

POLYCHLORINATED PARAFFINS

CHLORINATED PARAFFINS - THEIR TOXICOLOGY AND ENVIRONMENTAL EFFECTS AND REGULATORY IMPLICATIONS.

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Introduction

Chlorinated Paraffins (CPs), as a group of chemicals, are currently the subject of increasing regulatory attention at international level. The purpose of this session is to review the scientific basis of that regulatory activity in terms of their potential impact on both human health and the environment.

General Description of CPs

CPs are a large group of chemicals with a wide range of industrial applications. They fall into three distinct groups of products, based on the length of their straight chain alkane feedstocks: short chain CPs (C₁₀₋₁₃ - SCCPs), medium chain CPs (C₁₄₋₁₇ - MCCPs) and long chain CPs (C₁₈₋₃₀ - LCCPs). Different grades of product are achieved by varying the degree of chlorination, to achieve the desired properties for the intended end-use application. Most of the products are viscous liquids with low volatility, although some of the LCCPs are solid (wax grades).

Different grades of CP are used as additives in metalworking fluids (to improve their high temperature performance), as plasticisers in PVC and sealants, as paint additives and in the leather tanning industry, amongst other applications.

Mammalian Toxicity

CPs are absorbed via the GI tract, but are not absorbed significantly through the skin. In industrial scenarios, one has to consider the possibility of the absorption of aerosols of CP via the respiratory tract. There is some evidence of the metabolism of CPs in rodent studies, although this is not fully described. CPs tend to be excreted relatively slowly.

CPs are of low acute toxicity and, in general, display mild irritant effects in contact with the skin. They are not skin sensitisers, although there are some reports of skin sensitisation ascribed to CPs in the literature which are, in general, due to the presence of sensitising stabilisers which, historically, were added to certain formulated products.

Repeated administration of relatively high doses of CPs to mice or rats leads to adverse effects in a

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variety of organs, principally the liver, the kidney and the thyroid. The potency of CPs as chronic toxicants tends to decrease with increasing carbon length. Little can be said about the influence of the degree of chlorination on their potency in this respect. A typical grade of SCCP has been the subject of a lifetime carcinogenicity study in both rats and mice by the US NTP. Tumours of the liver, thyroid and kidney (male rats only) were observed. The mechanisms of tumour formation and their relevance to human health risk assessment will be discussed in the session. A typical grade of LCCP was also tested by the US NTP, and was found to be without significant effects on tumour incidence.

A typical grade of an MCCP has also been shown to cause internal haemorrhaging in new-born pups in a single generation reproductive toxicity study in rats. The significance of this finding will be discussed.

Environmental Occurrence and Effects

The environmental distribution of CPs is widespread, where they are particularly associated with the soil and sediment compartments. Their environmental occurrence will be reviewed in the session, as will their tendency to bioaccumulate.

SCCPs have been shown to be toxic to daphnia and, to a lesser extent, fish. MCCPs, on the other hand, appear to show appreciable toxicity only to daphnia and not to higher aquatic species. There is no information concerning their toxicity to sediment-dwelling or soil-dwelling species. The environmental effects data on CPs will be discussed in the session.

Regulatory Activity

SCCPs, in particular, are the subject of current regulatory activity. A majority of the OSPAR countries have voted in favour of a prohibition of releases to the sea, which implies a ban on their manufacture and use. Some member countries have ratified this agreement in their national legislation (e.g. The Netherlands). OSPAR is now turning its attention to longer chain CPs.

SCCPs have also been proposed as candidate POPs under the developing UNEP POPs Convention, although this proposal has not been fully accepted at this time.

SCCPs were also amongst the first group of high volume chemicals to be considered as Priority Chemicals for Risk Assessment under EU Regulation 793/93. This risk assessment, which covers their impact on both the environment and human health, is completed and recommends risk reduction measures for their use in metalworking fluids and leather treatment. The regulatory instrument to put these recommendations in place is being developed by the EU authorities. The details of this risk assessment will be reviewed.

MCCPs are also being considered under the EU Regulation, although the risk assessment is yet to be agreed. An update on the progress of this risk assessment will be given.

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