

Solubility in water @ 20°C/68°F:..... 1.1 g/100 mL
 @ 50°C/122°F:..... 1.4 g/100 mL
 pH of saturated aqueous solution:..... 9.1
 Coefficient of expansion: (°F-1) 0.000491

Antimicrobial Activity

BIOBAN™ P-1487 is intended for use in alkaline solutions at a pH of 7.0 or above. Loss of effectiveness may occur at a pH below 6.0.

Bacteria	Minimum Inhibitory Concentration (MIC)	Fungi	Minimum Inhibitory Concentration (MIC)	Algae	Minimum Inhibitory Concentration (MIC)
<i>Staphylococcus aureus</i>	100-500 ppm	<i>Candida albicans</i>	16-32	<i>Plectonema boryanum</i>	2-4
<i>Streptococcus faecalis</i>	100-500	<i>Penicillium levitum</i>	125-250	<i>Oscillatoria prolifera</i>	4-9
<i>Streptococcus hemolyticus</i>	100-500	<i>Aspergillus niger</i>	125-250	<i>Chlorella pyrenoidosa</i>	1
<i>Escherichia coli</i>	100-500	<i>Fusarium sp.</i>	500-1000	<i>Anabaena flos-aquae</i>	<16
<i>Pasteurella pseudotuberculosis</i>	10-100	<i>Aureobasidium pullulans</i>	2000	<i>Selenastrum capricornutum</i>	<16
<i>Pseudomonas aeruginosa</i>	100-500	<i>Cephalosporium sp.</i>	1000-2000	<i>Nitzschia closterium</i>	<16
<i>Desulfovibrio desulfuricans</i>	50-100				
<i>Bacillus subtilis</i>	500-1000				

Uses in Metalworking Fluids

In laboratory tests, representative metalworking fluid emulsions and BIOBAN P-1487 were placed in a continuous circulating system containing iron chips to simulate industrial use conditions. The system was inoculated initially and at weekly intervals thereafter with a heavily-contaminated emulsifiable metalworking fluid. In such tests, most oil-based fluid emulsions containing 1000 ppm of BIOBAN P-1487 resist gross microbial contamination for at least six weeks. At a concentration of 500 ppm, its effectiveness lasts from two to four weeks. In similar laboratory tests, 100 ppm - 200 ppm of BIOBAN P-1487 introduced at weekly intervals usually is effective in controlling gross microbial contamination over a period of several weeks at ambient temperatures.

Storage Stability in Concentrates

A dosage rate of 1000 ppm in the undiluted fluid is recommended. Representative oil-based metalworking-fluid concentrates containing 2.5% concentration of BIOBAN P-1487 were stored for two months at 50°C. Another set of samples was stored for one year at ambient temperatures. Emulsions prepared from these concentrates still resisted gross microbial contamination for at least six weeks when tested in the circulating system as above. Specific formulations of metalworking fluid concentrates must be examined to determine their individual stability with BIOBAN P-1487 under storage conditions. Likewise, emulsions prepared from these concentrates should be tested for the most practical concentration of BIOBAN P-1487 to control microbial contamination.

Addition to Concentrates

BIOBAN P-1487 is highly miscible with metalworking fluid concentrates. However, it is recommended that BIOBAN P-1487 be added to the concentrate as the last ingredient. Also, the concentrate should be cooled to a temperature of less than 90°F/32°C which will lessen the chance of decomposition.

Under some conditions of use, BIOBAN P-1487 will decompose to release a vapor which causes tearing of the eyes. Some practices which will lessen the possibility of such an occurrence are:

- Do not add BIOBAN™ P-1487 to diluted fluids with a pH of less than 7.5.
- Do not add BIOBAN P-1487 to fluids undergoing “Ammonia Blush.”
- Whenever a fresh charge of fluid is made, pretreat dilution water with AMP-95™ (2-amino-2-methyl-1-propanol) to achieve a level of 1000 ppm (0.1%).

