Dragon, Karen E. (CDC/NIOSH/EID)

From: Hollenbeck, Scott M. [hollenbecksm@ornl.gov]
Sent: Tuesday, February 22, 2011 10:26 AM
To: NIOSH Docket Office (CDC)
Subject: 161-A - Occupational Exposure to Carbon Nanotubes and Nanofibers
Attachments: Comments on NIOSH Current Intelligence Bulletin - CNMS.pdf

Please see the attached comments regarding NIOSH Docket 161-A. I realize that the public comment close-out period was last Friday but I hope you will accept them with my apologies for being late.

Thanks,

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Comments on NIOSH Current Intelligence Bulletin, *Occupational Exposure to Carbon Nanotubes and Nanofibers* – November 2010 Draft.

A one-size fits all REL for carbon nanotubes (CNTs) and carbon nanofibers (CNFs) should be not considered the best approach as there is available information regarding varying levels of toxicity for CNTs involving different catalysts resulting in a wide range of functionalization structures. The level and type of functionalization for CNTs and CNFs can obviously play a significant role on the level of toxicity in various biological systems. A more reasonable approach, from the standpoint of safety conservatism without being overburdening from a regulatory standpoint, would be to apply the established asbestos air standard to CNTs and CNFs. The British Standards Institute has adopted a CNT standard similar to the asbestos standard which validates this line of reasoning. This approach would seem to be more biologically plausible as well.

- The asbestos standard would be more protective than the NIOSH recommended REL of 7 µg/m3 elemental carbon.
- In terms of a safety factor approach, using the 7 ug/m3/mass of 0.25 um x 5 um fibers as an upper limit, as diameters became smaller (presumed increase in toxicity) the safety factor would increase; while a mass based REL would not change with changes in particle size.
- Mass measurement does not correspond adequately with anticipation of potential health outcomes regarding exposure to CNTs and CNFs. It may be appropriate for a specific form of CNT/CNF where mass can be related to particle concentration or surface area but on the whole it would be better served to base measurement on particle counts and/or fiber counting methods. Available toxicity data appears to favor a surface area criterion over a mass criterion or a number concentration with specific dimensions i.e., the asbestos standard presuming a similar toxicological etiology to asbestos.
- There are numerous analytical methods established for determining asbestos counts in air that could be applied to CNTs in air (NIOSH 7402, ASTM 06281-06. OSP 10312: 1995).
- Count and size data could be subsequently used to derive estimates of surface area. This potential would be lacking with gravimetric exposure data, which would therefore be of limited use for retrospective epidemiology.
- For CNT forms of lesser anticipated toxicity, i.e., non-doped SWCNTs the fiber count approach for fiber glass could be applied which again addresses size while relaxing the stringency of control.
- Any exposure limit recommendations should address short-term exposure periods as certain workplaces (i.e., research and development) are task based and do not handle CNTs and CNFs on what would be considered an 8-hour work schedule. The higher sample volumes as required by the method are inappropriate for these types of short duration tasks.
- The information available through other recommended exposure standards such as Bayer Baytubes ® is based on specific knowledge of a specific CNT form. This approach is advantageous and should be studied by NIOSH in further detail and adopted as appropriate.
- NIOSH has historically provided many useful logic flow and/or decision tree diagrams to assist health hazard evaluators and in this case this would be very useful in providing more standardized measurement methods for CNTs and

CNFs.

- Development of an accurate REL should be based on more specific information and a discussion on other applicable analytical methods including microscopy (i.e., TEM, AFM, etc.) and elemental analysis (i.e., metals) should be in this dialogue.