274.

USE OF ANIMAL ACUTE TOXICITY DATA TO DERIVE IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONCENTRATIONS: EXTRAPOLATING TO HUMAN EFFECT THRESHOLDS.

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Immediately Dangerous to Life or Health (IDLH) concentrations have a long history of use in industrial settings in defining work practice and respiratory protection requirements for entry into potential high exposure environments. We explored approaches for extrapolating from acute toxicity data in animals to estimate human effect thresholds that might serve as the basis for deriving an IDLH value. Based on our analysis we propose updated default factors for extrapolating to an IDLH value from either an LC50 (the concentration estimated to cause a 50% mortality rate in an acute toxicity study) or an animal lethality threshold (commonly estimated as an animal LCLO, LC10, etc.) when more precise data are unavailable. We hypothesized that potent irritants may have a greater LC50/human serious effect threshold ratio than other chemicals. Our results were mixed with a significant mode of action effect observed for a subset of 20 chemicals, but not in a broader analysis of current IDLH values. Approaches for using endpoints other than lethality from acute toxicity studies also were investigated. We found that for many chemicals, the application of quantitative concentration-response approaches is hampered by typical study designs. One type of acute animal toxicity study result that often is used as a basis for deriving an IDLH concentration for irritants is an RD50 (a concentration that reduces respiratory rate in a standardized rodent test by 50%). We evaluated ratios of RD50 values to current human-effect based IDLH concentrations and, based on the distribution of these ratios, propose applying a default factor to these values to derive an IDLH concentration. Overall, this work further enhances the transparency of the underlying rationale for the default methods used to derive IDLH concentrations.

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ASSESSMENT OF EXPOSURE-RESPONSE PATTERNS FOR BERYLLIUM SENSITIZATION AND CHRONIC BERYLLIUM DISEASE.

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The current Occupational Exposure Limit (OEL) for beryllium was believed to be protective against chronic beryllium disease (CBD) until studies in the mid-1980s began using newer medical diagnostic techniques that identified beryllium sensitization (BeS) and subclinical disease in the absence of physical symptoms. The objective of this study was to review all available epidemiologic studies of beryllium workers to assess whether any patterns are observed for exposure indices, job categories, manufacturing processes, chemical forms of beryllium (e.g., beryllium oxide, metal, and alloy), and the prevalence of CBD and BeS. In addition, the influence of particle size and different exposure metrics on CBD and BeS was evaluated. Despite considerable variation in study findings, several patterns are apparent. First, the prevalence of CBD and BeS was greatest among workers involved with machining or grinding of beryllium oxide and metal. Second, no cases of CBD have been reported among workers with exclusive exposure to mining or processing of beryllium ore. Third, differences in the prevalence of CBD involving work with different chemical forms of beryllium appear to be dependent on the operation and generation of fine particulate. Fourth, frequency and magnitude of peak concentrations as well as particle size appear to be associated with the prevalence of CBD and BeS. In contrast, mean or median airborne concentrations of beryllium, cumulative dose, and exposure duration have not provided consistent dose-response associations. Fifth, CBD and BeS are observed among workers who are employed in areas where airborne beryllium concentrations are generally greater than 0.2 $\mu g/m^3$. Based on what has been learned in recent years, increased risk of BeS and CBD is likely derived from a combination of factors such as particle size, chemical form of beryllium, and peak exposure, which are important to consider when setting an OEL for beryllium.

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ANALYSIS OF BERYLLIUM EXPOSURE AMONG BERYLLIUM SENSITIZATION AND CHRONIC BERYLLIUM DISEASE WORKERS IN A BERYLLIUM METAL MACHINING PLANT: IMPLICATIONS FOR AN OCCUPATIONAL EXPOSURE LIMIT.

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The current occupational exposure limit (OEL) for beryllium has been in place for more than 50 years and was believed to be protective until medical diagnostic techniques in the 1980s identified beryllium sensitization (BeS) and chronic beryllium disease (CBD) in the absence of physical symptoms. A major challenge in identifying a revised OEL for beryllium is that previous studies have used inconsistent sampling and exposure assessment methodologies and definitions for BeS and CBD. These differences have prevented direct comparisons between studies as well as the identification of a clear exposure-response relationship. Industrial hygiene and health surveillance data from a beryllium metal machining facility were analyzed to assess whether this information provides insight into the exposure-disease relationship for BeS and CBD, which could be useful in identifying an OEL that is protective of worker health. Airborne beryllium concentrations for different job titles were evaluated, historical trends of personal and ambient beryllium levels were compared for pre- and post-engineering control measures (implemented in the 1990s), and average and upper bound exposure estimates were developed for workers identified as BeS or with CBD. This assessment included the analysis of 3,833 personal lapel and 614 general area samples and other new data collected by plant health and safety staff at the facility. Results of this analysis showed that all workers diagnosed with CBD were exposed to beryllium concentrations of 0.2 $\mu g/m^3$ (95th percentile) or greater. The prevalence of BeS among surveyed workers exposed below a 95th percentile beryllium concentration of 0.2 $\mu g/m^3$ was consistent with the anticipated background rate of BeS of 1–2%. It was concluded based on this analysis of BeS and CBD workers in a beryllium metal machining plant, concentrations maintained below 0.2 $\mu g/m^3$ 95% of the time will likely prevent BeS and CBD in nearly all beryllium workers.

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RESPIRATOR USE AND PRACTICES BY NATIONAL DEMOLITION ASSOCIATION MEMBER COMPANIES.

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Respiratory illnesses caused by airborne hazards at the workplace can be prevented by adequate control measures. In the absence of adequate engineering and administrative controls, proper respirator selection and use is essential. NIOSH conducted eight focus groups during March–November 2004 arranged by the National Demolition Association. The association represents the majority (approximately 80%) of U.S. demolition work in terms of revenue. The objectives of the focus groups were to identify the types of airborne hazards present at workplaces, control measures used to reduce these hazards, types of respirators used, and barriers impacting respirator use. Participants reported exposures to abrasive blasting agents, arsenic, asbestos, cadmium, carbon monoxide, chlorine, concrete dust and silica, dust from drywall, diesel, and gasoline fuels, fluorine, hydrogen sulfide, lead, man-made mineral fibers, mold, pigeon droppings, PCBs, ionizing radiation, and welding fumes. Engineering control measures included using water sprays, mechanization, longer torches and standing upwind when cutting, local ventilation, enclosed equipment cabs, and scrubbers on diesel-powered front-end loaders for interior work. Respirators were used where the feasible engineering controls could not reduce the exposures below acceptable limits. Barriers to proper respirator use included high ambient temperatures, fogging of full facepiece respirators, difficulty wearing other personal protective equipment with respirators, reduced peripheral vision, difficulty communicating and breathing, cultural differences with non-English speakers, low literacy, high worker turnover, and short duration of employment for laborers. Overall, participants were knowledgeable about and had implemented OSHA respirator program elements. This poster will describe the focus group findings and the current NIOSH education and intervention strategies to overcome the barriers identified. The