

(2)

11/8/79

20% solution

BAQUACIL

100.0 Pesticide Label Information

100.1 Pesticide Use

Swimming pool sanitizer

100.2 Formulation Information

A.I. - 20% - poly(iminoimidocarbonyliminoimidocarbonyl-
iminohexamethylene hydrochloride)

Inert Ingredients - 80%

PHMB contains trace metals:

1.	Iron	4 ppm
2.	Lead	1 ppm
3.	Chromium	6 ppm
4.	Zinc	320 ppm
5.	Mercury	less than 0.05 ppm
6.	Arsenic	less than 0.05 ppm
7.	Cadmium	less than 0.05 ppm

100.3 Application Methods, Directions, Rates

Dose and Maintain:

Adjust pool pH to 7.0-8.0 and add Baquacil at a 50 ppm level (10 ppm active). The concentration of Baquacil should be checked weekly with the Baquacil test kit and additional Baquacil added as indicated to bring the concentration back up to the 50 ppm level. The frequency of additional doses of Baquacil will depend on pool load and amount of organic debris.

Overwinter:

Adjust the Baquacil level to 50 ppm and top it up every several months as indicated.

Baquacil is not compatible with chlorine pool sanitizers. Do not add to a pool if it contains chlorine.

100.4 Target Organisms

Bacteria (primarily)
Fungi (secondarily)

100.5 Precautionary Labeling

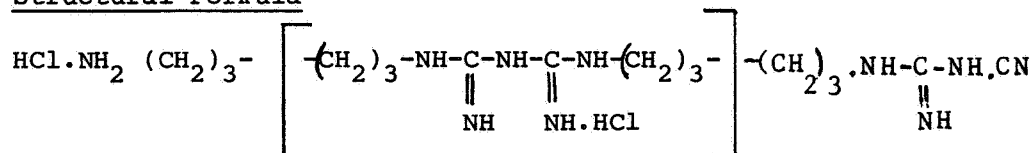
This product is toxic to fish. Do not contaminate water by cleaning of equipment or disposal of wastes. Keep out of lakes, streams, or ponds.

101.0 Physical and Chemical Properties

101.1 Chemical Name

Poly(iminoimidocarbonyliminoimidocarbonyliminohexamethylene hydrochloride)

101.2 Structural Formula



101.3 Common Name

P.H.M.B.

Poly(hexamethylene biguanide hydrochloride)

Other product names:

Vantocil 1B
20% P.H.M.B.
Polyhexamethylene biguanide
Baquacil SB
Cosmoquil CQ

101.4 Trade Name

Baquacil

101.5 Molecular Weight

(219.7)n (n average 4.5 to 6.5)

101.6 Physical State

Color - colorless to pale straw or pale yellow
Odor - practically odorless
pH - 5.0-5.5
Total Solids - 19-21% at 105°C
UV ratio (10 nm cell) - 1.2-1.6
237/222 nm

101.7 Solubility

It is stable under normal conditions but exposure to temperatures above 80°C for prolonged periods adversely affects its biological properties.

It is stable up to pH 12. Above this pH precipitation may occur.

It is readily soluble in hot or cold water, soluble in aliphatic alcohols and glycols, but generally insoluble in hydrocarbon and aromatic solvents.

102.0 Behavior in the Environment

102.1 Soil

102.1.1 Metabolism in Aerobic Soil

EFB concluded that the study on the degradation of ¹⁴C-Baquacil in soil was deficient. The tentative conclusions are that Baquacil appears to be stable to soil degradation and/or the compound adsorbs rapidly enough to sandy loam and loam soils to make it unavailable for degradative processes to occur. This conclusion is based upon results that indicate that over 50% of the biocide is bound to the soil (maybe to both mineral and organic soil surfaces) and that 30-40% of the bound radioactivity might still be present as the polymeric biguanide.

102.1.2 Leaching Mobility

Thick-layer chromatography studies indicated that there is very low mobility of ¹⁴C-Baquacil in calcareous clay loam, coarse sand, coarse sandy loam and loam soils. In these soils about 90-95% of the activity remained in the top 5 cm. of soil that had been leached with an equivalent 32 cm. of rain.

