This public health statement tells you about wood creosote, coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles and the effects of exposure.

The Environmental Protection Agency (EPA) identifies the most serious 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. Coal tar creosote, coal tar, or coal tar pitch have been found in at least 33 of 1,430 current or former NPL sites. However, it's unknown how many NPL sites have been evaluated for these substances. As more sites are evaluated, the sites with creosote, coal tar, and coal tar pitch may increase. This 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 creosote, coal tar, coal tar pitch, or coal tar pitch volatiles, 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 is creosote?

Wood creosote, coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles are rarely formed in nature. Creosote is the name used for a variety of products that are mixtures of many chemicals. Creosotes are created by high-temperature treatment of beech and other woods (beechwood creosote) or coal (coal tar creosote), or from the resin of the creosote bush (creosote bush resin). Wood creosote is a colorless to yellowish greasy liquid with a characteristic smoky odor and sharp burned taste. It is relatively soluble in water. Creosote prepared from coal tar is the most common form of creosote in the workplace and at hazardous waste sites in the United States. Coal tar creosote is a thick, oily liquid that is typically amber to black in color. It is easily set on fire and does not dissolve easily in water. Coal tar and coal tar pitch are the by-products of the high-temperature treatment of coal to make coke or natural gas. They are usually thick, black, or dark brown liquids or semisolids with a smoky or aromatic odor. Coal tar residues can also be found in the chimneys of homes heated with coal, especially if insufficient oxygen is present. Chemicals in the coal tar pitch can be given off into the air as coal tar pitch volatiles when coal tar pitch is heated.

Beechwood creosote has been used as a disinfectant, a laxative, and a cough treatment. In the past, treatments for leprosy, pneumonia, and tuberculosis also involved eating or drinking beechwood creosote. It is rarely used today in the United States by doctors, since it has been replaced by better medicines. It is still available as an herbal remedy, and is used as an expectorant and a laxative in Japan. The major chemicals in beechwood creosote are phenol, cresols, and guaiacol. Coal tar creosote is the most widely used wood preservative in the United States. It is also a restricted use pesticide. Coal tar products are ingredients in medicines used to treat skin diseases such as psoriasis. These products are also used as animal and bird repellents, insecticides, animal dips, and fungicides. Coal tar, coal tar pitch, and coal tar pitch volatiles are used in several industries, including road paving, roofing, aluminum smelting, and coking. About 300 chemicals have been identified in coal tar creosote, but there may be as many as 10,000 other chemicals in this mixture.

Coal tar creosotes, coal tar, and coal tar pitch are similar in composition. The major chemicals in coal tar creosote, coal tar, and coal tar pitch that can cause harmful health effects are polycyclic aromatic hydrocarbons (PAHs), phenol, and cresols. Coal tar pitch volatiles vary depending on the composition of the coal tar product that is being heated. Because coal tar creosote is the major type found in the environment and at hazardous waste sites in the United States, we will emphasize its effects on human health in this profile. The health effects of coal tar and coal tar pitch will also be described.

The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile for Polycyclic Aromatic Hydrocarbons, the ATSDR Toxicological Profile for Cresols, and the ATSDR Toxicological Profile for Phenol provide more information on these chemicals.

1.2 What happens to creosote when it enters the environment?

No information is available on what happens to wood creosote when it enters the environment. Coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles rarely occur in the
environment naturally since they are synthetic chemicals. Coal tar creosote is released to water and soil mainly as a result of its use in the wood preservation industry. In the past, waste water from wood treatment facilities was often discharged to unlined lagoons where it formed a sludge. Also, companies that preserve wood with coal tar creosote may treat their water wastes in treatment plants or release the waste water to the municipal water treatment system. This is still the largest source of coal tar creosote in the environment. However, new restrictions from the EPA have caused modification of treatment methods that have decreased the amount of creosote available to move into soil from waste water effluents. Coal tar creosote contains some components that dissolve in water and some that do not. Coal tar creosote components that dissolve in water may move through the soil to eventually reach and enter the groundwater, where they may persist. Once in the groundwater, breakdown may take years. The components that are not water soluble will remain stationary in a tar-like mass. Migration from the site of contamination is not extensive. Breakdown in soil can take months for some components of coal tar creosote, or much longer for others. Coal tar creosote components may also be found in the soil as a result of leaking or seeping from treated timber.

