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Agency for Toxic Substances and Disease Registry
Division of Toxicology and Human Health Sciences
Environmental Toxicology Branch
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Via Regulations.gov

RE: ATSDR-2015-0002-0003 – DRAFT TOXICOLOGICAL PROFILE FOR POLYBROMINATED DIPHENYL ETHERS (PBDEs)

The National Association of Clean Water Agencies (NACWA) appreciates the opportunity to comment on the Agency for Toxic Substances and Disease Registry's (ATSDR) Draft Toxicological Profile for Polybrominated Diphenyl Ethers (PBDEs), ATSDR-2015-0002-0003. NACWA represents the interests of more than 280 publicly owned wastewater treatment agencies across the country. NACWA's members serve the majority of the sewered population in the United States and generate millions of tons of biosolids on an annual basis.

General Comments

The land application of biosolids is strictly regulated under 40 CFR Part 503 by the U.S. Environmental Protection Agency (EPA). The Agency's Part 503 regulations are based on extensive scientific study and research and the foundation of the regulations has been reviewed regularly. The statements about biosolids made in the ATSDR document should reflect sound science, be accurate and quantifiable, and have data and criteria to support any claims made. To that end, NACWA recommends that ATSDR consult with EPA's Office of Science and Technology at EPA as this document is revised. It is unclear why EPA, the regulatory agency responsible for setting standards and overseeing the management of biosolids, was apparently not consulted during the development of this document. EPA can provide the proper context and accurate portrayal of recycling biosolids and NACWA encourages ATSDR to coordinate with EPA going forward.

Many of the statements regarding biosolids in the draft profile document are vague and may be easily misunderstood or misinterpreted. As an example, the document contains wording like: "a small amount" and "a lot of hand to mouth activity". In

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this instance, more specific, quantifiable information should be provided on the dosage rate and frequency of activity that would cause a health effect. Additionally, it is unclear whether some of the statements made throughout the document are actual quotes from researchers or the opinion of the U.S. Department of Health. Quotes from researchers should be made clear and not restated by the agency as fact.

Throughout the document, references to biosolids land application describe it as a disposal practice. Biosolids are rich in nutrients and organic matter and have been beneficially used/recycled by farmers throughout the U.S. and other countries for over 50 years. The application of biosolids to farmland is not a disposal practice and should not be characterized as such in the document. The application of biosolids to farmland is a highly regulated process with many protections built into the regulations to eliminate exposure to contaminants, including PBDEs. We recommend the terminology used regarding biosolids be re-worded so that it is clear to the reader that land application of biosolids is not disposal, but a beneficial reuse option approved by the U.S. EPA. Specifically, in Chapter 5 where biosolids appear under the "Disposal" section, we recommend that discussion be moved to the "Use" section. In addition, the document should also examine other sources of PBDE in soils, beyond biosolids land application, including, for example, air deposition, on which there are numerous scientific publications available.

Finally, the document also uses and cites scientific information from countries outside of the United States. We believe that this information does not accurately reflect conditions and regulations in the U.S. and should therefore be removed from the document.

Specific Comments

Our specific comments and recommended revisions are outlined below.

Recent Research and Long Term Risk

Recent research on the fate of PBDEs in biosolids following long term use and risks to public health has not been included in the report and should be added. In a 2011 study conducted by Quanrud, a risk evaluation of PBDEs based on "Hazard Indices" indicated that the health risk to humans of PBDEs was negligible when the dermal sorption and ingestion routes of exposure were considered, Quanrud et al. (2011)

Exposure Risk from Soil

> *PBDEs can enter soil from discarded products (e.g., in landfills) or biosolids (e.g., farmland). If you touch soil containing PBDEs, which could happen at a hazardous waste site, a small amount of PBDEs may pass through your skin into the bloodstream; ingestion of soil can lead to higher PBDE exposure. This route may be especially important for children who display a lot of hand to mouth activity. [p. 3]*

This statement is misleading to anyone not familiar with biosolids best management practices. The wording is confusing and implies that biosolids and landfills are hazardous waste sites. Landfills are limited access sites operated under strict regulations that preclude children from entering and coming into contact with PBDEs or other hazardous materials. Farmlands where biosolids are applied are strictly managed as well using prescribed best management practices.

