve, or manage a weapon of mass destruction incident will require an interagency effort. No single agency, not even the Defense Department, can simultaneously address hostile crisis management and consequence management challenges inherent in a weapon of mass destruction incident. This is true internationally as well as domestically.

A fundamental shift in our approach to terrorist incidents must include consequence management from the outset. Any action that could cause a terrorist to detonate or release a weapon of mass destruction must be carefully evaluated and weighed against the consequences. Those of us who deal in hostile crisis management must include those who have the expertise to handle mass casualty and cleanup for two reasons. First, we can cross the line between hostile crisis management and consequence management at any time. The magnitude of the consequence demand immediate and full knowledge of the incident from the beginning in order to facilitate the best response to all possible outcomes. Second, actions and planning conducted by consequence managers can inadvertently affect the crisis incident side. The evacuation of people from the danger area may serve as justification to the terrorist to detonate or release the device. Because the stakes are so much higher, all actions from both hostile crisis management and consequence management perspectives must be closely coordinated.

Finally, there are key tactical operational considerations involved in a terrorist weapons of mass destruction incident presenting response and planning challenges. These primarily fall into categories on warning, detection, identification, rendering safe, safe movement of devices, and final disposition. We seem to have a relatively good handle on the nuclear weapon scenario and are concentrating on improving efforts on biological and chemical cases. As this conference will show, there remains a great deal of work to be done.

The United States can choose from at least three courses of action. The first is to maintain the status quo. In this case, we would hope that terrorists and terrorist nations decide that weapons of mass destruction are either too costly (e.g., nuclear weapons) or too difficult to employ without self-injury (e.g., chemical and biological weapons). We could maintain our present capability and redouble our diplomatic efforts to get global acceptance of outlawing the production and eventually eliminating weapons of mass destruction. Alternatively, we can build up our defensive measures, concentrating our efforts on prevention, protection, and consequence management. These defensive measures would consist of nonproliferation efforts, continuing research and development into protective equipment and vaccines, and completing the integration of consequence management into a simultaneous approach with hostile crisis management. Lastly, we can build up both defensive and offensive measure. We would include all the steps I just mentioned in defensive measures plus continue our work on offensive countermeasures. This would include maintaining, improving, and exercising preemption options; redoubling our counterproliferation efforts; imposing sanctions when needed; and, when necessary, acting against those who would perpetrate weapons of mass destruction terrorist acts. Because the stakes are so high in terrorist activities involving weapons of mass destruction, logic appears to dictate this course of action. In the final analysis, we must take whatever means are necessary to ensure the safety of American citizens. Failure is not an option.

Question: Can you outline any more information on the PDD 39 at this time?

Admiral Young: I believe Mr. Clark went over the parts that were not classified in large measure; the rest of it at this time is in a classified sector.

Answer: I can make one general comment. At the risk of stealing some credit from the administration that I work for, Dick Clark and I have been at this for a long time. This is, I think, an outstanding piece of work. It builds on some tried and true work that was done in the Bush Administration. We worked off that National Security Directive until this one was ready. It is an improvement and refinement on what we had before, and it worked before. We have had a very collegial, focused interagency group for a long time, which is why we have got it down to a well-honed action/reaction planning process as far as nuclear weapons are concerned. Obviously the new emphasis now is on chem/bio. That is where we need to work.

Question: When President Bush was Vice President Bush in 1986, he led the task force on terrorism. Now that we are hitting 1996, a decade later, how do you feel about the

utility of convening a second task force, Vice Presidential Task Force, to see how we are doing since 1986 and also to fold in some of these evolving concerns and countermeasures.

Answer: Frankly, I think we are beyond it. We do not need another Vice Presidential Task Force. The lines of force are well laid out; we know where we are going. What we need to do now is to have an increasing number of both tabletop exercises and field training exercises, particularly within the United States, that involve the most complex challenges which would test what we have been talking about, where the lines of action/reaction of hostile crisis management and consequence management intersect. We need to practice, rehearse, over and over again, and refine those procedures. I do not think we need another Presidential or Vice Presidential Task Force.

Question: It is clear to me from what we have heard over the last day that law enforcement and intelligence are giving very high priority to this and that the resources are being applied. On the other hand, given the potential enormity of the problem, it is not clear to me that we are prepared to talk about spending a lot of money on consequence management. I get the feeling that if the National Security Council, the OMB, and the Congress all felt that this was a real problem that we might have to deal with, then one could preempt the money. Do you think that this is the right threat assessment, and that it makes this a national problem, and that people will start talking about what sorts of resources might be applied to it beyond what is being done today?

Answer: Far be it from me as a bureaucrat ever to refuse money, profit, so I would never say no to funding. But seriously, I think we have a good national threat analysis. I think people understand the magnitude of the problem. In this budgetarily lean period, before we go out asking for large amounts of money, what we need to do now, particularly in the consequence management area, is to do these exercises. We need to analyze our national resources, public health service, public hospitals, and private sector all over the country using increasingly complex exercises. We will see where the funds already exist that are under different rubrics today. They are there for other purposes, but it is my belief that those resources can and will be drawn on if we know where they are. We understand the synergy that can be drawn from using these different sources of money to address consequence management. I think that we need a period of time to work through exercises to identify those funds and resources and to practice using them. In the process, we will identify the shortfalls. It is at that point where we can go to the Congress in a more focused way and ask for additional resources.

Question: One of the things that Herb has been worrying about in a different vein is the communication infrastructure. In the type of exercise where there might be a very substantial, simultaneous series of events taking place, how is our communications and information infrastructure? Are we vulnerable or nonvulnerable in this way?

Answer: You mean vulnerable to interruption?

Question: Overload and interruption?

Answer: It is always possible that we would be vulnerable in certain sectors, but when you take the combined communications resources of the Department of Justice and the Department of Defense alone, not to mention Public Health Service, FEMA, and a few others, I would be astonished if we found ourselves short. The trick here always is to know what your resources are, to be organized, to switch into the crisis area that we are dealing with, bringing on line those communications nodes that are necessary to get the job done. Again, this is a question of rehearsal, of practice, and the process of identifying the weak points.

Admiral Young: It is my great pleasure to introduce Brigadier General Russ Zajtchuk. Dr. Zajtchuk has one of the larger responsibilities in the United States Army, which plays a lead role for the Department of Defense in dealing with weapons of mass destruction. His command includes many of the finest research institutions that the U.S. Army has at its disposal. For those of us who have worked together in consequence management, these excellent troops and facilities and capabilities of the United States Army are key in our joint planning and our joint development of operational capacity in combatting terrorism.

2.2 Medical Research to Support Counterterrorism

Brigadier General Russ Zajtchuk
Commander
U.S. Army Medical Research and Material Command

We all had great hopes some years ago that the world would become much safer. On the contrary, it is my personal feeling, and I am sure of many of you, that the world has become more dangerous. It is no secret that many nations are developing biological and chemical weapons at a very rapid pace. They are fooling around with genetic reengineering and making all kinds of terrible things, and you can buy these things if you have the money. You can buy these things because there is organized crime that is organizing, and many of the people can go to the scientists themselves, without having to go to the forms of governments, and purchase anything they want. I have been in this command for a year and 2 months but have had some interest in these subject matters for many years. It is true we do have some excellent facilities and scientists; some of them will be presenting here today. I am very proud of them.

Let me just mention a few capabilities. At Fort Detrick we have the BL-4 laboratory that is responsible for biomedical defense. There are not very many places in United States, that is the place. I keep pointing out to people, when they visit Fort Detrick and go through the building and tell me how sophisticated the construction is, that it is more than a building that is at stake. If you loose the scientists, you will not replace it by going to industry and saying, "Do this." Frankly, there is no interest in doing this type of thing because there is no economic profit in it. Therefore, I am marketing the place so that people do not continue to downsize and to decrement our resources. At Aberdeen we have a major laboratory that is doing work on chemical defense. We have such scientists as Dr. Sidell who is here today and others who are performing superb work. We continuously make efforts to keep the core competencies by reaching out to people, whether they are in the service or out of the service.

We also have the Waters Institute of Infectious Diseases here that has many scientists whom we draw upon to complement the ones who are working in the previous institutions.

We are also heading into a tri-service environment. We are going to have research and development as one command that will be composed of all three services. We have worked well in the past anyway with the Navy and the Air Force in doing medical research, but now this will become a joint command. There will some synergy. We will also then be able to rely on our overseas laboratories, which are in Thailand, Indonesia, Egypt, Peru, Brazil, and Kenya. We are looking at these overseas laboratories, not just to do research on infectious diseases, which of course is very important, but to help the rest of the world, the World Health Organization, the CDC, keep an eye on emerging diseases. The threat is not just one of terrorism attacks, but also by natural development of many these infectious diseases. You all read the papers and you are all familiar with the facts. We are forever getting more and more serious and resistant bacteria and viruses that our antibiotics and other medicines are not all that effective against. All you have to do is look at Zaire with the outbreak of the Ebola virus.

Throwing money and people at programs does not always get results. I appreciate that. But I do want to use a few examples that will indicate that what we are working on is not cheap, and it is not easy to find solutions. Let me just use one example: pretreatment of cyanide poisoning. We have been working at it for 29 years. One hundred ninety-four man-years have been expended upon it, and I keep on reassuring my staff that I am not critical of it. I am just trying to understand the problem. We have spent $36,000,000 in the process, and we do not have a product yet. We are looking at ways of how to shorten the cycle of production, how to do it cheaper. At the same time, we are using some of the more modern techniques of simulation, molecular modeling, and so on. But I still believe it will be expensive and one has to answer, "Can we afford it?" That is for policy people to decide: how much we want to afford and how much we want to invest into it. I can use many examples such as this, whether it is looking for pretreatment for mustard gas or for any of the biological things. Then we have a situation where we do invest a lot of effort and money into developing vaccines, anthrax for example; but then we do not use it. Of course, that is above my pay grade whether we use it or not. On the other hand, I think sometimes we need to be cautious that we do not become complacent and send our sailors, soldiers, and airmen around the world unprotected when there is a safe vaccine. There are many difficult questions that need to be answered.

Another example I will give you is that in 1990 the budget for chem defense was around $90,000,000; it is now $35,000,000: about one-third. I do not know what the right amount is yet because we are still going through the process of functional area analysis and so on. My feeling is that if you stretch the rubber band too much further, we will lose the core competencies, and we will not have the ability to do the things that our nation is asking us to do. Once you lose something, it is not always easy to build it up again. I think the current leadership, the President and all the rest of the people, realize the serious nature of this. I am optimistic that we will have the appropriate level of funding in the future.

We are called to help around the world. Right now, for example, we have people in Zaire helping CDC with the Ebola virus epidemic. During the Japan incident we had our people sent over there to help in Japan. We like to do that because we learn from it. It is our responsibility as this nation's partner with the rest of the world to do all that we can because ultimately it will be a problem that has to be solved jointly by all nations.

As I mentioned, Dr. Steven Joseph, the Secretary of Defense of Health Affairs, is very much interested in using the overseas laboratory to keep a watch on any kind of problem that may arise; this will basically be an infrastructure. The State Department, of course, is very interested in this. We have the infrastructure; it may just be able to begin without having to infuse a tremendous amount of money. Again, we work in partnership with CDC, with World Health Organization, and that is as it should be. It is not a matter of who is going to get the credit or who has got to lead; it is what it is that we want to do.

We are also putting a lot of emphasis on education, in terms of courses in chem defense, in chem emergencies, and bio. We are combining NBC (nuclear, biological, and chemical) training. Our courses are extremely good. There is no reason why other people cannot participate, visit, and partake in these courses. We are looking at how to make them better, how to combine these courses into one block of time. Frankly, putting on courses and having our active duty people attend; if you do not have refresher course, it does not last very long. I remember during Desert Storm and Desert Shield when I was a Deputy Command of Walter Reed Army Medical Center, the question came up, what will we do if there is a terrorist attack and we have a chemical problem?" Let me tell you, we did not have a quick answer. Our MOP gear was in poor state; it was laying around; people did not know how to put it on. I hate to put it like this but that is the way it is. Besides putting on the courses, you have to train, and you have to have a plan where you actually exercise on a regular basis. When I worked with Paul Gorman in Panama, we developed what we call rapid response teams. The idea was that if there were an incident around Central or South America we could deploy and help out, or for that matter, if it happened in Panama. We got to the point where we could actually be airborne within 2 1/2 hours, which is pretty good because you can launch the plan that much quicker. I think we should consider doing this type of thing right here and practice these things. That should be part of DoD readiness training programs. Talking about it and pushing this is sometimes very difficult, but it is like dripping water. If it drips long enough, it will make a dent. I think it is extremely important. We cannot put our heads in the sand and pretend that nothing will happen; something will happen. Imagine what would have happened if they used some anthrax during the Trade Building bombing. Imagine the terrible things. Some people take the attitude that it is so complicated, it is so difficult, you cannot do anything about it. Well, I think, someplace there has to be a balance. We obviously cannot find cures for everything and protect every citizen because of the nature of the disease so to speak. We can take at least a minimum amount of precaution, do some minimum planning. What that minimum is will be up to people like Secretary Holmes and others to decide. We are optimistic; we can execute anything. We have great people. They are dedicated; they will work day and night without complaining. All we need is your guidance as to what it is you want us to do.

Question: Sir, if we were to have an incident today, how many hospital beds could you make available for a chemical incident or biological incident in your command?

Answer: It depends on what kind of incident it is. If it is the agent that we would classify as BL-4 agent, we could take care of about four patients at a time. But we can then convert our BL-3 capability and make it BL-4, so we could probably take on a greater number. We also, as I mentioned, have the capability of going out and picking up people who have been exposed to dangerous BL-4 agents because we have the isolettes. In fact, we were on standby for Zaire. If any of our citizens got sick over there, we would have deployed a team that would evacuate them and bring them to this containment area at Fort Detrick.

Question: General, one of the realities of Desert Storm is that much of our medical manpower is in the Reserves or voluntary civilian components. I think that is even truer today, and yet civilians and military have always trained independently in terms of our medical response. Do you see any planning that will start allowing any of civilian and volunteer disaster teams to access military training?

Admiral Young: In view of the concern of the need to train together, do you visualize the opportunity for the National Disaster Medical Assistance teams and other voluntary civilian groups to co-train with the military?

Answer: We are taking steps with the Reserve and National Guard to first of all inform them of at least the capability of this research and material command and to get them involved with the training and send people to these courses I am talking about. We are making a great effort to meet with the commanders and let them know what we have available and encourage them to train with us or make some portion their training exercises relevant to what we are talking about. We are having this conference and we have the military and FEMA and all these people talking; the next step should be to draw up a strategic plan on how we can do it better in the future because we have not done it all that well in the past. This is not a criticism of anybody; we all have enough to do, and none of us are sitting down doing nothing. I think that we need to lay down a concrete plan of how we are going to do it. I would do it by regions, have a central authority that is responsible, pin a rose, as General Sherman used to say, on somebody and make sure that we all know who is responsible, then hold those people accountable to get that executed.

When you mentioned Desert Storm, I was reminded of the Gulf illness thing. We are still trying to figure out whether our service men and women were exposed to chemical agents over there. I am also working with detection and protection pieces and so on. We are looking at getting some devices or whatever so that we will not have to wonder what really happened. As a side issue, we are working with ARPA to develop a personal status monitor that will locate our wounded service people quickly and to start treatment quickly. We are also looking to how we can miniaturize the detection pieces to detect chemical things. Somebody might want to ask if it is practical to have some of these detection devices in strategic positions so when something happens you will know immediately what is going on rather than trying to

find out. There is a time delay. I do not need to tell you that the time is critical, is everything, in many of these situations.

Dr. Zajtchuk: I do not mean to cut into your time. Let me just give you one example of how you can bring everybody together: State government, Federal Government, Reserves, and National Guard. When I was Commander at Brook Army Medical Center, we organized what we called a humanitarian assistance exercise within our own country. After getting adequate approval, we had the State Department running the medicines and physicians and nurses. We had the active duty component, the 41st Combat Support Hospital, who would deploy if there was a problem. We had the Reserve and the National Guard from Air Force and the Army working together. We had the local people working together. We deployed to Star County, Texas; we set up our field exercise; we practiced with our equipment so it was not sitting someplace in a storage area. It was a wonderful opportunity. We even tested our advance technology because we were transmitting via satellite the actuates from Starcorn into Brooks Army Medical Center. You can set this type of thing up for any event. You just have to write the plan and do it. I think it is a great training opportunity. It is fun to do, and it is important.

Admiral Young: To set the next phase of our conference, we will have a video film that will introduce and give you a graphic picture of some of the concerns that had to be faced by our colleagues in Japan in regards to the recent gas attack.

CNN Videotape

On Monday, terrorists using poison gas turned Tokyo Subway System, the main artery of the city life, into a death trap. CNN reports that within hours police had zeroed in on a secretive religious sect whose leader has an obsession with poison gas.

Their Monday morning commute took their breath away. Tokyo commuters were overcome by nausea and darkening vision.

"I feel like my eyes are compressed. It feels like blood is not running around my eyes. That is how I feel; before, I was dizzy."

The symptoms struck almost 5,000 people at once early Monday morning. Ten of them died; the rest overwhelmed hospitals. The Tokyo subway system rolled to a stop. The death and injuries were no accident. Scores of commuters saw people place packages on subway cars during rush hour. One station employee tried to remove one of the packages, unaware of the danger.

"He had this thing. He fell right there. It was Mr. Takahashi who died later."

The packages were leaking liquid that turned out to be the chemical weapon sarin.

"This is such a lethal, such a toxic agent that a minute quantity should have inflicted horrendous casualties."

The chemical was developed by Nazi Germany and used during the Iran/Iraq war. Sarin disrupts the nervous system causing paralysis and suffocation. It can be made with ordinary lab chemicals, but not easily.

"It is not an easy material to handle. It is not an easy material to release. It does take some skill in manufacturing it."

This is the not the first time sarin has been released in Japan with lethal results. Last June, seven people died in the central city of Matsumoto when sarin seeped into their homes. The gas has turned up in other places as well. One expert says he sees a pattern.

"My assessment is that they were rather methodically developing their expertise in using these weapons. Using sarin as a weapon against targets."

But who are they? The Japanese police initially made no accusations; however, following the attack they staged a series of dramatic raids on a secretive religious sect known as Aum Shinrikyo or Supreme Truth. Police broke into the group's building in Osaka and its headquarters compound at the foot of Mt. Fuji. The police said they were searching for evidence in a kidnapping case, but they went clad in gas masks and carrying cages of canaries. They found stockpiles of chemicals that can be used to make sarin. Members of the sect videotaped the raids and loudly proclaimed their innocence. In the compound the police found about 50 dazed or unconscious people. Many were suffering from malnutrition. All were taken to the hospital. On each subsequent raid, police uncovered more and more chemicals in bags and barrels. By some reports the tons of chemicals could be used in the manufacture of enough nerve gas to kill millions of people.

"I cannot understand why they need such a lot of chemicals. It is like a chemical factory."

The groups leader says that it is easy to explain.

"Sodium chloride is necessary to make pottery; phosphorous trichloride, it is prepared as a plasticizer to make plastic materials and for herbicides and fertilizer."

In this videotape sent to Japanese news agencies, sect guru Asahara denied any connection to the poison gas and accused the police of trying to damage his group's reputation. The group had shown an obsession with nerve gas poisoning and death. In another videotape obtained by news services, Asahara blames the U.S. military for sickening his followers with poison gas, including sarin. Ex-members say they were sometimes warned to stay inside to avoid poison gas. Asahara has predicted the world will end in 1997 and the only survivors will be members of his group. Several times the group has faced complaints about irritating fumes coming from its buildings. On Saturday police sources told the Kyoto news service they have evidence linking Supreme Truth to the poison attacks. They say chemical finger-

prints or residue retrieved from the group last summer matches those found after the subway attack and the deaths in Matsumoto. Police may have had some idea such an attack was coming, they underwent special training in the use of gas masks the day before the subway attack. Since the attack, the sale of gas masks to civilians has soared.

"When people called us for inquiries, they named a specific substance, sarin. They asked whether we carry masks that would protect them from that particular chemical."

The fear has been accompanied by bewilderment that such a crime could happen in Japan.

"It is so scary. Japan is known as a safe country, but when things like this happen, I wonder if it is really safe here."

Traditionally, residents of Tokyo enjoy a level of personal safety almost unknown in Western cities. They move in public without seeming to give a thought to theft or attack. Suddenly that has changed.

"I checked around me for any strange packages that may have been left on the subway."

"My family called from my hometown and told me to be careful."

Hundreds of people injured in the attack Monday remain hospitalized. Some are facing long-term problems including poor eyesight. Special chemical teams decontaminated Tokyo's subway cars, but the residue of unease in the minds of the Japanese will not be so easy to banish.

End of CNN Videotape.

Admiral Young: I am particularly honored to be able to welcome our Japanese colleagues. The first, physician and scientist, Dr. Yanagisawa, investigated the Matsumoto event in 1994. As Professor of Medicine and Director of the Neurology Program and Acting Director of the University Hospital there, he brings great qualifications to this field.

2.3 Poison Gas Incidents

2.3.1 Matsumoto, Japan (June 1994)

Dr. Nobu Yanagisawa
Shinshu University Hospital

It is my dear honor to have the privilege to present the medical report in this meeting on the poisonous gas incident in Matsumoto which occurred about a year ago. I must say that I have some complicated feelings looking at the video right now. It is certainly a shame of

Japan that we have had such a terrible attacks twice in one year. I think it is our duty to communicate and present all the data which we obtained in research of the accidents, both in Matsumoto and in subway.

By attending this meeting yesterday, I was impressed by how many different organizations in the United States are working for responding to the consequences of chemical and biological terrorism. In Japan after successive disasters such as the Honshin earthquake and the Tokyo subway gas poisoning, actions on emergency preparedness are being taken very slowly.

In my talk today I will focus on facts: what occurred, what we did, and what we are doing. Systems or organizations in responding to this incident may not be informative to you. A special liaison committee of the Matsumoto regional comprehensive medical council was responsible for information exchange, collecting medical data, conducting health investigations, conducting questionnaire survey of residents, and data analysis. Results of the investigation report on noxious gas intoxication of Matsumoto City were published in the middle of April. We sent summary galley proofs of this report to hospitals on the occasion of the Tokyo subway incident, and it was very helpful. This report is in Japanese, but we will translate it into English in the near future.

I would like to talk about what happened in Matsumoto. I would like to talk on the items listed here. I will give an outline of the incident, and, as the medical reporter, I will summarize the data on medical patients including those who were found dead. I will present the results of questionnaires sent to residents and casualties on the rescue teams. I will also briefly touch on the causative agent and presumed method of emission. The causative agent was proved, or conceded, to be sarin. Other toxic substances were not detected. I just want to briefly comment on our documentation and followup of the casualties.

This is Matsumoto City. Matsumoto is located in the center of the island of Honshu with a population of 200,000. It is characterized by the castle; this is a national treasure, a center for talent education, and a major company headquarters. This is the best town for a mountain resort. It is just like Denver, Colorado. The toxic gas poisoning occurred in the late evening of June 27, 1994, in a residential area north of the castle. There were 7 deaths, 54 were admitted to hospitals, 208 visited outpatient clinics, and, by inquiry to the residents, it was disclosed that 277 had symptoms but did not consult with physicians. The outcome after 4 months for medical subjects was one admitted in a vegetative state due to cardiac and respiratory arrest at the incident, five are still visiting clinics, and nearly 200 recovered completely. Fourteen are still having symptoms but stopped visiting clinics, and 46 are unknown.

This is our view of the places where it occurred. The distance between these two is approximately 150 meters, and this green spot is the place where sarin is suspected to have been emitted. This shows the place where victims were found dead. There were seven victims found dead or who died shortly after the incident. This blue spot shows the place where sarin and related substances were detected from water or from air. This is called an emergency doctor vehicle because we have had a system in Matsumoto the last 10 years that if

a doctor is asked to go to the spot of some emergency incident, the doctor car will bring the doctor to that area. This night one of the neurosurgeons in my university was on call. He went to the spot and he did very well triaging the victims. Therefore, we only lost seven lives, and the others in very serious conditions all recovered.

This is the condition of the dead subjects which was described by this doctor. Three were found dead inside living rooms. They looked as though they had died while reading a book or watching TV. All these three showed myosis. The doctor judged there must have been some generalized convulsions in these victims. Another one was found dead in a hot zone with a window open. Another one was found with gasp spontaneous respiration, but the radial pulse could not be heard. He was carried to a hospital in an ambulance but was DOA. Also, we had information of another subject who died within 5 hours after arriving at the hospital. The last one was a condition of epileptics. Injection of diazepam in large amounts could not stop the convulsions, and he died in 3 to 4 hours. This is the distribution of the age of 270 subjects who were medicated. You can see that there are many young subjects. This is a residential area; it is the apartments and dormitories. There are many students attending Shinshu University and young businessmen living there. This is the site of the presumed emission; this is the house of the first reporting. The first reporter was suspected for a long time before the Aum Shinrikyo was determined to be the perpetrator of this incident.

Here is a summary of medicated subjects. The subject symptoms which showed a positive correlation with degrees of cholinesterase level were headache, decreased individual acuity, constriction of the visual field, fatiguing, and also feeling of some heat. As objective findings, muscarinic effects including myosis, copious secretion, respiratory distress, vomiting, and arrhythmia were observed. A nicotinic effect, particularly in the tongue, was marked. Weakness and tachycardia were found in some subjects. Central nervous system effects were headache, convulsion, and consciousness disturbance. Both nicotinic and CNS effects were observed only in the severely affected subjects. By examination, positive correlation with a decrease of cholinesterase level were found in myosis and elevation of serum cholesterol, leucocytosis, and decreases in serum potassium and chloride rate. The prolonged effects were only observed in severe patients; the number is very small, less than five. That includes EEG abnormality with spikes and sharp waves and ECG abnormalities like premature ventricle contraction, anthracite fever.

Here I would like to present the course of one severely affected subject. He is a 19-year-old student who was admitted to my department so we could watch him in detail. As a history, he is a young student, but he had a common cold on that day and took a rest in the living room from early morning until about 11:00 at night when he opened the window and white smoke streamed right through it. This is from west to east. He felt visual disturbance but went to bed and slept. He was found unconscious at 1:00 a.m. in bed by the rescue team and was transported to our hospital. On admission he showed shallow spontaneous respiration and tachycardia. Slight elevation of blood pressure and body temperature were noted. He was comatose, he showed epileptics, and marked myosis. The diameter of the pupil was less than 0.5 millimeters. Deep-tendon and phalangeal reflexes were absent. Laboratory examinations discovered marked leucocytosis and slight decrease in the total cholesterol and triglyceride level. There was a marked degradation of blood glucose level, and potassium was slightly

decreased. The serum cholesterol was 21 units; that is 19 percent of the lower limit of the normal body. Cholesterol was below 0.1; that is below 10 percent of the normal lower limit. In addition, we had spike and wave and also sporadic spikes. He was treated with intubation and artificial respiration and the diazepam was injected with IV. Also, atropine sulphate was administered. Diagnosis at that point was severe organophosphate poisoning. This is taken 5 days after the incident, so the pupil became much more dilated than when he was admitted. This is between 1 to 2 millimeters in diameter, and you can also note the severe injection of the conjunctivae.

This is an EMG taken 30 hours after the incident. You can see the marked spikes in the front central region.

This is the clinical course of this subject. You can see the time scale here; also, there is the time scale for the recovery of cholinesterase of 50 in the bottom. By such treatment he recovered very quickly. After 2 hours we discontinued artificial respiration because he recovered spontaneous respiration, and after 4 hours he started to respond to doctors' inquiry. He could make verbal communication after 5 hours, but he was still drowsy for several days. Diazepam was given; 40 milligrams the first day, that is all. Atropine was given; 5 milligrams in the first day, and injection of atropine was continued until the tenth day. The consciousness disturbance and myosis lasted more than 1 week, and a slight fever was observed for 2 weeks. He gradually recovered within one month, but still at this stage, that is 1 year after the incident, severe epileptic and EEG abnormality were found by examination. Recovery of cholinesterase was shown here; the serum cholesterol recovered to normal in 1 month. That is coincidental with reports from animal experiments. Here is the level of cholinesterase in relation to duration of admission for all admitted subjects. Most of the subjects could be discharged within 20 days. There was a tendency that the subject with lower cholesterol activity needed to be kept in the hospital a little bit longer. We are concerned about the fate of the patient with marked decrease of serum cholesterol activity. These six subjects are the ones who showed below 20 percent of the lower limit of the normal body. There were several complications after 4 months. One patient showed a decrease, one is in a vegetative state, and in some there were complaints and EEG abnormality. This is the daughter of the first reporter, and she is 16 years old. It is remarkable to note that despite the cholinesterase being 12 percent, she completely recovered after 4 months. We should keep in mind that young females in the estrus state show the physiological decrease of cholinesterase activity; part of this decrease might be due to such a physiological phenomenon. The younger subjects recovered much quicker than the elder subjects in our incident. There is a correlation between the cholinesterase and the extent of myosis. Naturally the subject having very severe myosis showed decreased activity compared to those who showed moderate or mild myosis or normal pupils. If we look at individual values, the degradation of cholinesterase level, and the size of pupil shown here, it is important to note that more than half of the very severely myosis patients showed the normal range of cholinesterase activity. This may mean that myosis can be produced by other systemic effects, by inhalation of toxic gas as well as by local contact of gas to the eye. This patient group showed only myosis and symptoms of upper respiratory tract; they recovered much quicker than those who showed decrease of activity.

We only measured acetylcholinesterol activity in about 60 subjects. It is considered that acetylcholinesterols reflect the activity of cholinesterase at the site of neuroneuronal transmission at neuromuscular junction much more precisely than the serum cholesterol. In our cities, only one-fourth of the subjects showed decrease of the acetylcholinesterols. They recovered gradually; we measured acetylcholinesterol activity at 1 month, 2 months, and 3 months, and examination after 3 months resulted in all normal recovery for those who showed decrease of acetylcholinesterols in the initial examination.

In the treatment of severe casualties. We needed ventilation assistance. Atropine sulphate was effective for muscarinic effects. We needed an ample amount. In our cities, we gave up to 50 milligram for the first 24 hours, but even in this patient, we did not find any sign of atropine intoxication. As to oxygen, we only used oxygen in one hospital. Medical patients were treated in six hospitals, but oxygen was used only in one hospital because we did not know the causative agent. The signs which are produced by organophosphate poisoning have a similarity to those which are caused by carbamate poison. In the case of carbamate, oxygen may have the opposite effect, so you cannot use oxygen if the causative agent is unknown. Diazepam was very effective in not only the subject who showed convulsion, but it also had considerable effect on irritability and even headaches. Diazepam should be used in subjects who show CNS effects by organophosphate poison. Ample liquid transfusion is necessary. Because of vomiting, diarrhea and copious secretion, the affected subjects were dehydrated.

Now I will discuss the results of the questionnaire to the residents. We sent two questionnaires. The first questionnaire was sent to residents of the area and members of the rescue teams 3 weeks after the incident. To our surprise, we obtained responses from 85 percent of the residents who were given the questionnaire; 1,743 responded. An analysis was made by the Department of Public Health of Shinshu University Medical School. The results were that 471 had subjective symptoms; 40 were admitted to hospitals, 156 visited outpatient clinics, and 277 had symptoms but did not consult a doctor. These results are not identical with that obtained in a survey of the medical patients, but this is because of the method of the questionnaire. The second questionnaire was sent out 4 months later to residents who reported symptoms on the first questionnaire and medical subjects with causes unknown. We received a 60 percent response – remember, there is still one patient in a vegetative state – six had visited outpatient clinics and 55 still had symptoms. After this second questionnaire was sent out and we had received the responses, we scheduled a consultation for the subjects who wished to talk to nurses or doctors. We also examined more than 100 patients who did not show any objective sign of intoxication.

By analyzing the questionnaires, we could obtain fairly important information. This was a distribution of the victims who had symptoms (this is the site of the supposed emission). The wind was blowing in this direction, a southwest wind. The subjects with symptoms were in an elliptical region 400 meters by 300 meters, but if we include the area where only small number of subjects complained of the subject symptoms, the area extended to 800 meters by 570 meters. This is the frequency of the subjects' symptoms divided into three groups. The uppermost part shows the admitted patients, the middle shows the outpatients, and the bottom shows the subjects who had symptoms but did not consult with doctors. Symptoms observed

during the total course were shortness of breath, dim vision, constriction of visual field, blurred vision, and headache. This is the frequency of symptoms which were also felt first: runny nose, cough, and shortness of breath. Dim vision and blurred vision were also frequently observed.

These are the signs which disappeared first, including runny nose and nausea.

This is a table showing the symptoms which were still present when the second questionnaire was sent out. They included paraesthesia and others which include fatigue of the eyes, fatigue when reading or writing, runny nose, itching of the eyes, heavy head, and headache.

These are nonspecific symptoms.

There was another interesting finding and that was the time when the symptoms were first felt by residents. It was most frequently reported around 11:00 at night, but there was a second peak the next morning from 6:00 to 8:00 a.m. If you look at the individual symptoms which appeared in this phase or this phase, runny nose was observed in both phases, but cough, shortness of breath, dim vision, which are a bit more severe symptoms, appeared only that night but not the next morning. The Department of Public Health people analyzed this in detail and found the age distribution is different between the two groups. It was noted that older people showed the first symptoms in the morning. Of course, the outcome included the subjects who experienced symptoms only in the morning, who had very mild symptoms, and who did not consult with any doctors but only responded to the questionnaire sent to the residents. We consider the reasons for having two peaks of subject symptoms as follows: one possibility is that the habit of the life of older people in Japan perhaps may be a cause and perhaps it is the same in this country. Old people in Japan go to bed early and they close every window while sleeping. Then they get up early in the morning and go outside, and then maybe they suffered from the remaining gas outside. There are other possibilities but the next morning it was cloudy and rainy, and it was cool with no sunshine at all.

Next is the casualties of rescue teams. This is how they worked during the night.

This is a building where three were found dead. The rescue teams did not wear anything to protect themselves from gases or other toxic substances. Only policemen wore gloves, but they did not worry about carrying the victims. There were 52 persons formed into 18 teams from 5 fire departments of surrounding villages and cities. Eight persons, 15 percent, complained of symptoms. One was admitted to a hospital, and the rest did not consult with doctors. Members of the staff who developed symptoms worked in the early hours from 11:00 at night until 2:00 in the morning inside or outside of the buildings.

This is a history of the subjects from rescue teams who were admitted to hospitals. This is a 45-year-old fireman. He went to the house of the first reporter, and the wife was in a vegetative condition. The next morning they found the sarin in the air of the house, as well as in the water from the basin in the bathroom. The subject rescue worker worked there for several minutes where three were found dead. He worked very hard. After finishing the

transportation of victims at about 5:00 in the morning, he felt headache and nausea and was admitted to the hospital. The status on admission was severe myosis. The pupil is a pinhole and there was a severe conjunctivae injection. By auto inhalation and atropine he recovered very quickly and was discharged the afternoon of the same day. Examination revealed slight elevation of hepatic enzymes. Other complaints heard by members of the rescue team included ocular pain, dark vision, headache, constriction of vision field, and nausea. The next morning they were prepared to wear gas mask and also gloves, but by this time almost all of the toxic substances were gone.

The agent was identified as sarin by the Institute of Public Hygiene and Pollution.

The identification methods used were gas chromatography, mass spectroscopy, and by electro impact method coincidence of the mass spectra was found. By chemical ionization method, the molecular weight was found to be the same as sarin: 140. Library references were checked and a retention index of the substances were the same as those of sarin. Some of the materials examined were pond water, air from inside the house of the first reporter, and materials gathered from other places by different teams. The institute examined four substances as a possible causative agents. One was organophosphate which produces a very strong toxical substance, phosphine, by mixing with water; hydrogen cyanide and hydrogenated compound were also examined; and organophosphorus compounds including sarin and tabun were all examined. But only sarin and related substances were positive.

This is an example of the chromatograph of the pond water. There are three peaks: the big one is sarin. This is a mass spectrum of the phosphene. It coincides quite well with that obtained from the library references. This is the peak of sarin from the library. Sulfonate G isopropyl was the third peak, and, again, there is a good coincidence of the peak obtained from the library references.

This scene is the next morning and this area are support places for emission. We thought plants were observed here. You can see the dead crayfish and fish that were found the next morning in the pond near the site of emission.

How about the sarin and related substances? Were they detected in the tissues of the casualties? Yes. They examined sarin and phosphoric acid, di-isopropyl, and this is considered a byproduct in the course of the sarin production. The phosphoric acid mono-isopropyl and phosphoric acid both are degradation products of sarin. All three of these substances were detected in all of the seven dead subjects. Sarin was only detected in the nasal discharge of the one dead subject. However, all three substances were detected in all of the blood specimens from casualties admitted to hospitals who were examined. Sarin was considered the toxic substance. There still is no official statement, but according to the news media, a modified container truck was said to have been used. It was equipped with heater and fan. Evaporated sarin was expelled from the chimney attached to the cage of the container. The amount used has not been identified yet. It was less than 20 liters because it was said that they made 20 liters for the attack in Matsumoto. Some of it was used in the prior experiment, and we do not know how much sarin was used in Matsumoto.

This shows the weather that day from the weather bureau which is located 2 kilometers north of the site of incident. In late evening of June 27, the temperature was nearly 21 degrees centigrade. The usual high humidity of the rainy season was recorded; it was more than 93 percent, and wind direction changed gradually. After 11:00 p.m., when casualties complained of symptoms, the wind was blowing gently (0.5 meters) in a southwest direction. The next morning there was a misty rain and the temperature was around 20 degrees and still very humid. It was cloudy all day and the estimated sunrise was at 4:30. This sunrise did not affect condition of the air enough to produce the first complaints of the old subjects who came outside in the morning.

The documentation and the followup. We have prepared a 167-page medical report which was submitted to journals. The report was printed in *Lancet*. We have presented the report at various scientific meetings. We are planning a followup study at 1 year. It will include another questionnaire to be sent out to 2,000 residents. A medical examination of 154 subjects is also scheduled. Selection of the subjects depended on the condition of the subject at the acute stage. Subjects with marked myosis, the diameter of the pupil was below 2 millimeters, and subjects who showed decrease in serum cholesterol were included. On the occasion of the Tokyo sarin incident on March 20, we sent all this information to hospitals and Minister of Health and Welfare; it was helpful.

The government asked me to write guidelines for treatment of casualties in nerve agent incidents. I wrote the guidelines and they were transmitted to many university hospitals and health bureaus through the Ministry of Education and Ministry of Health and Welfare.

This shows the subjects which we used for the medical check at 1 year. The pupil size is listed here and the cholinesterols are listed here. The first subject died within 5 hours after admission to the hospital. The rest are still alive; some are very healthy. Data collection and other activities reported after the Matsumoto incident showed that we did not use much oxime. When we were asked, we told the hospitals involved in treating victims of the subway incident to use oximes and it was effective.

As for an information exchange system or registration of casualties, there is only a loose liaison committee of our groups. There is no registration system in case of an emergency like Matsumoto sarin incident.

This depicts the importance of our study. It is important to note that severe casualties recovered very quickly when given atropine, diazepam, and ample liquid infusion. Non-specific complaints were observed in less than 10 casualties. In our incident, psychogenic complaints were rather infrequent, and the casualties of rescue teams more frequent in those who worked in contaminated areas in the early hours. No protection was taken, but symptoms were all marked.

Question: How soon after the incident at Matsumoto was it proven that sarin that was the toxic compound? Was that information then released or not? And where did the sarin come from?

Answer: Medical examination did not show that the causative agent was sarin. We only could diagnose that the incident was due to very strong organophosphate poisoning. Only after detection of the sarin by Institute of Public Hygiene and Pollution did we know that the agent was sarin. Then we did not know where the sarin came from. I must say the first reporter, Mr. Coleman, was targeted as being responsible for the production of toxic substances, not intentionally, but accidentally. It was said that in 1 month it was impossible for one person to make sarin intentionally or unintentionally. Still the news media and perhaps the police stuck to the first report. Only after the Tokyo sarin incident did we know where that sarin came from.

Question: You said that the seven people who died were 80 meters downwind from the source of the contaminant. Were there others within those 80 meters who survived and how many? Do you have perhaps a conjecture as to why they survived as opposed to the seven who died?

Answer: That is a very important point. I did not mention the condition of the room of the dead victims, but all of them opened the window because it is very humid in the rainy season. There were no dead victims from the first floor. These apartments are three or four stories, and the residents who live in the first story usually close their windows because of safety. That is why they did not suffer from that poisonous substance. Only the subjects who opened the windows are dead. There must be some critical differences because the patient I talked about in detail, that 19-year-old subject, did open the windows in the room next to the room where the persons were found dead. We can only say that the condition of the door being open was critical.

Question: Has the article been published in *Lancet* already, and if so, what date?

Answer: I do not know. They accepted our paper about 1 1/2 months ago. We already made a galley proof, but I do not know if it is already published or not. It will come out soon.

Question: You use information regarding the response teams, the emergency teams, and their symptoms. How about the medical providers at the hospital itself, the emergency room personnel?

Answer: Yes, a few nurses complained of dim vision, and myosis was found in a very small number. I must say that the medical staff was not affected by secondary contamination.

Question: I am curious about the psychological effects of something like this. What happened to the people in the neighborhood? Do they view their neighborhood now as being contaminated? How do you handle something like that?

Answer: I think your question is on the small number of subjects who have the psychological symptoms. Yes, I think it is because the causes were unknown and the psychogenic reaction which you can expect from a sarin incident did not surface in the Tokyo

subway incident. We did not expect such a reaction, and it was part of our intention in sending the questionnaire to all residents in that area to make them feel safe. If there is anything the subjects feel needs to be checked we tell them to come to the hospital. I think it worked well.

Admiral Young: I would like now to continue our briefing on the gas tragedies that occurred in Japan. I would to introduce Dr. Obu, Chief of Neurology at St. Luke's International Hospital. Dr. Obu had the responsibility of treating many of the patients that came in.

2.4 Tokyo, Japan, Subway System (March 1995)

2.4.1 Japanese Medical Team Briefing
Dr. Sadayoshi Obu
St. Luke's International Hospital

I am the Chief Neurologist in St. Luke's International Hospital. I will present to you clinical and practical aspects of our sarin victims in Tokyo and talk about what and how we have done for them since that day. In the second half of our talk, Dr. Yamaguchi, head of ophthalmology, will show you all about our programs in sarin intoxication.

On March 20, the Tokyo subway system was attacked by terrorists releasing sarin. More than 5,500 subway passengers and employees were sickened. There were eleven fatalities. This is the Tokyo subway network; very complicated.

This is Tsukiji Station, a hospital is here, and this is Kodemmacho Station. Three lines, marunouchi (red), chiyoda (green) and Hibya (yellow) line, were attacked. Tsukiji is the nearest station to our hospital. The majority of our hospitalized patients were injured at Tsukiji and at Kodemmacho Station. On the day of the attack, 641 victims were accepted at St. Luke's International Hospital with an additional 392 victims being seen after the attack. This division of authorities, hospitalized patients and outpatients, is presented in this slide. The Tokyo sarin attack was, to our knowledge, the first and largest terrorist attack with this type of nerve gas documented in peacetime history.

This is our hospital building. This is the new building, and this is the old building. Originally, an American missionary medical doctor established our St. Luke's Hospital with help of American citizens.

This is the entrance to the emergency center.

This is the waiting space on the second floor. We used it as a holding space on that day.

This is our chapel, which we converted into a holding and observation area. In this area 22 patients remained overnight.

I am going to show you a sequence of events. After I have shown you this sequence of events, I will show you a videotape. Around 7:50 the incident occurs. Emergency call, the first critical patient, around here you will see in videotape, arrival of self-defense forces at the hospital and a call from Shinshu University Hospital, Dr. Yanagisawa, maybe 9:30 or so. We discussed with them, then we made protocols and questionnaire, and handout in Japanese, but I will show you.

This is protocol. Just the first one. In addition to this, we made a handout for notification of hospital staff, devised and revised three times in 2 days.

This questionnaire is for outpatients.

This is the handout for the patients. It says that sarin is the possible causative agent, that several hours of observation is needed. We will check to see if you can go home at 2:00 p.m.

Announcement of sarin, maybe 110 patients, all were not acute.

Then we checked at 5:00. The next day, 80 patient out of 111 patients were discharged. Now let me show you videotape.

Videotape of hospital (in Japanese); comments by Dr. Obu during video.

Fortunately, incidentally, we had a professional cameraman making videotapes for nurses' education. He took pictures around emergency entrance, near the chapel and in the waiting area.

This is a hospital doctor (door).

This is our director, he made a very good decision.

They came to the hospital by ambulance and by taxi. Many were on foot.

She is a nurse.

She meets victims and asks if they are okay. If their present condition is not so good, she calls a doctor quickly.

This is what happens in the entrance of the emergency center.

He ordered, "You must go to the chapel."

We have the boat from Tokyo Fire Department; oxygen nitrogen was detected.

That happened at the entrance.

This is the second floor waiting space. Maybe you are familiar with this scene on TV. This is entrance of the chapel.

Doctors from many departments such as psychiatries or pathology came to treat them. He is the head of urology.

This is the head of the hospital pharmacy. He expected increasing needs of atropine and pam and ordered additional ampules of atropine and pam in advance. Of course, the Director made a very good decision, but it was not the only the reason we did well. Each hospital personnel acts and thinks what he has to do in his or in her position. Off-duty hospital staff voluntarily came to the hospital to help us.

End of Video.

We are going to some clinical points. Of the total, five patients were in critical condition. Three of those patients presented in cardiopulmonary arrest. The first patient did not respond to resuscitation and expired. A curious clinical finding observed in this patient was extreme constriction of the pupils which continued to be present even after his death. The second and third patients were successfully resuscitated. The second patient was a 21-year-old woman. Her blood studies initially revealed extremely low serum cholesterol level: six IU per liter. Our reference value is between 100 and 250 IU per liter. Within 6 hours, this value returned to a normal level. However, she was diagnosed as having suffered irreversible brain death on a mechanical ventilator and expired on the 28th day. The third patient was a 29-year-old woman who collapsed while attempting to flee the underground station. Initially, her symptoms were ocular pain and dizziness. At 8:43 a.m. she was admitted to our emergency center in cardiopulmonary arrest. Within 5 minutes of cardiopulmonary resuscitation she had a spontaneous heartbeat with palpable blood pressure. One hour later she had a generalized convulsive seizure which responded well to 5 milligrams of intravenous diazepam. After it was learned that the causative agent was sarin, 1 gram of pyridoxime iodide (pam) was administered intravenously. Thereafter, she received 0.5 gram per hour of pam. Within 30 minutes she became alert and responsive, and within 4 to 5 hours she was able to breath spontaneously. At 4:00 p.m. the diameter of her pupil had recovered to 3 millimeters. An extremely low initial serum cholesterol value was 13 IU per liter when recovered, 81 IU per liter. Over 24 hours, a total of 1.5 milligrams of atropine sulfate IV and 8.5 grams of pam IV were given. By day 6 of hospitalization, she was discharged. The fourth and fifth critical patients were admitted to our emergency center in a drowsy state of consciousness. Several minutes later both developed generalized convulsions and then respiratory arrest. With the aid of mechanical ventilation, the neurological status improved and they were able to breath spontaneously. On day 3 and day 4 respectively, they were discharged without further problems. The initial treatment for those five patients was 2 milligrams of atropine sulfate. When it was learned that sarin was responsible for the patients' systems, pam IV was added to this treatment regime. However, from the beginning, organophosphorus compounds or carbamate pesticides were suspected to be the causative agent, especially in view of the patients peculiar signs and symptoms. Fortunately, pain was initiated in two critical patients before the confirmed identification of sarin.

On the first day of the attack, 160 patients were hospitalized for 24-hour observation. Those patients ages ranged from 13 to 60 years old. There were 45 men and 66 women including 5 who were pregnant. A synopsis of their signs and symptoms are presented in this slide. All but one patient had myosis. Maybe the eyes were myotic. Other eye symptoms included eye pain, blurred vision, and visual darkness. Headaches were experienced by many patients and were especially evident when looking at near objects. Symptoms such as dizziness, nausea, vomiting, fatigue, cough, agitation, and frustration were relatively common. Convergence with subsequent respiratory arrest occurred in two patients as described earlier. Within 24 hours, all hospital patients were given 0.5 to 6 milligrams atropine sulfate IV. Additionally, those patients were given 1 milligram to 8.5 grams of intravenous pain once information regarding sarin as the causative agent was received. During treatment with atropine sulfate and pam, five patients developed bronchial asthma, and one patient developed chest pain. Those symptoms were easily managed utilizing bronchial dilators and nitro-glycerin, respectively. Headache and morass seemed to be the most common, persistent, generalized symptoms noted after discharge from the hospital. Some patients also described anxiety, fear, nightmares, and insomnia. Five patients with severe nightmares and insomnia required followup by psychiatric nurses and psychiatrists. A detailed followup study is currently being undertaken to investigate lingering problems and other possible sequels to sarin poisoning.

In order to aid the staff in achieving a level of preparedness in the event of unforeseeable catastrophes, send troops into international hospitals and exercise routine disaster drills. The attack of sarin was so unanticipated that there were no developed guidelines for the management of such an extraordinarily large number of simultaneously affected patients. All victims were advised to remain in the hospital and receive intravenous hydration while the causative agent was being investigated. It was not until 3 hours after the attack that sarin was identified and extensive research was begun. All patients affected remained under hospital observation for at least 6 hours. Thereafter, about 500 victims with only eye problems were discharged that day. Patients with any disturbance of vital signs or other significant signs and symptoms and/or psychological symptoms were advised to stay overnight. Upon evaluation the following morning, 80 of the 111 hospitalized patients were discharged. Subsequently, within 1 week of the sarin attack, all hospitalized patients had been discharged except for the one patient who suffered severe anoxic brain damage: Case 2. One month after the attack, two patients received treatment at our hospital for psychological symptoms due to central nervous involvement by sarin or post-trauma distress disorder. Other than a small percentage of physicians and nurses who experienced pupillary constriction but did not require medical treatment, the hospital staff was free of any of the effects of exposure to sarin. This observation does not preclude a current detailed study that is being conducted utilizing 1,100 hospital personnel members and volunteers to determine if there are secondary casualties to this disaster.