Volatile chemicals in coal tar creosote may evaporate and enter the air. About 1-2% of the coal tar creosote applied to treated wood is released to the air. This is a small amount compared to the amount of coal tar creosote found in waste water or soil. Coal tar and coal tar pitch are released into the environment in a similar way. They are most often found in and around coke or natural gas-producing factories, or at abandoned coke or gas factory sites. Water or soil surrounding these areas may contain detectable levels of coal tar or coal tar pitch.

Once coal tar creosote is in the environment, both plants and animals can absorb parts of the creosote mixture. Some components of coal tar creosote have been found in plants exposed to creosote-treated wood in nearby soil. The plants absorb very little (less than 0.5% of the amount available to the plant). Animals such as voles, crickets, snails, pill bugs, and worms absorb coal tar creosote components in their environments. Aquatic animals, such as crustacea, shellfish, and worms, also accumulate coal tar creosote compounds. For instance, mussels attached to creosote-treated pilings, and snails and oysters living in water near a wood-treatment plant, had creosote in their tissues. Coal tar creosote components are also broken down by microorganisms living in the soil and natural water. The components of coal tar and coal tar pitch move in the environment in a similar way.

1.3 How might I be exposed to creosote?

Herbal remedies containing the leaves from the creosote bush (chaparral) are available as a dietary supplement and act as a source of exposure to wood creosote. Hazardous waste sites are a major source of contamination with creosote, coal tar, and coal tar pitch. Individuals working in the wood-preserving industry make up the largest part of the population that might be exposed to coal tar creosote. Asphalt workers and people working in the coke-producing industries are also at risk for potential exposure to coal tar pitch and coal tar pitch volatiles. They may breathe in vapors from or have direct skin contact with wood-preservation solutions, freshly treated wood, asphalt mixtures, or other products of coke-producing industries. Workers who use creosote-treated wood in building fences, bridges, or railroad tracks or installing telephone poles may be exposed; those who inspect or maintain these materials, or apply asphalt
or other coal tar pitch-containing materials, may also be exposed. Homeowners, farmers, or landscapers who apply coal tar creosote to wood in noncommercial settings using a brush or dip procedure, or who use railroad ties or telephone poles in landscaping, or who reclaim scrap lumber from a treated structure may also be exposed. In addition, people who work or live in treated-wood houses (log cabins) may be exposed through the air or by direct contact with the wood. Exposure to coal tar products may also occur in the natural gas and aluminum smelting industries. You can be exposed by any contact with water, soil, air, or plant and animal tissues that contain creosotes, coal tar, coal tar pitch, or its volatile components. Intentional or accidental eating of coal tar creosote has resulted in poisoning. If your activities bring you into contact with these mixtures, such as at hazardous waste sites, in contaminated groundwater, in wood products treated with creosote, or in contaminated shellfish, you will be exposed to coal tar creosote, coal tar, coal tar pitch, or coal tar pitch volatiles. Drinking water contaminated by a hazardous waste site may also be a source of exposure.

1.4 How can creosote enter and leave my body?

Creosotes and coal tar products can enter your body through the lungs, stomach, intestines, and skin. There is no information that describes how fast or how much of creosote or its components might enter the body after one or many exposures. The amount that enters the body depends on how you come in contact with it (air, food, water, skin), how much of the mixture is present, and how long you are exposed to it. Many of the parts of the coal tar creosote mixture (for example, PAHs) are rapidly absorbed through the lungs and the stomach and intestines. Prolonged exposure through the skin, without washing, may increase the amount of the creosotes or coal tar products absorbed into the bloodstream. Individual components of coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles may be stored in body fat. Some studies indicate that creosotes may cross the placenta into the tissue of the developing fetus. Because coal tar products may be stored in body fat, they may be found in breast milk. Creosotes are excreted primarily in the stool; a smaller amount is excreted in the urine.

