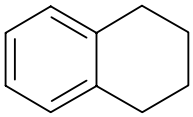
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	119-64-2
Chemical Name	1,2,3,4-Tetrahydronaphthalene
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

1,2,3,4-Tetrahydronaphthalene is rapidly absorbed when ingested or inhaled. The chemical is metabolized by hydroxylation at the non-aromatic portion of the molecule. The metabolites are excreted mainly as glucuronides with the urine, but elimination with the feces was also observed. Dark green colored urine, which is observed as a typical symptom in humans, indicates metabolization to a pigment.

The acute toxicity of 1,2,3,4-tetrahydronaphthalene was found to be relatively low with an oral LD_{50} of 2860 mg/kg bw (male rats), a dermal LD_{50} of 16,800 mg/kg bw (male rabbits) and no mortalities within 8 hours inhalation of a saturated atmosphere (ca. 1300 mg/m^3; male rats. In humans, the chemical is known to produce headache, nausea, vomiting, green-gray urine, and restlessness at high concentrations.

1,2,3,4-Tetrahydronaphthalene was a moderate irritant to the skin (OECD TG 404), but not to the eye (OECD TG 405). High exposure from the gas phase may cause irritation of mucous membranes and profuse lacrimation in humans. 1,2,3,4-Tetrahydronaphthalene was not sensitizing in a guinea pig maximization test (OECD TG 406, 1981).

In 13-week inhalation studies on rats and mice (performed within the U.S. National Toxicology Program and currently available only as abstracts plus key tables), no mortalities, no clinical abnormalities, and no gross pathological findings were observed at exposure concentrations up to and including 660 mg/m^3. In mice, transitional epithelial eosinophilic granules were observed in the urinary bladder of all exposed groups (dose-related), the toxicological significance of this finding is however unclear. In female mice, uterus atrophy was found at 82.4 mg/m^3, and atrophy of the ovary at 330 mg/m^3. In rats, a NOAEL could also not be established due to increased liver weight down to the lowest tested concentration (41.2 mg/m^3). The NOAEL for nasal lesions in rats was 82.4 mg/m^3 in males and 41.2 mg/m^3 in females, and 164.8 mg/m^3 in mice.

In a 28 day toxicity study in rats with gavage application of up to 150 mg 1,2,3,4-tetrahydronaphthalene/kg bw/day, no mortalities occurred in any group. Squatting position and closed eyes were observed in all treated groups. There was a transient decrease in absolute body weights of all treated males. Results of hematology were indicative of a hemolytic anemia in males and females of the high dose group, which was still present, though to a lesser degree, at the end of the recovery period. As a secondary reaction to the anemia, the reticulocyte counts for high dose females were increased and the extramedullary hematopoesis in the spleen of both high dose genders was enhanced. Based on the adverse effects on blood and spleen (significant at 150 mg/kg bw/day, but already beginning at 50 mg/kg bw/day), the NOAEL in this study was at 15 mg/kg bw/day.

1,2,3,4-Tetrahydronaphthalene was not genotoxic in bacterial systems *in vitro* (Ames test). In a Mouse Lymphoma test, results were negative and equivocal, without and with metabolic activation, respectively. *In vivo*, no mutagenic

activity was detectable in two micronucleus assays on mice according to OECD TG 474 using the oral and inhalation routes of administration.

No specific studies have been performed on the toxicity of 1,2,3,4-tetrahydronaphthalene to reproduction. There were no indications of an adverse effect on vaginal cytology, sperm and on reproductive organs from the 13-week inhalation study on rats. In mice, no effects on vaginal cytology and sperm were noted in the 13-week inhalation study, but uterus atrophy and atrophy of the ovary were found in the absence of systemic toxicity (*cf.* repeated dose section). Therefore, an effect of the chemical on reproduction cannot fully be excluded.

1,2,3,4-tetrahydronaphthalene did not show any developmental effects in a gavage study with rats performed in accordance with OECD TG 414 (2001) up to and including the highest tested dose level of 135 mg/kg bw/day. The NOAEL for maternal toxicity was 45 mg/kg bw/day, effects at 135 mg/kg bw/day were reduced food consumption and reduced body weight gain. The NOAEL for developmental toxicity was 135 mg/kg bw/day.

Environment

1,2,3,4-Tetrahydronaphthalene has a melting point of -35.8° C, a boiling point of 207.57° C at 1013 hPa, a water solubility of 45 mg/l and a vapor pressure of 0.34 hPa at 20 °C. The measured log K_{ow} is 3.78 (23 °C).

According to Mackay Level I model calculation, the main target compartment for 1,2,3,4-tetrahydronaphthalene will be the atmosphere (94.7 %), followed by water (2.7 %). The experimental Henry's law constant of 138 Pa m^3/mol indicates high volatility from surface waters. With a calculated K_{oc} of 1837 l/kg, the sorption potential to soil or sediment organic matter is expected to be high.

