Public Meeting on the Petition Regarding Additive Organohalogen Flame Retardants
U.S. Consumer Product Safety Commission
Bethesda, MD
September 14, 2017

EST	Panel		Presenter	Affiliation	Status
9:00 AM	**Opening Remarks**		Acting Chairman Ann Marie Buerkle		
9:05 AM	**Panel 1**	1	Linda Birnbaum, Ph.D.	NIEHS/National Toxicology Program	in person
9:15 AM	**Panel 1 Questions**		Commission		
9:35 AM	**Panel 2**	2	Eve Gartner	Earthjustice Northeast Office	in person
		3	Rachel Weintraub	Consumer Federation of America	in person
		4	Jennifer Lowry, MD, FAAP	American Academy of Pediatrics	in person
		5	Ricardo Simmonds	United States Conference of Catholic Bishops	in person
		6	Maureen Swanson, MPA	Learning Disabilities Association of America	in person
		7	Arlene Blum, Ph.D.	Green Science Policy Institute	phone
10:05 AM	**Panel 2 Questions**		Commission		
10:30 AM	**- - - - - B r e a k - - - - -**				
10:40 AM	**Panel 3**	8	Thomas Osimitz, Ph.D.	Science Strategies	in person
		9	Diana Zuckerman, Ph.D.	National Center for Health Research	in person
		10	Rick Goss	Information Technology Industry Council (ITI), the Consumer Technology Association (CTA™), and IPC – Association Connecting Electronics Industries®	in person
		11	Elena Rios, M.D., MSPH, FACP	National Hispanic Medical Association	in person
		12	Ansje Miller	Center for Environmental Health	in person
		13	Steven Taylor	Campaign for Healthier Solutions	phone
11:10 AM	**Panel 3 Questions**		Commission		
11:35 AM	**Panel 4**	14	Daniel Rosenberg	Natural Resources Defense Council	in person
		15	Liz Hitchcock	Safer Chemicals Healthy Families	in person
		16	Kathryn Rodgers	Silent Spring Institute	in person
		17	Kathy Attar	Physicians for Social Responsibility	in person
		18	Racquel Segall	International Association of Fire Fighters	in person
		19	Abigail Zapote	League of United Latin American Citizens	in person
12:05 PM	**Panel 4 Questions**		Commission		
12:30 PM	**- - - - - L u n c h B r e a k - - - - -**				
1:30 PM	**Panel 5**	20	Katie Huffling, RN, MS, CNM	Alliance of Nurses for Healthy Environments	in person
		21	Genna Reed	Union of Concerned Scientists	in person
		22	Robert Simon	American Chemistry Council	in person
		23	Sonya Lunder, MPH	Environmental Working Group	phone
		24	Heather M. Stapleton, Ph.D.	Duke University	phone
		25	Pamela Miller	Alaska Community Action on Toxics	phone
1:55 PM	**Panel 5 Questions**		Commission		
2:20 PM	**- - - - - B r e a k - - - - -**				

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EST	Panel		Presenter	Affiliation	Status
2:30 PM	**Panel 6**	26	Nancy Buermeyer	Breast Cancer Prevention Partners (formerly known as the Breast Cancer Fund)	phone
		27	Veena Singla, Ph.D.	University of California San Francisco	phone
		28	Miriam Diamond, Ph.D.	University of Toronto	phone
		29	Kathleen A. Curtis, LPN	Clean and Healthy New York	phone
		30	Julie B. Herbstman, Ph.D., Sc.M.	Columbia University	phone
		31	R. Thomas Zoeller, Ph.D.	University of Massachusetts	phone
3:00 PM	**Panel 6 Questions**		Commission		
3:25 PM	**Adjourn**				

Public Hearing
Petition Regarding Additive Organohalogen Flame Retardants
September 14, 2017

Oral Presentations of Panelists
and
Written Comments

Oral Presentations of Panelists

Presentations are in the order that they were received by the Office of the Secretary.

Heather M. Stapleton, Ph.D.
Duke University

Organohalogen Flame Retardants Petition
Oral Presentation

Heather Stapleton, PhD, will present via phone (available from 9am-noon EST)

I am an Associate Professor of Environmental Chemistry and Exposure Science within the Nicholas School of the Environment at Duke University. My research focuses on identifying flame retardant chemicals in consumer products, evaluating human exposure pathways, investigating potential effects of flame retardants on thyroid regulation, and epidemiology. For the past 17 years I have been conducting research on flame retardant chemicals and I have more than 70 peer-reviewed publications focusing on flame retardant research. In addition, I testified in front of the US Senate Sub-Committee on Environment and Public Works in May 2012 during a hearing on flame retardant chemicals.

During my presentation, I will briefly discuss the current knowledge regarding the use of organohalogen flame retardants in furniture, textiles and electronics. Specifically, I will discuss some of our research that examines links between flame retardant applications in furniture with exposure in the US population, and comment on several of our recent epidemiological studies. Publications of note which will be discussed include:

Hammel, S., Hoffman, K., Lorenzo, A.M., Chen, A., Phillips, A.L., Butt, C.M., Sosa, J.A., Webster, T.F., **Stapleton, H.M.** 2017. Associations Between Flame Retardant Applications in Furniture Foam, House Dust levels, and Resident's Serum Levels. *Environ. Internat.*, 107:181-189.

Hoffman, K., Lorenzo, A., Butt, C.M., Hammel, S.C., Henderson, B.B., Roman, S.A., Scheri, R.P., **Stapleton, H.M.,** Sosa, J.A. 2017. Exposure to Flame Retardant Chemicals and Occurrence and Severity of Papillary Thyroid Cancer: A Case-Control Study. *Environ. Internat.*, 107:235-242.

Hoffman, K., Gearhart-Serna, L., Lorber, M., Webster, T.F., **Stapleton, H.M.** 2017. Estimated Tris (1,3-dichloropropyl) Phosphate Exposure Levels for US Infants Suggests Potential Health Risks. *Environ. Sci. Technol. Letters*, **DOI:** 10.1021/acs.estlett.7b00196.

Carignan, C.C., Minguez-Alarcon, L., Butt, C.M., Willilams, P.L., Meeker, J.D., **Stapleton, H.M.,** Toth, T.L., Ford, J.B., Hauser, R. 2017. Urinary Concentrations of Organophosphate Flame Retardant Metabolites and Pregnancy Outcomes among Women Undergoing in Vitro Fertilization. *Environ. Health Perspect.*, DOI:10.1289/EHP1021.

Hoffman, K., Butt, C.M., Webster, T.F., Preston, E.V., Hammel, S.C., Makey, C., Lorenzo, A.M., Cooper, E.M., Carignan, C., Meeker, J.D., Hauser, R., Soubry, A., Murphy, S.K., Price, T.M., Hoyo, C., Mendelsoh, E., Congleton, J., Daniels, J.L., **Stapleton, H.M**. 2017. Temporal Trends in Exposure to Organophosphate Flame Retardants in the United States. *Environ. Sci. Technol. Letters.*, 4(3): 112-118.

Cooper, E., Kroeger, G., Davis Warnell, K., Clark, C.R., Ferguson, P.L. and **Stapleton, H.M.** 2016. Results from Screening Polyurethane Foam Based Consumer Products for Flame Retardant Chemicals: Assessing Impacts on the Change in the Furniture Flammability Standards. *Environ. Sci. Technol.*, 50(19): 10653-10660.

Heather M. Stapleton, Ph.D

Duke University, Nicholas School of the Environment
A220 LSRC, Box 90328, Durham, NC 27708
Phone: (919) 613-8717, Fax: (919) 684-8741, heather.stapleton@duke.edu

EDUCATION:

Southampton College	Biology and Chemistry	B.S.	1997
University of Maryland	Environmental Chemistry	M.S.	2000
University of Maryland	Environmental Chemistry	Ph.D.	2003
NIST	Analytical Chemistry Division	Postdoc	2003-2005

APPOINTMENTS AND EMPLOYMENT:

Duke University, Durham, NC

Associate Professor, Nicholas School of the Environment 07/12- present
Assistant Professor, Nicholas School of the Environment 09/05 – 07/12
- Faculty Member, Integrated Toxicology & Environmental Health 05/06- present
- Secondary Appointment, Civil & Environ Engineering 04/09- present

National Institute of Standards and Technology, Gaithersburg, MD

National Research Council Postdoctoral Fellow 09/03 – 08/05

AWARDS AND RECOGNITIONS:

- Thomson Reuters 2015 List of Most Highly Cited Researchers in Environment/Ecology
- Thomson Reuters 2014 List of Most Highly Cited Researchers in Environment/Ecology
- *Environmental Science & Technology* Excellence in Reviewing Award (2014)
- Testified at US Senate Hearing on Flame Retardant Chemicals (July 2012)
- Recipient of the Best Science Paper of 2011: *Environmental Science and Technology*
- Environmental Health News Communication Fellow (2010)
- Recipient of a 2008 NIEHS "Outstanding New Environmental Scientist" (ONES) award ($2.2 million grant for 5 years)
- National Research Council (NRC) Postdoctoral Research Fellowship (Sept. 2003 – Aug. 2005)
- Otto Hutzinger Award for the best student presentation at the 2003 International Symposium on Halogenated Organic Compounds in the Environment (Dioxin).
- Awarded a 3-year fellowship from the E.P.A.'s Science To Achieve Results (STAR) program. (September 1999). Fellowship number U-915564-01-0

EDITORIAL BOARDS:

- Associate Editor, *Environment International*
- Emerging Contaminants Advisory Board, San Francisco Estuary Institute
- Editorial Advisory Board, *Environmental Science & Technology,*
- Editorial Advisor Board, *Environmental Science & Technology Letters*

PROFESSIONAL MEMBERSHIPS

- Member, American Chemical Society
- Member, Association of Environmental Engineering and Science Professors
- Member, Endocrine Society
- Member, International Society for Exposure Science
- Member, Society of Environmental Toxicology and Chemistry
- Member, Society of Toxicology

PUBLICATIONS FROM DUKE:

(Advisor or co-advisor to underlined student/postdoc)

Hammel, S., Hoffman, K., Lorenzo, A.M., Chen, A., Phillips, A.L., Butt, C.M., Sosa, J.A., Webster, T.F., **Stapleton, H.M.** 2017. Associations Between Flame Retardant Applications in Furniture Foam, House Dust levels, and Resident's Serum Levels. *Environ. Internat.*, 107:181-189.

Hoffman, K., Lorenzo, A., Butt, C.M., Hammel, S.C., Henderson, B.B., Roman, S.A., Scheri, R.P., **Stapleton, H.M.,** Sosa, J.A. 2017. Exposure to Flame Retardant Chemicals and Occurrence and Severity of Papillary Thyroid Cancer: A Case-Control Study. *Environ. Internat.*, 107:235-242.

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Hoffman, K., Gearhart-Serna, L., Lorber, M., Webster, T.F., **Stapleton, H.M.** 2017. Estimated Tris (1,3-dichloropropyl) Phosphate Exposure Levels for US Infants Suggests Potential Health Risks. *Environ. Sci. Technol. Letters*, **DOI:** 10.1021/acs.estlett.7b00196.

Carignan, C.C., Minguez-Alarcon, L., Butt, C.M., Willilams, P.L., Meeker, J.D., **Stapleton, H.M.,** Toth, T.L., Ford, J.B., Hauser, R. 2017. Urinary Concentrations of Organophosphate Flame Retardant Metabolites and Pregnancy Outcomes among Women Undergoing in Vitro Fertilization. *Environ. Health Perspect.*, DOI:10.1289/EHP1021.

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Siebenaler, R., Cameron, R., Butt, C.M., Hoffman, K., Higgins, C.P., **Stapleton, H.M.** 2017. Serum Perfluoroalkyl Acids (PFAAs) and Associations with Behavioral Attributes. *Chemosphere*, 184: 687-693.

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Carignan, C.C., Butt, C.M, **Stapleton, H.M.,** Meeker, J.D., Minguez-Alarcon, L., Williams, P.L., Hauser, R. 2017. Influence of storage vial material on measurement of organophosphate flame retardant metabolites in urine. *Chemosphere*, 181: 440-446.

Castorina, R., Butt, C.M., **Stapleton, H.M.,** Avery, D., Harley, K.G., Holland, N., Eskenazi, B., Bradman, A., 2017. Flame Retardants and Their Metabolites in the Homes and Urine of Pregnant Women Residing in California (the CHAMACOS cohort). *Chemosphere*, 179: 159-166.

Ferguson, P.L., **Stapleton, H.M**. 2017. Comment on "Mutagenic Azo Dyes, Rather Than Flame Retardants, Are the Predominant Brominated Compounds in House Dust". *Environmental Science & Technology*, 51(6): 3588-3590.

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Kassotis, Christopher D., Masse, L., Kim, S., Schlezinger, J.J., Webster. T.F., and **Stapleton, H.M.** 2017. Characterizatio of Adipogenic Chemicals in Three Different Cell Culture Systems: Implications for Reproducability Based on Cell Source and Handling., *Sci. Reports*, 7:42104.

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Leonetti, C., Butt, C.M, Hoffman, K., Hammel, S.C., Miranda, M.L., **Stapleton, H.M.** 2016. Brominated Flame Retardants in Placental Tissues: Associations with Infant Sex and Thyroid Hormone Endpoints. *Environ. Health*. 15: 113-122. PMCID: PMC5123327.

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Butt, C.M., Miranda, M.L., **Stapleton, H.M.** 2016. Development of an Analytical Method to Quantify PBDEs, OH-BDEs, HBCDs, 2,4,6-TBP, EH-TBB and BEH-TEBP in Human Serum. *Analy. Biol. Chem.*, 408(10): 2449-2459.

Leonetti, C., Butt, C.M., Hoffman, K., Miranda, M., **Stapleton, H.M**. 2016. Concentrations of Polybrominated Diphenyl Ethers (PBDEs) and 2,4,6-Tribromophenol in Human Placental Tissues. *Environ. Internat.*, 88:23-29.

Barbaruska, V. **Stapleton.H.M.** 2016. Halogenated Flame Retardant Use in Residential Settings- Are They Safe For Our Health? *Fire Protection Engineering*, 4th Quarter, 11-22.

Mendelsohn,E., Hagopian, A., Hoffman, K., Butt, C.M., Lorenzo, A., Congleton, J., Webster, T.F. **Stapleton, H.M**. 2016. Nail Polish as a Source of Exposure to Triphenyl Phosphate. *Environ. International,* 86:45-51.

Hoffman, K., Butt, C.M., Chen, A., Limkakeng, A.T., **Stapleton, H.M.** 2015. High Exposure to Organophosphate Flame Retardants in Infants: Associations with Baby Products. *Environ. Sci. Technol.*, 49:14554-14559.

Macaulay, L.J., Chen, A., Rock, K., Dishaw, L., Dong, W., Hinton, D.E., **Stapleton, H.M.** 2015. Developmental toxicity of the PBDE Metabolite 6-OH-BDE-47 in Zebrafish and the Potential Role of Thyroid Receptor β. *Aquatic Toxicol.*, 168: 38-47. PMCID: PMC4618599

Miranda, M.L., Anthopolos, R., Wolkin, A., **Stapleton, H.M.** 2015. Associations of Birth Outcomes with Maternal Polybrominated Diphenyl Ethers and Thyroid Hormones During Pregnancy. *Environ. International:* 85: 244-253.

Fang, M., Webster, T.F., **Stapleton, H.M.** 2015. Effect-Directed Analysis of Human Peroxisome Proliferator-Activated Nuclear Receptors (PPARγ1) Ligands in Indoor Dust. *Environ. Sci. Technol.* 49:10065-10073.

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Maley, A.M., Falk, K.A., Hoover, L., Earlwine, E.B., Seymour, M.D., DeYoung, P.A., Blum, A., **Stapleton, H.M.,** Peaslee, G.F. 2015. Detection of Halogenated Flame Retardants in Polyurethane Foam by Particle Induced X-ray Emission. *Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms.* 358:21-25.

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Isales, G., Hipszer, R., Raftery, T., Chen,A., **Stapleton, H.M.,** Volz, D. 2015. Triphenyl phosphate-induced developmental toxicity in zebrafish: Potential role of the retinoic acid receptor. *Aquatic Toxicol.*, 161: 221-230.

