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FOREWORD

INTRODUCTION

**TRIETHYLENE TETRAMINE**  
**CAS N°: 112-24-3**

**SIDS Initial Assessment Report  
for SIAM 8**

(Paris, 28-30 October 1998)

**Chemical Name :** Triethylenetetramine

**CAS No:** 112-24-3

**Sponsor Country:** Germany

National SIDS Contact Point in Sponsor Country: Dr Jan Ahlers

**HISTORY:**

The SIDS Initial Assessment Report was discussed at SIAM 5 & 6 and adopted at SIAM 8.

**COMMENTS:**

**Date of Circulation:** July 1998



**SIDS INITIAL ASSESSMENT PROFILE**

|  |  |
|--|--|
| <b>CAS No.</b>   | 112-24-3   |
| <b>Chemical Name</b>   | Triethylene tetramine  |
| <b>Structural Formula</b>  | H <sub>2</sub> N-CH <sub>2</sub> -CH <sub>2</sub> -NH-CH <sub>2</sub> -CH <sub>2</sub> -NH-CH <sub>2</sub> -CH <sub>2</sub> -NH <sub>2</sub> |
| <b>CONCLUSIONS AND RECOMMENDATIONS</b>   |  |
| <p><b>Environment</b></p> <p>The chemical is toxic to algae, but PEC/PNEC ratios are lower than 1. It is currently considered of low potential risk and low priority for further work.</p> <p><b>Human Health</b></p> <p>The chemical is genotoxic <i>in vitro</i>, a severe irritant to skin and eyes and a skin sensitiser, but exposure is low and well-controlled. Therefore, it is currently considered of low potential risk and low priority for further work. However due to its hazard character appropriate classification and labelling are recommended.</p>  |  |
| <b>SHORT SUMMARY WHICH SUPPORTS THE REASONS FOR THE CONCLUSIONS AND RECOMMENDATIONS</b>  |  |
| <p>The production volume of triethylenetetramine (TETA) in 1990 is 1200-1500 t/a in Germany, ca. 6000 t/a in the Netherlands, &gt;11000 t/a in the USA and ca. 1800 t/a in Japan. TETA is mostly used as intermediate in chemical synthesis. Ca. 160 t/a are directly used as curing agent for epoxy resins in Germany. For Sweden, a similar use pattern was described. TETA is stable in neutral solution and is classified as "non biodegradable". The most sensitive environmental species to TETA is the alga <i>Scenedesmus subspicatus</i> (72h-EC10 = 0.67 mg/l). A PNEC of 13.4 µg/l is determined.</p> <p>TETA has a moderate acute toxicity: LD50 (oral, rat) &gt; 2000 mg/kg bw, LD50 (dermal, rabbit) = 550-805 mg/kg bw. The NOAEL for repeated dose toxicity is 600 ppm (92 (male), 99 (female) mg/kg bw) for mice (oral, 90 days). In <i>in vitro</i> tests the substance showed genetic toxicity whereas in <i>in vivo</i> test negative results were found. There are no animal data on reproductive toxicity available. From experience with humans TETA reveals no effects on reproduction. TETA is a severe irritant to skin and eyes. TETA induces skin sensitisation in guinea pigs, mice and man.</p> <p>The highest aquatic local PEC during processing as an intermediate was estimated to be 4.5 µg/l.</p> <p>The estimated human exposure at the workplace is estimated at &lt;0.143 resp. &lt;0.0143 mg/kg bw. Data on consumer exposure are not available.</p> |  |
| <b>NATURE OF FURTHER WORK RECOMMENDED</b>  |  |
| Appropriate classification and labelling are recommended.  |  |

## FULL SIDS SUMMARY

| CAS-NO.: 112-24-3                   |                                 | PROTOCOL                           | RESULTS   |
|-------------------------------------|---------------------------------|------------------------------------|---|
| PHYSICAL CHEMICAL                   |                                 |                                    |   |
| 2.1                                 | Melting-Point                   | NA                                 | 12 °C   |
| 2.2                                 | Boiling-Point                   | NA                                 | ca. 280°C (at kPa)  |
| 2.3                                 | Density                         | NA                                 | ca. 980 kg/m <sup>3</sup>   |
| 2.4                                 | Vapour Pressure                 | NA                                 | 1.3 Pa at 20°C  |
| 2.5                                 | Partition Coefficient (Log Pow) | (calc.)                            | - 1.4   |
| 2.6 A                               | Water solubility                | NA                                 | completely miscible   |
| B                                   | pH                              | NA                                 | 10.7. at 10 g/l   |
|                                     | pKa                             | 20 °C                              | pKa1 = 3.32 pKa2 = 6.67<br>pKa3 =9.2 pKa4 = 9.92  |
| 2.12                                | Oxidation : Reduction potential | /                                  | mV  |
| ENVIRONMENTAL FATE / BIODEGRADATION |                                 |                                    |   |
| 3.1.1                               | Photodegradation                | calc. (Atkinson)                   | In air T <sub>1/2</sub> = 1.7 hour  |
| 3.1.2                               | Stability in water              | NA                                 | no hydrolysis   |
| 3.2                                 | Monitoring data                 |                                    | In air = /mg/m <sup>3</sup><br>In surface water= /µg/l<br>In soil / sediment= /µg/g<br>In biota= / µg/g |
| 3.3                                 | Transport and Distribution      | calculated (fugacity level 1 type) | In air / %<br>In water / %<br>In sediment / %<br>In soil / %<br>In biota / %                            |
| 3.5                                 | Biodegradation                  | OECD 301 D<br>OECD 302 B           | not readily biodegradable<br>not inherently biodegradable   |

