

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

May 5, 1993

TO: Files for Bromo- and Chloro- Dimethylhydantoin
FROM: Cathy Simon
SUBJECT: Development of Screening Levels

The initial threshold screening level (ITSL) for the following bromo- and chloro dimethylhydantoin is 2 ug/m³, based on an 8-hour averaging time:

| <u>Chemical</u> | <u>CAS No.</u> |
|--|----------------|
| 1,3-Dichloro-5,5-dimethylhydantoin | 118-52-5 |
| 3-Bromo-1-chloro-5,5-dimethylhydantoin | 126-06-7 |
| 1-Bromo-3-chloro-5,5-dimethylhydantoin | 16079-88-2 |
| 1,3-Dibromo-5,5-dimethylhydantoin | 77-48-5 |

The ITSL for these compounds was derived from the ACGIH TLV and NIOSH recommended exposure level of 0.2 mg/m³ for 1,3-dichloro-5,5-dimethylhydantoin (DCDMH) as follows:

$$\text{ITSL} = \frac{0.2 \text{ mg/m}^3}{100} = 2 \text{ } \mu\text{g/m}^3$$

The following references or databases were searched for information on these chemicals: CAS Online (1967 - February 3, 1993), IRIS, RTECs, the Environmental Protection Bureau Library, IARC monographs, and NTP Management Status Reports.

The only chemical for which a specific occupational exposure level was available was 1,3-dichloro-5,5-dimethylhydantoin. The TLV for this compound was based upon unpublished correspondence establishing a maximal level of 10 ppm DCDMH in water for use as a sanitizing agent in swimming pools (ACGIH, 1991). This level was converted from a dosage in water to a TLV for air with an "appropriate safety factor". The TLV documentation also states that although the limit is based upon systemic toxicity in animals, it should provide "reasonable protection against respiratory irritation on the basis of limited experience", although specific data is not provided to support this conclusion.

A review of the available literature did not provide any chronic or subacute data that might be used to determine an ITSL for DCDMH. Several short term mutagenicity studies were available, which provided both positive and negative results.

Additionally no chronic or subacute data were available for the other chloro- and bromo- dimethylhydantoins listed above. These compounds are expected to have similar toxicological properties as DCDMH, based on structural similarity, differing only in the type of halogen (bromine or chlorine) present on the 1 or 3 position of the ring structure. All compounds would be expected to be respiratory irritants. Lacking good toxicological data to calculate an ITSL for these compounds, and considering the structural similarity to DCDMH, the ITSLs for the other chloro- and bromo- dimethylhydantoins are also based upon 1% of the TLV for DCDMH. Because these compounds are expected to have similar toxic effects, the combined ambient impact of all the compounds listed above should not exceed 2 ug/m³ based on an 8-hour averaging time. Some of the bromo- and chloro- dimethylhydantoin compounds had acute toxicity data that could have been used to determine an ITSL, however, the use of the TLV for DCDMH was considered more appropriate, given the structural similarity to DCDMH, the suggested human experience with this TLV, and the need to consider the combined impacts of these compounds. Although the TLV for DCDMH is poorly substantiated, due to lack of adequate animal or human data, the suggested human experience with this TLV provides more basis for using it to determine the various ITSLs, rather than acute animal toxicity data.

The available toxicological data for the other chloro- and bromo- dimethylhydantoins is discussed below.

3-Bromo-1-chlor-5,5-dimethylhydantoin (CAS No. 126-06-7)

This compound is a severe skin and eye irritant as measured in the Draize test in rabbits (NIOSH, 1993). The oral rat LD50 for this compound is 485 mg/kg in male rats and 720 mg/kg in female rats (FDRL, 1980a). The oral mouse LD50 is 680 mg/kg in female mice and 700 mg/kg in male mice (FDRL, 1980b).

1-Bromo-3-chloro-5,5-dimethylhydantoin (CAS No. 16079-88-2)

The only data available for this compound was an oral rat LD50 of 1390 mg/kg and a dermal rabbit LD50 of greater than 2 g/kg (NIOSH, 1993).

1,3-Dibromo-5,5-dimethylhydantoin (CAS No. 77-48-5)

The oral rat LD50 for this compound is 760 mg/kg in male and female Wistar rats combined (Bio/dynamics, 1978). Nine of ten Sprague-Dawley rats (5 male, 5 female) died within or shortly after exposure to 29.44 mg/l DBDMH for one hour (Bio/dynamics, 1979). Additionally, an abstract of a Russian study indicated that rats exposed to 3.5 and 7 mg/l in the drinking water for four months showed initially and then inhibited iodine uptake by the thyroid gland (Goncharuk, 1971)

References

- American Conference of Governmental Industrial Hygienists (ACGIH). 1991. Documentation of Threshold Limit Values and Biological Exposure Indices. Sixth Edition.
- Bio/dynamics, Inc. 1978. Acute oral toxicity study in rats. Compound: Dantoin DBDMH 736635. Submitted to Glyco Chemicals, Inc. May 15, 1978. Study submitted to U.S. EPA pursuant to Section 8(e) of the TSCA. 8EHQ-0581-0382.
- Bio/dynamics, Inc. 1979. An acute inhalation toxicity study of Dantoin DBDMH in the rat. Submitted to Glyco, Chemicals, Inc. January 11, 1978. Study submitted to U.S. EPA pursuant to Section 8(e) of the TSCA. 8EHQ-0581-0382.
- Food and Drug Research Laboratories (FDRL). 1980a. Acute oral LD50 assay in rats (EPA-FIFRA). November 20, 1980. Study submitted to U.S. EPA pursuant to Section 8(e) of the TSCA. 8EHQ-0581-0382.
- Food and Drug Research Laboratories (FDRL). 1980b. Acute oral LD50 assay in mice (EPA-FIFRA). December 4, 1980. Study submitted to U.S. EPA pursuant to Section 8(e) of the TSCA. 8EHQ-0581-0382.
- Goncharuk, E.I. et al. Phase changes in the functioning of thyroid gland of rats exposed to the chronic action of dibromantin. Gig. Sanit. 36(10):108-109. (As cited in Chemical Abstracts Service CA76(11):54928w).
- National Institute of Occupational Safety and Health (NIOSH). 1993. Registry of Toxic Effects of Chemical Substances.

CAS:ma