Product Safety Assessment

BIOBAN™ CS-1246 Antimicrobial
BIOBAN CS-1246 Eur Antimicrobial

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Names
- CAS No. 7747-35-5
- EC No. 231-810-4
- BIOBAN™ CS-1246 Antimicrobial
- BIOBAN CS-1246 Eur Antimicrobial
- EBCO
- EDHO
- 7a-Ethylidihydro-1H,3H,5H-oxazolo[3,4-c]oxazole
- Ethylidihydro-1H,3H,5H-oxazolo[3,4-c]oxazole\textsuperscript{1,2}
- 1-Aza-3,7-dioxa-5-ethylbicyclo (3.3.0) octane\textsuperscript{3}
- Oxazolidine E\textsuperscript{4}
- 5-Ethyl-3,7-dioxa-1-azabicyclo(3,3,0)octane\textsuperscript{5}
- 7-ethyl bicyclooxazolidine

Product Overview
- BIOBAN™ CS-1246 Antimicrobial and BIOBAN CS-1246 Eur Antimicrobial are alternate trade names for the same product. For the purposes of this document, both will be referred to as BIOBAN CS-1246 Antimicrobial.
- BIOBAN CS-1246 Antimicrobial is a colorless to yellow liquid. It is a biocide containing the active ingredient EDHO, which is an abbreviation for 7a-ethylidihydro-1H,3H,5H-oxazolo[3,4-c]oxazole, a heterocyclic amine compound. The product is water soluble, slightly basic, and has a relatively high vapor pressure.\textsuperscript{2} See Product Description.
- BIOBAN CS-1246 Antimicrobial is used primarily for the preservation of paints, inks, emulsions, slurries, nonfood-contact adhesives, surfactants, consumer, household and institutional products, and metalworking fluids.\textsuperscript{3} See Product Uses.
- BIOBAN CS-1246 Antimicrobial can cause both skin and eye irritation. It is acutely harmful through skin contact or if inhaled. Skin contact with this material may also cause an allergic reaction in a small proportion of individuals.\textsuperscript{2} See Health Information.
- Occupational exposure to BIOBAN™ CS-1246 Antimicrobial may occur by inhalation as well as skin contact. Consumer exposure to BIOBAN CS-1246 Antimicrobial in dilute form is likely. However, the potential for consumer exposure is considered much lower compared to occupational exposure. See Exposure Potential.
- BIOBAN CS-1246 Antimicrobial is not flammable, does not have explosive characteristics, and is not an oxidizing agent. Decomposition of EDHO, the active ingredient in BIOBAN CS-1246, may result in the release of formaldehyde.\textsuperscript{2} See Health Information and Physical Hazard Information.

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**Manufacture of Product**

- **Capacity** – Dow is the only global manufacturer of BIOBAN™ CS-1246 Antimicrobial, with production capacity satisfying worldwide demand for this product.
- **Process** – The process for manufacturing BIOBAN CS-1246 Antimicrobial is proprietary. The chemical structure of active ingredient EDHO is shown below:

![Chemical Structure](image)

**Product Description**

BIOBAN™ CS-1246 Antimicrobial is a colorless to yellow, water-soluble liquid. The active ingredient in this product is 7a-ethylidihydro-1H,3H,5H-oxazolo[3,4-c]oxazole (EDHO). EDHO constitutes more than 95% of the composition of BIOBAN CS-1246 Antimicrobial. In addition to EDHO, the product contains a few low-level impurities. BIOBAN CS-1246 Antimicrobial is compatible with a wide range of formulation raw materials and can be handled as a liquid concentrate that readily dissolves in water. It is also soluble in ethanol, benzene, chlorinated hydrocarbons, and acetone.

