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Using Workplace Medical Surveillance to Evaluate A New Preventive Program in the Beryllium Industry: A Model for The Manufacturing Sector

KJ Cummings (1) presenting, CR Schuler (1), DC Deubner (2)

National Institute for Occupational Safety and Health, Morgantown, WV, United States (1), Brush Wellman Incorporated, Cleveland, OH, United States (2)

As many as 130,000 U.S. workers are exposed to beryllium and potentially at risk for chronic beryllium disease (CBD), an immune-mediated granulomatous lung disease. The blood beryllium lymphocyte proliferation test (BeLPT) detects beryllium sensitization, identifying workers at higher risk for CBD. Prevention of sensitization and CBD has traditionally emphasized engineering controls to maintain airborne beryllium levels below the Permissible Exposure Limit (PEL) of 2 □g/m3. A beryllium ceramics manufacturing facility initially focused preventive efforts on engineering controls such as enclosing machines and augmenting exhaust ventilation. Yet a 1998 survey of the facility's current workers showed 10% (15/151) were sensitized and 3% (5/151) had CBD. A new preventive program, stressing administrative controls and personal protective equipment (PPE) in addition to further engineering controls, was subsequently established from 1998-2000. In 2000, medical surveillance was initiated for early identification of prevention failures, allowing ongoing evaluation of the preventive program. We aimed to determine the effectiveness of the new preventive program and the impact of medical surveillance on its content.

Starting in 2000, newly hired workers had BeLPTs at hire and 3, 6, 12, 24, and 48 months of employment. We compared workers hired from 2000-2004 with workers hired from 1993-1998 and tested in the 1998 survey, using sensitization per person-months of employment. With the facility's industrial hygienist, we reviewed changes made to the preventive program after the establishment of medical surveillance, identifying changes resulting from detection of beryllium sensitization.

From 2000-2004, the facility hired 126 new workers; 97 of these had at least 1 BeLPT after hire. Four workers had abnormal BeLPT results at hire, and 1 developed sensitization during employment, giving a range of sensitization of 0.7 (excluding those workers with abnormal results at hire) to 2.7 (including those workers) per 1000 person-months of employment. From 1993-1998, the facility hired 200 new workers; 70 were still employed during the 1998 survey and participated. Seven had sensitization, or 6.4 per 1000 person-months of employment. A total of 37 changes to the preventive program occurred from 2000-2005; 9 (24%) were motivated by medical surveillance results.

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These findings demonstrate the effectiveness of the new preventive program at reducing beryllium sensitization during the first years of employment. They also highlight the substantial impact that the workplace medical surveillance had on the preventive program's content. The extension of this comprehensive preventive program, in which engineering controls to reduce airborne beryllium levels are augmented by enhanced administrative controls and PPE, to other beryllium facilities has the potential to improve workplace safety and health throughout the beryllium industry. This preventive approach may also be useful in other manufacturing sector industries in which the existing PEL does not prevent adverse health outcomes or in developing industries for which exposure limits have not been established. More generally, workplace medical surveillance can be used to provide feedback on health and safety interventions throughout the manufacturing sector.

The findings and conclusions in this abstract have not been formally disseminated by NIOSH and should not be construed to represent any agency determination or policy.

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