

# SENSOR

# Occupational Lung Disease Bulletin

Massachusetts Department of Public Health

Occupational Health Surveillance Program, 2 Boylston Street, 6th fl, Boston, MA 02116

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July 2004

Dear Health Care Provider,

In this issue we are presenting a summary of an article on chronic beryllium disease written by Lew Pepper, MD, MPH Assistant Professor of Environmental Health at Boston University School of Public Health (BUSPH).

Occupational exposures to beryllium are of great concern as very low-level exposures can cause beryllium sensitization and chronic beryllium disease. Today, exposure to beryllium occurs in aerospace, telecommunications, automotive, and electronics industries. Beryllium exposures also occur in operations in metal machine shops, and in alloy applications, such as gas drilling, jewelry, bicycle frames, and dental appliances. Many studies indicate that the current legal exposure limit is not adequate; therefore there is a great need for awareness, prevention and medical screening among those exposed<sup>1</sup>.

Under Dr. Pepper's direction, Boston University School of Public Health has received a contract to develop and implement a medical screening and surveillance program for former beryllium exposed workers in Worcester, Massachusetts. This bulletin takes a closer look at the industries targeted by this program, the health effects of workers exposed to beryllium, and the methods of diagnosing chronic beryllium disease. Beryllium disease is one of several occupational lung diseases that are reportable to the Massachusetts Department of Public Health.

To receive your *Bulletin* by e-mail send a message to [Occupational.Asthma@state.ma.us](mailto:Occupational.Asthma@state.ma.us)

Sincerely,  
Kathy Raleigh, MPH

## Medical Screening for Chronic Beryllium Disease in Massachusetts

*By Lew Pepper, MD, MPH Assistant Professor of Environmental Health at Boston University School of Public Health*

Beryllium, which has been used extensively in the U.S. Department of Energy (DOE) nuclear weapons program, is a concern among current and historically exposed workers. Congress recently enacted the Energy Employees Occupational Illness Compensation Act of 2000 to provide

compensation benefits for DOE weapons workers who developed work-related illnesses due to radiation, beryllium and silica exposure.

Beryllium is a metal that although lighter than aluminum, is 40% more rigid than steel. Beryllium is ideal for use in the nuclear industry due to its ability to withstand high temperatures and to act as a thermal conductor. Highly toxic dust and fumes are generated when beryllium is ground, machined, heated, or combusted in fuel. Beryllium exposure has been known to cause chronic beryllium disease, a debilitating and potentially fatal disease affecting the lungs. Other major health problems caused by beryllium exposure include beryllium sensitization, acute beryllium disease (now exceedingly rare), and lung cancer.

In Worcester, former workers from a number of companies which performed beryllium work under contract to the DOE and the Atomic Energy Commission (AEC), urged their congressional delegation to support a medical program to identify beryllium related disease in this group. The Massachusetts Coalition for Occupational Safety and Health, United Steelworkers Local Union #2285, along with the assistance of Senator Kennedy and Congressman McGovern of Worcester, convinced the DOE of the need to screen former beryllium workers from the Worcester area. In 2003, the U.S. DOE awarded Boston University School of Public Health a contract to develop and implement a medical screening and surveillance program for former beryllium exposed workers in Worcester, Massachusetts.

The overall objective of the medical surveillance and screening program is to minimize the health impact of diseases caused by beryllium exposure to former workers at the companies Wyman-Gordon and Norton Abrasives (Saint Gobain). Wyman-Gordon supplied beryllium-containing products to the Rocky Flats Colorado DOE plant and the Oak Ridge Tennessee Y-12 plant. Approximately 50% of the beryllium work at Wyman-Gordon was for the DOE, while the remainder was for other government contracts.

Norton Abrasives (Saint-Gobain) developed methods for shaping beryllium powder for use in nuclear reactors. By 1949, at least one death from beryllium poisoning had been recorded at Norton. Norton provided thorium and uranium products to the AEC, and was a beryllium vendor for the AEC/DOE between 1943 and the mid 1950's.

<sup>1</sup> Infante P. and L. Newman. Beryllium exposure and chronic beryllium disease. *Lancet* 2004; **363**: 415-416.