Davis, E.F. Gunsch, C.K. **Stapleton, H.M.** 2015. Fate of Flame Retardants and the Antimicrobial Triclosan in Planted and Unplanted Biosolid-Amended Soils. *Environ. Toxicol. Chem.*, 34(5): 968-976.

Dong, W., Macaulay, L.J., Kwok, W.H., Hinton, D.E., Ferguson, P.L. **Stapleton, H.M.** 2015. The PBDE Metabolite 6-OH-BDE-47 Affects Melanin Pigmentation and THRb mRNA Expression in the Eye of Zebrafish Embryos, *Endocrine Disruptors*, DOI: 10.4161/23273739.2014.969072.

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Degradation of Decabromodiphenyl Ether (BDE 209) in House Dust Following Sunlight Exposure. (2005) Report Prepared for the Environment Agency, Chemical Assessment Section, United Kingdom.

INVITED TALKS, SEMINARS, & WEBINARS

"Flame Retardant Chemicals: Exposures & Health Concerns". Invited presentation at the National Fire Protection Association Special Symposium. Boston, MA, June 6, 2017.

"Flame Retardant Chemicals in Residential Furniture: Exposure & Health Concerns." Testimony presented to the National Fire Protection Association Technical Committee, May 25th, 2017.

"Flame Retardant Chemicals: Use, Exposure and Health Concerns". Presented to the Environmental Committee of the Washington State House of Representatives, April 13, 2017.

"Sex-Specific Accumulation of Brominated Flame Retardants in Human Placental Tissues: Associations with Thyroid Hormones". Invited talk at the ITEHP Spring Symposium on Sex-Specific Effects in Toxicology, March 24, 2017.

"Human Exposure to Flame Retardant Chemicals: Concerns for Thyroid Dysregulation and Thyroid Cancer". Invited talk at the University of Wisconsin School of Medicine and Public Health, Madison, WI, February 18th, 2017.

"Flame Retardant Chemicals: Use, Exposure and Potential Links with Thyroid Cancer". Invited Seminar at Pittsburgh University, Environmental Engineering Department, Pittsburgh, PA. January 13, 2017.

"Associations Between Brominated Flame Retardants and Thyroid Hormones in Human Placental Tissues: Sex-Specific Differences?" Webinar sponsored by the Collaborative on Health and the Environment. January 18, 2017.

"Sex-Specific Accumulation of Brominated Flame Retardants in Human Placental Tissues and Associations with Thyroid Hormone Levels". NIEHS Environmental Health Science Fest, Durham, NC Dec. 5-8th, 2016.

"Flame Retardant Chemicals: Sources, Exposure and Impacts on Thyroid Hormone Regulation", Invited Seminar at Indiana University, School of Public & Environmental Affairs, Bloomington, IN, November 2nd, 2016.

"Flame Retardant Applications in Camping Tents and Residential Furniture: Are There Concerns for Human Exposure and Health Effects?". Presented at the Association of Textile, Apparel, and Materials Professionals Flammability Meeting, Research Triangle Park, NC, September 22nd, 2016.

"Brominated Flame Retardants in Placenta Tissues: Associations with Thyroid Deiodinase and Sulfotransferase Activities". Presented at the Gordon Conference on Endocrine Disruptors, Newbry, ME, June 23rd, 2016.

"Flame Retardant Chemicals: Uses in Consumer Products and Human Exposure Concerns".

Presented at the annual conference of the International Association of Bedding and Furniture Law Officials (IABFLO) in Philadelphia, PA on April 28th, 2016.

"Identifying Flame Retardant Chemicals in Consumer Products and Understanding Human Exposure Pathways", Presented to the Department of Toxic Substances Control in Sacramento, CA, April 14th, 2016.

"Exploring Links Between Flame Retardant Exposures & Thyroid Cancer", Presented at Grand Rounds, Duke Medicine Hematology Oncology Grand Rounds, March 30, 2016.

"Flame Retardant Chemicals: Use in Consumer Products and Human Health Concerns", Presented to the Environmental Review Committee of the North Carolina State Legislature, LOB room 544, March 9, 2016

"Flame Retardant Application in Residential Furniture and Electronics: Linking Sources to Human Exposure", Invited Seminar at Oregon State University, February 22, 2016

"Flame Retardants in Your Home, Weighing out the Risks". Science Café, NC Museum of Natural Sciences, Raleigh, NC, February 11, 2016.

"Identification of Flame Retardant Additives in Consumer Products Using Mass Spectrometry and Understanding Human Exposure Pathways", Pacifichem Conference, Honolulu, HI, December 17, 2015.

"Flame Retardant Chemical Applications in Residential Furniture and Electronics: Linking Sources to Human Exposure", Keynote Speaker at the International Symposium on Persistent Toxic Substances, UC Riverside, CA, November 17 2015.

"Brominated Flame Retardant Exposures and Associations with Thyroid Hormone Regulation in Placental Tissues: Insights from In Vivo and In Vitro Studies", Invited Speaker at the Environmental Protection Agency, RTP, NC, October 15, 2015.

"The Evolving Science of Flame Retardant Chemicals", Invited Speaker at the annual American Home Furnishings Alliance Conference, Hickory, NC, October 1, 2015.

"Exploring Links Between Flame Retardant Exposures and Thyroid Cancer", ITEHP Spring Symposium, Duke University, April 3rd, 2015.

"Flame Retardant Use in Consumer Products: Beneficial or Potentially Toxic?", Carnegie Science Center, Pittsburgh, PA, April 21st, 2015.

"Flame Retardant Use in Consumer Products: Beneficial or Potentially Toxic?", NC Society of Toxicology Spring Meeting, Research Triangle Park, NC, February 23, 2015.

"The Flame Retardant Saga: Is TSCA Reform Needed?", Duke NSOE Back to Class Event, Washington DC, December 9, 2014.

"Children's Exposure to Flame Retardant Chemicals and Potential Health Effects", EPA Webinar on Children's Health, November 12, 2014.

"Debromination of DecaBDE (BDE-209) in the Environment", United Nations Persistent Organic

Pollutant Review Committee (POPRC10), Rome, Italy, October 27, 2014.

"Human Biomonitoring for Firemaster 550 and Potential Endocrine Disrupting Effects", Keynote Speaker at the Brominated Flame Retardant Conference, Indianapolis, IN, June 24, 2014.

"Human Exposure to Flame Retardants Used in Upholstered Furniture". Underwriters Laboratory Sponsored Meeting on Flame Retardants in Upholstered Furniture, Atlanta, GA, May 21, 2014.

"Environmental Concerns Regarding Chemical Flame Retardants". Fire Retardant Technology Symposium, Preston, U.K., April 15, 2014.

"Exposure and Endocrine Disrupting Effects of Flame Retardant Chemicals Used in Upholstered Furniture", National Toxicology Program, March 19, 2014.

Human Exposure to Flame Retardant Chemicals and Potential Health Effects. NC State Toxicology Department, February 4, 2014.

"Re-evaluating Perspectives and Definitions of "Persistence". PBT Panel, Washington DC, January 17, 2014.

"Identifying Flame Retardant Chemicals in Consumer Products by Mass Spectrometry and Novel Insights into Human Exposure Pathways". ASMS Asilomar Conference, October 20, 2013.

"Identification of Flame Retardant Chemicals Used to Meet the CA TB 117 Flammability Standard and Implications for Human Exposure". Underwriters Laboratory Sponsored Meeting on Flame Retardants in Upholstered Furniture, Atlanta, GA, April 17, 2013.

"New Findings on Flame Retardants in Consumer Products, Dust and Biospecimens", CA Biomonitoring Program Biannual Meeting, April 11, 2013.

"Children's Exposure to Flame Retardant Chemicals: What are the Risks?". UNC Chapel Hill, Gillings School of Public Health, January 23, 2013.

"Human Exposure & Health Effects Associated with Flame Retardants Commonly Applied to Upholstered Furniture", ASTM Meeting, Atlanta, GA, December 4, 2012.

"Exposure to Flame Retardants: Do Fire Safety Benefits Outweigh the Health Risks?". Invited Seminar, Arnold School of Public Health, University of South Carolina, Columbia, S.C. December 3, 2010.

"Environmental Forensics: Using Mass Spectrometry to Identify Potentially Hazardous Flame Retardant Chemicals in Consumer Products". Invited Seminar, Hamilton College. October 8, 2010.

"Fate and Transport of Brominated Flame Retardant Chemicals in the Environment: Implications for Human Exposure". Invited Seminar, Chemistry Department, Wake Forest University, Winston-Salem, NC, February 4, 2009.

"Human Exposure to Brominated Flame Retardants: Sources, Pathways and Consequences". Invited Seminar in the department of Human and Occupational Health, University of Washington, Seattle. September 28, 2008.

"Debromination of the Flame Retardant Decabromodiphenyl Ether: Is it Environmentally Relevant",

Plenary Speaker, International Symposium on Halogenated Persistent Organic Pollutants (Dioxin 2008), Birmingham, United Kingdom, August 2008.

"The Environmental Fate and Biotransformation of Brominated Flame Retardants" Invited Seminar in the Environmental and Molecular Toxicology Department at NC State, Raleigh, NC. December 2007.

"The Flame Retardant Decabromodiphenyl Ether: The Extent and Significance of Debromination". Presented at the Natural Environmental Resource Council Annual POPs Network Meeting. University of Birmingham, U.K. July 11, 2007.

"The Flame Retardant Decabromodiphenyl Ether: New Insights on Exposure, Toxicology and Environmental Fate". Presented at the National Caucus of Environmental Legislators Semi-annual Meeting. November 2006.

"Bioaccumulation Potential of Natural and Anthropogenic Brominated Compounds in Aquatic Food Webs: Friends or Foe?" Presented at the Gordon Research Conference on Biogeochemistry, August 2006.

"The Environmental Fate, Transport and Transformation of Brominated Flame Retardants" (October 4, 2006) Oberlin College, Oberlin, Ohio.

"Biotransformation of the Flame Retardant Chemicals PBDEs: Debromination in Fish and Humans" (Jan. 25th, 2006). Carleton University, Ottawa, Ontario, Canada.

"Determination of Anthropogenic and Naturally Produced Brominated Compounds in California Sea Lions Stranded Between 1993 and 2003" (Nov. 2005). 2005 International Environmental Specimen Banking Symposium, Charleston, SC.

"PBDE Exposure and Accumulation in Fish: The Impact of Biotransformation" (Sept. 2005) 2005 National Forum on Contaminants in Fish, sponsored by the Environmental Protection Agency.

"DecaBDE: Human Exposure and Debromination Potential in the Environment" (July 2005) Technical Briefing to the Illinois State Environmental Protection Agency regarding regulation of DecaBDE.

"Monitoring Brominated Flame Retardants in the Environment" (May 2005) NOAA sponsored workshop to Identify Emerging Contaminants of Concern and their Implications for the Estuarine/Marine Environment and Human Health. Charleston, SC

"The Environmental Fate and Biotransformation of Brominated Flame Retardants in Fish" (March 2005), St. Mary's College of Maryland.

"Brominated Flame Retardants: Environmental Fate and Analtyical Uncertainties" (February 2005), Washington D.C. Chromatography Discussion Group, Rockville, MD.

Bioaccumulation of brominated flame retardants in aquatic food webs. (October 2002). Emerging Contaminants Workshop sponsored by the E.P.A.'s Toxic Subcommittee and the Chesapeake Bay Program, Solomons, MD.

Using stable isotopes to tracers of organic contaminant dynamics in the Great Lakes. Presented at the Horn Point Environmental Laboratory in Cambridge, Maryland. (November 2001).

PRESENTATIONS AT NATIONAL AND INTERNATIONAL CONFERENCES:

Stapleton, H.M., Jeremiason, J.D., and Baker, J.E. (1998) PCB accumulation in the food web of Grand Traverse Bay, Lake Michigan: Investigating current sources. Presented at the 41st Annual IAGLR Conference in Hamilton, Ontario.

Stapleton, H.M., Jeremiason, J.D., and Baker, J.E. (1998) Organochlorine accumulations within the food web of Grand Traverse Bay, Lake Michigan: Investigating current sources." Presented at the SETAC 19th Annual Meeting in Charlotte, N.C.

Stapleton, H.M., Cohen, A.R., Cornwell, J., Jeremiason, J.D., and Baker, J.E. (1999) Loadings of PAHs, PCBs, and Toxaphene in Sediment Cores Collected from Grand Traverse Bay, Lake Michigan. Presented at the 42nd Annual Conference of the International Association for Great Lakes Research in Cleveland, Ohio.

Stapleton, H.M., Jeremiason, J.D., Ostrom, N.E., and Baker, J.E. (1999) "Organochlorine burdens in the food web of Grand Traverse Bay, Lake Michigan." Presented at the 42nd Annual Conference of the International Association for Great Lakes Research in Cleveland, Ohio.

Stapleton, H.M., and J.E. Baker. (2000) Evidence supporting PCB metabolism within deepwater sculpin in Grand Traverse Bay, Lake Michigan. Presented at the 21st annual SETAC meeting in Nashville, TN.

Stapleton, H.M, R.J. Letcher, and J.E. Baker. (2001) Formation and bioaccumulation of methylsulfonyl PCBs in Lake Michigan Fish. Presented at the 44th annual International Association of Great Lakes Research in Green Bay, Wisconsin.

Stapleton, H.M., C. Masterson, J. Skubinna and J.E. Baker. (2000). Using stable isotopes to measure pelagic-benthic coupling of HOCs in Lake Michigan. Presented at the American Society of Limnology and Oceanography's summer meeting in Copenhagen, Denmark.

Stapleton, H.M., P. Ostrom, C. Masterson, J. Skubinna and J. E. Baker. (2000). Accumulation fo atmospheric and sedimentary PCBs and Toxaphene in a Great Lakes food web. Presented at the 20th International Symposium on Halogenated Environmental Organic Pollutants and POPS in Monterey, California.

Stapleton, H.M. and J.E. Baker. (2001) Comparing the temporal trends, partitioning and biomagnification of PBDEs and PCBs in Lake Michigan. Presented at the 3rd annual Brominated Flame Retardant Conference in Burlington, Ontario.

Stapleton, H.M. and J.E. Baker. (2001). Accumulation of Polybrominated diphenyl ethers in a Lake Michigan food web. Presented at the 22nd annual SETAC meeting in Baltimore, MD.

Stapleton, H.M., R.J. Letcher and J.E. Baker. (2002). Uptake, metabolism and depuration of PBDE congeneres by the common carp (*Cyprinus carpio*). Presented at the 4th annual Brominated Flame Retardant conference in Burlington, Ontario.

Stapleton, H.M., R.J. Letcher and J.E. Baker, (2002). Uptake, metabolism and depuration of PBDE congeners by the common carp (*Cyprinus carpio*). Presented at the 22nd International Symposium on Halogenated Environmental Organic Pollutants and POPs in Barcelona, Spain.

Stapleton, H.M., R. J. Letcher and J.E. Baker. (2002). Uptake, metabolism and depuration of PBDE congeners by the common carp (*Cyprinus carpio*). Presented at the 23rd annual SETAC meeting in Salt Lake City, Utah.

Moore, A., J. Ashley, **H.M. Stapleton**, and D. Velinsky. (2002). Assessing nonylphenol contamination in sediment from the Schuykill and Delaware River. Presented 23rd annual SETAC meeting in Salt Lake City, Utah.

Tuerk, K.J.S., J. Kucklick, **H.M. Stapleton** and J.E. Baker. (2002). Toxaphene and PBDEs in Atlantic white-sided dolphins and rough-toothed dolphins. Presented at the 23rd annual SETAC meeting in Salt Lake City, Utah.

Klosterhaus, S., **H.M. Stapleton** and J.E. Baker. (2002) PCB, PBDE and organochlorine concentrations in marine invertebrates and juvenile fish from the Antarctic peninsula. Presented at the 23rd annual SETAC meeting in Salt Lake City, Utah.

Stapleton, H.M., R.J.Letcher and J.E. Baker. (2003) Debromination of the flame retardant decabromodiphenyl ether by juvenile carp (*Cyprinus carpio*). Presented at the 23rd International Symposium on Halogenated Environmental Organic Pollutants and POPs in Boston, MA.

