

Endocrine Disruptors and Polybrominated Diphenyl Ethers in the United States:
An Environmental, Health, and Financial Crisis

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Three Hundred billion dollars: that is how much endocrine disruptors are estimated to cost the United State annually in health care expenses. Unfortunately, the term endocrine disruptors tends to allude the public's understanding. They are chemicals that interact with the body's endocrine system which can cause harmful health effects ranging from cognitive development impairment to reproductive defects. Endocrine disruptors are found in a wide spectrum of manmade products: plastic toys, detergents, pesticides, cosmetics, and flame retardants. One group of flame retardants, polybrominated diphenyl ethers (PBDEs), are gaining notoriety in the United States as they are linked to various cognitive impairments. The health and economic issues surrounding the use of endocrine disruptors seize the attention for any emerging environmentalist as they can affect a diverse amount of potential stakeholders from health care companies and physicians to college students and the everyday citizen. The Environmental Protection Agency and its Toxic Substance Control Act (TSCA) would regularly deal with the regulation of these PBDEs and certain endocrine disruptors; however, they is no mention of the term endocrine disruption. Due to volatile and harmful nature of endocrine disruptors, in specific PBDEs, under the next update to the Toxic Control Substance Act the EPA should inform people of the hazards of endocrine disruptors and subsequently increase restriction of the use of PBDEs in consumer products. An action towards the restriction of endocrine disruptors would aid in the fight for environmental justice while simultaneously utilizing the Precautionary Principle to insure a decrease in health care cost.

The Toxic Substance Control Act is a notable chemical and environmental regulatory law administered by the United States Environmental Protection Agency signed under President Ford in 1976. The TSCA is extremely important as it provides the EPA with the authority to monitor, regulate, and restrict certain chemical substances that eventually reach consumer products;

however, one major issue is the lack of acknowledgment of endocrine disruptors (EPA & OPRM 2016). The most recent TSCA update occurred in June 2016. This was the first time in nearly 40 years since an update has occurred, demonstrating that it could unfortunately take many years for another update. Previous to the 2016 update, signed under President Obama, many existing chemicals were grandfathered in, meaning the TSCA focused on new chemical regulations rather than examining the effects of chemicals that were already considered “safe”. Now there are established guidelines and deadlines provided in order to ensure that all existing chemicals are regulated and analyzed in a timely manner to decrease incidences of negative exposures (Colby 2016). Endocrine disruptors are not new chemicals, they have been around for quite some time and are found in a vast amount of consumer products: plastic toys, detergents, pesticides, cosmetics, and flame retardants. Endocrine disruptors can be defined as, “chemicals that may interfere with the body’s endocrine system and produce adverse developmental, reproductive, neurological, and immune effects in both humans and wildlife (NIEHS 2016). Endocrine disruptors are associated with many known health conditions such as: breast cancer, testicular cancer, birth defects, decreased IQ, thyroid complications and additionally as having environmental effects as they can negatively affect wild life animals (Solomon & Schettler 2000). Since endocrine disruptors range in a wide category of products, certain types of endocrine disruptors would not be covered in the TSCA, such as the endocrine disruptors found in foods, pesticides, and cosmetics. The TSCA is a powerful law which utilizes several regulatory processes. The TSCA assess and prioritize chemicals based on their risk evaluations, this is some of the reason why certain chemicals take longer to be strictly regulated versus others. With the 2016 update the TSCA took a step forward in identifying and evaluating existing chemicals but it also introduced the concept of increasing public transparency about