102.1.3 Soil Adsorption

Baquacil is readily adsorbed by sandy loam, calcareous clay loam, and coarse sand. Equilibrium was reached between 1 and 4 days.

102.2 Water

The study that was submitted on the photodegradation of Baquacil in water was determined by EFB to not fulfill the data requirement.

102.3 Activated Sludge Metabolism

Results indicate that Baquacil is resistant to microbial attack. In addition, at concentrations of 40 mg/l and higher the sludge process is affected such that respiration is affected and pH values become more basic (to 7.5-8.0). This latter effect can lead to inhibition of nitrification and accumulation of suspended solids. From 10% to 23% of the material may be discharged into the receiving aquatic environment (over 25 days), or 1% per day depending on the concentrations of suspended solids. No effect was observed on anaerobic sludge digestion from 56 to 250 mg/l

<u>Organisms</u>	<u>(mg/l)</u>	<u>Limits(mg/l)</u>	<u>Category</u>	<u>Compound</u>
Bluegill	24-h 0.62	0.46 - 0.83	Invalid <i>p.o.</i>	Formulated
	48-h 0.62	0.46 - 0.83		
	96-h 0.62	0.46 - 0.83		
	(no effect level - 0.24)			
Rainbow				
Trout	24-h 17.5	--	Supplemental	Formulated
	48-h 15.0	--		
	96-h 13.5	--		
<u>Daphnia</u>	48-h 0.18	0.12 - 0.30	Supplemental <i>cite</i>	Formulated
	(no effect level - 0.024)			

104.0 Hazard Assessment

104.1 Discussion

Since the acute toxicity data submitted to date are unacceptable, only a limited hazard assessment can be made. There is minimal chance of any hazard occurring to aquatic organisms while the treated water is contained in the swimming pool. However, because Baquacil appears to be highly toxic to aquatic organisms, they will probably be affected if they come into contact with discharged pool water. This is very likely to occur when backyard pools are discharged into storm sewers which empty into bodies of water.

Aside from this type of discharge, the pool water could also be discharged into a sewage system. This is a potentially hazardous situation since Baquacil adversely affects the aerobic sewage digestion process at a concentration less than the amount applied. Consequently, a significant amount of the chemical will be discharged into the receiving waters. In addition, raw sewage could also be discharged into the effluent.

Another potential problem involves the presence of heavy metals. Every time additional Baquacil is added to the pool to maintain the desired concentration the heavy metals will be accumulating. If the water is held in a tank after being discharged the heavy metals can be removed either by precipitation or by passing the water over carbon filters. (George Jett, personal communication, October, 1979). However, without these precautions, the aquatic organisms will be exposed to additional toxicants.

104.2 Adequacy of Toxicity Data

None of the fish and wildlife studies submitted to date is acceptable to support registration. Aside from specific defects in each study the major reason is that the technical compound and not the formulated product must be used.

Furthermore, the protocols of the submitted studies should more closely comply with the ones recommended by the Agency, Methods for Acute Toxicity Tests with Fish, Macroinvertebrates, and Amphibians, EPA - 660/3-75-009, April, 1975. The major discrepancies with the rainbow trout study concern the large size of the fish, the short length of the acclimation period, a narrow range of test concentrations, and calculation of the LC₅₀ values with a non-standard method. The major problem with the bluegill study is the low dissolved oxygen value. Two discrepancies with the Daphnia study concern the age of the Daphnia, which must be in the first instar and preferably 6 to 8 hours old at the start of the experiment, and failure to report the mortality data as a total value, not the mean value.

104.3 Additional Data Required

Hydrolysis and volatility studies are needed.

107.0 Conclusions

The Ecological Effects Branch concludes that the registrant must submit 3 new acute aquatic organism studies plus 2 avian dietary LC₅₀ studies and an avian single-dose LD₅₀ study as required by the EPA Proposed Guidelines for Registering Pesticides of July 10, 1978. In addition, hydrolysis and volatility studies are also needed.

108.0 Note to the P.M.

As noted in Section 100.2 of this review, this chemical contains heavy metals. Because one of the metals, cadmium, has been RPAR'ed we believe SPRD should be notified. Similarly, we are

notifying the Toxicology Branch of this potential hazard. It should also be noted that an EUP was issued on the chemical several months ago.

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