Stapleton, H.M, and J.E. Baker (2003) Debromination of polybrominated diphenyl ether congeners by the common carp. Presented at the 24th annual SETAC meeting in Austin, Texas.

Stapleton, H.M., N.G. Dodder, M.M. Schantz and S.A. Wise (2004) Measurement of polybrominated diphenyl ethers in Household Dust. Presented at the 3rd International Workshop on Brominated Flame Retardants in Toronto, Canada.

Stapleton, H.M., N.G. Dodder, J.H. Offenberg, M.M. Schantz and S.A. Wise (2004) Polybrominated diphenyl ethers and HBCD in House Dust. Presented at the 24th International Symposium on Halogenated Environmental Organic Pollutants and POPs in Berlin, Germany.

Stapleton, H.M., J. Kucklick, N.G. Dodder, B. Porter, F. Guland, M.M. Schantz and S.A. Wise. (2004) Temporal trends in HBCD, PBDEs and Methoxylated PBDEs in California Sea Lion Blubber. Presented at the 25th annual SETAC meeting in Portland, Oregon.

Stapleton, H.M., J. M. Keller, J.R. Kucklick, M.M. Schantz and S.A. Wise (2004) Measurement of PBDEs in Environmental Matrix Standard Reference Materials. Presented at the 25th annual SETAC meeting in Portland, Oregon.

Stapleton, H.M., J.M. Keller, J.R. Kucklick and M.M. Schantz. (2005) Indoor Dust and Fish Tissue Standard Reference Materials Certified for PBDEs. Presented at the 25th International Symposium on Halogenated Environmental Organic Pollutants and POPs in Toronto, Canada.

Stapleton, H.M, B. Brazil, S. Anderson, R. Benedict, C. Mitchelmore and D.R. Holbrook. (2005) In Vivo and In Vitro Debromination of Decabromodiphenyl Ether (BDE 209) in Juvenile Rainbow Trout. Presented at the 25th International Symposium on Halogenated Environmental Organic Pollutants and POPs in Toronto, Canada.

Stapleton, H.M.; B.Brazil, R. Benedict, C. Mitchelmore and D.R. Holbrook. (2005) Uptake and Debromination of Decabromodiphenyl Ether in Juvenile Rainbow Trout: Assimilation and

Biotransformation. Presented at the 26th Annual SETAC meeting in Baltimore, Maryland.

Stapleton, H.M.; N.G. Dodder. (2006) Photodegradation of Decabromodiphenyl Ether (BDE 209) in Natural and Amended House Dust. Presented at the 8th annual Brominated Flame Retardants Workshop in Toronto, Ontario, Canada.

Stapleton, H.M. (2006) Bioaccumulation Potential of Natural and Anthropogenic Brominated Compounds in Aquatic Food Webs: Friend or Foe?. Presented at the Gordon Research Conference on Organic Geochemistry.

Stapleton, H.M.; N.G. Dodder. (2006) Photodegradation of Decabromodiphenyl Ether (BDE 209) in Natural and Amended House Dust. Presented at the 26th International Symposium on Halogenated Environmental Organic Pollutants and POPs in Oslo, Norway.

Stapleton, H.M., S. Kelly, C. Mitchelmore. (2007) Biotransformation of PBDEs in Fish and Human Liver Microsomes. Presented at the 4th International Workshop on Brominated Flame Retardants, Amsterdam, The Netherlands.

Stapleton, H.M., S. Kelly, C. Mitchelmore (2007). In Vitro Debromination of PBDEs in Carp Liver. Presented at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, Milwaukee, WI.

Stapleton, H.M., S. Kelly, J.G. Allen, M. McClean, T.F.Webster (2007). Indoor Exposure and Fate of a New Class of POPs: PBDEs. Presented at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, Wilwaukee, WI.

Stapleton, H.M., J.G. Allen, S. Kelly, A. Konstantinov, S. Klosterhaus, D. Watkins, M. McClean, T. F. Webster. (2008). Alternate and New Brominated Flame Retardants Detected in U.S. House Dust, Presented at the 28th International Symposium on Halogenated Persistent Organic Pollutants (Dioxin), Birmingham, United Kingdom.

Wang, D., **H.M. Stapleton**. (2009) Analysis of Thyroid Hormones in Serum by Isotope-Dilution Liquid Chromatography Tandem Mass Spectrometry. Presented at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, New Orleans, LA.

Stapleton, H.M., S. Eagle, A. Wolkin, M.L. Miranda. (2010) Serum PBDE Levels in Pregnant Women: Associations with Thyroid Hormones. Presented at the 4th International Brominated Flame Retardants Workshop in Kyoto, Japan.

Stapleton, H.M., E. M. Cooper, L.Dishaw, F. J. Seidler, T. Slotkin, T. F. Webster. (2010) Tris (1,3-dichloroisopropyl) phosphate, a PentaBDE Replacement: Detection in Consumer Products, Human Metabolism and Neurodevelopmental Effects.

Stapleton, H.M., S. Klosterhaus, A. Keller, S. van Bergen, E. Cooper, A. Blum and T.F. Webster (2010). Identification of Flame Retardants in Polyurethane Foam Collected From Baby Products. Presented at the 30th International Symposium on Halogenated Environmental Organic Pollutants and POPs in San Antonio, TX.

Stapleton, H.M., S. Eagle, R. Anthopolos, A. Wolkin, M.L. Miranda. (2010) Serum PBDE Levels in Pregnant Women: Associations with Thyroid Hormones. Presented at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, Portland, OR.

Stapleton, H.M., S. Eagle, A. Sjodin, and T.F. Webster (2011) US Toddler Exposure to PBDE Flame Retardants: Associations with House Dust, Hand Wipes and Social/Economic Variables. Presented at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, Boston, MA.

Stapleton, H.M., S. Klosterhaus, A. Keller, S. VanBergan, P.L. Ferguson, E.M. Cooper, T.F. Webster and A. Blum. (2011) Current Use Flame Retardants: Chemicals Used in Polyurethane Foam and their Measurements in Indoor Environments. Invited presentation at the annual Society of Environmental Toxicology and Chemistry (SETAC) meeting, Boston, MA.

Stapleton, H.M. S.C. Roberts, H.Patiaul. (2012) Developmental Exposure to Firemaster 550: Uptake, Metabolism and Toxicity. Presented at the annual Brominated Flame Retardant Conference, Winnipeg, Canada.

Stapleton, H.M. J. Misenheimer, T.F. Webster. (2013) Toddler's Exposure to PentaBDE Replacements From Indoor Dust and Hand to Mouth Contact. Presented at the annual Brominated Flame Retardant Conference, San Francisco, CA.

POPULAR PRESS COVERAGE:

"Tracking Everyday Chemical Exposures", April 18, 2016. Chemical & Engineering News

SERVICE ACTIVITIES:

2014: Invited guest at the United Nations Persistent Organic Pollutants Review Committee (POPRC10) (October, Rome, Italy)
2012: Senate testimony provided for the Environmental & Public Works committee (July, Washington DC)
2010: Participated in Ethics Training for PhD students and postdoctoral researchers
2008: Assisted in "Durham School Days", an educational opportunity for local Durham 8th grade students to motivate them to pursue college (10/23/08). Sponsored a project on "Environmental Pollution and Engineering Careers".

2007, 2008: FEMMES (Females Excelling More in Math, Engineering and Science). Co-sponsored a project called "Build Your Own Aquifer: Lessons on Water Pollution".
Organized the 7th annual North American Workshop on Brominated Flame Retardants, held June 13-15, 2005 at NIST in Gaithersburg, MD (165 participants)

Proposal Reviewer: NIH, NOAA, Environment Canada, Health Canada

Ad hoc Journal Reviewer: *Environmental Science & Technology*, *Environmental Science & Technology Letters*, *Chemosphere*, *Marine Pollution Bulletin*, *Environment International*, *Analytical and Bioanalytical Chemistry*, *Environmental Health Perspectives*, *Environmental Health*, *Talanta*, *Toxicological Sciences*, *Environmental Toxicology & Chemistry*

COLLABORATORS:

Dr. Joseph Allen, Harvard University School of Public Health
Dr. Kim Anderson, Oregon State University, Corvallis, OR
Dr. Jeff Ashley, Philadelphia University and the Natural Academy of Sciences

Dr. Scott Belcher, North Carolina State University, Raleigh, NC
Dr. Linda Birnbaum, National Institute of Environmental Health Sciences, RTP, NC
Dr. Asa Bradman, University of California, Berkeley, Berkeley, CA
Dr. Julie Daniels, University of North Carolina, Chapel Hill
Dr. P. Lee Ferguson, Duke University, Dept. of Civil and Environmental Engineering
Dr. Rebecca Fry, University of North Carolina, Chapel Hill
Dr. Evan Gallagher, University of Washington at Seattle, Seattle, WA.
Dr. Claudia Gunsch, Duke University, Dept. of Civil and Environmental Engineering
Dr. Russ Hauser, Harvard University
Dr. Christopher Higgins, Colorado School of Mines
Dr. Jennifer Keller, National Institute of Standards and Technology, Charleston, SC
Dr. John R. Kucklick, National Institute of Standards and Technology, Charleston, SC
Dr. Seth Kullman, North Carolina State University, Raleigh, NC
Dr. Robert J. Letcher, Carleton University, Ottawa, Canada
Dr. Michael D. McClean, Boston University School of Public Health
Dr. John Meeker, University of Michigan, School of Public Health
Dr. Marie Lynn Miranda, Rice University
Dr. Carys Mitchelmore, University of Maryland, Center for Environmental Sciences
Dr. Heather Patisaul, N.C. State University, Raleigh, NC
Dr. Julie Ann Sosa, Duke Medical Center, Durham, NC
Dr. Andreas Sjödin, Center for Disease Control, NCEH
Dr. David Volz, University of California, Riverside, CA
Dr. Tom Webster, Boston University School of Public Health

CLASSES TAUGHT:

ENV 360	Environmental Toxicology & Chemistry
ENV/CE 540	Fate of Organic Chemicals in the Environment
ENV 780	Environmental Exposure Analysis
ENV 899	Environmental Health & Ecotoxicology Seminar for MEM students

THESIS ADVISORS:

M.S. and Ph.D. Advisor: Dr. Joel Baker, University of Maryland, Center for Environmental Science
PostDoc Advisor: Dr. Michele Schantz, National Institute of Standards and Technology

GRADUATE STUDENTS ADVISED

Master's Students:
Josie Bamford, (May 2007)
YuChun Kuo, (December 2011)
Lauren Gloeckler, (May 2013)
John Misenheimer, (May 2013)
Zhuoyuan Chen, (May 2014)
Brit'Ny Hawkins, (May 2014)
Genna Gomes (May 2015)
Peyton Ward (May 2015)
Rebecca Siebenaler (May 2016)
Rochelle Cameron (May 2016)
Meredith Frenchmeyer (May 2017)
Bridget Flaherty (May 2017)
Allison Killilus (May 2017)

PhD Students:
Ellen Cooper, (May 2009)
Elizabeth Davis (May 2013)
Pam Noyes, (May 2013)
Simon Clay Roberts, (August 2014)
Laura Dishaw (May 2015)
Laura Macaulay (July 2015)
Mingliang Fang (May 2015)
Chris Leonetti (July 2016)
Stephanie Hammel
Allison Phillips
Matthew Ruis

UNDERGRADUATE STUDENTS INDEPENDENT STUDY PROJECTS

John Blades, Chemistry (2007)
Aminah Cherry, Arts & Sciences (2007)
Stephen Lubin, Chemistry (2008)
Jenifer Fuh, Arts & Sciences (2011)
Olay Ayinksku (2011)
Alex Keller (2012)
Matthew Mrozek(2012)
Katharine Gifford (2014)
Nikalesh Raju (2013)
Amy Trey (2015)
Tom Neufeld (2015)
Spencer Pecha (2015)
Deanna Badger (2016)

POSTDOCTORAL RESEARCH ASSOCIATES
Dr. Dongli Wang (2009-2010)
Dr. Wu Dong (2011-2014)
Dr. Craig Butt (2010-2014)
Dr. Kate Hoffman (2013-2014)
Dr. Erin Kollitz (2014- present)
Dr. Christopher Kassotis (2015-present)
Dr. Tara Rafferty (2015-2016)

ACADEMIC COMMITTEES

PhD Committee Member, Rae Benedict, University of Maryland (2007)
PhD Committee Member, Jon Bearr, University of Maryland (2010)
PhD Committee Member, Nerissa Wu, Boston University School of Public Health (2010)
PhD Committee Member, Erin Yost, NC State University (2013)
PhD Committee Member, David Szabo, UNC Chapel, Hill (2012)

PhD Committee Member, Changlong Wu, Environmental Engineering, Duke University (2008)
PhD Committee Member, Michael Watts, Environmental Engineering, Duke University (2008)
PhD Committee Member, Shuyi Wang, Environmental Engineering, Duke University (2010)
PhD Committee Member, Amrika Deonarine, Environmental Engineering, Duke University (2011)

PhD Committee Member, Andreas Gondikas, Environmental Engineering, Duke University (2012)
PhD Committee Member, Ashley Parks, Environmental Engineering, Duke University(2013)
PhD Committee Member, Tong Zhang, Environmental Engineering, Duke University (2012)
PhD Committee Member, Ryan Holzem, Environmental Engineering, Duke University (2014)

PhD Committee Member, Deanna Howarth, NSOE, Duke University (2010)
PhD Committee Member, Carrie Flemming, NSOE, Duke University (2011)
PhD Committee Member, Lyndsey Van Tietem, NSOE, Duke University (2011)
PhD Committee Member, Bryan Clark, NSOE, Duke University (2011)
PhD Committee Member, Audrey Bone, NSOE, Duke University (2015)
PhD Committee Member, Gordon Getzinger, NSOE, Duke University (2016)
PhD Committee Member, Claudia Gonzalez, NSOE, Duke University
PhD Committee Member, Tony Luz, NSOE, Duke University
PhD Committee Member, Drew Day, NSOE, Duke University
PhD Committee Member, Xioxing Cui, NOSE, Duke University
PhD Committee Member, Judy Winglee, Environmental Engineering, Duke University

Jennifer Lowry, MD, FAAP
American Academy of Pediatrics

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

September 14, 2017

Testimony of
Jennifer Lowry, MD, FAAP

On behalf of the
American Academy of Pediatrics

Before the
U.S. Consumer Product Safety Commission

"Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants."

American Academy of Pediatrics • Department of Federal Affairs
601 13th Street NW, Suite 400 North • Washington, DC 20005
Tel: 800.336.5475 • E-mail: kids1st@aap.org

Good morning Chairwoman Buerkle and Commissioners Kaye, Adler, Robinson, and Mohorovic:

Thank you for the opportunity to present this morning about the child health impact of organohalogen flame retardants. My name is Dr. Jennifer Lowry, and I am here representing the American Academy of Pediatrics (AAP), a non-profit professional organization of 66,000 primary care pediatricians, pediatric medical sub-specialists, and pediatric surgical specialists dedicated to the health, safety, and well-being of infants, children, adolescents, and young adults. I serve as the Chair of the AAP's Council on Environmental Health Executive Committee.

In addition to my role within the AAP, I also work at Children's Mercy Kansas City, where I am the Chief of the Section of Clinical Toxicology and Environmental Health and the Medical Director of the Division of Clinical Pharmacology, Toxicology, and Therapeutic Innovation.

Introduction

I am here today to express AAP's continued support for U.S. Consumer Product Safety Commission (CPSC) action to protect children from the harmful health and developmental effects of organohalogen flame retardants. The AAP is concerned by CPSC staff's June recommendation to not begin rulemaking following the petition to CPSC requesting the banning of all organohalogen flame retardants in four product classes under the Federal Hazardous Substances Act (FHSA). The AAP is one of the original petitioners, and we continue to strongly support CPSC moving forward on this important child health issue.

This petition requests that CPSC use its authority under the FHSA to ban the use of organohalogen flame retardants in four key product classes:

1. All children's products other than car seats, which are generally under the jurisdiction of the National Highway Traffic Safety Administration's jurisdiction unless they also serve as infant carriers;
2. Upholstered furniture;
3. Mattresses and mattress pads; and
4. The plastic casing on electronic devices.

