

Toxics Use Reduction Institute Science Advisory Board Meeting Minutes
April 25, 2022
Virtual Zoom Meeting
1:30 PM

Members Present: Robin Dodson (Chair), Christine Rioux (Vice Chair), Christy Foran, Lisa Cashins, Denise Kmetzo, Helen Poynton, Heather Lynch, Wendy Heiger-Bernays

Members not present: Amy Cannon, Rich Gurney, Dave Williams

Program staff present: Liz Harriman (TURI), Heather Tenney (TURI), Hayley Hudson (TURI), Tiffany Skogstrom (OTA), Caredwen Foley (OTA), Sandy Baird (MassDEP), Kari Sasportas (OTA), Baskut Tuncak (TURI)

Others present: Carol Holahan (Foley Hoag ACC), Christina Bramante (Nano-C), Raza Ali (ACC), John Monica (Offit Kurman), Tom Lada (Nano-C), David Jones (Arxada LLC), Jermone Lang (Nano-C)

Welcome & Introductions

The chair noted that this meeting is being conducted remotely, consistent with [An Act Extending Certain COVID-19 Measures Adopted during the State of Emergency](#). This Act includes an extension, until July 15, 2022, of the remote meeting provisions of Governor Baker's March 12, 2020, Executive Order resulting from the outbreak of the 2019 novel coronavirus, known as "COVID-19."

Board members introduced themselves, program staff were announced, and attendees were asked to put their name and affiliation in the chat.

Approve March Meeting Minutes

A motion was made to approve the March meeting minutes as written, and there was a second.

A roll call vote was conducted, and the minutes were unanimously approved by the seven members present.

Carbon Nanotubes and Fibers Petition: Carbon Nanofibers

At the last meeting the board made a recommendation *to list Multi-walled Carbon Nanotubes (MWCNTs) based on the evidence of pulmonary toxicity, lung cancer, mesothelioma, and environmental persistence. There are additional concerns for genotoxicity and toxic environmental degradation products.*

The topic for this meeting was Carbon nanofibers, focusing on:

- **Genotoxicity**
- **Environmental effects**
- **Additional effects and comparability to MWCNT**

Genotoxicity

- There is evidence of genotoxicity/mutagenicity of CNF. Board members summarized the findings and results of Kisin (2011) and Fraser (2020).

- Kisin (2011) compared SWCNT to asbestos and used comet assay and micronucleus assay to evaluate chromosomal damage. Concentration and time dependent loss of cell viability after exposure to these materials was observed. Asbestos>CNF>SWCNT.
- Fraser noted evidence of genotoxicity, the MOA is ROS. Problematic lengths and diameters did not need to be in the majority of the sample. Noted that CNTs and CNFs were well characterized (not the case for Kisen study).
- The Greenscreen was also consistent with these studies, although it was noted that the determination relied on MWCNT surrogate studies.
- It is worth noting that all the genotoxicity studies are in vitro.
- There was further discussion around different pathways and exposure scenarios.

Environmental Effects

- A research group in Brazil published three papers, with weaknesses in study designs noted.
- The Gomez (2020) trophic transfer study put worms in soil containing CNFs and then fed the worms to zebrafish and then to bigger fish. They then measured different markers of genotoxicity and did see effects. Gomez workgroup measured total organic carbon and that could be problematic when measuring CNFs.
- In the Guimaraes (2021) study four-month-old turtles were exposed to CNFs and then observed increased total organic carbon in the liver and brain. Problems with keeping all turtles in one tank were noted.

Additional effects/Comparability to MWCNT

- The GreenScreen used MWCNT-7 and others as a surrogate especially for the cancer endpoint.
- Board members discussed the merits and drawbacks of using MWCNTs as a surrogate for CNFs. Concerns included the increased presence of metals in CNTs.
- DeLorme (2012) study on CNFs found effects after 30 days post exposure – this reiterates the concern for persistence. The GreenScreen also noted CNFs as very persistent.
- There was discussion surrounding the authoritative bodies distinguishing between the tubes and fibers versus grouping them together. For example, NIOSH lumped them together while IARC made only a very distinct recommendation on MWCNT-7. The use of surrogates and a read-across approach is appropriate for NIOSH when the objective is to protect workers when little or no data exist for the target substance.
- No information to say that the fibers are acting any different than the tubes, e.g., see the same micronucleus formation, ROS, and same cell viability concerns. In addition, most of these studies are in vitro (except the DeLorme (2012) study) which won't show systemic effects that were seen for MWCNT in vivo studies.
- The potential variability of carbon nanomaterials is indicated in the Fraser (2020) table.
- The GreenScreen assessment of environmental persistence was based on one OECD guideline study of CNFs with a result of very high persistence.
- There was further discussion of the structure of CNFs in comparison to CNTs. An additional study, Pacurari (2016), was noted as describing CNF in the same family as CNT yet possessing distinct features.

