Pyrene

CAS: 129-00-0
MF: C16H10
MW: 202.2
Solubility in water: 0.135 mg/l at +25ºC; soluble in alcohol, benzene, ether, and petroleum ether.

Major uses
Pyrene belongs to aromatic polycyclic hydrocarbons (PAHs). It is used commercially to make dyes, pesticides, pharmaceuticals, and plastics.

Human toxicity
Pyrene is a ubiquitous product of incomplete combustion, occurring in exhaust from motor vehicles and other gasoline or diesel engines, emissions from cigarette smoke, coal-, oil-, and wood-burning stoves and furnaces.

Human data on toxicity of pyrene are not available; however, inhalation of pyrene in rats caused hepatic, pulmonary, and intragastric pathologic changes.

The data regarding toxic doses and blood concentrations of pyrene are not available.

Carcinogenicity: No data are available in humans. Inadequate evidence of carcinogenicity in animals.

Kinetic data
Human data are not available; only animal data are available.

Absorption: Data about pyrene are lacking, however there are data on benzo(a) pyrene, B(a)P, which is a typical representative of PAHs and close relative of pyrene. B(a) pyrene is readily absorbed from the intestinal tract. It tends to localize primarily in body fat tissues such as e.g. breast.

Half-life in blood: Disappearance of B(a)P from blood and liver of rats following single IV injection is very rapid, having a half-life in blood of less than 5 min, and a half-life in liver of 10 min.

Elimination: In blood and liver initial rapid elimination phase is followed by slower disappearance phase, lasting 6 hr or more.

Metabolism and excretion
Only data obtained in experimental animals are available.

PAHs are metabolized in liver. Metabolic activation of PAHs consists of an oxidation of the rings of unsubstituted PAHs. This oxidations is carried out by "mixed function" oxidases of the liver, which contain cytochromes p450 and p448, and require reduced nicotinamide adenine dinucleotide and oxygen. In this oxidation, an epoxide intermediate is formed which has been shown to have the requisite chemical reactivity to form covalent complexes with DNA and histones and to serve as the ultimate carcinogenic form of PAHs.

In rats and rabbits, pyrene is metabolized by liver microsomal fraction to 1-hydroxypyrene, 1,6-dihydroxypyrene, 1,8-dihydroxypyrene, 4,5-dihydroxypyrene, as well as two different diphenols.

PAHs, including pyrene, are highly soluble in adipose tissue and lipids. .

Excretion: via urine and bile.

Toxicological mechanisms
Only data obtained in experimental animals are available.

The reactive metabolites of PAHs (including pyrene), so called diol-epoxides, can bind directly to DNA, and produce DNA adducts, which have both mutagenic and carcinogenic effects in man and experimental animals.

Target organs: lungs, liver, gastro-intestinal tract (data from experimental animals).

Reference: Hazardous Substances Data Bank, TOXNET (via Internet).

Written by Ada Kolman, September 2007
ada.kolman@telia.com