BRUSHWELLMAN
ENGINEERED MATERIALS

Brush Wellman Inc.
17876 St. Clair Avenue
Cleveland, Ohio 44110
216-486-4200

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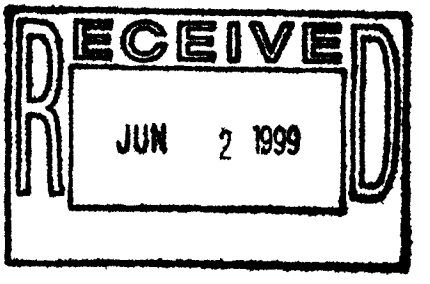
VIA FEDERAL EXPRESS



Dr. C. W. Jameson
National Toxicology Program
Report on Carcinogens
79 Alexander Drive
Building 4401, Room 3127
MD:EC-14
Research Triangle Park, NC 27709

Re: Beryllium and Beryllium Compounds

Dear Dr. Jameson:

The National Toxicology Program (NTP) has announced its intent to review beryllium and beryllium compounds for possible updating of the current listing to a known human carcinogen. 64 Federal Register 15983 (April 2, 1999).

NTP has requested public comment on this nomination of beryllium and beryllium compounds as a known human carcinogen and "relevant information on the carcinogenic properties of the substances from completed or ongoing experimental animal or human epidemiology studies, as well as current production data, use patterns and human exposure information." Id.

Brush Wellman Inc. appreciates this opportunity to submit comments on these subjects and invites NTP to contact us if we can provide any additional information that might be of assistance to the NTP in its deliberations.

Uses of Beryllium

Brush Wellman is a leading international supplier of high performance engineered materials. It is the only fully integrated supplier of beryllium, beryllium alloys and beryllia ceramic in the world. Beryllium is a unique material exhibiting physical and mechanical properties unmatched by any other metal. It is one of the lightest structural materials known, yet has specific stiffness six times greater than steel. It possesses high heat absorbing capability and has dimensional stability over a wide range of temperatures.

Articles manufactured from Brush Wellman products saves lives, e.g., they are used as critical, high-reliability elements in air bag sensors, fire extinguisher sprinkler heads, x-ray

windows for mammography, medical laser bores, pacemakers, landing-gear bearings, and GOES satellites for severe weather forecasting.

Beryllium products form critical components in many of the advanced systems on which society depends, including both wired and wireless communications, including the Iridium satellite global telephone system. Copper beryllium is used extensively in auto electronics, including the ignition control systems of many modern automobiles to increase gas mileage, thereby reducing air pollution. Other applications include computers, oil exploration equipment, and plastic injection molding dies.

Beryllium products still fill critical military needs as well. Most of the advanced electro-optical targeting and infrared countermeasure systems contain beryllium components, improving their performance and protecting our military personnel. Beryllium components are also found in advanced missile systems and the radar systems that control them. Many of the advanced surveillance satellites also contain beryllium structures and electronic components.

Brush Wellman's Experience with Beryllium

Since its founding in 1931, Brush Wellman has concentrated its operations and skills on advancing the unique performance capabilities and applications of beryllium-based materials. As the world leader in beryllium production and technology, Brush Wellman strives to remain the leader in medical knowledge of beryllium and in the environmental, health and safety aspects of the material as well. Brush Wellman has sponsored basic research concerning the environmental and health effects of beryllium, including carcinogenic responses. Brush Wellman supports the work of the Beryllium Industry Science Advisory Committee.

Although chronic beryllium disease properly has been and remains the primary health concern of regulatory agencies, and Brush Wellman, with respect to exposure to beryllium, Brush Wellman has studied the issue of the carcinogenicity of beryllium for over two decades. In fact, Brush Wellman encouraged and supported much of the early research into this issue. Brush Wellman's plants, particularly its former Lorain plant, are the focus of much of the epidemiology research done on this issue.

Relevant Scientific Information

Enclosed for review by the NTP are the following documents:

1. Morgareidge Ingestion Studies.

   A. Morgareidge et al., Chronic Toxicity of Orgally Administered Beryllium in Albino Rats

B. Cox, et al., Chronic Feeding Studies with Beryllium Sulfate in Rats (1975)
C. Chronic Feeding Studies with Beryllium in Dogs (1976)

These animal studies, which were co-sponsored by Brush Wellman, report a lack of carcinogenic response in animals, from the ingestion of soluble beryllium salts.

2. Reviews of Epidemiology Studies.

A. MacMahon, The Epidemiological Evidence on the Carcinogenicity of Beryllium in Humans. J. Occup. Med 1994: 36 15-24.
B. Beryllium Industry Scientific Advisory Committee. Is Beryllium Carcinogenic in Humans? J. Occup. Environ. Med. 1997:39-205-8.

These articles provide a critical review of the principal epidemiology studies of beryllium exposure and lung cancer, Steenland and Ward (1991) and Ward, et al. (1992).

3. Cancer Hazard Assessment.

A. Cruzan, Draft Carcinogen Risk Assessment, 1996.

This assessment reviews the beryllium literature and evaluates the carcinogenicity of beryllium using the methodology employed by US EPA's proposed cancer risk assessment guidelines.

Exposure Data

In the seven-plant study by Steenland and Ward (1991) and Ward, et al. (1992), attention is given to the Lorain Plant because it had the largest excess lung cancers reported by the authors, although questions exist as to the adequacy of the smoking adjustment and other confounders, such as sulfuric acid mist.

In evaluating estimated exposure levels at Lorain, it may be useful to consider exposure data from plants for which excess lung cancers were not reported, despite long latency periods. Exposure data for the years 1950 to 1978 at these plants are presented in Seiler, et al., A Study of Beryllium Exposure Measurements, Applied Occupational and Environmental Hygiene, 11(2):89 (1996). Exposures estimates are given for various job title and by various exposure categories. For the Hazelton facility, where there was the greatest number of samples, the authors give the following exposure estimates ($\mu g/m^3$) based on samples taken from 1958 through 1971:

Job Table	Exposure Estimate
Laundry	2.4
Stores, shipping	1.0-1.3

Labs (R&D)	2.1-3.3
Maintenance	1.1-2.5
Melt and cast	3.9-4.3
Melt and pour	3.6-3.9

The absence of reported lung cancer excesses at these plants at these exposure levels should be considered in deciding whether to rely on the excess lung cancer cases reported for the Lorain Plant.

Comments

Brush Wellman believes that NTP should not classify beryllium and compounds as a "known human carcinogen." The criterion for such a classification – "sufficient evidence of carcinogenicity from studies in humans which indicates a casual relationship between exposure to the agent, substance or mixture and human cancer" – is not met. As the enclosed articles, reviews, and assessment demonstrate, the epidemiology studies concluding that beryllium causes cancer of the lung do not offer sufficient evidence to support that conclusion. Furthermore, to the extent that one believes that the epidemiology studies show a relationship between exposure and lung cancer, it is more appropriate to conclude that there is a relationship between the process studied – which produced exposure to beryllium and sulfuric acid mist – rather than to beryllium alone.

Any discussion or listing of carcinogenicity should distinguish between various species of beryllium and should not be in terms of beryllium and beryllium compounds. For most beryllium compounds, no studies of human exposure exist.

Lastly, any discussion or listing the carcinogenicity of beryllium or a beryllium compound should be explicit as to the route of exposure.

Please contact me if Brush Wellman can provide additional information that would be useful to NTP's review.

Sincerely,

[redacted]

Marc E. Kolanz, CIH
Director
Environmental Health & Safety

MEK/elm
Enclosures