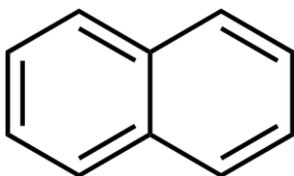


Polycyclic Aromatic Hydrocarbons (PAHs)

What are PAHs and where do they come from?

Polycyclic aromatic hydrocarbons (PAHs) are by-products from burning gas, diesel, oil, coal, wood, and tobacco, among other substances. PAHs contain several carbon and hydrogen rings that are linked together. An example of the chemical structure of Naphthalene (a PAH) is shown below. PAHs are released into the environment through both natural (e.g., forest fires) and human processes (e.g., smelters, coal plants). They are present almost everywhere in terrestrial, aquatic and atmospheric environments, and have been detected in surface waters, groundwater, soils, plants, and animals throughout Canada. PAHs are very widespread, partly because they are released from sources that are used every day and in every community, and partly because they can attach to particles in air. Once in the air, PAHs can be transported great distances.



Chemical structure of naphthalene, a PAH

Large scale oil spills, pipeline leaks, and tanker accidents can release PAHs into the environment. These spills can have huge environmental consequences. In 1989, the oil tanker *Exxon Valdez* ran aground off of the southern coast of Alaska, releasing up to 119 million litres of crude oil into the coastal ecosystem. There is evidence that PAHs continue to persist in the coastal sediments over 20 years later. Another example of an oil spill was the 2005 train derailment and spill into Lake Wabamun, Alberta. During this incident, approximately 712,000 litres of heavy bunker C fuel oil spilled around and into the lake. In addition, approximately 88,000 litres of highly toxic Imperial Pole Treating Oil containing naphthalene and other PAHs spilled from a ruptured tank car. The photo below shows the oily sheen on the water after the spill. This spill affected fish, birds, and wildlife in and around the lake.



Photo credit: Heidi Swanson

Large industrial developments can release PAHs into the environment and these contaminants can be transported to Canada's North. For example, the development of tar sands in northern Alberta has been shown to release PAHs into the Athabasca River. There are concerns that these releases are causing fish deformities downstream towards Lake Athabasca. These and other oil and gas mining activities in Canada's North (including the Mackenzie Gas Pipeline) should make us think carefully about environmental and health issues as development increases.



Photo credit: Shell

PAHs in the Environment

The release of PAHs into the environment is a concern because PAHs have been found to cause certain cancers, mutations and birth defects in fish and other animals. PAHs do not dissolve easily in the water so they mostly accumulate or attach to soil particles or lake mud. Accumulation of PAHs in lake and river mud is a particular concern because this is where fish lay their eggs and where fish embryos develop. Lab studies show that eggs laid in sediment contaminated with PAHs can die. If the eggs survive, some of the hatching fish can have deformities in their eyes or spine; this often makes it difficult for them to grow and reproduce. PAHs can be degraded by various bacteria and microbes in water and soil, but this can be a slow process because most microbes are affected by the toxicity of PAHs. This means that PAHs can reside in the environment for long periods of time. Because of their potential effects on ecosystems, Canada and the United States list more than ten PAHs as priority pollutants in natural waters.

References/For More Information

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