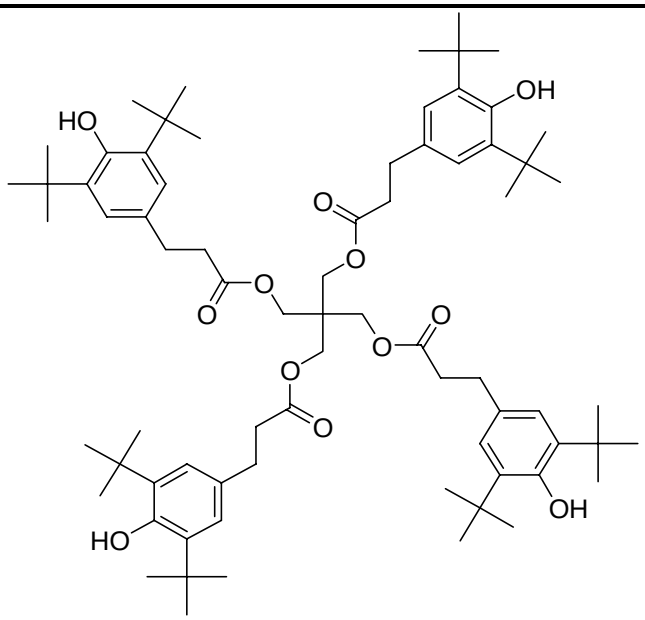
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	6683-19-8
Chemical Names	Pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate)
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

No ADME data are available for this compound.

The acute oral LD_{50} of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) in rats and mice is >5000 mg/kg bw. No clinical signs were reported. For acute dermal toxicity the LD_{50} in rats is >3160 mg/kg bw. Slight erythema and desquamation were noted. The LC_{50} for inhalation toxicity in rats is >1951 mg/m^3. Ruffled fur and exophthalmus were reported until day 5 after exposure. No human data on acute toxicity are available.

Based on tests with rabbits pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) is not considered to be a skin or eye irritant. No human data are available. No sensitization potential is found in the guinea-pig in a Maurer optimisation test.

Repeated oral exposure to pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) (0, 1000, 3000 and 10000 ppm) induced decreases of body weight gain, food consumption and thyroid weight in a two year study with rats at 10000 ppm. The NOAEL is set at 3000 ppm (135-166 mg/kg bw/day). No effects were observed in a 90-day study in dogs, leading to a NOAEL of 10000 ppm (302-343 mg/kg bw/day).

Pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) was negative in an Ames test and in an *in vivo* micronucleus test. There are no indications that pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) possesses genotoxic properties.

In a 2-year dietary carcinogenicity assay in mice (0, 100, 300 and 1000 ppm) and a chronic toxicity study in rats (0, 1000, 3000 and 10000 ppm) no increased tumour incidence was found at any of the dose levels tested.

In a two generation study in rats pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) (0, 1000, 3000 and 10000 ppm) did not have any adverse effects on reproduction based on absence of effects on mating performance, pregnancy rate and gestation duration at the highest dose tested 688 mg/kg bw/day (males) and 823 mg/kg bw/day (females). The NOAEL for developmental toxicity is 688-823 mg/kg bw/day (10000 ppm) based on the absence of effects at the highest dose tested.

In teratogenicity studies in rats and mice (0, 150, 500 and 1000 mg/kg bw/day) performed mainly according to OECD TG 414) the NOAEL for maternal toxicity and teratogenicity is 1000 mg/kg bw/day. The NOAEL for developmental effects is set at 500 mg/kg bw based on an increased incidence of delayed ossification in mice at 1000 mg/kg bw. No teratogenic effects were observed.

