Product Safety Assessment

Bronopol Antimicrobial

Product Safety Assessment documents are available at www.dow.com/productsafety/assess/finder.

Select a Topic:

Names

- CAS No. 52-51-7
- Bronopol
- 2-Bromo-2-nitropropane-1,3-diol
- 2-Bromo-2-nitro-1,3-propanediol
- BNPD
- AQUCAR™ BP Water Treatment Microbiocide
- BIOBAN™ BP Antimicrobial
- ROCIMA™ Biocide

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Product Overview

- Bronopol is the common name for the active ingredient in a series of broad-spectrum antimicrobial agents marketed by The Dow Chemical Company and its global affiliates under several trade names. It is available as a white to off-white powder, as a pale yellow to colorless liquid, and formulated with other biocides.[1] For further details, see Product Description.
- Bronopol is used as a biocide and preservative in process fluids, paper mills, personal-care products, metal-working fluids (not used for metalworking in EU countries), fuel/oil storage tanks, and water-based paints, inks, and adhesives.[2,3] For further details, see Product Uses.
- Those working with bronopol in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Dow does not sell bronopol for direct consumer use, but it is used at low levels (less than 0.1%) in certain consumer products. Bronopol is approved for indirect food-contact applications and as a preservative for personal-care products (within certain limitations). The low levels of material in these products would not be expected to represent a health hazard.[4,5] For further details, see Exposure Potential.
- Eye contact may cause severe irritation with corneal injury that may result in permanent impairment of vision, even blindness. Chemical burns may occur. Prolonged skin contact may cause skin irritation with local redness. Repeated skin exposure may cause burns. Skin contact may cause an allergic skin reaction in a small proportion of individuals. This material has moderate toxicity if swallowed.[6] For further details, see Health Information.
- Bronopol is water soluble and would be expected to biodegrade slowly under environmental conditions, would be removed by wastewater-treatment facilities, and would not persist in the environment. It is not likely to accumulate in the food chain, but is highly toxic (US classification) / very toxic (EU classification) to aquatic organisms on an acute basis.[7] For further details, see Environmental Information.

- Bronopol is stable under recommended storage and normal use conditions, but can decompose at temperatures above 130°C (266°F). Contact with bases can result in the formation of flammable formaldehyde gas.[8] For further details, see Physical Hazard Information.

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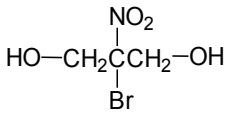
Manufacture of Product[9]

- **Locations** – The Dow Chemical Company and its global affiliates produce biocide products in North America, Europe, Asia, and Latin America. Global production of bronopol by all manufacturers has been estimated at 5000 metric tonnes (11 million pounds) annually.
- **Process** – Bronopol is produced using proprietary materials and technology. The structure is shown below.



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Product Description[10]

Bronopol is the common name for 2-bromo-2-nitropropane-1,3-diol, which is the active ingredient in a series of broad-spectrum antimicrobial agents marketed by The Dow Chemical Company and its global affiliates under the trade names AQUCAR™ BP Water Treatment Microbiocide, BIOBAN™ BP Antimicrobial, and ROCIMA™ Biocide. Products containing bronopol are available as a white to off-white crystalline solid, pale yellow to colorless liquids with essentially no odor, or formulated with other biocide actives.

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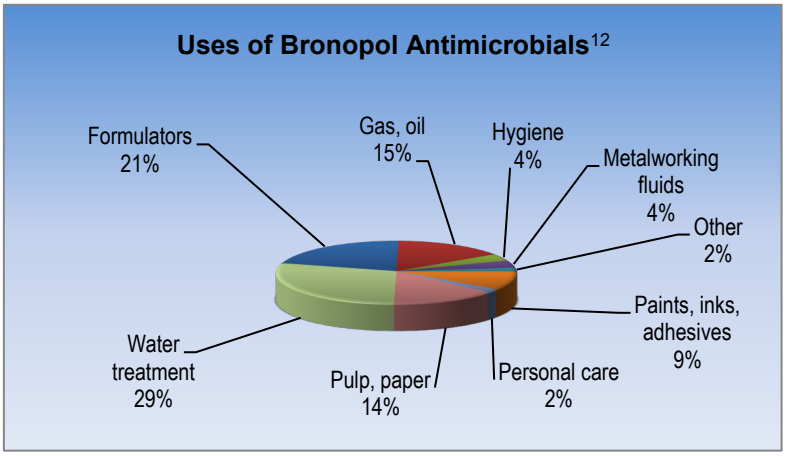
Product Uses[11,12,13]

