ToxGuide™ for Creosote

(wood creosote, coal tar creosote, coal tar, coal tar pitch, coal tar pitch volatiles)

CAS # 8021-39-4; 8001-58-9; 8007-45-5

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Sources of Exposure

General Populations

- The general population is generally exposed to creosote at low levels. Coal tar creosote is restricted for use to certified applicators only.
- Potential sources of exposure to creosote include contact with creosote-treated wood products, incineration of creosote-treated scrap lumber, or ingestion of contaminated groundwater.
- Exposure may also occur during the therapeutic use of coal tar dandruff shampoos and coal tar ointments for treatment of eczematous dermatitis or psoriasis.
- Exposure may also occur through ingestion of dietary supplements or tea that contains leaves from the creosote bush.
- Some people who live near wood treatment facilities may be exposed to volatile and semi-volatile organics in the mixture.
- Coal tar pitch volatiles are used to seal driveways and parking lots in the eastern half of the United States. Therefore, being on or playing on freshly treated surfaces is a source of exposure.

Occupational Populations

- Individuals who work in the wood-preserving industry make up the largest percent of the population that might be exposed to coal tar creosote.
- Exposure to coal tar pitch and coal tar pitch volatiles may occur in asphalt workers; in rubber, aluminum, iron, steel, and tire factory workers; and in coke-producing industries.

Toxicokinetics and Biomonitoring

Toxicokinetics

- Creosote components can enter the body through the lungs, stomach, intestines, and skin, although there are limited data quantifying absorption efficiency.
- Some components of creosote may be stored in the body fat and may be found in breast milk. Coal tar components may be metabolized.
- Components of creosote are primarily excreted in the stool, with a small amount excreted in urine.
- Most of the available information comes from studies on coal tar products; very little information is available on the toxicokinetics of wood creosotes.

NHANES Biomonitoring

- No data for the entire creosote mixture are available.
- NHANES does provide references for several naphthalene and other polycyclic aromatic hydrocarbons that are within the creosote mixture.

Biomarkers/Environmental Levels

Biomarkers

- No specific biomarkers of exposure have been identified for creosote or coal tar products. Excretion of components of these mixtures or their metabolites can be used as biomarkers of exposure, although they are not specific to creosotes.
- Several creosote mixture components, including polycyclic aromatic hydrocarbons and naphthalene, do have biomarkers.

Environmental Levels

- Wood creosote and coal tar products are complex mixtures that can vary greatly, even within the broad categories. As such, there is no specific method for measuring these compounds in the environment. Creosote levels can be estimated by measuring certain components of the mixtures, such as polycyclic hydrocarbons, but these components are not specific to creosote.
- Many of the components of the creosote mixture are odorous at low levels and several air issues can be addressed with ATSDR's Environmental Odors website: Environmental Odors | ATSDR (cdc.gov).

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2023. Toxicological Profile for Creosote (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

Also see toxicological profiles for naphthalene and polycyclic aromatic hydrocarbons.

U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Creosote

- Creosote is the name used for a variety of products: wood creosote, coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles. These products are mixtures of many chemicals created by burning of beech and other woods, coal, or from the resin of the creosote bush.
- Wood creosote is a colorless to yellowish greasy liquid with a characteristic smoky odor and sharp burned taste. It is soluble in water and is derived from the resin of leaves of the creosote bush and beechwood. Beechwood creosote is no longer produced in the United States.
- Coal tar products include coal tar creosote, coal tar, coal tar pitch, and coal tar pitch volatiles. Coal tar creosote is the most common form of creosote in the workplace and at hazardous waste sites in the United States. It is a thick, black, oily liquid that does not dissolve easily in water. Coal tar creosote is widely used as a wood preservative; its use is restricted to certified applicators. It is also used to treat skin diseases such as psoriasis and as an insecticide and fungicide.
- Coal tar and coal tar pitch are thick, black, or brown liquids or semisolids with a smoky aromatic odor. They are distillation products of coal tar. Residues are found in chimneys of homes heated with coal. Coal tar pitch volatiles are chemical vapors that become airborne during the heating of coal tar pitch.

Routes of Exposure

- Inhalation – Minor route of exposure for the general population. Predominant route of occupational exposure.
- Oral – Major route of exposure for the general population.
- Dermal – Major route of exposure for the general and occupational populations.

Creosote in the Environment

- Coal tar creosote is the major type of creosote found in the environment. It is released to water and soil mainly as a result of its use in the wood preservation industry.
- Some components of coal tar creosote dissolve in water. Those that dissolve move through soil and leach into groundwater, where they persist and take years to break down. Components that do not dissolve will remain in a tar-like mass.
- In soil, breakdown can take months for some components and longer for others. Coal tar creosote that remains in soil or water is toxic to animals and possibly to humans.
- Once in the environment, plants and animals can absorb parts of the creosote mixture.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate-, or chronic-duration inhalation MRLs were derived for wood creosote or coal tar products.

Oral

- No acute-, intermediate-, or chronic-duration oral MRLs were derived for wood creosote or coal tar products.

Health Effects

Wood creosotes

- Liver effects have been observed following oral or dermal exposure to wood creosotes.

Coal tar products

- 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 death.
- Prolonged dermal or inhalation exposures to low levels of coal tars may result in increased sensitivity to sunlight; damage to the cornea; skin reddening, blistering, or peeling; or irritation to the respiratory tract.

Health Effects (continued)

Coal tar products

- Developmental and respiratory effects have been observed in animals exposed to high doses of coal tar products.
- Increased cancer risks have been observed in coal tar creosote, coal tar, and coal tar products workers. The Department of Health and Human Services (HHS) has determined that coal tar, coal tar pitch, and coke oven emissions are carcinogenic to humans. The U.S. Environmental Protection Agency (EPA) has determined that coke oven emissions (coal tar pitch volatiles) are a human carcinogen, and that creosote is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has classified creosotes as probably carcinogenic to humans. Additionally, IARC has classified the carcinogenicity of creosote compounds for specific occupational settings and cancer types, including during coke production (lung cancer), coal gasification (lung cancer), aluminum production (lung and bladder cancer), coal-tar distillation (skin cancer), and roofing and paving (lung and bladder cancer), all of which are considered to be carcinogenic to humans.

Children's Health

- Children are expected to be affected by creosote poisoning in the same manner as adults.