Pentachlorophenol and By-Products of Its Synthesis

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 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.
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

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