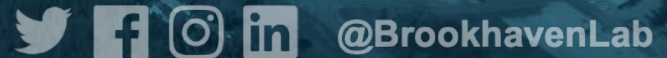




TAKE FIVE for Safety- Working with Beryllium

Frank Craner

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Primary Health Effects Associated with Exposure to Beryllium

The most common health effects associated with overexposure to beryllium in the workplace include: beryllium sensitization, chronic beryllium disease (CBD), and lung cancer.

Beryllium Sensitization - Beryllium sensitization is the activation of the body's immune response to beryllium. Beryllium sensitization can result from inhalation or skin exposure to beryllium dust, fume, mist, or solutions. While no clinical symptoms may be associated with sensitization, a sensitized worker is at risk of developing CBD when inhalation exposure to beryllium has occurred.

Chronic Beryllium Disease - CBD is a chronic lung disease caused by inhaling airborne beryllium after becoming sensitized to beryllium. Some common symptoms of CBD are shortness of breath, unexplained coughing, fatigue, weight loss, fever, and night sweats. CBD can result from inhalation exposure to beryllium at levels below the current OSHA PEL (0.2 $\mu\text{g}/\text{m}^3$). Progression of CBD can vary among individuals. CBD can progress to a chronic obstructive lung disorder, resulting in loss of quality of life and the potential for decreased life expectancy. CBD shares many signs and symptoms with pulmonary sarcoidosis, a granulomatous lung disease of unknown cause or origin. Without appropriate diagnosis, CBD may be difficult to distinguish from sarcoidosis.

Lung cancer - Based on numerous studies in occupational settings, OSHA has determined that occupational exposure to beryllium causes lung cancer in humans. In addition, the International Agency for Research on Cancer (IARC) classifies beryllium as a Group 1 carcinogen (carcinogenic to humans), and the National Toxicology Program (NTP) lists beryllium as a known human carcinogen.

Acute Beryllium Disease (ABD) - Acute beryllium disease (ABD) is a rapid onset form of chemical pneumonia that results from breathing high airborne concentrations of beryllium. ABD is generally associated with exposure to beryllium levels at or above 100 $\mu\text{g}/\text{m}^3$ and may be fatal in 10 percent of cases. ABD is extremely rare in the workplace today due to more stringent exposure controls implemented following occupational and environmental standards set in the 1970s.

DOE Prevention Program

- DOE established a chronic beryllium disease prevention program (CBDPP) to reduce the number of workers exposed to beryllium in the course of their work at DOE facilities, minimize the levels of, and potential for, exposure to beryllium, and establish medical surveillance requirements to ensure early detection of the disease.
- Chronic Beryllium Disease, sometimes called berylliosis, is a chronic lung disease caused by an immunological response from exposure to beryllium.
- CBD can progress to a serious and life-threatening disease if left undiagnosed and beryllium exposure continues.

DOE- “Safe Levels” Are Not Known for Everyone Working Around Beryllium

- The health effects of beryllium exposure depends on at least three factors:
 - 1. Concentration of beryllium particles in the inhaled air,
 - 2. Length of exposure, and
 - 3. Whether an individual has become sensitized to beryllium.
- Most people who are exposed to low levels of beryllium do not become sensitized or develop the disease. This is true even for people who had continuous, direct exposure.
- Still others get the disease from intermittent, incidental exposure. The amount of airborne breathable beryllium required to cause the disease varies for different individuals.
- The exposure limit set by the Occupational Safety and Health Administration (OSHA), or the lower action level at DOE facilities may be good enough for many workers.
- However, none of the studies published so far have established a level that is clearly safe for everyone.
- Because levels that are safe for all people are not known keeping airborne beryllium levels as low as possible is important.

Work Planning and Controls

- Exposure to beryllium via inhalation of airborne beryllium or skin contact with beryllium-containing dust, fume, mist, or solutions can cause health effects.
- Employers must reduce exposures to airborne beryllium to or below the beryllium PELs through engineering controls to the extent feasible, supplemented by respirators where all feasible controls are not sufficient to reduce exposures to or below the PELs.
- In addition, personal protective clothing and equipment (PPE) (e.g. gloves, shoe covers) is required when airborne exposures can exceed the PEL or STEL or there is the potential for skin exposure.
- Employers provide workers with detailed training on the health effects of beryllium. Training must include, among other things: information on the health hazards associated with airborne exposure to and dermal contact with beryllium, including the signs and symptoms of CBD; information on the purpose, proper selection, fitting, proper use, and limitations of personal protective clothing and equipment, including respirators; any protective measures workers can take to protect themselves from airborne or skin exposure to beryllium (including personal hygiene practices); and the purpose and description of the medical surveillance program and medical removal protection.

Job Hazard Analysis Example

ACTIVITY	KNOWN HAZARDS	CONTROL MEASURES
<p>Dust removal with HEPA vacuum cleaner.</p>	<p>Metal dust containing 2% beryllium.</p>	<p>HEPA Vacuum Personal Protective Equipment:</p> <p>Eye: Full-face respirator with eyeglass kit.</p> <p>Body: Polyolefin (Tyvek®, Klean-guard®) or similar suits to cover exposed personal clothing.</p> <p>Hand: Nitrile, PVC, Natural rubber, Neoprene, or Polyethylene disposal gloves.</p> <p>Foot: Rubbers or PVC/polyethylene/Tyvek shoe coverings or rubber boots.</p> <p>Respiratory Protection: Full-face Air Purifying Respirator, with HEPA Filter</p> <p>Clothing contaminated with beryllium may not leave the site or be taken home.</p>
<p>Disassembly of components.</p>	<p>Metal dust containing 2% beryllium (POTENTIAL).</p>	<p>PPE listed in Minimum PPE Requirements above.</p> <p>Additional Wipe samples will be taken at the conclusion of the Dust Removal with alcohol wipes. If sampling results, from those samples prove there is no potential for exposure, then PPE will be reevaluated with the Beryllium Subject Matter Expert.</p>

Conclusion

- Work Planning Process drove us to develop tailored set of training, controls, and verification activities for this work
- Planning process incurred delays
- Challenging mix of requirements and unknowns
- Questioning Attitude exhibited throughout planning
- Much cooperation has enabled us to finalize planning

Note- Slides developed from OSHA and DOE guidance and training materials.