Visitor Questions/Comments

There was an opportunity to have any visitor comments or questions and there were none.

Overall Concerns:

- The lack of data doesn't mean a lack of effect.
- Concerns about genotoxicity – but concerned that most of the evidence is only in vitro studies.
- Concerns about persistence – but based on one study.
- Possible concerns about pulmonary toxicity but lack of studies.
- Key cellular assays look very similar to MWCNT suggesting similar systemic responses.

Questions around the use of MWCNT-7 as a surrogate for CNFs, noting GreenScreen's rationale for their surrogates.

Overall, the board felt there is not sufficient evidence that CNFs are different or the same as MWCNT because there are so few studies available. There is concern for genotoxicity (in vitro), persistence (one study) and pulmonary toxicity (needs more study). Better rationale for a surrogate would be helpful. [A board member noted that NIOSH 2013 finds that "although data from animal studies with CNF are more limited, physical-chemical similarities between CNT and CNF and findings of acute pulmonary inflammation and interstitial fibrosis in animals exposed to CNF indicate the need to also control occupational exposure to CNF at the REL of 1 µg/m³ EC. Until the results from animal research studies can fully explain the mechanisms \(e.g., shape, size, chemistry, functionalized\) that potentially increase or decrease their toxicity all types of CNT and CNF should be considered a respiratory hazard."](#)

Will circle back to this after looking at SWCNTs, to see if any gaps filled or further insight gained.

Background on Threshold Determinations

It was noted that the petition requested that the program add carbon nanotubes and fibers to the TURA list of toxic or hazardous substances at a 100g threshold. TURA can only statutorily lower a threshold if a substance is designated as a Higher Hazard Substance. The rationale for historical listing threshold determinations under TRI were reviewed. . While the SAB will first focus on whether CNT and CNF should be listed, it may be helpful for members to know that we will have to later consider whether they should be Higher Hazard Substances.

Remote Meeting

Heather gave an update on the extension of the remote meeting option until July 15th. The board may want to consider a vote on remote participation for when the remote meeting option ceases. Under the open meeting law, a board can vote to allow remote participation. If the board does so, some members can participate remotely, as long as there is a quorum in the room, the chair is present, and all votes are by roll call. There was further discussion around different options and locations for meetings.

Program Updates

- The Advisory Committee is meeting next Wednesday. There will be a presentation on the Ad hoc committee process.
- The state came out with their PFAS interagency task report which provides a great overview of the state of PFAS in the Commonwealth.

- There is a new information page on the OTA website with resources about PFAS.

Next Meeting

We are trying for two more remote meetings before summer break. Heather will send a When2Meet for a meeting at the end of May.

A motion was made to adjourn, and there was a second; the vote was unanimous.

Visitor Comments (inserted verbatim from zoom chat)

From Dave to Everyone 01:31 PM

David Jones, Arxada LLC

From Raza Ali to Everyone 01:31 PM

Raza Ali, American Chemistry Council.

From chris to Everyone 01:32 PM

christine rioux, environmental health scientist

From Caredwen Foley, MA OTA to Everyone 01:32 PM

Caredwen Foley, MA OTA

From Christina Bramante to Everyone 01:32 PM

Christina Bramante

Representing Nano-C

From Carol Holahan to Everyone 01:32 PM

Carol Holahan, Foley Hoag, LLP

From Jerome to Everyone 01:33 PM

Jerome Lang Nano-C

From Liz Harriman to Everyone 01:35 PM

Please put your name and affiliation in the chat if you haven't already. thanks!

From Kari Sasportas (OTA) to Everyone 01:35 PM

Kari Sasportas - OTA

From Tom L to Everyone 01:42 PM

Tom Lada - Nano-C, Inc.

From Heather Tenney to Everyone 01:48 PM

I'll point it out, thanks! Roughly after the genotox proper!

From iPhone to Everyone 02:50 PM

John Monica, Offit Kurman.