Now let me discuss some points. After one is exposed to a nerve gas, the resulting acetylcholinesterase causes signs and symptoms mainly in muscarinic, nicotinic, and CNS structures. It attacks the respiratory system and induces respiratory failure. Respiratory failure can occur because of CNS involvement, a nicotinic effect on the respiratory muscles, and muscarinic effect on smooth muscles and secretary glands of the airway, resulting in

bronchial constriction and excess bronchial secretions. Impressively noted was that two patients in full respiratory arrest that developed shortly after convulsive seizure, and who were successfully resuscitated, described that alarming sensation of being fully conscious but unable to breath. We have divided the victims in this attack into three groups according to their clinical course. Group One consists of two victims who were either dead on arrival at the hospital or died of severe anoxic brain damage within 4 weeks of successful cardiopulmonary resuscitation. Group Two consists of three victims who recovered completely several hours after cardiopulmonary arrest or a pulmonary arrest without physical sequel. Group Three consists of victims who had various milder symptoms in addition to myosis and myosis-related symptoms. Within several days, almost all patients in the third group were discharged from the hospital without physical symptoms. Some developed or continued to experience psychological symptoms. Initially, there was a handful of the most critical cases; in contrast, an overwhelming majority suffered only mild symptoms. We surmised that the sarin used in this attack was not pure, but diluted; information that has now been verified. Needless to say, this incident could have been more disastrous given the logistics of the crowded areas of subway, commuter trains, and stations.

Pam was initiated after the official announcement was made identifying sarin as the causative agent. Pam is the only oxime available in Japan. Only a small amount of pam, 1 to 2 milligrams per person, was administered to most of the hospital patients who were not critical.

The level of serum cholesterol was found to be within normal range within 2 to 24 hours. In 24 mildly sickened patients, the average body was 79.5 IU per liter on March 20 and 170.5 IU per liter on March 21. A normal range of serum cholesterol is 100 to 250 IU per liter. It was our clinical impression that we could have managed the signs and symptoms of almost all of our mildly affected patients without pam. In the patients who did not receive pam, the serum level recovery was not as fast. With a small dose, there was rapid recovery. Serum cholesterol is not a good clinical indicator. Clinically, however, those in critical condition, seem to have benefited from pam, as muscle frustration and convulsions were suppressed. Diazepam IV was utilized only for convulsions, with good response.

Finally, I would like to comment on some possible reasons why we could cope with this unforeseeable disaster: preparedness, a sense of vocation as professionals, space, the time of the day, the fact that a majority of victims were not very old, and a simple, single injury; no trauma, no bleeding.

Japan had no previous experience with this form of terrorism. We are now aware that governments of other countries have developed contingency plans to cope with this type of terrorism. The aid and advice from the international community to help cope with this disaster were greatly appreciated. We have learned that worldwide cooperation of healthcare professionals is the most important factor to manage and overcome a disaster of this magnitude.

Question: What was the number of casualties you received in the first 24 hours?

Answer: First 24 hours, 641 victims.

Question: Do you have any data on the treatment of patients with just atropine alone and atropine plus pam? Do we have any sense of how valuable the pam was?

Answer: We tried to make that determination, but in this accident we could not do the control study. The record is not clear-cut, but we will try to differentiate the effects of atropine and pam. The emergency department doctor says that pam is clinically effective. The pam is effective in increasing the value of the cholesterol; serum cholesterol. Serum cholinesterase is not the same as tissue cholesterol. So I do not know exactly.

Question: I was very much impressed that you had available pam for treatment and that you had assays for serum cholinesterases. Did you have advance preparation for the possibility of this kind of attack?

Answer: Absolutely not. Two or 3 hours after the accident occurred, sarin was proven to be the causative. Other times we studied reaction to sarin. Before the identification of sarin, some information gave an indication of acetonitrile, but that in itself is not too toxious so we had no preparation.

Audience Comment: Could I just say one thing on that, I am assigned to the U.S. Embassy in Tokyo. The information that we have, managed to obtain over the past few months is that the Japanese police had been planning a raid on the sect's facilities throughout Japan a few days after the sarin attack occurred. The sect got information. It seems that the raid was about the take place, and they did a preemptive strike before the police were going to raid them. It seems that the government had laid in supplies and ordered pam and atropine that are not normally found in that quantity in hospitals in Japan.

Admiral Young: I would like to now welcome our next colleague from Japan, Dr. Yamaguchi, who is head of the Ophthalmology Department at St. Luke's Hospital.

2.4.2 Dr. Tatsuo Yamaguchi
St. Luke's International Hospital

Before talking about the eye symptoms, I would like to quickly explain the anatomy and physiology of the eye. This is a cross-view of the eyeball: cornea, conjunctivae, cilia and iris; and here is the pupil, lens, vitreous body, retina, and optic nerve. There is the ciliary body that is very important, it produces aqueous humor that contains nutrition. It is between iris and lens. We call it the anterior chamber. Eye pressure is controlled by the secretion of the aqueous humor and the filtering function of the cornea. The depth of the anterior chamber is from the back of the cornea to the anterior surface of the lens. Later I will show you some clinical pictures, so please remember this.

This is the conjunctivae and cilia. This is cornea, and the brown color is the iris and pupil. You cannot see the surface of the lens from this photograph. This is a normal eye. This is the reflection from the cornea and this reflection is from the iris and lens; so the distance between cornea and iris the is depth of the anterior chamber.

Let us talk about the treatment for a sarin patient at the Department of Ophthalmology on March 20. At 7:50 the incident occurred at Tsukiji subway station. At 8:28 the first patient arrived at the hospital. Around 8:40 we were told that several hundred patients would arrive at the hospital in the future. At 8:50, the first patient was observed at the Department of Ophthalmology. We saw the very pinpointed pupils. We kept IVs on all of the patients. We checked all of the textbooks on ophthalmology, and organophosphate was suspected. We were going to try injecting atropine by IV but waited for a while.

These are typical, critical pictures of the eye. You can see hyperemia around the cornea. We call it cilia injection, which means something happened inside the eyeball. You can also see some congestion in the conjunctiva. The pupil is really in a myotic condition.

This is a cross-view of the pupil. It is under 1 millimeter. I have spent 24 years as an ophthalmologist, but I have never seen this kind of pinpointed pupil. Around 9:00 we sent an ophthalmologist to the emergency clinic, and around 9:40 a.m. we were informed that acetonitrile was determined to be the agent. We got some people from the library, but little information was written about the eye. I considered using a steroid in IV, but it was a very difficult decision. It was the first time in my life I had to make a decision in such a short period of time and I postponed using a steroid. Around 11:00, sarin was determined and cholinesterase was examined in all of the patients. Around 11:30 we got symptoms and treatment. I sent a fax to the Office of Tokyo Ophthalmologists Association, and the information was faxed to the major hospitals and the Chief Ophthalmologist in each area of metropolitan Tokyo. Later I was thanked by many ophthalmologists for sending these faxes.

This picture was taken from a newspaper. The physician is one of the residents in our department. He treated a patient systemically and also ophthalmologically. We were in the dark. We did not know what was going on or what was happening outside. Just 5 minutes from our hospital a terrible disaster was going on.

First we treated myosis using three different kinds of eyedrops. In Japan there are three muriatic agents available and Mydrin P. Atropine is good, but the effect lasts from 5 to 7 days. Some of the patients came in on day 3 or day 4. They complained of difficulty in reading up close. We had used atropine with these patients.

This is another clinical photograph of a patient. You can see ciliary injection, myosis, and some conjunctival congestion. This is the same patient. Please look at the distance between cornea and iris. We call it the shallow anterior chamber. It means the ciliary body had developed edema.

This photograph is taken from the same patient 30 minutes after application of the Mydrin P. Even using Mydrin P, it usually dilated 8 or 9 millimeters, but it was stuck, and no light refraction occurred.

This is an electric retinogram (ERG). It shows the function of the retina. We call it A-wave and B-wave, right and left.

This is a patient exposed to sarin with strong myosis on March 20. As you can see, the A-wave is low and shallow in the right and left eyes. After a time it has improved, but when I saw this one I thought something happened in the retina and that some of the patients would be blind but after we put the application of Mydrin P, the pattern of the retinogram became normal. We were relieved.

Around 2:00 p.m., some of the patients started showing light reflex: pupillary reaction. At 3:00 p.m., the IVs were removed. Around 5:00 p.m., the 100 outpatients in our department started going home. We gave an information sheet to all of the patients stating that during the next 24 hours they would need special intensive care so if any symptoms occur, please call the hospital.

On March 20, six ophthalmologists took care of 112 patients from the incident and 180 patients with appointments; we could not reject these patients.

On March 21, 111 admitted patients were examined and all of them showed severe myosis. Hyperemia was more severe than it was the day before.

The evening of March 20, we worked until 9:00 without eating a meal. It was really a difficult and long day for us.

The number of the sarin patients had decreased. Finally we followed up patients.

Let us return to the clinical findings on the eye. You can see myosis, slight ciliary injection, and conjunctival congestion. This patient had developed severe conjunctival congestion which might have developed from the solvent.

This is the same patient after application of Mydrin P. Ciliary injection and conjunctival congestion have become much lighter. The pupil is still small.

This is another patient 4 days after the incident. You can still see myosis and ciliary injection. This patient shows a less superficial condition of the cornea. You can see staining from the special dye. This patient was exposed to very strong winds because someone opened the window of the subway.

This is 5 days after the incident. You can see ciliary injection at 3:00 and also 9:00. I do not know why, but ciliary injection is characteristic of patients exposed to sarin. On day 5 you can see more severe conjunctival congestion: subject with symptoms like dim vision, blurred vision, constricted vision field, eye strain, ocular pain, especially reading up close,

headache, loss of concentration, redness, foreign bodies sensation, irritation. Objective symptoms are myosis, decrease in vision, hyperemia, constricted vision field, shallow anterior chamber, superficial punctate keratitis which I showed you before, subnormal pattern in ERG, changes in accommodation.

Dim vision was the most frequent symptom on March 20 and that gradually decreased through March 24. All of the symptoms gradually decreased with time; however, hyperemia increased with time. We checked the correlation between the level of cholinesterase and the symptoms. We did not find any positive relationship.

Three months after the incident, we decided to do a clinical investigation. From the March 20 records, we called 41 randomly selected patients: 17 of our hospital's admitted patients and 24 outpatients. Examinations were completed. Complaints included fatiguing eyes, discomfort, blurred vision, eye pain, eye strain, and constriction of the visual field. Systemic complaints were fatigue, dullness, headache, shoulder strain, and sleeplessness. One patient was treated at the Department of Psychiatry. Another examination showed no decrease in vision in any of the patients. It was very fortunate for us as well as for the patients. Myosis was found in 29 percent of the patients, and abnormality of light reflex was still seen in 6 patients, or 7.3 percent.

This is a picture taken 3 months after the incident; you cannot see any hyperemia. This patient did not show any light reflex. After the application of the Mydrin P, the pupil is still smaller than normal. Even though the pupil size is the same on both sides; the ERG in the right eye is still subnormal, and the left eye looks normal.

This is another patient. He does not show any light reflex, and after the application of Mydrin P, his right eye is okay, but his left eye still shows no light reflex. The pupil is oval shaped, and it is not fully dilated. Another examination showed an increase in cornea thickness in two patients. Allergic conjunctivitis, abnormality in optic nerve disk, and abnormality in ERG were found in 13 patients. We should followup these patients for a longer period of time. Abnormality in visual field was found in three patients.

This was the result of the optimization. This is standard curve in Japanese. Accommodation decreases with age, and this is the patient with a range of relatively more accommodation. This means the ciliary body or ciliary muscle is still having some trouble.

Hyperemia and foreign body sensation. This time we checked all of the patients more than 30 minutes after the incident so the sarin was already absorbed into the conjunctiva. There was no need to irrigate the eye with a solution. Treatment of hyperemia for ciliary injection: we prefer Mydrin P. For conjunctival congestion: 0.02 percent of a steroid for the treatment of the foreign body sensation. Application of Mydrin P is also good for conjunctival congestion. For superficial punctate keratitis: vitamin B1 ointment or 1 percent sulfate eye drops might work.

In summary, we treated 480 sarin patients with subjective symptoms. These symptoms gradually decreased with time. This is 3 months after the incident; this is 14 months; this is 17; and this is 24.

Myosis and abnormality in ERG and accommodation have been observed in some patients 3 months after the incident. Long-term followup is needed for these patients even though the symptoms are not severe. We treated patients who had relatively lighter symptoms. Fortunately no patients developed blindness. For future emergencies, from the ophthalmological point of view, I would like to propose establishing a core center inside of the hospital to make decisions, and establish a quick delivery system to send information and decisions to each department or each section inside of the hospital. They would also establish a link by telefax through the medical association to send information such as symptoms and treatment to the domestic doctors who have private clinics in the town.

In closing, I would like to express deep sympathy to the people who died in Matsumoto and Tokyo.

Question: Did the eye treatment involve irrigation of the eyes with saline?

Answer: I do not think so. It is written in the literature that sarin is absorbed into the eye tissue within 5 or 6 minutes. If you see a patient within 5 minutes after the incident, it is better to wash and irrigate, but if the patient only gets the vapor of sarin, I do not believe that the patient needs irrigation.

Question: When the patients are discharged from the hospital, did the family members retrieve them from the hospital and take them home? How did you get them back to their home of residence?

Answer: We were very concerned about the patients' condition. As I told you, the patients who came to the Department of Ophthalmology did not have so many systemic symptoms, so we decided they could return home alone.

Admiral Young: I would like to invite Dr. Fred Sidell to the podium. Fred was one of the members of the four-person team that went over to Japan to learn and consult. The team was headed by Scott Lillibridge who could not be here today.

2.5 U.S. Medical Team Briefing

Fred Sidell, M.D., U.S. Army
Medical Research Institute for Chemical Defense

We were in Tokyo, and I will detail the chronology of how we happened to get there. We have a course at Edgewood, Management of Chemical Casualties, which we have been teaching for about 15 years. In the last couple of years we have combined that course with the one on management of biological casualties. Incidentally, as an aside, we do accept civilian

emergency care providers. The fact is we have had a number of those from Harford County, our local area, who have taken the course. We have even had additional special courses for those emergency medical responders in the area. Nonetheless, this incident happened on March 20, which was the first day of a course, and it got everybody in the course all excited. It kept people alert all week.

March 20 was a Monday. The news came out over the television and in the newspapers and a day or two later I received an E-mail message from an American employee at the embassy in Tokyo. His wife was in one of those subways and had been one of the casualties. He was extremely concerned about her for two reasons: (1) she was having eye effects and what was going to happen to her eyes and (2) she happened to be 37-weeks pregnant and what effect was sarin going to have on their child.

I corresponded with him by E-mail for a day or two. Finally, he sat down and wrote what she dictated about her experience with that exposure, and I was able to present that to the class, making this probably the first first-hand case report of this incident. This is what the lady wrote: at 8:00 she boarded the train; she noticed a small newspaper-covered rectangular object on the floor surrounded by a clear, sticky-looking gelatinous substance. She did not notice a smell. Now this differs. Different people give different stories about this. Some noticed, at least as reported by American TV, a terrible smell; some reported a watery substance. She walked past this, coming within a foot of it, to sit on the opposite side of the train. The compartment filled up and everybody seemed to be avoiding this stuff. Within a minute she had difficulty inhaling and started to cough. Thinking of the baby's health she got up and exited that compartment. She did not notice any reaction among the other passengers. She felt stuffy with a slight headache, but breathing was easier. She noted people in the compartment she had just left started coughing and moving away from the substance and appeared to start panicking. They went on to the next station. This is only 5 minutes later. Passengers in that compartment rushed out of the train, but she did not exit. One older passenger who had been sitting directly across from the substance remained in the train and started convulsing. He appeared to be unconscious. He had apparently been sitting next to the substance and had inhaled much more than those passengers who had been moving about. Others dragged him out of the train.

A couple minutes later, she exited the train, and went up the stairs. She started to lose visual clarity, she felt weak and off-balance, and she had a severe headache. Her eyes were watery. She tried to hail a cab but could not distinguish a cab from other vehicles. She found a cab and proceeded to the hospital. The reason she was taking the subway and going to the hospital was because she had an appointment for an obstetrical exam. So she continued to the hospital. The cab driver noticed that her face and eyes looked red. She arrived at the hospital; she was asked to lie down; she got mixed in with the other casualties; and the hospital began to prepare to receive the rest of these patients. This hospital was St. Luke's, coincidentally.

A few minutes later she saw her obstetrician. She was admitted, an IV was started, and she was given oxygen. Sometime in the afternoon she was given atropine, which I believe was 1/2 milligram. Nonetheless it helped her breathing, but her vision was still dim. That

afternoon she also had her regular obstetrical exam, which is the only time that she removed her clothing. This business of decontamination I mentioned yesterday sometimes is overdone. I think one problem that one might encounter in a situation like this is if there is a lot of liquid splashed around, and people get liquid on them and then go out and catch taxis, they are going to contaminate other people, interiors of cars, and other things. Under these circumstances, these people have to be kept under control. This is going to be a major concern after a large spill of liquid. The same thing is true with HAZMAT operations. You cannot let these people get out of control.

Over the next couple of days she continued to improve. Three days later she still felt weak and a little bit breathless and was still having eye trouble. I got a message on April 13 from this individual. On April 12, she delivered a perfectly normal 7-pound, 6-ounce baby boy.

I heard again from the father a couple of days ago. She still has eye fatigue, which may have been in one of the people who were reported on a few minutes ago, but nonetheless otherwise she is doing well.

Immediately after this incident occurred on March 20, the President made an offer to the Government of Japan to send assistance to help with this tragedy. After thinking about it for a few days, the Government of Japan replied. They said that they pretty much had things well in hand, and I think as you saw what happened at the hospitals, the people in subways cleaning up, and everything else, you will agree that they had taken care of most of what needed to be done. The Government of Japan also said, "If you want to send some of your bright, young physicians and medical people over, we will be happy to share with them our experiences with these patients." This request went to the Department of Health and Human Services down through the Public Health Service, and people from CDC were selected to go. Dr. Lillibridge, Dr. Leffingwell, and Dr. Liddle who is here with us today. Dr. Liddle is a biochemist and went over from that point of view. Then to counterbalance all these young, bright medical people, they decided to invite me to go along with them, for which I am very grateful.

Our schedule was somewhat busy; we were only in Tokyo for 2 days. The first day we had a lot of meetings with embassy and government officials in the morning, and we spent the afternoon at St. Luke's Hospital. I heard quite a bit of what you just heard plus a lot more. We spent a very pleasurable, educational afternoon with the staff at St. Luke's. We exchanged some mutual information, and I enjoyed it very much. The next day, we went to some other hospitals, saw some other patients, and had another very frenzied day. We did not get to spend as much time as we would have liked in each place. We had some more places to go. If you remember, on that date the State Police Chief, or the National Police Chief, was shot, and one of the other hospitals we were scheduled to visit was closed so our visit was cut short.

These are the numbers that we were given: 5,510 casualties; they had a total of 12 deaths, there were 8 as of that day; 17 critical patients; 37 severe, and 984 moderate. This leaves about 4,000 casualties who reported to medical facilities who seemingly had nothing

wrong with them. I am going to touch on that point in a minute. The definition that we got was they considered a moderate casualty as one who had myosis. By and large, they admitted these people. A severe casualty was someone who was short of breath or had muscular twitching or gastrointestinal problems along with the myosis. A severe or critical casualty was one who required intensive care unit care. That was the breakdown. As it was pointed out, they did have a total of 12 deaths altogether out of 5,500 casualties. The description of the agent, we heard different descriptions. Some of these are from American television; some of them were from people in Japan. We had first thought that maybe there were two agents used. Maybe there was a binary agent; none of this has really been confirmed. The signs and symptoms that we heard of and that we saw were all consistent with poisoning by sarin and sarin alone, or, if not sarin, a very similar substance.

Altogether we were told that 278 hospitals and clinics received patients, most of those were in Tokyo within a couple of kilometers of the incident. Now think about that as we think of our own large cities. How many facilities are in the middle of our cities? How many could receive patients like this? I got the impression some of these were private physicians' offices and small clinics, not necessarily all large hospitals. Four thousand nine hundred and seventy-three patients were seen on day 1 and not hospitalized. They had no signs of agent effects. In the judgment of the physician who saw them, they were not exposed. Dozens came to the hospital within the next 48 hours. Apparently, they had been on a train, or heard about the incident and they were not feeling well and thought perhaps they had been exposed.

The next statement, I think, is extremely important to people who are going to respond to incidents like this. In World War I, a war in which one-third of our casualties were chemical casualties and a war in which one-third of the shells were chemical shells, at least toward the end of the war, large numbers of people reported to medical facilities thinking they had been gassed. This is, even though they had been trained to recognize the signs and symptoms of gassing by whatever agent, they still came to the medical facility. One-third of the people who reported were not, in fact, actually injured by a chemical agent. In this case, 80 percent of the casualties that reported in Japan had no chemical injury. I point this out because the incidence of people who are scared, or who think they are injured and are not, is going to be a major problem. You are going to have to deal with them. You are going to have to sort them out and you are going to have to sort them out very quickly so you can get to those who are, in fact, injured.

The initial care; we were basically told that no drug treatment was given until the casualties were received at a medical facility.

Now this is an issue in this country in connection with the CSEPP program. The CSEPP program is a program around military installations where chemical weapons are stored. There is training for off-site chemical exposure, I guess. Although chemicals have been there for 50 years, and it has not happened yet, they are making plans for it. The question is, can civilian people off-site use the military autoinjectors to give the antidotes offpost? This becomes an issue, and it probably should be an issue addressed during EMS training and first responder training for this type of incident if, indeed, there is going to be training for this type of incident. Are you going to use the autoinjectors to administer the

antidote on site? My personal opinion is the sooner the antidote is given, the better the chances are for survival; so they should be used.

The second point, decontamination. The lady I described was not decontaminated. Most people were not, but it was vapor exposure alone. If they had been exposed to liquid, they would have been a walking source of agent contamination wherever they went.

Signs and symptoms have been previously reported. I do not need to dwell on them particularly except to show you, that this, in fact, was sarin. Treatment: atropine has been used in treatment since 1945. We use slightly different doses in this country, and we also do not use pupil size because it takes a lot of atropine to do that. Pralidoxime was first used in the late 1950s. Incidentally, there were a number of sarin casualties before pralidoxime that were treated with atropine alone, and they seemed to do quite well. Pralidoxime was first developed about 1950 at Columbia University. Some of the first case reports of the use of Pralidoxime were from Japan. The fact is I have been trying for years to get some of these case reports translated; I should have brought them with me. Nonetheless, pralidoxime has been there, they were probably using it in Japan before we did. Cholinesterase. Some hospitals measure both red cell plasma; the red cell erythrocyte probably is a better indicator for nerve agents. People who deal with pesticide poisonings usually use plasma.

A couple of comments. A question came up, "If you dump a bunch of sarin on a crowded subway, why don't a lot of people die?" A lot of people do not die for several reasons: (1) sarin is a liquid. It does not go poof, and evaporate, and fill the car immediately; it takes a while to evaporate. As I pointed out yesterday, it evaporates like water or even slower than water. (2) People were moving around, nobody stood in that vapor for any long period of time, except for maybe the man who was sitting near it. There was not much dissemination. Had somebody put this on a little heating pad, warmed it so the vapor would come up faster, and then put a fan into the air vents of that car there would have been good dissemination, and a lot more people would have been heard from. But this is why most people got only a very small dose of it.

Decontamination: again, vapor exposure only. These people were in fresh air between where they were exposed and the medical facility, and no harm seems to have been done. It was pointed out that at Matsumoto, some people got signs; but if you looked at those people they were in the site where the agent had been released. That was a good size release, and you saw pictures of them walking around without masks on in that area. They did not get exposed from handling patients.

We felt that the Japanese did an outstanding job in managing this situation. The mere fact that they had only 12 death out of over 1,000 real casualties says it all. They did an outstanding job dealing with a mass casualty situation and in taking care of the casualties.

That leads me to my final point which is a question that was on our mind from the minute we left this country to go to Tokyo; what would happen if this happened in one of our major cities? Do we have the know-how? Do we have the training? Do we have the antidotes? Are we ready for this? Then again, that is why we are here this week, is it not?

Question: The newspaper accounts indicated that perhaps 12 different devices were used to deploy sarin or whatever on perhaps as many as 5 trains on those 3 lines. As you indicated, the eyewitness accounts ran the gamut of different colors and different viscosity of liquids, and so forth. Was there anything about the clinical symptomatology that you reviewed that may have indicated that there is anything more than sarin being used here?

Answer: No. In fact, that is what convinced us, made us about 98 percent sure that it was only sarin. The signs and symptoms that we heard of were totally consistent with sarin exposure. I did have another slide that I did not show that indicated that some of the people were bleeding. We heard no reports of that over there, and it could have been explained by falling down, by seizures, and so on. As for the delivery devices, I understand the FBI has a good handle on that. Maybe you should ask someone in the FBI.

Question: The material that was found on the train. How was it removed, decontaminated and what type of solution was used?

Answer: I cannot answer that because I do not know. That was not within our mission, which was strictly to deal with the casualties.

Comment: We had some information on that at the embassy. It seemed to be water, detergent, and industrial-type cleansers. However, the opinion of the people who saw what was done was that it was quickly put on and washed off immediately. The feeling was that it would have to stay on the subway car floor for at least 15 or 20 minutes to have an effect, and it was washed off too quickly.

Question: About the decontamination effort: you said it was not important because it appears to have been a vapor. Would you still not recommend that there might be aerosolized liquid sticking to people? Would you not still recommend decontamination as a matter of course?

Answer: If you did not know, yes, but very frequently you do know. I worked in a toxic aid station for years, and people would come in and say, "Gee, that stuff spilled across the room or down field and, you know, I got a whiff of it and I have these signs and symptoms." Well, they were 20 to 50 feet away from the liquid; we were reasonably sure they were not exposed to liquid, so they were not decontaminated. These people, most of them probably, gave a history that they were not in contact with the liquid.

Admiral Young: It is my pleasure now to introduce Kyle Olson. Kyle had the privilege of going over to Japan to look at some of the aftermath. He is a person who has dedicated his more recent life to looking at the biological and chemical arms control programs through the Chemical and Biological Arms Control Institute.

2.6 Overview: Recent Incidents and Responder Implications

Kyle B. Olson
Chemical and Biological Arms Control Institute

The subject of my talk this afternoon (visual 1, page 2-45) is essentially what we have been talking about already, the events in Japan and some of the lessons that we might be able to derive from them. I am not going to address it necessarily from a medical responder's point of view. I am going to try to provide a little bit more in the way of some of the overview (visual 2, page 2-46), maybe some of the details that you might not have been aware of, or in many cases, some of the things that may have popped up in the media and you may have forgotten about already.

I do not think it is any surprise that we know that on March 20 of 1995 (visual 3, page 2-47), during Monday morning rush hour, there was an attack on the Tokyo subway system at approximately 8:00 a.m. (visual 4, page 2-48). Packages were placed on five different trains on three different lines of the Tokyo subway system. The packages began to emit a toxic gas that would ultimately be determined to be composed, at least in part, of sarin. By the end of that day (visual 5, page 2-49) we had already heard about the 5,500 injuries; there would be 12 dead or dying, and there would be as many as 15 others who would be significantly incapacitated, not permanently incapacitated; that is an overstatement.

This event in Tokyo did not occur without any warning (visual 6, page 2-50). In fact, it was a pleasure hearing this morning about the medical reports concerning Matsumoto, in particular. On June 27 of last year, Matsumoto experienced a sarin attack. I would point out that we were very fortunate in our package to have this red book from the State Department, "Patterns of Global Terrorism." We did not look for the attack in Matsumoto (visual 7, page 2-51); our people missed that. It does not exist in there, even though you had as many as 500 people ultimately injured.

In July of 1994 an event took place in the area around Kamakuishiki. There were toxic fumes on a train in Yokohama. A mysterious briefcase found in the Tokyo system. Matsumoto (visual 8, page 2-52), as noted, is in central Honshu, the main island of Japan. Between 9:00 and 11:00 at night (visual 9, page 2-53) gas was released into a residential neighborhood of this city. Matsumoto is significant in that it has virtually no political, military, or symbolic value of any kind. It does not really present itself as a very good terrorist target. Furthermore, there was no claim of responsibility lodged by anyone for this attack. It was literally death without warning and death without any attribution. Police did initially accuse a local man; the first responder of having been responsible for either having deliberately or accidentally creating sarin by mixing various gardening chemicals and possibly photographic developing fluids. They stuck with this for probably the first crucial week or so after the event and really focused their effort on him. Never mind that he himself was seriously hospitalized and lost about 40 pounds in the course of his medical treatment. His wife is the person who is in the permanent vegetative state; his daughter was also significantly affected. About 3 1/2 weeks later, at Kamakuishiki (visual 10, page 2-54), which is at the foot

of Mount Fujiyama (visual 11, page 2-55), there was a release of a chemical that would ultimately be identified by Japanese authorities, based on a degradation process, as also having been sarin. This information was not released by the police or by the authorities in Japan until January first of this year, even though the event took place in the middle of last year (visual 12, page 2-56).

You have a number of people who reported symptoms of headaches and problems with their vision. Ultimately, they did find products in the environment that were determined to be degradation products of sarin. There are other interesting aspects of Kamakuishiki: it is the headquarters of the Aum Shinrikyo Sect that maintains factories and dormitories there. There were anecdotal reports from various people who drove around the area that night of having seen members of the cult lying in the road outside their buildings, obviously ill. It is also around this time that the Aum Shinrikyo aggressively mounted a rather sophisticated media campaign alleging that they were the targets of chemical weapons attacks.

There were two more events (visual 13, page 2-57). I do not have a slide on Yokohama, but on approximately the 6th of March, there was a report of a noxious chemical released on a commuter train beyond Yokohama and Tokyo (visual 14, page 2-58). Approximately a dozen people complained of symptoms. No identification of that chemical was ever made. Then in Tokyo itself there was a mysterious incident involving three briefcases (visual 15, page 2-59). Was this an experiment? There were three briefcases down at the Tokyo subway station. One was giving off a visible vapor of some kind. Each contained a cylinder of an unknown gas – that gas has never been revealed to my knowledge – had a motorized fan, vents, and a battery to make it operate. This occurred about 2 weeks before the subway attack.

All this not withstanding, what are the attributes of a good terrorist target (visual 16, page 2-60)? We already established that Matsumoto was not one. One would argue that a rural community in Kamakuishiki probably was not either. Let us say this: for a terrorist target we would want many potential victims. Ideally, we would like a confined area, particularly if you are thinking about using a chemical weapon. That gives a little bit more control. As we heard yesterday, one of the things you want to control if you can is the environment: the meteorological conditions. One of the things we got back and noted in the Matsumoto incident is that Matsumoto is usually wet and cold around the time of the attack last year. In fact, there was a 2-day break in the weather in which temperatures soared from 20 degrees Fahrenheit to around the high 80s. The humidity level and the rains dropped to almost nothing; it was unusually dry. The attack in Matsumoto last year took place on the second day of that break in the weather. Finally, a really good terrorist target should have some sort of high symbolic value. I am just going to offer this next slide for whatever it might be worth (visual 17, page 2-61). Tokyo subway certainly meets a lot of those criteria. In fact, my institution issued a report late last year in which we concluded that the Matsumoto attack was a precursor to a larger event, that in all likelihood there would be another event, and that a likely target was the Tokyo subway system.

The plan (visual 18, page 2-62), as it sorted itself out, was to place sarin on the five trains all converging on the center of Tokyo: two lines, the east and west bound trains on the Hibya line, which is one of the oldest lines on Tokyo; the Kyoto line; and also the marunouchi line. All these converge on the Kasumigaseki Station which is near the government core. The objective was to cause fatalities and injuries throughout the city. In fact, there is every reason to believe that the cult expected to create not a dozen deaths but rather hundreds if not more than that. The attack (visual 19, page 2-63) on Tokyo itself involved at least 10 persons directly in the delivery of packages. One person was carrying the package, and the other person served as what I call the umbrella person, which is the person who, using a sharpened umbrella or other object (visual 20, page 2-64), was stabbing the bags that contained the sarin. As I said, polyethylene bags containing the sarin were wrapped in newspaper and placed on the trains. They were then allowed, once they had been punctured, to spill out and evaporate. As a consequence, you have 15 different stations (visual 21, page 2-65) in the Tokyo subway system affected. The Hibya line, the oldest line, had the heaviest casualties. We have already talked about the numbers, the deaths, the widespread panic, and also the obsession on the part of the Japanese society, and on a good part of the world society for a period of time, over the consequences of this attack.

In terms of the response (visual 22, page 2-66), police, fire, and emergency medical personnel were very quickly on the scene in force. It is also worth noting that the Japan Defense Force (JDF) Chemical troops were there within a couple of hours of being notified that they were needed (visual 23, page 2-67). This says a couple of things: prior event planning pays off, and it also helps if you have been tipped to the fact that there is a very real chance you may be facing something like this. It is rather clear that the Japanese authorities had intended to launch a raid on the Aum Shinrikyo. In fact, the Friday before the subway attack, 500 Japanese police went through chemical training involving the use of chemical protective gear and tactics in that environment. It is also reported, though I do not think I have ever seen any official confirmation, that there were expert police and other personnel on the streets on March 20. It is worth noting that in terms of the scenario planning – and there was a scenario for dealing with a chemical release in Tokyo – the medical community was not apparently involved in that planning process.

Police investigation (visual 24, page 2-68) focused very quickly on the Aum Shinrikyo, the Supreme Truth Sect. Raids and arrests began within a couple of days. Investigation would last several more months but that does not reflect a lack of knowledge. It was rather more of a characterization of the Japanese police method, which is very deliberate, but that results in convictions about 98 percent of the time. During the raids, police found sarin precursor chemicals in very large quantities. They also found various bio-organisms including a report of finding clostridium botulinum in one laboratory. There was also chemical and biological processing equipment, and conventional weapons, and the equipment and the tooling for the manufacture AK47s.

The cult itself has operations not just in Japan, but around the world (visual 25, page 2-69). We are aware of the fact that they have operations in Russia, in Sri Lanka, and an office in Germany (visual 26, page 2-70). They have had an office in the United States since 1987, and they have a very interesting presence in Australia. One of the things which came

out over the last couple of months is that at one point they tested sarin at a ranch that they owned in western Australia. The Australian authorities recovered in the neighborhood of about a dozen sheep carcasses, which all showed the degradation products of sarin. The leader of the cult and many of his lieutenants made trips at least on one occasion to that facility. It was about 200 miles northeast of Perth. As you can see it is sort of a goulash, but that seems to be very trendy these days. The cult was very successful in attracting well-educated members, including scientists. Followers number somewhere between 5,000 and 40,000: 40,000 probably their estimate, 5,000 probably a low ball. It is somewhere in the middle there.

Asahara and his wife started the cult actually as a yoga school (visual 27, page 2-71). It is organized into 12 different ministries, and it is modeled on the Japanese Government. Do not strain your eyes, but that is an organizational chart of the cult (visual 28, page 2-72). Cabinet heads, most of them are college educated and very interestingly, many of them are scientists (visual 29, page 2-73). Asahara himself, noted as the venerated master (visual 30, page 2-74), yogi or pope, is a charismatic individual by all accounts and is partially blind, which lends something to his charisma. He is, by all accounts, politically and financially ambitious. The other side of the coin (visual 31, page 2-75) is that he has had a number of business failures in his past; he has had legal problems; he is on one hand messianic; he is also something of a millennialist. He did not predict that the world would end in 1997. What he predicted was that World War III would happen between 1995 and 1997; that it would be fought with chemical, biological, and nuclear weapons; and that his cult would survive. By all accounts he has been directly involved in the day-to-day operations of the cult.

Since March 20 (visual 32, page 2-76), there have been at least five, possibly six, subsequent attacks on train stations in Tokyo and Yokohama. Two nuisance attacks involving apparently a tear-gas type agent or a mace-type chemical in Yokohama. In fact, the police have in the last week and a half arrested an individual who does not appear to have ties to the Aum Shinrikyo cult. There have also been three different instances in which cyanide gas devices have been placed in train stations in Tokyo. In all three instances, they have been discovered before they went off. All three posed credible threats, not quite the league in which the media was talking about with tens of thousands of casualties, but certainly these were very credible devices. Last week there were two devices found within about 24 hours of each other. These devices were more sophisticated than the one which was uncovered about a month and a half ago.

You had media play in Japan regarding the story that makes the O.J. Simpson case look like fifth-page news, and you have a continuing fear factor in Japan, not without reason. You have also had occasional demands for changes in the system. Perhaps there is less of that now than there was before. But there were concerns over the fact that the cult status of the religious organization gave it some unique protection from police investigation earlier. Again, there is every reason to believe that the police had at least some focus on the Aum Shinrikyo from last summer and had carried forward an investigation in their very deliberate fashion. But in terms of the protection that the cult enjoyed, I do not think we should ignore the fact

that the cult, for example, reportedly had a business arrangement with the Japanese mob to use one of their facilities near Kamakuishiki for the production of illegal designer drugs such as ecstasy and others. In essence, they were off limits to police and police raids for the most part.

Sarin (visual 33, page 2-77): I am not going to waste time with sarin. We have already gone through that to quite an extent, but the Tokyo sarin is worth talking about. Based on what we know, it was probably manufactured using the German salt process (visual 34, page 2-78). It is the method that the United States used for a time during the 1950s. It was not distilled, and, as a consequence, it was not terribly pure. It was only about 25 percent pure; that is an average. JDF scientists who analyzed samples taken from the subway said that they found concentrations ranging, depending on the sample, from about 10 to 40 percent, averaging out to about 25 percent pure. Acetonitrile was apparently used as a salt; it was apparently used to help jump-start the evaporation of sarin into the environment on the trains. We already noted no distillation. Production was very interesting. It was said earlier that no one person can make sarin; well, that is not quite true. If they have got the money, they can go out and buy the same Swiss-built chemical synthesizer that the cult did (visual 35, page 2-79); it was purchased in Tokyo, essentially over-the-counter. It is used commercially in facilities to prototype chemicals. In this case, they may have used an American software package. Frankly, that was not a critical step in the process. We now understand, based on the account of people who are in jail, that the sarin was produced at Asahara's command only 2 days before the attack on March 20. Apparently this was triggered by information the cult had received from people within the JDF that training was under way for a raid by police officers. We have been told, again by the cult scientists, that there was less than 24 liters of chemical produced (visual 36, page 2-80). It was packaged in the two-ply plastic bags manufactured by this sect. We have also been told by the same scientists who are in custody that they acknowledge making other chemical agents (visual 37, page 2-81) in this process including VX, tabun, and mustard. They had also assembled some cyanide compounds.

I have an asterisk next to the VX because there have been at least two assassination attempts, one successful, engineered by the cult, which apparently involved the use of VX in a hypodermic syringe sprayed on the victim. In one case, the victim was in the hospital for 2 weeks, comatose at one point; in another instance the victim was killed.

In terms of the delivery system (visual 38, page 2-82), it is really primitive stuff. The plastic bags in the middle of the cars and punctured with the umbrella. The agent's evaporation did serve as the mode of dispersal, but it was quite rightly pointed out that this is a very crude method because the stuff does not go up like smoke. In fact, the most danger is posed to those who actually come into contact with the fluid. Most people got some of the limited amount of vapor that went up. There was at least one and possibly two instances, however, where people did come in direct contact with the liquid. When the trained arrived at Kasumigaseki Station and the passengers got off, two employees of the subway system got on the train. First a uniformed member of the staff got on board and attempted to remove the package by himself. He made it about 100 meters before he collapsed and died. Then a

janitor went on board that same train car attempting to mop up the chemical. He also died shortly afterwards.

Initially the slow dispersal rate probably resulted in more stations being effected simply because it was not the big boom.

These are all the points that were imminently well made here. Low-quality sarin, inefficient dispersal system, and air renewal system may have been factors. It is interesting to note that the systems in which you had the largest number of casualties were on the Hibya line which has the oldest lines, the smallest stations, and the worst air circulation systems; in essence one vent in the middle of the train station. Also, they had limited experience in terms of delivering the package; we had a good ration of luck here in that the cult had to hurry up their activities.

Reasons for the attack (visual 39, page 2-83): Asahara ambitions were certainly a factor. The intention to deter police seems to be a major consideration here. The cult, aware that the police were going to raid their operations, was attempting to send a message, in essence, trying to act like an independent state, saying, "We are militarily powerful, do not mess with us." Fulfillment of prophecy, that certainly is possible. There are possibly apocryphal stories of cult members having circulated flyers on the Ginza the day before the attack which on one side carried Asahara's prophecies concerning the coming war, the cult's chances of success, and noting the chemical weapons that would be used, and, supposedly, on the other side there were maps of the Tokyo subway system. It is a great story whether it is true or not. Finally, I think there is the kids-with-matches hypothesis here. The cult seems to have been very successful in attracting people who were, to say the least, somewhat retarded in their social skills: people who may have had college educations but who have never really gotten very far in the school of life to the point that they seem, in some cases, to be playacting at what they were doing here. At one press conference about a month or so after the attack, by way of justifying what the cult's operations were all about, their public spokesman, a guy who, by the way, has become something of a teeny-bopper heartthrob in Japan because of his frequent TV appearances, actually stood up and explained that the cult was trying to be sure that when Western civilization crumbled, it would be able to build a better society on its ruins. By way of saying, and here is proof that it is possible, he proceeded to hold up a series of science fiction novels by Isaac Asimov called the *Foundation Series*. He said that these books prove that this is possible, that this can be done. For those of you who are familiar with those novels, you may know that there are some rather disturbing parallels between the notion of a person who can see the future and then goes about trying to affect how that future is going to evolve.

Now it could have been much worse (visual 40, page 2-84). These are the three topics. First of all Santyam 7 (visual 41, page 2-85), which is at Kamakuishiki, was a dedicated sarin production facility; it is hidden behind a shrine to the goddess Shiva. We noted before that the cult has a variety of different theologies in its kit bag; Shiva is the Hindu goddess of destruction and rebirth. This production facility was probably never successfully operated. In fact, I think there is good reason to believe that the event last July in Kamakuishiki probably was an accident centered on their failed efforts to get the plant up and

running. It was designed to manufacture thousands of kilos of sarin and possibly other agents. I do not know if any of you have ever been inside a terrorist chemical weapons plant; this is what one looks like. This is the Santyam 7 production facility. This photograph (visual 42; page 2-86) and the three others I am going to show you were taken by an Italian photographer who snuck past the police lines, climbed in through a window on the third floor of the building, and snapped these photographs before he was chased off. Among the interesting points here, you will notice the large structure to the left of the tower there; that is a distillation column. They were focusing not on making 25 percent pure sarin, but rather on making a rather purer grade of sarin. We see a couple of items here, one of them being a reactor. You will note it is lined with a thermal blanket that is designed to generate the heat necessary to produce the agent. One of the things that you might find disturbing, if you have been involved in chemical weapons production, is this plastic sheeting down here, as if they had problems with leaks in the past. It is not the kind of thing you would really want in your nerve gas factory. Here is another shot that is kind of interesting. In the lower right hand you will see a hose sort of looping over a pipe that is part of the rather elaborate air cleaning system, which you probably have seen in the photographs of the buildings at Santyam 7, that goes to their exhaust system. One more detail here, and it is not going to show it all, but where that catwalk crosses, right there in the original photograph, you will see a bucket designed to catch leaks also. My assessment is that the cult had a high degree of book learning but virtually nothing in the way of technical skill. In fact, to remedy that, the cult definitely made overtures to Russian scientists, former engineers in the Russian chemical weapons program, and attempted to recruit several to help them master some of the upscaling problems.

On the biological weapons front, since this conference addresses both problems, let us note that they had a dedicated toxin production laboratory as long ago as 5 years ago. It was the site of an unsuccessful attempt to aerosolize bot tox. In talking with the cult defector who gave me the information regarding their laboratory, which was inadvertently subsequently confirmed by a member of the cult who was assassinated a couple of months ago; we got to talking about how one would go about distributing botulin toxin or a biological agent. I said, "Well, you could just drive around the Ginza in a car that had a pumping system and a vent during lunch time or something like that." He got very excited at that point, and he said, "Oh hey, we had a truck like that" (visual 43, page 2-87). It turns out they had a large truck with an air compressor system and six hidden vents on the side.

The cult also owns a couple of remote control helicopters of the kind used in Japan for aerosol spraying of crops. When asked by the vendor whether or not they wanted the spray tank attachments, they said, "No we already have our own, thank you."

This is a drawing of the layout (visual 44, page 2-88) of the alleged biological weapons laboratory at Kamakuishiki. This particular facility is no longer in use; in fact, it has been disassembled. The green squares at the top were fermentation tanks. The red area there is fermentation tanks; the darker green being concentration tanks. According to the person who worked in the lab in 1990 (visual 45, page 2-89), the product was extracted here from the concentration tanks, and walked around through this air lock into the processing area. It was initially freeze dried, then put into a heat dryer. It was then ground up and then sprayed as an

aerosol onto guinea pigs here. Apparently, Asahara himself was very unhappy when the guinea pigs refused to die.

Nuclear option (visual 46, page 2-90): here are some fun and games. The cult has an established Russian connection. In fact, there is every indication they spent millions of dollars buying their way into the inner circles in Moscow. In fact, one of President Yeltsin's closest friends apparently is several million dollars richer himself personally. Whether that was exactly the way it happened or not, the cult was able to attain access to a number of very impressive facilities. They were able obtain time on Russian TV and radio, and Asahara's comings and goings to Moscow made the evening news on a regular basis.

Notebooks captured by the police say there are references to places for Russian nuclear devices. Whether this is a true story or whether it was a scam and the cult itself got bit, it is hard to tell. The cult also did make an effort to obtain land in northern Japan where they hoped to obtain uranium themselves. Certainly the technology of nuclear weapons has to pose an appeal to a group like this.

Just for what it is worth, Asahara dreamed of an independent nation within the nation of Japan (visual 47, page 2-91). He wanted significant military capability loyal to him, and given that he was never going to have the numbers, he wanted to leapfrog. He needed a power base to recruit new members, and, of course, he wanted power. Today most of the cult leaders are in jail (visual 48, page 2-92). There are still about eight out on the street, and, in fact, a couple of them have been linked to at least one of the cyanide bomb attacks in the subway. The organization is losing its legal status as a church; that will take about 3 years. Russian-owned operations were ended by legal action, the assets frozen. The followers, interestingly enough, are trying to salvage the cult's business operations. For what it is worth, we are not just talking about a religious sect; we are also talking about the $1.5 billion international corporation.

Tomorrow, well, obviously another taboo has been erased, at least one (visual 49, page 2-93). Others are obviously going to learn the lessons of the Tokyo use of CW and probably the work on BW. In fact, if anything, if I am a terrorist somewhere else and I take a look at the Keystone Cop antics of the cult, I have got to think to myself, "I am a lot smarter than they were." The effects will therefore, no doubt, be more devastating than they were in the subway attack and in the Matsumoto event. Obviously it could happen anywhere. The unfortunate conclusion is that it will happen somewhere.

Question: A reporter for a Matsumoto newspaper spoke to me a few days ago and said that the cult was having trouble with the landlord of a building in which they were working in Matsumoto. The landlord was suing them, and they wanted to kill the judges who were to hear the case. Apparently at least one of the judges was sickened by the Matsumoto attack, and they were successful in delaying the case.

Answer: I have not included that as the reason for the attack to this point because, up until this point, it was viewed by many people as a coincidence or possibly just another factor

that chose Matsumoto as a site, but there is a possible tie there. The three judges all apparently lived within the general vicinity of the Matsumoto site.

