



Product Safety Assessment

2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

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Select a Topic:

- [Names](#)
- [Product Overview](#)
- [Manufacture of Product](#)
- [Product Description](#)
- [Product Uses](#)
- [Exposure Potential](#)
- [Health Information](#)
- [Environmental Information](#)
- [Physical Hazard Information](#)
- [Regulatory Information](#)
- [Additional Information](#)
- [References](#)

Names

- CAS No. 10222-01-2
- 2,2-Dibromo-3-nitrilopropionamide
- DBNPA
- 2,2-Dibromo-2-carbamoylacetone nitrile
- 2,2-Dibromo-2-cyanoacetamide
- AQUICAR™ Water Treatment Microbiocide
- BIOBAN™ Antimicrobial
- DOWICIL™ Antimicrobial
- SUMP BUDDY™ Antimicrobial Tablets

[Back to top](#)

Product Overview

- 2,2-Dibromo-3-nitrilopropionamide is a white to yellow powder with a mild, medicinal antiseptic odor. 2,2-Dibromo-3-nitrilopropionamide is a fast-acting, broad-spectrum antimicrobial marketed by The Dow Chemical Company and its global affiliates under several trade names.^{1,2} For further details, see [Product Description](#).
- 2,2-Dibromo-3-nitrilopropionamide controls algae, bacteria, and fungi growth and is a popular choice for use in process water treatment. It is intended for commercial use in pulp, paper, and paperboard mills; industrial cooling water systems; industrial air-washer systems; enhanced oil and gas recovery systems; metal-working fluid systems; and the paint and coatings industries. It may also be added to finished products as a preservative enhancer.^{3,4} For further details, see [Product Uses](#).
- Those working with 2,2-dibromo-3-nitrilopropionamide in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. 2,2-Dibromo-3-nitrilopropionamide is an industrial product that is not sold for direct consumer use, but it can be present at low levels in certain consumer and household products. Consumers could also come into contact with paper or paperboard packaging that contains small amounts of this material. The low levels of material in these products would not be expected to represent a health hazard.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. Brief skin contact may cause skin burns. Prolonged, excessive exposure to dust may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to the upper respiratory tract (nose and throat) and lungs, including pulmonary edema (fluid in the lungs).⁶ For further details, see [Health Information](#).

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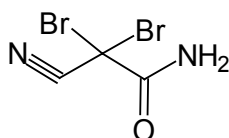
Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

- 2,2-Dibromo-3-nitrilopropionamide can be considered rapidly degradable, 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](#).
- 2,2-Dibromo-3-nitrilopropionamide is stable under recommended storage and normal use conditions. However, it can undergo hydrolysis, and decomposition can occur at elevated temperatures or with exposure to sunlight. Avoid contact with amines, strong bases, strong oxidizers, strong reducing agents, and metals such as aluminum.⁸ For further details, see [Physical Hazard Information](#).

[Back to top](#)

Manufacture of Product⁹

- **Locations** – The Dow Chemical Company and its global affiliates produce biocide products in North America, Europe, Asia, and Latin America.
- **Process** – 2,2-Dibromo-3-nitrilopropionamide is produced by the acid-catalyzed bromination of cyanoacetamide using proprietary materials and technology. The chemical structure is shown below.



[Back to top](#)

Product Description^{10,11}

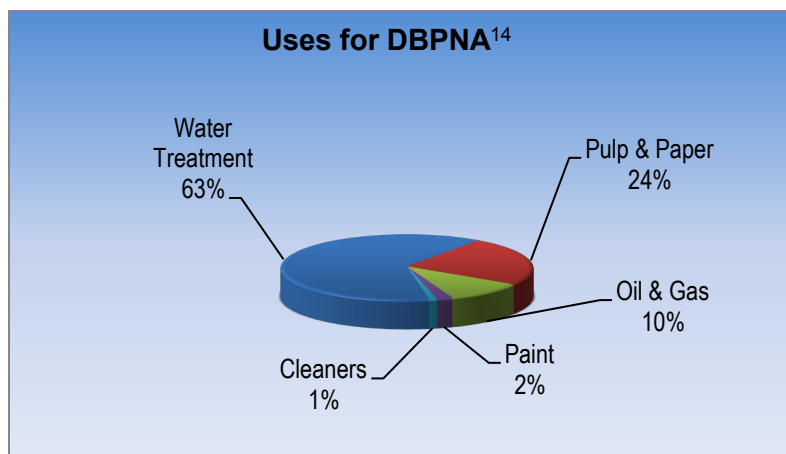
2,2-Dibromo-3-nitrilopropionamide is the common name for the active ingredient in a series of fast-acting, broad spectrum antimicrobial agents for industrial use. In its pure form, 2,2-dibromo-3-nitrilopropionamide is a white to yellow powder with a mild, medicinal antiseptic odor. This material is formulated into liquid concentrates, powders, and time-release tablets depending on the intended use. 2,2-Dibromo-3-nitrilopropionamide is marketed by The Dow Chemical Company and its global affiliates under trade names that include, but are not limited to, AQUICAR™ Water Treatment Microbiocide, BIOBAN™ Antimicrobial, DOWICIL™ Antimicrobials, and SUMP BUDDY™ Antimicrobial Tablets.