Organohalogen flame retardants have well-documented association with significant deleterious child health effects and are extensively used in these four product classes. These chemicals are known to leech from those products, resulting in widespread human exposure. Given the demonstrated hazard of these chemicals to children and their prevalence in these product categories, we maintain that the CPSC is well-positioned to act on this public health threat through its FHSA authority. We urge you to reject the June staff recommendations and instead move forward to develop a proposed rule to ban this chemical class in these four product categories.

Children Are Disproportionately Vulnerable to Toxic Chemicals

Not only do children have more opportunities to be exposed to environmental chemicals, but as children grow and mature, their unique physiologic, developmental, and behavioral differences make them especially vulnerable to chemical exposures. Because

children are smaller than adults, their surface area–to–body mass ratio is greater. Children eat more food and drink more water per unit of body weight than do adults, and breathe at a faster rate. Infants and children of all ages spend more time on the floor or ground than adults. Therefore, children will come into more contact with contaminants on these surfaces. Chemical exposures can disrupt the critical and rapid stages of development that occur in prenatal and early childhood life, particularly involving the neurologic and endocrine systems. Even low-dose exposures to chemicals during these periods can have major lifelong health effects.

Chemical Flame Retardants Are Associated with Negative Health Effects

Organohalogen flame retardants are associated with a wide range of serious adverse health effects, including reproductive impairment, neurological effects including IQ decrements and learning deficits, endocrine disruption and interference with thyroid hormone action, genotoxicity, cancer, and immune disorders. Children exposed to these chemicals can face serious and irreversible health consequences. Banning these flame retardants will help to prevent these adverse health effects in children.

Inexplicably, the CPSC staff recommendation package does not adequately account for the well-documented health risks of this chemical class. The recommendations suggest that there is insufficient data to support these claims, and that federal regulation should not apply to these chemicals as a class. However, there is extensive evidence that organohalogen flame retardants pose a serious chronic health risk, particularly to children. In addition, the structural similarities across this chemical class represent a common

hazard. Failure to ban organohalogen flame retardants as a class will simply lead to regrettable substitution, whereby the banning of one problematic compound leads to the adoption across the industry of a chemical with similar health risks but less available research demonstrating them. This health threat across the class is precisely the reason that the petition requests that CPSC use its FHSA authority to regulate this entire chemical class.

Children Face Extensive Exposure to Chemical Flame Retardants

In addition to the extensive evidence for the detrimental health effects these chemicals pose to children, the U.S. Centers for Disease Control and Prevention's (CDC) biomonitoring program estimates that 97 percent of U.S. residents have measurable quantities of these chemicals in their blood. Further, the highest levels of harmful flame retardants in the general population are found in young children from communities of low socioeconomic status and communities of color. Flame retardant exposure is ubiquitous in the U.S., presenting a serious public health threat to children.

The AAP is also concerned by the rationale in the June recommendation to reject the petition that argues the "mere presence" of organohalogen flame retardants in the blood and urine is insufficient to demonstrate that an adverse effect or disease may occur. These recommendations do not account for extensive scientific evidence that demonstrates the cumulative impact of chronic exposure to multiple chemicals acting on the same negative health endpoints. Additionally, the recommendations fail to contemplate the robust body of

evidence for the significant health effects that chemical exposures can cause even at very low dose exposure levels. Pediatric research continues to demonstrate significant negative health effects for low-dose exposures. This is particularly true for children, who both face a longer exposure time-horizon and are uniquely susceptible to even small changes to their endocrine system during key developmental changes. Given the science demonstrating the hazard these chemicals pose and their ubiquity in the bodies of U.S. residents, organohalogen flame retardants pose a clear health hazard that CPSC should regulate under the FHSA. Public health action is critical to protect children from organohalogen flame retardants.

CPSC Action Is Critical to Protecting Child Health

Given the health risks that organohalogen flame retardants pose and the widespread human exposure to these compounds, it is even more troubling when one learns that they are not necessary for products to meet any mandatory flammability standard. Organohalogen flame retardants are unnecessary to protect against fires, and instead pose their own serious risks to children. We urge CPSC to advance this petition to the rulemaking process and promulgate a proposed rule to ban all organohalogen flame retardants in these four product classes.

An FHSA ban of this entire chemical class in all four product categories is necessary because history and extensive scientific research demonstrate that the health threats from these chemicals are present across the chemical class. Warning labels are insufficient to protect children and families from the risks flame retardants pose. Previous attempts to

address the health effects of flame retardants on a chemical-by-chemical basis led to regrettable substitution, whereby the banning of one problematic compound led to the adoption across the industry of a chemical with similar health risks but less available research demonstrating them. CPSC has the expertise and the authority under the FHSA to effectively address this public health issue. The petition and the existing scientific literature on organohalogen flame retardants make clear that this chemical class poses the FHSA definition of a hazard, and CPSC should regulate it as such in these four product categories. The AAP urges CPSC to move forward in developing a rule to protect children from the adverse health effects of flame retardants.

Conclusion

The AAP strongly supports the petition to ban all organohalogen flame retardants in children's products, upholstered furniture, mattresses and mattress pads, and the plastic casing of electronic devices. We are dismayed that CPSC staff's current recommendation is to take no meaningful action on this issue, and urge the Commission to move to regulate this chemical class to protect children from the unnecessary health risks posed by organohalogen flame retardants in these four product categories. Thank you again for the opportunity to speak today, and we look forward to working with you on this important issue.

Kathy Attar
Physicians for Social Responsibility

Organohalogen Flame Retardants Petition; Oral Presentation

My name is Kathy Attar and I am the Toxics Program Manager at Physicians for Social Responsibility (PSR). PSR is a nonprofit organization based in Washington, DC and with chapters in multiple states across the country. Our mission is to protect human life from the gravest threats to health and survival; we number environmental pollution among those threats. Many of our members are health professionals who care deeply about the health of communities and believe prevention is the answer to rising disease rates and health care costs. PSR has a long history of educating, organizing, and advocating around the issue of toxic chemicals and their link to poor health.

I have over 10 years of experience on issues related to chemical toxics. As PSR's Toxics Program Manager, I work with physicians and other health professionals across the country, providing them information on the health effects of hazardous chemicals and assisting them in preparing to speak, write and testify on related topics. I myself have engaged in legislative advocacy on environmental health issues including Toxic Substances Control Act reform and provided direct education to Congressional offices on the health threats associated with toxic chemicals. I have also highlighted the health effects associated with toxic chemicals in consumer products by submitting comments to federal regulatory agencies signed by health professionals.

I'm also a mom of two children Farah age 8 and Alex age 5.

PSR strongly supports the petition that a broad coalition of health, environmental and public interest groups submitted to the Consumer Product Safety Commission in 2015 that seeks to ban organohalogen flame retardants from children's products, furniture, mattresses and household electronics.

As a parent, you are determined to do whatever you can to ensure your children are safe.

When my daughter was younger she put everything in her mouth, as most babies and toddlers do. I mean everything—toys, TV remotes, books—anything that fit. During this time, through my work as an environmental health advocate, I started to learn about health dangers related to certain chemicals in consumer products. Chemicals like harmful flame retardants. Flame retardants are linked to an ever-increasing number of health concerns such as cancer, neurological deficits, developmental problems and impaired fertility. Many persist in the environment and can bio-accumulate, meaning that levels increase as they move up food chains.[1] As most flame retardants are not chemically bonded to the consumer product they can continuously migrate out of products and into indoor environments. The main route of exposure to these harmful chemicals is believed to be through ingestion and inhalation of contaminated indoor dust.[2]

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[1] Shaw SD, Blum A, Weber R, Kannan K, Rich D, Lucas D, Koshland CP, Dobraca D, Hanson S, Birnbaum LS. Halogenated flame retardants: do the fire safety benefits justify the risks? Rev Environ Health. 2010 Oct-Dec;25(4):261-305)

[2] Lorber M. Exposure of Americans to polybrominated diphenyl ethers. J Expo Sci Environ Epidemiol. 2008 Jan;18(1):2-19

Children of color and low-income kids bear a higher burden from these chemicals than others—a fact that raises serious concerns about environmental injustice. [3] Not everyone can go to stores in their communities which may sell less toxic products or can afford to purchase safer items. Extensive literature documents disproportionate exposure to toxic chemicals, and to health impacts linked to chemical exposures, among people of color and low-income people.

A report by the Campaign for Healthier Solutions (PSR is a member of the campaign)—a coalition that is advocating for discount retailers to phase out harmful chemicals in the products they sell- revealed that 81% of the products tested from several dollar stores contained toxic chemicals that link to learning disabilities, brain development, and cancer.[4] Further, imported products are more likely to contain organohalogens and these products often show up on the store shelves in low-income communities and communities of color.

Many communities served by dollar or discount stores are predominantly communities of color or low-income communities where they might be the only place to buy essential household items.

One of my son's favorite toys is our couch--it's a flat-bed truck or a cargo ship or a castle. Unfortunately, the couch was purchased several years before California issued its new safer furniture flammability standards (which no longer require the use of chemical flame retardants) so it undoubtedly has toxic flame retardants in it. I'm pretty obsessive about wet mopping our living room but there is little doubt my kids have been exposed to some level of dust containing these hazardous chemicals.

The average lifetime of a couch is 15-20 years per owner, and couches are often passed on to others—purchased at a second-hand or thrift store perhaps by a low-income family where they are used for many more years. Flame retardants in furniture are a prime example of the hazardous legacy of inadequate chemical regulations.

Even when chemicals are voluntarily withdrawn under pressure from regulators or the public, the substitutes often end up being just as worrisome because they also contain organohalogens or are similar in chemical structure. Numerous scientific studies have shown a variety of adverse effects associated with flame retardant alternatives including cancer.[5] A critical reason why we need a ban on the whole class of organohalogens.

Organohalogen flame retardants are endocrine disrupting chemicals (EDCs) which mean they can mimic or inhibit the action of naturally occurring hormones. Exposures to EDCs during critical times of growth and development can result in genetic modifications that are passed down to subsequent generations. Endocrine-related disease is on the rise:

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[3] Sifferlin, Alexandra. Time. May 23,2012 **"Toxic Flame Retardants: Why Does Kids' Exposure Vary by Race and Socioeconomics?"** http://healthland.time.com/2012/05/23/toxic-flame-retardants-why-does-kids-exposure-vary-by-race-and-socioeconomics/

[4] http://ejforall.org/assets/media/documents/Report_ADayLateAndADollarShort.pdf

[5] Betts, Kellyn. *Environ Health Perspect* 121:A150 (2013). http://dx.doi.org/10.1289/ehp.121-a150 [online 01 May 2013] "Exposure to TDCPP Appears Widespread." https://ehp.niehs.nih.gov/121-a150/#r8

- Neurobehavioral disorders associated with thyroid disruption have increased over the past decades.
- Rates of endocrine-related cancers (breast, ovarian, prostate, and thyroid) have been increasing over the past 50 years.[6]

The speed with which the increases in disease incidence have occurred in recent decades rules out genetic factors as the sole explanation for why we are seeing more cancers and neurobehavioral disorders.

These environmental health statistics became very real for me in 2015. In August, my mom was diagnosed with late-stage ovarian cancer and a few days before Halloween I was told I had early-stage invasive ductal carcinoma, a form of breast cancer. While I will never know what "caused" our cancers, exposure to environmental pollutants may have played a leading or supporting role in the onset of our disease.

I worry about my children, and particularly my daughter and what her future health risks might be given my family's history of endocrine-related cancers in women.

We need binding regulatory change that, by keeping toxic chemicals out of our products and our lives, can reduce the risk of chronic diseases for all families and individuals no matter your race or socioeconomic status. It is not enough that use of halogenated flame retardants is going down. We need the CPSC to take steps that will ensure that organohalogen flame retardant chemicals are removed from imported, low-cost products and other items in which they are still used.

Flame retardants are not needed to prevent fire and improve overall safety in the four product categories outlined in the petition—children's products, mattresses, furniture and household electronics. So, there is no reason to continue exposing children and other consumers to these hazardous substances. Parents want and need the government to step in much more robustly to protect the health of all families.

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[6] WHO/UNEP. **State of the science of endocrine disrupting chemicals - 2012**
http://www.who.int/ceh/publications/endocrine/en/

Sonya Lunder, MPH
Environmental Working Group

Organohalogen Flame Retardants Petition; Oral Presentation
Comments will be submitted by phone

Sonya Lunder, Senior Analyst

My name is Sonya Lunder and I am a senior analyst at the Environmental Working Group, a nonprofit, research and advocacy organization dedicated to protecting human health and the environment. As a core part of our mission, EWG works to inform the public about potential hazards posed by harmful chemicals in food, drinking water and consumer products. Our educational materials reach millions of Americans.

Over the past 14 years EWG has performed original studies to document the extent of human exposure to organohalogen flame retardants. We have collaborated with academic laboratories to measure PBDEs, a type of brominated flame retardant, in paired serum samples from toddlers and their mothers,[1] in mothers' milk, umbilical cord blood, household dust, and fish caught for subsistence by individuals and families.[2,3,4,5,6] More recently, EWG worked together with Duke University researchers to measured metabolites of chlorinated Tris and Firemaster 550™ flame retardants in preschool age children and their mothers.[7,8] Our studies suggest widespread exposure to unnecessary and toxic flame retardants, particularly during pregnancy, infancy and early childhood.

EWG strongly supports the petition to ban four general categories of consumer products whenever they contain organohalogen flame retardants in additive form. These categories include children's products, mattresses, upholstered furniture and electronics casings. EWG submitted comments supporting the organohalogen product ban in 2016 and now joins the petitioners, Consumer Federation of America and Earthjustice, in disputing the recommendation by Consumer Product Safety Commission staff to deny the petition, as detailed below.

1. Flame retardants continue to pose serious health concerns

A large body of research has documented the health harm from bromine- and chlorine-containing flame retardants, also known as organohalogen flame retardants (OFRs), which have been widely used in home furnishings and electronics for decades.

In its briefing package, the CPSC staff recommended that the Commission deny the petition based on insufficient toxicity data for the class. Yet, such data are in fact available, as outlined in the 2015 petition. Furthermore, since the petition was submitted in 2015, dozens of new studies have documented the environmental persistence of these chemicals, widespread human exposure, and the health risks organohalogens pose to people.

For example, PBDEs are detected in nearly every American. A systematic review published in August 2017 examined 15 studies of PBDE exposure and neurodevelopmental disorders, and found sufficient evidence that developmental PBDE exposure impacted childhood IQ.[9] While the Environmental Protection Agency had negotiated a phase-out of PBDEs from production in the United States in 2003, the Agency proposed but did not finalize restrictions against the import of PBDE-containing articles. As a result, PBDEs are still found in products sold in the United States.[10]

Additionally, the 2015 petition documents a clear pattern of "regrettable substitution" where restrictions on specific organohalogen flame retardants have repeatedly resulted in a substitution with new, poorly studied halogenated alternatives.

Restrictions on PBDEs have also led to greater use of chlorinated Tris as a replacement flame retardant in consumer products. Scientists recently reported a dramatic increase in one form of Tris (TDICPP) in Americans between the mid-2000s and 2015.[11] Human exposure and toxicity concerns have lead four states – Maryland, New York, Vermont and Washington – to ban two forms of Tris, TDCPP and TCEP, in foam products.[12] Without clear federal action to restrict organohalogen flame retardants as a group, the market would likely shift toward newer, poorly studied halogenated chemicals, perpetuating the cycle of regrettable substitution.

2. Organohalogen flame retardants have qualities that make them hazardous to human health

CPSC staff contend that the variable chemical structures and toxicological impacts of the organohalogen flame retardants preclude the Commission from taking action to ban organohalogens as a group. It is true that bromine- and chlorine-containing flame retardants are a diverse group from a structural and chemical perspective. Yet, every one of the 10 halogenated flame retardants the EPA examined in its 2015 assessment of replacement options for polyurethane foam was rated "high hazard" in at least one category for either human health effects and/or environmental impact, such as persistence or bioaccumulation.[13] The addition of halogens to large organic molecules also increases the capacity to form harmful dioxin- and furan-like compounds during incineration.