chemical information. Since endocrine disruptors are not mentioned in the TSCA, there information will not reach the general public and many may not be strictly regulated. With the scientific data supporting the negative effects of endocrine disruptors found in consumer products it is imperative that an update to the TSCA should occur, with it at least acknowledging and informing the public of these chemicals. One of the lesser known EPA regulatory laws is the 1990s Endocrine Disruptor Screening Program (EDSP) found under Section 408(p) of the Federal Food Drug and Cosmetic Act. The EDSP utilizes a two tiered approach to screen pesticides, chemicals, and environmental contaminants for their potential effects on the endocrine system (EPA & OCSPP 2016). One major issue with this program is it lack of strict regulations. As of now, the EPA has not published a confirmed list of endocrine disruptors. Currently, from the evidence that is presenting the rise of endocrine disruptors, the program is not doing an efficient job in regulation and therefore a larger more powerful legislation like the TSCA should implement regulations on these harmful chemicals. One particular endocrine disruptor: Polybrominated diphenyl ethers (PBDEs), are becoming increasingly important as they are in high use within the United States and are subsequently leading to increased health effects and environmental justice issues.

They are found everywhere: from electronics, plastics, motor vehicles, to household furniture including couches, beds, and drawers; polybrominated diphenyl ethers (PBDEs) pose serious health risks to millions of Americans all the while increasing environmental justice issues across the nation. Currently the EPA is aware of the potential hazards of PBDEs and have proposed to amend the TSCA under the Significant New Use Rule to further monitor and test any products including the specific PBDEs of c-pentaBDE, c-octaBDE, or c-decaBDE (EPA 2016). While there are current regulations on the PBDEs, it is vital that some form of increased

regulation approved through the TSCA shall pass due to the serious health affects surrounding exposure to PBDEs. According to a meta-analysis which compared the association between thyroid function and exposure to PBDEs, PBDEs like other endocrine disruptors have a direct effect on thyroid function (Zhao 2015). The EPA has further expressed concern about PBDEs due to their ability to bioaccumulate and cause toxic effects on both humans and the environment. The endpoint of human health of PBDEs that concerns EPA and other federal agencies is neurobehavioral effects which includes decreased IQ (EPA 2016). Today the regulations that the EPA are utilizing are clearly not strict enough as the EPA themselves report increasing levels of PBDE exposures as well as the increased evidence claiming PBDEs are causing environmental issues across the states. Recent research has revealed that nonwhite toddlers in North Carolina carry almost twice as much toxic flame retardant chemicals in their bloods compared with white toddlers. The study adds to the concern of how low income communities are at risk for higher exposures to toxic chemicals, especially due to the high levels of PBDEs found in cheap furniture (Denison 2012). A second study reveals that there are health disparities in minority communities with connection to exposure to PBDEs and their associated health effects (Adamkiewicz 2010). With an update to the TSCA, these environmental injustice issues can be addressed. While the EPA has attempted to amend the TSCA in order to increase PBDE regulation, under TSCA section 21 any person is able to petition in order to initiate an amendment process under Sections 4, 6 ,8, 5(e), 6(b) (2). These sections deal with chemical testing, information, processing, ordering, and monitoring. Section 21, allows for public input which could lead to significant changes such as increase chemical testing of PBDEs before they are put into consumer products. This section of the TSCA could provide a role for stakeholders in environmentalist groups by giving them a voice through the form of a petition. It is important

that people stay active and fight against environmental injustices, in order to decrease the health disparities being exploited across minority communities.

The European Union has begun to take the first steps in implementing stricter regulations on endocrine disruptors and PBDEs in order to cut health care expenses and the associated health risks. Like the European Union is doing with their chemical legislation, the United States should update the TSCA and follow suit as those countries have realized the significance surrounding these chemicals. The Europe Court of Justice has successfully banned the use of the PBDEs: pentaBDE and octaBDE in 2004 and then subsequently decaBDE in 2008; however, many states in the United States still allow for the use of decaBDE in their products (Betts 2008). The European Union also recognizes endocrine disruptors as a major concern and have created advisory boards such as the The Endocrine Disruptors Expert Advisory Group. Furthermore the EU is leading the world in the regulation of endocrine disruptor chemicals by creating legislation such as REACH, which regulates the use and incorporation of endocrine disruptors. They are striving to create increased public health protection but at the same time they believe that through the creation of legislation such as Reach, it will create precedents for global chemical agreements plans like the Strategic Approach to International Chemicals Management (Trasande 2015). This relates to the United States legislation regarding endocrine disruptors as it shows how other developed countries have displayed how important the regulation of endocrine disruptors are. Much of this ideology relates to the Precautionary Principle: the United States needs to monitor and regulate endocrine disruptors and PBDEs sooner than later regardless of the lack of acknowledgement of endocrine disruptors in the TSCA. It is important to note that some endocrine disruptors still lack sufficient evidence to be considered harmful. While some of these endocrine disruptors do not have the prioritization of other chemicals in the current TSCA, the

