



PUBLIC HEALTH STATEMENT

JET FUELS (JP-5 and JP-8)

CAS#: 8008-20-6

Division of Toxicology

August 1998

This Public Health Statement is the summary chapter from the Toxicological Profile for Jet Fuels JP-5 and JP-8. It is one in a series of Public Health Statements about hazardous substances and their health effects. A shorter version, the ToxFAQs™, is also available. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present. For more information, call the ATSDR Information Center at 1-888-422-8737.

This public health statement tells you about the jet fuels JP-5 and JP-8 and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most hazardous waste sites in the nation. These sites make up the National Priorities List (NPL) and are the sites targeted for long-term federal cleanup activities. JP-5 and JP-8 have been found in at least 22 of the 1,445 current or former NPL sites. However, the total number of NPL sites evaluated for this substance is not known. As more sites are evaluated, the sites at which JP-5 and JP-8 are found may increase. This information is important because exposure to these substances may harm you and because these sites may be sources of exposure.

When a substance is released from a large area, such as an industrial plant, or from a container, such as a drum or bottle, it enters the environment. This release does not always lead to exposure. You are exposed to a substance only when you come in contact with it. You may be exposed by breathing, eating, or drinking the substance or by skin contact.

If you are exposed to JP-5 and JP-8, many factors determine whether you'll be harmed. These factors include the dose (how much), the duration (how long), and how you come in contact with it. You must also consider the other chemicals you're exposed to and your age, sex, diet, family traits, lifestyle, and state of health.

1.1 WHAT ARE JET FUELS JP-5 AND JP-8?

Propellants are substances that move other objects or give thrust. JP-5 and JP-8 stand for jet propellant-5 and jet propellant-8. They are used by the military as aircraft fuels. JP-5 is the U.S. Navy's primary jet fuel, and JP-8 is one of the jet fuels used by the U.S. Air Force. Both JP-5 and JP-8 are colorless liquids and smell like kerosene. Kerosene is the primary substance in each. Although JP-5 and JP-8 are liquids at room temperature, they can also change into gas vapor. Both JP-5 and JP-8 are flammable. JP-5 and JP-8 can be made from refining crude petroleum oil deposits found underground and under the ocean floor. They can also be made from shale oil found in rock. Because kerosene (which is also referred to as fuel oil no. 1) is the main part of JP-5 and JP-8, the profile sometimes uses the word kerosene and other names that it can be called instead of the words JP-5 and JP-8. In addition to kerosene, both JP-5 and JP-8 contain various additives according to standards specified by the U.S. Air Force and U.S. Navy. Other common names for JP-5, JP-8, and kerosene are these:

- fuel oil no. 1
- straight-run kerosene
- kerosine
- range oil

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Deobase (the trade name of a clear, white, deodorized kerosene)
coal oil

1.2 WHAT HAPPENS TO JET FUELS JP-5 AND JP-8 WHEN THEY ENTER THE ENVIRONMENT?

JP-5 and JP-8 are made up of many different substances. Some of these chemicals easily evaporate into the air when jet fuels are spilled accidentally onto soils or surface waters (for example, streams, rivers, lakes, or oceans). Other chemical parts of JP-5 and JP-8 are more likely to dissolve in water following spills to surface waters or leaks from underground storage tanks. Some of the chemicals in jet fuels may slowly move down through the soil to the groundwater. Another group of chemicals in jet fuels readily attach to particles in the soil or water. Once attached in water, these particles may sink down into the sediment. The chemicals that evaporate may break down into other substances in air by reacting with sunlight ("photooxidize") or other chemicals in the air. The chemicals that dissolve in water may also be broken down into other substances by living organisms (primarily bacteria and fungi) in the soil or water. However, this may take many years to occur, depending on the environmental conditions. The breakdown products of JP-5 and JP-8 are not known, so it is not known whether they are toxic. Some chemicals that attach to soil or other matter (for example, marsh sediment) may remain in the environment for more than a decade. Although they make up only a tiny fraction of JP-5 and JP-8, benzene, toluene, and xylenes (single-ring aromatic compounds), as well as polycyclic aromatic hydrocarbons, are the components of JP-5 and JP-8

about which we have the greatest amount of information. These substances are toxic to humans.