Die Cast Lubricants and Mold-Release Agents

BIOBAN P-1487 is effective against bacteria and fungi which can cause problems in die cast lubricants and mold-release agents for plastics. For efficient antimicrobial activity, a concentration of 100 ppm is suggested. Stability testing should be performed to ensure compatibility in specific formulations. A pH of 7 or above should be maintained.

Toxicity

BIOBAN P-1487 is a high-boiling liquid with low vapor pressure at ambient temperature. Avoid breathing mists which contain BIOBAN P-1487, or vapors from BIOBAN P-1487 at elevated temperature.

BIOBAN P-1487 is harmful if swallowed; do not induce vomiting. Have patient drink large quantities of fluid and call a physician. The acute oral LD₅₀ for rats is 625 mg/kg. Oral ingestion is accompanied by inflammation of the intestinal tract and labored respiration.

The dermal LD₅₀ in rabbits is 420 mg/kg. BIOBAN P-1487 is therefore considered to be harmful by dermal contact. Persons handling it should wear impervious rubber gloves to prevent contact.

Undiluted BIOBAN P-1487 is highly irritating to the skin or eyes on prolonged contact. It is not, however, a corrosive liquid based upon results of the U.S. D.O.T. corrosivity test (49 CFR 173.240). Workers who handle undiluted BIOBAN P-1487 should use face and eye protection, wear gloves and other protective clothing to prevent skin contact with the liquid, and wash thoroughly after handling. In case of contact, immediately remove contaminated clothing and shoes and flush skin or eyes with copious quantities of water for at least 15 minutes. Get medical attention if the eyes are involved. Wash contaminated clothing before reuse; discard contaminated shoes.

BIOBAN P-1487 may cause an allergic skin reaction. Tests were conducted on panels of 100 human volunteers at use dilutions in water and in a typical metalworking fluid. A definitive sensitization reaction was produced in only three subjects exposed to 0.1% BIOBAN P-1487 in water. No sensitization was evident in the panel exposed to the metalworking fluid which contained 0.666% BIOBAN P-1487 in the concentrate. Potential for sensitization can be mitigated substantially by keeping skin contact with BIOBAN P-1487 at a minimum. In case of contact, wash the exposed skin immediately with soap and water.

BIOBAN P-1487 was not mutagenic in the Salmonella reverse mutation assay (Ames test) either in the presence or absence of S-9 liver activation. The test was conducted in strains TA-98, TA-100, TA-1535, and TA-1537. Toxicity was noted in all plates at greater than 1 mg/plate of BIOBAN P-1487. In additional testing, BIOBAN P-1487 did not induce chromosome aberration when tested in vitro in Chinese hamster ovary (CHO) cells; neither did it induce increased DNA synthesis in a UDS rat liver assay.

In 90-day dermal toxicity testing, no histopathological effects were noted for rats dosed at 300 mg/kg/day. Some erythema and scaly appearance was noted at the application site, however. At 1000 mg/kg/day, well defined erythema, eschar formation, and scaly patches occurred at the application site and body weight gain was reduced for both male and female rats. Hematology and serum chemistry were unaffected, but chronic inflammation of the

bladder and a possible reduced medullary mineralization of the kidneys were observed in female rats. The NOEL for systemic toxicity was judged to be 300 mg/kg/day.

An oral teratology study was conducted in rats. BIOBAN™ P-1487 was administered to pregnant female rats by gavage at 10, 30, or 100 mg/kg/day during the period of organogenesis. From clinical observations of the dams, it was determined that toxic effects occurred at the 30 and 100 mg/kg doses. Fetal examinations uncovered no fetal abnormalities attributable to exposure to BIOBAN P-1487. BIOBAN P-1487 was judged to be non-teratogenic.

