



Pentachlorophenol and By-Products of Its Synthesis

Key Points



Pentachlorophenol and By-Products of Its Synthesis

- *Reasonably anticipated to be a human carcinogen*
- A wood preservative, used to treat utility poles
- Highest exposure occurs in the workplace, but environmental exposures can also occur
- Exposure is associated with an increased risk of non-Hodgkin lymphoma

Report on Carcinogens Status

Reasonably anticipated to be a human carcinogen

What is pentachlorophenol and by-products of its synthesis?

It is a complex mixture of chemicals used as a wood preservative. Pure pentachlorophenol exists as colorless crystals. Technical-grade pentachlorophenol is a mixture, which includes by-products of its synthesis, many of which are higher chlorinated dioxin compounds that may contribute to its carcinogenicity. These by-products of pentachlorophenol synthesis vary in concentration, depending on the manufacturing process. However, they are present in nearly all commercial pentachlorophenol. Virtually everyone who is exposed to pentachlorophenol is exposed to its synthesis by-products.

How is pentachlorophenol and by-products of its synthesis used?

In the U.S., pentachlorophenol has been regulated since the 1980s as a restricted-use pesticide. It is currently used industrially for treating utility poles, wood pilings, fence posts, and lumber or timber for construction. Over 90% of all pentachlorophenol-treated lumber is used for utility poles and cross arms. Prior to 1987, pentachlorophenol was

one of the most widely used biocides in the U.S., to prevent growth of harmful organisms.

How are people exposed to pentachlorophenol and by-products of its synthesis?

People are exposed to pentachlorophenol and by-products of its synthesis in the workplace and in the environment.

Most exposure has occurred in settings where workers treat lumber or come in contact with treated lumber. While pentachlorophenol is no longer produced in the U.S., it is still being used. People are still exposed in the workplace or environment, but exposure may be decreasing.

Workplace exposures occur through direct skin contact with the substance or treated wood products, or by breathing contaminated air.

People can also be exposed through the environment. There is evidence of exposure to people living near wood-treatment facilities, as well as in the general population. Exposure can occur by contact with pentachlorophenol-treated wood or surrounding soil, which may become contaminated by the treated wood as it weathers.



The Report on Carcinogens, Thirteenth Edition, is prepared by the National Toxicology Program, an interagency group coordinated by the U.S. Department of Health and Human Services. The report identifies agents, substances, mixtures, or exposures in two categories: *known to be a human carcinogen* and *reasonably anticipated to be a human carcinogen*. **The full Report on Carcinogens is available at <http://ntp.niehs.nih.gov/roc13>.**





What is the evidence that pentachlorophenol and by-products of its synthesis causes cancer?

Human Studies

Studies of sawmill workers and pentachlorophenol production workers have found a positive association between exposure to pentachlorophenol and non-Hodgkin lymphoma. However, due to the small number of studies, there is no definitive link showing exposure to pentachlorophenol causes cancer in humans.

Animal Studies

Exposure to pentachlorophenol caused tumors in the liver, adrenal gland, and blood vessels in mice. Male rats exposed to pentachlorophenol had increased incidences of tumors in the nose and tunica vaginalis, the membrane that covers the testis.

Mechanistic Studies

The exact mechanism of how pentachlorophenol causes cancer is not fully known. Pentachlorophenol or its metabolites may cause DNA damage, suppression of the immune system, and inhibition of apoptosis, or cell death.

What are some things I can do to reduce exposure to pentachlorophenol and by-products of its synthesis?

Limit reuse of, and contact with, pentachlorophenol-treated lumber, such as utility poles and cross arms, railroad ties, wooden pilings, fence posts, and lumber or timber for construction. Also limit contact with soil in pentachlorophenol-contaminated waste sites or around pentachlorophenol-treated lumber.

When working with pentachlorophenol-treated wood, practice good occupational health behaviors, which may include wearing protective clothing, respirators, and gloves. Work places should be well-ventilated, and the time people are exposed to pentachlorophenol should be reduced.

Where do I go for more information?

National Toxicology Program
<http://ntp.niehs.nih.gov/go/37897>

Environmental Protection Agency
http://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:3:0::NO:1,3,31,7,12,25:P3_XCHEMICAL_ID:3237

National Institute for Occupational Safety and Health
<http://www.cdc.gov/niosh/npg/npgd0484.html>

Occupational Safety and Health Administration
<https://www.osha.gov/chemicaldata/chemResult.html?recNo=726>

Centers for Disease Control and Prevention (CDC)
Agency for Toxic Substances and Disease Registry
<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=402&tid=70>

CDC National Center for Environmental Health
http://www.cdc.gov/biomonitoring/pentachlorophenol_biomonitoringsummary.html