1.3 HOW MIGHT I BE EXPOSED TO JET FUELS JP-5 AND JP-8?

It is unlikely that you will be exposed to JP-5 or JP-8 unless you work with jet fuels or live very close to where they are used or spilled. Exposure to JP-5 or JP-8 can occur if you have skin contact with soil or water contaminated from a spill or leak. You may also be exposed to JP-5 or JP-8 if you swim in waters where jet fuels have been spilled. If jet fuels have leaked from underground storage tanks and entered underground water, you may drink contaminated water from a well containing JP-5 or JP-8. You might breathe in some of the chemicals evaporating from a spill or leak site if you are in an area where an accident has occurred. Exposure to some of the components of JP-5 and JP-8 might occur from air releases if these components settle to the ground near populated areas. There are no data on the background levels of JP-5 and JP-8 that may be found in the environment.

Workers involved in making or transporting jet fuels or in refueling military aircraft that use JP-5 or JP-8 might breathe air containing these substances. Some workers may be exposed to JP-5 or JP-8 through their skin if they come into contact with them without adequate protection from gloves, boots, coveralls, or other protective clothing.

1.4 HOW CAN JET FUELS JP-5 AND JP-8 ENTER AND LEAVE MY BODY?

JP-5 and JP-8 can enter and leave your body when you breathe them in the air, when you drink water

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or eat food containing them, and when your skin comes into contact with them. This can occur in the workplace or if you live near a facility where these fuels are made or near a military base. When you use kerosene or heating oil, you are exposed to some of the same substances that are found in JP-5 and JP-8. We do not know how much of these compounds might be taken up by your body if you inhale JP-5 and JP-8 vapor, drink contaminated water, or come in contact with JP-5 or JP-8. We have no information on what happens to these chemical mixtures once they enter your body. We do know that when animals were exposed to kerosene, small amounts were found in their brains, lungs, livers, spleens, and kidneys. It is not known whether kerosene would be found in these parts of the body in similarly exposed people. We do not know if JP-5 and JP-8 are broken down and leave the body primarily in the urine or the feces. The toxicological properties of JP-5 and JP-8 are very dependent upon the crude stock and batch lot. These compounds are complex and varied mixtures, and their composition may affect their toxicity.

1.5 HOW CAN JET FUELS JP-5 AND JP-8 AFFECT MY HEALTH?

We know very little about the human health effects caused by JP-5 and JP-8, but some health effects might be predicted because of what we know about kerosene, the main chemical substance in these jet fuel mixtures. Many things will determine if you will be harmed by exposure to these substances, including how much you were exposed to; how long you were exposed; how you came in contact with them; and your age, sex, diet, family traits, and other factors described in the beginning of this section. Breathing in large amounts of JP-5 or JP-8

vapors or aerosol for a short time would cause you to have a suffocating feeling, and breathing would be painful. Numerous case studies have reported accidental poisoning in children as the result of drinking kerosene. Drinking kerosene may cause vomiting, diarrhea, swelling of the stomach, stomach cramps, drowsiness, restlessness, irritability, and loss of consciousness. Coughing, pneumonia, and difficult or painful breathing after drinking kerosene suggest that kerosene has entered the lungs. In addition, drinking large amounts of kerosene can put you into a coma, cause convulsions, and may even cause death. When kerosene gets on your skin for short periods, it can make your skin itchy, red, and sore. Sometimes blisters may occur and your skin may peel.

Breathing kerosene or JP-5 vapors can also affect your nervous system. Some of the effects that have been noted in case studies include headache, lightheadedness, anorexia (loss of appetite), poor coordination, and difficulty concentrating.

To protect the public from the harmful effects of toxic chemicals and to find ways to treat people who have been harmed, scientists use many tests.

One way to see if a chemical will hurt people is to learn how the chemical is absorbed, used, and released by the body; for some chemicals, animal testing may be necessary. Animal testing may also be used to identify health effects such as cancer or birth defects. Without laboratory animals, scientists would lose a basic method to get information needed to make wise decisions to protect public health. Scientists have the responsibility to treat research animals with care and compassion. Laws today protect the welfare of research animals, and

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scientists must comply with strict animal care guidelines.