STATE OF THE ART TERRORISM: THE TOKYO SUBWAY ATTACKS

Visual 1

OUTLINE

- THE ATTACK
- WARNINGS AND PRECURSORS
- THE CULT
- TECHNOLOGIES AND AGENTS
- OBSERVATIONS

Visual 2

Visual 3

THE ATTACK

MARCH 20, 1995

- **MONDAY MORNING RUSH HOUR**
- **AT APPROXIMATELY 8:00 AM, PACKAGES ARE PLACED ON FIVE TRAINS**
- **THE PACKAGES EMIT A TOXIC GAS, THAT WILL ULTIMATELY BE IDENTIFIED AS SARIN**

Visual 4

THE ATTACK

AT THE END OF THE DAY

- **15 STATIONS AFFECTED**
  - **HIBYA LINE HAD HEAVIEST CASUALTIES**
- **3,796 INJURED**
- **1,000 REQUIRE HOSPITALIZATION**
- **12 DEAD OR DYING**

Visual 5

JAPAN
TIMELINE

Visual 6

WARNINGS

PRECURSOR EVENTS

- **JUNE 27,1994 - MATSUMOTO**
  - **SARIN ATTACK**
  - **7 DEAD, 200+ HOSPITALIZED**
- **JULY 14,1994 - KAMAKUISHIKI**
  - **MYSTERY FUMES SICKEN DOZENS**
  - **INVESTIGATION INDICATES SARIN**
- **MARCH 6,1995 - YOKOHAMA**
  - **TOXIC FUMES ON COMMUTER TRAIN**
- **MARCH 15,1995 - TOKYO**
  - **BRIEFCASE DEVICES FOUND**

Visual 7


JAPAN
Matsumoto
June 27, 1994

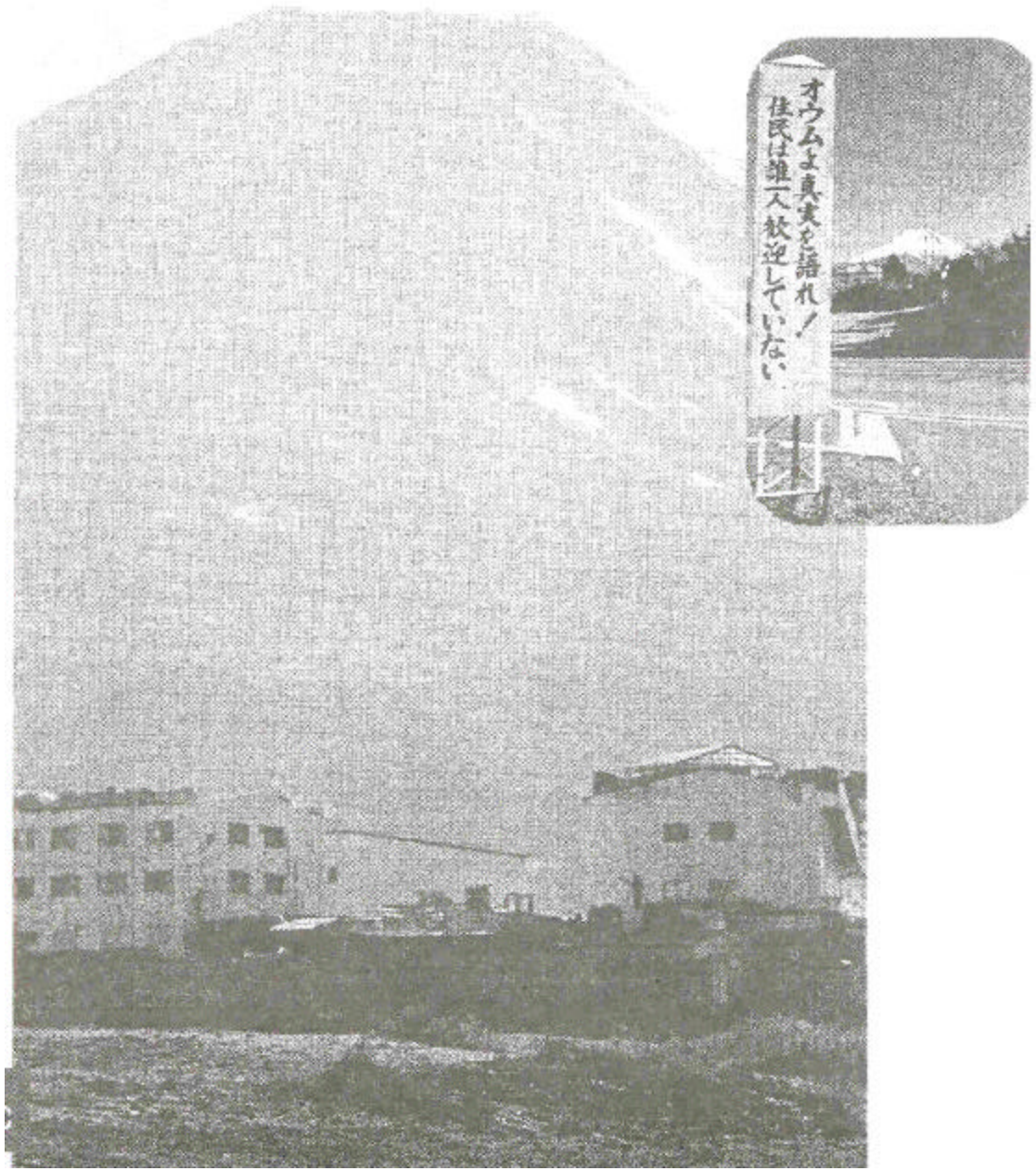
WARNINGS

MATSUMOTO

- SARIN GAS RELEASED AT NIGHT
- RESIDENTIAL NEIGHBORHOOD
- NO POLITICAL, MILITARY, SYMBOLIC IMPORTANCE AS A TARGET
- NO CLAIM OF RESPONSIBILITY
- POLICE INITIALLY ACCUSE LOCAL
- ULTIMATELY TIED TO ATTEMPT ON JUDGES' LIVES

Visual 9

Visual 10



Visual 11

WARNINGS

KAMAKUISHIKI

- RURAL COMMUNITY NEAR MT. FUJI
- FACTORIES AND DORMITORIES
- H.Q. OF AUM SHINRIKYO
- REPORTS OF SECT MEMBERS LYING IN ROAD, OBVIOUSLY ILL
- AUM SHINRIKYO COMPLAINS IT IS TARGET OF CHEMICAL WEAPONS FROM U.S. AND JAPANESE PLANES

Visual 12

Visual 13

WARNINGS

YOKOHAMA

- **“MYSTERIOUS” FUMES ON COMMUTER TRAIN SICKEN APPROXIMATELY TWO DOZEN RIDERS**
- **NO CAUSE IDENTIFIED**
- **PROBABLY LINKED TO COPYCAT**

Visual 14

WARNINGS

AN EXPERIMENT

- **THREE BRIEFCASES FOUND BY POLICE AT KASUMIGASEKI STATION**
- **ONE IS GIVING OFF VISIBLE VAPOR**
- **EACH CONTAINS:**
  - **UNIDENTIFIED MATERIAL IN CYLINDER**
  - **ULTRASONIC VAPORIZER**
  - **ELECTRIC FAN AND VENT SYSTEM**
  - **CAMCORDER BATTERY**
- **BOTULIN TOXIN**

Visual 15

ATTRIBUTES OF A TERRORIST TARGET

- MANY POTENTIAL VICTIMS
- CONFINED SPACE
- CONTROLLED ENVIRONMENT
- SYMBOLIC VALUE

Visual 16

Visual 17

TACPAC

THE PLAN

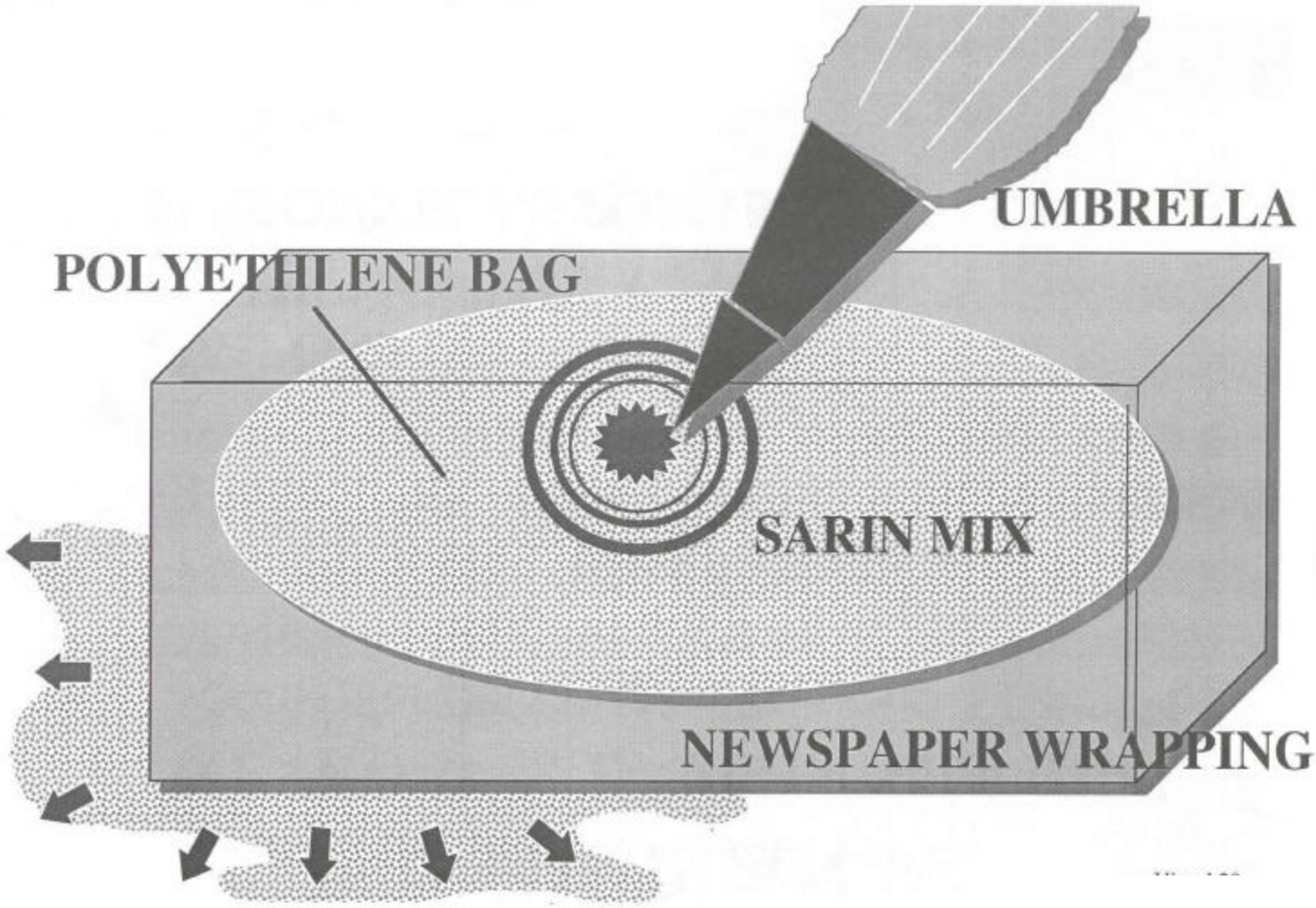
- **RELEASE SARIN ON FIVE TRAINS, ALL CONVERGING ON CENTER OF TOKYO**
  - **HIBYA LINE EAST AND WESTBOUND**
  - **CHIYODA LINE WESTBOUND**
  - **MARUNOUCHI LINE WESTBOUND (2)**
- **CAUSE FATALITIES AND INJURED THROUGHOUT CITY**

THE ATTACK

THE PLAN

- **FIVE TWO-MAN TEAMS INVOLVED**
  - **ONE DELIVERYMAN**
  - **ONE "UMBRELLA" MAN**
- **PLASTIC BAGS, WRAPPED IN NEWSPAPER, CONTAINED SARIN "SOUP"**
- **PUNCTURED TO SPILL OUT AND EVAPORATE**
- **OBJECTIVE: KILL AS MANY POLICE PERSONNEL AS POSSIBLE**

THE PACKAGES



THE ATTACK

CONSEQUENCES

- **WIDESPREAD PANIC**
- **NATIONAL OBSESSION**
- **DEMANDS FOR LEGAL CHANGES**

Visual 21

THE ATTACK

THE RESPONSE

- **POLICE AND EMERGENCY PERSONNEL ARE QUICKLY ON THE SCENE IN FORCE**
- **JDF CHEMICAL TROOPS ARRIVE BY MID-DAY**
- **PRIOR EVENT PLANNING PAYS OFF**
  - **MEDICAL COMMUNITY NOT PART OF THE PLANNING PROCESS**

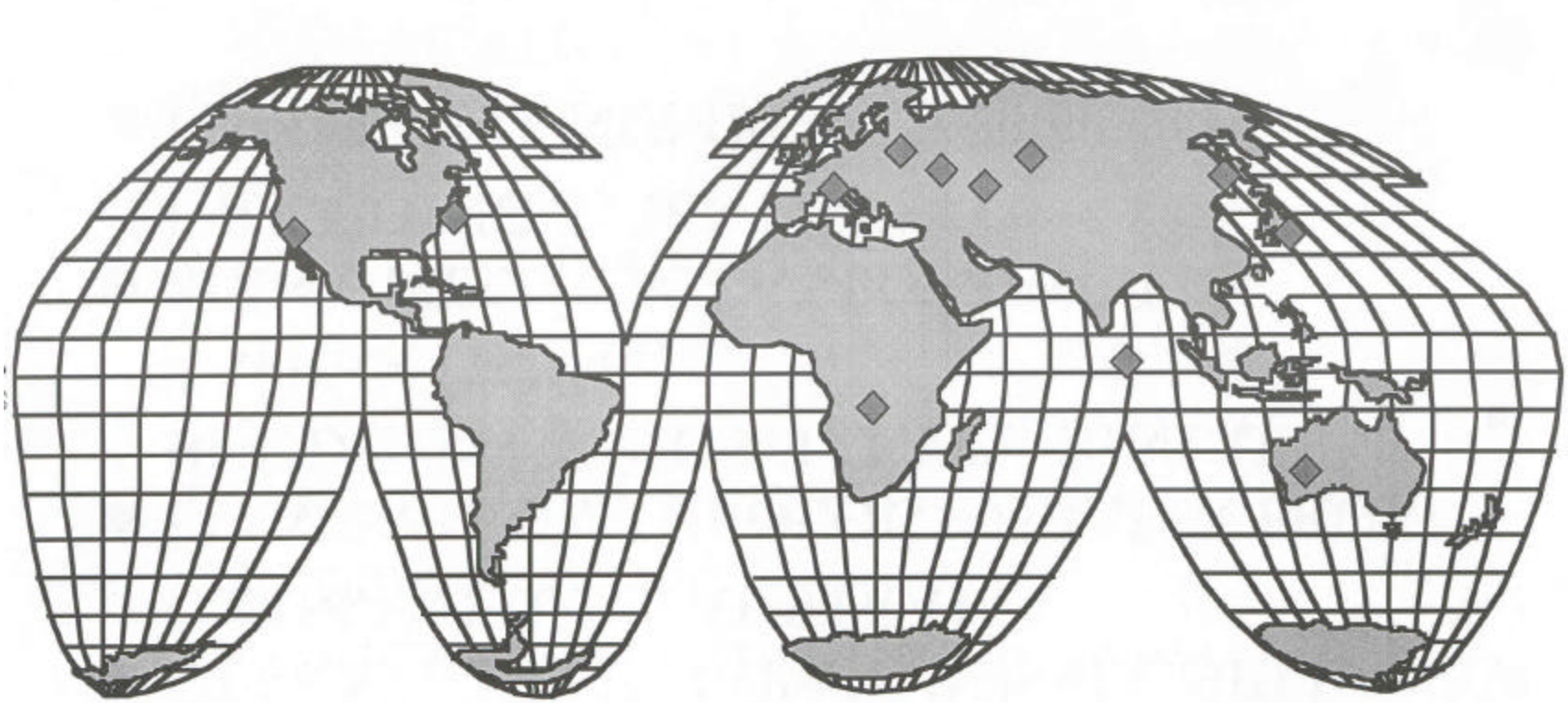
Visual 22

Visual 23

THE INVESTIGATION

- **POLICE IMMEDIATELY FOCUS ON AUM SHINRIKYO SECT**
- **RAIDS AND ARRESTS BEGIN WITHIN TWO DAYS OF ATTACK; 6 MONTH INVESTIGATION**
- **FOUND: SARIN PRECURSOR CHEMICALS, BIO-ORGANISMS, PROCESSING EQUIPMENT, AND CONVENTIONAL WEAPONS**

CULT OPERATIONS AND FACILITIES



Visual 25

THE CULT

SCOPE

- OPERATIONS IN JAPAN, RUSSIA, SRI LANKA, GERMANY, USA, AUSTRALIA
- ELEMENTS OF THEOLOGY DRAWN FROM BUDDHISM, CHRISTIANITY, HINDUISM, TAOISM, YOGA
- MANY WELL-EDUCATED MEMBERS, INCLUDING SCIENTISTS
- FOLLOWERS NUMBER 20,000-60,000

Visual 26

THE CULT

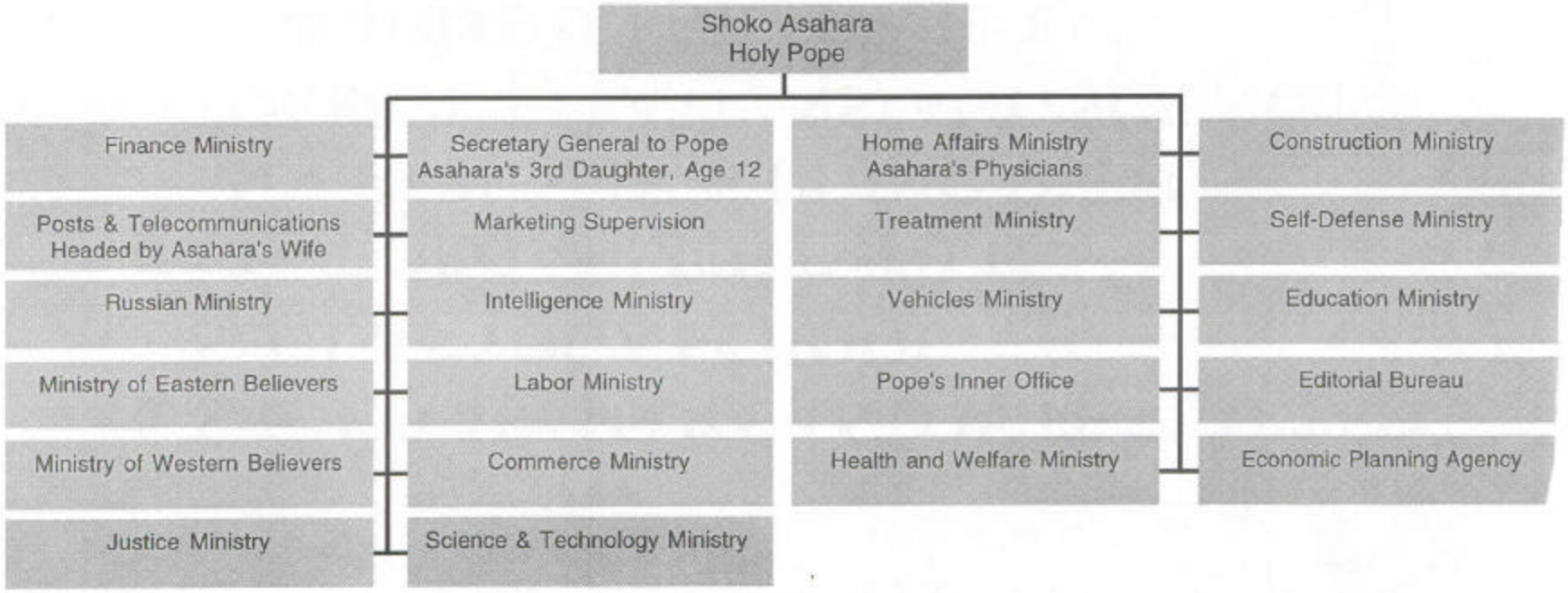
ORIGINS

- **SHOKO ASAHARA AND WIFE STARTED SECT AS YOGA SCHOOL**
- **CULT ORGANIZED INTO 12 MINISTRIES, INCLUDING DEFENSE, FOREIGN RELATIONS, AND SCIENCE**
  - ➢ **MODELED ON THE JAPANESE GOVERNMENT**

Visual 27

THE CULT

AUM SHINRIKYO "CABINET"



Visual 28

THE CULT

CABINET HEADS

- **MOST ARE COLLEGE EDUCATED**
- **MANY ARE SCIENTISTS**

Visual 29

THE CULT

SHOKO ASAHARA

- **VENERATED MASTER, YOGI, POPE**
- **CHARISMATIC, PARTIALLY BLIND**
- **POLITICALLY, FINANCIALLY AMBITIOUS**

Visual 30

THE OTHER SIDE

- **BUSINESS FAILURES, LEGAL PROBLEMS**
- **MESSIANIC**
- **MILLENIALIST**
- **DIRECTLY INVOLVED IN DAY TO DAY CULT OPERATIONS**

Visual 31

THE ATTACK

JAPAN SINCE 3/20/95

- **AT LEAST FIVE SUBSEQUENT ATTACKS ON TRAIN STATIONS**
  - **TWO "NUISANCE" ATTACKS**
  - **THREE CYANIDE GAS DEVICES**
- **O.J. SIMPSON-STYLE MEDIA PLAY**
- **CONTINUING FEAR**

Visual 32

THE ATTACK

SARIN

- **NERVE AGENT -- ONE OF THE MOST HIGHLY TOXIC CHEMICAL SUBSTANCES KNOWN TO MAN**
- **RESPIRATORY LETHAL DOSE (VAPOR) IS 70 MG-MIN/METER^3**
- **DEATH WITHIN 15 MINUTES**

Visual 33

TECHNOLOGIES AND AGENTS

THE TOKYO SARIN

- **PROBABLY MANUFACTURED USING THE GERMAN SALT PROCESS**
- **SARIN WAS NOT DISTILLED**
- **ONLY 25-30% PURE**
- **ACETONITRILE (A SOLVENT) APPARENTLY USED IN EFFORT TO ACCELERATE EVAPORATION**

Visual 34

TECHNOLOGIES AND AGENTS

PRODUCTION METHOD

- **SUBWAY SARIN WAS PRODUCED IN SWISS-BUILT COMPUTERIZED CHEMICAL SYNTHESIZER**
  - **PURCHASED IN TOKYO**
  - **USED COMMERCIALLY TO PROTOTYPE CHEMICALS**

OBSERVATIONS

WHY ONLY A DOZEN FATALITIES?

- **RELATIVELY SMALL QUANTITY OF CHEMICAL (< 24 LITERS)**
- **LOW QUALITY (25%)**
- **INEFFICIENT DISPERSAL METHOD**
- **SUBWAY AIR RENEWAL SYSTEM**
- **AUM INEXPERIENCE**
- **LUCK**

TECHNOLOGIES AND AGENTS

OTHER CW AGENTS

- CULT SCIENTISTS HAVE ACKNOWLEDGED MAKING OTHER AGENTS:
- VX
- TABUN
- MUSTARD
- CYANIDE COMPOUNDS

TECHNOLOGIES AND AGENTS

DELIVERY SYSTEM

- **VERY INEFFICIENT METHOD**
- **PLASTIC BAGS PUNCTURED WITH SHARPENED UMBRELLA TIPS**
- **AGENT'S EVAPORATION SERVED AS MODE OF DISPERSAL**
- **MOST DANGER TO THOSE COMING IN CONTACT WITH THE FLUID**

THE CULT

REASONS FOR ATTACK

- INTENDED TO DETER POLICE
- ASAHARA'S/AUM'S AMBITIONS
- FULFILLMENT OF PROPHECY
- IMMATURE FOLLOWERS CAPTURED BY GROUP THINK

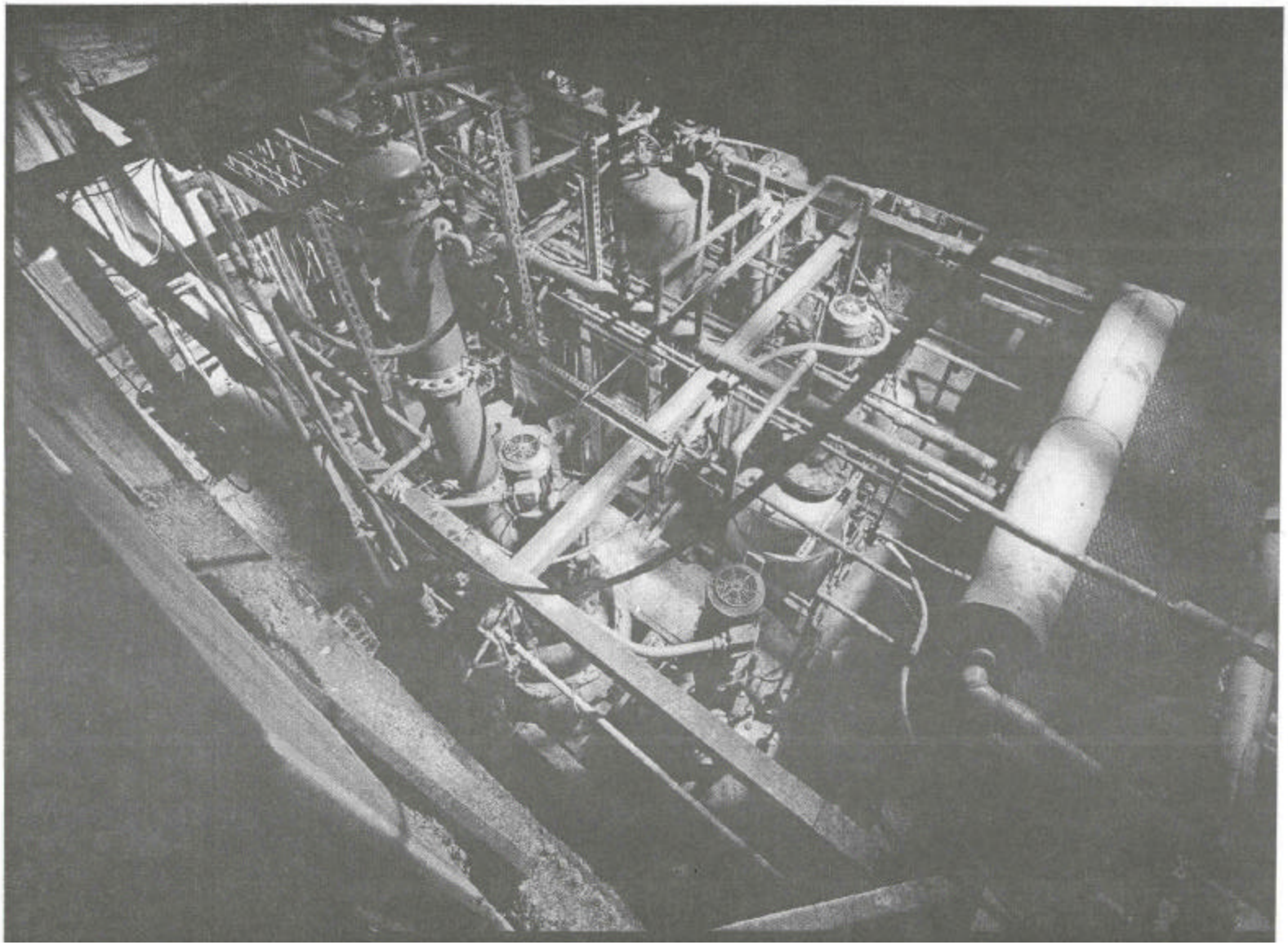
OBSERVATIONS

IT COULD HAVE BEEN MUCH WORSE

- SATYAM 7
- BIOLOGICAL WEAPONS RESEARCH
- NUCLEAR
- THE NOVEMBER COUP

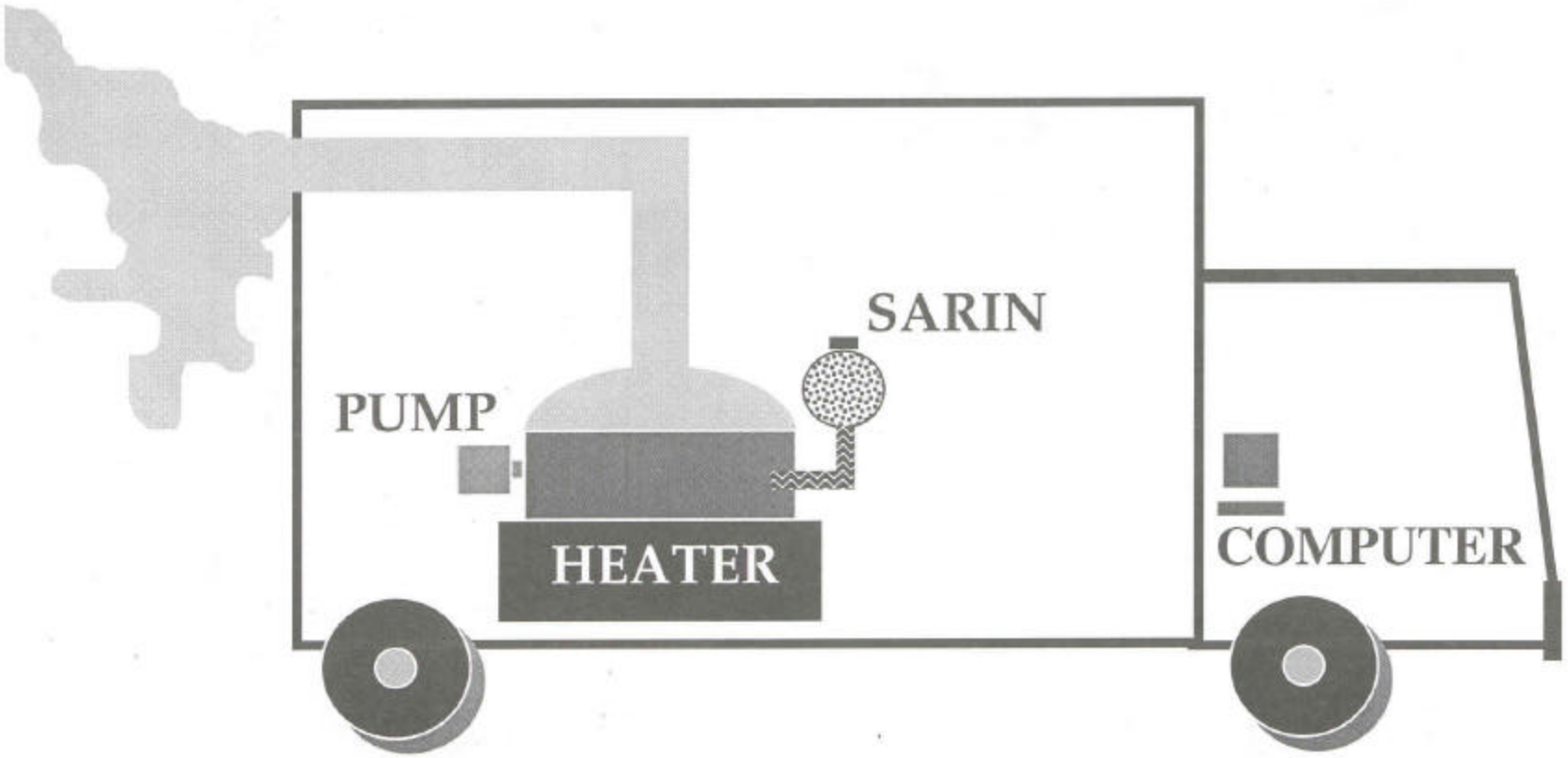
TECHNOLOGIES AND AGENTS
SATYAN 7

- **DEDICATED SARIN PLANT**
- **CONCEALED IN SHRINE TO SHIVA**
- **PROBABLY NEVER SUCCESSFULLY OPERATED > JULY 1994 ACCIDENT**
- **FALL OF 1994: VOLGOGRAD RECRUITING EFFORT BY CULT**
- **SATYAN 7 WAS DESIGNED TO MANUFACTURE THOUSANDS OF KILOS OF NERVE AGENT**



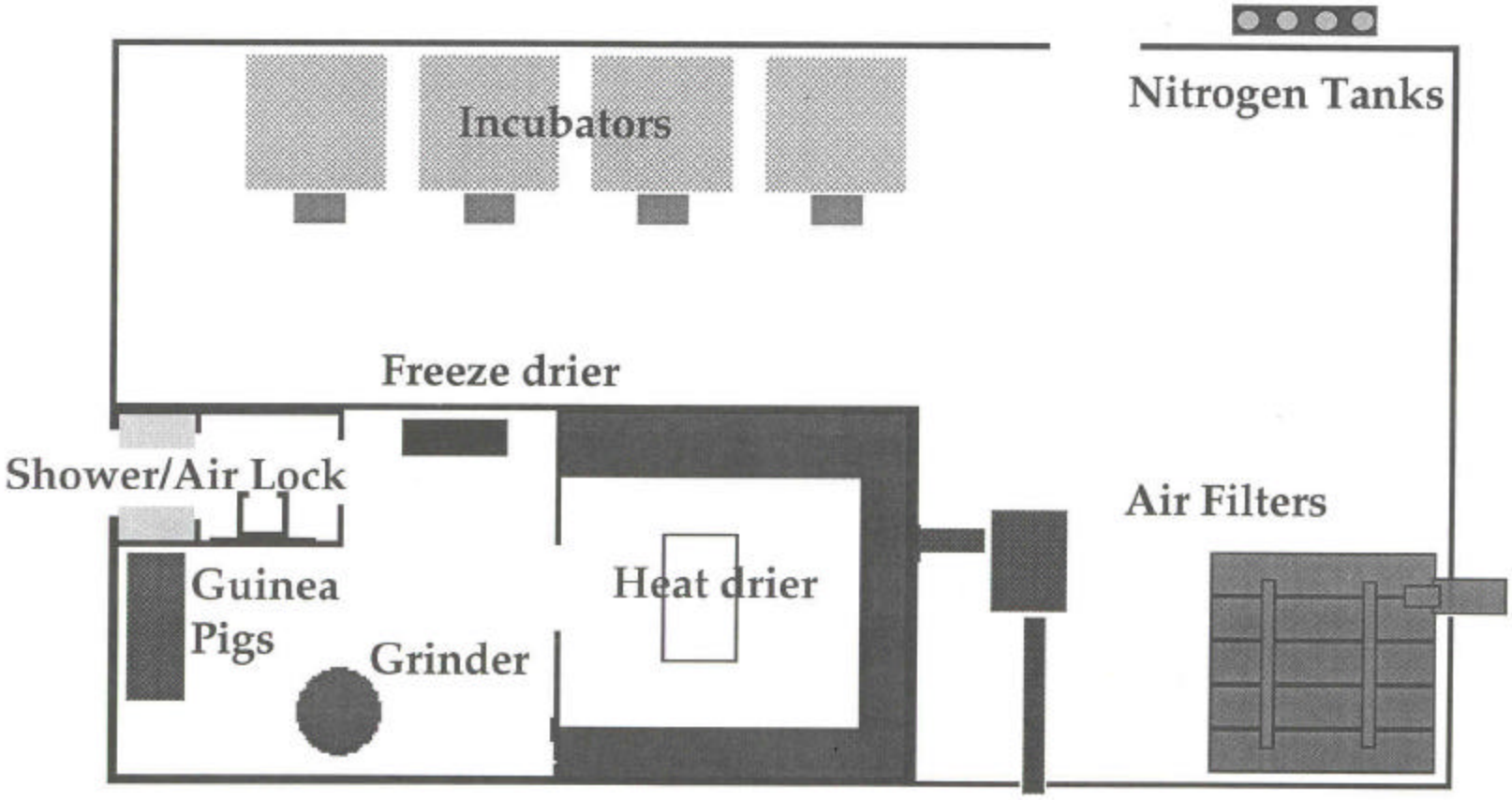
Visual 42

CW SPRAY TRUCK



Visual 43

LAYOUT OF ALLEGED BW LAB AT KAMAKUISHIKI (IN 1990)



Visual 44

TECHNOLOGIES AND AGENTS

BIOLOGICAL WEAPONS

- **ASAHARA'S FIRST WMD INTEREST**
- **DEDICATED TOXIN PRODUCTION LABORATORY AS EARLY AS 1990**
- **TWO NEW LABS: KAMAKUISHIKI AND TOKYO**
- **PRODUCED AND ATTEMPTED TO AEROSOLIZE BOTULIN TOXIN, ANTHRAX, CHOLERA, Q-FEVER**
- **RELEASED IN TOKYO 1990-94**

TECHNOLOGIES AND AGENTS

NUCLEAR OPTION?

- **THE RUSSIAN CONNECTION**
- **NOTEBOOKS WITH REFERENCES TO PRICES FOR NUCLEAR DEVICES**
- **EFFORTS TO PURCHASE URANIUM MINING SITES**

THE CULT

ASAHARA'S DREAM

- **AN INDEPENDENT NATION WITHIN A NATION**
- **SIGNIFICANT MILITARY CAPABILITY LOYAL TO HIM**
- **POWER**

OBSERVATIONS

TODAY

- **MOST CULT LEADERS IN JAIL**
- **3+ FUGITIVE MEMBERS**
- **RUSSIAN OPERATIONS ENDED BY LEGAL ACTION, ASSETS FROZEN**
- **ORGANIZATION TO LOSE LEGAL STATUS AS CHURCH**
- **FOLLOWERS TRYING TO SALVAGE SECT'S BUSINESSES**

Visual 48

OBSERVATIONS

TOMORROW

- ANOTHER TABOO ERASED
- OTHERS WILL CERTAINLY LEARN THE LESSONS OF TOKYO AND USE CW OR BW
- THE EFFECTS WILL NO DOUBT BE MORE DEVASTATING
- IT COULD HAPPEN ANYWHERE
- IT WILL HAPPEN SOMEWHERE

Visual 49

2.7 Afternoon Introduction

Admiral Young: It is a rare privilege when I have an opportunity to introduce a couple that I have read about in a book. We are privileged that we have at the Frederick Command, and at CDC, the laboratories that can take care of and serve the nation in dealing with this. Thus, it is a pleasure to first show a video film, and after that I will introduce Colonel Gerald and Colonel Nancy Jaax.

Video – 48-Hours Television Show

Dan Rather: Imagine a world where infectious disease has run amok. Where there are no pills, no shots, no cures for lethal viruses spreading everywhere. Where each of us is powerless to defend against a terrifying killer. It sounds like a horror movie, but experts say that horror could come true and soon. Why do we face this deadly new threat decades after the U.S. Surgeon General all but announced the end of infectious disease in this country? And what do we have to fight back? Tonight we bring you some answers as we step out of the world we know and into the danger zone.

Title: No One Is Immune. Speaker: Susan Spencer

Down this hallway, behind these walls, are some of the world's deadliest killers. Killers with names like Marburg, Machupo, Houdin, and Ebola. They are newly discovered viruses. Viruses for which there is no vaccine.

These things that you are talking about are considered worse than AIDS?

Oh yes and there is no treatment and no cure. Most of the viruses that we are talking about here are readily infectious by the aerosol route, just breathing in the air.

Peter Jarling is the Senior Research Scientist here at the United States Army's Research Institute of Infectious Diseases, nicknamed USAMRIID. Almost all of the most dangerous viruses Jarling studies were unknown two decades ago.

So this a BL-4.

The most lethal ones are only studied in a BL-4 lab.

So these things are both highly contagious and caught from vapor?

That is correct.

BL stands for bio-safety level.

That material probably contains about 10,000,000,000 to 100,000,000,000 virus particles per milliliter.

At USAMRIID, level 4 is as high and as hot as it gets.

You have got hundreds of thousands of lethal doses of virus that you are holding in your hand.

You want to go in here and work, what do you have to do?

You go through the outer change room where you take off street clothes, put on a sterile suit, put on your personal protective suit or what we call a space suit, and enter the BL-4 suite through the space suit shower. There is a germicide or disinfectant in there which is used to disinfect the outside of the space suite. Upon entering this area, you put on an extra layer of rubber boots, and you are good to go.

Look at that.

One of the nastiest BL-4 viruses.

Man they are loaded.

It is Ebola. Ebola virus is a monster. It is a true monster.

Author Richard Preston is writing a book on dangerous viruses including Ebola.

It is a paradoxical condition where you both die of blood clots and you die of massive hemorrhages at the same time. They use the term biological meltdown.

Man, is that all extra cellular?

Nancy Jaax, Chief of Pathology at USAMRIID, got the scare of her life while dissecting monkeys who had died of Ebola. Their blood was loaded with the virus.

I looked down and I had a big hole in my glove. Needless to say it was a scary thing.

Scary because days before she had cut herself on the palm.

You kind of feel this clenching in your stomach and you go "Oh my!"

The cuts had not healed yet.

I would have been put in the isolation ward.

The isolation ward is where she would have gone most likely to die. Around USAMRIID it has the nickname, "the slammer." Why do you refer to it as the slammer?

Well, because of the way you're walking down physically and probably a little bit emotionally because…

Literally slamming her in here.

Where we are actually sealing the doors.

This is a demonstration of how the isolation team would handle a lab worker like Nancy Jaax or anyone else who was even possibly infected with a BL-4 virus.

We would pick the person up, we would put them in the isolator, we would seal it.

Major Mark Bither heads the unit.

We would transport them through that port into this high-containment area and to the waiting staff already in their blue suits.

As it turned out, Nancy Jaax was not infected, never had to go to the slammer. The 20 cases that have been admitted were all false alarms. Experts warn, do not expect that luck to hold.

Things are out there; things are going to happen.

Virologist, Carl Johnson.

We are going to be so unprepared the day one of them lands on our shores and takes off. I cannot imagine the kind of panic it is going to produce in this society.

What if a virus appeared that was much more infectious than AIDS? How would it be handled? We could not possibly develop a vaccine for it in time. Do we have a defense against it?

And, if you get it, you are going to give it to me, just if I come into the same room with you. When that one happens, if that one happens, yeah, the human species is in real trouble.

Scientists say that day may be closer than they feared because of what they found in the suburb of Washington, DC. That story when we come back.

It could happen anywhere, it happened in the USA. Reston, VA, a nice place to live, good schools, pricey homes, and Ebola. Ebola is a virus, but not just any virus. A strain of it broke out in the winter of 1990 in this building in Northern Virginia. The building has been abandoned ever since.

People would panic if they knew what Ebola does to people. There would have been panic.

Most people never had heard of the Ebola incident until Richard Preston wrote an article for the *New Yorker*. Twentieth Century Fox now is making that report into a movie.

There is a sense of horror about this agent, this living thing which can get into you, and when it does get into you, it does absolutely extraordinary things to the human body. You die in ways that are almost unimaginable.

The first outbreak of the virus came in 1976 near the Ebola River in Zaire. HBO portrayed it this way in *And the Band Played On*.

You get a bad headache, then you get sick to your stomach. Your blood begins to clot, clots which lodge in your brain, lodge in your lungs, lodge in your intestine. And then the rest of your blood becomes like the blood of a hemophiliac, loosing its ability to clot, and streams out of all the orifices of your body including the eyes, including your dimples and so, essentially, your entire body becomes a kind of oozing, melting mass of virus.

Africa was the last time anyone saw Ebola, until a shipment of monkeys like this one came to the U.S. in late 1989. The monkeys came from the Philippines and went to the Hazelton Research Primate Quarantine Unit in Reston, VA.

I got a call from this laboratory in Virginia. The veterinarian in charge said, "I think I have got some simian hemorrhagic fever."

These monkeys were dying?

And his monkeys were dying.

When tissue samples arrived at USAMRIID.…This is a flask, actually a little larger than the one we used.

Peter Jarling agreed with Hazelton's vet that they were probably dealing with a common monkey virus. He began some routine tests to make sure. Since you thought that this could not affect people, were you working at that point in the space suit?

No we were not wearing a space suit.

To better study the virus, he tried to grow it in healthy cells.

These are just normal tissue culture cells.

But something went wrong.

In one of the flasks we had something similar to what you see here. If you look closely you can see there is some gunk floating in there. When we suspected that the flask was contaminated with bacteria, a common technique is to simply remove the top and to waft your

hand over it like this and if there is a very pronounced smell of grape juice, common bacterium that slips past our antibiotics.

So you took a giant whiff of this stuff just to see? Well, I wafted it past my face, I inhaled.

Once?

I don't know how much, maybe twice.

But there was no grape juice smell and Jarling was puzzled.

I suppose in hindsight they should have taken it directly into level 4 in space suits, but how could they have known? The sample that came to them had not killed anybody; it came from a monkey, not a human being, and there was no reason to think it was a lethal virus.

Actually, as small as that section is that you see there, in that whole section there could be billions of particles; millions and millions anyway.

Nancy Jaax was looking for what was wrong with the monkeys too. But she was looking at pieces of tissue under an electron microscope.

Here you see one right here. This is a whole cluster of virus particles right here.

Scientists can photograph what the microscope sees.

In the middle of all this, finally you get a picture.

That is right, and the picture really scared us because it was clearly a felo virus. There is nothing else in the world that looks like felo virus.

So felo virus, as you knew it then, included only viruses that essentially killed people.

Yes, that is correct. I think the reaction was like throwing a rock into a bee's nest. That place went crazy. These people are military bio-hazard experts, they know what level 4 agents can do to people and they were scared.

What was the atmosphere in that room?

Tense, very tense, because we all recognized that we were perhaps at the beginning of a major outbreak of a lethal disease in the United States.

So, at that point, no one worked with the virus any longer outside of BL-4 lab wearing a space suit. There tests soon confirmed Ebola.

I named it Ebola; it did not exist yet.

Carl Johnson is one of the only scientists in the world ever to actually see an outbreak of Ebola. He was in Zaire in 1976.

There was absolute fear and panic that Andromeda had finally occurred. It was close to 90 percent fatal; if you got sick, you could start measuring for the pine box right now. I have to say to you that I was shit scared.

For the first time this virus had literally been brought home. You have got to realize that there is a real sense of urgency here; we were working long hours, well into the night. These monkeys, they were in airplanes, they were on trucks, a whole lot of people had been exposed. We thought that if we could get on top of this quickly, we might be able to contain an outbreak.

Did you expect an outbreak at that point?

We feared the worst. You go gulp! I mean that is pretty heavy.

And something else was adding to their fear.

What made it clear in Reston that this could go through the air?

The animals were continuing to die. It was continuing to be spread, and there was no other way for them to get it.

And Peter Jarling knew what that could mean for him. What in the world went through your mind? I mean, you actually sniffed a glass that now you find out what was in it.

Sure, I got a little shot of Adrenaline, and, yes, I worried. This is no job for a hypochondriac.

Jarling was feeling healthy, but the monkeys at Hazelton Research were dying by the dozens. The company allowed the Army to take over its building and kill the remaining animals in an effort to keep the virus from spreading.

My group was the most vulnerable; there is no doubt about that.

Colonel Gerald Jaax, the head of USAMRIID's Veterinarian Division and Nancy Jaax's husband, ran the operation.

Did you ever wonder as you were driving over to this place, driving by houses and these people have no idea what is going on in that building?

Yeah, that was a concern. But the decision was made that we did not want to arrive in space suits and create a panic situation in a suburb of Washington.

But by the time they did arrive, to start their work, there was disturbing news. One of the monkey handlers was sick.

We were told that there was an employee who had exhibited some flu-like symptoms and because that is one of the clinical signs of Ebola, it certainly heightened our resolve.

They knew what that virus was, and they understood the danger to the suburban population of Washington.

Over a period of days, the team killed close to 500 monkeys.

We had to give these monkeys lethal injections. A needle can easily penetrate the space suit, and if the needle happens to have a little bit of Ebola blood on it, you're dead.

They sealed the building and decontaminated it by flooding it with formaldehyde gas.

I think everybody in our team had that same sort of feeling that it's kind of an alien feel. When the team was done, the Army was convinced nothing, not even Ebola virus was left alive, but what about the people already exposed?

One of the early signs of this disease is a high fever, and I took my temperature.

You did?

Sure I did.

Every day until you were sure?

Twice a day.

His temperature never changed; he never got sick at all. The animal caretaker who had the flu symptoms apparently really did have the flu. Although tests showed he and several other workers were infected with the Ebola virus, mysteriously, no one got sick.

None of them developed the disease.

Why not?

For reasons that we do not begin to understand.

This virus will turn on itself and form what we call shepherds crooks.

All they know for sure is that this is a new strain of Ebola: deadly to monkeys but apparently harmless to humans. They named it Ebola Reston.

Even now, if you had Ebola Zaire, the kind that kills people, next to Ebola Reston, the kind that does not, could you look in this microscope and tell?

No, you cannot distinguish.

This is a negative stain of the Reston virus. This is a similar preparation of Ebola Zaire. These viruses are indistinguishable.

There is no way to understand what the difference is?

That is right. You just touched on one of the great mysteries; there is no way that you can tell which virus is going to be virulent and which one is not.

We were just lucky.

Yes, we were.

Could it happen again? Sure it could. Especially since we do not know how it got to that primate facility in the first place.

Ebola is cyclic: some unknown reservoir of animals, somewhere in the world. We have not seen the last of Ebola. Ebola will be back.

End of 48-Hours Video

2.8 Presentations

COL Gerald Jaax, D.V.M.
Assistant to the Deputy for R&D
U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)

COL Nancy Jaax, D.V.M., Chief of Pathology
U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID)

Gerald Jaax: It is really a pleasure for my wife and me to be able to come down and talk to you today about the Reston Ebola incident. This is a little bit different. We have talked about this a couple of times, but we have never had the film shown right in front of us. You folks are kind of ahead of the power curve as to what we are going to talk about and perhaps some of the issues that we deal with (visual 1, page 2-116).

What we are going to do today is, I am going to start out with sort of a short period. We are going to do this kind of shell game, and Nancy is going to come up and talk to you about diagnosis and some of the issues that we went through trying to determine whether, in fact, we had a felo virus here in the United States. Then I am going to talk a little more, well maybe a lot more, about how we handled the incident once we decided that we had Ebola

virus in the monkeys in Reston. Then Nancy is going to finish up by talking about ongoing efforts. We know that Ebola has returned. There is an outbreak ongoing in Africa right now, and we have some folks who have been over there.

What we are talking about today is an emerging virus, but I think that the thrust that we are gathered here to talk about, response to a biowarfare threat or terrorism, is appropo. What we are going to try to do is to show how this particular incident that happened 5 years ago has lessons and applicability towards the kind of things that we are talking about now.

I am going to tell you a little bit about USAMRIID, which is the United States Army Medical Research Institute of Infectious Diseases at Fort Detrick (visual 2, page 2-117). I think it is important also to understand why the military got involved in this situation that really is not categorized as our mission. What we do at USAMRIID is provide defense against biological warfare agents, naturally occurring agents of military importance, and probably the most important, those agents or organisms that require special containment. This is really what sets USAMRIID apart from most of the other research facilities in the United States; there are few in the world really that equal the sort of facilities and resources that we have (visual 3, page 2-118). Some of our facilities are as follows: 23 laboratory suites containing over 10,000 square feet of BL-4, and 50,000 square feet of BL-3 space; a 16-bed clinical research ward; and a 4-bed BL-4 containment suite. You saw that in the video. We have a BL-4 containment clinical lab and autopsy suite and special facilities features that really encompass state-of-the-art air handling and environmental controls.

Other resources I think that are appropo to this audience is that we can provide technical biomedical expertise and consultation (visual 4, page 2-119). Certainly we do not want to say that this is our piece of what we do, but we have things to help people here in the United States to evaluate threat capability regarding specific threat agents, and medical and operational planning. We can provide an expertise in how to protect responders, decon facilities and personnel, and evaluate agent delivery methods and impacts. We also are developing capabilities and have capabilities in unknown sample identification, and rapid diagnosis, which is a critical piece in any sort of an attack or an incident. We have special vaccines that can protect responders, targets, and potential targets. We have specialized transport of biological casualties, and a specialized medical care facility which we have talked about. Down at the bottom, and this is probably a theme you are going to hear from me throughout this talk, I believe that we bring an integrated, multidisciplinary team approach. If there is one thing they teach us in the Army, it is to form teams and to build teams. I think the scenario that we are going to go through today will reemphasize that it is something that we feel is critical to an effort like the one we are going to talk about.

This is what makes USAMRIID unique, is its capability to contain high-hazard organisms.

This is the air medical evacuation team (visual 5, page 2-120). I am going to skim through this stuff because you saw it in the film, but that is the coupling to what they affectionately call the slammer in the film clip that we saw.

That is the inside. It is really my belief that if you wake up some day and see these guys with blue suits hovering over you and wanting you to tell them what your temperature is or how you feel, that is bad. You should probably consider contacting someone to dispose of your belongings.

This is the BL-4 morgue. We hope we never have to use it.

I told you this first part was going to be brief, and I want to have Nancy come up. She is going to go through what happened during the initial stages of the Reston Ebola incident.

Nancy Jaax: We would like to chronologically reconstruct a little so that you understand exactly the multidisciplinary or team approach that was required in the diagnosis and handling of this problem. I want to spend a little time on this one slide and reflect on what my discipline does and show you how it interacts in this entire sequence of events. As pathologists we are frequently asked two specific questions. The first is, "Is it or isn't it?" We get a sample and they say, "Is it or isn't it simian hemorrhagic fever?" The second one is, "What is it?" I felt compelled to put this one here because many times we get samples that say, "Is it or isn't it?" The sample is collected with that in mind, and when we use it up and we say, "It isn't," and they say, "Well, what is it?" I have to say, "I do not know," because we do not have enough left to find out. I think it is critical from a point of sample selection, and I just wanted to emphasize that a little bit. Our ability to make a diagnosis in pathology depends entirely on the selection of the samples that we receive. History may form a very important part of that epidemiologic history of where the sample came from. You may have selected a sample for a particular reason or we get what I fondly refer to as the grab bag or jar on the doorstep: that is they collect a little bit of everything, leave it on your doorstep, and you are supposed to reconstruct what you have. Obviously, we like selected samples. With a careful history and carefully selected samples we can put together a nice diagnostic piece.