**Product Uses**

BIOBAN™ CS-1246 Antimicrobial provides broad-spectrum bactericidal activity in water-based formulations and is effective over a wide pH range (7–11). The product is effective when used alone or in combination with other preservatives. When used alone, BIOBAN CS-1246 Antimicrobial has limited efficacy against fungi. BIOBAN CS-1246 Antimicrobial is not approved for use in food-contact applications. Typical uses for BIOBAN CS-1246 Antimicrobial are shown in the chart and include the following:

- **Metal-working fluids** – for preservation of synthetic, semi-synthetic, and soluble metal-working fluids
- **Paint** – for preservation of water-based paints, including latex formulations based on styrene-butadiene, polyvinyl acetate, acrylics, and vinyl chloride
- **Consumer, household, and institutional products** – for preservation of dishwashing and laundry liquids, surface cleaners, and polishes
- **Adhesives** – for preservation of nonfood-contact adhesives based on starches, latexes, proteins, and gums
- **Emulsions and inks** – for preservation of wax and resin emulsions and water-based inks.
- **Mineral slurries** – for preservation of mineral slurries such as calcium carbonate, titanium oxide, and kaolin clays
- **Surfactants** – for preservation of anionic, nonionic, amphoteric, and cationic surfactants used in the production of industrial and consumer products

**Uses for BIOBAN™ CS-1246 Antimicrobial**

- Metal-Working Fluids
- Paints
- Other

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Exposure Potential

Based on the applications in which BIOBAN™ CS-1246 Antimicrobial is used, the public could be exposed via inhalation or skin absorption. The potential for exposure to active ingredient EDHO and/or its breakdown products, including formaldehyde, could occur through:

- **Workplace exposure** – Personnel working with this material in manufacturing and/or formulating operations could be exposed during maintenance, sampling, testing, or other procedures. Additionally, formulators who add biocides to products during manufacturing and workers that use products that contain dilute concentrations of BIOBAN CS-1246 Antimicrobial could also be exposed. Use of recommended industrial controls and personal protective equipment will limit exposure under most conditions. For workers using products that contain EDHO or BIOBAN CS-1246 as a preservative, exposure is minimal since the amount of EDHO is low (maximum 0.2% by weight of formulation). See Health Information.

- **Consumer exposure to products containing BIOBAN CS-1246 Antimicrobial** – This material is not sold for direct consumer use, but it is formulated into products used by the general public, such as metal working fluids, paints, adhesives, and household detergents. Because some products used in households contain dilute concentrations of BIOBAN CS-1246 Antimicrobial, the public is likely to be exposed to these products. However, the concentration of active ingredient in these products is low, and thus the potential for consumer exposure to active ingredient EDHO is minimal. See Health Information.

- **Environmental releases** – EDHO, the active ingredient, shows minimal accumulation in aquatic organisms, and is unlikely to persist in either aquatic or terrestrial ecosystems. EDHO is highly toxic to algae. However, given the rapid dissipation of the compound in aquatic systems and the exponential growth dynamics of algae, long-term impact on algal populations is highly unlikely. If released directly to soil or water, the substance will hydrolyze and degrade. In the event of a spill, the focus is on containing and recovering the spilled material quickly to prevent contamination of soil and surface or ground water. 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. Positive pressure, self-contained breathing apparatus (SCBA) with a full-face mask approved by the National Institute of Occupational Safety and Health (NIOSH) is recommended for emergency work. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event.

- **In the event of a fire** – Deny any unnecessary entry into the area and consider the use of unmanned hose holders or monitor nozzles. Use water fog or fine spray, dry-chemical or carbon-dioxide extinguishers or foam to extinguish fires. Alcohol-resistant foams are preferred. Firefighters should wear positive pressure, self-contained breathing apparatus (SCBA) and protective clothing. Move containers from the fire area or cool with water spray if this is possible without hazard. Containers may rupture from gas generation in a fire situation. During a fire, smoke may contain the original material in addition to toxic and/or irritating combustion products that may include nitrogen oxides, carbon monoxide, and carbon dioxide. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information

The most likely route of exposure to BIOBAN™ CS-1246 Antimicrobial is via inhalation or skin absorption. Oral exposure is insignificant because BIOBAN CS-1246 Antimicrobial is not used in materials in direct contact with food.
BIOBAN™ CS-1246 Antimicrobial is acutely toxic by dermal and inhalation routes of exposure, but has low acute oral toxicity. Severe skin irritation may result from prolonged or repeated contact, and the material may cause an allergic reaction in a small proportion of individuals. It is also irritating to the eyes.

