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I-21027 Ispra (VA) Italy

PROPAN-1-OL

Part I – Environment

CAS No: 71-23-8

EINECS No: 200-746-9

Summary Risk Assessment Report

The mission of the IHCP is to provide scientific support to the development and implementation of EU policies related to health and consumer protection. The IHCP carries out research to improve the understanding of potential health risks posed by chemical, physical and biological agents from various sources to which consumers are exposed.

The Toxicology and Chemical Substances Unit (TCS), commonly known as the European Chemicals Bureau (ECB), provides scientific and technical input and know-how to the conception, development, implementation and monitoring of EU policies on dangerous chemicals including the co-ordination of EU Risk Assessments. The aim of the legislative activity of the ECB is to ensure a high level of protection for workers, consumers and the environment against dangerous chemicals and to ensure the efficient functioning of the internal market on chemicals under the current Community legislation. It plays a major role in the implementation of REACH through development of technical guidance for industry and new chemicals agency and tools for chemical dossier registration (IUCLID5). The TCS Unit ensures the development of methodologies and software tools to support a systematic and harmonised assessment of chemicals addressed in a number of European directives and regulation on chemicals. The research and support activities of the TCS are executed in close co-operation with the relevant authorities of the EU Member States, Commission services (such as DG Environment and DG Enterprise), the chemical industry, the OECD and other international organisations.

European Commission
Joint Research Centre
Institute of Health and Consumer Protection (IHCP)
Toxicology and Chemical Substances (TCS)
European Chemicals Bureau (ECB)

Contact information:

Institute of Health and Consumer Protection (IHCP)

Address: Via E. Fermi 1 – 21020 Ispra (Varese) – Italy

E-mail: ihcp-contact@jrc.it

Tel.: +39 0332 785959

Fax: +39 0332 785730

<http://ihcp.jrc.cec.eu.int/>

Toxicology and Chemical Substances (TCS)

European Chemicals Bureau (ECB)

E-mail: esr.tm@jrc.it

<http://ecb.jrc.it/>

Joint Research Centre

<http://www.jrc.cec.eu.int>

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SUMMARY RISK ASSESSMENT REPORT

Final report, 2007

Germany

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Contact point:

Bundesanstalt für Arbeitsschutz und Arbeitsmedizin
Anmeldestelle Chemikaliengesetz (BAuA)
(Federal Institute for Occupational Safety and Health
Notification Unit)
Friedrich-Henkel-Weg 1-25
44149 Dortmund (Germany)

fax: +49(231)9071-679

e-mail: chemg@buaa.bund.de

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PREFACE

This report provides a summary, with conclusions, of the risk assessment report of the substance propan-1-ol that has been prepared by Germany in the context of Council Regulation (EEC) No. 793/93 on the evaluation and control of existing substances.

For detailed information on the risk assessment principles and procedures followed, the underlying data and the literature references the reader is referred to the comprehensive Final Risk Assessment Report (Final RAR) that can be obtained from the European Chemicals Bureau¹. The Final RAR should be used for citation purposes rather than this present Summary Report.

¹ European Chemicals Bureau – Existing Chemicals – <http://ecb.jrc.it>

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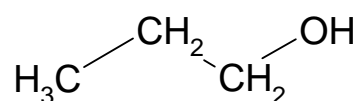
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1 GENERAL SUBSTANCE INFORMATION

1.1 IDENTIFICATION OF THE SUBSTANCE

CAS No.: 71-23-8
EINECS No.: 200-746-9
IUPAC Name: Propan-1-ol
Synonyms: 1-Hydroxypropane, 1-Propanol, Ethylcarbinol, n-Propanol, n-Propyl alcohol, Propanol-1, Alcohol C₃
Molecular formula: C₃H₈O
Molecular weight: 60.1 g/mol
Structural formula:



1.2 PURITY/IMPURITIES, ADDITIVES

Purity: > 99%
Impurities: methanol
ethanol
C6 aldehydes
propyl propionate
2-methylvaleraldehyde
≤ 0.2% w/w aldehyde
< 0.1 w/w dipropyl ether
≤ 0.1% w/w water
≤ 0.003% w/w acetic acid