evidence regarding the public health and environment effects of endocrine disruptors is increasing thus proving the need to precautionary limit exposure. One factor to heavily consider is the lack of public knowledge, environmentalist need to educate the public about the harmful effects of endocrine disruptors. This could be done through various methods: seminars, posters and flyers, social media updates, and even video presentations.

One opposing argument for the continued use of PBDEs is their cheap availability and the safety (as a flame retardant) they bring to many household items. Furthermore the opposition could argue that the TSCA basis its chemical evaluation of prioritization, therefore; if PBDEs were really that harmful all of them would have been removed by now. This opposing argument could come from manufacturers who use cheap flame retardants (PBDEs) in their products in order to keep cost low. Manufacturers could state that a vast amount of furniture that contain these raw PBDEs give low income people access to cheap furniture: but in reality this just leads to environmental injustices. While many of these flame retardants and other endocrine disruptors have not been fully evaluated yet, the evidence is pointing towards their toxic abilities. Even if PBDEs are cheap, the health care cost that they are creating in the United States vastly outweighs the “benefits” of the decreased cost for the consumer and manufacturer. PBDEs alone, cost the United States around \$200 billion in health care expenses annually, demonstrating their highly toxic abilities and their economically poor qualities (Bienkowski 2016).

Endocrine disruptors and their effects play a role in a wide array of people: from the common consumer, to health care physicians, all the way to governmental health care officials. As the chemical world progresses, the regulations associated with these chemicals need to be created in a strict and timely manner. Endocrine disruptors are becoming an increasingly important environmental and public health issue across the globe as they are found in a prevalent

amount of consumer products. Polybrominated diphenyl ethers serve as a significant example as to why this chemical class needs to be further regulated. The Environmental Protection Agency's Toxic Substance Control Act, while recently updated, needs to take further steps in securing new testing and regulatory statures against appropriate endocrine disruptors and PBDEs. This process has the capability to be advanced under the TSCA petition process. The petition process grants citizens the ability to initiate an amendment process which could subsequently lead to further testing and regulations of these ever harmful endocrine disruptors. This allows for the people of the United States to act against environmental injustices that many low income communities continue to be plagued by. While the EPA and certain states have passed regulatory laws against certain PBDE's and endocrine disruptors, it is not at a satisfactory rate as exposure rates are on the rise consequently escalating the cost of health care expenses in the United States. Other countries have shown the importance for updating legislation relating to endocrine disruptors: it is time for the United States to follow. As Arele Blum, a chemist from the University of California appropriately puts, "Instead of adding new fire retardant chemicals that ultimately may be shown to cause health problems, we should be asking whether we need to use these chemicals or if there are other ways to achieve equivalent fire safety" (Betts 2008).

Works Cited:

