Miller, Diane M. (CDC/NIOSH/EID)

From: Wambach, Paul [Paul.Wambach@eh.doe.gov]
Sent: Monday, May 12, 2008 12:26 PM
To: NIOSH Docket Office (CDC)
Cc: Lentzen, Marge; Whitmore, Susan; Worthington, Patricia; Richter, Bonnie; McArthur, Bill; Weitzman, David
Subject: 120 - NIOSH Alert: Beryllium
Attachments: Comments on Draft NIOSH Alert 120.doc

In response to your request for public comments, attached are Department of Energy, Office of Health, Safety and security comments on the subject draft Alert.

<<Comments on Draft NIOSH Alert 120.doc>>

Paul Wambach, CIH
Industrial Hygienist
Department of Energy
Illness and Injury Prevention Programs, HS-13
Phone: 301-903-7373
Email: Paul.Wambach@hq.doe.gov

Comments on Draft NIOSH Alert
"Preventing Chronic Beryllium Disease and Beryllium Sensitization"
Department of Energy, Office of Health, Safety and Security

The Alert will help meet an important health risk communication need and we encourage its publication. The following comments and suggested changes are offered for your consideration. The suggested changes in wording are included to clarify comments.

1. The title could be changed to "Preventing Chronic Beryllium Disease."

   Comment: The overall goal is the prevention of morbidity and mortality associated with chronic beryllium disease (CBD.) Beryllium sensitization (BeS) is a biomarker of CBD with a sufficiently high predictive value to make it useful both for screening to identify individuals with CBD and for surveillance of populations to understand the prevalence and risk factors for CBD. This relationship is well explained in the Alert. However, it is conceivable that, in the future, circumstances may arise in which BeS is prevalent without CBD and its morbidity. Including it in the title is unnecessary and casual readers may interpret it as implying BeS is a separate disease.

2. Page iii, the warning could be changed to read "Workers breathing beryllium-containing materials may develop chronic beryllium disease, a potentially disabling or even fatal respiratory disease."

   Comment: Specifying "particles, fumes, or solutions" distracts readers from the warning. These are technical terms subject to misinterpretation by a casual reader who is unfamiliar with the jargon. These categories are all-inclusive so listing them is unnecessary. For occupational heath specialists, including "solutions" is controversial and will distract these readers. The Alert explains that exposure to solutions is a risk factor for CBD; however, the implication that exposure to solutions is sufficient to cause CBD would be controversial and not supported by the literature cited in the Alert. This complexity is best left for the text where it can be explained in more than one sentence.

3. On page iii, we suggest changing the heading to "Workers should take the following steps to protect themselves:" for the reasons given above.

4. On page iii, we suggest combining the major bullets "Keep beryllium out of the lungs" and "Keep beryllium-containing dusts and solutions off the skin" to read "Keep beryllium out of the lungs and off the skin:"

   Comment: The protective advice to control at the source and keep work surfaces clean help prevent both inhalation and skin exposure.

5. On page iv, we suggest changing the bullet that says "Keep airborne concentrations of beryllium as low a possible, since no safe exposure limit for beryllium is known." to "Keep airborne concentrations of beryllium as low a possible, since the safe exposure

limit for beryllium has not yet been determined."

Comment: As currently stated, many workers will incorrectly assume that exposure to a single molecule of beryllium can cause beryllium disease. That assumption is incorrect. Workers exposed to very low levels of beryllium are not contracting beryllium disease nor are members of the general population exposed to trace levels in ambient air. That means that there exists a safe level given the common use of the word "safe." The proposed change more accurately states the situation that the safe level has not yet been determined while suggesting that studies continue.

6. Page 1. We suggest a simpler title and warning statement (see comments 1and 2.)

7. Page 2, the paragraph that reads "A worker's immune system determines whether he or she will develop health problems from working with beryllium. Some workers become sensitized to beryllium, which means that beryllium has triggered the immune system to recognize and respond to this metal as a foreign substance. The risk of sensitization is determined by beryllium exposure, but it may be increased by certain genes that have been inherited from each parent."