[Back to top](#)

Product Uses^{12,13,14}

Antimicrobial formulations containing 2,2-dibromo-3-nitrilopropionamide are used to treat raw materials, processing water, and various recycle water systems in the following applications:

- Pulp, paper, and paperboard mills
- Evaporative condensers
- Heat exchangers
- Scrubbers
- Sewage systems
- Air-washer water systems
- Enhanced oil-recovery systems
- Cooling systems – recirculating cooling towers, influent systems, cooling ponds, canals, and lagoons
- Laboratory equipment water baths
- Industrial water-purification units – reverse osmosis (RO) and other pressure-driven membrane systems



Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

2,2-Dibromo-3-nitrilopropionamide is also added to finished products as a preservative enhancer. Products containing 2,2-dibromo-3-nitrilopropionamide or products manufactured by processes that use 2,2-dibromo-3-nitrilopropionamide include:

- Industrial adhesives, animal glues, caulk
- Industrial and paper mill coatings
- Metal-working and cutting fluids
- Paper, paper products
- Emulsions, polymers, and defoamers
- Specialty industrial products (ink, waxes, polishes, detergents, and cleansers)
- Water-based paints – latex paints (in-can), latex/oil/varnish paints (applied film)
- Wet-end additives (pigment slurries and sizing)
- Consumer, household and institutional water-based products

[Back to top](#)

Exposure Potential^{15,16}

2,2-Dibromo-3-nitrilopropionamide is used in a broad range of industrial processes. Based on the uses for this material, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in facilities that manufacture 2,2-dibromo-3-nitrilopropionamide or in the various industrial or manufacturing facilities that formulate or use this material. It is produced, distributed, and stored in closed systems. Those working with 2,2-dibromo-3-nitrilopropionamide 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. The Occupational Exposure Limit recommended by Dow is 2 mg/m³ ceiling. See [Health Information](#).
- **Consumer exposure to products containing 2,2-dibromo-3-nitrilopropionamide** – Dow does not sell 2,2-dibromo-3-nitrilopropionamide for direct consumer use. However, it can be present at low levels in certain consumer and household products. Consumers could also come into contact with paper or paperboard packaging that contains small amounts of 2,2-dibromo-3-nitrilopropionamide. Use of 2,2-dibromo-3-nitrilopropionamide and products containing this material should comply with all regulatory requirements for specific applications. The low levels of material in these products would not be expected to represent a health hazard. Always read product information before use and follow the label/use instructions. See [Health Information](#).
- **Environmental releases** – Small quantities of 2,2-dibromo-3-nitrilopropionamide may be released into the environment if products or treated water containing this material are discarded. In the event of a release, the focus is on containment 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., organic vapor cartridge with a particulate pre-filter, type AP2) is recommended. For small spills, this product should be absorbed with materials such as sand. Deactivation with sodium bisulfite is recommended prior to removal of the spills. Because of its high water solubility, this material 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. 2,2-Dibromo-3-nitrilopropionamide 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., organic vapor cartridge with a particulate pre-filter, type AP2) 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 fog, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Do not use a direct water stream as it may spread the fire. 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](#).

[Back to top](#)

Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

Health Information¹⁷

Health information for products containing 2,2-dibromo-3-nitrilopropionamide 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 2,2-dibromo-3-nitrilopropionamide appears below. Consumer and commercial products containing this material generally contain very low levels of the material and are unlikely to represent a health hazard.

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

Skin contact – Brief contact may cause skin burns. Symptoms may include pain, severe local redness, and tissue damage. Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Skin sensitization – Skin contact may cause an allergic skin reaction.

Inhalation – Vapors are unlikely due to physical properties. Prolonged excessive exposure to dust may cause serious adverse effects, even death. Excessive exposure may cause severe irritation to upper respiratory tract (nose and throat) and lungs, including pulmonary edema (fluid in the lungs). Prolonged and excessive exposure to fine dusts may cause lung injury.

Ingestion – This material has moderate toxicity if swallowed. Swallowing small amounts incidental to normal handling operations is not likely to cause injury; however, swallowing larger amounts may cause serious injury, even death.

Repeated exposure – Excessive exposure may increase levels of bromine in blood and tissue. Observations in animals include kidney effects following repeated ingestion, but no evidence of systemic toxicity following repeated dermal exposure at maximum attainable doses.

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

For more information, request the relevant Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Environmental Information^{18,19}

2,2-Dibromo-3-nitrilopropionamide 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.