- Adamkiewicz, G., Zota, A. R., Fabian, M. P., Chahine, T., Julien, R., Spengler, J. D., & Levy, J. I. (2011). Moving environmental justice indoors: Understanding structural influences on residential exposure patterns in low-income communities. *American Journal of Public Health, 101*(S1), S238–S245.
- Betts, K. S. (2008). New Thinking on Flame Retardants. *Environmental Health Perspectives, 116*(5), A210–A213.
- Colby Bermel, E. (2016, June 22). CHEMICALS: Obama signs TSCA reform into law. Retrieved November 5, 2016, from E & E Publishing, LLC, <http://www.eenews.net/stories/1060039241>
- COMM. (2016, August 16). Endocrine disruptors - chemicals - environment - European commission. Retrieved November 5, 2016, from European Commission, http://ec.europa.eu/environment/chemicals/endocrine/index_en.htm
- Denison, R. (2012, May 23). Exposure to Toxic Flame Retardants is an Environmental Justice Issue: New Research Finds Differential Exposure in Children. Retrieved November 5, 2016, from Emerging Science, <http://blogs.edf.org/health/2012/05/23/exposure-to-flame-retardants-is-an-environmental-justice-issue-new-research-finds-differential-exposure-in-children/>
- Environmental Health Sciences. (2016, October 16). Toxic economy: Common chemicals cost US billions every year — environmental health news. Retrieved October 23, 2016, from Environmental Health News, <http://www.environmentalhealthnews.org/ehs/news/2016/oct/toxic-economy-common-chemicals-cost-us-billions-every-year>
- EPA. (2016, May 19). Polybrominated Diphenyl ethers (PBDEs). Retrieved November 5, 2016, from EPA US Environmental Protection Agency, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/polybrominated-diphenyl-ethers-pbdes>

- EPA, & OCSPP. (2016, May 19). Polybrominated diphenylethers (PBDEs) significant new use rules (SNUR). Retrieved November 5, 2016, from EPA US Environmental Protection Agency, <https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/polybrominated-diphenylethers-pbdes-significant-new-use>
- EPA. (2016, July 11). Summary of the Toxic Substances Control Act. Retrieved November 5, 2016, from EPA US Environmental Protection Agency, <https://www.epa.gov/laws-regulations/summary-toxic-substances-control-act>
- EPA, & OCSPP. (2016, May 24). Endocrine Disruptor screening program (EDSP) overview. Retrieved November 7, 2016, from EPA US Environmental Protection Agency, <https://www.epa.gov/endocrine-disruption/endocrine-disruptor-screening-program-edsp-overview>
- EPA, & ORPM. (2016, July 11). Summary of the toxic substances control act. Retrieved November 7, 2016, from EPA US Environmental Protection Agency, <https://www.epa.gov/laws-regulations/summary-toxic-substances-control-act>
- Hooper, K., & She, J. (2003). Lessons from the polybrominated diphenyl ethers (PBDEs): precautionary principle, primary prevention, and the value of community-based body-burden monitoring using breast milk. *Environmental Health Perspectives*, 111(1), 109–114.
- Quirós-Alcalá L, Bradman A, Nishioka M, Harnly ME, Hubbard A, McKone TE, & Eskenazi B. (2011). Concentrations and loadings of polybrominated diphenyl ethers in dust from low-income households in California. *Environment International*, 37(3), 592-6.
doi:10.1016/j.envint.2010.12.003
- National Institute of Environmental Health Sciences. (2016, July 15). Endocrine Disruptors. Retrieved November 5, 2016, from National Institute of Environmental Health Sciences, <https://www.niehs.nih.gov/health/topics/agents/endocrine/>

Solomon, G. M., & Schettler, T. (2000). Environment and health: 6. Endocrine disruption and potential human health implications. *Canadian Medical Association Journal*, *163*(11), 1471–1476.

Retrieved from <http://www.cmaj.ca/content/163/11/1471.short>

Trasande, L., Zoeller, R. T., Hass, U., Kortenkamp, A., Grandjean, P., Myers, J. P., ... Heindel, J. J. (2015). Estimating burden and disease costs of exposure to endocrine-disrupting chemicals in the European Union. *The Journal of Clinical Endocrinology & Metabolism*, *100*(4), 1245–1255.

doi:10.1210/jc.2014-4324

Zhao, X., Wang, H., Li, J., Shan, Z., Teng, W., & Teng, X. (2015). The correlation between Polybrominated Diphenyl ethers (PBDEs) and thyroid hormones in the general population: A Meta-Analysis. *PLOS ONE*, *10*(5), e0126989. doi:10.1371/journal.pone.0126989