The acute toxicity of BIOBAN P-1487 with respect to several aquatic species is as follows:

Species	LC ₅₀	LC ₀
Bluegill sunfish (<i>Lepomis macrochirus</i>)	1.3 mg/L/96 hr.	0.56 mg/L/96 hr.
Rainbow trout (<i>Salmo gairdneri</i>)	1.1 mg/L/96 hr.	0.56 mg/L/96 hr.
Pink shrimp (<i>Penaeus duorarum</i>)	2.2 mg/L/96 hr.	—
<i>Daphnia magna</i>	1.9 mg/L/48 hr.	0.56 mg/L/48 hr.

In the mallard duck, the LD₅₀ of BIOBAN P-1487 was 2695 mg/kg (by gavage), and the 8-day dietary LC₅₀ of BIOBAN P-1487 was greater than 5620 ppm in the diet for both mallard ducks and bobwhite quail.

First Aid

If in eyes, flush with plenty of water for at least 15 minutes. Call a physician immediately.

If on skin, wash thoroughly with soap and water. Remove and wash contaminated clothing before reuse.

If inhaled, remove immediately to fresh air. If not breathing, apply artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

If swallowed, do not induce vomiting. Drink promptly a large quantity of milk, egg white, or gelatin solution; or if these are not available, drink large quantities of water; avoid alcohol. Call a physician immediately.

NOTE TO PHYSICIAN

Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression, and convulsions may be needed.

Precautionary Labeling

Labels for BIOBAN P-1487 carry the following warning statements:

DANGER!

CAUSES SEVERE EYE DAMAGE AND SKIN BURNS. MAY CAUSE ALLERGIC SKIN REACTION.

HARMFUL OR FATAL IF SWALLOWED OR ABSORBED THROUGH THE SKIN.

Do not get in eyes, on skin, on clothing.

Causes skin sensitization.

Wear goggles or face shield and rubber gloves when handling.

Avoid breathing vapor or mist.

Avoid contamination of food.

Do not take internally.

Handling and Storage

BIOBAN™ P-1487 can be shipped and stored in ordinary steel containers. While there may be some darkening on prolonged storage, this does not impair its antimicrobial activity. Do not subject to pH below 6.0, or decomposition will occur.

BIOBAN P-1487 can be shipped and stored at normal ambient temperature (above 50°F/10°C) without phase change. At lower temperatures, crystallization in the product may occur because of extreme cooling. Should this occur, the product may be liquified by immersing the drum in warm water or storing it in a heated area until the crystals thaw. If BIOBAN P-1487 is frozen or partially frozen when received, do not heat above 95°F (35°C) in any thawing operation. Under no circumstances should steam, open flame or band heater be used to thaw BIOBAN P-1487.

Shipping and Packaging

BIOBAN P-1487 is classified as a Division 6.1 toxic material in the regulations issued by the U.S. Department of Transportation (49CFR), the International Air Transport Association (IATA) and the International Maritime Organization (IMDG Code).

The bill of lading description used by DOW is:

DISINFECTANTS, LIQUID, TOXIC, N.O.S. (4-(2-NITROBUTYL)MORPHOLINE), 6.1,UN3142,III. DISINFECTANT NOI. OTHER THAN MEDICINAL OR TOILET PREPARATIONS. NMFC ITEM 57100 SUB 3 CLASS 60. TRADE NAME = BIOBAN P-1487

Shipping Container	Net Wt.	Gross Wt.
5-gallon steel drum	42 lb	47 lb
55-gallon steel drum	450 lb	490 lb
350-gallon SS tote tank	3126 kg	3601 lb

Product Stewardship

Dow Microbial Control encourages its customers to review their applications of Dow Microbial Control products from the standpoint of human health and environmental quality. To help ensure that Dow Microbial Control products are not used in ways for which they are not intended or tested, Dow Microbial Control personnel are willing to assist customers in dealing with ecological and product safety considerations. Contact your representative if you need any assistance or information. When considering the use of any Dow product in a particular application, review the latest Safety Data Sheet and country-specific product label to ensure the intended use is within the scope of approved uses and can be accomplished safely. Before handling any of the products mentioned in the text, obtain available product safety information and take necessary steps to ensure safety of use.

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