POLYCYCLIC AROMATIC HYDROCARBONS (PAHs) FACT SHEET

WHAT ARE PAHs?

PAHs, short for polycyclic aromatic hydrocarbons, are a group of chemicals consisting of numerous carbon atoms joined together to form multiple rings. There are at least 10,000 different PAH compounds. Most are formed from the incomplete combustion of plant or animal matter, or carbon fuels, such as coal or petroleum. PAHs in the environment will be familiar to most as the sooty part of smoke or ash. PAHs can be the result of natural (forest fires) or man-made practices or industrial processes. Many useful products contain PAHs, such as mothballs, blacktop, and creosote wood preservatives. They are also found at low concentrations in some special-purpose skin creams and anti-dandruff shampoos that contain coal tars.

Automobile exhaust, industrial emissions and smoke from burning wood, charcoal and tobacco contain high levels of PAHs. In general, more PAHs form when organic materials burn at low temperatures, such as in wood fires or cigarettes. High-temperature furnaces produce fewer PAHs. Smoke from fires contains tiny particles of PAHs and other chemicals. These are known as particulate matter, or PM. When PM is microscopic in size, it remains suspended in air and can move long distances.

Most PAHs do not dissolve in water but, instead, bind to sediments. When sediments become suspended in water, PAHs can be transported with the sediment. PAHs can enter groundwater from ash, tar, or creosote that is improperly disposed in landfills.

HOW ARE PEOPLE EXPOSED TO PAHs?

PAHs are everywhere. Urban environments, in particular, have many sources of PAHs.

Low-level PAH exposures: PAHs are extremely common in the environment. All of us are exposed to PAHs every day in the air we breathe and the food we eat. Our metabolism is adapted to handle these frequent low-level exposures. Based on our knowledge of the effects of higher-level exposures in workers and experimental animals, we can calculate a degree of risk from low-level exposures. However, the effects of low-level exposures are difficult to observe and measure in the general population.

Breathing: PAHs are familiar to most of us as the sooty material in smoke. Most people are exposed to PAHs when they breathe smoke, auto emissions or industrial exhausts. Most exhausts contain many different PAH compounds. Frequent exposure over many years may lead to health problems, particularly to the lungs and heart. People with the highest exposures are smokers and, people who live or work with smokers, as well as, roofers, road builders and people who live near major highways or industrial sources.

Drinking/Eating: Grilled, smoked and charbroiled foods, especially meats, are a source of some PAH exposure. PAHs may be in soil near disposal sites where construction wastes or ash is buried. Due to metabolism of PAHs by vertebrates, there is no significant accumulation of PAHs in fish meat. However, eating shellfish living in contaminated water may be another major source of exposure. Vegetables do not take up significant amounts of PAHs that are in soil. PAHs may be in groundwater near disposal sites where construction wastes or ash is buried; people may be exposed by drinking this water.

Touching: Concentrated PAHs can affect the skin, particularly when dissolved in oily solvents to form tar. Contact with oily or tarry materials, combined with sunlight, can cause redness or irritation to the skin. In contaminated waterways, exposures can come from contact with oily sheens in the water or contact with oil on fish or driftwood. Most of the exposure is to the hands, with a lesser probability from splashes to limbs or

face. In addition to exposure related to fishing, there is a potential for skin contact via wading. Skin that comes in contact with PAHs should be washed immediately with soap.

DO STANDARDS EXIST FOR PAHs?

Water: Wisconsin has established drinking water standards for five of the most studied PAHs: Anthracene - 3,000 parts per billion (ppb), Benzo(a)pyrene - 0.2 ppb, Benzo(b)fluoranthene - 0.2 ppb, Fluoranthene - 400 ppb, and Fluorene - 400 ppb. We suggest you stop drinking water containing more than these amounts. If other PAHs are found in your drinking water, contact your local public health agency for advice.