The preliminary diagnosis: the object in that is very important and with our preliminary diagnostic testing we do multiple-agent screening. If we are dealing with an unknown and we do not know the diagnosis our object is cast a very wide net. For instance, in a case of hemorrhagic fever in primates, we apply a standard bank of assays that may incorporate 9 to 15 hemorrhagic agents depending on the geographic location from where the sample is submitted, all the way up to the history that is involved. I put this up here as a schematic because we are often faced with a requirement for what we call rapid diagnosis, or a preliminary diagnosis, which can be rendered in a matter of hours. I think the most common technology that is applied to that, and I am sure many of you understand antigen capture ELISA, which can be done in 4 hours or less, serology, chain reaction, or PCR. The next level or more of what I call an intermediate time frame has to do with immunohisto chemistry in which we apply the same reagents that you use in an antigen capture ELISA, but we couple that to a tissue section. What that enables us to do is coordinate; recognize the antigen. But is it occurring in concert with a lesion? In other words, is it causing the disease in the animal? So that is our sample, human in some cases. That is a critical piece of information because sometimes we can have extraneous viruses that may or may not have caused the disease. That was particularly interesting in this outbreak because an initial diagnosis of simian hemorrhagic

fever had already been rendered, was validated, and did occur. But we picked up an extra agent which turned out to be Ebola. Had we not done a very thorough screening of the samples, we would have been unlikely to arrive at that diagnosis in the period of time which we did. Then the final stage in a pathology or diagnostic arena is what we call classical verification and characterization: isolation of the agent. This can occur in anywhere from 3 to 7 days, depending on most of the agents that we deal with and then reinoculation of that into an experimental animal model or cell culture system. Then there is recovery and fulfillment of Coke's postulates. This is what is involved. There is a big trail to the final diagnosis of one of these disease outbreaks.

Two years, or about 18 months, prior to this outbreak at Hazelton, there was a very dramatic outbreak of simian hemorrhagic fever in New Mexico, and we sent a team to that. Dr. Jarling and two of my pathologists went to that outbreak in New Mexico. It was a very extreme outbreak of simian hemorrhagic fever; the facility was virtually wiped out. We performed a standard bank of diagnostic tests for hemorrhagic fever. The first thing you always think of in primates, especially newly imported primates, is that you want to rule out Marburg. That, obviously, is one of the reasons that the primate quarantine was instituted in this country. So, in this particular case, the veterinarian at Hazelton Labs was familiar with this. Dr. Jarling had lectured quite frequently on this outbreak of simian hemorrhagic fever. On October 4, 1989, a large group of primates arrived at Hazelton Research Facility. Within the first 2 weeks, there were 3 to 4 animals lost. That was not considered very unusual, particularly in wild crop primates where there is a fairly high mortality rate. Six days later, over a weekend, when a large number of people were away at a meeting, 13 more primates died. Unfortunately, at that time it was coupled with a malfunction in the heating and air conditioning system. It was felt that the temperatures had exceeded 90 degrees in the primate room. The animals were necropsied and there was a tentative diagnosis made of heat stroke. Really not a lot more was thought of that. Within 5 days, 18 more animals died, and, at that point, the attending veterinarian became very concerned. When they did the autopsies, the only thing he really noticed extreme was that a very small percentage of the animals had this bloody nasal discharge that you see right here, some swelling around the eyelids, and they had very enlarged spleens that is a very common finding in simian hemorrhagic fever. So given the scenario that the attending veterinarian was faced with, he contacted Dr. Jarling, who he knew as having successfully isolated simian hemorrhagic fever in the prior outbreak, and arranged to ship samples to USAMRIID for virus isolation.

These are the organ lesions. This is very typical. It is not what we call pathognomonic for simian hemorrhagic fever or any other hemorrhagic disease. These are lungs. What you see here are very large areas of hemorrhage. This is what the lung should look like; all of this tissue is flooded with hemorrhage and full of blood. You get a very distinctive, pathognomonic lesion of simian hemorrhagic fever. This is the stomach. There is a very sharp line of demarcation, and then you get diffuse hemorrhage in the duodena. Actually, this is a lesion that occurs in Ebola as well as other hemorrhagic fever diseases. It is a result of DIC, or disseminated intervascular coagulation.

This is Tom Geisbert who is responsible for the initial identification of Ebola at the electron microscope. What happened is when these tissues are received at the laboratory, we

divide them essentially into two sets. One set goes to Dr. Jarling's group that does virus isolation, and frozen assays are done on frozen tissues. The other half goes to my lab where, if they are not received fixed, we fix them in formalin and do examination by electromicroscopy and immunohisto chemistry. In the cell cultures we confirmed the presence of simian hemorrhagic fever. Tom is a very astute microscopist, and he also noticed that in two samples there was a very unusual cytopathic effect. At the time it was felt that it was probably a bacterial contaminant, but it was so bizarre that Tom took those samples, spun the pellet down, treated it in a lab, and looked at it under the electron microscope. I am sure this is where he got the big clutch factor; this is a cluster in a cell culture of felo virus. There are only two viruses at this point in time that look like this: Marburg and Ebola (visual 6, page 2-121). They are both extremely deadly pathogens, and there is just simply no other virus that looks anything like this. Based on that preliminary diagnosis, he immediately notified Dr. Jarling. This is a little bit closer up where you can see the characteristic shepherds crook or the virus turning on itself. Again, this happens both in Ebola and Marburg.

This is just a little bit of background on the disease. Again, the film preempted this. At this point in time there are only two viruses in this family that were known, and they were both known to be deadly pathogens. They had never occurred in the United States; they were restricted to Africa. At this point we had a lot of things that did not make sense. These were monkeys that were in from the Philippines. This is a virus that had only been isolated in Africa and, again, had never occurred here. We immediately took the cell cultures and used IFA, or immuno fluorescent antibody, technique for Marburg and Ebola. The sample was positive, this apple green fluorescence that you see is the monoclonal antibody that is tagged to a color indicator, fluorescein. It was positive for Ebola virus (visual 7, page 2-122), so we knew the cell culture was positive. Given the fact that we do operate in a BL-4 facility, we felt verification of tissues was extremely critical, in other words, we knew we had that agent in cell culture. But we wanted to absolutely rule out any possibility of a laboratory contaminate, so we took the tissues from the monkey that had been submitted, and by this point had been fixed in formalin. We performed electro microscopy and, again, the felo virus did occur in the monkey. So we knew we had it in the tissues. The next thing we wanted to be able to do for absolute diagnosis is to associate that with the lesion that occurred in the monkeys. When you look at hemorrhagic fevers without immunohisto chemistry, there is nothing that identifies them from anything else, any other type of hemorrhagic disease. Although it gives a very characteristic picture, it is not diagnostic.

I will flash through a few of those. This is a section of lung; actually it is a section of the lung you saw in the earlier picture. These are air spaces and should appear totally clear. You can see that they are full of blood; the animal essentially bled out into the lungs. This is a very characteristic lesion that is seen in hemorrhagic fevers. This is a section of spleen with a lymphoid nodule. I call it a bull's-eye lesion, but this perifollicular hemorrhage is extremely characteristic of any hemorrhagic fever disease. Again, not pathognomonic for Ebola or Marburg. The kidneys quite frequently have very large infarks in the glamarial line. You get a lot of hemorrhage into the tubules. They will have blood in the urine. This is hemorrhage in the kidney. This is something a lot of people would miss if they are not used to looking at them. In fact, at Hazelton this diagnosis was missed on the first nine index cases. The thing that would be missed is that they have characteristics inclusion bodies that are very unusual.

They are very large; they are red or acidophilic, and, again, very unusual mainly because most inclusion bodies in viruses have a very specific size, structure, and morphology. These are almost like plastic or silly putty. They assume all types of very bizarre shapes; it is extremely unusual. That in itself is very indicative of either Marburg or Ebola. Very few other things look like this. At this time, we applied immunohisto chemistry to the tissues, our standard hemorrhagic fever bank that we use, and this is where I got the big gulp. This was very positive for Ebola. All of this red that you see, is a monochromal antibody that reacts only with Ebola virus, nothing else. This is a section of liver; you can see that there is just a tremendous amount of antigen here. In fact, I sent the tissues back to the lab to be rerun because I was convinced that the controls had gotten mixed up with the primary, there was so much antigen. At this point, we knew we had Ebola virus. We knew it was in this country, we knew it was in monkeys that were shipped in from the Philippines, that it was basically an African virus, and that the only two members in this family were deadly human pathogens. We knew we had a very serious problem. This is just another slide of the antigen distribution in the adrenal gland. This is an electron micrograph of the inclusion body of the virus, inclusion in the oral pharynx or the mouth of this monkey. Again, just a brief recap of the disease which Richard explains much more dramatically than I do. I think at this point I would like to turn it over to Colonel Gerry Jaax to discuss how we dealt with the outbreak.

Gerald Jaax: On November 30, 1989, we very suddenly came to the conclusion that we had a problem. I was the Chief of the Veterinary Medicine Division there at USAMRIID at the time. Our job is to take care of the animals in the Institute. We support the research. We have a large animal care and use program, and, because of the nature of the work that we do in the Institute, we have expertise in containment, in high-hazard animal containment, and animal work. The Army's help was officially requested through coordination with the CDC and lots of other folks who were involved in this (visual 8, page 2-123). We were quite close by, about 45 miles away. The facts, as we knew them, were we had Ebola virus in Reston; there were about 450 monkeys, give or take 15 or 20; there were potential human exposures because of the folks in the quarantine facility who had been in there working with the animals; and we needed some teams to go down. Principally because of the configuration that we found where we were dealing with monkeys. They were inside of a building, and we were fairly certain that at the moment they were not going anywhere and the virus was not going to leave the building except in a potential human exposure. We needed animal care specialists. This is different than perhaps what we might find in some other sort of a scenario. I think the point I would like to make is that this shows the flexibility that we have to use in any sort of a BW scenario because we do not know what is going to happen. We certainly cannot plan to a degree where we would really have a contingency that would work like this on the shelf. We really had to come up with something on the fly. I do want to mention that we asked for volunteers. The kind of people we are talking about are veterinarians that worked in my group and animal technicians; some of these kids were 18, 19 years old. They are Army technicians and when we asked for volunteers to go down we explained exactly what we thought we had and out of the group of people who work in my shop, we had to turn away people who wanted to go. I did not think it was too unusual at the time, but it now occurs to me that they had not read the book. If we were to go next week, I do not know how much luck we would have because it is amazing how many people say, "God, I didn't know you

were doing all that." I guess I have to thank Richard because maybe we did not realize it either.

I want to emphasize again that this was not an Army operation (visual 9, page 2-124). The USDA and AAFES, the CDC, World Health Organization, the Maryland and Virginia Departments of Health, our superior command, the R&D Command at that time, of course, the Institute was heavily involved. The print and electronic media were involved. There was often talk, when Preston's book came out and this became more well-known, that the Army had hidden this somehow or tried to keep it hidden. There were pieces in the paper at the time so that is not true at all. The primate importers, of course, you can imagine the chagrin with which they dealt with this. Not only was it dangerous, but it was not great for business. Of course, the State Department and other governments were also concerned.

What I am trying to show is that one of the great riddles here is how these monkeys got from the Philippines to Amsterdam to JFK to Reston, VA, with Ebola virus (visual 10, page 2-125), which we had believed was only an African virus. We still do not know exactly how that happened. There is speculation, but nothing has ever been proven. At least I do not know how it happened.

On that day, November 30, Colonel C.J. Peters – who at the time was the Chief of the Disease Assessment Division – Colonel Peters now is the Chief of Special Pathogens at the CDC-came down to my office after a big meeting where we essentially decided that the Army was going to be heavily involved. He said we need to get ready to go. The good news is that you guys are going to do it; the bad news is we want to do this in about 36 hours. You can imagine that seemed like a short time to us. We sat down immediately with the folks that we decided were key staff that were going to play, and we started planning (visual 11, page 2-126). We brought in the people who were experts and could help us plan how we were going to try to establish this operation. These are the things that we decided were our principal objectives (visual 12, page 2-127). We wanted to plan and organize the operation from the beginning to the end. We wanted to establish an emergency BL-4 containment area. I think that is the critical piece in what we were trying to do if you can picture that (visual 13, page 2-128). We wanted to maximize our scientific information. If all we needed to do was kill the monkeys, that would be a piece of cake. We could have taped the building up and gassed, or we could have done all kinds of different things. But we wanted to learn as much as we could because this was really an unprecedented event. We needed to depopulate the quarantine facility, and we needed to decontaminate the facility. The principle things that we were trying to accomplish were to contain the virus in the facility, and to protect the civilian population.

As far as planning and organizing, safety was our number one concern (visual 14, page 2-129). We had to establish a command and control matrix. We used a team approach by dividing up tasks. We had to assemble the equipment and supplies. This is probably something that you do not think about very much here, but the logistics of this operation were absolutely incredible. We had timelines that we were dealing with, and the transportation was a big concern for us. Safety was priority one. Some of the things we thought about, and again, I am going to go through these things for you in the context of if you are ever faced

with having to deal with something like this, these are the sorts of things that you have to think about. In this particular case we were dealing with monkeys, with live creatures who have six prehensile things that they grab you with. They have all four hands and feet, their mouth, and their tail, and they all grab you. If you have ever held a monkey, you know that a 10-pound monkey is as strong as a person. We were very concerned that we did not get people injured while handling these monkeys. Strict needle hygiene: if you recall, in the previous experiences that we knew about Ebola, contaminated blood and poor needle hygiene were probably the reasons that the people in the African outbreaks had died. So we were concerned about needle hygiene and sharps: sharp objects such as scalpels and scissors. We restricted scalpel use completely, which made it much more difficult but, we believe, made it safer. We established that we would use a deep plane of anesthesia mandatory on any animals. In other words, we were not going to handle any monkeys that were not totally anesthetized, close to dead, and I think if you really counted it up, most of the animals that got out to bio sample teams were very close to being dead. We restricted contact with conscious monkeys. We enforced rest periods with our people. We made a decision that no one would work for more than an hour without having to sit down, relax. At that time the people who were in charge would come around, and we would chat with them and try to find out how they felt, if they were becoming fatigued. We had buddy systems; we did not do anything alone; we did not have anyone wandering around the facility by themselves; we had organized tear inspections. The suits that we use are quite easily torn. They have a positive pressure hood that blows air into them. So it is not really all that dangerous when you think of a tear because it is positive pressure and air would be going out. If you did get a tear, we would tape it with a piece of tape. And we had the conversational evaluations teams.

Establishing the emergency BL-4 containment (visual 15, page 2-130): I think this is the keystone of the whole procedure. We used the Air Medical Evacuation Team. My understanding is that they are going to have a demonstration of this tomorrow, and I would encourage you to go see this team. We used their procedures, equipment, and personnel. We would not have been able to do this had we not had this capability on the shelf in our facility. We used these people to essentially gown us up and point us in the right direction. We used our animal expertise with their equipment and their procedures. We had to establish a preparation and staging area; we put together a gray zone which means a transition area from the cold area in our facility that we were establishing into the hot area. Communications were important. The first thing you want to think about when you go someplace is communications. The first day we were there we had not thought about this, and it really compromised us in some respects. And, of course, decontamination. We had to come up with a plan for how to decontaminate.

Because we are talking about establishing a field BL-4 (visual 16, page 2-131), you saw some examples of BL-4, I am going to give you a very quick idea. When we talk about BL-4 at USAMRIID, that is a very specific thing. There are only a very few people who go into the BL-4 suites at USAMRIID because we limit access into those suites. There are redundant safety measures upon redundant safety measures to make it to where we can work in relative comfort with these pathogens. Some of the things that make it unique: special sewage treatment. Any sort of liquid waste is specially treated; you shower in and shower out and put on a space suit. You have disinfectant dunk baths for various pieces of equipment that can

become saturated. There is an airlock for large pieces of equipment that go in and out with UV light with SOPS or protocols for how long you have to have them in contact with UV. All of the air is hepafiltrated. We have class 3 glove cabinets, which is one way of doing BL-4 and of course, people in regular lab clothing could use those through glove ports. But the principal way that we do BL-4 at USAMRIID is in the space suits and the space suits are positive pressure. You have seen pictures of those. And autoclaves, of course, we have autoclaves everywhere. That is what we have at USAMRIID. These are what the suits look like with the umbilicals and the pig tails running to the wall. This is what we were going to use to go down there. These, in fact, are some of the folks that went out to California in the recent Hantavirus investigations that they were doing. So, we wanted to establish a BL-4.

The other thing that we really needed to do was maximize scientific information (visual 17, page 2-132). I mentioned this before. We made clinical and epidemiological observations, and we tried to correlate those with spacial relationships. We were there about 6 to 7 days and every day there were new monkeys that were sick. We had an opportunity to evaluate the monkeys. We looked at where they were in the facility, and we tried to make some decisions about how the virus was spreading within the facility. We had to collect, ID, and package bio samples safely. We took about 3,700 samples while we were there. The administration in trying to get samples from the animals was quite a task. We had to transport the samples that we did take back to USAMRIID, and we had to coordinate with the USAMRIID scientific staff; Dr. Jarling, Colonel Nancy Jaax, and the folks that were back at USAMRIID trying to make heads or tails out of what we had going on down there. We had to depopulate the quarantine facility. As I said, my group takes care of the animals in these facilities, and this was not something that was a lot of fun for us. When we took over the facility, and I use "take over" in the benign term; we were there. We still had responsibilities to these animals to make sure that they were properly cared for and so that they did not suffer unnecessarily while we were getting to them. We used a systematic approach on how to depopulate. We collected samples on every animal. We wanted to make sure that we had thought of efficient and safe methods for disposal of tissues that we believed to be extremely dangerous.

We decided to use a teamwork approach out of my group (visual 18, page 2-133). We had a anesthesia team who would actually go into each animal room. These were really the only people who went into the rooms where the animals were. Their job was to anesthetize the animals. Once these animals were deeply anesthetized, we would bring them out into a work area, into a centralized work area where we had bio sample teams. These teams were people who would take the animal that was either deeply anesthetized or near death's door from an overdose, they would draw blood, take tissue samples, and then euthanize the animals. Do not ever forget about the support people who are not actually in the facility, in contact with the thing. Without the support people we had on the outside who kept feeding us the supplies and the things that we needed, or resolved things that were going wrong that we needed a fix for, they were exceptionally important. This was not something that was done in a vacuum; there were folks down there who knew what was going on.

I am going to give you a walkthrough of the actual thing. This is the back door of the facility. These particular crates are the ones that the monkeys came from the Far East. You

can sort of picture those in Amsterdam and JFK full of monkeys, especially if they are harboring a dangerous virus. We had a coed team. We were down there in December. This is our dressing room and the choke point about getting into the facility. The actual physical mechanics of getting the suits on and getting into the facility meant that it took about 30 to 35 minutes to get two people in. We put two people in at a time and you cannot underestimate how much of you day is taken up by putting people into this facility and taking them out.

Crowd control is always a problem. This is Colonel Peters over here. He is here giving orders, which is comforting. Here is Nancy down here. They were giving us all kinds of advice.

This is Captain Hill, and I want to mention again, this Nurse Corps Officer was the Chief of the Aeromedical Evacuation team at the time that we were there. These folks really provided us the means to be able to do what we did.

We used these space suits as we call them (visual 19, page 2-134). You wear green surgical scrubs under them. They are a Tyvek disposable gown. They are quite thin and easily torn but we triple glove; you would have one heavy latex glove. Keep in mind that we were taking bio samples from the various animals, and it is not easy to do when you have three pairs of gloves on, one of which is kind of like the ones that I have to use when I do dishes at our house. It is hard to use these gloves because your dexterity is bad. Then you would have a pair of tennis shoes on that never fit and rubber boots, and you would have this clear plastic helmet with tiedowns that would go over it. Then you would have a RayCal unit which is a positive pressure air blower that comes up through your helmet. It has a hepafiltered supply and it has a 4- to 6-hour battery life. When you have one of these RayCals on, you feel like that Pillsbury Dough Boy because your thing all puffs up, and then every interface between the suit and the gloves and the helmet is taped down. That is a picture of the RayCal unit, and that is taped on your back. Here is one of my officers suiting up over here on the right. Colonel Powell is pulling on the Tyvek suit over his scrubs. You can see how they are taped; see the arms here and the same would be on the legs.

I do want to say one thing. When you saw Richard Preston in the clip we saw and he was talking about how scared everybody was, I beg to differ. These guys, this is the second day that we were there, these guys do not look scared. I must have several hundred pictures that were taken down there on the outside and I took some pictures inside which I will show you later. These guys were happy to be there. It is an opportunity to really do something, and that characterization, that our folks were terrified, is just flat wrong. If we had an opportunity to go tomorrow, I believe our people would saddle up and do exactly the same thing.

This is into that little gray area that I was talking about. This guy is essentially ready to go into the facility. This is a schematic of the animal quarantine facility at Reston. Those rooms where you saw the people gowning up. This is the back of the facility here, and this room right here was our staging area. There were doors right here, and all of these had doors, but right here was the gray zone that is the transition between the outside and the inside

of the facility. The way we had this planned was that the interior of this building, all the rest of it, was the hot zone.

I am going to take a second to tell you a personal story about when I came in because it is one of things I remembered most vividly about going down there. The first day that we went, this room right here, Room H, was the room that we were going to do because it was believed that the infection was limited to that room. Every one of these long rooms that you see with the "1" in it had animals in it; there must be 8 or 10 of these rooms. We were just coming into this room, and, at that particular point, the contractor had not evacuated the facility. I do not believe I will ever forget when we went down that very first day. We went through this 20- or 30-minute thing, one of my officers and I, to go into this facility. I came through this door not knowing what to expect in my space suit and walked through the door and closed it, and walking down the hallway was one of the quarantine facility employees in his coveralls and his thongs and a little paper mask on and we almost bumped into one another. I stood there looking at him, and he stood there looking at me, for about 10 or 12 seconds. I know what is going through my mind: one of us is a damn fool. He looked at me, and he did not say anything, but he turned around and went the other way again. That was just something that has really stuck in my mind.

So, once we got in there, here is what we decided to do (visual 20, page 2-135). We deeply anesthetized the animal, we used ketamine/rompun/telazole cocktail, and you could give that IM. It provides a very good range of safety for the animals, although that was not a great concern for us. We gave them a massive anesthetic overdose intraperitoneally. Once the animals were down in their cage, we transported them to the staging and sampling station, and then we collected the samples. We really tried to limit liability by restricting contacts with conscious animals to very few people because we viewed that was probably the most critical interface.

Anytime you do one of these things, you have to deal with old Dr. Murphy's Law (visual 21, page 2-136). I threw this in here, it could go about anyplace. One of the things that really screwed up our operation was the traffic. Anyone who drives into Washington on a day-to-day basis can appreciate this. We did not realize how much trouble it was going to be to get from Fort Detrick down to Reston. We were always late; our people were tied up. We did not realize that there was a daycare center right down the hill from this place, and that was a real concern for our folks. You could hear the kids when they were out back of the facility, and we were concerned that they were down there. Nancy mentioned the HVAC, that is the air conditioning and the ventilation, that really caused us a heck of a lot of trouble because the second day we were in there, it went belly up and the ambient temperature, even though it was December, went up into the 90s. We were in these suits, and spending 4 1/2, 5, and 6 hours in there, and that caused us a big problem. The biggest thing that happened was that at this particular facility, about 30 to 40 percent of these animals were not in squeeze cages. For people who do not work with monkeys, that is a false back cage that you slide forward; it brings the monkeys to the front of the cage and it pins them against the front. Then you give them a shot in the thigh and let the back go. You come back 3 or 4 or 5 minutes later, and the animals are laying on the ground. Since 30 percent of these animals were not in squeeze cages, the people in the quarantine facility would have to reach in and grab the animals. We

did not want to do that so we had to improvise. Again, Murphy's Law: so we had to improvise. You might say, "Well, where were your capture guns?" We had capture guns, but because we are on a military installation, we had to deal with arms and we had to keep them in the arms room so we decided to get rid of our capture guns. We had blow guns, and we tried blowing them through those helmets. It did not work, and that was a real problem. What we finally ended up doing was we got a mop handle. We taped a towel onto the end of a mop handle, which was kind of a u-shaped device. We taped that down and it looked like one of those things that you push people off the stage with at the theater. We would pin the monkeys in the back of the cage with that and then with a pole syringe, which is a long syringe with a needle on the end, we would stick the monkeys in their leg and try to anesthetize them. That was a real hassle. Here are a couple of my guys. This is one of those pole syringes. We have not got the stuff on here yet, but that is the pole syringe and this is the mop.

These are actually inside the facility. It is not very simple taking pictures in here. The camera is in a great big bag and he wants his Nikon back, so you have got to be careful.

These are the monkey cages up here. Wilt Chamberlain might be able to crawl up there and look at them, but we had to get on stools to do that. On the bottom line you had to get on your hands and knees, especially when you were trying to trap the monkeys. This is one of my NCOs. He is giving one of the monkeys who is down in this cage who has already been given anesthetic an intraperitoneal injection prior to bringing him out; this is result. These would come out, and from every one of these animals, about 450 of them, we took nasal swaps, we took pharyngeal swabs, we took three tubes of blood, we took pieces of liver and spleen. We had to make sure that we had identified every one of those to cage and to animal number, which were often times difficult to pick out. This is some of our teams picking the samples. You can see we believed that with a felo virus infection the blood that you see on these guys gloves is as good as a death sentence if you have a glove cut. You can appreciate that we never let anybody use scalpels, but we were awfully concerned that somebody was going to make a mistake in a week's worth of doing this.

Here is another monkey. I told you we had enforced rest periods. What we usually do in these rest periods is have people fill syringes.

We would send the samples back to Fort Detrick (visual 22, page 2-137). We would take this blood where they would do virus culture isolation, EM, CBCs, and veterinary clinical things. They would do cultures and immunohistocyto chemistry on the swabs. They would do path and VI culture on the tissues.

The bio sample containment and transportation (visual 23, page 2-138): a lot of people are concerned that we were transporting these goods from Reston up to Fort Detrick. We had these paraffin impregnated hat boxes. We put the animals into two bio hazard bags; they would be taped shut. Then we put absorbent material into the bottom of these bags, because keep in mind that we were concerned about liquid contamination. If there was leakage out of the bio hazard bags, we wanted to make sure that we absorbed as much of that as we could. If there was an accident or a wreck, we did not want blood splashing all over the roads.

Everything was drenched in bleach. Bleach is very efficacious against Ebola; we were very confident of that prior to the whole exercise. They were put in styrofoam chests, taped, and then taken to Fort Detrick.

You can see how the hat boxes are sort of stained white. Those are stained with bleach. They have got two additional bio hazard bags on the outside, keep in mind we had two bags on the inside that are taped. This goes into the styrofoam chest, out into the truck, and off to USAMRIID.

Murphy sort of stuck up his head again in the second or third day we were there. One of the Hazelton employees came up with this bag and there were two or three dead monkeys in it. One of the things about being a veterinarian, you learn about body language, and this kind of reminds me of guys at the rattlesnake hunt. I had two or three pictures of them. They are giving it a lot of this, and, you know, they really did not know how to deal with this. They sprayed it down, put it in a box, and sent it up too.

Decontamination (visual 24, page 2-139): we had to decontaminate the samples, the animals, the rooms, everything that was part of this thing. We had to make sure that we decontaminated.

Personnel (visual 25, page 2-140): the personnel decontamination was really important to us. The AIT, or the Air Medical Evacuation team, would decontaminate us as we came out. You have got this bleach drainage while you were in this gray zone. Your filters and gloves were removed and bagged. You were scrubbed with bleach and soaked towels, you were dried with towels, and then your clothing was bagged and incinerated. This is a picture of us coming out of the facility the day our photographer was down there. One of the things I would like to point out is you can see these helmets; it got so hot in there that you could not see out of them and that really complicated dealing with the monkeys where the light was not very good at all. You would get all this condensation on the inside. You can see that these are the folks from the AIT team. You are soaked with bleach here, and they were washing you down. This guy here, I do not know if you can appreciate it, but from his waist down his scrub suit is completely soaked. Many of our people were pouring sweat out of their boots. This is a tear that I had talked about.

The facility decontamination (visual 26, page 2-141): they put 39 electric skillets throughout this building, they taped it tight, every seam in the building, and they cooked off paraforrnaldehyde with the target of 10,000 parts per million paraformaldehyde in the air. The building sterilized completely.

I think that these are the two most important slides that I am going to show you (visual 27, page 2-142). Of the folks who worked at Reston, there were five people who they believed were at risk because they worked routinely in the animal facility dealing with the monkeys. Four of these employees tested positive for Reston Ebola on serology. In other words, four of the people, their immune systems saw this virus, and they were infected. They did not become sick and no one died. One person did not seroconvert. Of those four people, at least two of them really had no known exposure. In other words, they had not been bitten,

or they had not cut themselves, or they had not stuck themselves with a needle. You can certainly speculate that they were invested by aerosol. I have to point out that I know why my son does not let me help him with his math; this is supposed to be 42 (visual 28, page 2-143). We had 18 people on my teams, there were 16 people who were working with this agent back at the Institute, and there were the folks on the AIT; we had these folks tested. The last thing that I was interested in was taking people down to this facility having somebody become infected and die; one of my soldiers. I think that you can see by this that we did not have one person seroconvert. What this tells me is that even had this been Ebola Zaire with an 80 or 90 percent mortality rate, we would not have had one person get sick. To me – that is the criteria for success that I choose to put on this whole exercise. It says that the things that we did and the way we handled it was the proper way and it all worked. I once again want to emphasize the interagency cooperation (visual 29, page 2-144); CDC managed the public health aspects of this throughout the whole exercise. They performed patient serology and case followup on the human exposures; they were on site every day. Dr. Tipple, an epidemiologist from the CDC, was right there with us, not inside the facility, but she was on site. They provided technical and field expertise, and they looked at the big picture perspective for us. The Virginia Department of Health also had an officer there with us. They monitored the operation. They were on site every day.

The collateral effects of what went on down there: this is the sort of stuff that is more important to the biomedical research folks. There are a whole bunch of things that have happened since then as far as how you can import monkeys (visual 30, page 2-145). You can imagine that this got a lot of people's attention. There are a lot of new requirements for documentation for importing monkeys into the United States.

There really are a lot more questions than there are answers (visual 31, page 2-146). Is this an African or an Asian virus? Of course, we still believe it is strictly an African virus. Why did it not kill people? It was certainly killing monkeys; I want to reemphasize that these animals were dying. What is the natural host and infection cycle: mammal, reptile, who knows what? We are going to have some folks here who are going to talk about that today because there is going to be lots of new information about that. Is there aerosol potential? We clearly saw in the Reston facility that there was aerosol potential. I think Nancy is going to talk about the fact that we verified that experimentally in the laboratory and, of course, these last two questions. When will Ebola resurface? We know the answer to that one. Will we be ready? I do not know; do we know?

The conclusions (visual 32, page 2-147). One thing I want to say is that the nonhuman primate quarantine system worked. The original 1967 Marburg outbreak instituted the quarantine procedures that we now do for importing monkeys. These animals broke with this disease in the quarantine facility, so those procedures worked. It was not something that got away from us. You know it is a small world. With airplane traffic the way it is, I think it makes emerging disease problems much more difficult. Ebola as we know it is probably not the big one because I do not think it is so infectious that it is going to create a horrendous outbreak. I think most people believe that there are probably candidates out there that fill the bill for having a really serious outbreak.

The legacy (visual 33, page 2-148): again, perhaps these apply more to animal use, but it revealed a vulnerability. Here we had this exotic virus in the United States it is a possible template for action, and I believe that we can use this as a case study for how to respond to a biological emergency. It certainly created a heightened awareness after the publicity that we received, and there is increased research and surveillance.

Lessons learned: these are really my thoughts and I do not attribute them to the DoD per se, but I believe the chain of command and who is in charge was extremely important where we worked. It was very comforting to know that you were responsible for a certain piece, that you did not have to be thinking about other things, and that you knew that there were people who were doing those other things. I think that allowed a coherent and coordinated direction for the whole operation.

Team building perspective: I would reemphasize that I think that team building is the way to go, and some of the things that I have heard in the talks this morning about interagency cooperation to establish proactive measures is extremely important. One of the things that would help with team building is a division of responsibility, and I think you get a good expertise match. You are able to reach out and touch people who are going to be helpful to your operation. You need to establish communications and liaisons. Maybe what I should have put on this is, "Who're you gonna call?" I think you have to know who you are going to call. You have got to have those contacts established so that you do not have to sit around and try to decide. I think pre-positioned and off-the-shelf supplies are extremely important. I think we were able to hit the ground in Reston earlier than within 2 days from the time we actually had any idea we were going to do something because we had the stuff on the shelf.

I think that you have to have contingency flexibility, I would qualify it by saying that this was already contained by the time we got there. But an emergency operation can be planned and executed on a short notice. I think this is an example of how that works.

We are getting close. What I show this for is that nobody died. We thought it was a very interesting operation after it happened, and, of course, nobody died, nobody got sick; it just faded away. Of course, when Richard Preston uncovered it, he created more awareness. What was the big deal with Reston Ebola? You know the old cliche: if it looks like a duck, and walks like a duck, and quacks like a duck. It was not the killer duck, but it was certainly close enough that we reacted in a way that would have taken care of the killer duck. If it were to happen again, we would do exactly the same thing. At USAMRIID we still use Reston Ebola in BL-4, and I do not anticipate that it will ever come out of there.

This is my last slide, and to me these are the unsung heroes of Reston. These are veterinarians and technicians. This was taken inside the facility, and I could not be more proud of these folks who labored in anonymity and have not gotten any of the notoriety that some of us have gotten. They are the ones who did all the work, and my hat is off to them.

Experiences in the "Hot Zone"

A Case Study in Emerging Disease Issues and Management

Nancy K. Jaax, DVM
Gerald P. Jaax, DVM

Visual 1

USAMRIID

Research Facilities:

- **2 Primary Research Buildings**
  - **300K square feet**
- **23 Biocontainment Laboratory Suites**
  - **6 lab suites certified at Biosafety Level 4 (BL-4)**
- **Aerosol Exposure Capability**
- **AAALAC Accredited Animal Care Unit**

High-Hazard Containment Facilities and Capabilities are a National Resource

Visual 2

USAMRIID

Unique Programs & Facilities:

- **20-Bed General Medical Ward**
- **16-Bed Medical Research Ward**
  - **isolation capable**
- **Aeromedical Isolation Evacuation Team**
- **BL-4 Patient Containment Facility**
  - **clin lab, morgue, "docs"**
- **Special Immunizations Programs**

Visual 3

Counterterrorism Capabilities

- **Technical expertise**
  - **evaluate threat capability re: specific agent(s)**
  - **medical & operational planning**
  - **protect responders**
  - **decon facilities & personnel**
- **Assist in evaluation of agent delivery methods & impacts**
- **Unknown biosample ID - “rapid diagnosis”**
- **Special vaccines**
  - **responders**
  - **targets**
- **Specialized transport of biological casualties**
- **Specialized medical care facility**

limited

Integrated, multidisciplinary, team approach

Visual 4

VICKERS ISOLATION TEAM

Portable Isolation Equipment & Expertise

- **Standby for Emergency Deployment Worldwide**
- **Airframe Capability at Andrews AF Base**
- **Coupled to the “Slammer”**

Visual 5

FILOVIRIDAE

Only 2 known members of this relatively new class of viruses

- **African Virus**
  - **Natural History, Reservoir, Epidemiology Unknown**
- **Explosive Disease Outbreaks**
  - **1967,1976,1979**
- **No Known Cure**
- **Treatment symptomatic - supportive care**

Visual 6

EBOLA FEVER

- **Caused by Ebola virus**
- **1976, 79 outbreaks in Zaire & Sudan**
- **Close contact with infected patients, blood, secretions, & tissues**
- **Incubation period 4-16 days**
- **Severe & usually fatal hemorrhagic disease**
- **Case fatality rate: 90% in Zaire, 60% in Sudan**

Index Case Infections: Source Unknown

Visual 7

Reston Ebola Incident

Situation → **Army help requested**

- **Ebola/SHF in Reston, VA**
- **450 monkeys**
- **Potential human exposures**
- **"Away" Teams needed**
  - **veterinarians**
  - **technicians**
  - **biohazard experience** → **Volunteers**

Visual 8

Reston Ebola Incident

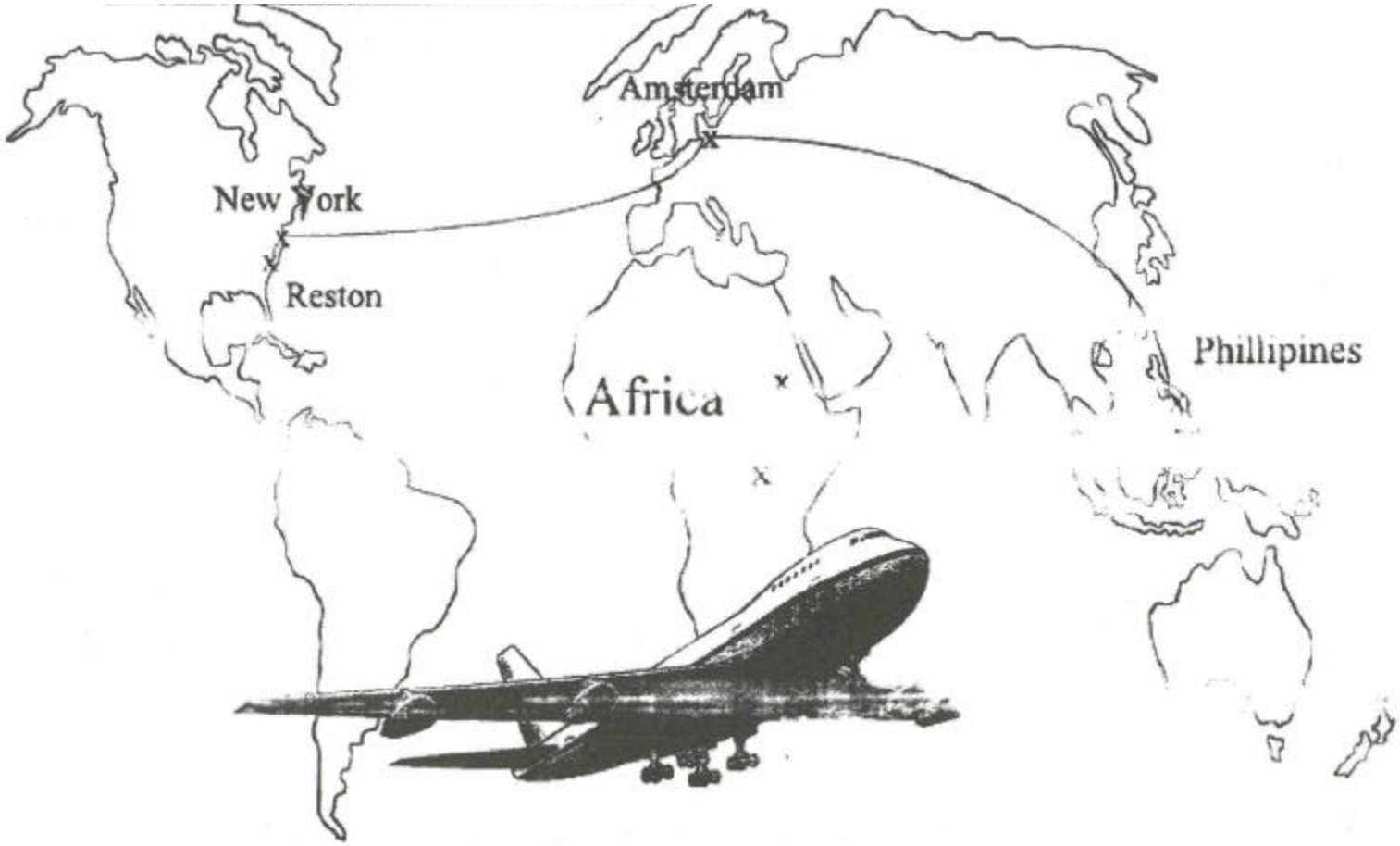
The Players:

- **USDA / APHIS**
- **UPHS / CDC**
- **World Health Organization**
- **Virginia & Maryland Health Departments**
- **U.S. Army Medical Research & Development Command**
- **USAMRIID**
- **Print & Electronic Media**
- **Primate Importers**
- **U.S. State Department**

Visual 9

The Great Mystery

African Virus — Asian Monkeys



Visual 10

Reston Ebola Incident

Plan & Organize Operation:

- **SAFETY**
- **Command & Control**
- **Coordination**
- **Team Approach**
- **Equipment & Supplies**
- **Time Lines**
- **Transportation**

Visual 11

Reston Ebola Incident

Principal Objectives: → **Contain the Virus in the Facility**

- **Plan & Organize Operation**
- **Establish Emergency Field BL-4 Containment**
- **Maximize Scientific Information**
- **Depopulate Quarantine Facility**
- **Decontaminate Facility**

Protect Civilian Population

Visual 12

Reston Ebola Incident

Depopulate Quarantine Facility:

- **Humane Concerns**
  - **food**
  - **water**
  - **procedures**
- **Systematic Approach**
- **Sample Collection**
- **Efficient & Safe Disposal**

Visual 13

Reston Ebola Incident

Safety Priority #1:

- **“Team Approach” to all activities**
- **Strict needle hygiene**
- **Restricted scalpel use**
- **Deep plane of anesthesia “mandatory”**
- **Restricted contact with conscious monkeys**
- **Enforced rest period**
- **Buddy systems**
- **Organized “Tear Inspections”**
- **Visual & conversational evaluations of teams**

Visual 14

Reston Ebola Incident

Establish Emergency Field BL-4 Containment

- **Use Aeromedical Evacuation Team**
  - **procedures**
  - **equipment**
  - **personnel**
- **Staging/Preparation Area**
- **Gray Zone**
- **Communications**
- **Decontamination**

Visual 15

USAMRIID ENVIRONMENTAL & ENGINEERING CONTROLS

Biosafety Level 4 (BL-4)

- **Restricted entry (unique PIN #)**
- **Positive pressure HEPA filtered "Space Suits"**
- **Chemical decon showers**
- **Class III biological hoods – "glove box"**
- **Steam & high-pressure autoclaves, UV lights, chemical decon**
- **Exhaust air & liquid waste treated**
- **Specialized training**

Visual 16

Reston Ebola Incident

Maximum Scientific Information

- **Clinical & Epidemiological Observations**
  - **correlated with spatial relationships**
  - **serology & path**
- **Collect, ID, & Package Biosamples Safely**
- **Transport Samples**
- **Coordinate with RIID Scientific Staff**

Visual 17

Reston Ebola Incident

Vet Med Teams: → **"Planned from Scratch"**

- **Anesthesia Team**
  - **clinical observations**
  - **anesthetize monkeys**
  - **transport to work area**
- **Biosample Teams**
  - **bleed & harvest tissues**
  - **euthanize**
- **Support Team**
- **Care & feeding of the "hot teams"**

Visual 18

Reston Ebola Incident

"Space Suits"

- **Green surgical scrubs**
- **Tyvek disposable gown (thin plastic)**
- **Triple gloved, one heavy latex**
- **Tennis shoes & rubber boots**
- **Clear plastic helmet – with tie downs**
- **Racal unit**
  - **Positive pressure through helmet**
  - **HEPA filtered air supply**
  - **4 to 6 hour battery life**

Taped

Visual 19

Reston Ebola Incident

Clinical Progression:

- **Deeply anesthetize animal**
  - **squeeze cage or pole syringe**
  - **Ketamine / Rompun / Telazole – high dose IM**
- **Massive anesthetic overdose – IP**
- **Transport to staging & sampling station**
- **Collect samples**
  - **ID, package, decontaminate, disperse**

Limited Liability: restricted contact with conscious animal

Visual 20

Reston Ebola Incident

Murphy's Law

- **Commuter traffic**
- **Day care center**
- **HVAC malfunction**
  - **heat & exhaustion factor**
- **Squeeze cages**
  - **loose monkey**
    - **blow gun**
    - **capture gun**
    - **net**

Visual 21

Reston Ebola Incident

Laboratory Analysis:

- **Blood**
  - **virus culture & isolation**
  - **EM exam**
  - **CBC, clinical chemistries, ELISA**
- **Nasal & pharyngeal swabs**
  - **VI & Culture**
  - **immunocytochemistry**
- **Tissues**
  - **path exam**
  - **VI & culture**

Visual 22

Reston Ebola Incident

Biosample containment-transportation:

- **Paraffin impregnated hat boxes**
- **Biohazard bags**
- **Absorbent materials**
  - **kitty litter**
  - **paper towels**
- **Bleach drench**
- **Styrofoam chests**
- **Tape**

Into BL-4 Hotsuite at USAMRIID

Visual 23

Reston Ebola Incident

Decontamination: → **Sterilization**

- **Biological samples**
- **Animals**
- **Animal rooms**
- **Equipment & supplies**
- **Personnel**
- **Building**
  - ➢ **particulate decontamination**
  - ➢ **complete paraformaldehyde penetration**

Verification

Bacillus subtilus niger

Visual 24

Reston Ebola Incident

Personnel Decontamination:

- **Aeromedical evacuation team**
  - **staged one at a time**
    - **bleach drench in the "Gray Zone"**
  - **HEPA filters removed**
  - **external gloves removed & bagged**
  - **scrubbed with bleach soaked towels**
  - **dried with towels**
- **Clothing bagged & incinerated**

Visual 25

Reston Ebola Incident

Facility Decontamination:

- **All particulate matter scraped**
- **Concentrated bleach soak**
- **Taps & drains drenched**
- **Building taped – airtight**
- **Paraformaldehyde**
  - **39 electric skillets**

Visual 26

Reston Ebola Incident

Human Infections: → **Blood tested by IFA**

- **5 quarantine facility employees tested**
  - **4 Reston Ebola positive**
  - **1 Reston Ebola negative**

→ **80% infected**

Speculate that several may have been infected by aerosol

Visual 27

Reston Ebola Incident

At-Risk Team Surveillance: → **Blood tested by IFA**

- **USAMRIID personnel at risk**
  - **18 on VMD teams**
  - **16 USAMRIID scientists & support**
  - **8 Vickers team**

- **42**

→ **All personnel at risk – <u>No Seroconversion</u>**

Visual 28

Reston Ebola Incident

Interagency Cooperation:

- **Centers for Disease Control (CDC)**
  - **managed public health aspects**
  - **performed patient serology & case followup**
  - **on site every day**
  - **technical & field expertise**
  - **“Big Picture” perspective**

- **Virginia Department of Health**
  - **monitored operation**
  - **overview of decontamination & disposal**
  - **on site every day**

Visual 29

Reston Ebola Incident

Collateral Effects: → **CDC Interim Guidelines:**

- **Special import permit required**
  - **Cynomolgus, Rhesus, African Greens**
- **Surprise inspections of importers**
- **New requirements & documentation**
  - **isolation in the airframe**
  - **PPE, training, documentation, at airport**
  - **quarantine requirements**
  - **reporting requirements**

Visual 30

Reston Ebola Incident

More questions than answers:

- **Africa or the Philippines??**
- **Why didn't it kill people??**
  - **was killing monkeys**
- **What is the natural host & infection cycle?**
- **mammal, reptile, plant, soil, water, arachnid, or what . . .**
- **Is there "Aerosol, Oral, or Conjunctival" potential?**

Visual 31

Reston Ebola Incident

Conclusions:

- **NHP quarantine system worked**
- **It's a "Small World"**
- **Environmental changes may alter ecology of Ebola & other viruses in the wild**
- **Ebola (as we know it) is probably not the "Big One"**

But → **Most experts agree that there are likely candidates out there**

Visual 32

Reston Ebola Incident

Reston Legacy:

- **CDC interim guidelines**
- **Transportation impacts**
- **Revealed vulnerability**
- **Possible template for action**
- **Heightened awareness**
- **Increased research/surveillance**

Visual 33

Gerald Jaax: Now I would like to turn this over to Nancy. She is going to talk a little bit about current initiatives as far as the outbreak that is ongoing right now.

Nancy Jaax: I thought you all might be interested in what we are doing at the laboratory right now in view of the latest Ebola outbreak as far as current research initiatives. Most of you are probably aware that we have established alternate routes of infection other than classical, what we call iatrogenic or needle-borne infections. We did experimentally establish that Ebola Zaire can be transmitted via aerosol. That publication has been approved and will be released next month. Based on a number of primate tissues that I looked at, we had another case that has been submitted. We had a natural, during one of our studies two of our control animals became sick and died. Actually this occurred in the early 1980s. That was the point where I became convinced and actually precipitated the aerosol experience that this could be gotten by other than needle or direct contacts with fluid. We had two control monkeys across the room that became sick and died after the conclusion of the original experiment. Based on the antigen patterns in those monkeys, I was convinced that conjunctival or oral infection was a real possibility with this virus and, in fact, it had been alluded to I think in early publications as a possible means of infection. We have performed this in guinea pigs and in primates as well. I can tell you that we did construct an experiment in primates where four animals were given one milliliter of this virus via the mouth. Effectively we mimicked a splash situation where you would get blood or a blood product in the eye: half a milliliter was flooded over the eye surface. Four of the four that were conjunctivally exposed contracted the disease and actually died earlier than the intramuscular or injection control. Three of the four that were exposed orally died. This opens up a lot of questions not only about the original reservoir and how the index cases got this virus, which we really do not know because usually the index cases is not recognized. It also emphasizes the importance of, or possibility of, fomite transmission, how important it is to clean up an area, and the persistence of the virus. What that has also precipitated is a series of tests that are in process right now to determine exactly how long this virus survives in secretions, blood products, that type of thing without decontamination. We feel that is very important to know.

I do not know how many of you are aware of the Russian publications with horse IGG against Ebola virus. We will be testing that passive antibody or the efficacy of that starting a week from Tuesday. We will be inoculating primates experimentally and administering the antidote to establish or validate the Russian publications. The other efforts that are ongoing; identification of potential reservoir species. Under the umbrella of the WHO, two team members deployed to Zaire in a very large collaborative effort for sample collection and to try to identify the natural reservoir of this host. We do know that orally and conjunctivally it will infect guinea pigs and, obviously, primates are an amplification species. This virus goes to very high titers in those species, greater than 7 logs per mil. of virus, so they can become very infectious. Also a prime piece of this is to validate our rapid diagnosis and validation of assays. We do have ELISA that have been one of the byproducts of Reston because of the large number of monkeys that were involved, we were able to quite accurately validate the ELISA for Ebola virus. Validation is always an issue with these outbreaks because many times we do not have enough human tissue or enough primary research material to really

establish the validity of a given assay. I think that is a very important spin-off that will come out of these studies.

What does it mean? I guess it is something I find intriguing. If you look at terrorist threats or natural disease outbreaks, some of the best documented threat agents that we have are natural, endemic, and there are zoonotic diseases. It is very important if you come up with a positive assay to ask yourself, "What does it mean?" Many times, "What does a positive ELISA mean? What does a positive PCR mean?" I think this brings in what I feel USAMRIID as an institute, or the CDC as an agency used to dealing with the whole picture, are able to do; that is, to integrate a lot of different samples and a lot of different information. If you couple that with intelligence and data gathering, you can come up with exactly what it means.