Moreover, organohalogen flame retardants share physical and chemical qualities that warrant their consideration as a group under the Federal Hazardous Substance Act, legislation that gives the CPSC authority to ban certain products. The halogen-carbon bond, which imparts thermal stability, also results in persistence and longevity of these chemicals in the environment and contributes to their toxicity to human health.

An interdisciplinary team of researchers based at the University of Toronto recently reviewed 94 novel flame retardants that could be used as substitutes for consumer

products, and found that 40 percent had medium or high concern for potential environmental persistence.[14] The researchers called for replacement flame retardants to be evaluated as a class stating that the "one-by-one regulatory approach is problematic for ensuring that alternative FRs … will be less hazardous than their predecessors."

3. Flame retardants can be safely removed from consumer products, a change that must happen with federal action

The addition of chemical flame retardants to consumer products has not been proven to improve public safety. California's updated furniture flammability rules can achieve fire safety without the addition of flame retardant chemicals to polyurethane foam.[15] Many manufacturers are voluntarily removing these chemicals from foam and electronic products.

Some states have already adopted laws to prohibit the use of chemical flame retardants in upholstered furniture and/or children's products, yet 22 percent of the children's products examined by CPSC researchers **still contain** organohalogen flame retardants. Federal action is urgently needed to protect all children in the U.S. from these harmful chemicals.

Forward-looking manufacturers who care about transparency and heed the interests of their customers can readily source furniture foam and plastic housing free of additive organohalogen flame retardants. Further, handheld X-ray fluorescent (XRF) technology allows for rapid, affordable and noninvasive compliance monitoring, so the Consumer Product Safety Commission would not need to specify that manufacturers submit their products for costly third party analysis.

4. Data gaps shouldn't impede action

CPSC staff characterize the exposure data to be insufficient to link the four product categories named in the petition as the source OFRs in people. Specifically, the staff concluded that vehicles and contaminated food also contribute to human exposure.

Yet, research has shown that consumer products are the primary source of overall exposure to flame retardants. Together with these comments, we are attaching a publication suggesting that twice as many pounds of PBDEs were added to polyurethane foam in household products compared to vehicles.[16] Flame retardants from household products and vehicles migrate into the environment, and eventually into the food supply.

Additive bromine- and chlorine-containing flame retardants have been shown to migrate from foam and electronic products into household dust where they can be ingested by residents of the house, especially children. Many studies find an association between

contact with flame retardant-containing household products, contamination of household dust, and human exposures to these toxic chemicals.[17,18,19,20]

5. Voluntary action will not protect consumers from harm

In closing, EWG urges the Commissioners to take decisive action to protect the public, especially children, from exposure to toxic organohalogen flame retardants in everyday products. Despite an encouraging market shift away from additive flame retardants in household products, organohalogen flame retardants continue to be used. Voluntary action by manufacturers, and state-by-state restrictions on individual chemicals are not sufficient to keep these toxic chemicals out of our homes, our food supply and our bodies. We urge the commissioners to grant the petition request and ban organohalogen flame retardants from these four key product categories.

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Stocks and Flows of PBDEs in Products from Use to Waste in the U.S. and Canada from 1970 to 2020

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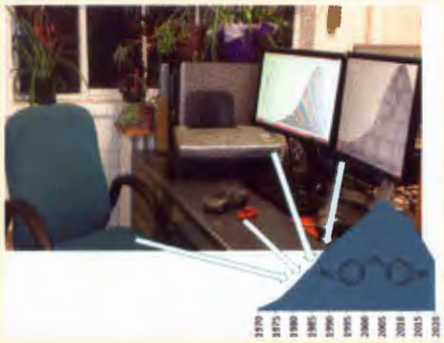
Supporting Information

ABSTRACT: The time-dependent stock of PBDEs contained in in-use products (excluding building materials and large vehicles) was estimated for the U.S. and Canada from 1970 to 2020 based on product consumption patterns, PBDE contents, and product lifespan. The stocks of penta- and octaBDE peaked in in-use products at 17 000 (95% confidence interval: 6000–70 000) and 4000 (1000–50 000) tonnes in 2004, respectively, and for decaBDE at 140 000 (40 000–300 000) tonnes in 2008. Products dominating PBDE usage were polyurethane foam used in furniture (65% of pentaBDE), casings of electrical and electronic equipment or EEE (80% of octaBDE), and EEE and automotive seating (35% of decaBDE for each category). The largest flow of PBDEs in products, excluding automotive sector, to the waste phase occurred between 2005 and 2008 at ~10 000 tonnes per year. Total consumption of penta-, octa-, and decaBDE from 1970 to 2020 in products considered was estimated at ~46 000, ~25 000, and ~380 000 tonnes, respectively. Per capita usage was estimated at 10–250, 10–150, and 200–2000 g·capita^{-1}·y^{-1} for penta-, octa-, and decaBDE, respectively, over the time span. Considering only the first use (no reuse and/or storage) of PBDE-containing products, approximately 60% of the stock of PBDEs in 2014 or ~70 000 tonnes, of which 95% is decaBDE, will remain in the use phase in 2020. Total emissions to air of all PBDEs from the in-use product stock was estimated at 70–700 tonnes between 1970 and 2020, with annual emissions of 0.4–4 tonnes·y^{-1} for each of penta- and octaBDE and 0.35–3.5 tonnes·y^{-1} for decaBDE in 2014.



1. INTRODUCTION

Prior to being banned or phased out in Europe, Canada, and the U.S., polybrominated diphenyl ethers (PBDEs) were used as flame retardants (FRs) in a variety of products. Since they are not chemically bound to plastics, foam, fabrics, and other materials to which they were added, PBDEs migrate from products into indoor and outdoor environments.[1−4] This, in turn, has resulted in human exposure as well as the contamination of soils, wastewater, waterbodies, biota, and consequently food supplies. Many in vitro and in vivo animal studies have demonstrated a range of adverse effects from PBDE exposure.[5−8] Further, epidemiological evidence has found associations between PBDE exposure and altered concentrations of thyroid hormones, decreased fertility in adults, and lowered IQ in children exposed to ambient levels.[9−12]

The marketing and use of products containing more than 0.1% of the commercial mixture of penta- and octaBDE (c-penta and c-octaBDE) was first banned by European Union (EU) in 2003, in part because of concerns about rising levels of these compounds in human breast milk.[13] The EU then banned the use of the commercial mixture of decaBDE (c-decaBDE) in electrical and electronic equipment (EEE) in 2008.[14] In Canada, the homologues in c-penta- and c-octaBDE were declared toxic in 2006 under the Canadian Environmental Protection Act,[15] after which their production and use in new products was banned in 2009, while the government called for voluntary measures to limit the release of decaBDE during its use in manufacturing of new products. In the U.S., starting in the early 2000s, regulations banning the use of PBDEs were adopted by individual states (e.g., Washington, Maine).[16] At the federal level, U.S. manufacturers agreed to voluntarily phase out the production of c-penta- and c-octa- before the end of 2004 and c-decaBDE after 2013. Also, U.S. manufacturers and importers of c-penta- and c-octaBDE are required to submit a significant new use notice to the U.S. Environmental Protection Agency 90 days prior to their manufacture, import or use.[16]

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Neither the U.S. nor Canada have regulations that pertain to imported finished products that contain PBDEs.

At the global scale, tetra- to heptaBDE congeners were added to the list of chemicals targeted for global elimination from production and use under the Stockholm Convention on Persistent Organic Pollutants in 2009.[14] In 2013, Norway filed a petition to add c-decaBDE to the list of POPs under the Stockholm Convention.[17]

The bans and restrictions noted above do not specifically address existing stocks of PBDE-containing products that are still in use or have entered the waste phase. In addition, penta- and octaBDE in recycled plastics have been exempted from the controls placed on these two commercial mixtures by the Stockholm Convention.[18] Since PBDEs contained in in-use products will presumably continue to be a source of human and environmental exposure to PBDEs, our first goal was to develop time-dependent estimates of the stocks of penta-, octa-, and decaBDE commercial mixtures in in-use products and to estimate the magnitude and the rate at which the PBDEs in these products leave the use phase and enter the waste phase in the U.S. and Canada. A second goal was to estimate PBDE emissions to air from the stock of PBDEs in the use phase. The stock for the period from 1970 to 2020 was based mainly on consumption patterns of PBDE-containing products over time and their residence time in the use phase. The projected changes in the stock of PBDEs are intended to provide insight into the effectiveness of efforts aimed at reducing levels of PBDEs in the environment.

The use of decaBDE in the transportation sector began prior to 1970.[19] Limited reporting of production values of most PBDE commercial mixtures began in 1970;[20] however, reliable information on their use is scarce. In the 1990s, PBDE formulations were produced by three major commercial manufacturers, two of them in the U.S. (Chemtura, which was previously known as Great Lakes Chemical Corporation, and Albemarle) and Israel Chemicals Limited (ICL).[17] PBDEs were also produced in Europe (Germany and Netherland), China, and Japan.[20]

The Bromine Science and Environmental Forum (BSEF), of which Chemtura, Albemarle, and ICL are members, reported the 1999 and 2001 market demand for PBDE commercial formulations,[21,22] which can be roughly translated into sales data (Table S1 in the Supporting Information). These values have been widely and repeatedly reported[23−26] and used to estimate the time-dependent consumption of PBDEs and PBDE emissions in Europe and/or North America.[24,27−29]

UNEP[14] reported that ~100 000 tonnes of pentaBDE have been manufactured globally since 1970. Using the 2001 BSEF data and some other sources, Alcock et al.[24] estimated that about 85% of the total pentaBDE was used in North America and the remainder in Europe. More than 90% of the global use of pentaBDE was for the treatment of polyurethane foam (PUF) with the remainder used in EEE.[14] Total global consumption of octaBDE was estimated at ~110 000 tonnes with its main use in EEE.[14] The total global production of decaBDE was estimated at ~1 100 000 to 1 250 000 tonnes from 1970 to 2005.[14] By 2005, production of decaBDE was estimated to have exceeded 60 000 tonnes per year with over 40% of the total global production used in North America.[30] The consumption of decaBDE in North America may have increased due to the curtailed use of penta- and octaBDE (for compatible uses), but there is no firm evidence of this. DecaBDE was mainly used in EEE, the transportation sector, textile and fabrics, and construction materials. It needs to be emphasized that these estimates reported in the literature bear considerable uncertainty, even if this is not specified.[16] Below, we present our estimates of the stock of PBDEs in in-use products and the movement of this stock to the waste phase of each commercial mixture in the U.S. and Canada according to product usage as well as PBDE emissions to air from 1970 to 2020.

2. MATERIALS AND METHODS

According to the Stockholm Convention technical guidance,[31] the inventory of PBDEs comprises the stock of PBDEs in products in-use and in the waste stream, in stockpiles and potentially contaminated sites. Here, we consider the stock of PBDEs in in-use products and their movement to the waste phase but not stockpiles of the chemicals or potentially contaminated sites. The product categories we considered are listed in Table S2, and those excluded, due to a lack of data, are listed in Table S3. With one exception noted below, the approach we used was based on balancing the mass of all time-dependent inputs (annual consumption) into the system (use phase) and the mass of all outputs from the system (to the waste phase) plus a storage time (stock) that considers accumulation in the system of in-use products. A major gap in our study was quantifying the amount of decaBDE used in wall coverings, roofing material, and other building and construction materials as well as PBDEs used in large vehicles such as aircraft and trains.[16] We also included only PBDEs in EEE used in the casing of products and did not include PBDEs that may have been used in other parts such as motherboards and other interior components of these products.

The products were assumed to enter the waste phase at the end of their first use or lifespan; the uncertainty associated with a product's lifespan was considered in the uncertainty analysis. Detailed methods for each product category are provided in the SI (Section 1). The flow of PBDEs in in-use products to the system was estimated based on consumption patterns and sales data of PBDE-containing products (mostly in the U.S.) from 1970 to 2010 and projections to 2020. Where the number of products entering the use phase (e.g., sales data) was available or could be extrapolated based on a consumption pattern or production rate, a "top-down" approach[32] was used, as described below. For the casings of all electrical and electronic equipment (EEE), PUF slabstock used in furniture (e.g., couch cushions and nonmolded chairs), and plastic pallets, the mass of PBDEs in products entering the use phase in a given year was added to those remaining in the use phase from previous years calculated using a Weibull statistical distribution. The Weibull distribution was used to estimate the probability distribution of products purchased in a given year entering the waste phase in subsequent years according to their specific lifespans. Further details are provided in the SI. Annual vehicle registration and vehicle age data were used to estimate the stock of PBDEs in cars and light trucks. A "bottom-up" approach was used for PBDEs in textiles for which no data were available on annual product sales, the percentage of textile products treated with PBDEs, or the PBDE concentrations in those products. In this case, the stock was estimated from the aggregated annual consumption of PBDEs and the overall percentage of PBDEs used to treat textiles.[16]

The probability distribution of one product type remaining in the system over time, in this case the use phase, was assumed to follow the complementary cumulative probability function of

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the Weibull distribution. Specifically, the distribution provides the probability over time of one product entering the use phase in a specific year and remaining in the use phase in subsequent years, as follows

$$W'(t) = 1 - W(t) = e^{-\left(\frac{t-t_0}{T}\right)^k} \quad (1)$$

where $W(t)$ is the cumulative Weibull function, whereas $W'(t)$ is the complementary Weibull function that defines the fraction of a product type that remains in the use phase over time; t is the calendar year, adjusted by putting t in the middle of the year for each year (i.e., t = 2013.5 for the year 2013); t_0 is the calendar year when the mass entered the use phase; T is the average lifespan of a given product type (also known as the scale parameter); and k is the distribution parameter (also known as the shape parameter) defining the shape of the Weibull function. The initial total mass M_0 (tonnes) of one type of product entering the use phase in a specific year was obtained by multiplying the total number of products of one type purchased in a given year with their average mass. The mass of these products that remain in the use phase over time, $M(t)$ (tonnes), was then calculated as

$$M(t) = M_0 \cdot W'(t) \quad (2)$$

The stock of products of one type remaining in the use phase over multiple years was built by adding the complementary cumulative probability functions for the mass of products of that type entering the use phase in each year considered

$$M_{\text{Total}}(t) = \sum_{i=1970}^{2020} M(t, i) \quad (3)$$

where $M_{\text{Total}}(t)$ is the total mass (tonnes) of products of one type over time from, in this case, 1970 to 2020, i is the calendar year in which a product was purchased.

The Weibull density function $w(t)$ (eq 4), which is the first derivative of the cumulative distribution function (eq 1), was multiplied by M_0 to estimate the annual mass flow of products of one type that accumulated in the use phase in each year entering the waste phase over subsequent years (eq 5)

$$w(t) = \frac{k}{T} \cdot \left(\frac{t - t_0}{T}\right)^{k-1} \cdot e^{-\left(\frac{t-t_0}{T}\right)^k} \quad (4)$$

$$m(t) = M_0 \cdot w(t) \quad (5)$$

The total annual mass flow to waste management, $m(t)$ (tonnes y^{-1}), was obtained in an analogous manner as for the total mass in products in eq 3 above.

For those products for which the stock was estimated using a Weibull distribution (eqs 1−5), the shape parameter k (expressing the relative likelihood of products leaving the use phase over time) was 2.4 for most EEE[33] and 3.5 for CRT displays.[34] The lifespan (T) of each product-type was based on a U.S. national survey of the age of household products.[35] The numbers of products of any one type entering the use phase in a given year were translated into product mass, M_{Total} (tonnes), using the average weight of each product.[35] The mass of PBDEs in each product in the use phase, M_{PBDE} (tonnes), was calculated as

$$M_{\text{PBDE}} = M_{\text{Total}} \cdot F_{\text{P}} \cdot F_{\text{FR}} \cdot C_{\text{PBDE}} \quad (6)$$

where F_{P} is the mass fraction of that product comprised of a particular polymer to account for products that are comprised of multiple types of materials of which only some may have been treated with PBDEs, F_{FR} is the mass fraction of that product treated with PBDE to account for products for which only some were treated with PBDEs, and C_{PBDE} (tonne tonne^{-1}) is the concentration of PBDEs in the polymer fraction of each product. Values of F_{P} were taken from Morf et al.[26] and Wäger et al.[36] F_{FR} was taken from a screening of the Br content of ~1000 products estimated by means of X-ray fluorescence (XRF) analyzer (Table S4 for EEE). A Br content of 0.1% (Restriction of Hazardous Substances or RoHS European Union) was used as a threshold to discriminate between products with purposefully added PBDEs and those without PBDEs. C_{PBDE} was obtained from several sources including a companion study in which 120 products spanning a range of manufacturing years were analyzed for their congener-specific PBDE concentrations by GC-MS (Tables S4 and S6). Since penta- and octaBDE were phased out in 2004 and the production of decaBDE was expected to be discontinued after 2013, we assumed that no products containing penta- or octaBDE entered the use phase after 2004 and for decaBDE, after 2013.

