

# Return to Work in Beryllium Areas: What is a "Safe" Level?

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# Medical Removal

- “The responsible employer must offer a beryllium-associated worker medical removal from exposure to beryllium if the SOMD determines ... that it is medically appropriate...”
  - ... where beryllium exposures are as low as possible, but in no event at or above the action level (0.2 ug/m<sup>3</sup>).
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# Why Removal?

- For a sensitized individual.
    - May or may not prevent CBD.
  - For a CBD individual.
    - May or may not arrest disease progression
    - Is disease severity based on lung burden?
      - Genetics
      - Type of exposure
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What is as low as possible?

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# Beryllium as a Naturally Occurring Substance

- Beryllium is the 44<sup>th</sup> most abundant element.
    - 1 - 15 ug/g in soil.
    - Mean of 1.9 ug/liter water
  - Air Concentrations
    - 0.00002 ug/m<sup>3</sup> to 0.002 ug/m<sup>3</sup> (ATSDR)
    - Pennsylvania – mean of 80 air samples was 0.0002 ug/m<sup>3</sup> (Sussman)
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# Community Levels Implicated in Sensitization or Disease

- Eisenbud – Lowest concentration associated with CBD =  $0.025 \text{ ug/m}^3$  or  $0.01 \text{ ug/m}^3$ .
    - With increased production = 8 x higher.
  - Lieben – Community cases with be levels greater than  $0.01 \text{ ug/m}^3$ .
    - Up to 5 miles from the plant.
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# Workplace Levels Associated with Sensitization or CBD

- Less usable data???????
    - Different sampling methods.
    - Compliance sampling.
    - Potential spike exposures.
    - Multiple exposure types.
    - Exposure duration.
  - Attack on the 2  $\mu\text{g}/\text{m}^3$  Standard
    - Shima
    - Kreiss
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# Low exposures related to BeS and CBD

Study	Industry	Lowest exposures associated with BeS/CBD
Stange, 2001	Nuclear workers	$< 0.5 \mu\text{g}/\text{m}^3$
Kelleher, 2001	Precision machinists	0.02 to $0.1 \mu\text{g}/\text{m}^3$
Hennenberger, 2001	Beryllia Ceramics	$0.05 \mu\text{g}/\text{m}^3$ to $0.06 \mu\text{g}/\text{m}^3$

# Our Experience

- Sensitization can happen with less than one month exposure at levels below 2  $\mu\text{g}/\text{m}^3$ .
  - Sensitization and disease can happen at mean exposure levels of less than 1.0  $\mu\text{g}/\text{m}^3$ .
  - Mean levels of less than 0.3  $\mu\text{g}/\text{m}^3$  seem to result in lower sensitization rates.
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# Current Standards

- OSHA PEL =  $2.0 \text{ ug/m}^3$ 
    - Considered not protective
  - NIOSH REL =  $0.5 \text{ ug/m}^3$ 
    - Carcinogen driven
  - DOE Action Level =  $0.2 \text{ ug/m}^3$ 
    - May reduce sensitization.
    - May or may not help sensitized individuals
  - Wambach and Tuggle =  $0.1 \text{ ug/m}^3$
  - ACGIH =  $2 \text{ ug/m}^3$ 
    - Proposed =  $0.02 \text{ ug/m}^3$  with skin designation.
  - EPA =  $0.01 \text{ ug/m}^3$  for 24hr Monthly Average
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# Our Suggestions

- For employees that are sensitized or have CBD.
    - Potential exposures should be as low as possible and at least below  $0.01 \text{ ug/m}^3$ .
    - The potential for re-suspension of beryllium dust should be minimal in areas where they work.
    - These requirements should be verified by sampling unless the area is known to have never had beryllium contamination. (Nevada experience)
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# Determination of Airborne Beryllium Concentration

- Collect enough samples to assure that the exposure level is less than  $0.01 \text{ ug/m}^3$ .
    - Samples should be in the area in which the employee is to work.
    - Enough samples should be taken to assure statistical significance.
    - Samples should be taken under normal working conditions.
    - Some samples should be breathing zone samples.
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# Potential Re-Suspension

- Is beryllium present in accumulated dust at levels above ambient levels?
  - Is it possible that beryllium will be brought into the facility?
    - Employee carried contamination.
    - Ventilation system contamination.
    - Introduction of beryllium parts.
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# Wipe Sampling for Beryllium Accumulation

- Wipe samples should be taken in representative areas.
    - Areas where dust has been for some time.
    - Areas that have been cleaned frequently.
    - Ventilation system samples.
    - Above ceiling samples.
  - Analysis of samples
    - Samples should be taken with as low a detection level as possible.
    - Background samples should be taken in some areas where beryllium contamination is not possible.
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# Continued Sampling

- Periodic wipe and air samples should be taken to assure continued low exposure levels.
  - Samples should be taken when the employee requests samples.
    - Sample priority for sensitized individuals.
  - All sampling results should be provided to employee or employees in area.
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# Skin Exposure

- Still very little information regarding skin exposure.
  - If previous conditions are maintained, skin exposure should be minimal.
    - No contaminated equipment.
    - No contaminated dust at levels above ambient.
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