1.3 PHYSICO-CHEMICAL PROPERTIES

Table 1.1 Physico-chemical properties

Physical state	Clear colourless liquid with characteristic odour	
Melting point	-126.5°C	CRC Handbook (1991/92)
Boiling point	97.1°C at 1,013 hPa	Hiaki et al. (1994)
Density	0.803 g/cm ³ at 20°C	Wilhoit and Zwolinski (1973)
Vapour pressure	19.4 hPa at 20°C	Hiaki et al. (1994)
Surface tension	67.1 mN/m at 25°C c=1 g/l	CRC Handbook (1991/92)
Partition coefficient	0.34 (shake flask method)	Hansch and Anderson (1967)
Water solubility	completely soluble	Yaws et al. (1990)

Table 1.1 continued overleaf

Table 1.1 continued Physico-chemical properties

Physical state	Clear colourless liquid with characteristic odour	
Flash point	22°C (corrected to the presence of iso-propanol) 23.5°C (99.9% pure)	CHEMSAFE DIN 51755, ISO 3679
Auto flammability	385°C	CHEMSAFE DIN 51794
Flammability	flammable	CHEMSAFE
Explosive properties	not explosive	due to structural reasons
Oxidizing properties	no oxidising properties	due to structural reasons

1.4 CLASSIFICATION

No classification for the environment.

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GENERAL INFORMATION ON EXPOSURE

There is one production site of propan-1-ol in the EU. The chemical is imported by 5 other companies from outside of the EU. There is no information on possible exports. Based on the production and import quantities approximately 30,100 tonnes/annum of propan-1-ol are used in the EU.

Propan-1-ol is produced almost exclusively by the reaction of ethene with synthesis gas.

Approximately 55% of propan-1-ol in the EU is used as solvent for the formulation of lacquer and paints (19%) as well as household chemicals such as pharmaceutical products, disinfectants, cosmetics and cleaning/washing agents (33%). A small portion of solvent use (3%) could not be further specified.

About 45% is processed chemically to intermediates such as n-propylacetate (34%), propylchlorformiate (9%) and reactive resins (2%), which in turn are needed for the synthesis of herbicides, aroma and perfume substances, cosmetics and pharmaceuticals.

3 ENVIRONMENT

3.1 ENVIRONMENTAL EXPOSURE

The major relevant fate and behaviour characteristics of propan-1-ol are that:

- it is readily biodegradable;
- it is completely soluble in water;
- it has a high vapour pressure (19.4 hPa at 20°C);
- it has a low log K_{ow} (0.34);
- it has an estimated atmospheric half-life of 3 days;
- no hydrolysis or photolysis in water is expected.

Propan-1-ol is moderately volatile from an aqueous solution. A Henry's law constant of 0.117 Pa m³/mol at 20°C can be calculated.

No bioaccumulation potential is to be expected due to the measured log K_{ow} value of 0.34. Propan-1-ol is very mobile in most soil types and adsorption to soil and sediment particles are very low (K_{oc} calculated as 4.291 l/kg).

During production, processing (use as an intermediate), formulation of products (containing propan-1-ol) and further use as a solvent, propan-1-ol is expected to enter the environment. Release to water is the most important environmental exposure route.

3.1.1.1 Predicted environmental concentrations (PECs)

Concentrations in water, air and soil are estimated according to the methods in the TGD, and these are summarised in **Table 3.1** (for water and air). No monitoring data relating to the occurrence to propan-1-ol in the environment are available.

Table 3.1 Summary of PECs for propan-1-ol

Scenario	PEC _{water} [µg/l]	PEC _{air} [µg/m ³]
Production	8.73	0.83
Processing as intermediate	11.4	116
Formulation of solvent (household)	33.8	9.40
Private use of solvent (household)	29.3	negligible
Formulation of solvent (paint and lacquer)	261	14.1
Private use of solvent (paint and lacquer)	8.79	0.30
Processing of solvent (paint and lacquer)	46.4	75.1
Formulation of solvent (not specified)	71.6	3.59
Processing of solvent (not specified)	166	9.09
Regional	8.59	0.095

The PECs for sewage treatment plants are calculated as $2.02 \cdot 10^{-3}$ mg/l to 2.52 mg/l. Data on occurrence in the sediment do not exist for propan-1-ol. According to the known physico-chemical properties, there is no indication that propan-1-ol accumulates in the sediment. No PEC_{sediment} was derived.