I would like to close with a quote from Laurie Garrett in *The Coming Plague* because I think it is very important; it is important for all of us to realize: "The skills needed to describe and recognize perturbations in the Homo sapiens' microecology are disappearing with the passage of generations leaving humanity, lulled into complacency born of proud discoveries and medical triumphs, unprepared for the coming plague."

Question: Are you still wearing the same suits?

Nancy Jaax Answer: Yes.

Question: Two parts to this question. Did all these monkeys that died of Ebola down in Reston also have simian hemorrhagic fever? Secondly, is there no evidence in the Philippines of any indigenous infection with felo virus abilities?

Nancy Jaax Answer: In that order, I will answer your questions. We affectionately refer to the outbreaks as Reston 1 and Reston 2. After the diagnosis was made in the first outbreak, and the people at Hazelton had depopulated one room based on the diagnosis of simian hemorrhagic fever. There were over 30 monkeys that had died in that room; they did depopulate it. When we went back and looked retrospectively at those tissues, all of those animals had Ebola virus by immunocytochemistry; we had no biologic samples banked. We do not have good testing for simian hemorrhagic fever. It is a very difficult virus to work for, and the assays for that really can only be done by exclusion and culture. At the point that we had a definitive diagnosis, the outbreak was going on and a large number of these animals that were euthanized were not positive, obviously, because we depopulated the entire facility; not all animals at the point of euthanasia were infected with simian hemorrhagic fever or Reston. They had not yet contracted the disease and a decision was made in Reston 2, when this outbreak resurfaced again the following February; because of epidemiologic interests and the fact that at that point we knew that humans were not lethally infected, they attempted to follow this out to its natural end point. At that point, over 300 of these animals did die from a combination simian hemorrhagic fever and Ebola virus. We were not able to segregate out the two; they coexisted. There were no animals that had simply one and not the other. What we did do experimentally was we picked Ebola virus Reston and it was purified. We re-inoculated

that experimentally, we recovered only experimentally, only Ebola virus in those animals, so the agent Ebola virus Reston alone is capable of causing mortality. There was no evidence experimentally of simian hemorrhagic fever in that group. I know that is the long way around, but I think that answers your question.

As far as the facility in the Philippines, it did become apparent because of Reston 2. Animals were received ill, already incubating the disease. It was determined that there was an enzootic circulation of the virus in that primate facility and that it was not contracted via transport. Initially in Reston 1 our biggest worry was that somehow they had come in contact with an African group of monkeys. There was a tremendous amount of time expended on whether or not these animals became exposed to the virus during transport. It was actually traced to an enzootic circulation of the virus in the Philippines.

Question: Would you please speculate on how you adapt your policies and procedures to an outbreak in a human facility or in a hospital.

Nancy Jaax Answer: The question was how we would adapt what we did in Reston to a human situation or a human hospital. You have to deal with it by containment and quarantine; you would use exactly the same procedures. The difficulty, I think, in humans becomes in controlling egress. You do not have a problem with monkeys saying, "I think I am going to go home tonight." You have a very controlled situation, so this would be idealistic in the case of a human infection because you have to control comings and goings. You have to deal with the incubation of the disease; it spirals geometrically quite quickly.

Gerald Jaax Answer: I think containment is the big issue. That is double-pronged containment: the geographical containment and then you have to deal with personnel and, of course, that is much more difficult than geographical containment.

Question: It seems that there was a gap in Reston when you described those five individuals: they appeared to be uncontrolled and let back out into society.

Nancy Jaax Answer: I think that you got more the impression of that from the book, but I do not believe that is the case. One of the things that we do know experimentally from this virus is that it is one of the few that I have worked with that you can really almost set your clock by. It has a very predictable course. Typically the animals never shed virus before they are febrile, and these people were monitored as far as temperatures and symptoms.

Audience: That appears to be a gap in the system if we had this type of outbreak in this society as a whole. The question is, is there any jurisprudence that enables us to quarantine without volition?

Nancy Jaax Answer: The question is "is there any jurisprudence that would allow us to quarantine without volition?" I think the CDC basically has the authority to invoke, and I am not an expert on their procedures. That is how that is handled. The danger is that a virus is not recognized.

Gerald Jaax Answer: I think if you got into a situation where a couple of people dropped dead, that piece of it would perhaps be easier to deal with. In this situation the CDC had some people who were on the ground there dealing with this who had extensive experience with deadly Ebola virus in Africa, and they were making the recommendations that dealt with that. One of the nice things about the way the Army was able to deal with this is that we had this separation of church and state, so to speak, so that they were making those decisions. They were looking at the human populations, and we only had to deal with the animal piece. There was clearly a plan on how to deal with the human exposures, and that was handled by the experts who know best.

Nancy Jaax Answer: And I think, retrospectively, you have to say they made the right decision.

Question: I was just curious. I have heard some comments about not wearing personal protective gear for some of the rescuers because those types of patients that are that deadly do not present themselves to your facility, whereas you guys use all of your protective gear to probably the maximum level. I was very interested to see that you guys had no seroconversions whereas some of the other exposures to other chemicals, rescuers did have some symptoms.

Nancy Jaax Answer: That comment was made about the degree of protection that we employed, and I think that is a valid one. I would also tell you that I think that is where the conjunctival, the oral route, possible route of infection, and persistence of the virus in the environment becomes an issue because surgical masks are worn routinely in primate facilities. Obviously we knew this monkey outbreak had been going on. We had identified tissues that were positive up to 4 weeks prior. One of the first questions that people ask is, "Why weren't any people sick?" My point was, well, nobody has cut themselves yet and everybody is under standard primate protection wear because of the danger of Herpes B, so all people who were handling primates routinely wear gloves, outer lab coats, and masks.

Gerald Jaax Answer: It was not really as clear as it is now that there was an aerosol or a particulate method of transmission, as we believe there is now.

Question: The bleach that you use is a common household bleach. What dilution, or did you use a stronger concentration.

Nancy Jaax Answer: 10 percent standard household bleach off the shelf.

Gerald Jaax Answer: Again, I would say that because we had worked with Ebola experimentally, we had lots of confidence in the efficacy of the regimen. That is the beauty of having the kind of expertise that we have. We had people who did this for a living as far as decontamination; they were able to advise us. When I talk about a multidisciplinary team approach, that is very important because it would be unfair to me, a doggy doctor, to have to worry about how we are going to decontaminate when we had a big job to do, and we had other people, and that was their responsibility. We had this very capable interface of

professionals and paraprofessionals who made the whole thing happen. I think that is extremely important to a successful outcome.

Question: Do you have any evidence if Reston protective antibody has any efficacy against Zaire?

Nancy Jaax Answer: The question is do we have any evidence if Reston protective antibody has any efficacy against Zaire. Yes, we do. Dr. Jarling is in the midst of publishing some guinea pig data that indicates that there is cross-protection. Oddly enough I will tell you we have an n of one. We had one primate survivor from Reston that we challenged with Zaire virus; not only was he not protected, but there is evidence that he had a more severe disease. It appears that you get an antibody enhanced mediated lesion. He had much more severe lesions than I have ever seen in monkeys that have only gotten Zaire. So it is something that is going to be very critical to work out by strain as more and more of these substrains. I am very worried; the n is extremely small, and I know you cannot predict on that, although the primate model is very predictive, much more so than the guinea pig. I would say that there is a very real danger.

Question: How long was it before you saw antibody in the four people with serum conversion in Reston.

Nancy Jaax Answer: I am not positive of that date.

Gerald Jaax Answer: That was the CDC's show.

Nancy Jaax Answer: Right. I think that they did IGM and IGG. I know the IGG was some 30 days out. They might have detected IGM around 14 days, but I am honestly not positive of that.

Question: What is the type of the Russian study that you are going to validate?

Nancy Jaax Answer: As near as we can tell from the literature, and I think it is fairly well worked out, but we do not know the exact method. I do not speak fluent Russian so I deal with a translated document. Horses were immunized with killed Ebola virus; they were then challenged with live Ebola virus. They developed a titer IGG. The Russians subsequently took that IGG serum. It is not despeciated; it is horse antiserum straight and crude. Then they injected that simultaneously with Ebola virus into a group of primates. I believe they also did it in a 10-minute time period when they injected the passive antibody in simultaneously with the virus. They did get protection. I am not sure of the numbers. I believe it was 3 out of 3, and when they injected at a later time point, they saved 3 out of 4. I think the jury is out. You have to look when you are giving simultaneous passive antibody in conjunction with virus. You have essentially set up a monkey as an in vitro neutralization test, so I think that test will be told with a later injection of the IGG. However, it is a one-time treatment because it is not despeciated. It can only be given once, and it will have to be done very judiciously.

Question: Would you define for us the coordination process between your operation, when you launched into Reston with CDC, and State and local governments?

Gerald Jaax Answer: Let me answer that one. First of all, I will plead ignorance in exactly what happened because I do not believe either of us were part of that. The scenario as I understand it is when we got to the point where we felt confident that we had a felo virus, Pete Jarling and C. J. Peters immediately went across the street to our command headquarters and General Phil Russell, and they said, "Hey guess what. We have got this real problem." He immediately got on the phone to the CDC and that was the start of the scatter effect. Between the two of them, they pulled together who they believed would be the key players. They arrived the next day while the confirmatory process was still ongoing, and then those decisions were made based upon the assembled expertise that they had. That essentially launched the mission.

Question: Did you and CDC arrive at the scene together? Was that a coordinated effort?

Nancy Jaax Answer: Basically the answer to that question is yes, other than initially; we had made one initial visit. When we came up with the preliminary diagnosis of Ebola we felt it imperative to get fresh kills or fresh deaths, and we also felt it was very important to establish the initial or index case. We had one initial visit to the facility prior to CDC involvement and that was for purposes of confirming the infection. Everything past that time, all meetings were joint.

Question: Have you found any markers that differentiated between Reston Ebola and Zaire Ebola?

Nancy Jaax Answer: The question is have we found any markers to differentiate between Reston Ebola and Zaire Ebola. The only way you can tell them apart is by viral sequencing. As it stands right now, our monoclones generated will not differentiate between species. They will only differentiate that is it Ebola. I think what will happen after the sequencing is completed is that a specific set of primers will be generated that will be able to do that. At this point that has not been completely validated. It still looks like a duck and quacks like a duck, and unless you have the whole picture, you do not know which duck you have.

Question: You did not go to the local government level. I wonder if you were set up with your own medical people, if you had some kind of an accident inside the facility, to evacuate or back up to Frederick, or had you preplanned with the local hospital and the EMS suppliers to deal with the situation there?

Gerald Jaax Answer: Yeah, well, in fact the Service Specialized Transportation Unit, that we merchandised in some of our slides, was right there with us. They were the folks that were on scene and had we had a significant exposure, we would have gone right back to Fort Detrick where we had the containment facility and that . . . Did I misinterpret that?

Question: I was talking about trauma, cardiac, heat stroke, some kind of immediate problem like that.

Gerald Jaax Answer: I do not recall that was part of our planning. The answer to that, I guess, is no.

Nancy Jaax Answer: During this time they did have an animal care taker who did become ill. We also had one that was extremely diabetic, later we had one that cut himself and the local health authorities were involved. There was a CDC person at the facility the entire time. The CDC basically performed all of those interface with the local and State just as they would in any infectious disease. It was elected that patient would be handled in an essentially barrier nursing situation at a local hospital. He was deemed to be severe cardiac risk. He was very obese, he had diabetes, he was admitted to a local hospital, and he was maintained under barrier care.

Gerald Jaax Answer: That was an interesting exercise, by the way. They talked about it in the film clip, but we were there when that happened. We were in the facility, and this guy who was a facility employee, got out of his car, came across the lawn, went down to his knees, and vomited. They called us in on the radio and said, "Guess what. Old Joe just lost it on the lawn."

Nancy Jaax Answer: Fasten seat belts, here we go.

Gerald Jaax Answer: That sort of got our attention.

Question: Out of curiosity, exactly how did you dispose of the dead monkeys, and when the monkeys were transported to the United States were they flown commercial?

Gerald Jaax Answer: They went commercial airlines.

Question: Do you know if there were any other animals that they had been near for a long time?

Gerald Jaax Answer: I think she alluded to the fact that there was a tremendous epidemiological look at where these monkeys had been, what they had been in contact with. The original fear was that they had been contaminated in route in some way. They were also concerned that there would be a potential for infection that would come from the monkeys. The monkeys were on a commercial airline, and that is pretty much the standard way that they are transported. However, I sort of glossed over the slides because we were running out of time here. There have been some interim guidelines from the CDC that have been put out. Subsequent to this, the guidelines that deal with the importation of monkeys have increased the personal protective requirements, the documentation, the testing, the quarantine; now animals have to be quarantined at origin, which is a big change and one that is going to slow it down.

I want to say one more thing to make sure you understand that the system worked here. The doomsday scenario, at least in my opinion, is someone who is traveling wherever it is that he can pick up one of these things. He gets onto an airline, infected but not symptomatic, incubating, and in a 12- or 14-hour flight I think there is ample opportunity to infect lots of people. To me that is the scariest and a much more dangerous scenario than the one that we are talking about as far as importing these animals. We have all kinds of controls there. We have none on this other.

Question: I heard from the Texas State epidemiologist that half of those monkeys on that plane went to Texas.

Nancy Jaax Answer: Yes they did. The virus did occur down there, and the Texas facility was depopulated also. They were all procured by the same buyer, and the shipment was split into actually three different shipments. Animals from that lab went to three different locations. Two labs in the Washington area and one in Texas.

Gerald Jaax Answer: I have one question that sparks something that I want to take a minute to explain that made this sort of a unique exercise. It was in relation to the kind of procedures we use and the suits that we use. This is something I think is important that I did not explain when we showed a BL-4 suite at USAMRIID. There are only a very few people who go into that suite. There is an awful lot of training, evaluation, and justification of the need to get into one of these suites before anybody goes in. In fact, the first time you go into a BL-4 suite, they do not allow you to touch anything. You just sort of walk over and stand beside the wall because they want to make sure that you are not going to slit your wrists or do somersaults or do something crazy that would compromise your own safety and that of the suite. So what I am saying is that in the controlled environment and in the hard-shelled BL-4, everything is redundant as far as safety is concerned; every effort is made to make sure that you do not have an uncontrolled situation. When we went to Reston, I would say fully 60 percent of our team had never been in a suit before. They were animal handlers, and again, some of our people did it every day. So you are very familiar with it, but about 60 percent of the folks that we took down there, many of them 18- and 19-year-old soldier technicians, animal technicians that had never been there before. Not only were we dealing with sort of an emergency situation, but we were dealing with people we were not all that sure of. I think when you look at the results of what happened, it makes it more remarkable in my mind that we were able to go down there, handle all these animals, handle all these sharps materials and not have a documented accident. I do not know of any significant cut that occurred or break in our technique. I think our serology data backs it up. There is a big difference in how we do business on a day-to-day basis at USAMRIID and what we were able to do. But again, it shows that it can be done. It shows that if you have a rational plan and you have the right people you can make these things happen and you do not have to compromise your people. That does not mean that the next time we do it we might not have an accident, but you can mitigate those circumstances through planning in some respects.

Question: I would like to ask how the animals that were destroyed, how did you dispose of them?

Gerald Jaax Answer: Okay, we were asked this. Do you know how many carcasses actually got back?

Nancy Jaax Answer: In the initial group we brought over 50 of those animals into USAMRIID. We did complete diagnostic necropsies on those, in fact Gerry's team would typically finish up about 2:30 or 3:00 in the afternoon, the animals would hit the Institute and then we would do post mortems until about 1:00 in the morning. Everything that we do at the Institute when we work in the BL-4 suite is autoclaved out; all refuse from that is autoclaved out. Then the bag is reautoclaved again, and the carcasses are incinerated. As it became apparent through that outbreak and through Reston 2 that we were not dealing with an agent that would infect humans, they arranged for incineration of those carcasses that we did not need for diagnostics purposes. That was really arranged also with the local State health authority.

Question: When you took the formaldehyde to decon the whole building, how did you deal with the issue of community's right to know and so forth.

Gerald Jaax Answer: The question was, when we got around to decontaminating, how did we deal with community rights to know and alerting the population. When I talked about division of responsibility, this is the good part of division responsibility; that was not my responsibility. We have public affairs officers, and, in conjunction with the people who were really the brains of the operation as far as the handlers of telling us what to do through the chain of command, they dealt with that. The Virginia Department of Health was on the scene, and I think as far as community issues were concerned, they probably were the ones that interfaced on the community level.

I want to say one other thing about the monkeys about the decon. There were two categories of ways that things happened down there. There were a certain number of animals that were obviously ill or clinically showing signs, and any animal that looked like they were sick went back to the Institute after we had taken their tissues and the samples for a complete workup. Those that were not obviously ill, we took the samples and they were disposed of by the Virginia Department of Health in a pathological incinerator under the watchful eye of the Virginia authorities. But they were all incinerated, and the ones that go to USAMRIID go through the double mother of autoclaves.

Nancy Jaax Answer: Big Bertha! as we affectionately call her.

Question: What was the time frame from the time that you were notified that there was a problem until the time that you had discovered, or surmised, that there would not be any human contractures of the disease; then what was the final time frame to the time that you decontaminated the building?

Nancy Jaax Answer: Because there were primate protection rules in force for the animal handlers and at that time we felt most virus is gotten by cut, we felt the time started ticking when one handler had cut himself doing an autopsy. Then it is almost a given that in

7 days you should have a dead human. When that did not happen, I think that was the first point when we were very comfortable that this virus was not going to kill people. As far as from beginning to end; the initial diagnosis, which was made, I believe, November 26, and the final decontamination and everything was done by December 5th or 7th. A very short time space.

Gerald Jan Answer: In the 7 days that we were there, I think by the 6th day, it was obvious, at least we believed, that there were no people who were clinically ill who had worked in the facility. However, I would have to say that did not mean that we did not have to worry about it because the incubation period can go out to 2 weeks or even a little more. Typically, it is pretty regular as far as the incubation period is concerned. By the time we were finished, it was becoming obvious that something had gone wrong as far as the virus was concerned.

Question: In the event that there was fatality to humans, what contingency plans did you put into place to protect the surrounding local population.

Nancy Jaax Answer: That was under the CDC umbrella, and they were in charge of that. This was an unusual situation because the outbreak occurred in primates and involved the veterinary community. Certainly the military was involved in the animal side of the issue, but the CDC was totally responsible for the human side. There was absolutely no question about those authority lines.

I would like to introduce the next segment with a film that will set our scene.

Film

People in the African country of Zaire have died of a mysterious disease. Tonight, official word on the cause.

Sources tell NBC News the test of this maximum containment laboratory at the Centers for Disease Control in Atlanta have confirmed that the outbreak is due to the Ebola virus, one of the most deadly infectious agents known to humanity. The virus kills at least 90 percent of the people it infects through massive bleeding and diarrhea. There is no treatment and no vaccine. At least 60 people are dead and hundreds ill in Kikwit, a city of 600,000 now under total quarantine in the African nation of Zaire. This scene from the film, *And the Band Played On* portrays the investigation of the last Ebola outbreak in Zaire which occurred in 1976. Experts know the virus is transmitted by blood, and they worry that there may also be airborne transmission. The CDC and the World Health Organization are dispatching teams of experts to Zaire. They say it will take several days to determine whether the deadly epidemic can be contained. NBC News, New York.

As survivors mourn their dead, they also realize to their own frightening odds of falling victim. CNN has the latest from Kikwit, the center of the misery.

Mourning dead at Kikwit hospital, keeping their distance from the ward where the victims of Ebola are dying. This is ground zero in the epidemic. About a month ago the first known Ebola patient, a medical technician, was admitted here. Doctors thought he had an intestinal blockage and performed two operations on him before he died. Even then no one knew what killed him. Suspecting nothing dangerous to themselves, most of the doctors and nurses who touched and cared for that patient were also infected and the Ebola virus began to spread. Dozens of medical workers at the hospital have now died. On Saturday the latest was a Zairian nun, her coffin is waiting outside the Ebola ward. Four doctors who have been infected are still alive; this one making the strongest recovery. At the hospital on Saturday, the isolation measures were not impressive. There were no guards at the Ebola ward; medical waste was dumped at the back of the hospital.

It is difficult. Even in the hospital we have many problems to contain the patients in the ward.

These are the conditions surveyed by the advisory team from the World Health Organization, the Centers for Disease Control and the Pasteur Institute. Authorities now say that the Ebola ward is blocked off, quarantined, and rigid isolation procedures are being enforced. In the town there is a relief that international aid has arrived.

This man said many people thought witchcraft was causing the deaths; now they know it is a sickness and can be controlled. The real question is how far the virus has spread beyond this hospital and the hospitals in three other towns in the region where Ebola cases have been confirmed.

As more dead from the hospital are buried, there were widespread rumors that many others had died in their homes and were put to rest without any of the safeguards used in this cemetery near the hospital.

The emergency medical team is now focusing on the crowded streets of Kikwit, sending surveillance teams to find any evidence that the killer virus is now on the loose among the people here. CNN, Kikwit, Zaire.

Victims bleed to death as their internal organs disintegrate. It kills within a couple of weeks, and although not easy to get, it is contagious.

Ebola has been sensationalized in the movie *Outbreak*.

Twenty-four hours, 26 hours, 48 hours.

But the virus is no work of fiction.

It grows in the cells lining the blood vessels, and those cells then lose integrity. They begin to leak, they lose plasma, and the patient goes into shock as vascular integrity is further degraded. The patients begin to bleed, and they eventually die in shock with an overt loss of blood both in the internal organs and externally. If somehow that were to be linked up with its

virulence potential, you would have a virus with a high morbidity, mortality, the infectiousness of influenza.

What we do not know about Ebola: it is a surprising amount. We do not know why it is so virulent for man, and we do not know what it is doing, where it is when it is not causing epidemics. We cannot find it. There is no other virus family, the family that Ebola belongs to, that we have such a profound ignorance about. Many other viruses like influenza use ribonucleic acid in their genetic material. They do not copy it very well, so they have very high mutation rates.

Film over

Admiral Young: Regretfully, Dr. Kziazek will not be able to address us today. I would like to ask Captain Russell Coleman of the Diagnostic Division of USAMRIID to focus his efforts and review some of these issues for us.

2.9 Zaire

Presentation

CPT Russell Coleman, Ph.D.
Chief, Vector Assessment
Diagnostic Systems Division, USAMRIID

The outbreak of Ebola in Zaire: this is an ongoing operation. If you have kept up with the literature at all you know that there are still cases occurring. It is not over with yet. The CDC, and I was a member of a CDC/WHO team, is still in Zaire, and they anticipate this operation will continue, possibly through the end of September. So by no means is it over. We do not have answers yet on some of the goals that we had in terms of identifying that reservoir or the vector, so I cannot give you answers on that. What I will try to give you is an overview of this whole situation.

I am the Chief of the Department of Vector Assessment. What that means is that I am a medical entomologist tasked for this mission. I study insect-borne diseases. I had a very specific mission in Zaire with focus on collecting arthropods that might have been involved in this disease. I was not the team leader and there is a lot of what went on there that I am not directly familiar with. Unfortunately, at 3:00 I found out that Dr. Kziazek would not be able to make it. What I will try to do is give you as broad an overview of this outbreak as I can. Please accept some of my own limits.

I find this whole thing rather surreal, starting with the Reston outbreak in Virginia and then, I think it was a *New Yorker* article coming out, then the book coming out, suddenly there is a movie, and wouldn't you know, bingo, another Ebola outbreak. Certainly the world's attention was drawn to this whole subject; judging by the crowd here, this interest continues. What I would like to do today is give you my perspective on the operation. I want to paint the

picture for you of what is going on over there and try to identify some of the real successes we had as well as some of the difficulties that we encountered.

Part of the surreal experience was getting on a plane with very short notice and winding up in Kikwit, Zaire. Probably by the look of my face, there is a little bit of shock there. This is the CDC team. We were living in the house of a Portuguese entrepreneur, quite different from anything I have been exposed to here in this country. I consider myself very privileged to have been involved in this operation. I got back about a week and a half ago, and I have been belabored by people asking me questions, reporters and so forth, and I keep getting asked, "Weren't you scared to be there?" Yes, there was some fear, but above all it was really a privilege to be selected to go on this type of mission.

I am just going to give you a little background on Ebola, which I am sure you are all somewhat familiar with at this point. First identified in 1976 in Zaire; a very large number of cases, very high mortality rate. Subsequent to this, there have been isolated outbreaks. Mostly throughout equatorial Africa. However, certainly the Reston incidence was an exception to this rule. Based on the limited number of outbreaks, we do not have a whole lot of information on Ebola. The big mystery remains: where does this virus come from in between these epidemics? That is what this CDC team was put together to try to address.

Here is a map of Zaire. As I mentioned, Ebola has occurred throughout equatorial Africa. There have been cases in Kenya, an outbreak in Sudan in 1976, and then in northern Zaire. The current outbreak is situated in Kikwit, which is somewhere down around this region to the east of the capital of Kinshasa. So it is a totally new focus for this disease, at least in terms of recorded presence. It may have been here all along, and we did not know about it. This is one of the mysteries of the disease.

Just a little background on the current epidemic. I spoke with the folks in Kikwit last night. We are currently up to 296 cases; I think that is listed on the next slide. It is still running about 80 percent fatality rate, so it is quite severe. It was first noticed in the Kikwit Hospital. Working back from the cases that they found here, they tracked it to a phlebotomist, a hospital worker. It appeared at that time that this was the index case, and he was admitted around 9 April. The CDC team had three main components. We had an epidemiology team whose main interest was tracking the spread of this outbreak, trying to identify contacts and cases and where it originated. We then had a vertebrae team that was focusing efforts on collecting mammals, birds, reptiles, and so forth to try to find if the virus came from these animals. Then we had an invertebrate team, the entomologists, myself, and Dr. Paul Rider from San Juan, Puerto Rico, and we were looking at the various arthropods, ticks, sand flies and mosquitoes to see if the virus could have come from this source. Extremely important to our efforts was finding out how this whole epidemic originated and got moving.

Here is some background information on this. Again, it was first identified in the hospital, and 70 percent of the first patients were health care workers; doctors, nurses, and so forth. When the CDC team hit the ground in Kikwit, the hospital was basically deserted. There were no medical staff there; there were still patients, and there were bodies in the various wards, there was blood spattered around. One of CDCs first efforts was to get into

the hospital and get it running again; clean it up, get rid of the bodies, and then train the doctors, nurses, and health care workers to work with the containment apparatus to prevent their contacting the disease. I must say CDC put on a very effective operation and very quickly got this hospital turned around to where it became effective at limiting the spread of the outbreak.

Through the work of the epidemiology team, at this point we have traced back this index case not from the phlebotomist in the hospital who acquired it from someone, but to a charcoal worker who was first infected sometime in early January. So several months before this phlebotomist got the disease in April, there were a large number of cases that were going on, just not strictly identified as being due to Ebola. This index case, as I mentioned, was a charcoal worker. We ran into some of his family. It is a sad story: there are 13 family members in this index case's family; 11 of them are dead. We talked with the patriarch of the family, the grandfather, and the only reason he was spared, apparently, was that he was in the hospital at the time with tuberculosis. When he emerged from the hospital, his family was essentially gone. Currently the epidemic has gone through these waves of virus spreading through the population. There have been, as far as I know, five major waves, and although the outbreak has slowed down, it is smoldering there. There are still cases going on; there are cases in the hospital at this moment.

Colonel Jaax mentioned the fact that the Russians have done some work with some hyperimmune serum. There is work going on in the hospital in Kikwit where they have taken whole blood from people who have survived the Ebola and transfusing patients. Although I am not aware of the current status, I believe out of eight patients, seven of those are still alive. Seven survivors out of eight infected is a far cry from 80 percent mortality. There may be something to that, however, there are several problems with this. One is that, as far as I know, some of these patients were suspected Ebola cases they gave this transfusion to. It is not known that they were, indeed, Ebola cases and there is a risk there that you could expose these people to Ebola by giving whole blood of convalescent patients. While they survived, there may still be virus in that blood somewhere, so there is a very real risk there. This is something that clearly needs to be pursued, and some of this work is being looked at by USAMRIID.

Again, some more on what is going on there. We are currently up to 296 cases; still only 233 deaths, so it is slightly less than 80 percent fatality. Again, this is primarily in Kikwit, although there are a number of towns in the surrounding areas that do have cases.

What I would like to do now is outline the rest of my presentation. First, I want to give you an overview of USAMRIID involvement in this operation. Secondly, I want to go into the whole operation: how we prepared for, how we deployed, what went on in Zaire, kind of paint you a picture of what the situation is like there, and get into our redeployment. I am not going to try to focus my talk on identifying some problems, kind of an after-action report. I will try to raise a couple of specific issues that did come to light, and afterwards I am sure there are going to be questions on very specific things.

This was a CDC team. CDC has BL-4 capabilities; however, CDC has undergone some cuts in recent years and their personnel is stretched very thin. You have got Hantavirus outbreaks; you have got this Ebola outbreak; they are being asked to do an awful lot of work, in some cases without sufficient resources. USAMRIID is the other laboratory in the United States with the BL-4 capabilities, and CDC requested support from USAMRIID. It was agreed upon very early that USAMRIID would be playing a supporting role. However, our resources were available to the CDC team. CDC and USAMRIID have a long history of collaboration. Dr. Tom Kziazek used to be Military Officer of Science at USAMRIID, and Dr. C. J. Peters used to work at USAMRIID. So there is a clear link between the two institutes, and we are not shy at all about working with each other.

Some of the ways that USAMRIID has assisted with ongoing laboratory assessment of Ebola virus: what is the ideology, the pathogenesis, and so forth. CDC had a real need to clear up some of their backlog of potential Ebola specimens. Dave Bressler went down from USAMRIID to CDC to assist them in the BL-4 suites and did a tremendous job of helping clear up this backlog. Currently, there are animal inoculations with Ebola going on at USAMRIID. The studies on primates have been mentioned, the Russian hyperimmune sera, looking for efficacy in the primates and this area here, trying to plan for any future outbreaks of Ebola or similar felo viruses.

USAMRIID does have the aero medical isolation team. This is basically an evacuation team. This gives a rough breakdown of the composition of this team. As part of going to Zaire, obviously the safety of the team was of paramount importance. CDC requested support from USAMRIID on this, and USAMRIID made sure that our AIT team was prepared to deploy to Zaire, in case the CDC team or any U.S. personnel there needed to be evacuated. Colonel Eitzen was involved with this, and for several weeks these people were on a 6-hour standby, ready to go and pull us out of trouble if need be. Fortunately, that was not needed.

Again, prepared to evacuate citizens, the Air Force supplied a C17 aircraft. Unfortunately, it would have been about a 16- to 17-hour round trip: that is one of the problems you face working at the far end of the world. Even with these very sophisticated capabilities, getting to us out there in Zaire would have been a problem. It was prearranged that if any had to be picked up, those patients would have been taken either to Germany to the Army hospital or to USAMRIID to the stammer as you already heard about.

What I will mainly be talking about today is our efforts for this environmental assessment and that gets back to the whole question of where does the darn virus come from. We have seen a scattering of outbreaks through the years, but other than that we do not have a clue. Let me say right from the start, it is like looking for a needle in a haystack; we all knew this right from the beginning going to Zaire. However, it was felt this was a golden opportunity. CDC put together what I think was a tremendous team with a lot of capabilities, and they have been rotating people in and out. I was part of the first wave of this team. A second group came about a week and a half ago, and they have got different areas of expertise. They have been able to expand some of the things that we looked at to try to get a comprehensive look at those potential reservoirs and/or vectors.

I had just returned from Peru when I got a phone call on a Saturday morning saying, "We need you to go to Zaire for the Ebola 5 days from now." That is one point that I would like to make: the reason that USAMRIID has a lot of this expertise is that we are out in the field an awful lot. In the past year, I have been out in overseas locations eight times. A lot of people at USAMRIID have similar experiences, so we have the capability to put together an operation and get to the far ends of the world to work with these viruses. We were initially notified that we were going in 5 days. I will say it is fortunate that we did not leave within 5 days; we actually had about 2 weeks' grace period. I realize in a lot of cases that luxury is not available; Colonel Jaax mentioned previously the importance of having all your equipment and resources prepositioned with it ready to go. This whole exercise was very timely from my Department's perspective because we have been kind of selling ourselves as the field arm of USAMRIID, able to get out there in the field and work on very short notice. We had just tried to sell this whole concept throughout the command. But we had not yet positioned this equipment, and it was one of our goals. We had started this process, but there was still a number of items missing. I will say your whole logistics system makes or breaks your operation. I am extremely fortunate in working at USAMRIID; they have got a system that was getting difficult-to-obtain items to me on 12- to 24-hour notice. In my hands and ready to go; I have not seen that anywhere else. So the kudos to the logistics folks at USAMRIID.

Looking back now, I said it took 2 weeks from the time I was notified until the time we got off the ground. Initially we were told that it is going to be a three-person team; two from USAMRIID and one CDC person. We did not know about logistics, we did not know about where we would be living, where we would be working, about food and water, and a lot of very basic questions. The mission, initially, was not totally clearly defined, at least not as clearly as I would have liked to have seen it. Looking back, I can see we had some problems, but we had some real successes. What we faced came down to three things. One, you clearly identify that mission; you get right up front to start. We did that fairly effectively, and CDC had done that. Two, you identify your priorities: what is it going to take to put this mission together? What it is going to take to get a team of eight members from San Juan, Puerto Rico, from USAMRIID, from CDC Atlanta, from Wisconsin, from Belgium, from all over the world to arrive at Kikwit and get out in the field on a very short notice with everything you need is just an incredible logistics undertaking. That we sat down and hammered out some of these priorities right from the start was critical to our success. CDC actually set up a whole logistical effort to support this operation. They had logisticians in Atlanta working on this; they had a logistician in Kinshasa, as well as down in Kikwit. In terms of getting stuff from Atlanta out to us in the field, they had this whole operation greased where things really flowed smoothly. Once you have identified all these things, you put it together, and you hit the ground. We got to Kikwit on a Friday; the original intent had been to have us out in the field working within 7 to 10 days. We arrived in Kikwit on Friday, and we were in the field Friday night conducting our preliminary surveys and actually out there trapping and collecting samples the next day. So it did go very effectively.

Now that I have said all that, the whole deployment issue worked into some snags: this was in getting from our home bases to Kinshasa. The only real problem that I saw there was in terms of air movement. An operation like this has a tremendous amount of baggage, and it is critical to make sure the people setting up to get you from point a to point b are aware of

this. We had probably 40 medical chests amongst the team. When I got my plane tickets I was set to go on the shuttle from DC to New York; if any of you have been on a shuttle, you know it is a small plane. There is no way it is going to take that amount of baggage. Little things like this can really throw a monkey wrench into any operation. If we had not been able to correct this, all of our critical equipment would have been sitting there for possibly a week. Coordination played a key role. As a CDC operation, however, we fell under the auspices of the UN. We actually flew from our various points to Geneva to coordinate with UN officials to make sure we had their full support and got a UN Liaise Passe, which opened doors throughout the places that we worked. It was basically a "stay out of jail" ticket, and it did open up many doors. Once we arrived in Zaire, we spent a little extra time to go ahead and coordinate with the local health officials, the Zairian Ministry of Health. They were informed of what we were doing out there, and they were supporting us fully.

Now I am going to talk about the actual mission and what went on over there. Again, I am a medical etymologist; I will be talking about bugs, mosquitoes, and some of the mammals and all. It may not be of direct interest to you, but really this was our operation. After I have given you this overview and painted a picture of life there, I will get into some specific issues and problems that we did face.

It has been mentioned that Kikwit is a town of 600,000 people. I think that is an overstatement; there are probably 200,000, 300,000 people. There is one paved road in town and this is it. Mostly dirt streets throughout the rest of the town, typical Third-World setting.

Kikwit is fortunate in that it does have a hospital, and it does have a medical clinic and pharmacies available. This is the hospital here. As I said, when the CDC team got there it was in complete shambles. I think that one individual that needs to get credit for this is Dr. Pierre Rolland, who went in, and turned this hospital around. He got it functioning again, and did a great deal to curb this entire outbreak.

Again, this is a typical in town scene. This is the upper-class type dwelling there. Most of what you see is mud huts on dirt streets, no running water, no electricity anywhere to be found. It is a rather picturesque location for a town. It is located along the Kwilu River, a fairly large river. This is typical scenery in the Kikwit area.

Once you got outside of town-this is just a kilometer outside of town-houses were few and far between; this is what you typically would find there.

How did we operate over there? As I mentioned, we were broken down into three teams of which the epidemiology team, while not really part of trying to identify the vector or the reservoir, played the key role. In any operation like this, you are involved in a detective mission; you know nothing about this virus. It could be coming from anywhere in Zaire; how do you pinpoint your efforts? How do you focus things where you may have at least a reasonable chance of success with this type of operation? The epidemiology team went into the hospital and basically started playing detective. They looked at the cases; they interviewed all the contacts; they interviewed family members; they spent a tremendous amount of time trying to put together a picture of what went on. On the wall of the place where we lived they

had this tremendous map listing every single patient and all the contacts. It really painted a clear picture when you saw this just how this epidemic had spread. In almost all cases, they were able to identify a direct human contact where the transmission occurred in a small percentage, and I am not sure of the exact number, maybe 30 cases, they could not identify a direct link from one patient to another patient. I do not think that this means that there were 30 potential index cases, people who got infected from the reservoir of the virus. Here, we are, well after the fact, well after the peak of the epidemic, trying to track down what happened and working with cases where 11 out of 13 family members died. How to track down information is one of the biggest obstacles they identified.

This epidemiology team was identifying cases and it became apparent that there were clusters of cases in town. Again, in most of these it was an individual coming down with the disease and then either hospital workers in the hospitals or family members who were handling these patients coming down with the disease. Just to point out how you are all very spoiled by hospitals in America; in Zaire the nursing care is very limited. If you need a needle stick, if you need to get a drip bag or something; nurses will do that. However, nurses do not do the routine care. Nurses do not give you meals, nurses do not change the sheets, give you bed pans, or clean up the mess. Family members are expected to do that. This is really what leads to this outbreak where you get these clusters and they are all family members. Here is index case's house: 11 people living right there in very close quarters, going to the hospital every day, helping treat that patient and take care of him, and they, unfortunately, came down with it. It should be noted that when we got to Kikwit, there was no panic. As I was looking at some of the video on the TV and so forth; it indicated Kikwit was just really in a mess. That people were extremely upset, and in a panic situation. That was not the case. What did go on is that these isolated clusters of family members became pariahs. I would not say they were stoned by their neighbors; however, they were clearly shunned. People knew that this was something that was capable of infecting them and kept away from them in all cases.

Here is really my best effort at painting a picture of Kikwit. Again, it is a town of 200,000 people with the one paved main street, the two hospitals, an airport on the outskirts of town, and a fairly large river running through the town. Here is index case's house where we started playing detective. We tracked this guy and his family, and we tried to find out everything we could about how this guy lived. In fact, it became a pretty clear cut picture. Here we have Ebola showing up in Zaire. This thing could have originated anywhere in Zaire, so where did this guy live? Well, it was right here. Where did he work? I will talk about that in a minute. Did this guy travel anywhere else in Zaire where he could have possibly picked up this disease? As far as we know, he did not travel anywhere outside this area, so we focused on this man's lifestyle. He lived in town, and every single day he went out to this site. This is not a short distance; this is 9 to 10 miles. He did this by bicycle; he was one of the fortunate few. Most people walk this route, and it is an interesting situation in Kikwit. Here in America, we have commuters living in the suburbs who go into the city to work. Kikwit is the exact opposite; everyone lives in town. Almost no one lives out here, but in the morning there is a mass exodus, hundreds of people walking along the roads. Some of them going this 9 miles to where they work, some of them going even further. In this case, the efforts of the animal team and the insect team focus on the house, the commuter route, and

the field site. We looked at where we thought was most likely and started our efforts on this field site here.

This is what we have out here in the field. I will show you a few slides to show you what it looked like. For any of you who have been to a tropical rain forest, this is not a tropical rain forest. This is an extremely hilly area. It was not that hot. It was up around 85 to 90 degrees but incredible humidity, 100 percent humidity. In a typical rain forest you would have this tremendously thick canopy. None of this vegetation would be growing down here; sunlight would not be filtering down. This whole area that this index case worked in was a palm oil site. A big company owned the rights to this land and were harvesting palm oils, but as part of this they let various people work out here. When I first heard that there was a charcoal worker as an index case, my impression was a situation where this guy was out here all by himself, no one else was around, that the virus could be throughout this area, and that it was just this guy's misfortune that he was working on this site, and he naturally came down with it. But when you get out to the site, the reality is that there are dozens and dozens and dozens of people working out here. The palm oil factory or company has permitted them to use this land. This is all cassava, a crop that people grow and there are people out there growing cassava, there are people growing corn, there are people harvesting manioc plants. Charcoal cutting is a big industry and I knew about charcoal cutting before I went there. These people basically are cutting down trees, cutting them up into small bits of wood, burying them underground, covering them with dirt, and then burning the stuff. It takes about 3 months for them to harvest a charcoal pit and for their efforts they get paid $24 for 3 months' work. It is a very hard life that most of these people live. What I get back to is, was Kikwit in a panic situation? Not really. There are 300,000 people; there were a couple of hundred cases. Most of these people are struggling to eke out an existence and to survive here.

Here are a couple of charcoal workers whom we worked with as part of our efforts to track down this guy. We went out and talked to all these other people working out here in the field and we quickly became familiar with this guy. Although he was 5 months dead, we figured out his routine.

Just some more typical shots here; again, the tremendous trees, which in some cases were 200 feet high, but there is mostly scattered vegetation throughout the area. Here is another of my best efforts at painting a map of what was out there. This was that particular site that was 9 miles out from town, about 6 miles along a good paved road, and then 3 miles on this little bitty dirt track. We would park our vehicles here and then we would walk here. This is about a 30-minute, brisk-paced walk up and down hills; you are sweating, and you are working hard. I thought I was in good shape, and I was suffering. We tracked this guy's life out here. It turns out that this guy was a charcoal cutter. He would take this trip out here every day and he would park his bike right around here. Then he would follow this trail down, up and down these hills and over this big hill down to the site here where he had his fields. Every morning he would spend roughly two hours there. He had a corn field and a cassava field, and he would take care of that. In some cases, his family would come out there with him. Once he was done harvesting these crops, he would head back up here. He had a

site right around here where he was cutting trees down, then that wood would come across the way. He had his charcoal pit right here, so we were focusing our efforts in this entire area.

This whole area is filled with people. I do not know the exact number, but there must have been 50 or 60 people out here. This implies several things: why did these other people not come down with Ebola? It does not sound like it is scattered throughout the area and that it is a common disease right here. Somehow, this index case had the misfortune to come down with this virus. To get back to my original concept, we do not know that it was in this area. This is our best educated guess at this time, and this is where we focused our efforts. It could have been somewhere 200 miles from here. Until we analyze all the specimens, we are not going to have a clue about this. What we have at this point is two teams going out to the site everyday, going out about 6 in the morning and typically working out there through the evening setting traps for arthropods and setting traps for any animals that lived out there. We tried to coordinate our efforts very closely. Here are light traps for mosquitoes; here are mammal traps. When we started our planning for this mission, we tried to look at what we thought were the real likelihoods for being a reservoir or vector of Ebola. Zoonotic viruses are found in animals and are transmitted to humans. We are kind of a dead end host, but they can hit us pretty hard. In a lot of these cases rodents, small mammals, are a reservoir. For a lot of different viruses, mosquitoes or various other body insects are involved, so there was a possibility for either of these two scenarios. We all felt that the arthropods were a minimal risk. Again, there are 50 to 60 people out there; if there are mosquitoes feeding on an Ebola-infected reservoir you would logically have expected more cases. However, with something we know so little about, you cannot go into it really with any hard, fixed rules that you can play by, so our effort was to collect everything we could out there, just take what we can. There is another beasty here: this is a sand fly. It transmits a number of diseases: sandfly fever virus, and a couple of others. These were found out there in the field in fair numbers. Most of the mosquitoes and sand flies are nighttime feeders. Some mosquitoes are the exception, but we did not find them out there in the fields during the day. This is another reason why we do not think the body arthropods like mosquitoes or sand flies were involved. Everyone who was out there in the field heads back to town before dusk. You know, an hour or two before, they are walking back to town and they are out of this environment, so it is probably not a night biting mosquito that is involved with this outbreak. Soon as I say that, we will go back, we will start assaying these specimens, and I will be proved wrong. But that is our gut instinct at this point.

Insect-wise, again, we set up a multitude of different types of traps for biting flies. Here is a trap. You stick a goat under here, insects are going to come in and you go collect them the following morning. Here is a filth fly; this is a fly spitting out something that it has previously ingested. It could conceivably go from a source of a pathogen to a host, or sit on your plate and spit this gunk out and transmit a disease. We do not think it is that likely but needs to be checked into, so we were collecting various filth flies.

One of the questions that people have asked me about is the whole issue of safety. Let me just give you a scenario. There were three teams: epidemiology team, vertebrate team, and the invertebrate team. The epi team was working in the hospital in very close contact with patients with Ebola. Well, that whole hospital was set up as an isolation ward; anyone who

went in there was essentially in this BL-4 condition with the full space suit. When they came out of there they were washed down with a Lysol rinse, and extreme precautions were taken. Out there in the field it is a somewhat different story. You are surrounded by lots of other people working out there and none of them are in any protective gear. They are not getting exposed to the virus but, again, you look at the risk that you are undergoing. The mammal team is out here, and they are collecting what could be potential reservoirs. That is, they are collecting mice, and these mice are in a live trap. The mice are there overnight urinating and defecating. It is clearly shown that the dry urine can be a source of the Hantavirus. So the mammal team took precautions. When they went out to collect traps, they were typically wearing double gloves, and those traps immediately went into a double-sealed bag. But they were not in BL-4. In these conditions of lets say 90 degrees, 100 percent relative humidity, up and down hills, they would be risking heat stroke in a heart beat. As a matter of fact, one of the South African scientists there was medivacked out. I think it was a combination of malaria and heat stroke, but he had some big problems. You cannot always be in this idealized BL-4 condition when you are working out there in the field. So you devote your protective measures to deal with the situation that you face. When they are working with dissecting mammals and so forth, they are in this protective gear. Out there doing normal daily work, you would not expect to find them in this outfit.

The mammal team focused on bats, lizards, snakes, anything out there, birds, the whole 9 yards. The efforts then expanded to cover additional areas, not just the field site but the route going to town and the in-town areas: working with the animal markets in town, collecting various type animals, monkeys. This is a civet cat. Monkeys are not found in the Kikwit area. They are not found for about a day's journey around there; however, people do hunt them and bring them into town.

Just to give you a quick summary of where we now stand, and this is as of last night. There are about 25,000 arthropods that have been collected of various types, and they have got a very comprehensive animal collection: mammals, birds, bats, going down the list here.

To summarize, at this point, it is an ongoing operation. It has been a lot of hard work, and where we stand now is we have got these tremendous numbers of specimens that have to be processed. This is where the real work starts. This is going to be a long, drawn out operation. It is not within weeks that we are going to have an answer. I anticipate that months down the road we will still be working on these specimens.

Question: What about HIV as far as the immune serum?

Answer: That is a very real question. They had a quick baseline, basically a dipstick type test that they were screening that serum with for HIV-the accuracy and specificity of the test is not known-as well as other potential pathogens. They felt they were doing the quickest screen they could, ruling it out. Above that they could not really say. They felt that these people, if they really had Ebola, if there were a 80 percent chance of dying, most of these people would be happy with any possibility of being cured.

Admiral Young: Before the final speaker, we have a very brief video to show, and I think it will set the stage.

Video

We were trying to figure out why after 6 months of antibiotics, Joan was still sick. Lab work showed, beside staph infection, Joan had another bacteria in her system: VRE or Vancomycin resistant enterococcus. As the name implies, it has already become immune to Vancomycin and every other antibiotic, but in Joan's case, the organism made one more unexpected evolutionary leap.

We were flabbergasted by what we saw.

What they saw is on this culture plate smeared with Joan's bacteria; a disk of Vancomycin is in the middle.

You can see the only place on this plate that the bacteria are growing are around that disk containing the Vancomycin. They need that Vancomycin in order to multiply, and if they do not have that, they will not grow. In a sense they are using the Vancomycin as food.

The bacteria not only resist the drug but have evolved to the point where they thrive on it. In response, doctors stopped giving Joan Vancomycin, and the bacteria died. This was the first time ever scientists had seen the new bug, but it will not be the last.

Bacteria are really phenomenal, and they have an amazing ability to adapt to whatever stresses we inflict upon them. Not only do they develop resistance to antibiotics, they even find ways to use that antibiotic to help them grow.

That adaptability worries scientists. Many believe a death-dealing, all-resistant apocalypse bug is inevitable.

I cannot see that this problem is going to get better; all that is going to happen is that it is going to get worse.

The Centers for Disease Control think so too. They have a special team on standby to race to any emergency. How serious is the war with these organisms? As serious as survival.

Microbes have been around for 3 billion years, and we have been around for a lot less time than that. They have shown their ability to survive and adapt to change, and the question is whether we can.

End of video.

Admiral Young: For those of us who are physicians in the room, it is well recognized and understood that there are few people who start research in medical school that leads to a

Nobel prize a few years later. Our next speaker, Dr. Joshua Lederberg, was on leave from Columbia and Yale when, through his definitive experiments, he opened up the field of microbial genetics. He was so excited by that work that he never finished medical school, to our regret, but he went on from his Ph.D. there to Wisconsin where he built the Department of Microbiology, to Stanford where he founded the Department of Genetics, to Rockefeller University where he was President. I want you to know one other thing: Joshua Lederberg's mind is that of the mind that jumps from mountains to mountains. So we jump not only from Escherichia coli, where he discovered bacterial conjugation in its early years, to working in a soil bacillus, bacillus subtilus. Now he has jumped to being a leader and a spokesman for both microbiology medicine and science at the policy level. He has spent a great deal of his most recent career worrying about the fields of emergency preparedness, as it relates to emerging infections, and terrorism, as it focuses on chemicals and biologicals.

2.10 The Challenge of Emerging and Re-Emerging Infections

Joshua Lederberg, M.D.
Nobel Laureate
The Rockefeller University

We have been exposed to a good bit of this approach to the issues of emerging infection. More importantly, we have had a setting of the scene by a number of the speakers today, so I am not going to repeat for this audience what we mean by emerging infections.

