

BMF 40 (Edition 2.0) – Priority PAHs

Polycyclic aromatic hydrocarbons (PAHs) occur in oil, coal and tar deposits, and are found as pollution in air, water and soil. PAH are amongst the most toxic compounds known to man. Several PAHs are proven to be carcinogenic, mutagenic and teratogenic. Due to their wide distribution and toxicity, it is considered important to monitor the levels of these compounds in food and in the environment.¹⁻²

PAHs are by-products of burning fuel; both fossil fuel and biomass. Incomplete combustion - such as can occur in industrial processes, barbecuing, in fires and in cigarette smoke - can also lead to formation of PAHs. Fire-fighters and coal workers are considered among those most exposed. PAHs are also present in foodstuff, and the highest intake is shown to come from cereals, oils and fats. Smaller amounts come from vegetables and cooked meat.

The toxicity of the PAHs is highly structurally dependent; isomers may vary from nontoxic to very toxic, and the carcinogenicity is often related to PAHs with a "bay" or a "fiord" region. PAHs are quickly metabolized in the body to epoxydiols, which are considered the ultimate carcinogens. They can be monitored by elaborate methods such as the tetrol metabolites in hair samples.³

PAH compounds of particular toxicological and environmental concern are monitored using internationally recognized methods. The list of priority PAHs varies in different countries. In the United States the Environmental Protection Agency (EPA) has listed 16 priority PAHs based on those most abundant. The EU-list of 15+1 PAH is based on those considered most toxic in foodstuff. Those of highest concern in food are the sum of benzo[a]pyrene, benz[a]anthracene, benzo[b]fluoranthene, and chrysene.⁴

The European Chemical Agency (ECHA) are listing industrial compounds of **very high concern** (SVCH). Four PAHs are now on the SVCH list. The last two; chrysene and benzo[a]anthracene, were listed in 2018 due to their carcinogenic, **persistent, bioaccumulative and toxic** (PBT) and **very persistent and very bioaccumulative** (vPvB) properties.⁵

All of the high priority PAHs, as well as internal standards and several hydroxy-, keto- and nitro-metabolites are available from Chiron as solutions and as neat material.

The scope of BMF 40-Edition 2.0 is to list priority PAHs, their associated internal standards and ready-made mixes available. A complete list of available PAH mixes can be found in the Chiron product list (S-list). The metabolites are listed in BMF 59 (www.chiron.no).

Literature:

1. <https://www.atsdr.cdc.gov/csem/pah/docs/pah.pdf>
2. Michael Brauer (2016) Poor air quality kills 5.5 million worldwide annually. Available at: <http://www.healthdata.org/news-release/poor-air-quality-kills-55-million-worldwide-annually>

3. Grova N et al. New insights into urine-based assessment of PAH-exposure from a rat model: Identification of relevant metabolites and influence of elimination kinetics. *Environ. Pollut.* 2017;228:484-95 and Grova N et al. Gas chromatography-tandem mass spectrometry analysis of 52 monohydroxylated metabolites of PAHs in hairs of rats after controlled exposure. *Anal Bioanal Chem.* 2013;405:8897-911.
4. <http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1447765874610&uri=CELEX:32014R1327>
5. <https://echa.europa.eu/candidate-list-table>