INFORMATION PROFILES ON POTENTIAL OCCUPATIONAL HAZARDS

VOLUME I. SINGLE CHEMICALS

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Final Report
Contract No. 210-78-0019

December 1979

Prepared for:

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INTRODUCTION

An information profile is a working paper used by the National Institute for Occupational Safety and Health (NIOSH) to assist in establishing Institute priorities. It is an initial step in determining the need to develop comprehensive documents or to initiate research. Each profile summarizes data on known and suspected health effects, the extent of worker exposure, physical and chemical properties, and the industrial importance of individual chemicals and classes of chemicals. The profile may also be used by industry, labor, and the occupational health community as a synopsis of information on each subject and to identify possible health hazards associated with their workplaces.

Although detailed literature searches are conducted using computerized and manual searching techniques to identify pertinent and recent information, not all the literature obtained is incorporated in the report due to the summary nature of the profiles. Further, literature published after 1978 may not be included in these profiles because it was generally unavailable at the time the search was completed.

TERT-BUTYLAMINE

SUMMARY

Tert-butylamine is used as an intermediate in the production of various organic chemicals. Roughly 840 workers are exposed to tert-butylamine each year. Several million pounds or less of tert-butylamine are produced annually.

Very little information concerning the biological effects of exposure to tert-butylamine was encountered. Straight chain butylamines cause irritation of the eyes and respiratory tract, excitability, followed by depression, and pulmonary edema in laboratory animals. Danger to humans results from skin and respiratory tract irritation.

1. Synonyms: 2-Aminoisobutane
2-Amino-2-methylpropane
Dimethylethylamine
2-Propanamine, 2-methyl
Trimethylaminomethane

2. Chemical Abstracts Service Number: 75-64-9

3. Registry of Toxic Effects of Chemical Substances Number: EO33300

4. Molecular Formula: $C_4H_{11}N$

5. Chemical Structure: $(CH_3)_3CNH_2$

6. Physical and Chemical Properties:

Molecular Weight	73.16
Physical State	Liquid
Boiling Point	44-46°C
Melting Point	-72.65°C
Vapor Pressure	169.8 mm at 25°C
Evaporation Rate	
Solubility	Miscible (H_2O)
Specific Gravity	0.700 (15°C)
Stability	

7. Production and User Data

Production and Trends

A production figure for tert-butylamine is not available from the literature, except that the scale of manufacture is small (Schweizer et al., 1978). It is likely that the annual production of tert-butylamine is on the order of several million lbs, maximum, but more likely the annual production is less (SRC estimate).

Trends are not available.

Uses

Tert-butylamine is used as a chemical intermediate in the production of tert-butylaminoethyl methacrylate (a lube oil additive), as an intermediate in the production of rubber and pharmaceutical chemicals, and in rust preventative and emulsion deterrents in petroleum products (Lawler, 1977).

Producers and Distributors

The only commercial producer and distributor of tert-butylamine is Monsanto Chemicals in Texas City, Texas (SRI, 1978; Chem. Week, 1978; OPD, 1978).

Manufacturing Process

Tert-butylamine is manufactured by the addition of HCN to a solution of isobutylene in an acidic medium; the reaction is shown below (Schweizer et al., 1978):

$$(CH_3)_2C{=}CH_2 + HCN + H_2O \xrightarrow{H^+} (CH_3)_3CNHCHO \xrightarrow[H^+]{H_2O} (CH_3)_3CNH_2 + HCOOH$$

The reaction is run in a glass-lined, jacketed kettle for several hours at 30-60°C. The mixture is then heated to hydrolyze the intermediate amide, the excess acid is neutralized, and the amine is distilled and purified.

8. Biological Effects of Exposure

a) Acute Effects

A summary of acute toxicity data is presented in Table 1. The three straight chain butylamines produce increased reflex excitability, then depression and narcotic death with pulmonary edema. The liquid causes severe injury to the skin and cornea (Smyth, 1956).

b) Subchronic Effects

No data were encountered.

c) Chronic Effects

i. Carcinogenicity

No data were encountered.

ii. Mutagenicity

No data were encountered.

iii. Teratogenicity

No data were encountered.

iv. Other Effects

No data were encountered.

d) Human Effects

The greatest practical hazard from butylamine is injury to the skin (ACGIH, 1974). Inhalation of butylamine may cause irritation of the respiratory tract with lung edema being the maximum injury.

Table 1. Acute Toxicity - Tert-Butylamine

Species	Route	Dose	Result	Reference
rat	oral	180 mg/kg	LD_{50}	NIOSH, 1977
rat	ihl	2000 ppm/4 hrs	Survive	Smyth, 1956
rat	ihl	4000 ppm/4 hrs	Death	Smyth, 1956
mouse	oral	900 mg/kg	LD_{50}	NIOSH, 1977

9. Threshold Limit Values, OSHA Standards, NIOSH Recommended Standards

	Butylamine	(skin)	Reference
TLV	5 ppm	15 mg/cu m	ACGIH, 1977
OSHA Standard	5 ppm	15 mg/cu m	OSHA, 1976
NIOSH Recommended Standard	none		

The Threshold Limit Value of 5 ppm is recommended to prevent significant irritation to the respiratory tract.

10. Other Standards

The following table lists national standards (other than U.S.) for concentrations of tert-butylamine allowable in the occupational environment (Wills, 1979); no designation of the grade of amine is given.

Standard	Country
10 mg/cu m	Bulgaria, Romania (ceiling), SSSR
15 mg/cu m	Australia, Belgium, Finland, BRD, Japan, the Netherlands, Yugoslavia
17 mg/cu m	Switzerland

11. Occupational Exposures

According to an oral communication from Vera Hudson, Division of Criteria Documentation and Standards Development, NIOSH, approximately 840 workers are exposed to tert-butylamine yearly (oral communication, 1976).

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