



**SOME INDUSTRIAL
CHEMICAL INTERMEDIATES
AND SOLVENTS**

VOLUME 125

This publication represents the views and expert opinions of an IARC Working Group on the Identification of Carcinogenic Hazards to Humans, which met in Lyon, 5–11 November 2019

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IARC MONOGRAPHS
ON THE IDENTIFICATION
OF CARCINOGENIC HAZARDS
TO HUMANS

GENERAL REMARKS

This one-hundred-and-twenty-fifth volume of the *IARC Monographs* contains evaluations of the carcinogenic hazard to humans of five High Production Volume chemicals: allyl chloride, 1-bromo-3-chloropropane, 1-butyl glycidyl ether, 4-chlorobenzotrifluoride, and glycidyl methacrylate.

Allyl chloride was considered previously by the Working Group in Volume 36, Supplement 7, and Volume 71 of the *IARC Monographs* ([IARC, 1985](#), [1987](#), [1999](#)), when it was evaluated as *not classifiable as to its carcinogenicity to humans (Group 3)* because of *inadequate evidence* in humans and in experimental animals. New data have become available, primarily good laboratory practice-compliant bioassays in experimental animals, and these data have been included and considered in the present volume. The other four agents have not been previously evaluated by the *IARC Monographs* Working Group.

A summary of the findings of this volume appears in *The Lancet Oncology* ([Rusyn et al., 2020](#)).

Occupational exposure

The extensive uses of these industrial chemicals and solvents and the fact that they are all High Production Volume chemicals suggest that there may be occupational exposure, primarily through inhalation and dermal contact during production and use as industrial intermediates,

but quantitative data were very few or non-existent for all five chemicals.

4-Chlorobenzotrifluoride

Apart from its industrial applications, 4-chlorobenzotrifluoride is used as a component (at up to approximately 70%) in consumer products for cosmetic stain removal and aerosol, rust prevention, floor wax finishes, and sealers ([HSDB, 2011](#); [Lee et al., 2015](#)). Exposure of the general population is therefore highly likely, but no exposure data are available.

Glycidyl methacrylate

Glycidyl methacrylate is used as an important component of many polymers and resins. These polymers are widely used in many industries for a variety of purposes (see Section 1, Exposure Characterization). Glycidyl methacrylate-based polymers are also increasingly used for medical applications such as hydrogel contact lenses ([Musgrave & Fang, 2019](#)), polymeric prodrug microspheres for imaging-guided diagnosis and chemotherapy ([Pei et al., 2019](#)), and for dental

material ingredients, composite resins and sealants (Vervliet et al., 2018).

Owing to its interesting chemical and physical properties, glycidyl methacrylate is currently the focus of intense research for the elaboration of new composites, especially for biomaterials (Monmaturapoj et al., 2017). Glycidyl methacrylate is not expected to be released from resins or polymers containing glycidyl methacrylate or resins, so exposure to the general population is unlikely; however, no direct data were available.

Glycidyl methacrylate is a member of a family of chemicals that possess an epoxy ring, and which includes glycidol, a structural analogue and metabolite of glycidyl methacrylate that was previously classified by the Working Group as *probably carcinogenic to humans (Group 2A)* (IARC, 2000).

Scope of systematic review

Standardized searches of the PubMed database were conducted for each agent and for each outcome (cancer in humans, cancer in experimental animals, and mechanistic evidence, including the key characteristics of carcinogens). The literature trees for each agent, including the full set of search terms for the agent name and each outcome type, are available online.¹

For most of the agents evaluated by the Working Group at this meeting, there were very few articles in the published literature. There were no epidemiological data for four of the agents, and only one study was available for allyl chloride. Mechanistic evidence was sparse. Several technical reports made publicly available by the United States Environmental Protection

Agency (US EPA) provided relevant mechanistic data that was included in the monographs on glycidyl methacrylate, 1-bromo-3-chloropropane, and 1-butyl glycidyl ether.

References

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¹ The literature searches for the present volume are available from: <https://hawcproject.iarc.fr/assessment/615/> (allyl chloride), <https://hawcproject.iarc.fr/assessment/616/> (1-bromo-3-chloropropane), <https://hawcproject.iarc.fr/assessment/618/> (1-butyl glycidyl ether), <https://hawcproject.iarc.fr/assessment/617/> (4-chlorobenzotrifluoride), <https://hawcproject.iarc.fr/assessment/620/> (glycidyl methacrylate).

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