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## Health Effects and Prognosis

The major health problems associated with beryllium exposure are beryllium sensitization and acute and chronic beryllium disease (CBD). It is estimated that beryllium sensitization occurs at a rate of 2 - 14% in those exposed (higher rates among machinists). Sensitization occurs following exposure to beryllium and can be determined through a blood test known as the Beryllium Lymphocyte Proliferation Test (BeLPT). Sensitization is a precursor to CBD, and sensitized workers are at an increased risk of developing CBD.

Prevalence estimates of acute beryllium disease in workers ranged as high as 7% in the early literature. The disease often developed within days to weeks following massive exposure. Signs and symptoms of the acute disorder included shortness of breath, a nonproductive cough, chest pain, and a sudden, marked drop in vital capacity. Acute beryllium disease was quite devastating, with death occurring in approximately 10% of the cases. Those with slower-onset acute disease typically recovered in one to three months. Approximately 17% of workers with acute disease subsequently developed chronic beryllium disease.

The U.S. Occupational Safety and Health Administration (OSHA) permissible exposure limit for beryllium is currently  $2 \mu\text{g}/\text{m}^3$  as an 8-hour time-weighted average. This standard eliminated most acute beryllium disease, however it has not offered adequate protection from CBD. While the acute form of the disease is rare today, cases of chronic beryllium disease continue to be diagnosed in worker populations at DOE sites and in private industry.

Chronic Beryllium Disease is believed to be a cell-mediated hypersensitivity reaction which develops in most beryllium sensitized individuals. In sensitized people, beryllium stimulates a cellular immune response resulting in granuloma formation, which eventually may progress to pulmonary fibrosis. Research has shown that there may be genetic factors that put some individuals at an increased risk for beryllium sensitization and CBD.

CBD's early stages may be completely asymptomatic or it may begin with nonspecific respiratory symptoms, including mild shortness of breath and cough without recognizable changes on chest x-rays. The majority of patients develop symptoms more characteristic of chronic disease: cough, burning chest pain, progressive shortness of breath (dyspnea) with exertion, weakness, fatigue, dyspnea at rest, and, characteristic of advanced disease, anorexia, and weight loss. Signs of right heart failure may also be detected in advanced cases.

The clinical course of CBD is extremely variable. Some individuals remain stable for many years, while some

progress more precipitously, developing severe respiratory symptoms within a few months. The majority experience a slow, inexorable decline in pulmonary function. Mortality from CBD occurs in an estimated one-third of cases.

## Medical Screening Program Status

This past October, medical screening to identify beryllium related disease among former Wyman-Gordon workers was initiated at the Marlboro Hospital Occupational Health clinic. Former worker participants are provided a chest x-ray (with B-reading), spirometry, and a beryllium lymphocyte proliferation test. All participants receive a medical results letter from the project, and individuals who are BeLPT positive may enroll in the DOE energy employees compensation program. To date, approximately 200 Wyman-Gordon workers have been screened, and approximately 5% have been determined to be sensitized.

## Conclusion

The Boston University School of Public Health medical screening and surveillance program is an important step toward mitigation of health problems associated with beryllium exposure. Unfortunately, hundreds of thousands of U.S. workers continue to be exposed to beryllium today, and there are still many undiagnosed cases of chronic beryllium disease. Awareness on the part of the employee, employer and physician are all key components to preventing and controlling both exposure to beryllium and chronic beryllium disease.

*If you have any questions about the BUSPH Medical Screening and Surveillance Program please contact Christopher Mooney, the screening Program Manager at (617) 638-5814 (or toll-free at 1-877-466-3089) or Dr. Lew Pepper at (617) 638-4620.*

*For more information about the DOE program or CBD please visit:*

US DOE Chronic Beryllium Disease Prevention Program  
<http://tis.eh.doe.gov/be/>

Center to Protect Worker's Rights Beryllium Fact Sheet  
[www.cdc.gov/elcosh/docs/d0500/d000542/d000542.html](http://www.cdc.gov/elcosh/docs/d0500/d000542/d000542.html)

Agency for Toxic Substances and Disease Registry Beryllium Facts  
[www.atsdr.cdc.gov/tfacts4.html](http://www.atsdr.cdc.gov/tfacts4.html)

## Number of Work-Related Asthma Cases Reported to Massachusetts SENSOR, Total Cases from March 1992- June 2004

March	April	May	Total (3/92 - 5/04)
2	9	3	976

*Remember to report all cases of suspected or confirmed work-related asthma to the Occupational Health Surveillance Program by phone, fax or mail.*