Environment

Pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) is a white to off-white powder with a melting point of 116.5°C, a calculated boiling point of 1130°C and a negligible vapour pressure (1.55E-31 Pa at 25 °C). The substance has a very low solubility in water (<0.1 mg/L) and a high log Kow (≥5). The substance has four phenolic hydroxyl groups that can undergo protolysis. Dissociation constants (pKa_1 to pKa_4) are calculated to be 10.90, 11.54, 12.11, and 12.75 at 25 °C. Therefore the substance is a very weak acid and is expected to occur almost entirely as non-dissociated (neutral) species in natural aquatic environment.

Pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) is not readily biodegradable under experimental test conditions (4-5% in OECD TG 301B). The substance contains ester bonds that are not expected to hydrolyse rapidly under environmental conditions. Hydrolysis is not considered to be an important abiotic degradation process (EPIWIN, calculated $T_{1/2}$ for hydrolysis in water is 75 days at pH 8 and 2 years at pH 7).

The calculated half-life for the photo-oxidation (reaction with hydroxyl radicals) of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) in air is 1.2 hours. Level III fugacity modelling showed that after release to the environment 99-100% of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) will partition to sediment and soil, while <1% ends up in water.

Despite its high log Kow (19.6) the large diameter of the molecule (17.9 Å) indicates that the chemical is not considered to be bioaccumulative. An experimental determination of the BCF is available indicating a low potential for bioaccumulation of the substance in fish (BCF <2.3). Although the reliability of the test is not assignable the measured BCF is confirmed by calculations with QSAR models (EPIWIN) and EUSES.

For pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) no effects at the water solubility level (<0.1 mg/L) were observed in acute fish, daphnia and algae tests. A static study in zebra fish performed according to OECD TG 203 showed no treatment related mortality at the highest concentration tested (96-h LC_{50} >83 mg/L). *Daphnia magna* were exposed to the substance (dispersant used) during 24 hours in a static test (OECD TG 202). No effects on mobility were found at any of the concentrations tested (24-h EC_{50} is >100 mg/l). A 72h study with the algae *Scenedesmus subspicatus* showed no effect at the highest concentration tested (72-h EC_{50} >141 mg/L measured; growth rate and inhibition of biomass).

Exposure

For the year 2005 the global market for pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) was estimated to be 34,600 tonnes. The primary use of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) is as a sterically hindered phenolic primary antioxidant for processing and long-term thermal stabilization. The substance is used as a non-discolouring stabilizer for organic substrates like polyolefins and other plastics, synthetic fibres, elastomers, adhesives, waxes, oils and fats. It protects against thermo-oxidative degradation. Concentration levels in the polymers will range from 0.05-0.5% depending on the substrate and processing conditions (e. g. temperature of the processed polymer).

Limited consumer exposure is expected from the primary use of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) as phenolic antioxidant bound in a polymeric matrix (e.g. packaging materials). Other uses of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl) propionate) are preparations and articles

such as adhesives, lubricants, construction and insulating materials, fillers, screeding compounds and joint sealants, paints, lacquers and varnishes (Products Register of Nordic Countries and Swiss Register of Chemical Products).

There is potential environmental exposure during production and processing of pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) and due to losses of the antioxidant from preparations/products during service time or waste treatment. The migration rate from the polymer matrix in landfills is expected to be very low.

The use of low-dust granules and pellets will limit occupational exposure during packaging and handling of the additive (e.g. opening of bags, blending or filling operations).

RECOMMENDATION, RATIONALE FOR THE RECOMMENDATION AND NATURE OF FURTHER WORK RECOMMENDED

Human health: The substance is of low priority for further work due to its low hazard profile.

Environment: The substance is a candidate for further work. Short-term aquatic toxicity tests at 3 trophic levels are available which show no effects at the water solubility level in any of the tests. Although apparent emissions at manufacturing and processing sites in the sponsor country and emissions from the substances use in chemical preparations and articles are expected to be low, an exposure assessment and if then indicated a risk assessment is recommended. As pentaerythritol tetrakis(3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate) is not readily biodegradable and might end up in the sediment and soil, further testing on sediment dwelling organisms and degradation in sediment and soil may be necessary.