

Frequently Asked Questions about Beryllium and Cancer FAQ302

Is beryllium classified as a carcinogen via inhalation?

Yes. The National Toxicology Program (NTP)¹ and the International Agency for Research on Cancer (IARC)² have classified beryllium as a human carcinogen. The United States (U.S.) Environmental Protection Agency (EPA) classifies beryllium as a probable human carcinogen³ and the European Union contends that beryllium may cause cancer by inhalation.

However, recent studies by Levy^{4,5}, Brown⁶ and Deubner⁷ provide new evidence that exposure to beryllium does not represent a significant risk of cancer to humans. The 1992 Ward⁸ study finding of a “modest excess of lung cancer” has been used to support cancer classifications for beryllium by organizations such as the NTP and IARC. These agency reviews ignored the finding by Ward that after adjustment for smoking, the overall multi-plant cohort showed a non-statistically significant rate of lung cancer. The 2002 Levy study reanalyzed the Ward data using more relevant local cancer rates and three common smoking adjustments, and confirms Ward’s finding by concluding that “with smoking adjustment there was not an overall excess of lung cancer in the eight cohorts of beryllium workers.”

The 2001 study by Sanderson⁹ has been used to try to demonstrate a beryllium exposure response relationship for lung cancer. Both the 2007 Levy and 2007 Deubner studies identified a significant methodological error in the Sanderson study which negates the use of Sanderson as a dose/response cancer link for beryllium. Levy’s reanalysis correcting the error in the Sanderson study found that the lung cancer in this population was not associated at all with beryllium exposure, whether defined as time worked, or cumulative, average or maximum exposure. Deubner confirms the methodological error identified by Levy using repeated data simulations.

In 2009, Hollins¹⁰ published the findings from a weight-of-evidence analysis of both the available animal and human studies related to the carcinogenicity of beryllium. This assessment is the most thorough review and analysis of the available information completed to date. Thirty-three animal studies and seventeen epidemiologic studies were evaluated as part of this assessment. Based on their weight-of-evidence analysis, Hollins concludes that “the evidence for beryllium’s carcinogenic potential in humans should be considered either inadequate or marginally suggestive in modern industrial settings.”

Was beryllium metal tested to meet the requirements of the European REACH Regulation?

Yes. New studies¹¹ were conducted to comply with the European Registration, Evaluation and Authorization of Chemicals (REACH) regulation. These new studies showed that beryllium metal does not interact with DNA, produce mutations or cause DNA damage; and, does not cause structural chromosomal aberrations or forward gene mutations in mammalian cells. These new studies also provided authorities with proof that the decades old assumption that the toxicity of beryllium metal (which is commercially available) and soluble beryllium compounds (not commercially available) are the same is incorrect.

Additionally, a detailed analysis¹² of the quality of all available literature, using a globally accepted protocol, clearly demonstrated that the existing animal data on carcinogenic properties is conclusive only for rats and not for any other species which is not uncommon. The analysis conducted for the REACH dossier also revealed that all of the epidemiological studies focused on the same cohort of highly exposed beryllium production workers and that, depending on the reviewer, an excess cancer risk was found or not found. This previously unavailable information has significantly added to the body of scientific information and casts additional doubt on the premise that beryllium is a carcinogen.

How is Beryllium metal viewed in Europe?

Data from European disease registries and leading medical practitioners does not identify a link between beryllium exposure and lung cancer. For example, the Swiss Accident Insurance Fund (SUVA) reported that no lung cancer cases were observed in an occupationally beryllium-exposed population in Switzerland that was followed for over 20 years. In addition, a report prepared by the European Commission on beryllium in relation to occupational diseases¹³ states that: "The causal relationship between prolonged or repeated exposure to beryllium and the occurrence of bronchial cancer has not been firmly established, and due to the multi-causality of the occurrence of this type of cancer, the recognition of the occupational origin must lie on a thorough assessment based on rigorous scientific criteria taking into account all possible etiologies. Each case must, therefore, be considered separately."

Finally, beryllium was also evaluated as part of the recent assessment of 25 substances commissioned by the European Commission for possible amendments to the European Carcinogens and Mutagens Directive (2004/37/EC). The report¹⁴ stated, "there was little evidence for any important health impact from current or recent past exposures in the EU".

With all this new evidence, is there an effort to have beryllium properly classified?

Yes. The global producers, who were required by REACH to submit a registration dossier and agree on a classification, all concluded that beryllium metal was not properly classified and have been working with member states in the European Union to have beryllium metal reclassified.

How can I obtain assistance?

If you have any questions regarding the above information, please contact your sales representative; our sales department at +1-216-486-4200; or, the Product Safety Hotline at 1-800-862-4118 (in the U.S.) or +1-216-383-4019 (outside the U.S.). This document, as well as other product specific material safety data information, can be found at www.materion.com.

¹ National Toxicology Program – 10th Annual Report on Carcinogens – December 2002.

² International Agency for Research on Cancer. Beryllium, cadmium, mercury and exposures in the glass. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans 58: 41-117 (1993).

³ Toxicological Review of Beryllium and Compounds, Environmental Protection Agency, 1998.

⁴ Levy P., Roth H., Hwang P., Powers T. Beryllium and Lung Cancer: A Reanalysis of a NIOSH Cohort Mortality Study. *Inhalation Toxicology* 14:1003-1015 (2002).

⁵ Levy, P.S., Roth H.D., Deubner D.C. Exposure to Beryllium and Occurrence of Lung Cancer: A Reexamination of Findings from a Nested Case-Control Study. *J Occup Environ Med* 49: 96-101 (2007).

⁶ Brown S.C., et al. Lung Cancer and Internal Lung Doses among Plutonium Workers at the Rocky Flats Plant: A Case-Control Study. *Am J Epidemiol* 160(2): 163-172 (2004).

⁷ Deubner D.C., Roth H.D., Levy, P.S., Empirical evaluation of complex epidemiologic study designs: workplace exposure and cancer. *J Occup Environ Med* (2007).

⁸ Ward, E., et al. A Mortality Study of Workers at Seven Beryllium Processing Plants. *Am J Ind Med* 22: 885-904 (1992).

⁹ Sanderson W.T., et al. Lung Cancer Case-Control Study of Beryllium Workers. *Am J Ind Med* 39: 133-144 (2001).

¹⁰ Hollins, D.M., et al. Beryllium and lung cancer: A weight of evidence evaluation of the toxicological and epidemiological literature. *Critical Reviews in Toxicology*: 39(S1): 1–32 (2009).

¹¹ Strupp C. Beryllium Metal I. Experimental Results on Acute Oral Toxicity, Local Skin and Eye Effects, and Genotoxicity. *Ann Occup Hyg*; 55: 30–42 (2011).

¹² Strupp C. Beryllium Metal II. A Review of the Available Toxicity Data. *Ann Occup Hyg*; 55: 43–56 (2011).

¹³ European Commission Directorate-General for Employment, Social Affairs and Equal Opportunities. "Information Notices on Occupational Diseases: A Guide to Diagnosis": 19-21. - January 2009.

¹⁴ Cherrie J. et al. Health, socio-economic and environmental aspects of possible amendments to the EU Directive on the protection of workers from the risks related to exposure to carcinogens and mutagens at work. - Summary Report, IOM Research Project: P937/99, May 2011.