   We suggest changing the last sentence to "The workers that become sensitized are those workers that have inherited certain genes from their parents and receive a sufficient amount of exposure."

   Comment: Epidemiology studies focus on the cases but also demonstrate that most workers with relatively high exposures do not exhibit beryllium disease. This fact strongly suggests that only the genetically predisposed workers are susceptible.

8. Page 2, the paragraph that reads "No health symptoms are associated with beryllium sensitization. However, it is believed that a person must first be sensitized before beryllium in the lungs can cause the lung scars (called granulomas) of chronic beryllium disease [Kreiss et al. 1993a]."

   We suggest changing this to read "Beryllium sensitization is a change that often occurs in people who do not have chronic beryllium disease. However, it is believed that a person must first be sensitized before beryllium in the lungs can cause the lung damage of chronic beryllium disease [Kreiss et al. 1993a]."

   Comment: The original wording is a bit awkward since BeS could be thought of as a symptom and it is associated with CBD which has other health symptoms. Also, granulomas are not scar tissue.

9. Page 3, sentences that read "Screening beryllium-exposed workers for sensitization may not prevent chronic beryllium disease in those with abnormal test results. Screening can be used to prevent chronic beryllium disease in other workers only if it is part of a medical surveillance program. Medical surveillance of a workforce looks at medical test results over time in relation to information about jobs and processes."

We suggest changing this to read "Screening beryllium-exposed workers for sensitization may not prevent chronic beryllium disease but does provide the opportunity for treatment that can prevent lung damage. Screening results can also be used to prevent new cases of chronic beryllium disease in other workers. Investigating an individual sensitization case or the pattern over time of cases in a workforce can identify jobs and processes that would benefit from additional exposure controls."

Comment: A BeS case can be a sentinel event. You are trying to explain the technical definition of "Medical surveillance" that even confuses people in the field. We don't think you will have any success getting a general audience to make distinctions between screening, monitoring and surveillance.

10. Page 4. We suggest adding a new section titled "Skin Disease," which might read as follows.

"Different beryllium compounds cause a range of skin diseases [Epstein 1991]. Soluble beryllium salts cause irritant and allergic contact dermatitis. Larger particles accidentally implanted in skin or contaminating wounds can cause chemical ulcers. Less soluble forms of beryllium can result in granulomas at the site of implantation or contaminated wounds. Reports of cases where granulomas spread away from the wound are thought to be due to movement of removable beryllium oxide on the surface of the particle. The fact that beryllium can cause granulomas in skin has led to conclusions that skin exposure may have a role in the sensitization step of CBD [Tinkle et al. 2003]."

Comment: Preventing the morbidity associated with skin disease is additional justification for many of the protective actions recommended in this alert. A reference is: W.L. Epstein, Cutaneous Effects of Beryllium, In: Beryllium Biomedical and Environmental Aspects. M.D. Rossman; O.P. Preuss; M.B. Powers, Eds. Williams and Wilkins, Baltimore, MD, 1991.

11. Page 5, sentence "Workers who refine, prepare, and process beryllium and beryllium-containing materials are at the greatest risk for sensitization and chronic beryllium disease."

We suggest changing this to read "Workers in facilities that utilize beryllium-containing materials for metal and ceramic fabrication and in metal recycling operations are at the greatest risk for sensitization and chronic beryllium disease."

Comment: The evidence for high risk in mining, milling and material production is less compelling than is the evidence for high risk in utilization plants.

12. Page 5, paragraph that reads "Risk is not limited to production workers. In many studies, additional cases of sensitization or chronic beryllium disease were identified

among nonproduction workers or workers whose exposure appeared to be minimal, such as secretaries, other clerical workers, and security guards [Kreiss et al. 1993a; Kreiss et al. 1993b; Kreiss et al. 1996; Kreiss et al. 1997; Stange et al. 2001]."

Suggest changing to read "Risk is not limited to production workers. Dust disturbing tasks associated with cleaning, retooling, maintenance and remodeling jobs also create high risk. In many studies, additional cases of sensitization or chronic beryllium disease were identified among workers whose exposure appeared to be minimal, such as secretaries, other clerical workers, and security guards [Kreiss et al. 1993a; Kreiss et al. 1993b; Kreiss et al. 1996; Kreiss et al. 1997; Stange et al. 2001]."

