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8.1 PAH Sources and Exposure

PAHs are ubiquitous environmental contaminants, originating from both natural and anthropogenic sources. Anthropogenic sources dominate, and include incomplete combustion of organic materials, notably carbon fuels such as coal or petroleum. Natural sources include volcanic eruptions and forest fires. PAHs are distributed widely in the environment, generally as complex mixtures, and concentrations are often elevated in urban soils due to the presence of such mixtures. Exposures to these mixtures can occur through inhalation, ingestion, and dermal contact.

▼*Read more*

Motor vehicle exhaust, industrial emissions and smoke from burning wood, charcoal, and tobacco all contain high levels of PAHs. PAH formation from combustion depends in part on combustion temperature. 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. PAHs formed from combustion can bind to particulates in smoke or exhaust, and dispersion of suspended particulates in air can move PAHs over long distances. PAHs are also found in a wide range of products, including coal tar, crude oil, creosote, roofing tar, and mothballs, medicines, dyes, plastics, and pesticides, which can be additional sources of PAHs in the environment.

PAHs are relatively insoluble in water and are mostly associated with particulate matter, either in air as mentioned above, or in soils and sediments in the environment. Inhalation exposure to PAHs occurs from breathing polluted air, wood smoke, vehicle exhaust, or cigarette smoke. Ingestion of PAHs can occur from food sources, contaminated drinking water, and from incidental ingestion of soil near areas where coal, wood, gasoline, or other products have been burned. Incidental ingestion can also result from the soil at hazardous waste sites, former manufactured gas plant sites, and wood-preserving facilities. Dermal exposure can occur from contact with PAH-contaminated soil or commercial products containing PAHs, such as coal tar shampoos.

Although this guidance focuses on oral bioavailability, dermal absorption of PAHs has carcinogenic effects, both systemically and at the site of contact on the skin. Using standard USEPA default exposure values and the current oral cancer slope factor for the index PAH, benzo(a)pyrene (BaP), the ingestion route of exposure accounts for 72% and dermal route of exposure accounts for 28% of the potential cancer risk from direct contact with soil PAH.