1.5 How can creosote affect my health?

Exposure to creosotes, coal tar, coal tar pitch, or coal tar pitch volatiles may be harmful to your health. Eating food or drinking water contaminated with a high level of these compounds may cause a burning in the mouth and throat as well as stomach pains. Taking herbal remedies containing creosote bush leaves may result in damage to the liver. Reports describing coal tar creosote poisoning in workers, or accidental or intentional eating of coal tar creosote, indicate that adverse reactions may occur. These reports indicate that brief exposure to large amounts of coal tar creosote may result in a rash or severe irritation of the skin, chemical burns of the surfaces of the eye, convulsions and mental confusion, kidney or liver problems, unconsciousness, or even death. Longer exposure to lower levels of coal tar creosote, coal tar, coal tar pitch, or coal tar pitch volatiles by direct contact with skin or by exposure to the vapors from these mixtures can also result in sun sensitivity and cause damage to skin, such as reddening, blistering, or peeling. Longer exposures to the vapors of the creosotes, coal tar, coal tar pitch, or coal tar pitch volatiles can also cause irritation of the respiratory tract. Skin cancer and cancer of the scrotum have also resulted from long exposure to low levels of these chemical mixtures, especially through direct contact with skin during wood treatment or manufacture of
coal tar creosote-treated products, or in coke or natural gas factories. Cancer of the scrotum in chimney sweeps has been associated particularly with prolonged skin exposure to soot and coal tar creosote. These levels are much higher than the levels that you are likely to be exposed to in groundwater, food, air, or soil.

Rats and mice fed a large amount of wood creosote at one time had convulsions and died. Rats fed a smaller amount of wood creosote for a long period developed kidney and liver problems, and died. Limited evidence from experimental studies of pregnant pigs and rats indicates that components of creosote, such as PAHs, cross the placenta following maternal inhalation and may cause harmful effects in the baby. Exposure to coal tar products through the skin has resulted in skin cancer in animals.

The International Agency for Research on Cancer has determined that coal tar creosote is probably carcinogenic to humans. The EPA has also determined that coal tar creosote is probably a human carcinogen.

1.6 Is there a medical test to determine whether I have been exposed to creosote?

There is no medical test to determine if you have been exposed to wood creosote, coal tar creosote, coal tar, coal tar pitch mixtures, or coal tar pitch volatiles. However, chemicals contained in coal tar creosote or coal tar products (PAHs) can be found in the body and can be measured in body tissues (organs, muscle, or fat) or blood after exposure to coal tar creosote or other coal tar products containing PAHs. Exposure to the low levels of these substances found in groundwater, food, air, and soil may not be detected with the test. Chemicals in coal tar creosote and its breakdown products can also be measured in the urine of exposed individuals. Urine tests are commonly done for employees in industry who work with coal tar creosote, coal tar, and coal tar pitch to monitor their exposure. For example, the metabolite 1-hydroxypyrene, which can be detected in urine after exposure to specific PAHs (for example, benzo[a]pyrene) contained in creosote, can be used to detect exposure to creosote.

This test is available at a doctor's office and may require that a specimen be sent to a laboratory where special equipment for detecting the compound is available. These tests can confirm that a person has been exposed to the chemicals found in coal tar creosote and other coal tar products, but cannot accurately predict whether you will experience any health effects. Also, these tests cannot tell whether the chemicals came from coal tar creosote or other sources. Since the chemicals in coal tar products remain in body tissues for long periods, these tests may not be useful in determining when you were exposed. Tests that determine levels of breakdown products may be more accurate in predicting exposure within days. There are no specific tests for the components of wood creosote.

1.7 What recommendations has the federal government made to protect human health?

The Food and Drug Administration (FDA) has issued a public warning against consumption of herbal products derived from the leaves of the creosote bush (chaparral) because of reports of acute toxic hepatitis after use as a dietary supplement.
The federal government has not developed regulatory standards and guidelines to protect people from the potential health effects of exposure to coal tar creosote in drinking water and food. Regulatory standards and guidelines for air and water exist for the most important individual PAHs and phenols contained in wood creosote, coal tar creosote, coal tar, and coal tar pitch. The EPA has declared coal tar creosote a restricted use pesticide. This means it can only be bought and used by certified applicators and only for those uses covered by the applicator’s certification. In addition, coal tar creosote has been identified as a hazardous waste.

The federal government has developed regulatory standards and guidelines to protect workers from the potential health effects of other coal tar products in air. The Occupational Safety and Health Administration (OSHA) has set a legal limit (Permissible Exposure Limit or PEL) of 0.2 milligrams of coal tar pitch volatiles per cubic meter of air in workroom air to protect workers during an 8-hour shift.

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 E-29
Atlanta, GA 30333

* Information line and technical assistance

Phone: 888-422-8737
FAX: (404)498-0057

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

ATSDR Information Center / ATSDRIC@cdc.gov / 1-888-422-8737

This page last updated on June 22, 2001