BIOBAN CS-1246 Antimicrobial has been evaluated in sub-acute and sub-chronic laboratory animal studies by the oral route of exposure. The oral route was mainly limited to portal of entry effects such as gastric irritation, but no systemic toxicity was observed.

In vitro genetic toxicity tests with BIOBAN CS-1246 Antimicrobial were predominantly negative. The product also tested negative in the in vivo mouse micronucleus assay and the in vivo unscheduled DNA synthesis assay. Both tests are designed to evaluate genotoxic potential in the whole animal. In animal studies, relatively high oral doses have been shown to be capable of causing birth defects. However, these effects were seen only at doses that were toxic to the mother.

In summary, the toxicological profile for active ingredient EDHO does not indicate significant target organ or acute or sub-chronic toxicity when evaluated in a number of standard laboratory tests using a variety of toxicological endpoints.

Formaldehyde Release – Decomposition of EDHO, the active ingredient in BIOBAN™ CS-1246, may result in the release of formaldehyde. The extent of hydrolysis and amount of formaldehyde released to solution from BIOBAN CS-1246 Antimicrobial is dependent upon many factors, such as the physical and chemical characteristics of the solution (e.g., pH and temperature) and the formulation in which the product is used. If you need assistance or for more information, see the relevant Safety Data Sheet, review the Product Information, or Contact Us.

Environmental Information

BIOBAN™ CS-1246 Antimicrobial is very toxic to the green algae Selenastrum capricornutum and harmful to aquatic invertebrates. EDHO, the active ingredient, does not readily biodegrade; however, it breaks down rapidly by a combination of processes in the environment. For instance, EDHO is susceptible to rapid hydrolysis under acidic, neutral, and alkaline conditions, and its main hydrolysis products are also expected to undergo rapid biodegradation in the environment. EDHO is highly water soluble and that, combined with its rapid hydrolysis, suggests a low potential to bioconcentrate (accumulate in the food chain) in aquatic or terrestrial species. Due to the short atmospheric half-life and use patterns, EDHO is predicted to be present in the air at very low concentrations. Care must be taken to prevent BIOBAN™ CS-1246 Antimicrobial from entering soil, ditches, sewers, waterways, and/or groundwater, since spills or discharges to natural waterways are likely to kill aquatic organisms.

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information

BIOBAN™ CS-1246 Antimicrobial is slightly basic with a pH of 10.0 measured in 1% weight-in-volume solution at ambient temperature. The product is water-soluble, is not flammable, and has no oxidizing or explosive characteristics. Incompatible materials include oxidizing agents, halogenated hydrocarbons, strong acids, and metals such as aluminum and copper. Acidic pH must be avoided since reaction with acid can generate flammable formaldehyde gas.
BIOBAN™ CS-1246 must be stored in a cool and dry place away from high temperatures, hot pipes, and direct sunlight. Under recommended storage conditions, the product is stable in its packaging for at least two years.

For more information, see the relevant Safety Data Sheet.

Regulatory Information
Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of BIOBAN™ CS-1246 Antimicrobial. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Product Information, or Contact Us.

Additional Information
- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://dowac.custhelp.com/app/contact)
- Dow biocides web site (http://www.dow.com/microbial/about/)

For more business information about BIOBAN CS-1246 Antimicrobial, visit Dow’s Biocides web site.

References
1. European Chemical Substances Information System (ESIS) (http://ecb.jrc.it/esis/).
2. BIOBAN™ CS-1246 Eur Antimicrobial Safety Data Sheet, The Dow Chemical Company
3. BIOBAN CS-1246 Antimicrobial: Product Information, The Dow Chemical Company, Form No. Form No. 253-01210
6. Estimates by The Dow Chemical Company.
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