

BERYLLIUM GENERAL INDUSTRY STANDARD

Guidance on Medical Surveillance for Beryllium Exposed Workers¹

Beryllium is a lightweight metal used primarily in alloys to add strength, thermal stability, and other properties valued in the aerospace and defense industries. Workers can develop adverse health effects from breathing beryllium in dust, mists, fumes, or in other forms, or through skin contact with beryllium particulates, fumes, or solutions. OSHA has finalized beryllium standards for general industry (29 C.F.R. § 1910.1024), construction (29 C.F.R. § 1926.1124), and shipyards (29 C.F.R. § 1915.1024) to better protect workers from this toxic metal.

What is Medical Surveillance?

Medical surveillance is a way to optimize worker health using health data. Its purpose is to identify new or worsening cases of work-related disease and other adverse health effects, in order to identify emerging problems in the workplace and support interventions such as elimination or control of exposures to the hazards that are the underlying causes of adverse health effects observed in affected workers.

Medical surveillance programs can contribute to the success of workplace health and safety programs by identifying potential problem areas and verifying the effectiveness of existing control and prevention programs.

Health Effects Associated with Beryllium Exposure

- Beryllium Sensitization
- Chronic Beryllium Disease (CBD)
- Acute Beryllium Disease
- Lung Cancer

Medical Surveillance Requirements for Workplaces with Beryllium Exposure (paragraph (k))

OSHA has established medical surveillance requirements for beryllium exposure, which are highlighted in the following paragraphs. The agency requires employers to offer medical surveillance to workers when any of the following conditions are met: the worker is or is reasonably expected to be exposed at or above the action level of 0.1 µg/m³ for more than 30 days in a year; the worker shows signs or symptoms of CBD or other beryllium-related health effects; the worker is exposed to beryllium during an emergency²; or the employer has received a recommendation for continued medical surveillance from a licensed physician³ after the worker's most recent medical exam required by the standard. These conditions are referred to as triggers for medical surveillance and are outlined in paragraph (k)(1) of the standards.

When any of the triggers described above occur, the employer is required under the beryllium standards to offer medical surveillance to the worker.

¹ This guidance highlights and explains certain medical surveillance requirements in OSHA's health standards for beryllium. It is not comprehensive and interested parties are encouraged to review the relevant standard, available at www.osha.gov/beryllium, for a list of complete requirements.

² The requirement to provide medical surveillance after exposure in an emergency applies only to general industry.

³ Some of the beryllium standard's medical surveillance requirements must be performed by a licensed physician. Where the standard does not specify that a task must be performed by a licensed physician, a PLHCP can perform that task.

The medical surveillance provisions of the beryllium standards include the following additional requirements:

- The standards specify the frequency of medical examinations at paragraph (k)(2). Employers must offer a medical examination to a worker within 30 days of determining that the worker meets the criteria set forth in paragraph (k)(2)(i) (medical examination within 30 days or meeting criteria) or (k)(2)(iv)(A) (medical exam within 30 days of reaching criteria if employee has not had an exam within 2 years), and then at least every 2 years thereafter for those who continue to meet the criteria in paragraphs (k)(1)³. The standards also specify medical examination at the termination of employment. See paragraph (k)(2)(iii) in the standards.
- The medical examination must include:
 - Medical and work history with emphasis on past and present airborne exposure to or dermal contact with beryllium, smoking history, and any history of respiratory system dysfunction,
 - Physical examination with emphasis on the respiratory system,
 - Physical examination for skin rashes,
 - Pulmonary function tests,
 - Beryllium lymphocyte proliferation test (BeLPT),⁴ or other equivalent test, and
 - Any other test deemed appropriate by the licensed physician or other licensed health care professional (PLHCP).⁵

Regardless of whether an employee continues to meet the criteria in paragraph (k)(1)³, employers must continue to offer a BeLPT (or equivalent test) to employees who previously qualified for BeLPT testing at least every two years after the first examination, unless the employee is confirmed positive, as outlined in paragraph (k)(3)(ii)(E) of the standards.

OSHA requires that employers provide certain information to the PLHCP. This information includes:

- A copy of the applicable beryllium standard,
- A description of the employee's former and current duties that relate to the employee's airborne exposure to and dermal contact with beryllium,
- The employee's former and current levels of airborne exposure,
- A description of any personal protective equipment (PPE) (including clothing and respirators), used by the employee, including when and how long these were used,
- Information from records of employment-related medical examinations previously provided to the employee, currently within the control of the employer, after obtaining written consent from the employee.

