



## Bureau of Environmental Health and Radiation Protection

"Protect and improve the health of all Ohioans by preventing disease, promoting good health and assuring access to quality care."

# Polycyclic Aromatic Hydrocarbons (PAHs)

## Answers to Frequently Asked Health Questions

### What are Polycyclic Aromatic Hydrocarbons (PAHs)?

PAHs are a group of naturally occurring chemicals found in coal, coal tars, oil, wood, tobacco, charcoal and other carbon-containing organic materials. There are more than 100 different types of PAHs. Some are the waxy solids used in asphalt, coal tar pitch, creosote and roofing tar. Other types are used in medicines, dyes, shampoos, plastics and pesticides.

PAHs are ubiquitous (are found everywhere) throughout the world and can be found in every type of environment. PAHs are released into the environment as the result of the incomplete burning of oil, tobacco, coal, wood, etc.



### How do PAHs enter the environment?

PAHs can be released into the air from car and truck exhaust, smoking, volcanoes and burning wood. Urban environments (cities) tend to have higher levels of PAHs due to the large amounts of gas and oil burned as well as the increased use of asphalt and tars on roads and shingles on roofs. PAHs can enter the creek and river sediments (soils) from water running off asphalt roads, parking lots and driveways. Also, the PAHs found in roofing shingles and tars can run off roofs and be carried to downspouts and drainage systems.

### What happens to PAHs in the environment?

Most PAHs are heavier particles that do not dissolve in water, but stick to other solid particles and settle to the sediments in bottoms of lakes, rivers or streams. These "fat" PAHs that stick to soils and sediments will generally take weeks to months to break down in the environment. Microorganisms in soils and sediments are the main cause of breakdown. These heavy (high molecular weight) PAHs are known to cause cancer in lab animals and may be carcinogenic (cause cancer) to humans.

Some other types of PAHs are lighter and volatilize (evaporate) into the air. These PAHs break down by reacting with sunlight and other chemicals in the air. This process generally takes days to weeks. The more sunlight, the quicker these PAHs will breakdown. These lighter (low molecular weight) PAHs are less toxic to humans and are not carcinogenic (cancer causing).

### How might I be exposed to PAHs?

For most of the U.S. population, the primary sources of exposure to PAHs are inhalation of compounds in tobacco smoke, wood smoke and the ambient (outside) air. Smoke may contain both light (vapors) and heavy (soot or ash) PAHs.

You may also be exposed to PAHs by incidental (minor or casual) contact to lake, river or creek sediments or by eating smoked or charbroiled foods.

Overall exposure to PAHs will increase if persons come in contact with PAHs in their workplace. PAHs have been found in industries such as coal tar production plants,

smoke houses, coking plants, aluminum production plants, coal tarring facilities and municipal trash incinerators. Also, PAHs can be found in industries such as mining, oil refining, metalworking, chemical production, transportation and the electrical industry. PAHs have also been found in other facilities where petroleum and petroleum products are used or where coal, oil, wood or cellulose is burned.

PAHs are present throughout the environment and you may be exposed to these substances at home, outside or at the workplace. Typically, you will not be exposed to an individual PAH, but to a mixture of PAHs.

### **How do PAHs enter and leave my body?**

PAHs can enter your body through your lungs when you breathe air. However, it is not known how rapidly or completely your lungs absorb PAHs.

PAHs can enter your body through drinking water and swallowing food, soil or dust particles that contain PAHs. But absorption is generally slow when PAHs are swallowed and generally you will not be ingesting (swallowing) large amounts of PAHs.

Under normal conditions of environmental exposure, PAHs could enter your body if your skin comes into contact with soil that contains high levels of PAHs. Studies have shown that low molecular weight (lighter) PAHs can be absorbed through the skin but the absorption of high molecular weight (heavy) PAHs is quite limited.

Once in the human body, PAHs are changed into different substances and stored in tissue and fat cells.

Results from animal studies show that PAHs do not tend to be stored in your body for a long time. Most PAHs that enter the body leave within a few days, primarily in the feces and urine.

### **Can PAHs make you sick?**

Yes, you can get sick from PAHs. But getting sick will depend on:

- How much you were exposed to (dose).
- How long you were exposed (duration).
- How often you were exposed (frequency).
- Route of exposure: Ingesting (eating) and inhaling (breathing) is more of a risk than dermal (skin) exposure.
- General Health, age, lifestyle: Young children, the elderly and people with chronic (on going) health problems are more at risk to chemical exposures.

PAH's have a low acute toxicity. What this means is that if you were exposed to high levels of PAH's for a short period of time, you will most likely not experience harmful health effects.

### **Do PAHs cause cancer?**

It is uncertain if PAHs are carcinogenic (cause cancer) in humans. Several studies have shown that PAHs have caused tumors in laboratory animals. Studies in animals have also shown that PAHs can cause harmful effects on skin and the body's system for fighting disease after both short and long-term exposure. But please make note that these effects have not been reported in humans.

There are human studies of people exposed to PAH compounds for long periods of time which showed people may develop cancer. However, the studies were not certain if the cancer was caused by PAHs or the combination of the exposure to the other chemicals that were present as well.

The U.S. Department of Health and Human Services (HHS) has determined some PAHs are known animal carcinogens.

The International Agency for Research on Cancer (IARC) has determined some PAHs are possibly carcinogenic to humans and some PAHs are not classifiable as to their carcinogenicity to humans.

The U.S. Environmental Protection Agency (EPA) has determined some PAHs are probable human carcinogens and some PAHs are not classifiable as to human carcinogenicity.



### **Is there a medical test to show whether you have been exposed to PAHs?**

PAHs can be measured in the blood or urine soon after the exposure. It is not known how effective or informative the tests are after exposure has stopped. However, although these tests can show that you have been exposed to PAHs, these tests cannot be used to predict whether any health effects will occur or can they determine the source of your exposure. Also keep in mind the tests used are not routinely available at a doctor's office because special equipment is required to detect these chemicals and insurance is not likely to cover these tests.

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

**Water:** Drinking Water MCL (Maximum Contaminant Level) for *Benzo (a) pyrene* is 0.2 ppb (parts per billion). *Benzo (a) pyrene* is a heavy (or a higher molecular weight) PAH.

**Air:** No standards exist for the amount of PAHs allowed in the air of private homes. However, air standards have been set for occupational (work) settings.

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m<sup>3</sup>). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that

contains PAHs is 5 mg/m<sup>3</sup> averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m<sup>3</sup> for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar and mineral oil.

### **Where Can I Get More Information?**

For detailed information about PAHs, visit the Agency for Toxic Substances and Disease Registry (ATSDR) PAH Toxicological Profile at:

<http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=122&tid=25>

### **References:**

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. [Toxicological profile for polycyclic aromatic hydrocarbons \(PAHs\)](#). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

ATSDR. 2009. Polynuclear Aromatic Hydrocarbon (PAH) Toxicity. Case Studies in Environmental Health Medicine #13. U.S. Department of Health and Human Services. 68p.

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