A Monte Carlo analysis with 10 000 runs was performed to evaluate the uncertainty of the estimated stock and the sensitivity of the results to the most important and uncertain parameters (Table S9). All variables used in this study were assumed to be independent and to have a log-normal distribution[37] defined according to a confidence factor listed in Table S9. The 2.5% and 97.5% percentiles of the probability distributions were calculated for each year to obtain the 95% confidence interval for the mass of PBDEs in the use phase. Details of the uncertainty analysis are described in the SI (Section 2.3).

3. RESULTS AND DISCUSSION

3.1. Stocks of CRT TVs and decaBDE. The dynamic stocks of cathode ray tube televisions (CRT TVs) and PBDEs in CRT TV casings in the U.S. and Canada from 1970 to 2020 are used to illustrate results for those products analyzed using a "top-down" approach and the Weibull distribution (Figure 1). CRT TV casings are significant because they contain the highest concentration (40 000 μg g^{-1}, see Table S4) of decaBDE among the products included in the stock calculated here. Each color band in Figure 1a represents the mass of CRT TVs (sales data multiplied by average weight) that entered the use phase in a given year multiplied by its probability of staying in the use phase over time (Weibull shape parameter k = 3.5, T = 14 before 1990 and T = 9 after 1990). Our model begins in 1970 with 200 tonnes of CRT TVs entering the use phase (some CRT TVs that entered the use phase before 1970 may have contained PBDEs but were not included due to lack of data). The increase in the stock of CRT TVs in the use phase from early 1980s to early1990s was associated with an increase in market demand for these products followed by a moderate increase in late 1990s until a peak of ~7 million tonnes was reached in 2000 (Figure 1a). The stock of in-use CRT TVs then declined gradually from 2000 to 2010 due to the replacement of these products with lighter LCD and/or LED TVs. The change in the accumulation rate of CRT TVs in the use phase occurred as the lifespan of CRT TVs dropped from 14 to 9 years after 1990. The large flow of retired CRT TVs to the waste phase resulted in a rapid decline in the stock of CRT TVs in the use phase after 2010.

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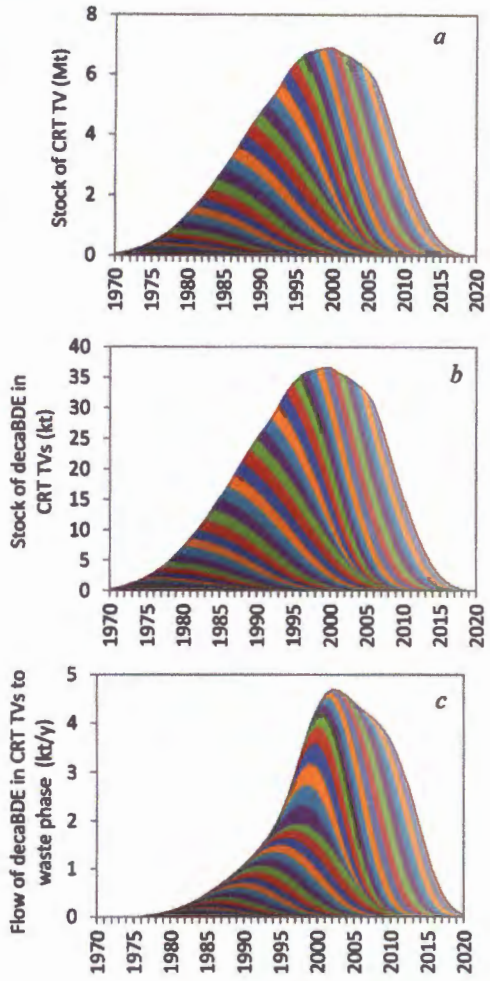

Figure 1. Stocks in the U.S. and Canada from 1970 to 2020: (a) stock of CRT TVs in the use phase (million tonnes), (b) stock of decaBDE used in CRT TV casings in the use phase (kilotonnes), and (c) flow of decaBDE used in CRT TV casings to the waste phase (kilotonnes year^{-1}).

The stock of decaBDE in CRT TV casings peaked in the use phase at ~35 000 tonnes in 2000 which corresponds to the largest stock of CRT TVs in the use phase (Figure 1b). Due to restricted use in Europe and impending controls in North America, use of decaBDE in new products was assumed to be zero following 2013. By 2020, we estimated that almost all decaBDE in the casing of CRT TVs will have left the use phase.

The substantial flow to the waste phase of decaBDE in those CRT TVs that entered the use phase in the early 1970s started in the late 1970s, almost 10 years after their first use. This is shown in Figure 1c where the peak (or maximum thickness) of each individual color band corresponds to the year in which the greatest mass of decaBDE in CRT TVs purchased in any specific year entered the waste phase. The sharp increase in the flow of decaBDE from the mid-1990s to mid-2000s reflects the increase in the use and discarding of CRT TVs that entered the use phase from early 1980s to 2000. The flow of decaBDE in CRT TV casings to the waste phase started to decline in 2004, four years after the peak in the use phase, and will continue to decline until 2020.

Section S2.1 contains details of similar Weibull distributions that were generated to estimate the stocks and flows of the three PBDE commercial mixtures in the casings of other EEE, wiring, PUF used in furniture, plastic pallets, and textiles. The time trend of the stock of vehicles was estimated based on available information about registered vehicles and their age distribution from 1970 to 2010 (SI Section 1.1.5).

3.2. Stock of Commercial Mixtures of PBDEs. A total mass of 46 000 tonnes (95% confidence interval or CI: 8000–76 500 tonnes, Table S7) of pentaBDE was estimated to have entered the use phase in products in the U.S. and Canada from 1970 to 2004 with 65% in PUF furniture, 33% in automotive vehicles, and 2% in EEE (Figure 2a). We estimated that 3500

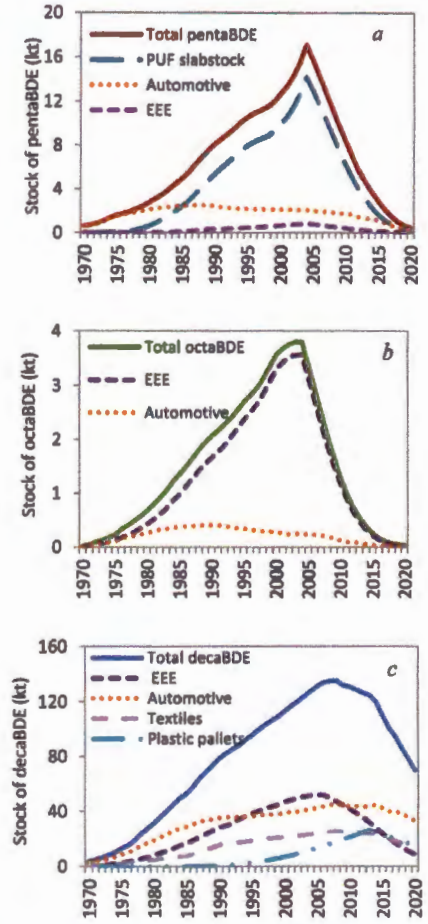

Figure 2. Stock of each PBDE commercial mixture in in-use products in the U.S. and Canada from 1970 to 2020, (a) pentaBDE in EEE, automotive vehicles, and PUF slabstock used in furniture, (b) octaBDE in automotive vehicles and EEE, and (c) decaBDE in plastic pallets, textiles, EEE, and automotive vehicles.

tonnes of pentaBDE entered the use phase in the U.S. and Canada in 2001 in comparison to 7,100 tonnes of market demand for this commercial mixture in North America reported by BSEF.[22] PentaBDE use in vehicle seating began in the early 1970s and in PUF furniture and EEE in the mid-1970s. By the 1990s, pentaBDE in vehicle seating was replaced with mainly chlorinated flame retardants,[19] while the amount of PUF furniture treated with pentaBDE increased by a factor of 3.

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The contribution to the stock of pentaBDE in the casings of EEE was assumed to be minimal.

The stock of pentaBDE in all applications peaked at ~17 000 (6000–70 000 tonnes) in 2004 in the U.S. and Canada (Figure 2a). The fastest annual growth rate of ~30% of pentaBDE stock occurred in the 1970s (Table S8). Considering only the first lifespan of products, most of the pentaBDE stock in these products was estimated to leave the use phase with an average annual rate of decrease of 16% by 2020. In comparison, by doubling the lifespan of PUF furniture from 15 to 30 years (i.e., use of second-hand furniture), the peak of pentaBDE in these products in the use phase would increase by 30% from ~13 000 to 20 000 tonnes and about 35% of the peak pentaBDE stock in these products in 2004 would remain in the use phase in 2020 (Figure S2).

The total mass of 25 000 (4000–45 000, Table S7) tonnes of octaBDE was estimated to have entered the use phase in products in the U.S. and Canada from the mid-1970s to 2004, with 80% used in the casings of EEE (CRT TV and computers) and 20% used to flame retard soft plastics in vehicles (Figure 2b). We estimated that 500 tonnes of octaBDE entered the use phase in 2001, compared with 1500 tonnes market demand reported by BSEF for the North America.[22] The stock of octaBDE increased rapidly from 1975 to 1985 at an average rate of increase of 18% (Table S8) due to strong consumer demand for these products, especially for CRT TVs. The total stock of octaBDE in the use phase peaked in 2004 at ~4000 (1000–50 000) tonnes after which no new use was assumed. By 2020, following an average annual rate of decrease of 25%, almost all octaBDE was estimated to have left the use phase (Table S8).

DecaBDE was used most extensively of the three commercial mixtures. A total of 380 000 (70 000–650 000, Table S7) tonnes was estimated to have entered the use phase from 1970 to 2013, with 35% in vehicle seating, and 35% in the casings of EEE, wire and cables, ~20% in textiles, and 10% in plastic pallets (Figure 2c). For 2001, 12 000 tonnes of decaBDE were estimated to have entered the use phase in the U.S. and Canada in comparison to 24 500 tonnes of the North American market demand reported by BSEF.[22] The main application of decaBDE prior to 1970 was to coat textiles used in vehicle seating[19] and, after that, other applications in the interior of vehicles.[38] However, its main use shifted in the 1980s to casings for EEE largely because of demand for CRT TVs.

DecaBDE stock peaked in 2008 at ~140 000 (40 000–300 000) tonnes after average annual growth rate of 8% from 1975 to 2008 (Table S8). The stock of decaBDE in EEE casings peaked around 2005 at ~50 000 tonnes after which CRT TVs and heavy desktop computers, which contained concentrations of decaBDE 5 to 400 times greater than other EEE (including flat screen TVs), were replaced by lighter alternatives. The peak of decaBDE in the automotive sector occurred in 2008 at ~45 000 tonnes, just before the U.S. recession reduced market demand for new vehicles. Due to controls and restrictions, we assumed that decaBDE was not used in new products following 2013 and will thus leave the use phase at an average annual rate of decrease of 7%. Approximately 70 000 tonnes of decaBDE was estimated to remain in the use phase by 2020, mostly in vehicles followed by plastic pallets, textiles, and EEE.

Due to a lack of data, the estimated stock of PBDEs in the transportation sector did not include PBDEs in large vehicles and public transportation (e.g., trucks, buses, trains, aircraft) and construction materials (e.g., wall coverings, roofing films, and other products). These products likely contribute significantly to the total stock of decaBDE[31] based on the requirements of flammability standards. Further details concerning uncertainties contained in this analysis are discussed in SI (Section 2.3).

3.3. Stock and Flows of PBDEs. The stock of total PBDEs in all products considered in the use phase from 1970 to 2020 in the U.S. and Canada was estimated by summing the stocks of penta, octa, and decaBDE (Figure 3a). PBDE stock peaked in

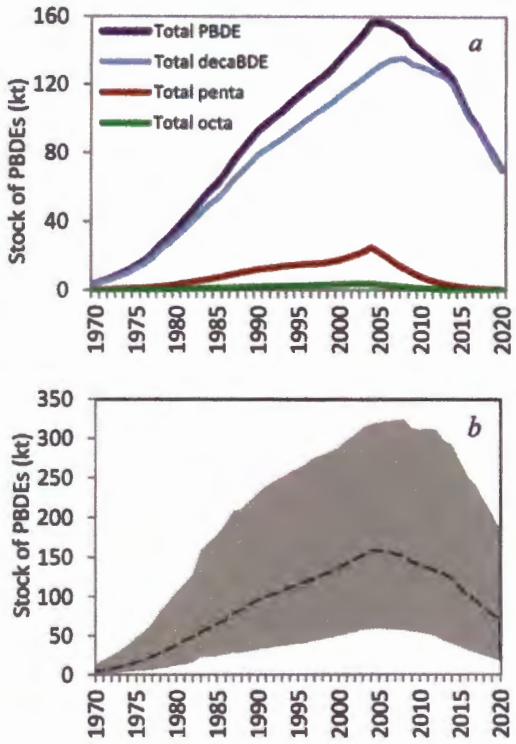

Figure 3. Stock of PBDEs in in-use products in the U.S. and Canada from 1970 to 2020, (a) "best" estimate of pentaBDE, octaBDE, and decaBDE and their total, and (b) best estimate (dashed line) and 2.5 and 97.5 percentiles (shaded area) of the stock of total PBDEs in the use phase estimated using a Monte Carlo analysis.

2005 at ~160 000 (50 000–330 000) tonnes (Figure 3b). Prior to that from 1980 to 2004, the stock of in-use PBDEs increased by 2–15% annually (a doubling time of 5–34 y) with the fastest rate occurring between 1974 and 1988. In comparison, Hites[25] estimated a doubling time of ~5 years in human tissues and marine mammals between 1970 and 2001 (mostly of penta- and octaBDE), which is consistent with our doubling time of 4–7 years for the inventory of penta- and octaBDE from 1970 to 2004. Total PBDEs only began decreasing between 2004 and 2013, at 3–8% annually, due to the discontinued use of penta- and octaBDE in 2004 and fewer vehicle registrations (with vehicles containing decaBDE) from 2008 to 2013. Assuming no new use of decaBDE after 2013 and the single use of products, ~120 000 (40 000–300 000) tonnes of PBDEs (95% decaBDE) was estimated to remain in the use phase in 2014. After that, the stock is anticipated to decrease annually at 7–15% from 2013 to 2020 (halving time of 4–10 y). The decrease is mainly attributable to decaBDE-containing EEE and vehicles entering the waste phase. Approximately 60%

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of the total mass of PBDEs in the use phase in 2014 or ~70 000 (10 000–180 000) tonnes, which is mainly decaBDE, is expected to remain in the use phase by 2020, mostly in vehicles. As noted above, these projections assumed only a single lifespan of product use and neglected the possible storage time of products prior to being discarded into the waste stream. Moreover, construction materials, large vehicles, and aircraft that have considerably longer lifespans (at least 20 years) were not included in this study and will prolong the stock of PBDE remaining in use. Our estimated PBDE consumption in 2001 in associated products is significantly lower than that estimated by BSEF for that year. We conclude that our estimates account for a lower estimate of the total usage and an expedited timeline for the retirement of PBDEs contained in in-use products.