Bronopol is used as a biocide and preservative in a number of processes and products. It is especially effective against a strain of bacteria known as *Pseudomonas aeruginosa*, which is difficult to control with most antimicrobial agents and can develop resistance to preservatives. Applications include:

- Gas and oil operations
- Pulp, paper mills – pulping operations, wet-end additives
- Water treatment – cooling-tower water, water baths, air conditioning/humidification systems, recirculating heating/cooling systems, oil-field muds and injection water
- Personal-care products – cosmetics, creams, and lotions
- Water-based paints, inks, and adhesives
- Household, institutional, and industrial – product preservation
- Metalworking fluids – except in European Union countries



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Exposure Potential[14,15,16]

Bronopol is used as a preservative and antimicrobial agent in industrial and consumer products. Based on the uses for this material, individuals could be exposed through:

- **Workplace exposure** – Exposure can occur either in facilities that manufacture bronopol or in the various industrial or manufacturing facilities that formulate or use bronopol. It is produced, distributed, stored, and consumed in closed systems. Those working with bronopol in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit exposure. See Health Information.

- **Consumer exposure to products containing bronopol** – Bronopol is not sold for direct consumer use, but small amounts are formulated into paints and personal-care products used by the general public. The low levels of material in these products are not considered to present a health hazard. Bronopol has been evaluated by the Cosmetic Ingredient Review Expert Panel and is deemed safe as a cosmetic ingredient. Always read product information before use and follow the label/use instructions. See Health Information.
- **Environmental releases** – Small quantities of bronopol may be released into the environment if products or treated water that contain the material are discarded. In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. Respiratory protection is necessary for cleaning up spills and leaks. An approved air-purifying respirator (e.g., particulate filter, type P2) is recommended. Deactivation with sodium bisulfite is recommended prior to removal of the spills. For small spills, bronopol should be absorbed with materials such as sand. Because of its high water solubility, it would migrate toward or remain in water if released to the environment. It biodegrades slowly, would not persist, and would be removed by wastewater-treatment facilities. This material is highly toxic (US classification) / very toxic (EU classification) to aquatic organisms on an acute basis. See Environmental, Health, and Physical Hazard Information.
- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Deactivation with sodium bisulfite is recommended prior to removal of the spills. An approved air-purifying respirator (e.g., particulate filter, type P2) is recommended. See Environmental, Health, and Physical Hazard Information.
- **In case of fire** – Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Use water spray or fine spray, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Use of a direct water stream may spread the fire or form ignitable dust. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Immediately withdraw all personnel from the area in case of rising sounds from venting safety devices or discolorations of the container. Keep fire water out of waterways and sewers to minimize the potential for environmental damage. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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Health Information[17]

Health information for products containing bronopol is summarized on the relevant Safety Data Sheets. It is important to note that health risks associated with individual products may vary based on their formulation or intended use. The Safety Data Sheet is the preferred source for specific health information. These products may also contain other components or additives that have additional health risks. An overview of health information for bronopol appears below. Consumer and commercial products containing bronopol generally contain less than 0.10% of the active material.

Eye contact – Contact may cause severe irritation with corneal injury, which may result in permanent impairment of vision, even blindness. Chemical burns may occur. Effects may be delayed.

Skin contact – Prolonged contact may cause skin irritation with local redness. Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage.

Skin sensitization – Prolonged or repeated skin contact may cause an allergic skin reaction in a small proportion of individuals.

Inhalation – Brief exposure (minutes) is not likely to cause adverse effects. Excessive exposure may cause severe irritation to upper respiratory tract (nose and throat) and lungs.

Ingestion – This material has moderate toxicity if swallowed. Swallowing may result in gastrointestinal irritation or ulceration. Swallowing may result in burns of the mouth and throat.

Repeated exposure – In animals, effects have been reported on the kidney and salivary glands. May cause nausea and vomiting.

Other – In laboratory animals, this material has been toxic to the fetus at doses toxic to the mother.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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Environmental Information[18,19]

Bronopol has low volatility, so evaporation from products containing it will be minimal. The material is very soluble in water and when introduced to the environment, will tend to migrate toward or remain in water. It has minimal tendency to bind to soil or sediment.

Bronopol is unlikely to persist in the environment. Based on stringent OECD test guidelines, this material cannot be considered to be readily biodegradable (51–57% biodegraded in 28 days per OECD 301B test). However, these results suggest that the material will biodegrade slowly under environmental conditions, including removal by biological wastewater-treatment facilities.

