EEE BRANCH REVIEW

DATE: IN _____ OUT _____ IN 9/21/77 OUT 1/21/77 IN _____ OUT _____

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. 551-EUR

PETITION OR EXP. PERMIT NO. _____

DATE DIV. RECEIVED _____

DATE OF SUBMISSION _____

DATE SUBMISSION ACCEPTED 3CID = Yes 2B

TYPE PRODUCT(S): I, D, H, F, N, R, (S) Cooling Tower Slimicide

PRODUCT MGR. NO. 31

PRODUCT NAME(S) Baird's Water Treatment Microbiocide

COMPANY NAME Baird & McGuire, Inc.

SUBMISSION PURPOSE Registration

CHEMICAL & FORMULATION Didecyl dimethyl ammonium chloride
Isopropyl alcohol

1. Introduction

Applicant submits environmental chemistry data.

Product is named "Baird's Water Treatment Microbiocide Twin-Chain Quaternary Ammonium Compound Concentrate Water Treatment Microbiocide for Building and Industrial Cooling Towers" and contains a combination of didecyl dimethyl ammonium chloride (50%) and isopropanol (20%) as active ingredients.

2. Directions for Use

Use 6-9 fluid ounces per 1000 gallons of water to be treated (20 ppm active quaternary). Repeat the initial dose every seven days or increase the frequency if needed. Treatment effluent should not be discharged where it will drain into lakes, streams, ponds or public water.

3. Discussion of Data

Applicant submits document entitled "The Biodegradability of Low Concentrations of Certain Quaternary Ammonium Antimicrobials by Bacteria" by L. J. Gawel and R. L. Huddleston, Continental Oil Company, Ponca City, Oklahoma. Presented at American Oil Chemists' Society National Meeting, Los Angeles, California, April 23-26, 1972. Publication status of this document is not reported.

In addition to the document, there is an "Addendum - R. D. Ditoro, Lonza, Inc" included within the body of the above document. The "Addendum" describes an additional study by Lonza Inc. but not by the authors of the document.

Discussion of "Biodegradability" study:

Five compounds were tested for "biodegradation" by bacteria. Bacteria used was obtained by mixed culture from soil and raw city sewage. No further identification of bacteria provided. All inocula were grown on gyratory shaker (250 rpm) at 22°C with proper aeration. Analytical methods were colorimetric for both the quaternary compounds and the phenolic compound.

UV spectrophotometry was used concurrently for one of the aromatic quaternary compounds. Colorimetric method for quats is sensitive to 0.25 ppm parent compound. Method does not analyze degradation products. Method for phenolic has unknown sensitivity. Nonradiolabeled materials were used. The compounds tested were didecyl dimethyl ammonium chloride, dioctyl dimethyl ammonium chloride, alkyl (C_{14}) dimethyl benzyl

ammonium alkyl (C_{14}) dimethyl ethylbenzyl ammonium chloride, and pentachlorophenol. Test level was 10 ppm initially.

Results

All four quaternary compounds showed 5-8% remaining after 48 hours as parent compounds. When cultures were acclimated for 24-48 hours, the rate of degradation increased. But after longer periods of acclimation (9 days) degradation of parent quats was only about 50%, with alkyl quats slightly more degraded than aromatic quats.

Pentachlorophenol degraded only 20% over 10 days in phenol adapted cultures.

Conclusion

The study is inadequate in that the following discrepancies are not addressed by the experiment:

(1) Exact nature of the material tested is not described. Report is not clear whether the quaternary ammonium compound was tested alone or as formulated material.

(2) Nonradioisotopic materials were used, whereas radioisotopic techniques or comparable techniques are required.

(3) Material balance is lacking whereas material balance is required.

(4) The nature and amounts of degradation products are not reported whereas these are required.

(5) No information on the degradation of the active ingredient, isopropyl alcohol, which is required.

(7) The study cannot delineate the effects of adsorption to soil or sediment particles as may be expected to occur in the environment.

(8) No evidence is presented to show that the test level approximates expected concentrations in the environment.