2,2-Dibromo-3-nitrilopropionamide is unlikely to persist in the environment. It is rapidly degradable by abiotic means, including removal by biological wastewater-treatment facilities. 2,2-Dibromo-3-nitrilopropionamide 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 (LC₅₀/EC₅₀ <0.1 mg/L) on an acute basis.

For more information, request the relevant Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

Physical Hazard Information²⁰

2,2-Dibromo-3-nitrilopropionamide is stable under recommended storage and use conditions, but decomposition may occur at temperatures greater than 70°C (158°F) or when exposed to sunlight, water, or moisture. Water contamination may generate heat during decomposition. Decomposition may generate harmful gases, which can cause pressure build-up in closed systems. 2,2-Dibromo-3-nitrilopropionamide is corrosive to mild steel, iron, and aluminum.

Avoid contact with amines, strong bases, strong oxidizers, and strong reducing agents.

For more information, request the relevant Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of 2,2-dibromo-3-nitrilopropionamide. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant [Safety Data Sheet](#) or visiting [Contact Us](#).

[Back to top](#)

Additional Information

- Safety Data Sheet (www.dow.com/assistance/dowcig.htm)
- Contact Us (www.dow.com/microbial/contact/index.htm)
- DOWICIL™ QK-20 Antimicrobial: A Fast-Acting, Broad-Spectrum Biocide for Treating Raw Materials, Processing Water, and Contaminated Products, The Dow Chemical Company, Form No. 253-01184-0100X/GW, January 2000 (http://msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_0031/0901b80380031894.pdf?filepath=biocides/pdfs/noreg/253-01184.pdf&fromPage=GetDoc)
- Reregistration Eligibility Decision (RED) for 2,2-Dibromo-3-nitrilopropionamide (DBNPA), U.S. Environmental Protection Agency Office of Prevention, Pesticides, and Toxic Substances, EPA 738-R-94-026, September 1994 (www.epa.gov/oppsrrd1/REDs/3056.pdf)
- R.E.D. FACTS: 2,2-Dibromo-3-nitrilopropionamide (DBNPA), U.S. Environmental Protection Agency, EPA-738-F-94-023, September 1994 (www.epa.gov/oppsrrd1/REDs/factsheets/3056fact.pdf)
- 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 2,2-dibromo-3-nitrilopropionamide, visit the Dow [Microbial Control](#) business web site at www.dow.com/microbial/index.htm.

[Back to top](#)

Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

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- ¹ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification and Physical and Chemical Properties.
- ² *Reregistration Eligibility Decision (RED) for 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, EPA 738-R-94-026, September 1994, pages 4 and 6.
- ³ *R.E.D. FACTS: 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, EPA-738-F-94-023, September 1994, page 1.
- ⁴ *DOWICIL™ QK-20 Antimicrobial: A Fast-Acting, Broad-Spectrum Biocide for Treating Raw Materials, Processing Water, and Contaminated Products*, The Dow Chemical Company, Form No. 253-01184-0100X/GW, January 2000, page 1.
- ⁵ *R.E.D. FACTS: 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, EPA-738-F-94-023, September 1994, page 5.
- ⁶ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification and Toxicological Information.
- ⁷ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Ecological Information.
- ⁸ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide 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 *Reregistration Eligibility Decision (RED) for 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, EPA 738-R-94-026, September 1994, pages 4 and 6.
- ¹¹ *DOWICIL™ QK-20 Antimicrobial: A Fast-Acting, Broad-Spectrum Biocide for Treating Raw Materials, Processing Water, and Contaminated Products*, The Dow Chemical Company, Form No. 253-01184-0100X/GW, January 2000, page 2.
- ¹² *Reregistration Eligibility Decision (RED) for 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, EPA 738-R-94-026, September 1994, pages 2–4.
- ¹³ *DOWICIL™ QK-20 Antimicrobial: A Fast-Acting, Broad-Spectrum Biocide for Treating Raw Materials, Processing Water, and Contaminated Products*, The Dow Chemical Company, Form No. 253-01184-0100X/GW, January 2000, page 1.
- ¹⁴ Estimates by The Dow Chemical Company.
- ¹⁵ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide 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.
- ¹⁶ *R.E.D. FACTS: 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, EPA-738-F-94-023, September 1994, page 2.
- ¹⁷ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Hazards Identification and Toxicological Information.
- ¹⁸ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Ecological Information.
- ¹⁹ *R.E.D. FACTS: 2,2-Dibromo-3-nitrilopropionamide (DBNPA)*, U.S. Environmental Protection Agency, EPA-738-F-94-023, September 1994, page 3.
- ²⁰ *BIOBAN™ DB 100 Antimicrobial and AQUICAR™ DB 100 Water Treatment Microbiocide Material Safety Data Sheets*, The Dow Chemical Company, Stability and Reactivity.

[Back to top](#)

Product Safety Assessment: 2,2-Dibromo-3-Nitrilopropionamide (DBNPA)

NOTICES

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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[Back to top](#)

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