Bronopol is not likely to accumulate in the food chain (bioconcentration potential is low), but is highly toxic (US classification) / very toxic (EU classification) to aquatic organisms (LC_{50}/EC_{50} <0.1 mg/L) on an acute basis.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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Physical Hazard Information[20]

Bronopol is stable under recommended storage and normal use conditions, but can decompose at temperatures above 130°C (266°F). Decomposition can generate gas that can cause rapid pressure build-up in closed systems.

Avoid contact with oxidizing materials, amines, bases, or strong acids. Reaction with bases can generate flammable gases. Bronopol can be corrosive to some metals, especially if wet.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

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Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of bronopol. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet or Contact Us.

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Additional Information

- Safety Data Sheet (www.dow.com/assistance/dowcig.htm)
- Contact Us (www.dow.com/microbial/contact/index.htm)
- *BIOBAN™ Bronopol PC, BIOBAN™ Bronopol PC 30 Preservative for Cosmetics and Personal Care Products*, The Dow Chemical Company, Form No. 253-02363-10-21-11 PS, October 2011 (msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_087c/0901b8038087c6de.pdf?filepath=biocides/pdfs/noreg/253-02363.pdf&fromPage=GetDoc)
- *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995 (www.epa.gov/oppsrrd1/REDs/2770red.pdf)
- *Bronopol Registration Review,* United States Environmental Protection Agency, (www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2011-0421)
- "2-Bromo-2-Nitropropane-1,3-Diol," cosmeticsINFO.org, The Personal Care Products Council (http://www.cosmeticsinfo.org/ingredient_details.php?ingredient_id=14170)
- Fink, Uwe, *et al*., "Specialty Chemicals Report: Biocides," *Chemical Economics Handbook*, SRI Consultants, May 2011 (http://www.ihs.com/products/chemical/planning/scup/biocides.aspx)

For more business information about bronopol, visit the Dow Microbial Control business web site at www.dow.com/microbial/index.htm.

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References

[1] *BIOBAN™ Bronopol PC, BIOBAN™ Bronopol PC 30 Preservative for Cosmetics and Personal Care Products*, The Dow Chemical Company, Form No. 253-02363-10-21-11 PS, October 2011, page 1.

[2] *BIOBAN™ Bronopol PC, BIOBAN™ Bronopol PC 30 Preservative for Cosmetics and Personal Care Products*, The Dow Chemical Company, Form No. 253-02363-10-21-11 PS, October 2011, page 1.

[3] *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995, pages 2–3.

[4] *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995, pages 17–22.

[5] "2-Bromo-2-Nitropropane-1,3-Diol," cosmeticsINFO.org, The Personal Care Products Council: http://www.cosmeticsinfo.org/ingredient_details.php?ingredient_id=14170.

[6] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide,* and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification and Toxicological Information.

[7] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide*, and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Ecological Information.

[8] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide*, and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Stability and Reactivity.

[9] Fink, Uwe, *et al*., "Specialty Chemicals Report: Biocides," *Chemical Economics Handbook*, SRI Consultants, May 2011 pages 26–28, 113, 120, 157, 162, 172, and 173.

[10] *BIOBAN™ Bronopol PC, BIOBAN™ Bronopol PC 30 Preservative for Cosmetics and Personal Care Products*, The Dow Chemical Company, Form No. 253-02363-10-21-11 PS, October 2011, pages 1–2.

[11] *BIOBAN™ Bronopol PC, BIOBAN™ Bronopol PC 30 Preservative for Cosmetics and Personal Care Products*, The Dow Chemical Company, Form No. 253-02363-10-21-11 PS, October 2011, page 2.

[12] *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995, pages 2–3.

[13] Sales estimates provided by The Dow Chemical Company.

[14] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide,* and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification, Fire Fighting Measures, Accidental Release Measures, Exposure Controls/Personal Protection, Stability and Reactivity, and Ecological Information.

[15] *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995, pages 17–22.

[16] "2-Bromo-2-Nitropropane-1,3-Diol," cosmeticsINFO.org, The Personal Care Products Council: http://www.cosmeticsinfo.org/ingredient_details.php?ingredient_id=14170.

[17] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide,* and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification and Toxicological Information.

[18] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide,* and *BIOBAN™ Bronopol PC Preservative Safety Data Sheets*, The Dow Chemical Company, Ecological Information.

[19] *Reregistration Eligibility Decision: Bronopol*, Case 2770, United States Environmental Protection Agency, Office of Pesticide Programs, Special Review and Reregistration Division, October 1995, page 26.

[20] *BIOBAN™ BP 100 Antimicrobial, AQUCAR™ BP 100 Water Treatment Microbicide,* and *BIOBAN™ Bronopol PC Preservative Material Safety Data Sheets*, The Dow Chemical Company, Stability and Reactivity.

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NOTICES

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