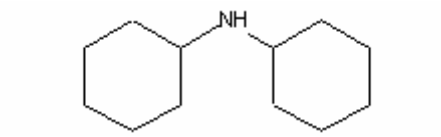
SIDS INITIAL ASSESSMENT PROFILE

CAS No.	**101-83-7**
Chemical Name	**Dicyclohexylamine**
Structural Formula	

SUMMARY CONCLUSIONS OF THE SIAR

Human Health

According to the available information from animal studies dicyclohexylamine is readily absorbed after oral application and following inhalation and dermal application and is excreted via urine.
The LD_{50} following dermal application to rabbits ranges between 200 and 316 mg/kg bw and LD_{50} (oral, rat) is 200 mg/kg bw.
Dicyclohexylamine is corrosive to the skin and has a strong eye irritant potential. There are no studies available to evaluate the possible activity to induce sensitization.

Repeated oral dose toxicity was assessed by a subacute toxicity study (28 days, Japanese Guideline) and in an OECD TG 421 assay in rats. Unspecific signs of intoxication in combination with changes in organ weights (adrenal glands, ovaries, testes) at the highest doses tested without histopathological correlates resulted in NOAELs (general toxicity) of 20 mg/kg bw/day (subacute study) or 40 mg/kg bw/day (OECD TG 421) for rats of both sexes, respectively.

Dicyclohexylamine showed no mutagenic activity in standard Ames test with and without metabolic activation system but induced chromosomal aberrations in Chinese hamster lung (CHL) cells at high concentrations and short exposure time (exposure time: 6 hours (a) with S9-mix.at 600 µg/ml; (b) without S9-mix: at 800 and 1000 µg/ml). Overall, dicyclohexylamine is not mutagenic but clastogenic *in vitro*. There are no valid data on genotoxicity *in vivo*.

There are no valid data on carcinogenicity studies *in vivo*. Using valid *in vitro* cell transformation assays with human cells and baby Syrian hamster cells, dicyclohexylamine yielded negative results.

In an OECD reproduction/developmental toxicity screening test (OECD TG 421) in rats dicyclohexylamine revealed effects on reproduction only in females at the highest oral dose tested (80 mg/kg bw/day) including slightly reduced gestation index, increase in stillborn pups and decrease in live born pups. Thus, the NOAEL (reproductive toxicity) is 80 mg/kg bw/day for males and 40 mg/kg bw/day for females. The NOAEL (offspring) is 40 mg/kg bw/day based on significant reduction in pup weights on day 0 and slight reduction in pup weights on day 4 in offspring of the parents dosed with 80 mg/kg bw/day. These adverse effects on the development of the F1-generation occur only in the presence of severe maternal toxicity (17 % mortality; 1 of 10 surviving dams without live pups; poor maternal behavior and nursing).

Environment

Dicyclohexylamine is a clear, colorless liquid with a melting point of – 0.1 °C, and a boiling point of 256 °C at 1013 hPa. The relative density of the liquid is 0.91 at 25 °C. The vapour pressure is 0.0442 hPa at 25 °C. The calculated log K_{ow} for the neutral and the protonated form are 4.37 and 1.26, respectively. The solubility in water is 0.8 g/l at 25 °C. The flash point is 105 °C, and the auto flammability (ignition temperature) 255 °C. A pK_a value of 10.39 indicates dicyclohexylamine to be a strong base which is mostly in its protonated form in the

natural aquatic environment.

In the atmosphere dicyclohexylamine is degraded by photochemically produced OH radicals. The half-life is calculated to be 2.9 hours. With regard to the chemical structure, dicyclohexylamine is not expected to hydrolyse under environmental conditions. An aerobic ready test was performed according to the national Japanese MITI test, comparable to the OECD TG 301C. After a period of 14 days 77 % biodegradation was observed. In a closed bottle test, comparable to OECD TG 301D performed with predominantly domestic sewage, more than 96 % of the test substance had been degraded after 20 days.

With a pK_a of 10.39 at 25°C, dicyclohexylamine will exist predominantly in its protonated form in the environment. According to the Mackay fugacity model level I, the favorite target compartment of the protonated form of dicyclohexylamine is water with 99.71 %. The Henry's Law constant for the neutral form of dicyclohexylamine, calculated with QSAR is 5.57 Pa m³/mol at 25 °C, prove a high potential for volatilization from surface waters. Regarding the Henry's Law constant for the protonated form of dicyclohexylamine of 4.26 x 10^{-7} Pa m³/mole, the substance is not expected to volatilize from water. The bioconcentration factor BCF = 459 for the neutral form of dicyclohexylamine calculated from the octanol-water partition coefficient indicates that there is a potential for bioaccumulation of dicyclohexylamine in aquatic organisms. The estimated BCF value of 3.2 for the protonated form indicates that there is no significant bioaccumulation potential of dicyclohexylamine in aquatic organisms. With an estimated K_{oc} value of 433 for the protonated form, dicyclohexylamine can be regarded as a substance with a moderate potential for accumulation in soil.