My approach is a bit more along these lines. I had the privilege of chairing a very extensive study of the problem to try to help establish the consensual, scientific, and intellectual base that there is a problem, where it is to be located, and what steps are needed to cope with it. I will say a little bit about the content of that, but, this afternoon, I want to try to get a broader picture of the intersection of the broader questions of natural infection, particularly the emerging diseases, and how they relate to the question of preparedness against biological terrorist attack, which is the sharper focus for the current meeting.

While we may have pronounced victory over infectious disease in the United States and many would say perhaps a bit prematurely as some current experience has indicated-this has never been the case and never thought to be the case in respect to health in the world. Infectious and parasitic disease remain the preeminent source of death on a global basis. If there is any folly, and there is plenty of it to go around, it is in the view that we can isolate ourselves from the global condition. We will never have eradicated infectious disease in a single country as long as we have the kind of international traffic that we do. The statistics I have seen are that 1,000,000 people every day cross an international boundary by air alone. We certainly live in one world in a fashion which is an unprecedented condition for the human species.

The major contextual factors that have contributed to emergence. I have already indicated number one, the sheer demographics and human behavior: the overall size and density of the world's population, its stratification into zones of affluence, ease, and

abundance of travel on the one hand; and dire poverty, a very rapid spread of disease, and very poor hygienic conditions on the other. If we were to design a system most likely to result in the initiation of pandemic foci, having them fester, and then spread rapidly throughout the world, you would have a description of the current status of the world. Then we have specific factors: the settlement of new habitats, new ways and places for humans to interact with vectors and with reservoirs of disease. The two basic threads of emerging infection have to do on the one hand with the evolution of new microbial forms and, on the other hand, there is changing ecological circumstance where an organism that has been adapted, often to an animal reservoir, will have had a degree of evolutionary equilibrium that has led to very limited or even no symptomatology, but crossing out of the species of origin into the human species and giving rise to severe disease in that case. We had several examples of both of those circumstances.

We are in a race. We have eschewed biological evolution as a principal factor in our own change, and better that we had unless we are willing to pay the price. Natural selection is not a very pretty thing when it is applied on a large scale and sufficient to give rise to rapid genetic change. It takes one genetic death to move some iota to a change in gene frequency. Since the establishment of the human as the kind of species that we are, the intelligent animal that uses wits rather than fang and claw as our way to compete in the world, it is our wits against their genes which are the essentials of the race.

It is often said not to worry: the eventual outcome of a viral host relationship is a gradual convergence towards equilibrium. Viruses that are too virulent will kill their host rapidly and burn themselves out. Mutations will accumulate that will favor those variants that are less aggressive. There are many zoonotic adaptations that indeed will express that. The trouble is eventually is a very long time, and there are fits and starts involved in the evolution of that adaptation. Imaginably we are seeing this with the HIV virus: that is, a speculation that this is what is actually happening. This is almost certainly a zoonosis which has had much more severe symptomatology in the human host than it did in its simian origin. Perhaps we are seeing a few cases of HIV that have longer latent periods and are somewhat more benign and may give some protection to the more aggressive strains of it. Fifty million deaths down stream, 30, 40, 50 years from now, perhaps it will have acquired a certain mutual adaptation in the long run if we are not so unlucky that there is another deviation and a different mode of spread or a variant of even higher aggressiveness. Our predators have a habit of indulging empiric victories which may not affect the long-term equilibrium outcome but can result in severe outbreaks that can have really dire consequences in the short run. I will give an outstanding historical example of that near the end of my talk.

I would like to impress on you the multiplicity of ways in which microbes can evolve. I spent most of my career studying microbe genetics, so forgive my preoccupation with that particular focus. Microbes are unusual in a number of respects, especially if you want to contrast evolution on the scale that we are accustomed to and what we see in the microbial world. For one thing, the population sizes. We are dealing with moles of organisms out there: you know, 10 to a very large exponent, a single test tube, 10^9, 10^{10}, 10^{11} organisms just to start. Imagine what you have got out there in the biosphere, compared to our puny some billions of human organisms. Generation times are measured in minutes in contrast to years.

There are intrinsic instabilities in microbial genomes. They have thin walls, and live in seas of chemical mutagens exposed to ultraviolet light. The germinal core does not have much protection from them. We have in the RNA viruses systems of replication of the genetic material which are themselves error-prone so there is opportunity for genetic variation in these huge populations, populations that can be decimated over and over again and yet are by no means destroyed. Evolution occurring very quickly is on a scale just totally incommensurate to anything that happens in the human experience. What you saw in the film about the evolution of adaptations for Vancomycin resistance and even Vancomycin dependence is just one of innumerable examples of what is happening every day right under our noses. The most obvious manifestation of genetic variation is in the area of antibiotic resistance because it is the most obvious there, and the selective pressures are the most recent and the most pointed. It probably plays a role in the variation of virulence and many other factors as well.

In addition to the intrinsic instability of microbial genomes, they are also very clever in their genetic communication networks. They exchange genetic information quite promiscuously, not only amongst closely related organisms, but from species to species and even from kingdom to kingdom. We have the movement of genetic factors: for example, the F-plasmid that is habitual in E. coli can be transferred, at least in the laboratory. We have in the agro bacterium a bacterium that habitually transes genetic information to plant cells. We have in our own genomes hundreds of integrated retro viruses that are testimony to our past exposure to that kind of genetic information being assimilated into our genomes. We have, in the mitochondria of every cell of the acarid organism, the remnant of a bacterial genome that once invaded some ancestral host and that may very well have had a precarious parasitic existence before the symbiosis finally settled down. Billions of years later, 3 billion years later, our very ability to exist as respiring organisms is a consequence of that early genetic interaction. But what is of most immediate interest to us is the ability of viruses to mingle with one another and exchange information, and the bacteria to exchange plasmids, often with virulence factors or with antibiotic resistance factors, quite promiscuously across many biological boundaries.

What is our answer? It is our wits, the technology, it is coming. We have such vast new marvelous opportunities in biotechnology that is emerging from molecular genetic interventions. We are unraveling so many of the aspects of the nature of virulence, defense mechanisms, new pharmaceuticals coming along that even as clunky as it is, our existing system, 20, 30, 40 years from now is going to provide answers to the very difficult challenges that we have presented to us in this field. It is the mean time that is a matter of very great concern, and the technology is only barely in time to catch up with the demographic situation which is, I think, what underlies what I can only describe as a crisis in our relationship with microbial predators.

If there is one single thing on the research agenda that is vitally needed, I think it is a new campaign to look for antiviral chemotherapy. That is, we are going to need agents that have a broader spectrum than vaccination is going to be able to provide us. There are hundreds of agents already out there that are potential sources either of natural emergence or, even more wickedly, by malevolent attack. We are never going to be able to have all of them in hand as a means of prior protection or of post-attack treatment. We can deal with most

bacterial infections pretty well with the repertoire of chemical; chemotherapeutic agents, and antibiotics that we have available. We are losing ground in some areas, I think, that will be a temporary setback. We will catch up; new antibiotics will be developed. There are economic and institutional issues involved, but we will get to them. We need to do nearly as well with viral infections, and we are very far behind. But with the new insights that we have from biotechnology, it is not an impossible task though there has been such great discouragement about it that there really is only a modest level of research going on in that area. If there is one research key for the problems that unite us at this meeting today, it would be antiviral chemotherapy.

Let me come to "It could happen here." The culprit I have no doubt about is influenza. This is just our customary annual cycle. You will recognize this as from one of the MMRs from not very long ago. I was a little startled when I looked at the scale because I had not really fully understood how important influenza was in its common, everyday, garden variety as a component of mortality in our population. I had been accustomed to seeing it and saying, "Well, 1/2 percent, something that affects only people at great risk; very young and very old. " Yet here we have a typical seasonal cycle which is oscillating between 5 and 6 percent of death certificates in which influenza is mentioned. It is often not given as the primary cause of death, but the reason I believe that it matters that flu is in the environment, even if it is a complication of other infections, is what happens in epidemic years. It matters enough that in those years where there have been particular epidemics, we get very substantial excursions from the routine cyclical baseline. So it is not just a matter of, well, if it were not flu, it would be some other bug that would do people in who have other complicating illnesses. It matters that flu is there. If we had more appropriate protection against influenza, just the common customary today's varieties of this virus, it would have a significant effect.

Here is this nasty critter. It has been very thoroughly analyzed; it is totally sequenced; it is divided into eight RNA segments. We know most of the genes that are present in this virus. You will notice that there are two principal epitopes; the NA, neuraminidase, and the HA, hemoagglutinin, 'that are involved in the characterization of the virus and provide the neutralization antigens in the vaccines that are customarily produced. Genetic reassortment between different varieties of influenza is occurring all the time and is responsible episodically for major shifts in the antigenic characterization of the virus and probably very familiar to almost everybody in this room. That is the reason we have to have rather drastic changes in our vaccine production every 10 or 15 years. The major sero types that have been identified as a consequence of these substantial antigenic shifts are summarized in this particular history. Between those shifts we have a drift. This is the accumulation of point mutations in either the H or the N epitope; they require smaller adjustments from year to year. These are connected to changes in the antigenic quality of the virus. They have a great deal to do with the efficacy of the vaccines at any given time, but they do not by themselves greatly alter the virulence of the organism. You do not see big changes in those cycles. But it did happen. In 1918 there was another variety of flu. The descriptions of the disease that we see back to that time match almost exactly what you have heard about Hantavirus: sudden, fulminating pneumonic involvement and quite high mortality. It did not reach the 80 percent or so, but it was a very significant one and involved a great many young people. In 1918 we lost half a million Americans to this viral infection. It would be almost three times that number today. Twenty-

five million people around the world died from that strain. By posterior reconstruction, by looking at the serology of people who had survived that event, we can infer that one of the sources of that flu was of a swine origin, and it is sometimes called the swine influenza. Where the special virulence came from, the pneumonic involvement, we really do not know. We do not have the virus in hand at this moment. It is something that we will either have to wait to see it happen again or PCR. There is one other hope; there is a nascent field of paleovirology that we see from time to time where organisms or traces of them can be found in mummies or other ancient specimens. I am just hoping that the people who are digging up remains in Siberia and looking for traces of smallpox that may still be buried in the permafrost with some of the people who have been put away under those very special climatic conditions, will also be on the lookout for remnant influenza in that particular refrigerated storage. I am also hoping that there would be, as these people would very much welcome, a higher degree of international cooperation and participation in that kind of event.

What is the intersection of this with problems of vulnerability to biological attack? First of all, the emergency response is very similar, but there are some differences. I do want to stick to something that did happen; I am not speculating about the possibility of that kind of a circumstance. It does not happen overnight; it is a matter of something taking hold and spreading over intervals. It will not be months under current conditions of travel, but it will be weeks. It will not be quite as explosive as a sudden aerosolization of a large volume of material at one particular site. Even that being said, there is a great deal in common between the two. We may face an importation of a new strain of Ebola that is less kindly in responding to containment. It could easily have happened if there had been a traveler. There were some precautions taken, but the comment was already made, with the speed of international travel today, one could go from any point on the globe to any other well within the latent period of almost any viral infection that you care to mention. It is just sheer luck that we did not happen to have a traveler from Kikwit show up in New York. Then only a week later, there were sprinklings of cases that might be anywhere at all; it is just a question of how rapidly and how far those had spread. Once you do have the possibility of fulmination, then we have to bring in the same kind of machinery of consequence management whether it is a matter of natural origin or of personal malice.

There is some correspondence but some distinction in the repertoire of the agents likely to be involved in natural outbreaks and in terrorist action. There are more differences than there are commonalities in any rational view of the matter. But how rational are antagonists likely to be if we look at something like Aum Shinrikyo as a prototype in that regard? One use to think of biological warfare as something that was calculated to have a particular military objectives, to take out some target, to effect troops, maybe even use at a strategic level. But who in their right mind would want to initiate a disease that would continue to spread and might then even flash back and make occupation of the territory impossible and so forth. Even with that limitation we perhaps have passed some kind of a threshold. Nevertheless, by and large, most threat analysis for biological attack does focus on agents that could be fairly easily produced, that would not ordinarily spread from person to person, but where there could be an attack, and as would be the case in the use of an explosion, you have got a target, you have got a probability of kill of the individuals who might be directly exposed. So you do something like aerosolize anthrax spores, and you have the ideal prototype. That is usually the

model of what one thinks of for biological warfare, and countries have played with that on a very significant scale. For a period during and since World War II, all the major super powers were, in fact, experimenting with, accumulating, and stockpiling anthrax with potentiality of its use in warfare. We do have a biological warfare disarmament convention: the very first disarmament treaty that has been negotiated in the post-war period. We have taken down all of our stocks, and Western Europe has taken down all of theirs. It is somewhat problematical what has happened in the rest of the world, and verification and enforcement of the treaty remain a significant problem right to this very minute including the headlines about just exactly what Iraq has done with its stocks which, happily, were not deployed during Desert Storm. Anthrax is not a likely problem as a matter of natural spread. It would have to be a very substantial alteration of the biological properties of that particular organism, and it illustrates that there are many differences between the world of biological warfare and emerging infections as there is commonality.

On the other side of the spectrum, the Bio Safety Manual for the NIH lists about 400 viruses, many of them different varieties of hemorrhagic fever, which require substantial precautions in their management in the laboratory. About two dozen of them are of such high hazard that they have actually killed personnel dealing with them and are, obviously, easily transmitted in the aerosol route. Those are the ones that require BL-4 and BL-3 containment. Behind them are several hundred others, almost all zoonosis, almost all arthropod-borne. They do not represent major threats to human safety with the exception of incidental contacts that humans might have, but if people are willing to go to the trouble of cultivating them and aerosolizing them, there is not one of them that does not represent a substantial possibility for being used in a BW attack. Most of them we do not know very much about. We have vaccines for a tiny proportion of them. Fortunately, it requires substantial sophistication to grow them, so it may be a little while before we have to face that on the screen as what we have to anticipate for civil defense. In the intervening interval of agents, there is a great deal that can be seen that are shared in the list of possible emergents and of possible use in attacks.

The research agenda is very similar. We face essentially identical problems in our requirements for early detection, verification of the presence of an agent in the environment, and with the development of management techniques and of the new therapeutic tools to cope with these sets of infections. There is entirely common ground in that regard.

I was trying to think of what one would have to say on an occasion of this sort. I have to tell you that trying to promulgate a sense of urgency and concern in this area of biological defense has been very troubling to me. It is something I have been occupied with for really quite a few years, but I have never really wanted to go very public with it. I felt I did not want to be the one who would be showing recipes about how to do it or putting ideas in peoples' heads. The more one says about how terrible the threat is, in my view, the more likely you are to inspire some crazy, or some not so crazy but with other motives of their own, to go ahead and do it. It has proven to be very difficult to get very much interest on the part of executive and political authorities on a matter that does not appear in the daily press day, in and day out. Perhaps Aum Shinrikyo has done us a favor by breaching that barrier and making it obvious that there is a very serious threat; that terrorists would use any means imaginable at their disposal; that questions of levels of sophistication, the production of

material, and so on are not a significant barrier. We do have to be dealing with them in a very serious minded way. Today's conference is a testimony to that.

There is one aspect of the relationship between naturally occurring infection and biological attack that I did find a historical precedent for, and I would just like to show that on the transparency which I have on the flip chart. I am going back to the 14th century on this one. It is a little bit of history that may not be widely known. In the year 1346, Kaffa, a Genoese trading post on the shores of the Black Sea, was again besieged by the Mongols. The Mongols had swept across Asia and were on the borders of Europe. During the same time, a vast epidemic of bubonic plague had rapidly spread through the Mongol Empire. In the words of Gabriele d'Mussio, a contemporary chronicler, the Tartars, "fatigued by such a plague and festiferous disease, and stupefied and amazed observing themselves dying without hope of help, ordered cadavers placed on their catapults and thrown into the city of Kaffa, so that by means of these intolerable passengers, the defenders died widely." The Tartars, in infesting Kaffa, were practicing a crude but very effective form of bacteriological warfare. They threw their own corpses into the fortress; it was completely infected. The Genoese evacuated Kaffa, returned to Italy, and started the Black Death in Europe. You can trace the beginning of the epidemics to the ports where their ships landed. Common sense would say it probably would have come across the European Asiatic boundary by another route, but this is the way that it happened. The best statistics we have on this circumstance show that the plague of the 14th century wiped out between one quarter to one third and 1/3 of the population in Europe and had enormous consequences in history. If you translate this into modern terms, when we see circumstances of dire epidemic of disease and devastation, I do not think we can take it completely for granted that people suffering from that disease, who are potential bearers of infection, are always going to take a completely benign and cooperative view with respect to their relationships to the rest of the world. They represent sources of infectious material that one might be hard put to grow by some other source. I would not want to have imputed the ability to grow Ebola virus per se, in the hands even of a group as sophisticated as Aum Shinrikyo, but I just have to remind you that natural infection does provide innumerable opportunities for that kind of malice as well as what is possible in the current world.

Question: As you look at this ability that the Mongols unleashed, do you see any tendencies in today's world from the political situations that might make biological weaponry, crude or sophisticated, more likely or less likely than before?

Answer: I think there has plainly been a moral barrier to the use of these weapons, even in the hands of the most vicious antagonists. I do not thoroughly understand it; it is not always consistent with the rest of their behavior. These are weapons of such potency, such ability to destroy that I do not know how else to account for the fact that they have been so little used up to the present time. I think very bad habits get started by example, and I think we have seen that during the last few months. I think the rules of the game may very well have changed in that circumstance. I am very worried that a threshold has been passed in that sense, it can have divergent effects. Such revulsion about an event of that kind may discourage some people who may have malice in their hearts in other respects from going about it, but my fear is that it will be exactly the other way around, folks looking at ways of

hurting their neighbors will see a very good example in what is seen there, and that we will see more and not less of that kind of an event. There is a view that the use of biological agents requires such a high degree of sophistication and that has been the barrier, and I just used the Tartars and the catapulting as a very strong counter-example in that regard. If somebody wants anthrax, they do not even have to grow it. Anthrax is endemic at a low level almost everywhere around the world in bovine populations. All you need is a dead cow.

Question: Does Dr. Lederberg or any of our Japanese visitors have any comment on the press report that Aum Shinrikyo sent a live mission to Zaire in 1992 to try to get Ebola.

Answer: That is the first I have heard of that allegation, but it sent shivers down my spine.

Question: I believe you indicated that, in terms of dealing with emerging infections, perhaps our greatest danger is from antiviral chemotherapy. What would you suggest was our greatest need in terms of dealing with biological terrorism?

Answer: I think it is even more important for the terrorism issue because the repertoire of potential agents that might be invoked is so large that it is far less predictable. We have Ebola as an example right now. There is no therapy available for the felo viruses. I suppose it will not be too long. If there are another couple of outbreaks, there will be plenty of motive to try to develop a vaccine. We have to be very unlucky for that to be impossible. I do not know how many more like that there are around, but let me take another example, the next major flu shift. We have to have a major reconstruction of the way we go about vaccine development for a new vaccine to be available in time to have a significant impact on the course of a 1918-style epidemic given today's world of travel. For those purposes, virus chemotherapy would be very desirable. We probably need to understand a little better how well existing agents would apply in those circumstances. Everyone will admit that they are pretty crude and far from what we would like to have. The more general statement is more versatile, more quickly adaptable modes of therapeutic management, if we can hype up how we get to our vaccines, that would be one necessary approach; but post-attack is too late, and we need viral chemotherapy to deal with that.

Question: One of the problems of public policy has been trying to stimulate the antiviral production; the companies at least say there is not enough market in it. It is not something that we should get into, and they raise the same thing on passive immunization. Shouldn't you be doing something?

Answer: I still need to understand that a little better. I am astonished that we have this lapse in bacterial chemotherapy. I would have thought that the market mechanisms, the evident need, and the fact that antibiotics have got to be rolled over from time to time, would have taken care of it. The industry has done a marvelous job until just about now in responding in that fashion. It could be that we have leaned over so far backwards on the regulatory side and on the tort side that agents have to be absolutely perfectly safe and absolutely perfectly effective before they can get on the market that the cost of entry is so high

that everything has become an orphan drug problem. Nobody knows better about that issue than you do, Frank. Do you have some comment about that from your past experience?

Admiral Young: I have been struggling with this because it seems as if the regulatory burden is just pushing it where it is. The antibiotics, unlike the penicillins and the some of the large cillin antibiotics, are now occupying very small niches. As they occupy very small niches, that recovery of profit has decreased, and there is charge for the $100,000,000 drug and the search for that rather than the drug that may be really medically much more important.

I cannot blame industry for looking for $100,000,000 drugs, and they are going to put most of their money where they can get that kind of return. It ought to be possible for drugs that have a market of $20,000,000. Maybe a substitute for vancomycin would not be more than that when you came down to cases, but then the cost of entry ought to be comparable to what the expected returns will be; so that it is not an either/or sort of situation. We have been spoiled. Penicillin was a miracle drug: wonderful efficacy, total safety for all intents and purposes, and did us very well for a very long time. It has set a standard of expectation about what we look for in drugs. I think there is enormous opportunity for new technology. Regarding the chance of getting another penicillin, I am not that optimistic.

CHAPTER 3

DAY 3: THURSDAY, JULY 13

3.0 WELCOME

Admiral Young: It gives me great pleasure this morning to introduce my boss, Dr. Philip Lee. Dr. Lee has had a long and distinguished career between the two times he has been Governor. He is the First Assistant Secretary for Health. He is now serving as Assistant Secretary for Health and is an expert in not only public health, but the whole concept of the health care system that we have been looking at. During the time that he has been Assistant Secretary, he has lead in the revitalization of our office, and much of what you see that led to this conference today is the direct responsibility of Dr. Lee's leadership. Immediately after the blast in Oklahoma, Dr. Lee made it possible for us to launch and the first DMAT was on the ground ready to treat people within 3 1/2 hours. This set a record for us of bringing in volunteers from the private sector to help other people at a time of need.

3.1 The Importance of Cooperation in Responding to the Consequences of Chemical and Biological Terrorism

The Honorable Philip R. Lee, M.D.
Assistant Secretary for Health
Department of Health and Human Services

I want to welcome our guests from Japan, Canada, and the UK, and I want to particularly thank Josh Lederberg for joining us in this meeting. Almost 15 years ago Josh wrote a paper which talked about newly emerging infections. This was when everybody was concerned about AIDS, and he said, "That is just the tip of the iceberg." There were not a lot of people who paid attention at that time, but he has persisted. That issue is now evident to most people, including the general public. He has also been very important in terms of influencing Federal policy both in the Department of Health and Human Services and in the Department of Defense particularly around issues of bioterrorism. It is a particular pleasure that somebody who has contributed so much was able to personally be here with us. I must say it is also a pleasure for me to be here and to join with all of you to discuss the Department of Health and Human Services commitment to cooperation and to discuss some of the challenges we face in responding to the consequences of chemical and biological terrorism. I cannot stress enough the lessons we have learned in recent years regarding the importance of a coordinated effort; that is at the Federal level, interdepartmental, interagency; then a Federal/State/local government cooperative effort; and then a public/private effort in which the DMAT teams play such a crucial role. It has been interesting since I have been Assistant Secretary this second time beginning in July of 1993; it seems that we have faced one disaster after another. I do not think I am the cause of those, but we have had floods, hurricanes, earthquakes, freezing winter storms, and then, of course, we had the tragic terrorism attack in

Oklahoma City. Unfortunately, we are now facing another disaster: the House Appropriations Subcommittee, for reasons that are not at all clear to me, have eliminated the funding for the Office of Emergency Preparedness in my office. They are funding the Office of Adolescent Health, and the Office of Women's Health, the Office of Minority Health, the Office of Research Integrity, but they are not funding Emergency Preparedness. They are proposing that they not fund International Health, Refugee Health, or Health Promotion and Disease Prevention. I must say that this kind of policy decision in the appropriations process is one that I find incomprehensible. It sends a message from Congress that this is not an important activity, when we face issues like possible terrorism at the Olympic Games. The message that sends, not only to my own staff and to staff in other Federal agencies who have cooperated with us, but to DMAT teams at the local level, to State disaster coordinators, is a very puzzling message to me.

When the Public Health Service formulated a new vision for Public Health in the 21st century, we identified six areas of focus; one of those was to respond to disasters and to assist communities in recovery. To meet the needs in this area, the Public Health Service relies on many disciplines and partners ranging from other Federal agencies and individuals in those agencies, to State and local governments, and private sector groups. We have also been working on the disaster side particularly closely with DoD, the VA, and the Environmental Protection Agency. In this area we have also been working very closely with the National Security Council and the FBI, among others. I must say that this cooperation among Departments and agencies across the Federal government in this area could not be better. Would that we were able to achieve that level of cooperation in a number of other areas as well.

The relationships that are established form the capacity to both plan and respond in prevention and then in dealing with the consequences of terrorism. As an example of this cooperation in the public/private sector, The President has cited the National Disaster Medical System as a model. The Disaster Medical Assistance Team, and the Disaster Mortuary Assistance Team, which tragically also must come into play, have contributed greatly to the care of victims and to the sensitive management of the dead in both manmade and catastrophic natural disasters. Seventy-two Federal coordinating centers are run by the VA and the DoD to ensure bed availability in hospitals participating in this effort. Through the efforts of Major General, now retired, Joe Gray, medicines and nurses have been provided by the VA from these centers to aid during recent disasters. The DoD has provided the capacity to evacuate patients and invaluable air transportation capabilities, while FEMA contributes mainly through its training efforts and serves as the overall glue that often puts all the pieces together in a natural disaster. Under James Lee Witt, we really have a revitalized agency and, as a result, a revitalized Federal capacity to respond to natural and manmade disasters.

Another type of cooperation has been between the military and the commission core of the Public Health Service. We are able to provide a rapid mobility and cross-training of personnel during tabletop and field exercises that enable the services to work very smoothly together in response to these disaster situations.

I am pleased today that DMAT commanders such as Susan Briggs from Massachusetts, Dr. Lou Stringer from North Carolina, and John Hoyle and Dr. Conrad Salinas from my

home State of California are participating in this seminar. I am also pleased that Dr. Ron Banks who is our Regional Health Administrator in the Public Health Service in San Francisco is here because of the importance that Ron attaches to the effort. And Jeff Rubin is here who heads the California Emergency Response and the DMAT teams. There are eight of them in California. Not only was their response in the Northridge earthquake outstanding, but they have undergone some more recent preparedness exercises which have demonstrated their capacity. With what they have done with limited resources, I think they are a model for many other States to follow.

The National Medical Disaster Medical Services illustrate the concept of partnership which we really need if we are going to be successful in dealing with the consequences of chemical and biological terrorism: the public health, medical, and environmental consequences of such attacks, as well as in the crisis management state, not only in that early stage, but in the followup. It is absolutely essential that we have this kind of cooperative, collaborative effort. First and foremost is the planning and first consciousness raising, this conference is partly an effort of the beginning of a planning process and then forging the teams that have to work together. The President, through Decision Document 39, directed the Department of Health and Human Services to provide a lead effort in this medical public health response. This includes FEMA, DoD, VA, Department of Transportation, Department of State, the FBI, which plays a critical role in this area, and the Environmental Protection Agency. We have developed an integrated consequence management plan, and this plan will be followed by detailed plans to develop and ensure cooperation at every level; local, State, and Federal, in order to make sure that we have the capacity to respond promptly and appropriately.

Just as infectious diseases ignore international borders, terrorist attacks may also involve not just a single nation, but many nations. Data presented at this seminar has clearly reinforced our need to strengthen international cooperation. The trilateral working group on chemical and biological terrorism that is meeting in association with this seminar has made a good deal of progress in this area in the past 3 years; however, much more needs to be done. In the future our international coordination should focus not only on prevention, but also on the consequence management of terrorism as well as many other important tasks that we have already begun to address such as the biological agents that might be at issue, surveillance systems, the medical research that is necessary, and then the issue of these newly emerging infections, which potentially pose very serious threats.

Meeting the multiple challenges posed by terrorist attack requires really unprecedented cooperation in planning and execution. No agency, no sector or government can succeed alone in responding to the consequences. The Department of Health and Human Services stands committed to being a full partner in the efforts you are gathered here to discuss. I am sure that in the coming months we will be able to convince Congress of the wisdom of that fact and the absolute necessity of that fact. I am sure that before the appropriations process is completed, we will be able to communicate a very clear message and, hopefully, we can reverse the decisions made by an appropriations subcommittee because that capacity must exist: it must exist in the Department, it must exist at the State level, and it must exist at the local level. We are committed to being full partners in that process.

Question: Dr. Lee will you have the opportunity to make a personal appeal to the membership of the House Appropriations Subcommittee to reverse the process.

Answer: The Secretary will be doing that. She will be meeting with Mr. Porter either this week or the first of next week before the *full* committee convenes and will be conveying to him, as well as to Mr. Livingston, but particularly through Mr. Porter, the importance of this, the absolute necessity of funding this effort and, hopefully, will communicate in a way that will reverse that even in full committee. It is not easy to do once the appropriations subcommittee has made its recommendations to the *full* committee, but the Secretary is absolutely committed to doing this.

Question: Dr. Lee, what was the rationale of the committee for cutting the funding, and what alternatives, if any, are being considered to fill the gaps created by these cuts?

Answer: The decision was incomprehensible so we have no idea what the rationale was. We are merging my office with the Secretary's office. The potential rationale was you could fund that out of the other funds in the Secretary's office, but they also cut those funds. I would say without any doubt that if Congress does not provide a line item, the Secretary would have to fund it out of other funds in her office, even though those funds had been reduced. Because she gets a fairly general appropriation for management, it is possible then to reallocate those resources. That would mean stopping doing some other things, but this is such a critically important area that I am sure she would do that. Is it very important from my standpoint to have a Congressional commitment to this activity. Without that, it does not send the kind of message I think needs to be sent to our partners in this process, and that is what the Secretary will be trying to communicate very strongly to Mr. Porter. That message, of course, will go to other members, not only of the subcommittee, because this was totally unexpected; I mean we did not think that this was an issue at all. It had not been raised in earlier discussion with Mr. Porter and the Secretary as a possible issue, so it really came as a complete surprise to us and will be included among her priority areas that she will be discussing with him, as I say, either tomorrow or Monday.

Question: I do not know if you want to comment on this or not, but I have been pondering the incomprehensibility of attacks on public health and wonder what kind of rhyme or reason could be found. It just makes me wonder about the following: we had what was a very controversial nomination for the Surgeon General, and we have a set of issues that is founded on. The Public Health Service is taking great leadership with respect to problems of tobacco, as we know, their interest was very much opposed to that, and more recently the Centers for Disease Control has taken a look at violence in ways that cut across other lobbies. I think there were basically some very positive steps and health promotional activities of the public, of examples on the coast where people have very parochial interests, and I think this may be their revenge.

Answer: In this time of no increase in the domestic discretionary spending which The President agreed to when they reached budget agreements in 1993, so we had no increase in discretionary spending in 1994 or 1995. It was difficult enough to get resources, and then as

you cut the budget, competing for resources is even more difficult. At that point there are very powerful commercial interests, whether it is the gun lobby, whether it is the tobacco industry, whether it is the polluting industries, whether it is the biotech industry, who want to deregulate or cripple the capacity for regulation. With the Center for Injury Prevention, for example, at CDC, because they have funded research in universities on the role of guns in violence, they were threatened with extinction. Fortunately, that did not happen in this appropriations process. The National Institute of Occupational Safety and Health (NIOSH) which supports research and training on occupational injuries, its budget was cut by about 40 percent. Again, the excuse was, "Well this duplicates what they do in OSHA," but, in fact, it does not duplicate. Those very strong political, commercial interests are now in a sense like the tobacco industry which is the leading opponent to public health. It will be interesting because JAMA, the *Journal of the American Medical Association*, will be coming out this week with a series of articles based on documents from the University of California San Francisco library, describing the record of Brown and Williamson over more than a 30-year period with respect to their knowledge of nicotine and its addicting capacities. The editorial which will accompany this series of articles is one of the strongest editorials I have ever seen to appear in JAMA regarding tobacco and the tobacco industry. I think you are right that those powerful interests are now the threats to public health. Even when people say it is somebody's behavior: "It is not guns that kill people, it is people; it is not the cigarette companies, it is somebody who blows out second-hand smoke," we often tend to blame the victims. That way you shift the focus of blame from the source to the victim of the problem. I must say that we have pondered a lot in the last couple of years about how to communicate these messages to the public. In some areas I think we have done a relatively good job on newly emerging infections, and I would say your leadership in this area is critically important. That is an area the public and Congress have begun to understand. But in the mid-1980s, when Ed Mason, who was the Director of CDC, proposed increased funding to deal with tuberculosis as a newly emerging problem, Congress refused to fund it. Five years later when the problem had become extremely serious in New York and Los Angeles and a number of other urban areas, the funds finally began to come forward and we began to get some appreciation of the problems beyond the AIDS epidemic. There has been a lot of attention directed to that. But some of these other threats are potentially equal or greater a threat, even as huge as the AIDS epidemic is currently, in the future. I think part of it is public education, and part of it is to change the way in which funds are provided to support Congressional elections. We need campaign financing reform; I do not think we can get health care reform until we have campaign financing reform. I said that in January of 1993. We still do not have either one, but I think these are key issues for us and things that all of us need to be thinking about. We need to develop ideas as to how we can inform the public about the nature of these problems and what needs to be done about them.

Admiral Young: What I would like to do now is call on Dr. Lynne Wall. She is from the Ministry of Defense at the Chemical and Biological Defence Establishments (CBDE) at Corton Down. Lynne is heading the UK delegation that is here for this seminar. She will say a few words about her program and will introduce the briefers.

3.2 National Consequence Management Concepts and Plans for Chemical and Biological Incident Response - United Kingdom

3.2.1 Dr. Lynne Wall
Ministry of Defence
Chemical and Biological Defence Establishment

I would like to say on behalf of the UK team what a pleasure it is to be here and participate in this very timely and important seminar. It is particularly nice for me because I have reacquainted myself with colleagues from the trilateral on CB counterterrorism. I would like to make a point about collaboration before I introduce the other members of the team and go on with my briefing. I think collaboration plays an extremely important role in the whole area of chemical and biological defense and issues to do with CB counterterrorism. One of the key reasons that it is quite difficult to get peer review of those sorts of studies and research that we do is because much of the work is classified and not available in open literature. I think the international collaboration actually provides that extremely well.

What we are going to do in our 24 minutes or so is that I am going to talk briefly at the beginning about some theoretical work to do with casualty levels. Then there will be two more speakers who will give you an insight into some of the aspects of medical planning for consequence management. Those speakers are David Morgan-Jones who is from Defense NBC Center in Salisbury and Tim Marrs from the Department of Health.

At Corton Down we are the UK home office to undertake various aspects of research and hazard assessment in the whole area of CB counterterrorism. It is some of those theoretical studies I would like to touch on first before handing over to the speakers who will talk about more practical issues.

We actually have a study underway this year to try to address likely levels of casualties in terrorism scenarios and then to consider what the implications are for consequence management as a result of dissemination of chemical and biological materials. I had a lot of sympathy earlier in the week with some of the comments that Jim Genovese made about really focusing on what the true issues are in a CB terrorism event, and that has tailored much of our thinking which has gone into the trilateral. In the UK, what we try to do is think very much in terms of particular types of scenarios. In order to get to consequence management, we need to have an idea of the likely casualty levels, and in order to get that, we need to have some idea, make some judgment, of the types of scenarios that we will face. While this is not a perfect science in any way, it does try to tailor our thinking. We have looked generically at types of attack as shown on the left here in terms of open-air scenarios, confined space, water and food contamination. In terms of the UK, we have tailored our thinking in terms of a town center, a large indoor building such as a airport terminal, but it could equally be a metro subway system, or food contamination at the point of sale. What we have then done is think quite broadly about the types of hazard that we might face in a CB terrorism event. To think not only about CW and BW agents, but the full range of toxic materials that might be available to the terrorist. We have looked at over 100 chemicals. We have looked at poisons and

pesticides, as well as CW agents. We start with a very broad canvas but the idea is to try to think what materials are likely to be of particular utility to the terrorist in that scenario. We try to hone this down by looking at particular factors: toxicity or measure of effectiveness of the material; how easy it would be for the terrorist to acquire a particular material; how easily it could be disseminated in the particular medium that we are concerned about; and what the considerations are for the terrorists in terms of handling safety and deployment of the material to the target. I am not going to go into the detailed findings because that has all been disclosed through the trilateral process but, for example, if we take a water scenario where we started with about 100 potential materials, we hone it down to a hit list of about 32. While that is still a considerable problem, it is maybe not as big as the one we started with. That just gives you a flavor of how we try to get our thinking into line. From there what we are trying to do is come up with representative casualty levels. It might be interesting just to show you the approach that we are using here.

We have actually acquired the UK population census database which we now have on computer. This shows a portion of greater London with varying levels of population density. What we can then do is take output from out computer models, which predict the downwind hazards from chemical and biological materials and superimpose that, which does not look particularly impressive, but then we can amplify that and get some idea of a casualty distribution. Again, the contours here reflect differences in population density for that area. This is actually a release of anthrax; a liter or so. If we go up to about 20 liters, which is what we heard is not difficult even for an ad hoc terrorist to produce, we are probably looking at something like 150,000 lethal casualties alone. From this kind of thinking we are trying to develop a theoretical approach to consequence management. We are doing this by looking at appropriate operation analysis techniques including soft approaches, some of which are listed here, so that we can begin to build up a sensible plan.

My last few foils just illustrate the approach that we are taking. They are very busy, for which I apologize, but it is hard to get the message across. On the left of this view foil we are looking at all the factors that might be involved in an incident, in a release, whether we are looking at intervention at the devise, looking at pre-release, post-release problems, the materials, the target population. Out of that will flow the casualty levels. On the right we are looking at some of the factors that we need to address in terms of developing a consequence management capability and the government departments with which we must develop an integrated approach stretch from Health to Department of Environment, Public Health Service, and so on. We begin to build up a preliminary list of the facilities and functions which are important and the types of requirement we need for contingency plans at all levels. This reflects some of the thinking we have heard already.

We are using a particular technique called multi-attribute utility analysis. I am sure that is not particularly important. This is a very common-sense approach to tease out and look at the key factors. Here we take as an objective minimization of casualties and that would include CB and non-CB, and then to formalize the thinking in terms of what kind of areas of policy do we need to develop: medical policy, pre- and post-exposure policies, evacuation policy (do we evacuate or shelter), decontamination policy for food and water. Out of this will flow particular areas that we need to focus on.

Just to finish. Some of the key areas that we are looking at at the moment are listed here, and it is no surprise that the top-level organization in terms of policy and planning is at the top. We need to develop a systematic and integrated approach. I have already mentioned evacuation and sheltering, and we are commissioning a particular study to address that issue. Most importantly, there are the factors effecting medical response pre- and post-exposure. That is just a glimpse of the theoretical side we are taking to the problem.

3.2.2 Dr. David Morgan-Jones
Major, Defence NBC Centre

I would like to give an overview of what we are going to try in the UK to tackle this particular problem (visual 1, page 3-10). I think the key emphasis here is to identify the strengths that already exist within the UK, maximize those, identify where the weaknesses are, and then try to put plans in to ameliorate (visual 2, page 3-10). I am just going to go through a general overview and then look at our chemical and biological responses on a fairly global level within the UK. But I would like to make a plea: let us not forget nuclear. There is a historical anachronism that C and B have always been closely linked, but in terms of casualty management, they are different. You can certainly link N and C because in the practical handling of casualties it is very much the same; B is different.

What do we have? Like all good things in medicine, prevention is the primary objective. What we are looking at is good planning, intelligence surveillance, international cooperation, perhaps legal mechanisms to reduce the capability of terrorism or terrorists using these particular mechanisms.

What about the incidents (visual 3, page 3-10)? Really we have got two phases: we either have an attack device or we have got one that has actually been released. Tokyo has been a classic example of both of those with the release of sarin and the discovery of cyanide.

All I want to do is reiterate and emphasize what has already been covered here in terms of the significant difference between C and B (visual 4, page 3-10). C occurs, in terms of time, almost instantly. You have a potential mass-casualty situation that needs to be dealt with immediately. Whether you know if a device has been released in terms of biological or not, what you do have is a time delay. What we are trying to do is to detect it as far down this curve as we possibly can because that is the only way that we are going to minimize the mortality and morbidity. In terms of reaction (visual 5, page 3-10), if a device is discovered (visual 6, page 3-10) in the UK, it is a military police response. If it is chemical/nuclear, we are really dealing with a hazardous material incident, and in terms of biological, we are looking for mechanisms of detecting that this has actually taken place and who has been affected. We already have in place plans to counter the specific problem of a device that has been discovered. In terms of the management of N and C (visual 7, page 3-11), what we are dealing with is a major hazardous material incident. We have concentrated on specific CW weapons as potential chemicals, but it could well be industrial chemicals. I think the key problem is how do we handle contaminated casualties and enable our emergency services to decontaminate or resuscitate at the site, and then move those casualties back, preferably clean,

to our hospital facilities (visual 8, page 3-11). We have spent some considerable work recently trying to overcome these problems, and I think we may well have succeeded, while keeping it fairly simple and cost-effective. In terms of consequence management, we try to identify the key components (visual 9, page 3-11) that take place, or need to take place, in terms of reaction to an incident. These are no different than an everyday HAZMAT incident. These are the consequences responsibilities: we have the specific actions and who is responsible in terms of the fire, ambulance, and police service, for dealing with these specific types of problems. For example, what you need to do is determine the downwind hazard prediction, and that will then lead on to your population protection mechanisms.

Within the UK we actually have a very capable and effective disease surveillance system. It is working on a day-to-day basis, and it is extremely comprehensive. Patients who would be presenting in our country, primarily to our primary care physicians, particularly numbers that we would see in a BW incident (visual 10, page 3-11), would rapidly begin to filter back to hospitals, to the consultants in communicable disease control; these people here. Mostly they have a series of statutory powers under the local authority; laws to deal with epidemics. That information would rapidly move up the public health system to the Department of Health, where we actually have a weakness which is that there are no formal links between that and major incident planning, and between that and the home office, who would take a lead in this type of incident.

In summary (visual 11, page 3-11), we already have in place a series of very capable building blocks. We just need to enhance this capability, and what we require, perhaps, is to follow what the U.S. has done in terms of the Central Planning Agency, improve the communication between the building blocks and the command and control elements, and spend a bit more time on the strategic training as opposed to the tactical training, the lower-level training which is already taking place.

UK Concept & Plans for C/B Incidents

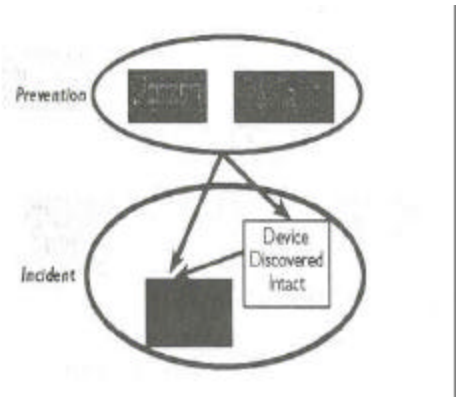
Visual 1

Aim

- **Strategic Overview**
- **Chemical Response**
- **Biological Response**
  (NB What about Nuclear?)

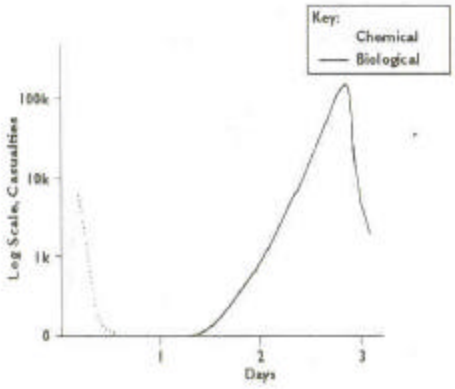
Visual 2

Strategic Overview



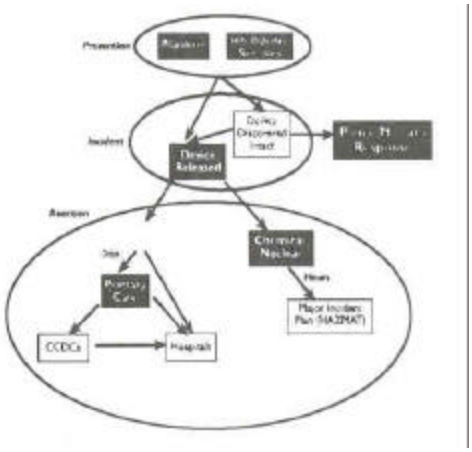
Visual 3

C/B – Time and Casualty Differences



Visual 4

Strategic Overview – Response



Visual 5

Device Discovered

- **National plans already exist to cover this eventuality**

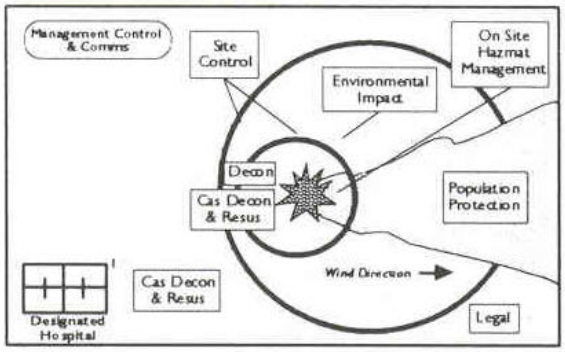
Visual 6

Management of N & C cas

- **N/C incidents may result in potentially large numbers of contaminated individuals some of whom may be injured**
- **N&C = Major HAZMAT Incident**
- **Each Region already has in place Major Incident plans**
- **Work is presently being undertaken to adapt these plans to cater for the major HAZMAT Incident**
- **UK Key Problem - How do we handle contaminated casualties?**

Visual 7

Major Incident Plan – Key Components

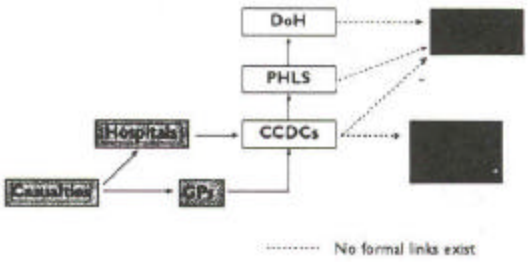


Visual 9

Major Incident Plan

Visual 8

Management of B



Visual 10

Summary

- **The "building blocks to manage these incidents exist within the UK**
- **What is required:**
  - **Central planning agency**
  - **Improve the:**
    - **Communication between the building blocks and control elements**
    - **Training**

Visual 11

3.2.3 Dr. Timothy C. Marrs
Department of Health

I am going to talk specifically about the Department of Health's response to a CBW incident (visual 1, page 3-17). The response is based on a concept we call integrated emergency planning (visual 2, page 3-18) or, sometimes, disintegrated emergency planning. Then I will talk about our concern with parts B and C of this: preparedness and response. Preparedness means stockpiling things like pralidoxime, and having it is, in risk assessment, a response of what we would actually do as a medical service.

From the preparedness point of view, our main concerns are adequacy of hospital beds, intensive-care units, enough drugs, and enough ambulances. Ambulances in the UK are part of the Health Service. The response and what we are concerned with is saving life (visual 3, page 3-19), preventing escalation of the event, relieving suffering, protection of property, and allowing forensic investigations to go ahead. One point I would like to make here is that the response (visual 4, page 3-20) from the Health Services point of view is not fundamentally different from a chemical incident of an accidental type from a factory or for a terrorist event, and that is the basis of our planning. Furthermore, quite a lot of the parts of the response are not the responsibility of the Health Service at all; the Health Service is simply responsible for the medical response. Many of the differences between the UK and USA are based on the fact that our system of health care delivery is different. The National Health Service in the UK supplies health care free at the point of delivery, and it covers hospitals, GPs, and ambulances. It is actually divided into four territorial administrations (visual 5, page 3-21) for England, Scotland, Wales, and Northern Ireland, respectively, but in fact, people can move from one part of it to another. This simplifies in some respect the response to any major incident.

The Health Service actually deals quite frequently with chemical incidence (visual 6, page 3-22), as you can imagine, because Britain has a largish chemical industry. We put out a handbook of emergency planning guidance for the National Health Service. I am sure you are not interested in its number unless you want to obtain it, but it does show that we have thought about these things. The National Health Service actually deals quite frequently with this sort of problem, albeit not from a terrorist point of view, but there is no fundamental difference in medical response. In addition, we have things called "HEPOs " (visual 7, page 3-23). Now that sounds like a new sort of land mammal, but is an acronym for Health Emergency Planning Offices. There are people in each English National Health Service region and in Scotland, Wales, and Northern Ireland, whose task is to plan ahead for major incidents of one sort or another, including chemical incidents (visual 8, page 3-24). Because they are appropriately vetted, they can be given classified briefing on matters such as CBW terrorism, and they can plan ahead for that without telling their colleagues and the people who work for them in the Health Service who, of course, will not be vetted, what they are up to. There is a conference of the HEPOs twice a year, chaired by the English Health Department, during which they are given updates on things like hazard assessment and assessment of threats of terrorism and such. Then there is the question of aid from the military authorities. It is possible that in a major terrorist incident it might be necessary to call upon the aid of the armed forces and even of U.S. forces who are stationed in England. This happens quite

frequently in the Health Service. Because of its centralized nature, for example, most neurosurgery in the south of England is done in one hospital in the middle of London. Patients from road accidents and such are often transported around by helicopters, and the helicopters usually belong to the Royal Air Force (visual 9, page 3-25). There is a system called MACC (Military Aid to the Civilian Community) and MACA (Military Aid to the Civilian Authority) sometimes called the Medical Aid from Canada and America, which is arranged through departmental official and will supply helicopters and such. Obviously, the need for these depends on the size of the incident.

The actual nitty gritty of the arrangement are that the appropriate army districts would be contacted. This is a map of Great Britain showing the districts of Scotland east of England, Wales in the west and south, and London, and the flags show the army headquarters.

I would like to talk about treatment of these incidents and make one or two rather obvious points about the treatment (visual 10, page 3-26). This is quite a serious view foil. One of the most serious problems we have identified is the number of intensive care unit beds; they are what would fill up most quickly. One of the problems is although in Central London there are quite a large number of ICU beds, some parts of the year they are quite full. One can hardly go up to Mrs. Brown who is recovering from her neurosurgery and say, "We are going to unplug you from the respiratory because something nasty has happened on the Underground." With the specific instance of the use of organophosphates, a large number of ICU beds would be necessary in any major incident simply because of the requirement for respiratory support and for cardiac monitoring.

We have done a study of likely antidotes that would be necessary (visual 11, page 3-27). There are surprisingly few compounds which could be used in the situations we have been talking about and have antidotal treatments. Organophosphates is an obvious one: atropine, oximes, diazepam (we have spent a lot of time thinking about that), cyanide, dicobalt edetate, sodium nitrate, sodium ferro sulphate, hydrogen sulfide, and, again, sodium nitrate. For many of the compounds that have been mentioned earlier in this meeting, sulphur mustard for instance, phosphene, there are satisfactory antidotes that could be sensibly stockpiled.