OSHA requires the employer to ensure that the **employee** receives a **written medical report** from the licensed physician within 45 days of the medical examination and that the PLHCP explain the results of the examination to the employee. The written medical report must include:

- The results of the medical examination, including whether the employee has any detected medical condition that may place the employee at increased risk from further airborne exposure or any medical conditions related to airborne exposure that require further evaluation or treatment,
- Any recommendations on the employee's use of PPE or respirators,
- Any recommendations for limitations on the employee's airborne beryllium exposure,
- Any recommendation for referral to a CBD diagnostic center, continued medical surveillance, or medical removal.

⁴ The BeLPT is a recognized diagnostic test for measuring the immune response to beryllium (e.g., beryllium sensitization). Workers sensitized to beryllium are at risk for developing CBD and need continuing medical follow-up. CBD is diagnosed when medical screening identifies a beryllium exposure history and characteristics in the lung that indicate CBD.

⁵ Other tests may include a low-dose CT scan, which is used for diagnosing lung cancer. See section on other tests deemed appropriate by PLHCP for further information.

OSHA also requires the **employer** to obtain a **written medical opinion** from the licensed physician within 45 days of the medical examination. The written medical opinion must include:

- The date of the examination,
- Statements that the examination met the requirements of the applicable beryllium standard and that the results of the examination were explained to the worker, and
- Any recommended limitations on the employee's use of respirators, protective clothing, or equipment.
- If the employee provides written authorization, the written opinion must also contain any recommended limitations on the employee's airborne exposure to beryllium.

If the worker is either confirmed positive for beryllium sensitization or diagnosed with CBD or a licensed physician has determined it appropriate **and** the worker provides written authorization then the written opinion must also contain:

- A recommendation to provide continued medical surveillance;
- A referral to a CBD Diagnostic Center (see below); and,
- A recommendation for medical removal.

If the written opinion includes any of the above, the employer must offer the worker what the licensed physician has recommended in accordance with paragraphs (k)(2)(ii) (periodic medical surveillance), (k)(7) (CBD Diagnostic Center), and/or (l)(2) (medical removal) of the standard.

Employee Participation in Medical Surveillance

Although employers must offer medical surveillance, participation in the medical surveillance program is voluntary for workers. If an

employee refuses to take the prescribed medical exams or tests, the employer could consider having the employee sign a statement that they refused the offered examination/tests. For additional information on employee participation in the medical surveillance program, including the impact for respirator use and future work assignments, please see www.osha.gov/laws-regs/standardinterpretations/2004-10-21.

In addition, the employer must ensure that the PLHCP advises the employee of the risks and benefits of participating in the medical surveillance program and the employee's right to opt out of any or all parts of the medical examination.

Workers with potential exposure to beryllium are encouraged to participate in the medical surveillance programs offered by their employer. In addition to protecting the individual worker, active participation in the medical surveillance program helps increase the effectiveness of any health and safety program by providing the employer with valuable information on potential sources of beryllium exposure that may result in adverse health effects (e.g., sensitization and CBD). Providing this information to the employer ensures that corrective actions can be taken to eliminate or reduce the risk to fellow workers. See section on "[Workers' Rights](#)" for more information.

Diagnosis of Chronic Beryllium Disease

Chronic Beryllium Disease (CBD) is a chronic granulomatous lung disease caused by inhalation of airborne beryllium by an individual who is beryllium-sensitized. In the early stages of CBD, an individual may not experience any symptoms. However, over time, the following symptoms may develop: shortness of breath with physical activity, dry cough that will not go away, fatigue, night sweats, chest and joint pain, or loss of appetite.

A work and medical history of exposure to beryllium is an important step in diagnosing CBD. The first medical test for diagnosis of CBD is the beryllium lymphocyte proliferation test (BeLPT). The BeLPT is a test that determines if the immune system reacts to beryllium as a foreign substance—

this reaction results in an abnormal BeLPT. In individuals who are not sensitized to beryllium and do not have CBD, the immune system does not respond to beryllium in any manner, and they have normal BeLPT results. Individuals must be sensitized to beryllium in order to develop CBD.

Individuals with either two abnormal BeLPT test results, an abnormal and a borderline test result, or three borderline test results are considered to be "confirmed positive." An individual may also be considered "confirmed positive" based on the result of a more reliable and accurate test indicating the person has been identified as having beryllium sensitization. In either case, the employee should be encouraged to undergo further evaluation to determine if they have CBD.

There is no known cure for CBD. Treatment may include corticosteroids, oxygen, and other means to ease symptoms or slow the disease progression.

