

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY**

**INTEROFFICE COMMUNICATION**

TO: Barium and soluble barium compounds File (CAS # 7440-39-3)

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

SUBJECT: Screening Level for barium and soluble barium compounds  
(CAS # 7440-39-3)

DATE: March 26, 2015

This memo and ITSL development is designed to cover barium and water soluble barium compounds with ITSLs all based on the barium threshold limit value (TLV) for each of those compounds (ACGIH, 2001a). The ITSL for barium and soluble barium compounds is 5 µg/m<sup>3</sup> based on an 8-hour averaging time. This ITSL applies to the following barium water soluble compounds, which includes:

Barium acetate (CAS # 543-80-6)	Barium iodide (CAS # 13718-50-8)
Barium bromide (CAS # 10553-31-8)	Barium nitrate (CAS # 10022-31-8)
Barium chlorate (CAS # 13477-00-4)	Barium oxide (CAS # 1304-28-5)
Barium chloride (CAS # 10361-37-2)	Barium sulfide (CAS # 21109-95-5)
Barium hydroxide (CAS # 17194-00-2)	

This screening level does not apply to barium sulfate (CAS# 7727-43-7), because it is practically insoluble in water, has a TLV-TWA of (10 mg/m<sup>3</sup>) that is 20 times higher than barium and soluble compounds (0.5 mg/m<sup>3</sup>), and the particulates are less easily absorbed by inhalation (ACGIH, 2001b).

This memo is an addition to a previous memo (Butterfield, 1992; see attachment), which provides the justification for barium and soluble barium compounds and adequately describes the derivation of 5 µg/m<sup>3</sup> based on an occupational exposure level (OEL) developed by the American Conference of Government and Industrial Hygienists (ACGIH).

**References:**

ACGIH. 2001a. Barium and Soluble Compounds. TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH Worldwide Signature Publications.

ACGIH. 2001b. Barium Sulfate. TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH Worldwide Signature Publications.

Act 451 of 1994, Natural Resources and Environmental Protection Act and Air Pollution Control Rules, Michigan Department of Environmental Quality.

Butterfield. 1992. Barium file; From: Gary Butterfield, AAC for Barium (CAS # 7440-39-3); Dated: March 9, 1992.

DL:lh  
Attachment

Michigan Department of Natural Resources

-----  
Interoffice Communication  
-----

March 9, 1992

To : Barium file

From : Gary Butterfield

Subject : AAC for Barium (CAS # 7440-39-3)

A CAS-on-line literature search conducted on articles published up to 1/91 revealed no inhalation toxicity studies of adequate quality to firmly establish the limits of health effects from barium inhalation. ATSDR 1990 revealed several anecdotal human over exposures to barium without being able to specifically quantify the exposure level, none of which are useful in establishing an AAC. Quality of reported animal and human exposures is considered to be poor due to limited number of subjects exposed and the poorly described details of those that were exposed including lack of exposure conditions, duration, etc. ATSDR 1990 considered reported inhalation exposure data for animals and humans as inadequate to reliably identify LOAELs or NOAELs.

An RfC (not verified on IRIS but reported in EPA's HEAST) based on general toxicity (weight loss, increased blood pressure, altered sperm counts and altered blood parameters in males, or reproductive effects on females) observed by Tarasenko et al (1977). In this study male rats were exposed to 1.15 or 5.2 mg/m<sup>3</sup> of barium carbonate (BaCO<sub>3</sub>), 4 hours per day, 6 days per week for 4 months. The described effects were observed at 5.2 but virtually no changes were observed at 1.15 mg/m<sup>3</sup> in the males. Females were exposed to 3.1 or 13 mg/m<sup>3</sup> for 4 months before evaluation of the reproductive impacts. For females, barium carbonate at 13 mg/m<sup>3</sup> caused severe reproductive effects. The effects at 3.1 mg/m<sup>3</sup> were not discussed. Reporting of few details including no discussion of effects at the lower dose levels AAC makes this study of questionable value for establishing an AAC.

EPA's IRIS has a verified oral RfD, of 70 ug/kg, based on Wones et al (1990), Brenniman and Levy (1984) and Perry et al (1983). It is inappropriate to convert this RfD to an air value because lungs are a target organ of barium inhalation. In humans, benign pneumoconiosis known as baritosis has been observed in several occupationally exposed individuals. Following controlled exposures with animals, pulmonary lesions have been reported that include : perivascular and peribronchial sclerosis, focal thickening of the interalveolar septa (Tarasenko et al 1977), and bronchoconstriction (Hicks et al 1983). Oral data makes use of impacts on target organs other than the more sensitive lungs. Therefore, the conversion of RfD to RfC is inappropriate for barium.

Due to the questionable quality of the single subchronic animal inhalation study and the poorly quantified human exposure, the best basis for the AAC is the TLV of 0.5 mg/m<sup>3</sup>. The resultant AAC is 5 ug/m<sup>3</sup> with an 8 hour averaging time.

References :

ATSDR. 1990. Toxicological profile for barium - DRAFT.

Brenniman and Levy. 1984. Epidemiology study of barium in Illinois drinking water supplies. In : Advances in modern environmental toxicology IX. Calabrese, Tuthill and Condie Ed. pg 231-240.

EPA. 1991. HEAST.

EPA. 1992. IRIS.

Hicks et al 1983. Arch Toxicol Suppl 9: . (As cited in ATSDR 1990).

Perry et al. 1983. Cardiovascular effects of chronic barium ingestion. Trace Subst Environ Health 17:155-164.

Tarasenko et al. 1977. Barium compounds as industrial poisons (an experimental study). J Hyg Epidemiol Microbiol Immunol 21:361-373.

Wones et al 1990. Lack of effect of drinking water barium on cardiovascular risk factor. Environ Health Perspectives 85:1-13.