I would like to talk about one or two aspects or organophosphorus antidotes. We all know atropine, oximes, pralidoximes, mesylate, tabin, obidoxime, and diazepam may be used. Atropine does not provide much in the way of problems (visual 12, page 3-28). It is widely held in hospital pharmacies; its main use and its value from the point of view of organophosphorus poisoning is it is dispensed in such small quantities; small ampules. The oximes present a little more of a problem in the UK. Pralidoxime methylate or pralidoxime methane sulphonate is the one we use (visual 13, page 3-29). It differs from the pralidoxime chloride that is used here. It is held in special centers throughout the UK based on a statistical analysis of the amount that has been used from the reserve in the past 5 years. The result of this is that London has large quantities; the Orkney Islands, where they do not go in for killing themselves with organophosphates, only have small quantities. On the other hand, likely scenarios for terrorist use of chemicals are, of course, in the big cities. There are two other considerations with pralidoxime: one is that the European Association of Poison Control Centers has recommended recently much higher dosing schedules (visual 14, page 3-30) for pralidoxime

salts than have been previously used. This, on the face of it, sent our calculations of need in the centers completely awry. However, this is based on recommendations from heads of poison control centers who were treating insecticide poisoning (visual 15, page 3-31). It does not seem to have been appreciated properly that insecticides, organophosphorus insecticides are non-volatile, highly fat soluble compounds with rather slow half lives in the body, whereas almost the opposite is the case of nerve agents. I do not think that this recommendation necessarily affects one's dosing schedules for nerve agents. The other point is, only the initial doses need be held near the site of the incident. You have got the whole of the rest of UK to call upon, you have got a firm in Paris making another pralidoxime salt called methyl sulfate and, of course, you can get it from the USA by plane using the Concord or something like that. There is one situation where organophosphorus poisoning from chemical terrorism might differ from insecticide poisoning: that is, whether one should stockpile obidoxime or not. Obidoxime is a dispyridinium oxime made by Merck and stocks are not widely held in the UK. The reason for that is that the World Health Organization has considered that obidoxime is toxic and it does not seem to have any particular advantages in the treatment of organophosphorus insecticide poisoning. But everybody knows who deals with organophosphorus nerve agents that it is effective against tabin, whereas pralidoxime salts are not. One of the questions we have got to sort out is whether we should hold stocks of obidoxime.

Lastly, I would like to say that one likely outcome of a not very well-organized chemical incident would be the inappropriate use of antidotes. We have had a number of incidents in the UK where people have been over atropinized after organophosphorus poisoning and where people have been given dicobalt vegetate, the cyanide antidote, when the amount of cyanide they have been exposed to has been very insubstantial, and the result of that has been that they have become suffering from cobalt poisoning.

Question: Are you supplied personal protective equipment from the military stocks in the UK, or is there a separate system and separate technology for that like in the United States?

Answer: The emergency services have their own protective equipment. Certainly on the hazardous materials side our fire services are extremely well-equipped nationally with enclosed breathing apparatus, and our problem is trying to integrate ambulance service to utilize that capability. At the hospital levels we tend to use industrial masks and splash suits though it is fairly patchy at the moment. It is an area we need to tighten up on.

Question: Because of the time lapse in the biological response that you very clearly showed on your graph, because of the need for hazard protection, there is a great need for proper deployment in biological detection. Could you comment on your strategy for deployment.

Answer: I shall be quite frank with you. I think deployment of detectors is particularly useless, and we have been having a lot of debate about this. I certainly think within the national arena to use detective systems is not an appropriate mechanism. The only way that we are really going to be able to achieve a capability against this is to accept that if it

takes place we are going to have fatalities. What we have got to do is respond quickly, to minimize mortality and morbidity by picking up quickly.

Question: I understand the sense of futility about the universal deployment of detectors. I hope we do not come to any point where we need them the way we need smoke alarms for fire incidents. One particular wrinkle, one of the most insidious things that is going to happen, is the combination of an explosive attack with biological or chemical contamination. The fact there has been that big boom means that there was a target and there was somebody very wicked who wanted to do a lot about that. I think the sense that every such incident should be accompanied with an effort to ascertain whether the explosive was also associated with chemical or biological contamination is something that ought to be more widely appreciated. It does not require the universal advance deployment, but it does require access to and sensitivity to those kinds of detectors.

Answer: We have had about 25 years of constant terrorism. It is a shame to say, but we have a considerable amount of expertise in determining the differences between the types of explosive mechanisms used. Certainly our ordnance people are very quick to pick up whether this is a typical or atypical explosion. I think there are markers that you will be able to detect, to give you a clue, whether something extra has been added to the explosive device.

Question: But how can you possibly do that if you do not have the specific sensors?

Answer: I think it is the actual structure of the weapon system itself, you can reasonably tell what has been deployed or used. If you have got an incident on the chemical side, you will end up with additional casualties; so that is your immediate detector. On your BW side, it then comes down to risk assessment, which is not my particular area, but are you going to use an explosive device to deliver BW weapon systems when there are much more capable systems to do that?

Question: I am sorry, I did not make my point clear. A very cost-effective way, if I want to maximize damage, is to use an explosive and to spike it with an additional quantity of biological material so as to greatly complicate the task of rescue, of recovery, of repair. The PR effect of that should be quite evident. I do not see how in the world that would affect the nature of the explosive. If you do not have specific biological detectors, the harm will be done, and you will have ignored the possibility of there being associated biological damage. It is not that this is the primary mode of dissemination; it is just to make even worse the original explosive attack with small additional effort.

I think it is the cocktail issue that Dr. Young spoke about yesterday. I think it worries everybody that a terrorist might not necessarily be a purist when it comes to what is being weaponized or released. It is like a truck going down the road without a hazardous materials placard: it does not necessarily mean there is not hazardous materials in that vehicle. It is a worrisome thing.

Answer: It is indeed.

Question: With all the ongoing debate about oxime therapy, it seems as though only atropine and diazepam are uniformly agreed upon. Are there any trilateral studies aimed at the idea of standardizing oxime therapy which could result in economies of scale for purchases by our governments?

Answer: I do not think so. One thing that may happen naturally is that there is a new oxime HI6 which the Canadians have been developing. If we can get it through our equivalent of your FDA, then we will certainly be looking at that. Maybe it is the use of a new oxime rather than standardization of oximes that already exist that may be the way forward. But whether that happens is not a question I can answer.

GENERAL PRINCIPLES OF UK

EMERGENCY PLANNING

1. Concentrate on effect not cause.

2. Response should be an extension of every day activity.

Visual 1

INTEGRATED EMERGENCY PLANNING

a) Prevention, e.g. — Prevention of Terrorism Act

b) Preparedness, e.g. — stockpiles of pralidoxime; hazard/risk assessment

c) Response

d) Recovery

Visual 2

RESPONSE I

AIM

1) **Save life**

2) **Prevent escalation**

3) **Relieve suffering**

4) **Protect property**

5) **Enable forensic and criminal investigations.**

Visual 3

RESPONSE II

Police → **Scene/Site(s)**

[Overall control and co-ordination]

Firemen → **Hazard(s)**

NHS → **Medical Response**

[Other specialist units]

Visual 4

UK NATIONAL HEALTH SERVICES

4 Territorial Administrations

[England, Scotland, Wales, N. Ireland]

Provides comprehensive services and is free at the point of delivery.

Hospitals, GPs, Ambulances

Visual 5

Handbook of Emergency Planning Guidance for NHS covered by HSG (93) 24. Deals with major incidents; including HSG(93)38 for chemical ones.

NHS deals with chemical incidents fairly frequently.

Visual 6

HEPOs
(Health Emergency Planning Officers)

Each English and each territorial administration region; given special classified briefing; are aware of special problems and can plan accordingly.

Conference of all HEPOs and health departments 2 x year chaired by Department of Health (England)

Visual 7

The Home Office is the lead department for:

Civil Defence

Civil Emergency Planning

Counter-terrorist contingency planning

Visual 8

DISPERSAL

Most serious - least distance

Ambulance → Neighbouring ambulance →
Military Assistance → Other (US) forces

MACC (MACA) arranged through Departmental Officials. Helicopters etc, Cost etc afterwards.

IP Police, Fire Service O.K.
Ambulance?

Visual 9

TREATMENT

Dead – No treatment

Seriously ill – ICU

Less seriously ill – DGH

ICUs necessary for respiratory support, cardiac monitoring

Problem: ICUs can rapidly fill up.

ANTIDOTES

ATROPINE

OXIME

- **pralidoxime mesylate**
- **obidoxime**

DIAZEPAM

Visual 11

ATROPINE

Not generally a problem

– widely held by hospital pharmacies

Visual 12

PRALIDOXIME (1)

Held in special centres, amount based on statistical analysis of use plus a contingency reserve,

i.e., London – a lot.

Orkney Islands – a little

Likely scenarios are in the big cities.

Visual 13

PRALIDOXIME 2

Considerations

(1) EAPCC recommends higher dosing schedules than previously

(2) Only initial doses need be held locally: rest of UK, Paris (France), USA by plane.

New use for Channel Tunnel!

Visual 14

Name	Abbreviation	Mwt	Firm	Initial Dose
Pralidoxime Chloride	**2-PAM**	**173**	**Ayerst**	**1-2g**
Pralidoxime Methanesulfonate	**P2S**	**232**	**UK Gov.**	**1-3g**
Pralidoxime Methylsulfate	**—-**	**248**	**SERB**	**0.4g**

Admiral Young: Paul Dubrule will be our next speaker. Paul is the Director General of the National Security Directorate in the Department of the Solicitor General in Ottawa. He is heading their delegation to this seminar this week.

3.3 Canada

3.3.1 Paul Dubrule
Director General/National Security Directorate
Department of the Solicitor General

This is a new field for me. I have only been in this position for just under a year so it is a great opportunity for me to meet all of you and to learn a great deal.

Having heard what the UK delegation just had to say, one thing struck me: it is that in Canada we are fortunate to have had a lack of terrorist incidents with which to deal, not just CB, but of any sort. While we have expertise certainly in national defense in dealing with CB matters, and in the departments of health and in provincial government departments as well, this lack of real fear that such incidents could arise in Canada unfortunately led to a sense of complacency which gave rise to a feeling that we were under prepared, should an incident actually occur. That sense of complacency was certainly shocked out of us as a result of events in Tokyo and Oklahoma City. The result has been a number of changes in the system in Canada. The first of these is in my Department, the Department of the Solicitor General. A Counterterrorism Division has been greatly expanded; and this group has a threefold mandate. It is to be the focal point in Canada for development of counterterrorism policy. This is one area where we have been lagging behind our colleagues to have a strategic vision as to how to deal with terrorist incidents both of the CB nature and just general terrorism. Second, this group is to take the lead responsibility in the organization and preparation of all our exercises. Third, one thing that has previously been mentioned here, this group is to have the responsibility for the coordination of all counterterrorism issues within Canada, with the various jurisdictions, and with foreign states; that is extremely important in dealing with trilateral matters. Under the first branch of this mandate, we are now in the process of revising and updating our counterterrorism policy and our national counterterrorism plan to take into account current realities. Our plan was developed a couple of decades ago with no reference to chemical or biological incidents, so we now are requiring those drafting the plan to make it up-to-date, taking into account these matters and to ensure that the plan is not only appropriate from a policy perspective, but is workable and practical in the field. Once we have this federal plan developed, we will then work with our provincial colleagues in a federal state. We have no choice but to work with them; so we are all coordinated in our effort.

The second component is exercises. As you are all aware, we recently had the G7 summit in Halifax; this followed the events in Tokyo and Oklahoma City. As a result, there was a great deal of interest on the part of the senior bureaucrats and government officials in Canada as to security. In preparation for that summit, we undertook our major exercise of the year. Unfortunately, the planning had been underway for so long that a CB component could

only be added as a adjunct, but we are determined to have full CB exercises in the future. We will be able to test our capacity in that regard.

The one thing that I would like to say before I leave is very simple. Canada and the United States share the longest undefended border in the world, and 80 percent of our population lives within 100 miles of the U.S. border. Any incident that occurs on either side could easily have an impact on the other country. It is for that reason that our cooperation is greatly needed and that we have learned from each other's experience.

I would now like to turn the floor over to my colleague, Dave Peters from Emergency Preparedness Canada, who will speak to you of consequence management.

3.3.2 Dave Peters
Emergency Preparedness Canada

I hope I do not have to live up to that billing and speak about consequence management in a lot of detail because, in respect to CB and nuclear threats, we are not as well prepared as we should be. We are using this seminar as an opportunity to activate ourselves, to energize ourselves to get going on the consequence management side especially when it comes to the counterterrorism aspects. What I would like to do over the next few minutes is give you an idea as to how emergency preparedness works in Canada as a whole. All we have seen is within the context of the management of the consequence of a nuclear, chemical, or biological emergency. Many aspects of our approach to emergency preparedness will be familiar to you, but there are some differences.

I do not want to give you a lecture in civics on this whole thing, but emergency preparedness is an essential element and responsibility of governments and as such reflects the constitutional background and organizational features of those governments. We find this is true whether we are considering governments between nations or governments of states or provinces or municipalities. Canada, similar to the United States, is a federal state comprised of 10 provinces and 2 territories. Our provinces have certain responsibilities and rights as does the federal government; there is a division of these powers. Generally, Canada is quite decentralized, in fact, even more so I believe than the United States is. This has a considerable impact on our preparations and our methods of preparing for emergencies because we have to gain consensus and agreement of a lot of different organizations to actually end up with a decent emergency plan. Canada is also a parliamentary system of government that is not like the United States, but is more like the UK. Each of the provinces is a parliamentary system of government, and this had implications with respect to emergency preparedness. For example, our executive branch of the government is the cabinet and the cabinet is led by the Prime Minister who is also head of the party in power in the legislature. Elected members of that legislature are appointed as cabinet ministers at the pleasure of the Prime Minister. You can see that the executive and legislative authorities are very much closer, and this has some very interesting implications with respect to emergency preparedness. It gives the Prime Minister quite a bit of authority.

There are four basic principles that guide our emergency preparedness and response processes in Canada. The first one is that the lowest level competent to respond does so. As a crisis expands beyond an individual's capability to respond, first the municipal, then the provincial, and then on request only, the feds get involved. In fact, the feds get involved very infrequently in most of the emergencies or disasters that happen in Canada except from a financial support and a provisional specialized resources point of view. Secondly, we take an all-hazards approach to emergency preparedness concentrating our efforts on the effects of disasters rather than the causes. There are so many kinds of disasters that can occur in Canada, 60 or so, that we do not have the resources to have a specialized plan for each one. Therefore, we have a generic approach to planning. This has been effective, but you have to realize that if you look at a hazard map of the world in terms of natural hazards, which has been our concentration up to now, Canada does not get our fair share. The all-hazards approach is great, but there are some problems that need a more specific approach. For example, we have learned by observation throughout the world and by reference to our scientists and seismology that we better not plan on such an approach with respect to getting ready for a major or catastrophic earthquake. Therefore, we have a specific plan for dealing with what we consider to be a very major problem on the west coast of our country. What we are pulling out of that is yes, we will have an all-hazards type approach to most situations, but where they are really catastrophic or very serious, it means that we may have to take a more specialized approach. I believe that is the case, and I have become much more sensitized to that over the last couple of days in this auditorium in respect to biological and chemical events, whether they are from emerging, in the case of biological, emerging diseases or, in the case of counterterrorism, from biological or chemical causes.

We also, as a third principle, use a building block approach, building on existing plans and organizations and arrangements, trying to create as little change as possible from normality in the flow of decisions and decision making and communications and what not in times of emergencies. This has worked pretty well for us in the past, but life is becoming more complicated. We are going to have to see now how we adapt or adopt this principle with respect to the situations that we have been discussing the last couple of days. In Canada, also, each minister is responsible for planning and preparing for crises within that minister's particular domain with respect to responding to disasters in provinces, etc. The Federal response is usually given to a lead minister and that lead minister does the coordination. This is a little bit different from how, I believe, FEMA works in the United States where FEMA is the Federal Government's coordination arm for Federal response to a disaster. In Canada it usually falls to one of the other ministers. We in Emergency Preparedness Canada, which is a very small organization of roughly 90 people, are there to facilitate and coordinate emergency preparedness. We monitor the situation in general, but we very rarely would end up coordinating for any more than a day or two in response to a disaster in Canada. It then goes to the lead minister; for example, in the case of a counterterrorism incident it goes to our Solicitor General. There are complications with respect to that because the biological/ chemical aspects of a counterterrorism threat could put the problem more in the laps of our health authorities. Who is the lead minister? Officially the lead minister for responding to counterterrorism is the Solicitor General Branch; however, we may have to have a transition, as I believe is the case in certain aspects of the U.S. plan, a transition to health authorities or public health being the lead. The problem gets more complicated by the fact that the

provinces in Canada are responsible for public health, and they jealously guard that domain. This tends to in some respects weaken the Federal capability to respond. What it does mean is that we have to develop a consensus, we have to educate the provinces. There are only 10 provinces versus the 50 States in the U.S. so maybe it is a little bit of an easier task, but we have to educate the provinces in the requirements to be prepared for the contingencies that we have been discussing the last couple of days. One of our problems is that there is not much of a public perception as Paul mentioned of a threat in Canada or to Canada. There is a tendency to say, "Well, that happens to the larger powers, but it does not happen to us." But we just hosted the G7 conference, and I can tell you we spent considerable time trying to prepare for every eventuality in that respect. It can happen to us, and we are going to have to sensitize our population and, frankly, our political masters and maybe their servants, immediate servants, to the problem. We are at the beginning of that process right now.

As far as NBC capability in Canada is concerned, across the spectrum of capability we have good expertise in certain lines, good technical expertise and whatnot with respect to certain lines of this spectrum. But there are giant gaps between the lines, and we really do depend upon other nations to help us fill in the technical gaps and even emergency preparedness gaps so that we can get ourselves as ready as possible.

Paul mentioned that 80 percent of the population of Canada is within 100 miles of the U.S. border; that has certain mental fallout aspects. There is a tendency of some Canadians to say, "Well, the U.S. can take care of us," but that is not the way an independent sovereign state should react. We have to try to persuade our masters and our populous that there is a requirement to do something in some of these areas.

To show you the complications of some of these things, we do have a BL-4 capable lab in Toronto in Ontario, but right now it is under court injunction not to open because of the environmental aspects of the situation. The local people are concerned that something could go wrong and have taken this action. That lab, by the way, is under provincial jurisdiction. We have to see what happens in that respect. As well, we have funded a lab in Winnipeg, Manitoba, a BL-4 type lab that will be under federal jurisdiction. I hope they have taken into account the environmental public review and consultation process, and maybe we can build and open that facility. We hope to have some capability there. In the Defense Research Establishment in Suffield we have a nuclear/biological/chemical research capability for defensive purposes. They have developed a number of pieces of gear and I believe some treatments for at least biological and chemical responses.

We also have a small team of military specialists who are available to respond to NBC problems. That team is very small but is rapidly deployable, and once given some alerting time is rapidly deployable across the country in a Hercules aircraft with its equipment. There probably are other capabilities in the non-governmental side, and we are hoping in the near future, inspired very much by this seminar, to get together and under the leadership of Hall, pull together an inventory of our capabilities and see where we go from there. We are hoping to have the same kind of communication and assistance that we have received from the U.S. and from other nations; Japan, the UK, and others, to help us get going on that.

Question: One, did the separatist movement present any specific challenges for emergency preparedness? Two, with the new trade agreement do you see or are you particularly concerned about any imports, possibly from Mexico, that would be strictly detrimental to your country if things get in?

Answer: On the first question, the only separatist threat, the only terrorist threat that has lead to an incident in Canada in the past 25 years, was from the Front Liberation d' Quebec, a Quebec separatist movement which kidnapped the British Trade Commissioner in 1970 as well as kidnapping and murdering a Quebec cabinet minister. The fact that it was a domestic group has made life more interesting given that there is currently a referendum underway in Quebec to see if the province wishes to secede from the Canadian Federation. We are looking at that issue very closely, but there is nothing to indicate that there is a current threat from any of the groups which are supporting Quebec separation. As to the second aspect, I have no information regarding any concern relating to goods which may be coming in from Mexico. Are you talking illicit goods or normal chemicals?

Question: Let's talk about the importation of land animals as was discussed yesterday. Are there some concerns about things that might be coming up from Mexico that were not concerns before the trade agreement?

Answer: I do not really know. I think there are normal controls, the normal quarantine controls, that have been in place for many years in terms of importing animals.

I do not know whether we have gone to the next step that the U.S. illustrated yesterday in terms of saying, "Well, quarantine them, but quarantine them on your side, not on our side." I do not know if that has happened.

I cannot point to that except that I do know that there are perhaps prohibitions, certain rules, certain regulations regarding importation of animals. What they are, I do not know. If you want more information, contact me afterwards, and I will put you in contact with the right people.

In terms of chemicals, we do have a coordinated, non-government agency/government agency, major industrial accident coordination committee. It is privately funded, and it has been in existence since Bopal to address the problem of industrial accidents of the Bopal nature. That has been in existence quite a while and has been quite successful in marshaling interest and action out of the private sector.

3.4 Trilateral

Michael A. Jakub
Department of State
Office of Coordinator for Counterterrorism

My name is Mike Jakub, I am from the Department of State Office of Coordinator for Counterterrorism. I was asked to make a couple of remarks this morning, very brief ones, about the trilateral that you have heard about here and about the work program. Without getting into all the gory details, our counterterrorism policy people from the United States, Canada, and Great Britain, about 4 years ago I guess it was, during the course of bilateral counterterrorism policy consultations which we have normally with those countries, decided that it would be really incumbent upon us not to duplicate our continuing programs because we were all working in this area of trying to develop programs to respond to potential chemical or biological terrorism. The thought was that we could gain a lot more if we worked this on a trilateral basis as opposed to simply unilateral or maybe bilaterally. The program has been in existence for about 3 years. The group has been very energetic. We have a number of sub-committees who work very specific issues, and we have a great deal of cooperation going in terms of research and development for equipment to help those elements of our governments that have to respond to a chem or a bio incident. We have another group that is working very hard in coordinating and developing programs in the area of intelligence and scientific and technical information support. There has been a lot of good work done by that subgroup as well. We meet annually in plenary session; our next meeting is going to be coming up the end of October, early November timeframe. Our working groups or subcommittees meet as required during the year to carry out the work programs and mandates of the group. However often these meeting have to occur, they occur.

When this conference was originally thought about and conceived, almost 18 months, close to 2 years ago, the idea was that we had not really taken a good look at consequence management issues, and especially medical response planning for countering terrorist events in either the chemical or biological arena. The thought was given by the Canadian, UK, U. S. (CANUKUS) trilateral group to take a look at consequence management in addition to the other issues. The Public Health Service agreed to put together a meeting and what you have here today is a combination of a couple of things. It is the culmination of that particular task plus PHS's efforts to get in front of the decisions that have been made domestically here to enhance our capabilities and coordination in the consequence management arena. We welcome our Canadian and British counterparts to this meeting.

3.5 United States - Crisis Management

3.5.1 Introduction

William E. Clark, M.S., Deputy Director
Office of Emergency Preparedness
U.S. Public Health Service

We are going to move in now to the U.S. plans. We are going to start out with an initial brief by the FBI on crisis management and their plans, and then go on with more FBI briefing and the consequence management community.

We have three people with us today to speak on behalf of the FBI. The first one leading this team is Richard Cimusz who is the Chief of the Domestic Terrorism Planning Unit which is located at FBI Headquarters. He has with him Special Supervisory Agent Steve Veyera, who is also in the planning unit, and Special Supervisory Agent Barry Subelsky who is with their Crisis Management Division, another critical incident response group, the CIRG, that goes out to major incidents and does on-scene management support for the deployed crisis management team.

3.5.2 Richard Cimusz

Chief, Domestic Terrorism Planning Unit
Federal Bureau of Investigation HQ

SSA J. Stephen Veyera
Domestic Terrorism Planning Unit
Federal Bureau of Investigation HQ

SSA Barry Subelsky
Crisis Incident Response Group
Federal Bureau of Investigation/Quantico

Richard Cimusz: My group will serve as the first of the organizations that will end up as a panel that is going to walk you through our chemical/biological response plan. It is a plan that we have devised and coordinated with our sister agencies. In fact, we have implemented it on several occasions, and it has worked extraordinarily well. The theme I want to stress is the interagency cooperation that we have experienced with the other participants that will be on the panel with us. That sort of cooperation, training, knowledge of our responsibilities is crucial if we are going to be capable of responding to an event perhaps like this.

The concession workers union at Kings Dominion recently lost a bid. This is hypothetical so bear with me, and do not repeat this to any news people as coming from the FBI because this is purely a hypothetical situation drawn from bits and pieces of real events. The concession workers union recently lost a bid to unionize the special effects and fireworks department at Kings Dominion, and there were sporadic acts of violence related to that union activity. Two days ago, the Kings Dominion security office received a threatening letter

indicating there was going to be a toxic release because of Paramount Pictures' recent movie which portrayed Arab terrorists as anti-United States and pro-Israel. There have been no other threats to Kings Dominion received. Kings Dominion, for those of you who do not know, is a theme park located between Fredericksburg and Richmond on Route 95 in Virginia. It is in a semi-rural area. Today in New Jersey a search warrant was executed at some known terrorist locations and during the course of that search warrant, these items were discovered: a culture of botulism, some precursor chemicals used in the manufacture of sarin, some blasting caps and detonating cord, some very crude diagrams of what appeared to be five or six different theme parks, various chemical equipment, books, some writings, and a manifesto written by this group against Paramount Pictures as well as copies of previous letter threats sent to Paramount in Los Angeles.

That is not too far from a situation that we might face, and that will be a situation that we will discuss to demonstrate how our plan will be implemented. The potential acts of chemical and biological terrorism can be in any number of forms. The one I have chosen, I think, is one that is going to get a whole bunch of different agencies involved, so you can see how we interact. But frankly, these types of acts are going to be limited by your imagination and by the skill of the terrorists. As we have seen in Tokyo, the skill, the professionalism, and the scientific training appears to have increased in some members of the terrorist community.

The types of incidents are important because when the gas was released in the Tokyo subways, I will ask these questions rhetorically because the answer is yes. Did we have a crime scene? Did we have a disaster? Did we have a search and rescue incident? Yes, we had all three, and there are three different kinds of agencies and groups of agencies that respond to those three different kinds of events. There is going to be some tension when everybody converges on the scene. What I am describing now has not reached the third level; the Tokyo attack was that third level. There was no warning, it was just a release. That is when the full court press immediately begins and everybody goes to the scene. What we deal with on a regular basis are threats. We receive, and industry receives, government offices receive, hundreds of threats: assassination threats, bomb threats, disruption threats. In every instance that we receive a threat, we evaluate that threat. If we can identify who the recipient or target of that threat is, we notify that person to take appropriate action, and we will take further investigative steps to identify the sender or the originator of that threat. The situation that we may have in our scenario and we do not know is do we have the confirmed presence of a weapon or of a device that could release, chemical or biological materials? Up until this point there has been no release and we are dealing for the most part with a law enforcement responsibility. As John O'Neill, our Section Chief, explained, there is no law against terrorism. Terrorists engage in specific criminal acts that the FBI investigates, that State and local police departments also investigate. When the thing goes boom, the local emergency services are going to be the first responders because the first thing that happens is someone dials 911. You do not dial 202-FBI-3000 because you want to get help there immediately and that is a problem (visual 1, page 3-10). We will discuss that interaction between the Federal national command level and the on-scene crisis management. Those are very critical things that have to be well-coordinated and rehearsed in advance if they are to be expected to work well.

Our statutory authority is specifically delineated in Title 18, which is the criminal code, and we have a variety of statutes. Extortion, for those of you not familiar with it, does require a threat coupled with a demand. In other words, you have to have a demand for some action whether it be money or change in behavior. If it is money, it is probably not a terrorist act. As we discussed earlier, terrorism targets innocent individuals without a profit motive for social and political purposes through the use of criminal activity, and extortion is one available to us.

We also work regularly on product tampering and various environmental statutes that the FBI has the authority to enforce along with EPA. There is one new one that was added last year called use of weapons of mass destruction, which gives us the broadest authority for chemical, biological, nuclear weapons, that is an all encompassing statute, and it provides us Federal jurisdiction where that occurs. Any event like this is going to be a terrorist act whether or not the perpetrators of the act are terrorists; it is the law enforcement responsibility to find out. What does law enforcement want to do? If we can, we want to prevent it through our intelligence, through our investigations of terrorist groups. We want to contain it so it does not get released, and we have post-incidence response responsibilities along with the other agencies represented here. The interaction is critical. We have a plan that we have put together and have exercised, and it works.

Let us go back to my scenario. Let us take the letter to Kings Dominion. We look at that letter, and we will assess the credibility of that threat from a technical, a behavioral, and an investigative level: the three important things that Steve Veyera will talk about later on. Where we need technical advice, we will get that. We may not have that technical expertise. I do not have it, but we do have a very sophisticated FBI laboratory. They are part of that threat advice that we get along with the other Federal agencies that will be represented on the panel. Bear in mind that there are hundreds of these threats that are received by various victims that we are advised of. Depending on the credibility of the threat, we have to make a determination on whether or not we are going to increase our concern with the specific threat based on a number of factors: the quality of the threat, the likelihood of the threat, our knowledge of previous or past practices, as well as any other intelligence information that we may gather. A lot of what we gather on international terrorism is highly classified. We get it from CIA; it is not something that we can share with you. By the same token, we look to you to provide us with intelligence. In fact, most recently there was the bubonic plague case that we worked as a mail fraud. Our first indication that bubonic plague might have been on the loose in the Cincinnati area came from the Centers for Disease Control. That was discussed in Tuesday's surveillance panel in the afternoon. It is a very important piece of intelligence that, if we get the information, we can take appropriate responses to it.

The FBI has a Central Headquarters and 56 field offices. We are the national command level for the FBI, but we do not do the investigations. We are the bureaucrats. We are the people that have liaison; we are the people that write the plans. All 56 field offices have a Special Agent in Charge (SAC) who runs that office; we refer to them as princes of the church. They are autonomous individuals with sole responsibility for their territories. Some territories are large: our Salt Lake City office, for example, covers all of Utah, Montana, and Idaho. Minneapolis covers Minnesota, and North and South Dakota. Florida has three

different field offices with three different SACs: Miami, Tampa, and Jacksonville. The size of the office geographically and population-wise varies; the function is consistent.

The next slide has to do with a command post structure that we have employed successfully in the past in any number of major types of operations. As you look at that, not all of those components, not all of those boxes are employed in each and every situation. We tailor our command post to the situation. We may not need a surveillance capability; we may not need a legal component in certain crises or certain situations. But those areas that we do need, we put them in little boxes because through experience we have found that they work much better where there is compartmentalization that leads up to a command group. In this particular slide you see a consequence management group. When we have had our threat evaluations that we have employed this year, we have integrated Public Health Service, FEMA, EPA, and DoD into our command post operations at Headquarters. It is critical that we have that expertise because if this criminal threat turns into an event, they need to be on the ball as to what has gone on before, what sort of response they are going to have to marshal with their resources. If they are not in the tent, we are going to lose valuable time and possibly lives. That is what we do at Headquarters. The on-scene commander in the field office will emulate this same sort of structure. One of the problems we have always encountered is getting accurate information back and forth from the field to Headquarters so appropriate decisions can be made and appropriate resources can be marshaled. The simplest concept here is that from each group only one person will speak to the command group, which is going to be comprised of the appropriate Federal agencies at their appropriate levels. The command group at our Headquarters, for example, might include our Section Chief, John O'Neill, Bill Clark from Public Health Service, and people from FEMA and DoD. Because if we have to move their resources to our crime scene, we want them all in the tent so that can be done expeditiously. There is always a continuing tension in those situations that this setup minimizes. As I said before, the Tokyo gas attack and the Oklahoma City bombing were both crime scenes, and search and rescue events, as well as catastrophes that had to be managed. We have separate agencies that perform all those functions but if we do not integrate those functions, we are going to be in trouble.

The FBI's concern in all instances is going to be for public safety, safety of the investigators and the other emergency workers at the scene. That takes precedence and priority over protecting the crime scene. We want to ensure that personnel work in a safe environment and do not jeopardize the crime scene because we could potentially lose a prosecution because of breaks in a chain of custody. If there is a piece of evidence on the scene that we cannot in court swear to the fact that we knew where that piece of evidence was from the time that piece of evidence was discovered until the time that we got to court, then we might not be able to use that evidence. That situation causes some of the tension that I mentioned earlier.

When you see a command center working, it looks confused, but with the overall structure of the command post structure that I demonstrated before, everybody will have a role and a responsibility; in fact, they work pretty well.

I am going to turn you over now to Steve Veyera who is going to provide some more of the technical liaison role that the FBI has and how we rely on you all for your expertise. Steve Veyera is assigned to my unit. He is a certified bomb technician for the FBI. He has a lot of experience in dealing with terrorism investigations and is the principal author of our chemical/biological contingency plan.

Stephen Veyera: As Rich said, I was recently assigned to the unit. I spent 6 years in New York on the Joint Terrorist Task Force. I am a certified bomb technician, and when I arrived they said, "Who knows something about poison gas?" and I said, "Well, I'm a bomb technician," and they said, "That is close enough."

I want to go through the history of how we put this plan together and some of the resources we call on and use when we do this. We try not to do this in a vacuum. We do not have the expertise within our shop to do what DoD does, to do what Public Health can do, to do what FEMA can do, and do what a lot of you emergency management services and emergency services can do; we recognize that. These are some of the advisory support people whom we have contacted as we drafted our plan and we have in our plan to use in the event of an actual incident, either a release or a threatened release. We have worked with the CDC on several different occasions, and they have been quite helpful. I am sure everybody has read the thing in the paper about the guy that received bubonic plague samples up in Ohio. We talked with CDC on that; they were very helpful providing us information. We also talked with the Department of Agriculture.

The people we rely on the heaviest and the most is the DoD. By and large they do more of the research, more of the work, and more of the handling of actual live agents and agent protection than anybody in the business. We deal with AFMIC, Foreign Science Technology Center, Medical Research Institute, Infectious Disease, this is our biological side, some of the folks whom we have contacted and dealt with in that particular arena. You will see how these people come into our plan when we implement it. On the chemical side, we rely on the Technical Escort Unit and the Chemical Research and Development Engineering Center for input and to assist us in training. They provide input on what we may need to tell our SWAT team, tell our investigators. When we devised our chemical/biological incident plan in conjunction with both these entities from DoD, we came up with an indicator list that we were able to send out to our field offices. This indicator list includes certain common things that investigators need to be looking for when they do an investigation. When they hit the drug house or somebody says there is a laboratory, and they hit a laboratory thinking it is a drug laboratory, and they are not making methamphetamine, and things do not look right, in conjunction with these outside sources and our own lab, our chem tox unit, we have come up with things to look at, indicators that should indicate to that investigator that there is something wrong, that there is something more going on than some guy making methamphetamine in his basement. We try to keep that list updated and current and keep that in the hands of the investigators so that they can tell us what they find. It is also useful when they are talking to assets or sources who are dealing with these people. People who are talking about blowing this up or releasing poison gas. Those assets who are in touch with the criminals or the

terrorists can ask the right questions so that we can begin that threat assessment process to determine whether this is a viable threat, whether this is real or it is not.

This is basically our threat assessment plan, how we implement that. The central unit is our unit at Headquarters, that is the Domestic Terrorism Unit in the Counterterrorism Section. We are the ones that receive the threat from the field offices. Once we receive that threat we then have a process we go through to evaluate that threat. Normally, within an hour to 2 hours after receiving the threat from the field, we have convened an initial teleconference with the parties that we want input from. Where it says FBI, it says CIRG ISU, that is the Critical Incident Response Group. They have an Investigative Support Unit; these people are our behavioral scientists. We look at the FBI laboratory, input from their chemical and toxicology people. Depending on the threat, if it is threatened chemical or it is threatened biological, we go to one source to put us there. We go to the Department of Defense, and we tell them what we have got. They are the ones who input whether we talk to USAMRIID, or the chemical people, or the infectious disease people. They are the ones who hook those people into our chain and into our decision process. DoD also is important. They participate in that and monitor the process so that as this group meets and we assess the credibility of this threat, if it is determined that it is a credible threat during the process of the discussion, when the consensus is reached, our DoD support is involved in that to be able to decide what assets we need to move, where we need to move them, and how we are going to get them there. We rely heavily on DoD in that. We have a cooperative agreement back and forth with DoD, and they have been very helpful in the past.

The threats are evaluated on three separate issues which are the ones on the right: behavioral, operational, and technical. Each one of these sections, each one of these people looking at this, looks at some of these things. Is it technically feasible what they are saying? Is there anything in the threat? If it is a videotape, a phone call, audio cassette, or a written letter; is there anything in there that is a clue that those behavioral scientists can look at and decide with some confidence whether it is real or not. They use their technical expertise to determine if it is a real agent. Is it something that is out there? Is it something that is capable of doing what they say it can do? Technical and operational sometimes mix in when someone may say in a threat letter that they have a certain biological agent and they are going to disperse it X way. The technical people come back and say, "You cannot do it like that. It will not be effective; it will not work." Those are the types of things we look at when we do this evaluation process.

We have exercised our plan before. We have done these conference calls. We have put together the threat assessment group, and we may have one of these come in and do an initial threat assessment like the scenario that Rich was talking about: the letter comes in to Kings Dominion. The group would meet and they decide at that point whether it is probable, or looks like it is probably a hoax. As additional information then comes in from our field offices, where the input came in from Newark in the scenario example; now they have done a search warrant, and they found the toxin, they found precursors for sarin, they found detonators, they found det cord. When that comes in, this group would reconvene and look at it again and start building the response that we are going to utilize to the incident.

Here are some of the people that we use in our response capability when we have an actual response: laboratory, Health and Human Services, Public Health Service, Environmental Protection Service. We liaison at the national level with these. Barry Subelsky from our Critical Incident Response Group is going to cover in his presentation on the organizational issue how it deals. We deal at the National Command Structure level here from Headquarters, and basically mirrored in this in the field is the Special Agent in Charge. He has very similar resources that he is direct on-the-ground, on-scene commander for during one of these incidents that we are trying to support his efforts with. Additionally, just some other units that we do call on that assist us in this process of both a response and an evaluation. These are mainly the people who we might look at and call on to respond to an incident or to assist us in our response to an incident.

I have just run through the first phase of that phased response: how we got there and basically how the system runs now with us doing that threat assessment phase. As we go into the phase response after we determine the threat is credible, I am going to turn it over to Barry Subelsky from our Critical Incident Response Group at Quantico. These guys are the crisis managers for the FBI. We write the plans, they implement the plans, and they put the plans to work.

Barry Subelsky: I thought I would start here with a little bit of Rich's scenario, just carrying it out a little further. The initial response to any crisis as far as we are concerned will be with the field division, with the Special Agent in Charge. Depending on where that is, that can be Washington; there are 500 agents, an Assistant Director, two SACs, four or five Assistant Special Agents in Charge, three squads that work terrorism. Lots of resources, lots of experience. As Rich mentioned, if you get out into some of the smaller divisions where there might be 60 agents, you may have only one agent that works terrorism because of the threat in that particular area. Some of the divisions will have less expertise in certain areas. Nonetheless, they will have the first response, and they will set up the initial command post and begin investigative activities.

This is pretty much what we do in any type of investigation regardless of whether it is chem/bio or some other major investigation. Following on with that I will explain what we do in the CIRG. About a year and a half ago the Director reorganized the components that respond to crisis in the FBI; I guess the closest thing I can compare this to is a JSOC type of arrangement. He took all of the elements that would respond to a crisis and put them under one Special Agent in Charge, that is, the tactical assets of the hostage rescue team (investigative support assets, crisis management, negotiators), put them all under one boss. In a large incident we would deploy to the scene as a unit, and we would function in one of two or three roles: one would be simply advising the on-scene Special Agent in Charge; we may be asked to take over; or any of our assets may be deployed to assist as needed. That is the way we train. In the Crisis Management Unit where I work, we are responsible for interfacing with various other Federal agencies to conduct training, to give advice. We do all our own training, we set up field problems for the FBI and local law enforcement; we come out and assist as needed.

We have just tailored the old advance party here, which I am sure you all are familiar with. The purpose is to send an advance party as quickly as we can to provide that SAC with as much support and information as we can give him to help in making informed decisions. One other thing I would like to mention: I do not see what we, we meaning all of us, do as being so much competing agendas as they all fit together. Our concerns are just like yours: public safety. Our end state is a prosecution. We think that part of the protection of American citizens is to make sure that anybody who breaks the law is eventually brought under the rule of law. I do not see professionals handling this as competing agendas. We want to work as a team because the end we are all looking for is the safety of American people; that is what this is all about.

Our concept of this deployment team is to provide technical support, on-scene assessment, containment advice, and a limited decon capability for ourselves. We have instituted training to provide over-guard protection for investigators and tactical agents on both the hostage rescue team and the enhanced SWAT teams throughout the FBI, so we have some limited ability to operate in a contaminated environment.

We see our deployment to a major incident in three phases. The first would be the rapid deployment of our advance party coupled with ongoing personnel as needed in the first phase to manage whatever that incident might be. Phase two would be more of the same: it is the old pile-on-him routine that I am sure all of you in the military are familiar with. We have two C 141 s that stand by basically for our use at Andrews for 4 hour movement of our personnel. Then last, but not least, would be a transition from law enforcement to disaster management. I do not think these things are as much transitional as they are all going to be moving up and down on the scale of what the priorities are as far as public safety is concerned at that particular point in the incident. This is our concept of a structure. These lines are not so much command lines as they are liaison and response. We would hope that at a major scene we could have senior managers from all different disciplines in a command group, so that when we have competing agendas we can work it out amongst the leadership as to what the priority is at that time. I think that just as much as I am sure none of you are interested in lifting fingerprints, I can assure you that we are not interested in inhaling the consequences of these events. You have that expertise. That is what you bring to the table, and we do not want to fight with you about that. We want to work together because there is no question that is going to be critical in a chemical or biological incident. The disaster in Oklahoma City was certainly a very traumatic event but there is no ongoing effect of that, it happened and that is it. It is going to be a little different if we have a significant release of a chemical agent.

Question: What do you do with a BL-4 problem?

Answer: The question is what do we do with a BL-4 problem. The answer has been given several times, although perhaps they did not realize that they had given the answer. We would depend upon USAMRIID and CDC. I think they have indicated that we would use them in an advice role and we would also use them in a response. If there was a need for BL-4, of course, it would be provided by those who have it.

Question: You have mentioned built-in potential conflicts between law enforcement protecting the evidence at the crime scene and the rescue and salvage operations. Where does the authority for the resolution of those finally reside? Who is empowered to make that decision?

Answer: I would not call them conflicts as much as I would call them tensions. The different agencies have different primary responsibilities. Within the field of terrorism, the FBI has been designated by The President as the lead agency. If we are dealing with a malevolent release of chemical or biological or even a nuclear device that, by definition, is a terrorist act, and from a law enforcement, combatting terrorism perspective, the FBI is the lead agency. From a consequence management perspective, FEMA is the lead agency; also by Presidential direction. When these types of events do happen, it will quickly escalate so that our command post is going to be in contact with higher level authorities at the cabinet level, say Janet Reno, the Secretary of Health and Human Services, the National Security Council; decisions will be made at that level. They will let us execute those decisions. That tension is going to be minimized the more and the better we know each other in advance. That is the function of this conference, and that is the function of our exercise plans and our liaison that continues to go on in anticipation of these kinds of disasters. I hope I answered the question.

Question: How would this unfold if instead of having some prewarning you might have some emergency room people who might realize they have someone who poses a threat?

Answer: The example I gave earlier, of how we found out about the bubonic plague, it was brought to our attention in that fashion. The other incident that we are going to discuss when the panel gets up here is what if there is no warning and we just have an incident like the Tokyo gas attack. That is when 911 is going to be the first thing dialed. Then the Federal authorities are going to have to get together to marshal the appropriate Federal resources to support local agencies and the State Emergency Preparedness people, who may not have the technical capability or technical expertise or the equipment to go into a contaminated environment. All of that is going to be made smoother if we plan for those events and we have those sorts of cooperation. At the national level we are doing that. At the local level that still needs to be done. There are networks out there that FEMA, Public Health, and EPA have through their regions that are not law enforcement-related networks, but those same networks are going to be the first responders. That sort of networking needs to be integrated into the plans we are talking about now and, again, you have to know who is the appropriate counterpart in your regional area.

Question: How will you coordinate your chem/bio response?

Answer: Our chem/bio response plan has been provided to all of our field offices and it describes the national coordination. We have instructed all of our field offices to initiate appropriate liaison with the appropriate local counterparts; the State, local, regional officials, to do two things: first, to have a table-top exercise in the event of such an emergency to bring the appropriate people together so you know who to call when something happens. Second, We have instructed them to initiate a field training exercise where there is going to be a

scenario that is going to be put out, and appropriate response will be exercised in that fashion. You need to know who is going to be out there. We have, in fact, called for that implementation at the field level as well.

3.6 Consequence Management

3.6.1 Coordination

William E. Clark, M.S., Deputy Director
Office of Emergency Preparedness
U.S. Public Health Service

To some of you this term "consequence management" is a relatively new term. To others it is not. You have heard about the crisis management piece. What we are going to describe in this next block is what is this consequence management piece when it comes to chem/bio terrorism? You come down to what is different about all of this? If you look at what we have traditionally been doing in our disaster response, its primarily been for natural disasters, and the U.S. Government Federal family has worked very diligently. The big change was Hurricane Hugo in 1989 in the lower right where Federal response was required, not just recovery activities. We did not have a response plan. Based on that, from 1989 to the present, we have really had some extraordinary plans develop. The Federal Response Plan has evolved quite nicely and has done very well in these relatively limited-demand sort of disasters and emergencies. You notice on here, the 1995 Oklahoma City bombing was very different. Although this had a limited geographic impact, those of you in this room who were there will never forget it. It is probably the most memorable thing you ever went to from the mental health and emotional context of the response. The question was asked earlier about how crisis and consequence management works and do the people with the guns always win? Maybe not. We had this concurrent giant crime scene and the great public safety activity of trying to locate some survivors and get them out of the rubble. These competing interests worked well. But it was this monstrous training ground, if you will, to say, "Can this really work together? Can crisis and consequence management really work in this emergent no-notice sort of event?" There were a number of glitches, but overall I would say it was a raging success. Everybody-local, State, Federal, private sector, volunteerism-really worked together. Crisis and consequence management came together.

What we have been looking at very robustly since the terrible attack in Tokyo is, "What if that were to happen here?" We looked at our standard plan, which is good for a standard plan, and we asked, "What is different about CB terrorism?" We came up with a scheme. You normally have a threat or information that something might happen, and then there is no use of anything: no explosion, no release. Then you might have a Tokyo event where suddenly there is use. You have this instantaneous response requirement just like Oklahoma City. Or you might get a threat like the Bureau was just describing, and you marshal people to analyze and say, "Is this credible or is it a hoax?" Certainly you never know with a threat what the outcome is going to be. Only time will tell. But, indeed, if it is a credible threat, then the issue is, what are you going to do? Are you going to deploy some-

body to go do something if possible? That still could end up with a use or no-use sort of situation. As we were looking at this and saying, "Okay, how might we be called? Immediately, with no notice?" Are we working on a threat, do we need to go somewhere and prepare for something? At least that gave us the context from a consequence management standpoint of what is important. Certainly we looked at saying, "If this occurs in the United States, the potential for mass killing is there." Certainly the mass illness potential is there. The importance of consequence and crisis management working concurrently is a major issue because public health and environmental issues are the two primary results of chem/bio terrorism. Our planning assumption was that local government would probably need some immediate assistance if they had a major incident.

Another issue that we have dealt with is what is the public going to be doing? What do they know about this, if anything? What is their expectation? What is their reaction? If somebody makes something known to the media that they have threatened New York City or Washington, DC, or Los Angeles or wherever, that has got to be a tremendous driving factor with the media involvement in intensity of live on-the-scene with their experts filling the airwaves.

Our current imperatives starting on March 20 were the following: to develop an interim consequence management plan to the Federal Response Plan. As you know, there is the Federal Radiological Emergency Response Plan, often referred to as the FRERP, which has been a self-standing plan. But that has been reworked recently, and that is going to be one of the family of plans under the FRP. What we are doing is developing a CB annex to go into that plan. We have identified some critical functions: what is really important early on in a major CB incident. This is only an interim thing: what can we do right now over the next 24, 48, 36 hours? Maybe 72 hours. Then when you can ramp up the normal structure under the FRP, let that come into play as best it can. We need something ready to go right now, predefined, that could move within hours, not within days.

We tried to say what the issues are and to identify the functions. Certainly this represents a lot of those issues. I am not going to read them, but we got the interagency family together and really worked in a robust way to do this. This was our concept, our approach to it. The first three items are things that we would do very rapidly. Number one is threat assessment. If the FBI were to call, we need to be able to get available within minutes the very smart people in chem and bio to help them with their threat analysis. The second one we came up with was emergency consultation. If suddenly there is a no-notice event and metropolis USA calls, we should be able to very rapidly, telephonically, put together experts that deal with chemical and biological to give their best advice. Toward that end we are building a national-level team called the Chemical/Biological Rapid Deployment Team, the CBRDT. The team is relatively small. We are talking about 25 people but it would be very smart people who could move out very quickly, get on ground rapidly, and provide some real support to the on-scene commander or authority having jurisdiction. Nobody here ever takes over, but whether we are going out to support the FBI or the City of New York or whatever it is, it is our ability to grab the really smart people, get them on an airplane and rapidly move them out. Then get the additional assets as they might be needed. We are really looking here in terms of minutes or hours versus the traditional days.

Here are the critical functions that we have identified to this point. They are reproduced in your program. You will see them all listed there: threat assessment, the CB consultation, and the importance of Public Affairs. We are going to describe these with a panel shortly. The agent identification, the epi investigation, the issue of expedient hazard detection, reduction, the issue of decon that has come up repeatedly earlier in this conference; what will work, what will not work. Clinical/medical support; providing some health professionals or laboratory support, evacuating patients, or providing some backup hospital support. Where to get the special meds from. Besides establishing a registry, and procuring special supplies and equipment, we will also consider the thorny issues: if you have a lot of casualties, how do you really deal with those potentially contaminated remains? Some other critical support functions we saw were the needs for communication, rapid transportation, and security. Who is going to control the people coming into an area where there might be a hostile crisis situation? The Bureau is working with us to provide that security if the rapid deployment team were needed to go out within hours. That is our annex approach to getting things going, at the same time FEMA would be trying to rapidly put in their normal FRP structure to bring up a disaster field office and do those really robust things that they can do. But it takes time to move heavy assets, to get them into place, to get lots of phone lines in, to move lots of people. This annex is really the jump start, the interim first few days before we get the traditional backup system in place to provide large quantities of specialized things.