Comment: At least in Stange et al 2001, construction trades, decontamination, and custodial workers were high risk groups.

13. Page 5, sentence that reads "When estimates of beryllium exposure (based on mass concentration of airborne beryllium) were calculated for study participants, no consistent relationship was found between airborne exposure and risk of either sensitization or chronic beryllium disease."

Comment: We disagree with this statement. The working-lifetime weighted mean (LTW) levels reported by studies using the job exposure matrix method for estimating exposures for BeS and CBD cases have been quite consistent. The following are median LTW levels for cases ($\mu g/m^3$):

- Kreiss 1996 — 0.55 for 8 BeS and CBD cases;
- Viet 2000 — 0.63 for 50 CBD cases and 0.22 for 74 BeS cases;
- Kelleher 2001 — 0.39 for 20 BeS and CBD cases;
- Henneberger 2001 — 0.38 for 15 new BeS and CBD cases in the same plant studied by Kreiss; and
- Madl 2007 — 0.41 for 20 cases studied by Kelleher and 7 new BeS and CBD cases from the same plant.

Kreiss 1997 is the only article that suggests an inconsistency and the authors note that higher estimates from 1990s era personal sampling compared to 1980s era DWA monitoring point to a possible underestimate that could explain the discrepancy. Overall estimated exposure levels in this plant were quite high; median LTW of 1.3 $\mu g/m^3$ for 5 CBD and 13 BeS cases among 201 workers hired after 1984.

Three references are:

Viet SM, Torma-Krajewski J, Rogers J. Chronic beryllium disease and beryllium sensitization at Rocky Flats: a case-control study. AIHAJ. 2000 Mar-Apr;61(2):244-54.

Madl AK, Unice K, Brown JL, Kolanz ME, Kent MS. Exposure-response analysis for beryllium sensitization and chronic beryllium disease among workers in a beryllium

metal machining plant. J Occup Environ Hyg.2007 Jun;4(6); 448-466.

Kelleher PC, Martyny JW, Mroz MM, Maier LA, Ruttenber AJ, Young DA, Newman LS. Beryllium particulate exposure and disease relations in a beryllium machining plant. J Occup Environ Med. 2001 Mar;43(3):238-49.

14. Page 6, we suggest a new sentence be added to the end of the paragraph on skin exposure that reads something like "Skin exposure to beryllium may cause skin diseases that will require medical care and result in lost time from work."

    Comment: At the 3rd International Conference on Beryllium Disease, Dr Rossman reported on a CBD case whose skin lesions waxed and waned with her lung disease. Reports of delayed hypersensitivity granulomatous skin response to the poorly soluble forms of beryllium would seem to provide strong evidence supporting your conclusion that the sensitization step can occur in the skin. See Dr. Rossman's presentation posted at http://internationalbeconference07.com/index.php?option=com_docman&task=cat_view&gid=21&Itemid=65.

15. Page 8, the section labeled "Other" under "Other Resources" included the Lawrence Livermore National Laboratory's implementation of the DOE Chronic Beryllium Disease Prevention Program."

    Comment: We suggest deleting this reference because it represents only one of the Department of Energy's locations. We believe that directing users of the Alert to the "Department of Energy-Title 10 CFR Part 850 Chronic Beryllium Disease Prevention Program" web site, also in the section labeled "Other" under "Other Resources," will be more helpful to the public. See http://www.hss.energy.gov/HealthSafety/WSHP/BE/.

16. Page 9, Conclusions: We suggest adding a new clause that reads "(3) offer workers who are at-risk for chronic beryllium disease BeLPT screening to help assure they receive medical care that can prevent permanent lung damage,"

    Comment: The opportunity for secondary prevention through removal and treatment is a key reason for screening. Without direct benefit to the individual being screened, use of screening raises issues that can be especially problematic in the workplace because of employment, economic and ethical concerns.

17. Page 9, as in comment 4, we suggest combining the lung and skin recommendations.