Repeated contact with fuels such as JP-5 and JP-8 can cause skin cancer in mice. We do not know if JP-5 and JP-8 can cause cancer in humans. The International Agency for Research on Cancer (IARC) has concluded there is not enough information available to determine if jet fuels or distillate (light) jet fuels cause cancer (Group 3 classification). However, IARC has determined that occupational exposures during petroleum refining are probably carcinogenic to humans (Group 2A classification). Exposure during petroleum refining includes exposures to substances that are not found in JP-5 and JP-8. We do not know if JP-5 or JP-8 can cause birth defects or if they affect reproduction.

1.6 IS THERE A MEDICAL TEST TO DETERMINE WHETHER I HAVE BEEN EXPOSED TO JET FUELS JP-5 AND JP-8?

No medical test shows if you have been exposed to JP-5 or JP-8. Methods are available to determine if your blood contains JP-5 and JP-8 components such as benzene, toluene, and xylenes. However, the concentrations of these chemicals in fuels such as JP-5 and JP-8 are very low, and if they were detected in your blood it might not necessarily indicate that you had been exposed specifically to JP-5 and/or JP-8. In this case, it would be helpful for your doctor to know whether you might have been exposed to other chemicals. For information on tests for measuring exposure to individual components of JP-5 and JP-8, see the ATSDR toxicological profiles on benzene, toluene, xylenes, and polycyclic aromatic hydrocarbons.

1.7 WHAT RECOMMENDATIONS HAS THE FEDERAL GOVERNMENT MADE TO PROTECT HUMAN HEALTH?

The federal government develops regulations and recommendations to protect public health. Regulations can be enforced by law. Federal agencies that develop regulations for toxic substances include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), and the Food and Drug Administration (FDA). Recommendations provide valuable guidelines to protect public health but cannot be enforced by law. Federal organizations that develop recommendations for toxic substances include the Agency for Toxic Substances and Disease Registry (ATSDR) and the National Institute for Occupational Safety and Health (NIOSH).

Regulations and recommendations can be expressed in not-to-exceed levels in air, water, soil, or food that are usually based on levels that affect animals; then they are adjusted to help protect people. Sometimes these not-to-exceed levels differ among federal organizations because of different exposure times (an 8-hour workday or a 24-hour day), the use of different animal studies, or other factors. Recommendations and regulations are also periodically updated as more information becomes available. For the most current information, check with the federal agency or organization that provides it. Some regulations and recommendations for JP-5 and JP-8 include the following:

The Department of Transportation regulates the transport of jet fuels such as JP-5 and JP-8 because

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they are classified as hazardous materials that are considered to pose a risk to health, safety, or property when moved. OSHA and the Air Force Office of Safety and Health (AFOSH) regulate levels of petroleum products in private sector workplaces and in Air Force workplaces, respectively. The maximum allowable amount of petroleum products in workroom air during an 8-hour workday, 40-hour workweek, is 400 milligrams per cubic meter (mg/m³). ATSDR has derived an intermediate-duration inhalation minimal risk level (MRL) of 3 mg/m³ for JP-5 and JP-8. An MRL is an estimate of daily human exposure to a substance over a specific period that is likely to be without an appreciable risk of adverse effects (noncarcinogenic).

1.8 WHERE CAN I GET MORE INFORMATION?

If you have any more questions or concerns, please contact your community or state health or environmental quality department or:

Agency for Toxic Substances and Disease Registry
Division of Toxicology
1600 Clifton Road NE, Mailstop F-32
Atlanta, GA 30333

Information line and technical assistance:

Phone: 888-422-8737
FAX: (770)-488-4178

ATSDR can also tell you the location of occupational and environmental health clinics. These clinics specialize in recognizing, evaluating, and treating illnesses resulting from exposure to hazardous substances.

To order toxicological profiles, contact:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Phone: 800-553-6847 or 703-605-6000

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological profile for jet fuels JP-5 and JP-8. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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