BeLPT

There are currently only a few laboratories with sufficient expertise to perform the BeLPT. Due to some procedural differences between laboratories performing the BeLPT, careful consideration of the BeLPT test protocols and interpretation of BeLPT results should be considered prior to making a laboratory selection. Under the OSHA beryllium standards, a laboratory must be certified under the College of American Pathologists/Clinical Laboratory Improvement Amendments (CLIA) guidelines to perform the BeLPT. Physicians and employers may want to review information contained within the Department of Energy Specification (DOE-SPEC-1142-2001 April 2001) Beryllium Lymphocyte Testing (BeLPT)) for background information to familiarize themselves with the BeLPT prior to selecting a laboratory (https://icpt.doe.gov/media/1257/attachment_b_doe_spec_1142_2001.pdf). Because the blood sample must arrive at the

testing site within 24 to 30 hours of being drawn, a key consideration is the laboratory's ability to accommodate this time frame.

Appropriate insulating material should be used to maintain satisfactory temperature control and to avoid extreme temperature fluctuation of the cells and maximize cell viability during shipping. The samples must be labeled with patient's name, date and time blood is drawn, identification number, and name of person obtaining specimen at a minimum. Biosafety packing should be utilized. Samples or the packing material should not be refrigerated, and shipping containers should be labeled: HUMAN BLOOD, DELIVER IMMEDIATELY, DO NOT FREEZE, PERISHABLE.

Other Tests Deemed Appropriate by PLHCP

Appropriate medical tests may include exercise tolerance testing, pulmonary function testing, a chest X-ray or CT scan, blood work and diagnostic bronchoscopy with biopsy and lavage (lung washing) but the extent and applicability of these tests should be based on the patient's overall health and the licensed physician's expert judgement. The diagnosis of CBD can be made on the basis of diagnosis of beryllium sensitization and the finding of granulomas, or by an abnormal beryllium test in the immune cells from the lungs and significantly elevated number of a particular type of an immune cell called a lymphocyte, in addition to the worker's medical and work history.

CBD Diagnostic Center

A CBD diagnostic center is a medical diagnostic center that has a pulmonologist or pulmonary specialist on staff and on-site facilities to perform a clinical evaluation for the presence of chronic beryllium disease (CBD). The CBD diagnostic center must have the capacity to perform pulmonary function testing, bronchoalveolar lavage (BAL) and transbronchial biopsy (see paragraph (b) of the standard for further information).

Evaluation at a CBD diagnostic center must be scheduled within 30 days and must occur within a reasonable time of (a) the employer's receipt of a licensed physician's written medical opinion to the employer that recommends referral to a CBD diagnostic center; or (b) the employee presenting to the employer a licensed physician's written medical report indicating that the employee has been confirmed positive or diagnosed with CBD, or recommending referral to a CBD diagnostic center.

As a general guide for referral to a CBD Diagnostic Center, an employee must be referred if confirmed positive or if the licensed physician otherwise deems it appropriate (for example, because the employee is showing signs or symptoms consistent with CBD).

If an employer is unable to schedule an examination at a CBD diagnostic center within the 30-day timeframe required by paragraph (k)(7), OSHA will consider the employer's good-faith efforts, where they have documented a reasonable attempt to schedule the examination consistent with the intent of paragraph (k)(7), in determining whether or not to issue a citation.

Further Information

For more information, see OSHA's Health Effects section in the [final beryllium rule](#), the National Institute for Occupational Safety and Health's [Workplace Safety and Topics – Beryllium](#) webpage; National Jewish Medical and Research Center's [Chronic Beryllium Disease Treatment](#) webpage; the Agency for Toxic Substance and Disease Registry's [ToxFAQs for Beryllium](#) webpage; and the Department of Energy's [Chronic Beryllium Disease Prevention Program](#) webpage.

Workers' Rights

Workers have the right to:

- Working conditions that do not pose a risk of serious harm.
- Receive information and training (in a language and vocabulary the worker understands) about workplace hazards, methods to prevent them, and the OSHA standards that apply to their workplace.
- Review records of work-related injuries and illnesses.
- File a complaint asking OSHA to inspect their workplace if they believe there is a serious hazard or that their employer is not following OSHA's rules. OSHA will keep all identities confidential.
- Exercise their rights under the law without retaliation, including reporting an injury or raising health and safety concerns with their employer or OSHA. If a worker has been retaliated against for using their rights, they must file a complaint with OSHA as soon as possible, but no later than 30 days.

For additional information, see OSHA's Workers page (www.osha.gov/workers).

How to Contact OSHA

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's workers by setting and enforcing standards and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

This guidance is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm.

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