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GDCh-Advisory Committee
on Existing Chemicals of
Environmental Relevance (BUA)

Dipropylene glycol

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(December 1993)

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on Existing Chemicals of Environmental Relevance (BUA)

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GDCh Office:
Dr. H. Behret, GDCh, Frankfurt am Main

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Dr. H. Behret
Gesellschaft Deutscher Chemiker
Postfach 90 04 40
D-60444 Frankfurt am Main

Translated by M.-J. Blümich

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Foreword

The German Chemicals Act (Chemikaliengesetz - ChemG) of 1980 stipulates that certain existing chemicals must be reported to the competent authority, if they exhibit properties which indicate that they may be hazardous, either alone or in combination with other substances.

In the summer of 1982, an Advisory Committee on Existing Chemicals of Environmental Relevance (BUA) was set up by the German Chemical Society (Gesellschaft Deutscher Chemiker - GDCh). It brings together representatives from the scientific community, the chemical industry and the governmental authorities. This Advisory Committee is responsible for elaborating appropriate solutions for substances of relevance for health and the environment on the basis of voluntary measures. It selects and examines existing chemicals from the aforementioned angles. The testing and evaluation are based on scientific criteria alone.

It was, therefore, necessary to develop priority setting procedures. In a first phase reports were only prepared for priority chemicals. Within the framework of a first priority setting procedure, chemicals were compiled from several priority lists and 135 chemicals were selected for detailed substance reports.

In a second priority setting procedure the survey of the German Chemical Industry Association (VCI) on all substances with a production volume of more than 10 tons per year was used as a starting list. Since this survey covered 4,600 chemicals, BUA decided to process the corresponding list in several stages. The first stage included approx. 1,050 substances with a production volume of more than 1,000 tons per year.

Detailed reports are drawn up on chemicals suspected of having a hazard potential and abridged reports on those presenting only a minor hazard potential, according to the current state of knowledge.

The detailed BUA reports take in both the published literature and data from industry. If data for the evaluation of the chemicals are not available, additional studies are recommended and the results are published as updates to the reports. The reports serve as a basis for the instigation of administrative measures, when there are indications of risks to health or the environment.

Tübingen, May 1993

Ernst Bayer
Chairman of the Advisory Committee
on Existing Chemicals
of Environmental Relevance

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BUA Report on Dipropylene glycol

Summary and conclusions

Ecological aspects

Production, Emission, Occurrence and Environmental Distribution

The annual production of dipropylene glycol (DiPG) in the Federal Republic of Germany was approximately 30,600 t in 1990. No additional amounts of DiPG were imported. Of the specified annual production, about 3,100 t/a were processed further or used at the manufacturers, and about 10,400 t/a were exported.

The pattern of DiPG use can be broken down into the synthesis of polyester resins (25 %), the formulation of cosmetics (40 %), dyes and printing dyes (15 %) as well as in other uses (20 %), such as e.g. solvents, moisture-retaining agents, in anti-foaming agents and cutting oils.

The emission of DiPG into the atmosphere in 1990 was about 30 kg/a from production and about 25 kg/a from one processor. The entry into the hydrosphere from production and processing by the manufacturers could be estimated at a maximum of about 34 t/a. The entry from use is established at about 6,000 t/a on the basis of one worst-case assessment. It is hereby assumed that 50 % of the application types are linked with a direct emission into the hydrosphere, that this application occurs mainly from the use in the cosmetic branch and that the degradation is set at zero. Further unquantifiable emissions into the geosphere and biosphere can e.g. take place by leaching from municipal landfills or by various uses. Emissions do not occur through wastes from production and processing.

In the Federal Republic of Germany, DiPG measurement values were determined neither for the atmosphere nor the hydrosphere. Measurement values in single samples of drinking water (order of magnitude: 0.2 - 0.4 ng/l) as well as the qualitative detection in groundwater from the vicinity of municipal landfills are described only from abroad (U.S.A.).

A transfer from water into the atmosphere is unexpected on the basis of the physicochemical properties. Because of the low emissions, on the other hand, a washing out from the atmosphere with ram ought not be quantitatively significant.

Degradability

DiPG is not readily biodegradable in laboratory tests. A more rapid primary degradation of over 90 % could be attained with adapted microorganisms, but under optimized laboratory conditions. In separate tests (likewise under optimal laboratory conditions), the subsequent product propylene glycol ,is readily biodegraded aerobically as well as anaerobically.

A hydrolytic or photochemical degradation is unexpected under environmental conditions. A degradation with a half-life of app. 13 hours occurs in the atmosphere by reaction with photochemically formed OH-radicals.

Accumulation

The danger of bioaccumulation is considered to be low. In one experimental study, BCF values ranging from 0.3 to 4.6 were found. Because geoaccumulation is not expected on the basis of calculated physicochemical parameters and the substance is considered to be not readily biodegradable, DiPG transport via leachate to the groundwater is expected.

Ecotoxicological Effects

For bacteria, there is a 13.5 % inhibition of cell reproduction at a DiPG concentration of 1,000 mg/l.

No data are available for plants and invertebrates.

The acute toxicity for fish (*Carassius auratus*) and for tadpoles of *Rana brevipoda porosa* lies at > 5,000 mg/l and is 3,181 mg/l for the larvae of the frog *Xenopus laevis*.

Toxicological Aspect

DiPG is rapidly absorbed after oral and i.v. application. DiPG is no longer detectable in blood after 24 hours.

No data are available on the mode of action of the substance.

The oral LD_{50} value is 1.5 - 15 g/kg b.w. for the rat and 17.6 g/kg b.w. for the guinea pig. After intraperitoneal application, the LD_{50} value for the rat is 10 - 10.6 g/kg b.w. and for the mouse, 4.5 - 4.6 g/kg bw. After intravenous application, LD_{50} values of 11.5 and 5.8 g/kg bw. are found for the dog and rabbit, respectively. Dermal applications to the rabbit produced LD_{50} values of > 5 g/kg b.w. and > 20 g/kg bw.

DiPG acts slightly irritating to the eye and skin.

No data are available on the sensitizing effect.

Within the framework of older studies on the repeated application of DiPG, individual cases of death occurred at very high dosages as well as degenerations of the tubulus epithelia in the kidney and single cases of degeneration of the parenchyma of the liver. A numerical NOEL cannot be derived according to current criteria; it ought to lie, however, in the gram-range corresponding to the low toxicity.

An Ames-test and one mouse-lymphoma test were negative.

No data are available on carcinogenicity.

There were no indications found of a teratogenic or embryotoxic effect in one teratogenicity study on rats. The $NOAEL_{maternal}$ is 800 mg/kg bw. and the $NOAEL_{fetal}$ 5,000 mg/kg b.w.

No data are available on the effects on the immune System.

For humans, DiPG showed no photosensitizing properties and no or only low sensitizing effects after repeated dermal application.

Recommendations

Ecology

The existing report shows missing data. With respect to the low aquatic toxicity, however, further studies (among others, degradation tests) do not seem to be currently necessary.

Toxicology

No data are available on the clastogenicity and carcinogenicity. Thus, the performance of an in vitro chromosome-mutation test is recommended for clarifying the clastogenicity. The performance of further tests is to be decided depending on the results.