| CAS-NO.: 112-24-3    |   | SPECIES                 | PROTOCOL           | RESULTS  |
|----------------------|---|-------------------------|--------------------|--|
| <b>ECOTOXICOLOGY</b> |   |                         |                    |  |
| 4.1                  | acute/prolonged toxicity to fish  | Poecilia reticulata     | 84/449/EEC, C.1    | LC <sub>50</sub> (96 hr) =570mg/l  |
| 4.2                  | acute/prolonged toxicity to aquatic invertebrates (daphnia)             | Daphnia magna           | 84/449/EEC, C.2    | EC <sub>50</sub> (24hr) =31.1mg/l  |
| 4.3                  | toxicity to aquatic plants e. g. algae                                  | Scenedesmus subspicatus | DIN 38412 part 9   | EC <sub>50</sub> (72hr) =2.5mg/l<br>EC <sub>10</sub> (72hr) =0.67mg/l                                  |
| 4.4                  | toxicity to microorganisms  | Pseudomonas fluorescens | DEV, L 8           | EC <sub>0</sub> (24 hr) =500mg/l   |
| 4.5.2                | chronic toxicity to aquatic invertebrates ( daphnia )                   | Daphnia magna           | OECD 202 part 2    | NOEC (21d) =1mg/l  |
| (4.6.3)              | toxicity to other non mammalian terrestrial species ( including birds ) | Agelaius phoeniceus     | NA                 | LD <sub>50</sub> (18hr) => 10mg/kg   |
| <b>TOXICOLOGY</b>    |   |                         |                    |  |
| 5.1.1                | acute oral toxicity   | rat<br>mouse<br>rabbit  | NA<br>NA<br>NA     | LD <sub>50</sub> =2500 mg/kg<br>LD <sub>50</sub> =1600 mg/kg<br>LD <sub>50</sub> =5500 mg/kg           |
| 5.1.2                | acute inhalation toxicity   |                         |                    | LC <sub>50</sub> =mg/m <sup>3</sup>  |
| 5.1.3                | acute dermal toxicity   | rabbit                  | NA                 | LD <sub>50</sub> =550 mg/kg  |
| 5.4                  | repeated dose toxicity  | mouse                   | NA                 | NOAEL =92mg/kg bw  |
| 5.5                  | genetic toxicity in vitro   |                         |                    |  |
|                      | bacterial test (gen mutation)   | S. typhimurium          | Ames test          | positive<br>(with and without metabolic activation)  |
|                      | non-bacterial in vitro test (chromosomal aberrations)                   | CHO cells               |                    | positive<br>(with and without metabolic activation)  |
| 5.6                  | genetic toxicity in vivo  | mouse                   | Micronucleus assay | negative   |
| 5.8                  | toxicity to reproduction  |                         |                    | NOEL =mg/kg (general toxicity)<br>NOEL =mg/Kg (rep. tox. parental)<br>NOEL =mg/Kg (rep. tox. F1)       |
| 5.9                  | developmental toxicity / teratogenicity                                 |                         |                    | NOEL =750mg/kg (general toxicity)<br>NOEL =750mg/Kg (pregnancy/litter)<br>NOEL =750mg/Kg (foetal data) |
| 5.11                 | experience with human exposure  |                         |                    |  |

**SIDS Initial Assessment Report****1. Identity**

|   |  |
|---|--|
| Name:   | Triethylenetetramine (TETA)  |
| CAS Nr.:  | 112-24-3   |
| Empirical Formula:                                | C <sub>6</sub> H <sub>18</sub> N <sub>4</sub>  |
| Structural Formula:                               | H <sub>2</sub> N-CH <sub>2</sub> -CH <sub>2</sub> -NH-CH <sub>2</sub> -CH <sub>2</sub> -NH-CH <sub>2</sub> -CH <sub>2</sub> -NH <sub>2</sub> |
| Purity of industrial product:                     | 60 - 70 %  |
| Major impurities:                                 |  |
| N,N'-Bis-(2-aminoethyl)piperazine                 | 11 - 13 %  |
| N-[1-(2-Piperazin-1-yl-ethyl)]-ethane-1,2-diamine | 10 - 13 %  |
| Tris-(2-aminoethyl)-amine                         | 4 - 6 %  |
| Diethylenetriamine                                | <= 3 %   |
| Water   | <=0.5 %  |