Interview with John Balbus, MD, MPH; Environmental Defense Fund

ICON: *Taken together, what do these papers tell us?*

**John Balbus:** They are two somewhat different models showing us the same thing: that Multiwalled Carbon Nanotubes with physical characteristics similar to asbestos also have similar toxicological characteristics. That they have the potential to cause the same kind of chronic inflammation and ultimately, carcinogenesis in the pleural and peritoneal cavities.

ICON: *Were there any significant limitations to the study?*

**JB:** Because the studies used direct injection into the peritoneal cavity rather than inhalation into the lungs, they can't tell us to what degree inhaled multi-walled carbon nanotubes can migrate through the lungs to the lung linings, what sort of physical shape they might be in if they can migrate in the same way as asbestos, and what amount of inhaled dose is necessary to increase the risk of cancer in people. A strength of the new study is that they used four different forms of multi-walled carbon nanotubes, but we have to keep in mind the tremendous variation within that class of nanomaterials, too; the study starts to suggest relationships between tube length and other characteristics and potential toxicity, but there is still a lot we don't know about the variations.

ICON: *How should people interpret these findings within the larger context of nanotechnology environment, health and safety research?*

**JB:** Two things: researchers and manufacturers who are designing applications with long, thin multi-walled carbon nanotubes should think twice about using them. This is an opportunity to design away these characteristics, although it must be kept in mind this is only one type of toxicity, and alternative designs may introduce alternative toxicities. The second recommendation is for workplaces that are working with materials with these characteristics: they should consider switching to nanotubes with lower aspect ratios if possible or halting production until more information on translocation and dose of inhaled nanotubes is available. If they continue to manufacture or incorporate long fibrous MWCNT’s into their products, they should ensure that workers are not exposed. And they must thoroughly investigate whether MWCNT’s can be released from their products throughout their entire lifecycle.

ICON: *Is any level of exposure acceptable?*

**JB:** We don't have enough understanding at this stage to make an informed assessment. So in light of now two studies showing this potential for serious hazard, we should adopt a precautionary approach and limit exposure as completely as possible until we have more answers. At the same time, as the authors note, they've only concerned themselves with a short-term study of one type of toxicity, so we have to be cautious that we don't equate a lack of asbestos-like toxicity in the other MWCNT’s with their having no significant toxicity of their own.

ICON: *Please comment on the likely impact of these works on other researchers or policymakers.*

**JB:** This is one study of one type of nanomaterial that fits a certain physical and shape profile. So you can't generalize too much from this study and the previous study by Tagaki et al., to overall risk
conclusions about nanomaterials. On the other hand, every study like these that comes out and shows the potential for serious harm provides a rationale for investing more in understanding the risk potential of the wide variety of materials being developed for commercial applications.

ICON: Anything else you’d like add?
JB: The other aspect of the publicity surrounding these studies is that asbestos is an iconic hazard that comes with a lot of associations. Getting this kind of toxicology information out into the public domain early and investigating it thoroughly can help the industry to avoid repeating the more notorious aspects of the asbestos story. The studies themselves are neither good nor bad for the nanotechnology industry; what matters is what happens in response to this information.

BIO

Dr. John Balbus earned his M.P.H. at Johns Hopkins University; his M.D., at the University of Pennsylvania; and an A.B. at Harvard University. A physician and public health professional, he works and consults on a broad range of environmental health issues, including air pollution, built environment and health, climate change, nanotechnology, toxicology, and antibiotic resistance. Prior to joining Environmental Defense, Dr. Balbus was on the faculty at the George Washington University Schools of Medicine and Public Health and Health Services, where he was founding director of the Center for Risk Science and Public Health and founding co-director of the Mid-Atlantic Center for Children's Health and the Environment. Board certified in both Internal and Occupational and Environmental Medicine, Dr. Balbus combines experience as a clinician with expertise in environmental health sciences. He is currently a member of the National Academy of Science Board on Environmental Studies and Toxicology, the Institute of Medicine Roundtable on Environmental Health Sciences, Research and Medicine, and the EPA Children’s Health Protection Advisory Committee.