Concerning the toxicity of dicyclohexylamine to aquatic species reliable experimental results of acute tests with fish, *Daphnia*, and algae are available, and results from chronic tests with invertebrates and algae. The tests were performed according to standard procedures. The effect values from short-term tests are (n = nominal concentration; m = measured concentration):

Danio rerio:	96 h-LC_{50}	= 62 mg/l (m)
Oryzias latipes:	96 h-LC_{50}	= 12 mg/l (m)
Daphnia magna:	48 h-EC_{50}	= 8 mg/l (m)
Daphnia magna:	48 h-EC_{50}	= 70.1 mg/l (n)
Daphnia magna:	21 d-EC_{50}	= 0.14 mg/l (m)
Daphnia magna:	21 d-NOEC	= 0.016 mg/l (m)
Pseudokirchneriella subcapitata:	72 h-$EC_{50growth\ rate}$	= 23 mg/l (m)
Pseudokirchneriella subcapitata:	72 h-$NOEC_{growth\ rate}$	= 2.0 mg/l (m)
Desmodesmus subspicatus:	72 h-$EC_{50growth\ rate}$	> 1 mg/l (n)
Desmodesmus subspicatus:	72 h-$NOEC_{growth\ rate}$	= 0.016 mg/l (n)

Since acute test results for dicyclohexylamine for three trophic levels and long-term results (NOEC) for *Daphnia* and *Pseudokirchneriella* are available, and there is convincing evidence that the chronic tests have been done on the most sensitive species, an assessment factor of 10 was applied for the derivation of the $PNEC_{aqua}$ according to the EU Technical Guidance Document. The lowest chronic no effect concentration (NOEC of 0.016 mg/l) was found for the algae species *Desmodesmus subspicatus* and for *Daphnia magna* on reproduction resulting in a $PNEC_{aqua}$ of 1.6 µg/l.

Exposure

The global production volume of dicyclohexylamine is estimated to be less than 10,000 tonnes by approximately 10 producers in 2003. In Germany, the only manufacturer of dicyclohexylamine has a manufacturing capacity of 1,000-5,000 tonnes/a. In Japan, there are 4 production sites with an estimated manufacturing volume of 1,000-5,000 tonnes/a in total.

Dicyclohexylamine is used mainly as an intermediate in chemical processes. It is used as an intermediate in the manufacturing of corrosion inhibitors, insecticides, paper and textile auxiliaries, emulsifiers, oil additives, vulcanization accelerators, plasticizers, and dyestuff precursors. Dicyclohexylamine is also used in the synthesis of pesticides, as a processing chemical for antibiotics, and as a fuel oil additive.
In Germany, the only producer manufactures dicyclohexylamine in closed systems. Virtually no dicyclohexylamine is emitted into the atmosphere or into the aquatic environment.
To protect workers from exposure, several precautionary and protective measures are taken, e.g. during sampling, repair and maintenance. Dicyclohexylamine is not processed in Germany. Traces of dicyclohexylamine were detected in machine cutting-fluid emulsion in Japan. Exposure of workers to

dicyclohexylamine is unlikely to occur. In the Sponsor country (Japan), similar measures are applied to protect the environment and the workers.

Dicyclohexylamine is listed in the Product Registers of Denmark, Finland, and Sweden in a total of 25 industrial preparations with a consumption of 9.1 tonnes in 2003 (last year of record). In Sweden, it is registered to occur in consumer preparations. For Norway there is a confidential listing. In Finland, dicyclohexylamine is used for the manufacture of chemicals, metal preparations, machinery and equipment. The main use category is "non-dispersive use".
In the Swiss Product Register dicyclohexylamine is registered for 78 products, including 73 industrial products. Of the 5 consumer products listed in the Swiss Product Register, there are one fuel additive with a dicyclohexylamine content of 3 %, a brake fluid with 1 %, a coolant additive with 3 %, and two products in the category of propellants, lubricants and heat transfer media which contain less than 0.001 % dicyclohexylamine.

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

Human Health: The chemical is currently of low priority for further work. The chemical possesses properties indicating a hazard for human health (acute toxicity, skin corrosivity, eye and respiratory tract irritation, chromosome aberrationin vitro at high concentrations, developmental toxicity in the presence of severe maternal toxicity). Based on the data presented by companies in Japan and by the Sponsor company in Germany, exposure is controlled in occupational settings in the Sponsor country and in Germany, and exposure of consumers is low. Countries may desire to investigate any exposure scenarios that were not presented by the Sponsor country.

Environment: The chemical has properties indicating hazards for the environment (acute aquatic EC/LC50 values between 1 and 100 mg/l). However the chemical is of low priority for further work because of its rapid biodegradability and its limited potential for bioaccumulation (protonated form).