The flow of PBDEs in products to the waste phase was calculated using the probability density function of the Weibull distribution (eq 4), except for PBDEs in the automotive sector for which a Weibull distribution was not used. Although the three PBDE mixtures were in use since the 1970s (and for decaBDE, even earlier), the flow of PBDEs to the waste phase was not appreciable until the mid-1980s (Figure 4). The flow of

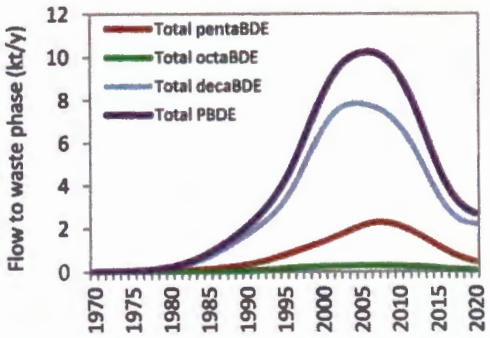

Figure 4. Flow of PBDEs to the waste phase in the U.S. and Canada from 1970 to 2020 (PBDEs in the automotive sector were excluded).

PBDEs to the waste phase in all products, excluding the automotive sector, peaked between 2005 and 2008 with the annual flow of ~10 000 tonnes, mainly because the retirement rate of CRT displays was highest in this period. Assuming that new products would not contain penta- and octaBDE after 2004 and decaBDE after 2013, we estimated that PBDEs entering the waste phase will decline at 4–12% annually after 2013.

Morf et al.[28] estimated that the stock of pentaBDE in Switzerland increased at 10–20% annually based on the production and the total consumption of pentaBDE and pentaBDE-containing products in Switzerland from 1980 onward, with a peak of 8 tonnes in 1994. The production and consumption of pentaBDE declined dramatically in Europe in 1990s.[24,27] Morf et al.[28] estimated that 30% of the stock of pentaBDE in 1990s in Switzerland would remain in the use phase until 2020. The longer residence time of the stock of pentaBDE in the use phase estimated by Morf et al.[28] than in this study is likely due to the longer lifespan of consumer products in Switzerland than the U.S. and Canada and, more importantly, the longer residence time of pentaBDE-containing construction materials in the use phase that were not included in our study. Earnshaw et al.[29] estimated that the stock of decaBDE in Europe peaked at ~80 000 (60 000–110 000) tonnes in early 2000s. The stock of decaBDE in in-use products in Japan was estimated to be ~60 000 tonnes in the 1990s based on the production rate and importation of PBDE-containing products.[39]

We estimated the per capita use of PBDEs in the U.S. and Canada as 10–250, 10–150, and 200–2000 g·capita^{-1}·y^{-1} for penta-, octa-, and decaBDE, respectively, from 1970 to 2020. These values compare reasonably well with Csiszar et al.[40] who estimated an equivalent of 50 g·capita^{-1}·y^{-1} consumption in 2007 of penta- and octaBDE in Toronto according to statistics and census data. Using the PBDE consumption estimates of Morf et al.[28] and Earnshaw et al.,[29] respectively, we derived a per capita use of pentaBDE in Switzerland and decaBDE in Europe of 5–10 g·capita^{-1}·y^{-1} and 250–350 g·capita^{-1}·y^{-1}, respectively. The higher consumption of PBDEs in the U.S. and Canada is consistent with relatively high reported concentrations of these chemicals in household dust and human tissues in these countries,[13,25,41,42] which is associated with the specific requirements of the flammability standards in the U.S. and Canada.

3.4. From Stocks to Emissions. As noted above, the stock of PBDE-containing products in the use phase provides an ongoing source of PBDE emissions to the environment.[39,40,43,44] Csiszar et al.[40] estimated, by means of mass balance modeling, that approximately 0.01% of the inventories of penta- and octaBDEs were emitted to air in Toronto in 2007. This estimate was derived by reverse modeling from measured air concentrations of Melymuk et al.[45] to obtain the emission rate necessary to support those measured concentrations. This value is less than the annual emission factor of 0.7% estimated by Palm et al.[46] and emissions from controlled chamber experiments of tetra- and pentaBDE congeners from TVs and PC monitors of 0.1 and 0.4% measured by Ball et al. (cited by Alcock et al.[24]). However, it is similar to the estimates of Alcock et al.[24] based on K_{OA}-corrected values developed for PCBs by Breivik et al.[47] Csiszar et al. also estimated an atmospheric emission rate of ~0.002% for decaBDE inventory in Toronto in 2007 (unpublished data). Sakai et al.[39] estimated an annual atmospheric emission factor of decaBDE of between 0.0003 and 0.003% of the decaBDE stock in Japan or the equivalent of 170–1800 kg·y^{-1} emissions relative to 60 000 tonnes of decaBDE stock in 2002. Using ranges in the annual emission factors of 0.01–0.1% annually for penta- and octaBDE stocks and 0.0003–0.003% annually for the stock of deca-BDE, we estimated that atmospheric emissions in the U.S. and Canada could be 0.4–4 tonnes·y^{-1} for penta- and octaBDE each and 0.35–3.5 tonnes·y^{-1} for decaBDE in 2014 when the respective stocks would be 4000 and 120 000 tonnes. Summing emissions from the stocks of all PBDEs in each year from 1970 to 2020 gives an estimate of 70–700 tonnes total atmospheric emissions of PBDEs.

In the future, we estimate that PBDE levels in air will decline at a rate proportional to the stock of PBDE-containing products, since secondary emissions of PBDEs from contaminated soils and surface waters have been estimated to be negligible in comparison to primary emissions.[48] Landfills could also be a source of PBDEs to air, but evidence for the importance of this emission source is inconclusive.[49] The best case scenario of the rate of decline of the total PBDE stock and hence air concentrations would be ~2–15% annually or a halving time of 5–34 y until 2020. The stocks of penta- and octaBDE were estimated to drop more quickly with an annual rate of 8–35% (halving time of 2–8 y) after 2004 due to what is likely an underestimation of the actual lifespan of PUF

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containing products (given our assumption of the single use of these products). These estimates are close to the measured halving time of ~6 y in air (vapor, particle, and precipitation) of pentaBDE congeners (BDE-47 and -99) in the Great Lakes region from 2005 to 2009.[50] In comparison, the decaBDE stock declined gradually from 2006 to 2012 at an average rate of 1−8%, after which a sharp decline is expected at an average rate of 4−14% (5−17 y half-life). These projections are consistent with the lack of a significant change in Great Lakes air concentrations of decaBDE from 2005 to 2009.[50] However, recently Ma et al.[51] reported more puzzling temporal trends in Great Lakes air concentrations based on data from 2005 to 2011: BDE-47 concentrations in vapor and particle phases were halving every 5−9 y in Chicago and Cleveland but had doubling times at rural sites of 7−11 y in the vapor phase and 2−4 y in precipitation, with no systematic changes in decaBDE concentrations. Concentrations of pentaBDE in Lake Ontario trout have shown halving times of 5−13 y[52,53] which is within the range estimated here.

Overall, estimates of the rate of decline of the stock of products containing PBDEs, along with decreases in measured PBDE concentrations in environmental media, suggest that PBDE reduction measures have been effective thus far in reducing the PBDE environmental burden in the U.S. and Canada. However, as PBDE-containing products continue to accumulate in the waste phase, waste management policies need to ensure that PBDEs are not emitted to the surrounding environment. Also, any reuse of PBDE-containing materials should only follow successful PBDE separation and removal from these materials. Finally, it should be pointed out that in order to meet flammability standards, manufacturers are replacing PBDEs with other flame retardants, which only now are being assessed for their potential persistence and/or toxicity and which are being detected in various environmental media.[51] As seen here, once a chemical such as a replacement flame retardant is incorporated into widely used products, it will remain in use long after it could be deemed inappropriate. Thus, it is important to consider potential ecological and human health effects associated with the use of flame retardants when developing or updating flammability regulations, standards, codes, or other requirements.

■ ASSOCIATED CONTENT

Supporting Information

Additional results and information are available. This material is available free of charge via the Internet at http://pubs.acs.org.

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Notes

The authors declare no competing financial interest.

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Organohalogen Flame Retardants Petition; Oral Presentation
September 14, 2017

Dear Chairman Buerkle and Commissioners Adler, Kaye, Mohorovic and Robinson:

I am writing to request the opportunity to make an oral presentation, **by phone from Canada**, in regards to the Organohalogen Flame Retardants Petition.

Below is a summary of the information I intend to present at the hearing schedule for September 14, 2017.

The main points I made in the statement in support of the petition of March 31, 2015 to your Agency continue to be valid. Indeed, these points are supported by additional research published and/or conducted since the time of writing. Below I lay out a brief reiteration of the main arguments I presented in 2015 followed by updates of additional evidence. I also argue the staff comments regarding the lack of evidence that links the four product categories to halogenated flame retardants (HFR) exposure overlooks relevant studies.

Brief Summary of Main Points from 2015 Statement in Support of Petition

1. Chemicals act in predictable ways based on their physical-chemical properties. All HFRs are in the larger category of semi-volatile organic compounds (SVOCs). HFRs, as SVOCs, seek a characteristic distribution among phases that comprise the environment. This is a fundamental characteristic of all HFRs as SVOCs. Indoors, those phases among which HFR distribute are air, dust, surface films on walls, windows and other surfaces and textiles (e.g., upholstery fabrics, clothes). The characteristic distribution of a particular HFR is dictated by the specific vapour pressure and other physical-chemical properties of that compound.

2 (a) As a class, HFRs that are added to a polymer migrate from the polymer until the HFRs reach their characteristic distribution between the polymer and indoor phases noted above, e.g., air, dust, textiles including clothing, flooring materials, and so on. Migration of an HFR (or any SVOC) added to, but not reacted with a polymer, is inevitable and entirely predictable based on the properties of the chemical, the polymer and other phases.

(b) NEW POINT. Another important "phase" indoors is skin. HFRs will, according to their physical-chemical properties, partition between air, dust, textiles such as clothing, etc and skin. Washing can remove the HFR from skin. After washing, the HFRs in air and other phases will once again seek to establish a characteristic distribution between the clean skin, air, dust, textiles, polymers, and so on.

3. HFRs, as a class, are persistent indoors. Once an HFR migrates from the product polymer into the indoor environment, the HFR will persist indoors. Persistence is attributable to the minimal degradation and removal processes that are available indoors and because of chemical partitioning into other materials indoors such as carpets, clothing and other textiles, and surfaces. This is the same phenomenon as the persistence of tobacco residues indoors after the cessation of smoking.

4. The migration of HFRs from products and their distribution among phases in the indoor environment provide opportunities for human exposure. Human exposure comes from inhalation of indoor air, inadvertent ingestion of contaminated dust, direct contact of HFR-treated products followed by hand-to-mouth contact, and partitioning to skin followed by dermal uptake.

Updated Evidence

Since March 31, 2015, numerous studies have corroborated these points and lend yet stronger support to the conclusion that HFRs, as a class, migrate from products, to which they have been added (not chemically bonded), resulting in human exposure (e.g.,[1,2,3,4,,5]). Moreover, many more studies have found adverse health effects connected to exposure in the general population to ambient levels of an increasing number of HFRs (e.g.,[6–9,10,11,12,13]).

Understanding of routes of exposure to HFRs from products has expanded and is relevant to CPSC staff's questions regarding the connection between products covered by the petition and exposure.

Exposure to HFRs (and other SVOCs and contaminants) from indoor sources can occur by:
1. Inadvertent ingestion of dust containing HFRs through partitioning of the HFR from product to air to dust or from direct transfer from a HFR-containing product to dust,
2. Hand-to-mouth transfer of HFR-containing dust on hands or direct hand contact with a HFR-containing product,
3. Dermal uptake directly from air or from clothing worn that has accumulated HFRs from indoor air and dust, and
4. Inhalation of HFRs from HFRs released from products to indoor air.

It is well documented that HFRs accumulate in indoor dust[14,15,,16,17]. There is now clear and strong evidence that HFRs in dust come from flame-retarded products, either due to direct contact with a flame retarded item[18] or due to HFR release from a product followed by partitioning directly into dust[19].

Following our paper in 2005 that identified dust as the main exposure route of polybrominated diphenyl ethers (PBDEs) to all except breast fed infants[20], attention turned to inadvertent dust ingestion as the main exposure route for PBDEs and, by extension other HFRs, in North America, e.g., [21,22]. Subsequent studies have provided support for inadvertent dust ingestion as a route of HFR exposure[23,24,25]. However, probing the relationship further has suggested that exposure may occur not from inadvertent dust ingestion per se (because dust ingestion rates are poorly known), but rather that dust may be acting as a proxy for indoor HFR exposure from other pathways.

Several studies have shown strong relationships between HFRs on hands and HFR exposure, presumed to be due to hand-to-mouth transfer[14,26,27,28]. Research in my lab has shown a significant relationship between HFR concentrations on the hands of 51 participants in Toronto and Ottawa regions in Canada and concentrations of these HFR removed by surface wipes of their handheld electronic devices. We also found correlations between HFR concentrations in hand wipes and HFR concentrations in in the air and dust in their homes[29].

Another exposure route that can contribute to HFR exposure is dermal uptake[30–32,33,34]. Dermal uptake can occur by direct partitioning of HFRs from a flame-retarded product to skin as in the case of hands. Direct

partitioning of HFRs, as SVOCs, can also occur from HFRs in ambient air to bare skin. There is sound evidence that dermal uptake is responsible for some exposure to phthalate plasticizers and other SVOCs such as nicotine, where the process is partitioning between these SVOCs in ambient air and bare skin[35,36].

Dermal transfer can be increased by skin contact with clothing exposed to SVOCs[37,38,39]. We have found that clean fabrics, not treated with HFRs, accumulate HFRs from indoor air[40,41,42]. Indirect evidence also has shown that fabrics and clothing accumulate HFRs from the indoor environment[43]. The potential for dermal uptake of HFRs from clothing with accumulated HFRs is a subject of a current investigation between myself and collaborators.

Inhalation was found to be relatively unimportant for PBDE exposure compared to dust ingestion or hand-to-mouth exposure. The minimal contribution of inhalation to PBDE exposure is due to low indoor air concentrations caused by low PBDE vapour pressures (volatility). These low vapour pressures account for PBDE partitioning from products to dust, hands, skin and clothing. However, inhalation may be an important exposure route for several "newer" HFRs that are being used, specifically Tri(2-chloroethyl)-phosphate (TCEP) and Tri(chloro isopropyl)-phosphate (TCPP)[44]. TCEP and TCPP have relatively high vapour pressures among SVOCs. As such, they tend to be found relatively more in air and less in dust leading to elevated indoor air concentrations[29] and hence potential for exposure by inhalation.

Connection between Four Product Categories and Exposure

The petition cites four product categories as sources of HFRs of human exposure, namely children's products, upholstered furniture, electronic devices and mattresses. Comments from staff question the connection between HFRs in these four product categories and HFRs in house dust, where house dust is a surrogate for human exposure. Following the broader understanding of routes of exposure, I discuss recent evidence that indicates that these product categories contribute to HFR exposure.

Electronic Devices

- As mentioned above, our work has found significant correlations between HFRs on hands of participants and HFRs removed from the surfaces of their hand-held electronic devices, notably cell phones, home telephones and tablets[29].
- We have also found a significant relationship between HFR concentrations in surface wipes of electronic devices and HFR concentrations in dust from corresponding homes[1].
- Several studies have confirmed emissions of HFRs from electronic devices into indoor environments, e.g., [45,46,47,48].
- Epidemiological studies have found associations between HFR exposure and the number of electronic devices owned[49,5].

Children's Products

- Children's products are known to contain HFRs[50]. Hoffman et al.[51] found an association between exposure of children age 2-18 months to an HFR (TDCPP) and the number of children's products owned. This relationship was corroborated in a subsequent study by Hoffman et al.[28] in which they found that children's HFR exposure was related to their interaction with toys.

Upholstered Furniture

- Hammel et al.[52] have provided clear evidence for the relationship between several HFRs (pentaBDE, 2-ethylhexyl-2,3,4,5-tetrabromobenzoate or EH-TBB) in sofas and corresponding house dust in an epidemiological study. Moreover, they found a significant relationship between levels of pentaBDE in a resident's sofa and that participant's serum level of pentaBDE, showing a direct relationship between the HFR in the sofa and exposure.

