Annex I 128.01

Phenols or counterparts or halogenated derivatives thereof

Definition of causal agent

Phenols are aromatic alcohols consisting of a hydroxyl group directly attached to an aryl ring. The most important phenols are phenol (hydroxybenzene), catechol (1,2-dihydroxybenzene) and cresols (ortho, meta, para-methylphenol). Major compounds of the halogenated derivates are the chlorophenols as 2,5-dichlorophenol, 2,4,6-trichlorophenol and, especially, pentachlorophenol.

Phenol is a white crystalline solid which turn pink or red on exposure to air and light (melting point 43° C). In water it is entirely soluble. Phenol has a characteristic acrid odour. Catechol is a white to tan solid with a melting point about 105° C. Cresols consist either of a white crystalline solid or a yellowish liquid (melting points between 11° C and 35 °C) with a phenol-like odour. Chlorophenols are solids at room temperature, exept for 2-monochlorphenol, which is a liquid. Technical grade chlorophenol products are a heterogeneous mixture of chlorophenols. They often include as microcontaminants polychlorinated organics as dibedoins, dibenzofuranes or biphenyls. Pentachlorophenol (PCP) is a solid, odourless substance consisting of needle-like crystals. It acts by decoupling reactions in the oxidative phosphorylation process, which explains its systemic effects.

Main occupational uses and sources of exposure:
Phenol is used for the production of phenolic resins, bisphenol A, caprolactam, chlorophenols and several alkylphenols and xylenols. Phenol has been used as disinfectant and antiseptic. Catechol exposure exists in the production of insecticides, perfumes, drugs, in metal plating and in coal processing. Cresols are used as disinfectants, preservatives, and chemical intermediate, partially as solvent (o-cresol) and in the dye industry (p-cresol), too. Chlorophenols are used in the lumber industry, pesticide manufacture and application; worth mentioning is the use of treated wood for construction, railroad ties or telephone poles. The exposure route of all theses organics is by inhalation and through the skin.

Toxic effects

1. Local effects

☐ Irritant effects

All these products are strong dermal irritants, they irritate the eyes. Local skin effects range from painless blanching or erythema to corrosion and deep necrosis. Inhalative exposure

results in irritations of the respiratory system. See section on ***Occupationally caused irritation of the skin and mucous membranes*** in Annex I entry nr. 202.

2. Systemic effects

☐ Acute

Phenols are rapidly absorbed by the skin, which may lead to systematic poisoning:

Target organs are central nervous system, kidneys, liver. Symptoms: cardiac dysrhythmias, renal failure, neurological effects as convulsions, coma, death. Especially pentachlorophenol can cause hyperthermic syndrome: Excessive sweating, rapid weight loss and dehydration in severe cases: loss of consciousness, convulsions, death by heart failure, respiratory arrest, pulmonary oedema.

Exposure criteria:

Minimum intensity of exposure: Occupational exposure confirmed, if possible assessed, by:

History and study of working conditions providing evidence of particularly intense exposure to these substances, especially by skin contact, and, if available, workplace air monitoring, better biological monitoring.

Guide values:

Pentachlorophenol:

Painful irritation of the nasal mucous membranes at 1 mg/m^3; workers accustomed to exposure may be able to tolerate up to 2.4 mg/m^3.

Signs of systemic poisoning at 3 to 10 mg PCP/L urine or 40 to 80 mg/L blood. Fatal intoxications: 28 to 520 mg/L urine, 46 to 173 mg/L blood.

Minimum duration of exposure: A few minutes to a few hours, depending on level of exposure.

Maximum latent period: Hours to a few days

☐ Chronic

Chronic exposure may provoke chloracne: Small, pale yellow cysts and comedones; in severe cases: inflammatory lesions with larger cysts, abscesses, follicular hyperkeratosis. Main sites: face (nose generally excluded), less frequently neck, shoulders, chest, back, and scrotum. This condition is extremely persistent and may last for decades, even after exposure has ceased. Other non-carcinogenic hazards are not really available, but symptoms of liver toxicity may be present (Chlorophenols). There is inadequate evidence in humans for the carcinogenicity of phenols or counterparts or halogenated derivates thereof.

Exposure criteria:

Occupational exposure confirmed, if possible assessed, by:

History and study of working conditions providing evidence of particularly intense exposure to these substances, especially prolonged or repeated skin contact, and, if available, biological monitoring.

Guide values:

Phenol: Well above 200 mg total phenol/L urine

Pentachlorophenol: Well above 0.3 mg/L urine; well above 1 mg/L blood

Minimum duration of exposure: A few weeks to a few months depending on the intensity of exposure.

Maximum latent period: Six months.