Air: PAHs in air are indirectly regulated by the National Ambient Air Quality Standard for PM2.5. PAHs are often an important component of PM. When PM over a region of the state exceeds, or is expected to exceed, the air standard, the Wisconsin Department of Natural Resources (DNR) may issue an Air Quality Advisory or an Air Quality Watch. The DNR regulates the amount of several PAHs that industries can release.

Soil: Many individual PAHs have soil screening values established by either the U.S. Environmental Protection Agency or DNR. Information on specific residual contaminant levels of PAHs can be obtained on the DNR website at http://dnr.wi.gov/topic/Brownfields/professionals.html.

WILL EXPOSURE TO PAHs RESULT IN HARMFUL HEALTH EFFECTS?

In general, chemicals affect the same organ systems in all people who are exposed. However, the seriousness of the effects may vary from person to person. A person's reaction depends on several things, including individual health, heredity, previous exposure to chemicals and medicines, and personal habits, such as smoking or drinking.

It is also important to consider the length of exposure to the chemical, the amount of chemical exposure, and whether the chemical was inhaled, touched, or eaten.

Short-term exposures:

When we breathe high concentrations of PAHs, it is usually in the form of smoke. The harmfulness of breathing smoke comes from the combined effect of many reactive chemicals in smoke. We can also have skin contact with high concentrations of PAHs in the form of tar, such as blacktop or roofing material. When these products get on the skin and are exposed to sunlight, they may cause redness, blistering, and peeling.

Long-term exposures: The following health effects can occur after several years of exposure to PAHs:

Cancer - Occupational and chronic exposure to PAHs may cause cancer**.** Several PAHs have been shown to cause lung and skin cancer in laboratory animals. People who have worked in industries where they had regular exposure to very high levels developed tar warts and skin cancer. Extracts of various types of smoke containing PAHs caused lung tumors in laboratory animals.

Reproductive Effects - Reproductive problems and problems in unborn babies' development have occurred in laboratory animals that were exposed to benzo(a)pyrene. Other PAHs have not been studied enough to determine whether they cause reproductive problems.

Organ Systems - A person's lungs, liver, skin, and kidneys can be damaged by exposure.

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HOW CAN I REDUCE MY EXPOSURE?

Awareness of potential PAH exposure through hobbies, recreational, and home/outdoor scenarios, and taking action to minimize or avoid exposure may decrease the risk of PAH overexposure. Cigarette smoke contains PAHs and other carcinogenic substances. Exposure to PAHs by smoking or second hand smoke may increase the risk of overexposure to PAHs and PAH-related disease.

Additionally, there are some foods that contain PAHs. Minimizing consumption of charbroiled, chargrilled and smoked meats and fish can all reduce your exposure to PAHs.

You can decrease your exposure to PAHs by wearing gloves when working with cutting oils, washing your skin immediately after coming in contact with products or contaminated soils containing PAHs, and avoiding smoke from campfires. Produce grown in contaminated soil should be washed before consumption and root vegetables should be washed and peeled.

CAN A MEDICAL TEST DETERMINE EXPOSURE TO PAHs?

Many PAHs can be detected in blood or urine soon after exposure. Tests for these compounds are not routine and can only be performed using special equipment not usually found in doctor's offices. People who think they may have been exposed to PAHs for a long time should contact their physician. Blood tests of liver and kidney function are available. People exposed to PAHs in air may want to ask their doctor to consider having lung function tests done.

Seek medical advice if you have any symptoms that you think may be related to chemical exposure.

This fact sheet summarizes information about this chemical and is not a complete listing of all possible effects. It does not refer to work exposure or emergency situations.

For more information, contact:

- Wisconsin Poison Center. 800-222-1222
- Your Local Health Department: http://www.dhs.wisconsin.gov/localhealth/
- Division of Public Health, Bureau of Environmental and Occupational Health, 608-266-1120 http://www.dhs.wisconsin.gov/eh/

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