Propan-1-ol is expected to enter the soil as a result of deposition from the atmosphere. Considering this route of exposure, the highest local concentration in soil can be expected as 13 µg/kg (Processing as intermediate) using a $PEC_{\text{regional,soil}}$ of 0.525 µg/kg. The given local PEC_{soil} of 13 µg/kg corresponds to a $PEC_{\text{soil-porewater}}$ of 69.1 µg/l.

Since there is no indication of propan-1-ol possessing a bioaccumulation potential, a risk characterisation for exposure via the food chain is not necessary.

3.2 EFFECTS ASSESSMENT: HAZARD IDENTIFICATION AND DOSE (CONCENTRATION) - RESPONSE (EFFECT) ASSESSMENT

3.2.1 Aquatic compartment (incl. sediment)

Acute toxicity test results are reported for fish, invertebrates, algae and microorganisms. Reported effect values for fish show similar sensitivity of the tested species without considerable influence of the exposure duration (48 or 96 hours). The lowest valid LC_{50} reported for fish is 3,200 mg/l (48 hours, *Oncorhynchus mykiss*).

The lowest 48-hour EC_{50} for invertebrates is 1,000 mg/l (*Gammarus pulex*). The lowest valid effect value for algae is a NOEC of 1,150 mg/l (*Chlorella pyrenoidosa*).

The majority of tests were performed in open static systems without analytical monitoring of the test substance concentration. As propan-1-ol is moderately volatile (Henry's law constant 0.117 Pa m³/mol) a decrease in test substance concentration may have occurred and the real effect values are therefore lower. However, the tests performed in flow-through systems with analytical monitoring found effect values of the same order of magnitude. Therefore, no significant decrease in test substance due to volatilisation is expected.

No long-term tests with invertebrates and fish are available. Based upon all of the available data a $PNEC_{\text{aqua}}$ of 10 mg/l is derived using an assessment factor of 100. This AF is applied because 1) Data from a wide selection of species covering additional taxonomic groups other than those represented by the base-set species (e.g. amphibians) are available which additionally cross three trophic levels, and 2) The mode of action law can be implemented (non-polar narcosis).

No risk assessment is required for sediment since there are no indications of adsorption of the substance to sediments and neither measured concentrations of propan-1-ol for sediments nor experimental investigations with sediment organisms are available.

3.2.2 Waste water treatment plant

A $PNEC_{\text{microorganisms}}$ of 96 mg/l is derived using an assessment factor of 100 with an IC_{50} of 9,600 mg/l (Activated sludge).

3.2.3 Terrestrial compartment

No ecotoxicological data are available for terrestrial organisms. A $PNEC_{\text{soil}}$ (porewater) of 10 mg/l is derived based on the $PNEC_{\text{aqua}}$.

3.2.4 Atmosphere

No ecotoxicological data are available for this environmental compartment. Neither biotic nor abiotic effects are considered likely.

3.2.5 Secondary poisoning

Since propan-1-ol does not possess a bioaccumulation potential and is neither classified as “toxic” nor “harmful”, no $PNEC_{\text{oral}}$ is derived.

3.3 RISK CHARACTERISATION

The risk characterisation is performed by comparing the PEC with the relevant PNEC for each environmental compartment/end-point. A ratio above 1 indicates concern.

There is no indication of a risk to the aquatic compartment (including sediment), wastewater treatment plants, the atmosphere and the terrestrial compartment from the production and use of propan-1-ol in the EU.

Conclusion (ii)

Since there is no indication of propan-1-ol possessing a bioaccumulation potential, a risk characterisation for exposure via the food chain is not relevant.

4 HUMAN HEALTH

(to be added later)

5 RESULTS

5.1 ENVIRONMENT

Conclusion (ii) There is at present no need for further information and/or testing and for risk reduction measures beyond those which are being applied already.

This conclusion applies to the aquatic compartment (including sediment), wastewater treatment plants, the atmosphere, the terrestrial compartment and accumulation via the food chain covering the production and use of propan-1-ol in the EU.

5.2 HUMAN HEALTH

(to be added later)

European Commission

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