The application of biosolids to farmland is a highly regulated process with many protections built into the regulations to eliminate exposure to PBDEs and other potential contaminants. EPA conducted a detailed risk

assessment on PCBs, which behave very much like PBDEs, when developing the Part 503 regulations. The risk assessment included the soil ingestion pathway for children during childhood. Scientists have agreed that this approach is a highly conservative estimate of average daily soil ingestion by children during childhood. Biosolids applied according to EPA Part 503 regulations have repeatedly shown that such applications do not pose a threat to human health (Chaney et.al 1997). Additionally, biosolids are typically applied to private farm sites where public access is restricted and potential exposure of children to PBDEs would be highly unlikely. Many states also require signage notifying the public that biosolids have been applied which provides additional controls.

We understand the need to be concise in the document. However, we recommend some changes to the paragraph from the document outlined above. Since it could be incorrectly inferred from the term "hazardous waste site" that the beneficial reuse of biosolids applied to farmland would result in the farm being labeled a hazardous site, we recommend the term be removed. We also recommend the term "recycled" or "beneficially reused" be added before biosolids as follows:

> "PBDEs can enter soil from discarded products (e.g., in landfills) or via the beneficial reuse of biosolids (e.g., on farmland). If you touch soil containing PBDEs, a small amount of PBDEs may pass through your skin into the bloodstream; ingestion of soil can lead to higher PBDE exposure. However, biosolids-borne PBDEs are tightly bound to the organic matrix and thus will not result in elevated exposure through skin"

Sources of PBDEs in Sewage

> *Hale et al. (2001b) reported that the practice of land application of sewage sludge may introduce significant amounts of the pentaBDE commercial mixture into the environment, although concentrations have not yet been quantified." [p. 333]*

PBDEs are not disposed of in wastewater treatment plants or publicly owned treatment works (POTWs). PBDEs are in consumer products and as a result end up in POTWs due to routine washing and cleaning practices or due to runoff from streets (Morace 2012). In addition, they are not disposed of by industry directly into POTWs. The presence of PBDEs in sewage is due to the magnitude of PBDE usage in consumer goods which guarantees their presence in municipal wastewater and sludges produced from biosolids (Quanrud et al. 2011).

Based on sampling conducted by one of NACWA's member, the loading of PBDEs from residential households is variable in both frequency and concentration, making it difficult to estimate PBDE quantities entering the POTW and biosolids. While NACWA acknowledges that PBDEs readily bind with biosolids during the treatment process, any assumption that the biosolids load is constant is not accurate.

We recommend the statement above be re-worded to:

> "PBDEs have been used in a number of consumer products, and as a result, are present in household wastewater discharged to the sewer and wastewater treatment plants as indicated by analysis of sewage sludge from various countries."

Note that Hale et al. (2001b) refers to an additional reference where this statement is derived (see Hale et al. 2001c). NACWA asks that reference to Hale et al. (2001b) be corrected to Hale et al. (2001c) in regards to the potential that "sewage sludge may introduce significant amounts of the pentaBDE commercial mixture into the environment, although concentrations have not yet been quantified." At the same time, without accurate PBDE data/values for comparison, Hale et al. (2001c) are making general statements that are subjective and non-specific. Since this statement does not provide a concentration for PBDEs and the term "significant" is subjective and non-specific, we recommend that term be removed. We recommend the following:

> "Hale et al. (2001b) reported that the practice of land application of biosolids may introduce pentaBDE commercial mixture into the environment, although concentrations have not yet been quantified."

Additionally, this paragraph appears under the "Disposal" section of the document. Since biosolids are beneficially used to fertilize farmland, the paragraph should be moved to the "Use" section of the document.

Sources of PBDEs in Farmland and Crop Uptake

> *PBDEs are released to farmland with their disposal as biosolids (i.e., sewage sludge). PBDEs were detected in biosolids destined for land applications in four different regions of the United States (Hale et al. 2001c). The total concentrations of pentaBDE in biosolids ranged from 1,100 to 2,290 µg/kg dry weight; the concentrations of pentaBDE were high and consistent, regardless of the region of origin. The concentration of decaBDE (BDE 209) varied widely among biosolids from different regions; the concentration of BDE 209 ranged from 84.8 to 4,890 µg/kg dry weight in the biosolid samples. [p. 343]*

The statement "PBDEs are released to farmland with their disposal as biosolids (i.e., sewage sludge)" is confusing and implies that PBDEs are biosolids. Biosolids may contain PBDEs, but the concentrations can vary based on numerous factors such as the treatment technologies used to process the biosolids.

