006315
128826

Shaughnessy No.:28501

Date Out of EAB: MAY 12 1987

To: Jeff Kempter
Product Manager 32
Registration Division (TS-767)

From: Akiva D. Abramovitch, Acting Chief
Review Section #1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached, please find the EAB review of...

Reg./File # : 38906-13, 15

Chemical Name: 5,5-Dimethyl Hydantoin (Halogenated)

Type Product : Disinfectant

Product Name : DANTOBROM

Company Name : GLYCO

Purpose : Registration for use in indoor and outdoor swimming pools and spas.

Date Received: 8/14/86 Action Code(s): 300

Date Completed: 5/1/87 EAB #(s) : 60799-800

Days: 2.5

Deferrals to: _____ Ecological Effects Branch

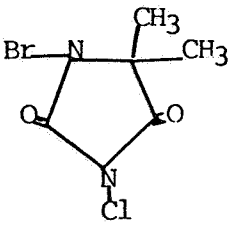
_____ Residue Chemistry Branch

_____ Toxicology Branch

Monitoring study requested by EAB: /__/

Monitering study voluntarily conducted by registrant: /__/

1.a CHEMICAL: Dimethylhydantoin.



Halogenated-5,5-Dimethyl Hydantoin
DANTOBROM™, DANTOCHLOR™

1.b Physical Properties:

Not included in this submission.

2. TEST MATERIAL: 98.6% pure 1-Bromo-3-Chloro-5,5-Dimethylhydantoin.
99.2% pure 1,3-Dichloro-5,5-Dimethylhydantoin.
98.8% pure 1,3-Dichloro-5,5-Dimethylhydantoin.
% purity based on active halogen.

3. STUDY/ACTION TYPE:

Review of studies for registration for use in indoor and outdoor swimming pools and spas.

4. STUDY IDENTIFICATION: Acc. # 263983.

1) Hydrolysis/Photolysis of Halogenated Hydantoins (report # 85-62).

5. REVIEWED BY:

Akiva D. Abramovitch, Ph.D.
Chemist
Environmental Chemistry Review Section 1/EAB/HED/OPP

Akiva Abramovitch
Date: MAY 12 1987

6. APPROVED BY:

Akiva D. Abramovitch, Ph.D.
Acting Chief
Environmental Chemistry Review Section 1/EAB/HED/OPP

Akiva Abramovitch
Date: MAY 12 1987

7. CONCLUSIONS:

Both the hydrolysis and the aqueous photolysis data requirement are satisfied for the registration of halogenated dimethylhydantoin for indoor and outdoor swimming pools and spas use.

The data indicate that halogenated hydantoins undergo a very fast hydrolysis at pH 5, 7 and 9 to mono-halogenated hydantoins. Sunlight does not appear to enhance the degradation of dihalohydantoins in water.

A note to the PM

The registrant has been forthcoming in providing information about potential formation of highly toxic N-chloro-iso-propylimine in the presence of high levels of chlorine. The registrant instructed on the label that the addition of sodium bromide to pools when high levels of chlorine are used would reduce/eliminate the formations of toxic N-chloro-iso-propylimine. Although it was reported that BCDMH is less likely to undergo ring opening to N-chloro-iso- propylimine, it might still be advisable to ask registrants of BCDMH to place similar precautionary instructions on their labels.

8. RECOMMENDATIONS:

EAB data requirements for the proposed registration of halogenated hydantoins for use in indoor and outdoor swimming pools and spas has been satisfied.

9. BACKGROUND:

A. Introduction: The registrant repeated the hydrolysis and photolysis studies to comply with the environmental fate data requirements for indoor and outdoor use in swimming pools and spas.

B. Directions for Use:

1,3-Dihalogenated-5,5-Dimethylhydantoin are to be used to disinfect indoor and outdoor swimming pools and spas. See attached label for details.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

10.1 A. Study Identification: Hydrolysis/Photolysis of Halogenated 5,5--Dimethylhydantoins (report # 85-62).

The study was conducted by Glyco R&D by Z.G. Gatcheff, F.L. Morse and T.R. O'Connell.

B. Materials and Methods:

All glassware and distilled water were sterilized in a 220°C autoclave prior to use. Sterilized buffers were prepared as follows:
pH 5: 0.02 M sodium acetate adjusted to pH 5 with 0.1 M acetic acid.
pH 7: 0.40 M NaH_2PO_4 and 0.040 M K_2HPO_4.
pH 9: 0.05 M $Na_2B_4O_7$ adjusted to pH 9 with 0.1 M acetic acid.
The studies were conducted in a 25°C thermostated bath. Photolysis studies were conducted under natural sunlight for a period of 8 hours a day. Aliquots were taken at 0,2,4,6,24, and 30 hours after dissolution and analyzed for acetone and N-chloro-isopropylimine. Analysis for 5,5-dimethyl hydantoin was conducted by HPLC and for acetone and N-chloroimine by GLC with detection limits of 2 ppm. Analysis for halogenated hydantoins samples were conducted by dehalogenating the halogenated hydantoins to hydantoin with sodium bisulfite and then quantifying the hydantoin. The amount of total halogen (Cl+Br) in the sample was measured by iodimetric titration.

C. Reported Results:

Two pathways for the hydrolysis of dihalogenated hydantoins in water: The first path shown below is a two step hydrolysis sequence producing free halogen, monohalogenated hydantoin and free hydantoin. The first reaction is rapid and 66-100% of the dihalogenated hydantoins are hydrolyzed to monohalogenated hydantoin in one hour while the second reaction from mono-halogenated hydantoin to hydantoin is considerably slower. The overall hydrolysis half life appears to be less than one day. Hydrolysis is faster for BCDMH than DCDMH and appears to be faster at pH 7 (see attachment).

The second pathway involves a ring opening reaction producing N-chloroimine acetone, carbondioxide, ammonia and chloride ion. In the presence of excess bromide ion, N-bromo-iso-propylimine is formed and degrades spontaneously to the corresponding ketone. The 1,3-dichloro-5,5-dimethyl hydantoin is more likely to undergo ring opening than the 1-bromo-3-chloro-5,5-dimethyl hydantoin. Ring opening in this case is greater at pH 5 and 7 than at pH 9.

Both reaction pathways do not appear to be affected by natural sunlight radiation to any significant degree.

D. Study Author's Conclusions:

No additional conclusions to those stated in the results in C, above.

E. Reviewer's Discussions and Interpretation of Study Results:

The reviewer is satisfied with the way the study was conducted. The data is accepted in fulfillment of the data requirements for hydrolysis and aqueous photodegradation.

11. COMPLETION OF ONE LINER:

Not completed.

12. CBI APPENDIX:

Attachment.