

Benzene Medical Surveillance

Overview

[Benzene is a clear, flammable liquid chemical](#) used in the manufacturing of rubbers, lubricants, dyes, detergents, drugs, and pesticides. In industrial operations, it is used as an ingredient to make plastics, Styrofoam®, resins, nylon, and synthetic fibers, and it is added to some fuels.

Health Effects

Benzene is rapidly absorbed by the body after inhalation and ingestion. Intact skin absorption, while less extensive, may increase total body burden. Short-term exposure can cause drowsiness, dizziness, and unconsciousness. Acute inhalation and overexposure can be fatal, according to a toxicological profile compiled by the [Agency for Toxic Substances and Disease Registry \(ATSDR\)](#). [Benzene is a known human carcinogen](#) primarily linked to the development of cancer of the blood and bone marrow, including leukemia, lymphoma, and multiple myeloma.

OSHA Requirements

The federal Occupational Safety and Health Administration (OSHA) enforces permissible exposure limits (PELs) for benzene. A medical surveillance program ([1920.1028\(i\)](#)) is required for employees who are or may be exposed to benzene at or above permissible exposure limits (PELs) for 30 or more days per year.

Under [1910.1028, Subpart Z, Toxic and Hazardous Substances](#), the PEL for benzene is 1 part per million (ppm) averaged over an eight-hour workday. The short-term exposure limit is 5 ppm (based on a 15-minute sample). States with their own occupational health and safety agencies are required to meet or exceed these standards.

OSHA requires an initial medical surveillance exam before an employee starts a job with benzene exposure risk or within 60 days of the benzene standard taking effect. The examining physician must review test results. An initial medical examination *is not* required



when adequate records show that a covered employee has been examined within the past 12 months.

The initial exam must include:

- Detailed medical history
- Complete physical examination
- Complete blood count, including a leukocyte count with differential, a quantitative thrombocyte count, hematocrit, hemoglobin, and erythrocyte count and indices (MCV, MCH, MCHC)

Annual (periodic) examinations must include:

- Brief history regarding any new exposure to potential marrow toxins
- Changes in medicinal drug use
- Changes in the appearance of physical signs relating to blood disorders
- Complete blood count (see initial exam)

Post-exposure emergency monitoring requires:

- An exposed employee to provide a urine sample at the end of his or her shift
- A urinary phenol test of the sample within 72 hours
- Employees who wear a respirator for at least 30 days a year to undergo a pulmonary function test every three years.

Exposure Guidance

In January 2024, the [American Conference of Governmental Industrial Hygienists \(ACGIH\)](#) reduced its benzene threshold limit value (TLV®) recommendation from 0.5 ppm to 0.02 ppm for an eight-hour workday and eliminated the short-term exposure limit from its guidelines. According to the ACGIH, industrial hygienists use threshold limit values to make decisions regarding safe levels of exposure to airborne concentrations of chemical substances. They represent conditions “under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse health effects.”

By lowering the TLV, industry observers say the ACGIH guidelines challenge occupational health and safety professionals in certain industries to reassess their protocols and develop strategies to further protect employees with benzene exposure risk.

While OSHA enforces its standard, it also recommends that employers consider using alternative benzene exposure limit guidelines to protect workers. In its [PEL – Annotated \(Z\) Tables](#), the agency states that [TLVs are recommendations](#) “intended for use in the practice of industrial hygiene, to be interpreted and applied only by a person trained in this discipline. They are not developed for use as legal standards and ACGIH® does not advocate their use as such. However, it is recognized that in certain circumstances individuals or organizations may wish to make use of these recommendations or guidelines as a supplement to their occupational safety and health program.”

Other available guidelines include the [National Institute for Occupational Safety and Health’s recommended exposure limit \(REL\)](#) for benzene, which is 0.1 ppm up to a 10-hour time-weighted average and a 1 ppm short-term limit. These guidelines are based on risk evaluations using human or animal health effects data, and on an assessment of what levels can be feasibly achieved

with engineering controls and measured by analytical techniques. More exposure limits and guidelines are [referenced by NIOSH here](#).

Best-Practice Recommendations

WorkCare occupational medicine physicians advise employers to apply these best medical practices for benzene medical surveillance programs to protect employee health and comply with standards and guidelines:

1. Require all employees with benzene exposure risk to undergo initial and periodic physical exams in person as stated in the OSHA standard.
2. For acute exposures, require the use of a urine S-phenylmercapturic acid (S-PMA) test. This test is not used for baseline and annual benzene medical surveillance monitoring. The [ACGIH Biologic Exposure Index](#) for S-PMA is 25 micrograms per gram of creatinine in the urine.
3. Consider following ACGIH guidelines, which are more protective of workers than the OSHA standard and represent current understanding of the significant health risks of benzene exposure. OSHA last updated its standard in 1987.

Contact WorkCare

Visit [WorkCare.com](#) to learn about our workplace medical surveillance, medical exam, drug testing, and regulatory compliance solutions for employers. We’re here to help.