

SIDS INITIAL ASSESSMENT PROFILE

CAS No.	7722-84-1
Chemical Name	Hydrogen Peroxide
Structural Formula	H-O-O-H

RECOMMENDATIONS

The chemical is a candidate for further work.

SUMMARY CONCLUSIONS OF THE SIAR**Human Health**

Hydrogen peroxide is an endogenous metabolite in the aerobic cell. The likely adverse effects by exogenous hydrogen peroxide concern local toxicity, although absorption at very high rates may also cause oxygen embolism with potentially serious consequences. Based on human case reports, the hazard of embolism may arise at fairly low doses (15-150 mg/kg bw) when hydrogen peroxide is introduced into body cavities such as in surgery or after oral intake.

Concerning single exposures, notable effect end points are acute toxicity (by the oral route: LOAEL approximately 100 mg/kg bw) and, for hydrogen peroxide vapours, irritant effects in the eyes and airways (LOAEL 3.5-10 mg/m³), irritant effects on the skin (LOAEL 20 mg/m³), for hydrogen peroxide water solutions, eye irritation (mild irritation at the concentration of 6 %, moderate irritation at 8%, severe irritation and corrosion at ≥ 10 %) and skin irritation/corrosivity (slight irritation at 10 %, moderate irritation at 35 %, corrosion at ≥ 50 %). The potential of hydrogen peroxide to cause skin sensitization was judged to be extremely low.

Concerning repeated exposures, oral administration (drinking water) in mice gave NOAELs of 26 mg/kg bw/day in males and 37 mg/kg bw/day in females based on a dose-related reduction of food and water consumption and local effect (duodenal mucosal hyperplasia). There is suggestive evidence from animal studies causing some concern that levels of about 10 mg/m³ may be associated with local changes in the lungs, reminiscent of oxygen toxicity, as well as local effects in the skin.

Hydrogen peroxide is a mutagen and genotoxicant in a variety of *in vitro* test systems, but negative results from DNA repair and micronucleus studies, and from a study of *in vivo* genotoxicity and mutagenicity in the mouse skin after repeated applications, are not in support of a significant genotoxicity/mutagenicity *in vivo*. A local carcinogenic effect was observed in the duodenum of a catalase-deficient mouse strain administered 0.4 % H₂O₂ in drinking water. Although an underlying genotoxic mechanism cannot be excluded, the weight of evidence at this time does not suggest that the carcinogenic properties of hydrogen peroxide should be regarded as practically significant.

Regarding reproductive toxicity, a 90-day drinking water study with mice did not indicate effects in reproductive organs, and there is a gap in the basic data requirement for developmental effects. However, it was presumed that because of the rapid degradation of the substance on absorption and due to local effects, studies would be unlikely to reveal any specific developmental effects.

Environment

Hydrogen peroxide is a naturally occurring substance (typical background concentrations < 1 - 30 µg/l). Almost all cells with the exception of anaerobic bacteria produce it in their metabolism. H₂O₂ is rapidly degraded in the environment (biotic and abiotic). Its half-life times are estimated to be < 1-5 days in surface water and sediment, one day in air and from minutes to a few hours in soil. Hydrogen peroxide does not bioaccumulate (log K_{ow} < -1). Hydrogen peroxide adsorbs poorly to sediment particles and is rapidly degraded, thus accumulation in the sediment is also not expected.

Despite the H₂O₂ decomposing mechanisms in all aerobic cells, hydrogen peroxide is toxic to aquatic organisms, Exposure of aquatic environment may have harmful effects on biota. Algae are the most sensitive organisms (EC₅₀ = 1.6-5 mg/l, NOEC = 0.1 mg/l). Acute toxicity to invertebrates varies from 2 to 17.7 mg/l, and to fish from 16.4 to 37.4 mg/l. Chronic toxicity to invertebrates is studied on zebra mussels (NOEC was 2 mg/l). No data for long term tests on fish is available.

PNEC to aquatic organisms according to the EU Technical Guidance Document would be 2 µg /l using the algal NOEC of 0.1 mg /l and an assessment factor of 50. Hydrogen peroxide is a naturally occurring substance (typical background concentrations <1 – 30 µg /l), Concentrations close to 30 µg /l are rare – occurring during summer afternoons in surface waters with high DOC level. On the basis of a field study, it is evident that even natural levels of H₂O₂ may be harmful to some organisms causing “natural risks“. Calculated PNEC of 2 µg /l seems to over estimate the toxicity and therefore PNEC = 10 µg /l is recommended.

Exposure

The estimated use of hydrogen peroxide was 670 000 t/a for 1995 in the EU. This chemical is used for bleaching of pulp and textiles, chemicals manufacture, environmental applications and various other purposes including consumer products.

Hydrogen peroxide is used in large volumes for the production of other chemicals, for bleaching of pulp, paper and textiles, for disinfection in the food processing industry, for etching in the electronics industry, for cleaning of metal plates and for water treatment and other environmental applications. Significant exposures to the vapours of hydrogen peroxide at or above occupational exposure limit levels may occur in the loading of tankers, in some applications of disinfection and in etching of circuit boards. In small-scale open uses involving manual handling, splashes of the more concentrated substance to the skin were noted to cause white spots.

Concerning consumer products, available household bleaches may contain up to 20 % hydrogen peroxide causing an obvious hazard of injury in case of a splash to the eye. Consumers may be exposed to hydrogen peroxide during bleaching and dyeing of the hair, and through the use of tooth bleaches or mouth washes. Presently, some applications and products may contain high enough concentrations of hydrogen peroxide to cause symptoms of irritation. Contact lenses contain low residues of hydrogen peroxide when the substance is used for disinfection.

NATURE OF FURTHER WORK RECOMMENDED

Site specific data on the production plants in Europe and PECs calculated using generic scenarios according to EU Technical Guidance Document indicates possible local risks to aquatic environment, especially if no biological waste water treatment system exists. Exposure data from industry will clarify this issue.

The hazards of repeated inhalation exposures to hydrogen peroxide are poorly defined, and they should be further explored (as a possible post SIDS activity) to enable the assessment of risks to workers. An experimental study performed with an appropriate animal model may be needed to resolve the problem.

In the context of the EU Existing Substances Regulation 793/93 a detailed risk assessment is being carried out.

OECD Member countries outside of the EU are invited to note this information and investigate the necessity for risk assessment in their own countries.