Now I am going to put this last foil up and talk about career ending opportunities. Every one of these things are demanding; they are unforgiving. You certainly need the ability to make correct decisions under pressure and this last bullet is really critical: success requires interoperability and partnership. Everybody at this seminar, whether you are down front presenting or up there questioning, wondering, and observing, we are all stake holders in this issue. We have a little saying that the advice rains down from the crowd around, but only the matador faces the bull. When the bull gets loose, there are a lot of matadors in here who are going to have sweaty palms, so this last bullet is where it is at. How do we all work together in some virtual cooperation to ensure that we can move rapidly? Based on that, I want to segue into our panel. What we will be doing is going over these critical functions.

3.6.2 Critical Functions Panel

RADM Frank Young, M.D., Ph.D.
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Bill Goforth, Deputy S3
U.S. Army Technical Escort Unit

SFC Mike Holden, Plans NCO
U.S. Army Technical Escort Unit

Robert Elliot
Emergency Medical Preparedness Office
Department of Veterans Affairs

Ken Stroech
Director, Special Preparedness Programs
Environmental Protection Agency

Joseph P. Lafornara, Ph.D.
Chief, Environmental Response Branch
Environmental Protection Agency

Admiral Young: I would like to have the people that I have spoken to before and VA come down. We have also got CDC, EPA, parts of DoD, some of our folks from chemical and biological, and escort functions. I will walk through what is in your program, and then throw questions to particular individuals and try to make this as interactive as we can from the panel. Then I would urge that as you see points or questions, raise you hand; we will try to interact and be interactive here as well.

I would like to just quickly start out by saying a few words on the overview of this approach and then move into the key components. The key issues that we are focusing on in our threat assessment, Bill has put into place. But if I could urge anything for local and State communities as well as the other governments, the key thing that we found, particularly in one of the deployments that was mentioned casually, is the need to have emergency consultation. Each of us needs to have a call-down list with enough redundancy so that in 15 minutes we will be able to call down experts in chemical and biological agents that can be made available to international or national needs. That has been exercised. Ironically, Bill and I put the list together the morning that it had to be exercised, and when we were asked, we were able, in 15 minutes, to have a complete call-down list and a complete conference call at 9:30. It is that type of action that I would strongly urge. That consultation list is widely known among the partners, so that I would have the same one person to call in the City of New York, the same one person to call in the State of New York. Fifteen minutes is about the timeframe that one needs.

William Clark: I would like to take this mike and just pass it down so people on the panel could identify themselves.

I am **Gary Moore.** I am with the Office of Emergency Preparedness and I am the Chief of Field Operations.

I am **Ron Berger** with the Emergency Response Coordination Group at the Centers for Disease Control and Prevention out of Atlanta.

I am **Ken Stroech** with the Environmental Protection Agency with the Chemical Emergency Preparedness and Prevention Office.

I am **Joe Lafornara** with the EPA, Environmental Response Team. We are a headquarters function located in Edison, New Jersey, outside the Beltway.

I am **Dave Franz.** I am the Deputy Commander at USAMRIID, Fort Detrick.

I am **Mike Holden,** U.S. Army Technical Escort Unit located at Aberdeen Proving Grounds, Maryland.

I am **Bill Goforth,** Technical Escort Unit, Aberdeen, Maryland.

I am **Jim Genovese, Chemical/Biological** Counterterrorism Team at Army's Chemical/Biological Defense Command in Aberdeen.

I am **Bob Elliot,** Deputy Director Emergency Medical Preparedness Office, Department of Veterans Affairs. Our headquarters is located in Martinsville, West Virginia, outside the Beltway.

Admiral Young: I would like to have two people stand up: Peggy Gillam, Peggy is our Emergency Coordinator in Mental Health; it is very important as we look into clinical activities to focus on mental health. Our table was running out of room so Peggy kindly consented to be up there and will add questions as necessary. I would like to have Art Knudsen stand up. Art Knudsen is our Emergency Coordinator from Health Services Resource Administration (HERSA). HERSA plays a very vital role in these actions as well within the Public Health Service.

The emergency consultation is a key issue, and I would strongly urge that network to be in place and ready to go. Another key issue that cannot be underestimated is that of Public Affairs. We have wrestled with three major concepts. The first is that we need to have, for the major biological and chemical agents that we might encounter, prescreened, preapproved, public affairs announcements. The announcements have to say the same thing in the common media market. I cannot begin to describe the horror and anguish in the Midwest flood when one State said boil the water 1 minute, another said 3 minutes, and another said 5 minutes. Then the question of hepatitis B vaccine came up and the media ran, "If they don't even know how long to boil water, how can we trust them on hepatitis vaccine?" That key of having a similar, preapproved message is essential. We also have to have pretrained, well-respected public authorities who could respond. We thought of possibly having the former Surgeon General C. Everett Coop as a spokesman. Known over the nation, in the private sector, he could be brought into this particular area at a time of crisis. There are similar individuals of that ilk in the Environmental Protection Agency's realm that we could bring in, as well as some of the other components in the State and local governments, so that everyone has the same message; the message can come out of the can at the time of use.

The second point: we have begun to explore whether or not we should bring the media leaders in the nation in at the very highest level to let them know the messages exist in the can and can be available. Now that is a plus and a minus. I am not sure of the answer to that, but that is going to be part of our planning process. Because the tragedy is when we take the same approach to fairness as say our argument for fairness in science: that we will take one

extreme view and then another extreme view and let the people choose. That is not what we need in a disaster; we have to have some consensus of what is appropriate.

The third part of Public Affairs is that we need to be able to ourselves communicate during the time of the crisis. That means we need to have well-equipped, scientifically, medically capable, and environmentally capable spokespeople on the emergency committees. In the absence of that, we are going to have a terrible amount of confusion.

Those are the two areas that I wanted to address immediately. Are there any questions on those two before I pass right over to Bill in regards to rapid deployment?

Question: Is the adequacy of emergency communication networks being addressed?

Answer: The answer is yes. When we had the other activity, we used the FBI SIOC, and that was where we did some of our command interaction. We have other networks that can be used and put into place rapidly. One of the things that the Department of Health and Human Services has proposed to the Office of Budget and Management is the development of a much more robust communication system that would tie all of the partners that you see here at the table, not only with the white world, but with normal secure communications and secure communications into the field. That proposal has been made. We feel very strongly about that, particularly since the cases of Oklahoma City, New York City, and Albany, Georgia, where I will be going this evening to look at the post-flood a year later. In all of those instances, in the first period ranging from as short as 3 1/2 hours to the longest 48 hours, the communications were blacked out in those areas. It has got to be done. It has got to be ready to go and got to be able to be unleashed rapidly.

Let me turn now to Bill Clark. Bill, would you like to focus please on the rapid deployment?

William Clark: CB Rapid Deployment Team: where we are coming from is that we are looking for something that would come out of the Washington, DC, area because so much of the expertise is resident in this area. Places like Aberdeen, Edgewood, Fort Detrick, and a number of other Federal agencies have real key people here in this geographic area. What we are looking at right now is a team of about 24 people. We would have several emergency physicians, and some medical operations people. In the bio area we would have several scientists who could do medical diagnostics and medical samples, and several physicians who could do epi assessment. We have in the chemical area several scientists and physicians who are also technicians. We would have people who could deal with remote meteorological sensing, provide some databases, do some hazard prediction modeling, cloud characteristics, things like that. We have even asked the Department of Energy for a person who could come along with us just to look for background radiation. I personally worry about cocktails. If somebody were to throw some sticks of plutonium into something, or some other radioactive, radiological materials, and we are not looking for it, we can't not know that it is not there. As this rapid deployment team comes together, we are looking for something. This might be a little too stringent a requirement, but we would hope to be able to have this team moving

within maybe 4 hours. If we can get it moving in 4 hours, we can get them anywhere in this country fairly quickly so from a response standpoint, from traditional consequence management response, we think that is a pretty stringent standard to try to meet. We have set that hurdle very high, and right now the community is struggling with that, trying to get weights and cubes and what the transportation requirements are. We have an awfully good mix of people from a variety of partners. Public Health Service, a lot of DoD support, Department of Energy, and EPA are the key players, as well as a representative from FEMA. This is our first view of what we are evolving as a CB Rapid Deployment Team.

Admiral Young: I would now ask members of the panel to discuss agent identification.

Ken Stroech: I want to give you an understanding of the assets that EPA brings into an incident like this. Under the National Contingency Plan, what is referred to as the National Response System, there are numerous assets that have existed in the United States for a great number of years and they are there primarily to deal with pollution incidents as a result of accidents or Super Fund sites or those sorts of things. But they have the very skills and equipment, emergency deployment capabilities, whatever, that they bring to bear in an intentional incident such as what would take place in a chemical and biological situation. Generally, the way EPA's assets are organized: our headquarters for policy development is in Washington, and the Environmental Response Team and its specialized assets of about 25 scientists knowledgeable in various aspects of these things and readily deployable is up in Edison. In our regional offices scattered around the country we have approximately 175 Federal On-Scene Coordinators. These are specially trained men and women whose job is to go on-scene and take charge of an emergency and deal with the aspects of decontamination and health and those sorts of problems. They are scientifically trained and have a great numbers of assets that they can bring to bear; mobile labs, they can call on Joe's team for special monitoring requirements. By the same token, those things that EPA does for inland incidents, the U.S. Coast Guard has that responsibility in water-borne situations. Organizationally, we have scattered around the country folks who do this sort of thing all the time. Here again, in conjunction with, in support of, and as needed by the local and State communities.

Within Washington, under the National Contingency Plan, there is an organization called the National Response Team which is made up of 15 Federal Departments and agencies who over the last 20 something years have had responsibility as far as policy development and for pollution incidents. Those same sources of expertise and knowledge that include the agencies that are up here, can do those kinds of things for chemical and hazardous materials incidents. That same kind of skill and applicability works here. At the regional level, that same organization of 15 Departments and agencies have regional response teams; there is actually 13 of them when you count Alaska and the Caribbean.

The point I am trying to make is that organizationally within EPA and within the Federal family there has been for a great number of years assets that with some slight tweaking of the way they may be deployed and slight skill additions (biologicals, for example), would be very effective in dealing with this type of incident. But by taking these base

organizations, base skills, base equipment, and things that we have available within the agency, and working with Public Health Service, FEMA, DoD, FBI, and others, we feel that, with some slight reconfiguration and work in this area, we can bring to bear a good number of resources we already have. Joe can tell us a little bit more about some of the details of the capability of those folks.

Joseph Lafornara: Take any scenario that might happen. Let's take the one where it just happens where we do not get any previous knowledge. Everybody knows the local police or fire department are called on scene; they respond. The Federal response system can be triggered at that point. The National Response Center would be called if there is a hazardous chemical or biological release. They would then call, depending on the location, one of the 10 regions. The 10 regions have 24-hour capability; they essentially have a hot line, somebody ready to respond on 5 minutes' notice, not 15 minutes' notice, to be on site. Unfortunately, these people are not located exactly where it is going to happen. They are located mostly in or around our regional office cities which are in the standard Federal regional offices. They could be there, if it is nearby, within a matter of minutes; if it is not, within several hours. When they do get there, they come equipped with the proverbial suitcase full of Federal money and contractors who can spend it. These contractors are safety trained 40 hours, and in a lot of cases more, on site entry, detection, and decontamination. They can bring anything from bulldozers to specialized decontamination equipment within 4 hours of their notification. What I am telling local people is not to expect to see a Federal person for 4 hours; if you see them before that, you are going to be lucky.

The Environmental Response Team is activated in one of two ways: either through headquarters, through Ken's group and the Washington group on some kind of early action, or as a support to our regional office. Often times when they sense that something is going to be tough and complicated, the on-scene coordinator will make his first or second call to the Environmental Response Team's 24-hour number; we will then dispatch an appropriate person. We have chemists, biologists, and engineers, who although they might not have specific chemical-agent chemistry knowledge, know how to apply chemistry given the DoD or some other people telling them what the chemistry is. They know how to employ that to do environmental decontamination, to decontaminate water, soil, buildings, and, in same cases, isolate and decontaminate confined space. This is what you could expect from EPA. Basically, EPA does this on civil accidents about 300 or 400 times a year. These people, the 175 people that he is talking about, are very knowledgeable on how to get things done in the field. It is kind of an anomaly in the Federal government where the authority to do something, the resources with which to do it, and the responsibility to get it done rest in the on-scene coordinator; it is amazing how effective they can be. In the initial states of a terrorist attack, they would come under the direction and work with the FBI and, then, as we fold into the Federal Response Plan, work with FEMA, and work under FEMA, potentially using FEMA funds. We do not need to get a Federal declaration though because we do have a charter under the Super Fund at least until the end of the year. If the House subcommittee does not get its way, maybe it will be longer. We can be called in and essentially not depend on FEMA money. We can trigger that before Presidential declaration.

Most of the time EPA, in the scenario I gave, would work as a Federal presence, the Federal on-scene coordinator with local on-scene coordinators. They use the unified command system, and I will not get involved in trying to define what the interactions are there because that is a separate conference that will take about a week.

Admiral Young: I am going to start the mike down here. In the interest of time, Gary, would you start please, give your functions, then pass the mike down the line so that each of the people here can talk of the functions of their agency.

Gary Moore: My function is to support health and medical at the scene of a disaster, and to provide all the services necessary to keep health and medical up at all the hospitals. In case the hospital was down, we have a rapidly deployable assembly shelter that we set up and use as a hospital. We have a tractor and trailer that you are going to see outside that has all of our equipment inside of and that we have the capability of using for a hard shelter to operate out of. We have our generators, we have basically all of our equipment out there today, and you will get a better idea of just what we do. Basically our function is to support health and medical.

Ron Berger: I am Ron Berger with the Centers for Disease Control and Prevention. We added prevention a few years ago, so now we are still CDC. In our small group called the Emergency Response Coordination Group, that is what we do: we coordinate. There are five of us there, and we maintain CDC's 24-hour phone number. One of the FBI folks pointed out there was a little situation in Ohio a few weeks ago concerning yersinia pestis, the organism that causes plague. I was wearing my beeper as I always do. Actually I was on the softball field at about 7:00 that night, the beeper went off, and it was the local and State authorities in Ohio asking CDC for some advice and consultation on what to do with this. Certainly we advised them that we have no regulatory authority, but the State and the local health officer can certainly do something and declare that there is a threat to public health. Then the sheriffs department or local police department in that city could take some action along with notifying the FBI, and that is exactly what was done. We all work for the public, but our clientele are State, local, and county health departments. We bring in the support that they need in reference to whatever the situation is. Many times it is simply a consultation, sometimes at 2:00 in the morning. But within about 20 minutes we could round up a team made up of health scientists, toxicologists, bug people, chemical people, and radiological people on the phone on a conference bridge and advise folks on how to handle that situation. Dr. John Marrs from New York State Health Department reminds me of the Legionnaires Disease outbreak that we had. It was the third major outbreak of LD in New York City. When that first happened in Philadelphia back in 1976, talk about agent identification; everyone was running around trying to identify what kind of an agent it was: whether it was a chemical or a bug. All sorts of laboratories were brought in; city labs, State labs, and CDC labs. We support the State and the city laboratories in agent identification through both of our environmental health labs as well as our bug labs, the bio labs, the BL-4 labs. But we are there to support the State, local, and county health departments 24-hours a day.

Colonel Franz: Let me step up one level in the chain of command as I address agent identification because we do not have anyone here from the chemical part of our command. We do not have Commander Jim Burens here either who is also funded out of our command whom we work closely with. Our mission within the Medical R&D Command is to develop medical countermeasures at USAMRIID against biological warfare agents and infectious agents that our soldiers may run into on the battlefield that require special containment. Speaking for the Institute of Chemical Defense, they would work on medical countermeasures against the chemical warfare agents. With regard to agent identification; we have a three-pronged program at USAMRIID, and I will include NMRI and Jim Burens's group in this as well. Our far-forward assay capability which is small microscope-slide size hardware kits can be sent forward and used by medics on the battlefield. These might find application in the field in a terrorist situation. Then we have reagent sets for the biological warfare as well as the endemic disease agents. ELISA-based reagent sets that require water and electricity essentially in that kind of a facility could be used in a hotel room bathroom and have been. Then we have PCR capability which is moving further and further into the field every day as cyclers become smaller.

In those areas we would be looking at body fluids or samples from the environment, and here I am stepping over into AMC's mission just a little bit. We do diagnostics; that is our mission. AMC does identification or detection on the battlefield, and identification in my mind sort of crosses over those areas. We can do it on the battlefield or on the street with regard to diagnostics. Then we also have the reference laboratory capability back at the Institute of Chem Defense in which we can do a much greater indepth look at samples that might come from the field, much like what you heard Colonel Nancy Jaax discussing yesterday.

With regard to threat assessment, our tech base becomes very important. You all see and deal with people like Colonel Ed Eitzen who is really our front person on these issues. But he has beneath him the rest of the iceberg, and that is a very important part of a program like ours, maintaining that tech base that feeds him the information that he needs. We have experts that deal in the viral agents and the classical bacterial agents, as well as the toxins. They work with them daily, understand the pathogenesis, understand what they do to mammalian systems, how to decontaminate them, how hardy they are in the environment, how to collect samples from humans or from animals, how to package those samples, and then, how to identify them in the laboratory. I think that could be an important part of any incident that might arise. We also have health care providers and researchers: health care providers like Colonel Eitzen and Major Les Coddle whom some of you have worked with in the past.

Finally, I would just like to mention an understanding of engineering capabilities for personal protection and for containment or barrier nursing. We could send experts out to hospitals to help with barrier nursing. This is an area in which the CDC has the same kinds of capabilities; so there is a lot of crossover as you have heard throughout this week. Those are areas that we could become involved in. Decontamination: our mission is not decontamination as such, but we understand the organisms quite well. We understand how hardy they are in sunlight or how long they persist in the environment. If Tech Escort is involved in

decontamination, we can work with them in some of the technical aspects related to decontamination.

Mike Holden: I am Mike Holden with the Tech Escort Unit. As Colonel Franz has just said, our mission is like theirs. We do provide a lot of Federal support, local agency support, and the technical assistance and support for advisories, decontamination, detection, identification, mitigation, sampling, packaging, and transportation of particular chemical and biological agents to the appropriate lab facility, whether it be Aberdeen Proving Grounds or Fort Detrick. As David had indicated, when it gets into specific agents, they are the experts for that, and we really look to them to provide the appropriate guidance when we have to handle such agents. As the EPA indicated earlier, they do work, on Super Fund sites. That has primarily been our organization's historic oversight. We work those Super Fund sites with a lot of their guidance and within the rules and regulations that have been put upon us with other Federal transportation regulation guidance and things such as that.

We basically are DoD's first responders to such incidents after this whole plan has been implemented. We are there to support this entire panel in whatever asset it is that they require us to support them with.

Bill Goforth: To continue with what Mike was talking about, Tech Escort is organized of approximately 100 to 150 personnel with detachments at Pine Bluff, Arkansas, and Dugway Proving Ground, Utah. To some of the important things that he has covered I would like to add one other thing that we do and that is provide a hazard prediction. When it involves sarin, HD, some of the chemical warfare agents, we use a D2 PC program. It is the only program that is authorized in the Department of the Army. We have pretty good experts operating that program. The transportation: I like to believe that we are pretty proficient in the sampling, packaging of samples that we collect, escorting those samples to provide safety, and security on route back to a lab or different labs for verification. Chain of custody becomes very important when the FBI starts their criminal investigation; your chain of custody is one of the primary things as evidenced by some of the O. J. Simpson trial. Again, chain of custody and hazard prediction; I like to think that we are pretty proficient at those.

James Genovese: Basically what I would like to do is fill in the gaps. I think a lot of the agent identification issues have been addressed here. What I would like to do is give you a panoramic view of how the CPCT team pulls all this together within CBDCOM. As my Tech Escort colleagues mentioned to you, they are the first line of defense; they are the hands-on guys; they are the ones who really take their life in their hands. They do the on-site analysis and sampling which is a real issue and one of the things that we need to consider. This is probably something that certainly Dave Franz, CBDCOM, and Medical Research Institute for Chemical Defense (MRICD), the basic Army players, need to work on. As some people mentioned, you may get a mixed bag or you may not even know what the hazard is. You sample it; if it is a BL-4 virus, how do you separate that out from nitrogen dioxide or sarin? We do have in place a protocol. I think what Army is going to be doing is looking at that protocol, making sense as to how we do that process, and integrating how we do that chain of custody within the limits of the FBI. As far as what CBDCOM brings to the table as far as

chemical identification, as Tech Escort mentioned, they are the first line of defense, and they have state-of-the-art capability that they use as the first echelon for detection. Edgewood Research, Development and Engineering Center is their backup, basically through my team. We provide both on-site and back-at-the-ranch assessments so that we can confirm what Tech Escort's initial assessment of the hazard is.

One of the things you will see after lunch when you go outside to some of the demonstrations is redundancy. You will see some impressive chemical agent identifiers. You will see a chemical warfare treaty flyaway package which is a package that has state-of-the-art mass spectrometric capability; we can fly it anywhere in the world. I think this is important, when it comes down to the issue of agent identification, and someone on high comes down and says, "What is it? And tell me what do I do next." If we have only one system to give them that answer, that may not be convincing enough even to the guys that work on this stuff day to day. It is my feeling from a monitoring standpoint as well as from an agent identification standpoint that we do two things: we will bring to the site multiple, redundant, convincing capabilities so that we get a good handle on what our hazard is; we will also make those things as mobile as possible so that we do not have to wait to transfer the sample back to the ranch. We can do the assessment right at the point of incident and give that field commander or that incident or crisis manager a good handle on what he is up against without having a significant time delay.

Robert Elliot: I appreciate very much the opportunity to express a few words of congratulations to this august panel up here because it portrays the fact that we have to have teamwork and cooperation. Every event is scenario related: the cause and effect factor. If it is BW, CW, hurricane, earthquake, or flood, we have to have people on the ground to make an accurate assessment of those requirements, and we try to match those requirements with in-house capabilities. There are a lot of people here in this audience who do the grass-roots level work. You know, we talk about where the event occurs; it could be in a metropolitan area, it could be in a rural area, but you have to have everything contacted together. In other words, we talk about the three Cs: command, control, and communications. It is so important that we have this liaison going on at the local level, at the county level, at the State level, at the regional level, and at the national level. Because when the requirement goes out, we have to match it with other assets nationwide. From the Department of Veterans Affairs, you have to look into this group of people who are very talented, and they are everywhere. As you know, we have 172 medical centers nationwide, we have in excess of 350 outpatient clinics, and we now have 205 outpatient vet centers. With this talented group of people, when Frank or the group up here says we have a need for your assistance as a support agency, we are ready to come together and provide that assistance on a moment's notice.

Melissa Howard - Federal Emergency Management Agency: You are absolutely right. We are not in this alone. I am Melissa Howard with the Federal Emergency Management Agency, FEMA, you have heard referred to. The Federal Emergency Management Agency is charged by The President with coordinating the preparation for response to recovery from and mitigation of disasters and emergencies. It is a broad mandate, but the organization is a generalist organization. It counts on that circle chart you saw a few minutes ago of the

28 supporting Departments and agencies who are signatories to the Federal Response Plan. I am the publisher of the Federal Response Plan, but all of the parts of it come from all of the partners in the Federal Government supported in many cases by the private sector and certainly by the States. But the primary purpose of the Federal Response Plan is to support the States when State assets have been exceeded in response to one of these bad things that can happen. The Federal Emergency Management Agency has headquarters here in Washington, DC, and ten regional offices in the standard Federal regions. It is a fairly extensive operation and the assumption in FEMA is that when something happens the regions are activated to respond immediately. I think it has been pointed out here that there is "fast" and then there is what has to be "really fast," and this Technical Response Team that is being designed is exactly the way to go to get that response within hours. When we talk about what we can get out the fastest, it is certainly our communications assets, which are extensive, and our urban search and rescue teams, which are State-based but FEMA-funded, and those fine folks from Oklahoma City that you saw on television so often.

The other things that FEMA could be expected to have would be geographic information systems that would be available immediately and offer an information brokering or issue brokering forum for the Departments and agencies, or the States, or anyone who had some difficulties in a situation. The only other thing I think I would like to add is the Federal Response Plan is very much all hazard now and is not only incorporating recovery from disasters but also moving very much toward special incidents.

Admiral Young: FEMA is a most important lead in our consequence management; you make it happen. We appreciate particularly all that James Lee Witt has done in the revitalization of FEMA and the excellent activities that have taken place on that chart that Bill Clark showed us.

I would like to make three points. You have seen here the array of coordinative activities. What we are focusing on is how to get that transition. The usual thing that we do is dealing with crisis, but now how do we get that transition so that we are right out the door and able to help you and the State and local governments. That is absolutely key, and to do that we need the coordination of all of the partners. Agriculture is not here today nor transportation. These are people are also very key in making this happen, and we have heard from them along the way. We are building an integrated program.

Two other people that I would like to introduce: Hugh Sloan and Ron Banks, Regional Health Administrators from Region Six and Region Nine, respectively. As we go into an area, we use regional field coordinators and the regional health administrators to help coordinate these activities in the region. The point on coordination that is key that I would like to emphasize with my colleagues in DoD: I am so particularly pleased as a member of the uniformed services to stand, if you will, between the civil authorities on one side and the military on another in a uniformed service and be both a genetic chimera, as Josh and I would say, in that fashion and the assets of DoD that you will see brought to bear under this transitional plan that we are bringing together. You have seen all of the elements that we are working on right now are absolutely key. We could not function without DoD. But as we

work in these areas, the civil agencies are the leads, and we have been charged under PDD 39 to develop this lead which we are doing under the Federal Response Plan.

Point two: as we look at the integration within DoD and these assets, we need to look and see how we can marry in the specialties themselves. They are the bringing together of the CDC and the USAMRIID that we saw in that excellent Ebola response, the rapid diagnostic work that is being done, the individuals who go into harm's way from Tech Escort, and then our DMATs that go in and how to bring them into the area where they are protected, but also very first responders.

A final area is that we need to bring worker safety and surveillance in at the very beginning. We did not do that in Desert Storm, and I know, Josh, you worked and labored to look at what the relationships are of diseases to exposure. We are going to see possibly urban search and rescue workers 2 years from now coming down with agent dust if we do not have a surveillance system as we walk out the door, ready to go, with uniform guidance for worker safety. Just as Tech Escort is given guidance on how to keep out of harm's way, we need that guidance for the workers that we bring into an area. I do not want to have to go through agent orange, agent smoke, agent dust with agent chemical X or biological X. That is another area that you will see us focusing on.

Finally, one thing I want all of the tripartheid and our Japanese guests know is what I will be doing with DoD is looking at, under the leadership of FDA, and Dr. Stuart Nightingale who could not be here today, how we bring the more experimental pharmaceuticals and diagnostics into a level of approval where they can be appropriately used. I know that the FDA pipeline is a very long pipeline; it is a 10-year pipeline. We need to see how we can deal with this and what our pharmaceutical capabilities are. We rely on our pharmaceutical supplies from VA, from Perry Point, from the private sector, Project Hope, MAP, DoD, and others. But at that point, we have got to look at the ones that are experimental. You need to know that is going on at this time. You see before you a consequence response group that works with a crisis management group, and we go hand in hand. I would like to call up the FBI so that we can have them join us and then open up for your questions so that we can respond in this integrated team: crisis, consequence management, and the multiple Federal agencies.

Question: Has any consideration been given to a power upgrade, retrofit, and training for VA personnel in the metro regions to be the designated hospitals to receive casualties, especially from biological events, to avoid the problems with the media, public, and security?

Answer: I will answer it generally and then pass it over to VA to answer. It is important to note that the National Disaster Medical System and the commanders that we introduced today, has three parts. It has the Disaster Medical Assistance teams and the mortuary teams that do primary care. The second is the Federal Coordination Centers (there are about 72 of those), and they have a network of hospitals around them. It is that network that we are doing a special review project on this year and is an advertisement in our NDMS conference in March in San Diego of 1996. We are going to be looking at the role of the

Federal Coordinating Centers and how this interfaces. We will have a terrorism subgroup on that, but these Coordinating Centers have the ability to look at over 118,000 private sector beds and coordinate those actions.

Veterans Affairs: I would just like to answer your question. As you know, in the last 5 years we have had these multiple catastrophic events including Andrew, the North Ridge earthquake, the Mississippi floods, the floods in the Southeast, the World Trade Center bombing, the bombing in Oklahoma City. Having said that, the VA has people who volunteer to take up the slack if you would: in other words, professional clinicians. We have not only the administrative side but the clinical side; we have to come together. We talk about pharmaceuticals. We have a great inventory, and what we try to do is get those pharmaceuticals and medical supplies into the disaster area within 24 hours. We work through the CMOP organization within the VA. But about physicians, I will give you another idea. It has not been exposed already in this conference, but I do tell you that we have under Federal Executive Order 12657 a medical emergency radiological response team that is formed up and trains and responds to disasters as required. We try to complement and supplement the requirements of these local areas. If you hear about nuclear power plants, we are preparing for those sorts of things. We do not want to advertise it too much to make the public unduly concerned, but we have to have that capability in house. I will tell you that the VA is looking very hard at existing resources and, so far, under down-sizing and reinventing government and base closures, we have managed to keep our act together. We have a real fine coordination, not only the people here at the table, but also at the DoD, because under public law we have a mandated mission to support DoD for military operations. If they do not have enough in-house medics we will support them immediately. They may need to be evacuated from overseas into the United States, and we would have that capability. It is a two-headed coin: it could be a domestic disaster or it could be an international disaster, but VA will be there to support the requirements of the scenario.

Question: As you know, I am a member of a Federal agency. I would like to speak on behalf of the State and local people here for just a moment. Even though it is evident by the comments of the people at the table that there is great capability within the Federal Government. I believe there is a great deal of coordination, and the Federal Government can scramble within a few hours to deploy, perhaps respond a few hours later. We are going to expect State and local people to respond within minutes. The local government, the local people, the national media, everybody will expect them to respond within minutes. At this point I think if we were to reflect on what happened in Oklahoma City, if that were to have been a bio incident instead of a classical munition incident, when you think about what those responders would have faced, and what other responders around the country would have faced in a similar situation, I know we expect acts of heroism on the part of these people and we repeatedly see that, but we do not expect suicide. I think one of the great shortcomings of consequence at this point is the training of the resources and so forth provided to State and local people; I think we need to address this if we really do expect these people to respond in a few minutes.

Admiral Young: I would like to respond to that because you are absolutely correct. The Secretary of Health and Human Services submitted a budget to OMB of $20 million in fiscal year 1996 with offsets. Nine million dollars was accepted by OMB, and it has a $2 million component for training. It also has another component dealing with what we are calling metropolitan response teams or metropolitan SWAT teams. The very idea that you mentioned is to organize within particular, identified cities the health professions and environmental folks, because they have got to go out there and be the first responders. The team would go out under whatever the health needs are for that first responder unit. If it is a case where the EMS is in command and control, it would go out and train with EMS and with local fire rescue, but it is a local team. It will be a level 5 national disaster medical assistance team, and their timeframe should be 30 minutes to not too much more than 120 minutes. That is a new concept that was worked out. The program that we are looking at is to not only be a Federal program, but a program that has to coordinate State and local. That is why the local issues are absolutely key. Let me ask Bill to make a comment.

Bill Goforth: I think you had a really important topic. Certainly the responsibility for this is not solely vested in the Federal Government. There are a lot of stake holders in here, in the municipalities, the counties, the States, the Federal Government, the private sector. The big issue that we have been struggling with the last few months is trying to identify the critical issues, and then about training, education, and exercises, and the need for special equipment, and how this all works. It is going to take some time to work all of that out. But I look at it the way the HAZMAT crisis was in this country several decades ago. Back then USDOT came out with the first national HAZMAT program; they funded it. I think the NFPA was doing the implementation programs around the country; they called it Emergency Services. I was part of that cadre. It was really dynamic for the time because it standardized the languages and the approach, and they had a lot of standardized materials. My personal belief is that we need something like that for this sort of threat. We need to get the right people together to get some national thinking and training packages and educational materials together because right now I know that everybody is struggling with these issues. Sometimes they are doing the right things, and sometimes they are doing the wrong things, but they are trying to do something because they are going to be the first people to face the problem when it occurs. It is an important issue, and there is not an easy answer.

Question: I represent a police department up in the Metropolitan New York area and we have been in contact with the Army at Fort McClellan. They have offered to train our people for this exact response so we are getting cooperation, we are making progress. It is just a matter of time; we hope it will be done in the next month or two. There is progress being made.

Question: Is the problem of responding to multiple-city terrorist incidents being addressed?

Answer: The PDD that was put out, that Mr. Richard Clark spoke to, has within it the concept of being prepared. The need for the redundancy that Jim described. Are we ready now? Not as well as any of us would like to be, but I do not think I would ever say I would

be ready for anything in particular. It is always on a line of improving. But we have played scenarios of multiple-city hits; that is a very complicated issue but an important one.

Question: With respect to the multiple-city problem, our field offices are set up to do that and, while it was not that same sort of problem, in the Oklahoma City incident we ended up with command posts in Kingman, Arizona, and also at Fort Reilly, Kansas, in addition to the one in Oklahoma City. We have that capability to apply that structure. Again, it is when there is a need for that extraordinary effort that we have seen the resources come forward. Certainly the resources will be strapped, but there will be response. There is no question about that.

Answer: Maybe you missed what I said. We in EPA, the Federal Response System, and the Coast Guard handle hundreds of toxic chemical incidents every year. I probably think that a lot of these will be triaged down to that level, and the on-scene coordinators are trained to handle these. We will probably end up with some kind of coordinating body that meets once or twice a day to receive reports from the field and cross our fingers. With State and local help we will just have to blunder through somehow.

Admiral Young: But you should know within the first hour after Tokyo, there were calls made. We were looking at whether this was potentially a multiple international cities hit, so those actions went off pretty fast.

Question: I would like to turn the attention to victim identification. Suppose you have 3,000 bodies on your hands; what do you do with those bodies? Because in the Judeo/ Christian tradition, the burial is a very important part of culture, what is the thinking regarding the disposal of thousands of bodies with potential contamination?

Answer: We have discussed this. At the present time, if we were dealing with a large number, this has not really been addressed to the complete level of policy; it is under discussion now. One of the things that we have been thinking of is using refrigerated storage until the proper burial and identification could be made. This is a very difficult issue, particularly with some religious customs, but we felt in the number of thousands that you just raised that refrigeration would be what we would do as a first. In fact, in Oklahoma City and in some of the air crashes where our disaster mortuary teams have been deployed refrigerated trucks have been used. That has been done with body parts. I do not remember the number of thousands; maybe, Bill, you have this memorized. But in the Indiana American plane crash, there was in the thousands of body parts that were separately packaged. It was well over 20,000, and they were separately packaged and stored and refrigerated until identification in that complicated situation. The DEMORTs have one portable morgue that can be brought out; they have been out on the field in less than 12 hours.

I think Ed Eitzen might be able to provide some information on this topic. One of the things that troubles us with the fatality management is when you get into the sheer numbers you do not have to have necessarily contaminated remains. If you have a major earthquake with massive fatalities and there are fresh deaths, you need to do something rather quickly or

you become relatively socially unacceptable when the remains start to decay. That is the issue. You are fighting with time with gigantic numbers. I know that Colonel Eitzen has some information on contaminated remains.

DoD went through this issue during Desert Storm, as you might imagine, with the potential for casualties due to biological and, potentially, chemical agents over in the Gulf. Colonel Franz was at USAMRIID when this was hashed out, and he may have some comments on this issue. We had a meeting down at Fort Lee about 2 years ago at the Army's Mortuary Affairs Center to deal with just these issues of how to handle the internment of contaminated remains past the initial storage, and how do you actually handle the bodies. I guess the easy answer is to incinerate the remains. But that is not considered to be consistent with Army policy or our national policy. What we came up with at Fort Lee was that on the chemical side, decontamination is not really difficult. I mean we can do that because it is all external. On the biological side, we have an issue of external decontamination and also internal decontamination. The internal is really not possible. We can externally decontaminate the remains. The Army has set up procedures for handling those remains that would prevent either the morticians that handle them or the family members at funeral services and that sort of thing from becoming infected. That is not a perfect answer, but it is what we came up with.

Colonel Franz: The only thing I would add is that when we were working through this drill during the war, C. J. Peters was still at USAMRIID. He took the lead on that and we did, use inhalation anthrax as the worst case and assumed if we could deal with inhalation anthrax we could deal with anything with regard to decontamination.

Admiral Young: That is a very important and sensitive question, and we are trying to work that through. I should add that when we were in Oklahoma City we were able to mobilize 15 people from the 54th Quartermaster Corps, the Graves Registration, and they went out with Gary Moore to support the DEMORTs. This integrated command and support of State and local has been very effective.

Question: I am worried about the biological scenario. I am not old enough to remember the polio epidemic in this country, and I do not buy the media hype on how biologicals might work. On the question of mass quarantine and restricting movement of large populations so that you can begin to examine each individual and do the isolation and decon, what are your current thoughts on how you might be able to make something like that work.

Answer: You have asked an extraordinarily difficult question. The most important thing to do with people once you know the agent, if it is a bacterial agent, is to not move them prior to treatment. If one is dealing with a plague, even anthrax, a week on antibiotic therapy markedly reduces the infectivity, so treat as early as you can to avoid movement and putting balloons up with medical centers where individuals could go to for treatment is key. Secondly though, people will flee. There were some excellent studies done following the explosion at the Trade Center. We now know from data that was presented that there were a lot of people who went to their own doctors, Connecticut, elsewhere, and that is going to happen. With

regard to the Ebola quarantine, I am not sure whether it would have worked or needed to work, I would ask USAMRIID. Apparently that is a hard disease to spread unless you are in contact with the infected individuals. I would ask Ron Berger because that is the responsibility of the Centers for Disease Control. To show you how I would handle it, I would give a tasking from Health and Medical to the Centers for Disease Control with a request that they call Colonel Franz and get back to me in 20 minutes with his answer. Now, Ron, since I did that to you 20 minutes ago, would you please tell me now, after your consultation, how you would manage that.

Ron Berger: We would hire a fantastic quarterback and throw a long touchdown pass to the State. If you look at Public Health rules and regulations, and Public Health Codes, the State Health Officer and City Health Officers have broad-based powers to declare a public health emergency, to quarantine people, and other things along those lines. You mentioned Ebola, and I think the things that we heard from the Ebola folks is that it is not that contagious, talking about body fluids; that these people were sick enough; that they certainly were not going to go anywhere. I can only draw upon a lot of my experiences working in tuberculosis control for 14 years and knowing the problem we have with tuberculosis now and knowing that, fortunately, tuberculosis is not that contagious. After years of putting them in sanitariums, then forever, then treating them for 2 years, then 18 months, then 12 months, and now I believe we are down to 6 months; even that is a chore to make sure people take medication every day or twice weekly. People thought about quarantining them. Working in New York City we did sort of quarantine people either to their house or there was some thought of putting them on Rikers Island. That did not go over very well; the State Health Officer and the Governor, those folks did not want to go on record and do that. Then we had Congress wanting to do things with HIV infected individuals, and that did not go over big. There are things on the books for the local and the State health folks to do, but it is very difficult. Working in smallpox, we isolated the patient and hired guards to stand in front of their houses or their huts and made sure everybody had been vaccinated. But dealing with people, dealing with society, it is difficult to do that. I heard an anecdotal story in South Dade County that the 911 operators had to be handcuffed to their headsets because they wanted to go home. We actually had to quarantine them more or less to keep them answering the 911 calls. It is a difficult process. I guess laws are there to do it, but to carry it out is a different story.

Admiral Young: We did a recent game that may be of some degree of help to you in which we tried to exercise how we would manage an infectious agent in a multi-city hit. We were looking at the States of Connecticut, New York, and New Jersey. I gave you part of the answer which was essentially to treat as expeditiously as we can and use incentives to keep people coming to places for medicine to try to reduce the contamination as rapidly as possible. Then we brought the three Directors of the Departments of Health together to try to develop a conjoined policy.

Question: Much simpler question, sir. Are we going to get a copy of the proceedings and an attendance list?

Admiral Young: I want to pass that over to Bill. We have a part logistics, part economic, and part financial situation. For those of you that put seminars together, you know that Bill Clark was able to put this together with the invitational travel and do a very cost-effective operation. What Bill never did because we did not have the funds at that time, was to do pricing to get the video and the lists out. Bill, how are we going to do it?

William Clark: I think there are some people who, for the sensitivity of their position, should not appear on that attendance list. I am going to try to scrub it. I want to get a mailing out to everybody who is registered. I am going to try to do a number of things up front: I am going to try to get back all the presentation materials from the briefers, and put it all together as a package to go out to all the attendees. The third thing that we are going to try to do is to try to summarize, if we can, the briefing. We had originally toiled with did we want to do some type of a verbatim transcript. We do not think so, but we think that trying to get a summary sense of the briefings could be of significant value.

Question: It would be extraordinarily helpful if you could send us out something like they did with the Emergency Infectious Package from CDC to carry around.

Answer: Well, this seminar certainly emerged into a much greater entity than we had ever hoped for or dreamed for. I just think the synergy that has come out of here has been remarkable. We are going to do our best to try to capture what we can to get it into your hands.

Admiral Young: Before calling on Mike Jakub to close, I would urge that as you go back to your State and local communities, please do what you can to increase the sensitivities. Also, please know that we are here to do our very best to support you. You see not one agency but an array of agencies that do get together very frequently. We do not need to exchange business cards; we know each other. I want to thank each and every one of our partners for what has been a spectacular effort. The speakers really came from all the agencies that are here. It could not have been done without them and, Bill, I want to thank you personally. Probably I know more than anyone else all the work you put into this. Gary Moore, the staff that has been here, and President Zimble who made these excellent facilities available, I thank you all. This is the beginning; it is not the end. This is just the beginning; it is our first conference. Now I want to call my good friend Mike Jakub for his closing remarks from Department of State. Mike, I want to thank you for the impetus that you gave to pulling all of this together.

3.7 Closing Remarks

Michael A. Jakub
Department of State
Office of Coordinator for Counterterrorism

I was looking back over the last couple of days, and I got to thinking: I have seen more pictures of monkeys than I probably will want to look at for quite a long time. I enjoyed

watching Jim Genovese chase a vacuum cleaner around the floor that would not work, and a couple of other things which were different highlights of the conference that folks are going to remember. But I jotted down a couple of notes to maybe keep us on track a little bit about what the conference has been about.

Some things I have jotted down from that last 3 days that we probably ought to keep in mind. Number one, the threat is real. If anybody has any more doubts about why we need to be prepared for chemical/biological terrorism, all we have to do is take a look at the events in March and some that occurred before that. Somebody made the point yesterday that we have to be prepared because the next time it is probably going to be worse. It can be either chem or bio. We had somewhat of a debate yesterday between those who say chem is more likely; we have others who say bio is more likely. You know what, it ain't really gonna matter. The problem we have got here is we have to be prepared to respond to it. Consequence managers have got to be able to respond to a terrorist-induced act of violence, and we are going to have to pull the same people in if we ever have a problem with a naturally occurring epidemic outbreak.

There is an old Chinese proverb: watch out what you ask for; sometimes you get it. Our problem now is for years and years there were many of us who cried in the night, "We have got to worry about chem/bio terrorism and we have got to be prepared for it," and we were all told, "Here is a cookie, go back to bed, get out of my hair." The problem is now on the scope of the highest level policy makers of this country, and guess what: now they are looking to us and saying, "I remember you guys talking to me. Gimme some ideas on what I can do." It has now been dropped back in our laps along with a legitimate request from our bosses and the people we work for, "Tell me what now needs to be done, and I will help you do it."

Over the last couple of days our speakers have outlined some capabilities that we already have and some things that are already underway to respond. I think they have given us some indications of where further efforts are needed in some general areas. Let me review some of the ones I took notes on. This is by no means a complete list.

We talked about the final publication of a PDD 39 which deals with response to weapons of mass destruction terrorism. That is a very broad policy formulation document. What in essence it says is that the U.S. will be prepared to respond to this kind of a thing, We will work with foreign nations in this particular regard. It outlines some broad areas of what we want to do. It is now up to the agencies working individually and especially in concert with each other to put some teeth into that policy. Now we have got to come up with policy formulation on some issues that we were talking about here today. Things like, what is the policy on mortuary service activities, etc. That is not something The President should be deciding; that is something that is being pushed down to the right levels. It is the interagency process, and it is folks in this room and the people we work for who are the ones who are going to have to identify what those policies should be and get them implemented properly. There are not only national things we have got to look at but international ones as well. This is one of the reasons why we are very encouraged by the work of the CANUKUS trilateral group; we will be following up on some of those items tomorrow. But we have also got to

look beyond that, maybe into some new areas that we need to be working, especially in the field of consequence management, which we will be addressing that in a lot more detail.

Some of our speakers pointed out areas we need to be concentrating on in the field of intelligence. I would say these include enhancing our capabilities, not only for gathering information about groups and intentions and capabilities, the normal types of things that our community does, but also information on foreign chemical and biological warfare capabilities and proliferation, and the networks that are being utilized to acquire equipment, precursors, and anything else necessary to make CB devices. In many respects there is a natural affinity there between the CB community and the proliferation community; it is one we need to work better, not only from the Intel side, but also from the connection between the intelligence communities who are working that issue and the policy makers who have to make some hard decisions about information that they are provided.

Many of you highlighted the need for better education and training programs, and not only for policy makers. But do not forget about those guys who have to make the ultimate decisions. It is a lot better making a decision when you know what the problem is and what the options are than it is doing it in the dark. We also need to educate and train all the way to the front line responders; especially doctors, fire fighters, police, hospital officials, etc. One item that came up again and again was the need to tap further into U.S. military capabilities and training opportunities for domestic response planning purposes to enhance capabilities. There have been some efforts in that area that have been identified in the group, but I think the feeling that has come out that there are probably a number of other areas that can be exploited in the future. I think that is a very key issue.

One other thing that came out was the need to better coordinate among Federal, State and local governments, agencies, and responders. There already are systems in effect: FEMA, PHS, and others run them. But I think what came out here is that they work fairly well, sometimes they work great for natural disaster. That is what they were put in place for, but nobody has really worked the CB angle before. What we need to learn is to draw on what we have learned from responding to natural disasters, and apply it to the CB arena.

There were a number of comments about the need for better response equipment, and technology to support equipment development, especially in the area of detection systems, warning systems, protective equipment, decontamination devices and equipment, etc. There is a lot of good work already underway in a number of those areas, but there are still a lot of things to do. Our R&D communities need to take hard looks at those issues to make sure we are not duplicating unless it is for a purpose. I think we already have in place the systems to pull that particular aspect of it together.

I heard time and again about making more of an investment in antibiotics, vaccines, therapies, and stockpiling the medicines some place where we are going to be able to get to them when we need them. I think the right folks are here today and there are others who were not able to attend who are going to have to take a hard look at that one and make some very hard decisions. We are going to need inputs from a lot of doctors, hospital administrators, and whatnot.

Another comment that we heard again and again was we need to conduct a lot more exercises at all levels. Not just the Federal level, but combinations: Federal, State, local, and whatnot. I see a couple of you in the room who may remember Transboard III back in the 1989-1990 timeframe. It was the first time anything was ever done on a chemical or a biological event. Actually that was a chem incident, and it was done not only with U.S. agencies playing, but it was done in cooperation with Canada. This was an exercise that simulated a chemical terrorist attack which occurs up in the Detroit area, naturally on the river where there is a border that kind of meanders; so it creates all kinds of international problems. But we have not had an exercise like that since 1990. Maybe it is time to take a look from the exercise standpoint. Do we need to do something like that again?

I want to thank our Japanese colleagues who came a long way to share with us some very critical information. They had to respond to a real-world event. They did a fantastic job, and the information that they shared with us in that particular regard is going to be very helpful as we begin our own efforts and take a look at our own capabilities.

I want to thank the other members of the CANUKUS trilateral who came to the meeting, who brought their insights on current systems and whatnot in their own countries. There is a lot we can all learn by mutual sharing of this information.

Last, but not least, I want to echo something Frank said. I want to thank Admiral Zimble for making this grand facility available; this has been absolutely splendid. To thank Admiral Manley for all her encouragement and for the work of this particular group. To thank Admiral Frank Young without whose guidance and firm direction this conference could not have been as successful as it was. Thank you very much, Frank. To thank a guy who I have been very proud to call a friend for about 15 years. Last night he and I were talking about what happens to people once they turn over 50. We will not even get into that, but… Bill Clark, thank you very much. This has been a fantastic conference, and I think everyone has gotten more out of it than we ever thought possible.

I just want to say 60 seconds worth of things and always give the last word to Frank. I kind of feel like the character Kevin Costner played in that movie a couple of years ago, the *Field of Dreams*. And he had that message: build it and they will come. And for our foreign visitors who might not understand the movie, he had to build this ball field on a farm in the middle of nowhere. He did this and the players came and it was extraordinary. I kind of feel that way with this seminar: build it and they will come. We tried our best to build this. We were expecting 150, 200 people maybe. They did come. You did come. We are really very pleased that we had this extraordinary turnout. Thank you for coming.

Admiral Young: I will just conclude by saying thank you for coming and also, this is the beginning. We look forward to planning this transitional plan that will be a seamless plan that will bring together in the best way that we can, not only the Federal family, but State, and most importantly, the local folks where the action is. My promise to you is that we will work as vigorously as we can together, with as much mutual support as we can together, with the assets that we can all bring together to be as ready as we can for this time.

Josh, I want to particularly thank you and through you the academic community because one of the parts that we need to do as emergency junkies is to reach out more to the academic community and involve the great private sector in the academic health centers, the academic universities. I thank you so much for coming, staying, and being part of it and for all that you have done over the years to make this happen. For those from the police and the fire rescue who were here, I know we may have scared you just a tad, that was our idea. We felt that if we did, that might be helpful in the motivation. Fear is a good part as long as it motivates you to do something. I look forward to working with all of you to develop other training and exercise activities. Remember this is going to happen. We have got to be prepared. Thank you all very much for coming.

3.8 Field Demonstrations

Field demonstrations were held on the ball field east of the USUHS campus by the following organizations:

- U.S. Public Health Service
- U.S. Army Medical Research Institute for Infectious Diseases
- U.S. Army Technical Escort Unit
- U.S. Army Edgewood Research and Development Engineering Center
- U.S. Navy, Biological Defense Research Program, Naval Medical Research Institute
- U.S. Environmental Protection Agency
- U.S. Department of Energy
- Montgomery County, MD, Department of Fire and Rescue Services HAZMAT Unit
- Prince Georges County, MD, Fire Department HAZMAT Unit