Discussion of the "Addendum" study:

Field trials in two water cooling towers of unspecified capacity, unspecified operation, unspecified design, and unspecified purpose were treated with Bardac-22 (didecyl dimethyl ammonium chloride). Tower I received three slug doses at 0, 5, and 8.25 hours at calculated dosages (from tower water capacity) of 29.0, 16.0 and 36.0 ppm of the quaternary compound. Concentration of the other active ingredient isopropyl alcohol is not reported. Tower II received one slug does at 0 hours of 41.5 ppm quaternary and unspecified amount of the other active ingredient isopropyl alcohol.

The cooling tower water was sampled at unspecified location in the system. The water samples were analyzed by an unspecified analytical method with unknown limits of detectability or sensitivity for the quaternary compound. No analysis reported for isopropyl alcohol.

Results: Tower I

Slug I		Slug 2		Slug 3	
Time (hrs)	PPM	Time	PPM	Time	PPM
0	29.0*	5	16.0*	8.25	36.0*
.25	3.0	5.5	2.0	8.5	7.0
.75	2.0	6	2.0	9	5.73
1.5	1.0	7	0.75	10	2.4
3	0.75	8		11	0.8
4	0.75			12	0.75
5	1.0			13	0.75
				14	0.7

* Calculated

Tower II

Time (hrs)	PPM
0	41.5 ppm *
0.08	11.0
0.5	4
6	1
24	0.0
48	3.0
72	1.0

* Calculated

Experimenter concludes that only small amounts of quaternary compound are found in blow-down water and that most of the quaternary compound is retained in the tower at negatively charged sites or in the slime itself. Experimenter concludes that slough off of the slime is the cause of the occasional increase in the concentration of quaternary.

Reviewer concludes the study is inadequate. The following deficiencies preclude evaluation of the study.

(1) Complete information concerning the design, operation, purpose and capacity of the two water cooling towers is needed.

(2) A complete description of the analytical methods, including recovery data, used to analyze the quaternary compound and the isopropyl alcohol.

(3) Information on the other chemicals used in the cooling system for various purposes at the time of the tests.

(4) Information as to the locations in the system where the slug dose was added, and where the water was sampled.

(5) The results of the analyses of the active ingredient isopropyl alcohol must be reported.

(6) Evidence that the quaternary compound is retained in the tower at negatively charged sites or in the slime is needed. Information is needed concerning the quarternary when the tower is cleaned: Is the quaternary removed from the negative charge sites or the slime or both during cleaning operations and what is the concentrations of quaternary in the cleaning effluent?

(7) Information regarding the discrepancy between the proposed use rate of 20 ppm and the three slug doses in Tower I at 29, 16, and 36 ppm within 14 hours and the one slug dose at 41.5 ppm in Tower II is needed.

4. Conclusions

No opinion can be given on unreasonable adverse effects on the environment. The submitted data is inadequate and insufficient to form such an opinion.

5. Recommendations

No recommendations
See conclusions

For registration, the following data on each individual active ingredient and as proposed combination are required under current operating procedures.

(1) Hydrolysis study is conducted on each active ingredient individually and as proposed combination. Radioisotopic or comparable techniques are required. Acidic, neutral, and basic pH's are used. Two concentrations and two temperatures are required.

Aliquots in duplicate should be taken at four sampling intervals with at least one observation made after one-half of the pesticide is hydrolyzed, or 30 days, whichever is shorter. A material balance, half-life estimate and identification of degradation products must be provided. Concentrations should approximate use rate and 10X use rate.

(2) An activated sludge metabolism study of the effects of each active ingredient individually and as proposed combination on wastewater treatment processes is required. Synthetic sewage (nutrients) and radioisotopic material are added to activated sludge and aerated in a dosed system for 23 hours; the sludge is allowed to settle for 30 minutes. A liter of supernatant (effluent) is removed for analysis of parent compound and degradation products, including a material balance. Add fresh synthetic and test compound to the remaining sludge and repeat the cycle. Dosage should start at 0.1 ppm and increase by increments to 100 ppm. Effects on microbial population must be determined by daily total counts of viable organisms in sludge.

Ronald E. Ney, Jr. 1/21/77

R. W. Cook 1-1-77

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Environmental Chemistry Section
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