In the atmosphere, 1,2,3,4-tetrahydronaphthalene is removed by reaction with hydroxyl radicals with a calculated half-life of 11.2 hours based on an experimental rate constant. In water, it is not expected to hydrolyze under environmental conditions. Photolytic degradation in surface waters is an additional removal process of unclear significance with a half-life at least above 34 hours. 1,2,3,4-Tetrahydronaphthalene is not readily biodegradable by every inoculum, but is degraded well by several rare microorganisms. Anaerobic degradation was also observed. Calculated bioconcentration factors between 162 and 326 indicate a bioaccumulation potential of 1,2,3,4-tetrahydronaphthalene.

The lowest valid acute test results of aquatic testing determined for fish, invertebrates, and algae were as follows:

Danio rerio: 96-h-LC_{50} = 3.2 mg/l
Daphnia magna: 48-h-EC_{50} = 9.5 mg/l
Daphnia pulex: 48-h-EC_{50} = 2.4 mg/l
Desmodesmus subspicatus: 72-h-E_rC_{50} = 11.0 mg/l; 72-h E_bC_{50} = 7.0 mg/l
Long term aquatic toxicity data are available for one trophic level:
Desmodesmus subspicatus: 72-h E_rC_{10} = 5.3 mg/l; 72-h E_bC_{10} = 3.8 mg/l

From the lowest among the acute values, an aquatic PNEC of 2.4 µg/l is calculated using an assessment factor of 1000 according to the EU Technical Guidance Document.

Exposure

1,2,3,4-Tetrahydronaphthalene is produced in the Czech Republic, Germany, Japan, and the United States of America with production capacities of < 1000, 9000, < 1000, and 12,000 t/year, respectively. Production rates are known or assumed to be well below capacities. The annual quantity on the market is estimated to be below 10,000 t/a. Use as an intermediate and as an industrial solvent are the only applications of 1,2,3,4-tetrahydronaphthalene with significant quantities. Direct use and use as an intermediate are of approximately equal importance. Beside 1-naphthol, from which Carbaryl® is made, the most important substance made from 1,2,3,4-tetrahydro-

naphthalene is decahydronaphthalene. 1,2,3,4-Tetrahydronaphthalene is used as a solvent in a wide variety of applications including viscosity adjustment. In European product registers products are listed for both professional and consumer use that contain 1,2,3,4-tetrahydronaphthalene in concentrations up to 50 % (higher for two professional use products).

1,2,3,4-Tetrahydronaphthalene also occurs in fossil materials such as coal and petroleum and their downstream products, and it is formed in various plants as well as in combustion processes.

Releases of synthetic 1,2,3,4-tetrahydronaphthalene into the environment may occur during production, solvent use, formulation, and use of formulations as well as from its use as a starting material for organic syntheses. Release from production in the Sponsor country is negligible because a closed system is used, there is no water involved in the process, and solid waste is incinerated. Releases into the terrestrial compartment may occur from the use of 1,2,3,4-tetrahydronaphthalene as solvent in herbicides. Further data for anthropogenic 1,2,3,4-tetrahydronaphthalene are not available.

Release of fossil 1,2,3,4-tetrahydronaphthalene may occur when fossil materials are stored in open containers, burnt incompletely, spilt, or disposed of improperly. Naturally formed 1,2,3,4-tetrahydronaphthalene already occurs in the environment.

The order of magnitude of background concentrations is approximately 10 – 30 ng/l in surface waters, based on monitoring data from around 1990.

The most probable human exposure to 1,2,3,4-tetrahydronaphthalene is through dermal contact or inhalation during manufacture or use. In the Sponsor country, exposure is controlled in occupational settings.
Consumers may be exposed to 1,2,3,4-tetrahydronaphthalene used as solvents in paints, varnishes, lacquers, waxes, shoe polishes, and in petroleum products (gasoline, motor oils).

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

Human Health: The chemical is a candidate for further work. The chemical possesses properties indicating a hazard for human health (irritant to skin and mucous membranes, repeated dose toxicity, potential effect on reproduction). Based on data presented by the Sponsor country, adequate risk management measures are being applied for occupational settings. A high potential for consumer exposure exists as a result of the use as solvent in e.g. paints, waxes, and polishes. It is therefore recommended to perform an exposure assessment and, if then indicated, a risk assessment. It is further noted that the chemical is currently being tested in a 2 year inhalation carcinogenicity study on mice and rats under the US National Toxicology Program.

Environment: The chemical is a candidate for further work. The chemical possesses properties indicating a hazard for the environment. Based on data presented by one company in the Sponsor country, exposure from production is low. However, environmental exposure may result from the use of 1,2,3,4-tetrahydronaphthalene as solvent and from the formulation and use of products containing the substance. Therefore, an exposure assessment and, if then indicated, an environmental risk assessment is recommended.