Hale et al. (2001c) does not quantify specifically what constitutes "high" PBDE values. This type of statement is not quantifiable and thus is a general statement from the authors that has no scientific basis. More recent research is available on the health risks associated with application of biosolids to farmland and should be included in the document. We recommend the following:

> "In a field study conducted by Quanrud et al. (2011) the fate of estrogenic activity, nonylphenol, and PBDEs in soil was determined following 20 years of land application of biosolids. Risk assessments were made based on the intake of compounds via inhalation, dermal sorption or ingestion. It was found that significant PBDE concentrations were detected, primarily in the surface 30 cm depth sample. Surface accumulation of PBDEs occurs due to their hydrophobic nature which results in sorption to colloids. The maximum amount of PBDE detected was 80ng/g soil as congener BDE-209. A risk evaluation of PBDEs based on "Hazard Indices" indicated that the health risk to humans of PBDEs was negligible when the dermal sorption and ingestion routes of exposure were considered. The researchers found that "based on data for these selected endocrine disruptors found in soil following long term land application of Class B biosolids, it would appear they do not pose a significant risk to human health".

The statement "The concentration of decaBDE (BDE 209) varied widely among biosolids from different regions; the concentration of BDE 209 ranged from 84.8 to 4,890 µg/kg dry weight in the biosolid samples" is incorrect and should be revised. The statement should instead read: "The concentration of decaBDE (BDE 209) did not vary significantly among biosolids from different regions; the concentration of BDE 209 ranged from 84.8 to 4,890 µg/kg dry weight in the biosolids samples".

Under "Soil", the phrase "PBDEs are released to farmland with their disposal as biosolids (i.e., sewage sludge)" inaccurately portrays the use of biosolids as a disposal practice. We recommend the following wording: "PBDEs are present in biosolids applied to farmland as fertilizer."

The document contains the following statement on plant uptake of PBDEs:

> *Biosolids from the Metropolitan Water Reclamation District of Greater Chicago, Stickney Waste Water Treatment Plant (WWTP), collected between 2004 and 2007, were applied at two sites at a depth of 15–20 cm (Hale et al. 2012). Maximum total soil PBDE concentrations were 565 and 1,810 µg/kg for high clay soil and sandy soil, respectively. Corn grown at the two sites after the third year of annual biosolid application was evaluated for PBDEs using GC/MS with ENCI. PBDEs were not detected in the 46 grain, stover, or root samples examined. Few studies have evaluated plant uptake of PBDEs from land-applied biosolids. [p. 346]*

Hale et al. (2012) shows in general terms that PBDEs are not taken up by agricultural crops. A stronger statement should be made in this document clarifying that this study showed no negative impact on respective agricultural crops in regards to PBDEs.

PBDE Persistence in Soils and Occurrence in Biosolids

> *Biosolids and Effluents. The concentrations of PBDEs in biosolids (sewage sludge) and effluents are summarized in Table 6-5. PBDEs were detected in biosolids from four different regions of the United States (Hale et al. 2001c). The total concentrations of pentaBDE in biosolids ranged from 1,100 to 2,290 ng/g dry weight; the concentrations of pentaBDE were high and consistent, regardless of the region of origin. The concentration of decaBDE (BDE 209) varied widely among biosolids from different regions; the concentration of BDE 209 ranged from 84.8 to 4,890 ng/g dry weight in the biosolid samples. Sewage sludge in the vicinity of the Dan River (Virginia) were collected and analyzed for PBDEs (Hale et al. 2002). [p. 364-366]*

In reference to the statement "[t]he total concentrations of pentaBDE in biosolids ranged from 1,100 to 2,290 ng/g dry weight; the concentrations of pentaBDE were high and consistent, regardless of the region of origin" in the excerpt above, it is unclear if the researcher Hale has made this statement or if it is the opinion of the Agency. Quotes need to be added if it is a statement made by the researcher, otherwise the words "high" and "consistent" need to be quantified and supported by criteria or eliminated from the document.

In addition, the excerpt above is incorrect and should be revised to:

> "The total concentrations of pentaBDE in biosolids ranged from 1,100 to 2,290 ng/g dry weight; the concentrations of pentaBDE were high and differed statistically by region. The concentration of

decaBDE (BDE 209) ranged from 84.8 to 4,890 ng/g dry weight in the biosolids and did not vary significantly by region".

Table 6-5 only includes data from the Dan River (Virginia) and does not include any of the data referenced as being collected from four regions of the U.S. (Hale et al. 2001c). If this data exists it should be added to the table.

Again, NACWA appreciates the opportunity to comment on the draft toxicological profile. Please contact me with any questions or to discuss further at 202/833-9106 or *chornback@nacwa.org*.

Sincerely,

Chris Hornback
Chief Technical Officer

References

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