Mattresses

- Zheng et al. estimated significant exposure to chlorinated organophosphate flame retardants during sleeping based on samples collected from beds[53].
- Imm et al. found a statistically significant relationship between PBDE concentrations in participants from a 44 person Wisconsin cohort and PBDEs in their sleeping pillows[54].

In conclusion, whether HFR exposure comes direct contact with the flame-retarded product itself or from HFR-contaminated dust, clothing or air does not alter the key fact that people are exposed to these chemicals and that these chemical originate from flame-retarded products. In addition, there is clear evidence showing HFR migration from the product classes cited in the petition and concentrations in dust and in people.

Sincerely,

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Alliance of Nurses for Healthy Environments
Bringing Science and Passion to the Environmental Health Movement

Statement of Katie Huffling, Alliance of Nurses for Healthy Environments
On the Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants
Docket No. CPSC-2015-0022
U.S. Consumer Products Safety Commission Public Hearing

August 31, 2017

Thank you Chairman Kaye and Commissioners for this opportunity to comment again on the Petition requesting rulemaking on products containing organohalogen flame retardants and the CPSC staff briefing package. My name is Katie Huffling and I am the executive director of the Alliance of Nurses for Healthy Environments. I am also a nurse and nurse-midwife.

The Alliance of Nurses for Healthy Environments is the only national nursing organization that focuses solely on the intersection of health and the environment. Our mission is to promote healthy people and healthy environments by educating and leading the nursing profession, advancing research, incorporating evidence-based practice, and influencing policy.

We have over 3000 members throughout the country. Our members include nurses from all walks of our profession – hospital-based, public health, school-based, academics, and advanced practice, to name a few. Nurses are the most trusted profession and we take our duties very seriously when providing education to patients and working to prevent disease.

The main work of our organization occurs through the generous volunteer work of our nurses. Through our policy and advocacy work group these nurses have led engagement of health professionals on the serious issues related to flame retardants and health. Our work has been guided by the American Nurses Association's Resolution *Nursing Practice, Chemical Exposure and Right-to-Know* which advocates a course of action that reduces the use of toxic chemicals, "demands adequate information on the health effects of chemicals and chemicals in products before they are introduced on the market, and creates more streamlined methods for [toxic] chemicals to be removed from use." Based on this Resolution, nurses need to advocate for consumer products that are free of toxic chemicals as part of their standard of practice.

Alliance of Nurses for Healthy Environments
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I am highly concerned that pregnant women, the growing fetus, and our children are being exposed to halogenated flame retardants every day. It's my job to help women have the healthiest pregnancies possible. As such I recognize the importance of having normal levels of thyroid hormones during pregnancy and monitor for symptoms of thyroid dysfunction so that action can be quickly taken if an abnormality is found. That this class of flame retardants are structurally similar to thyroid hormone and have been shown to disrupt thyroid function is highly concerning. Thyroid disruption during pregnancy can have a negative impact on fetal brain development as well as other poor pregnancy outcomes. With 1 in 6 kids in the US now facing the lifelong challenge of developmental disabilities such as autism and attention deficit hyperactivity disorder we need to seriously address chemicals that could be a component of this alarming trend.

I am also concerned with the effects of halogenated flame retardants on fertility. Elevated PBDE levels in human breast milk has been correlated with cryptorchidism as well as decreased testes size and decreased sperm counts. As infertility is increasing in this country, we need to be addressing these possible chemical origins.

As a nurse-midwife I'm frequently asked which products are safe to use with their baby. Which nursing pillow would I recommend? What's the best crib to buy? Due to the limited consumer information we have on many of the flame retardants addressed in the Petition, it can be very challenging as a provider to offer advice on the safest products. This is especially frustrating when it's been shown that these toxic chemicals are not even providing added flame protection.

When speaking with my pediatric nurse colleagues, they have described how they have many ways we can counsel parents to reduce risks of fire such as having working smoke detectors and not smoking in the house but they have no meaningful advice to give to parents on how to reduce the risks of kids' exposures to flame retardants. Manufacturers are able to add halogenated flame retardants to their products without labeling nor testing them for health effects.

This entire class of halogenated flame retardants all have a similar molecular and all are likely to react similarly in the human body. We believe that due to the hazardous nature of OFRs and the high potential for harm, especially to the grown fetus and children due to critical developmental windows of susceptibility, that the CPSC is compelled to regulate OFRs under the Federal Hazardous Substance Act. Also, the staff brief states that OFRs may not be pervasive as they were found in only 22% of the toys tested by CPSC. This is not an insignificant number as children have numerous toys in their toy boxes. 22% can lead to significant exposures amongst this vulnerable population.

Our next generation deserves to be able to grow up healthy and free of these toxic chemicals. Let's not make the mistake of regrettable substitutions and adopt the current proposal to restrict these unnecessary and health harming class of flame retardants.

Thank you,

Katie Huffling, MS, RN, CNM

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Organohalogen Flame Retardants Petition; Oral Presentation
By Phone
Veena Singla, PhD
Program on Reproductive Health and the Environment
University of California, San Francisco

August 31, 2017

The Program on Reproductive Health and the Environment's (PRHE) mission is to create a healthier environment for human reproduction and development through advancing scientific inquiry, clinical care, and health policies that prevent exposures to harmful chemicals in our environment. We have no financial interest in the products or chemicals that are the topic of these comments.

I received my PhD in Cell Biology from University of California, San Francisco and my B.S. in Chemistry with High Honors from University of California, Berkeley. I was a postdoctoral teaching fellow at Stanford University, adjunct faculty at the University of San Francisco, and staff scientist at the Natural Resources Defense Council (NRDC). My research focuses on chemicals in the indoor environment and I have published on human exposure pathways related to flame retardant chemicals, consumer products, and building materials.[1–3] I am currently Director of Research Translation at PRHE.

A number of the statements and conclusions in the staff briefing do not fully consider scientific studies that are in the record and/ or that are available in the open literature. In this testimony, I am highlighting some of those key areas related to the exposure pathways for these chemicals and considering organohalogen flame retardant chemicals as a class, topics covered in my previous testimony and in NRDC's responses to the Commissioner's Questions for the Record.

What is the evidence linking organohalogen flame retardants in the product categories that are the subject of the petition to human exposure?
Responsive to: The presence of OFR chemicals in household dust does not establish a link to the four product categories that the petitioners identify. Petitioners have not submitted data establishing this connection, and staff is not aware of such information.[a]

There is ample evidence connecting furniture, children's products, mattresses, and electronics to organohalogen flame retardant levels in dust, some of which was referenced in the original petition and answers to questions for the record. Though the staff briefing package cites a few of these studies, it does not review the evidence on this question in a

[a] United States Consumer Product Safety Commission. Staff Briefing Package: In Response to Petition HP15-1, Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants. May 24, 2017. Pg. 6

comprehensive manner, nor does it consider the factors which indicate this is a strong body of evidence. The Federal Hazardous Substances Act (FHSA) requires a finding that substances *may cause* harm based on exposures from customary use—it does not require a quantitation of those exposures or a calculation of risk.

I have referenced more of the studies linking the products in question to exposures, and described the factors to consider in evaluating this evidence below, but caution that I have not performed a systematic literature search. I am confident a comprehensive literature search would reveal further data on these products' contribution to flame retardant contamination in air and dust.

In relation to furniture, children's products, mattresses, and/ or electronics, studies find:

- Concentrations of organohalogen flame retardants in dust change with distance to products (highest concentrations observed near products); [4–6]
- Statistically significant relationships between the presence and/ or number of products and contamination levels of organohalogen flame retardants in air or dust; [7–13]
- Product removal from a room is associated with significant decreases in the levels of organohalogen flame retardants in air or dust;[6,14] similarly, product introduction into a room is associated with significant increases in the levels of organohalogen flame retardant contamination in air or dust; [6,15] and
- Organohalogen flame retardants are directly emitted from products when products are placed in an experimental chamber and the emissions measured.[16,17] In an actual indoor environment, such emissions would result in flame retardant chemical contamination of the room's air and dust.

To evaluate the relationship between a presumed cause and effect (in this case, organohalogen flame retardants in furniture, children's products, mattresses, and electronics and flame retardant levels in dust/ subsequent human exposure), scientists often consider the following factors: evidence of a gradient, strength of the effect, consistency, specificity, temporality, experimental evidence and coherence (known as the Bradford-Hill factors, which have been integrated into decision-making for evidence-based medicine).[18,19] Each of the factors is described below with brief summaries of the supporting studies.

Factor	Supporting Studies and Products Investigated
Evidence of gradient (there is a clear relationship between the factor in question and the level of the chemical)	Takigami, 2008 (Ref 4): **Electronics**: This study found the highest levels of brominated flame retardants in the dust inside televisions, strongly suggesting the brominated compounds are transferred from TV components into dust. Harrad, 2009 (Ref 5): **Electronics**: This study found that concentrations of the organohalogen flame retardant HBCD were 4-5 times higher in dust sampled closest to a computer and related electronic equipment compared to samples taken from other areas in the same room. They also found that a television was the epicenter of levels of HBCD – HBCD levels were extremely high on and near the television, and dropped dramatically with increasing distance from the TV. This strongly suggests that electronics are sources of HBCD emissions to dust, which is a subsequent source of human exposure. Muenhor, 2012 (Ref 6): **Furniture, electronics, mattresses**: This study found higher levels of PBDEs in areas close to electronics and furniture compared

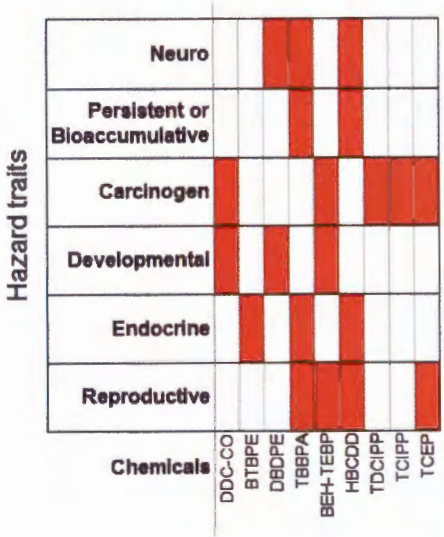
Factor	Supporting Studies and Products Investigated
	to areas further away from these products.
Strength of effect (the size or magnitude of the effect)	Harrad, 2004 (Ref 13): **Furniture, electronics**: This study found a significant positive correlation between PBDE concentrations in indoor air and the number of electrical appliances and/ or polyurethane foam-containing chairs. D'Hollander, 2010 (Ref 8): **Electronics**: This study observed a statistically significant contribution of electronic devices to the concentration of PBDEs in dust collected from randomly selected homes and offices. de Wit, 2012 (Ref 9): **Electronics, furniture, mattresses**: Significant correlations were found between concentrations of some PBDEs and HBCD in air and/ or dust and the presence of electronic/electrical devices, foam furniture, and polyurethane foam mattresses. Ali, 2012 (Ref 10): **Mattresses:** This study found a significant positive correlation between concentrations of the organohalogen flame retardant chemicals BTBPE, DBDPE, and TBPH in dust collected from mattresses and the levels of these chemicals in floor dust. This strongly suggests that mattresses contribute significantly to the loading of flame retardants in dust, which is a subsequent source of human exposure. Bradman, 2014 (Ref 11): **Children's products**: This study found that levels of the organohalogen flame retardant chemicals TCEP and TDCIPP in dust were significantly higher in children's facilities with napping equipment made out of foam. Since foam nap mats are known to contain these chemicals, this strongly suggests that these items contribute significantly to the loading of flame retardants in dust, which is a subsequent source of human exposure. Hoffman, 2015 (Ref 12): **Children's products**: This study found that the number of baby products in the home was strongly associated with an infant's exposure level to the organohalogen flame retardant chemical TDCIPP. Infants with the largest number of baby products in the home had exposure levels ~7 times higher than other infants. Because baby products are known to contain TDCIPP, this clearly suggests that the products are an important source of the infant's flame retardant exposure.
Consistency (different studies show the same results)	These studies were conducted in geographical locations around the world, with products from different countries, with similar outcomes.
Specificity (the effect is modified by variations in the putative cause)	Allen, 2008 (Ref 7): **Furniture and electronics**: Using a handheld device that can measure bromine in products, this study linked residential dust concentrations of PBDEs to household furniture and televisions. The results indicate that the bromine content of foam furniture is strongly associated with the concentration of pentaBDE in house dust. Bromine levels in televisions predict decaBDE in household dust, an association that was affected by the number of residents in a home, a potential surrogate for TV usage.
Temporality (the effect occurs after the cause)	Hazrati, 2006 (Ref 14): **Electronics**: This study finds that a computer contributed significantly to PBDE levels in an office because when the computer was removed, PBDE levels fell dramatically.

Factor	Supporting Studies and Products Investigated
	Stuart, 2008 (Ref 15): **Mattresses**: This study found a significant increase in dust concentrations of PBDEs after the introduction of a new mattress into a bedroom. Muenhor, 2012 (Ref 6): **Electronics, mattresses**: This study found levels of PBDEs increased significantly during time periods when electronics (a TV, laptops) were present in a room compared to when the products were not present. Also, levels of PBDEs decreased significantly when an old bed was replaced with a new one.
Experimental evidence	Kemmlein, 2003 (Ref 16): **Furniture, mattresses, and electronics**: In this study, products were placed in an experimental chamber and the emission of organohalogen flame retardant chemicals was directly measured. Furniture, mattresses, and electronics emitted halogenated flame retardants including TCPP, HBCD, PBDEs and TBBPA. Destaillats, 2008 (Ref 17): **Electronics**: This review summarized the measurements of the organohalogen flame retardant chemicals TCPP, TBBPA and PBDEs direct emissions from computers in experimental chambers.
Coherence (laboratory and observational studies "in the real world" have consistent findings)	Experimental chamber studies finding emissions of organohalogen flame retardants from products are consistent with the observational studies relating these products to flame retardant levels in indoor air and dust.

Overall, considering each of the factors related to causality and the evidence provided by these studies, this strongly supports that these products contribute to flame retardant levels in air and dust and subsequent human exposures.

Additional information documenting organohalogen flame retardant chemicals' presence in U.S. homes and health hazards

This information is from data in: Mitro, S. D., Dodson, R. E., Singla, V., Adamkiewicz, G., Elmi, A. F., Tilly, M. K., & Zota, A. R. (2016). Consumer Product Chemicals in Indoor Dust: A Quantitative Meta-analysis of U.S. Studies. *Environmental Science & Technology*, acs.est.6b02023. https://doi.org/10.1021/acs.est.6b02023



The above study published in 2016 documented 47 flame retardant chemicals found in U.S. indoor dust, with 14 organohalogen flame retardants measured in 3 or more datasets. Two organohalogen flame retardants (TDCIPP and HBCD) were found in 90% or more of samples tested, indicating that these flame retardants are ubiquitous and widespread in U.S. indoor environments.

The study also examined health hazards as designated by authoritative lists. As shown at left, organohalogen flame retardants present multiple health hazards. This analysis, though smaller than the Eastmond study presented in the original petition, is independent verification of the Eastmond findings because it used different methods but came to similar

conclusions about the hazards of organohalogen flame retardant chemicals.

These hazard findings also raise concern for consumers' co-exposure to multiple flame retardant chemicals present in dust, and the potential cumulative impacts. The National Academies of Sciences concluded that for chemicals that can contribute to the same adverse health outcome, co-exposures can add up to a bigger risk than any individual exposure.[20,21]

It is important to note that the varying hazards presented by the organohalogen flame retardants here do not preclude their consideration together as a class. The staff briefing states:

> "However, even the limited data on OFRs show varying toxicity and exposure potential among individual OFR compounds. These varying properties of individual OFR compounds indicate that OFRs, in fact, represent several subclasses of chemicals that should be examined separately. However, even then, individual compounds within the same subclass may differ in the effects that they cause, their potency, mechanism of action, and bioaccumulation potential."[b]

But, to the contrary, the standard in the Federal Hazardous Substances Act (FHSA) only requires a finding that substances have the capacity to cause illness (are toxic) and may cause harm—it does not require that chemicals be toxic or cause harm in exactly the same way. The National Academies of Sciences recommends focusing on adverse health outcomes, not the pathways that lead to them.[21] The fact that each of these chemicals presents some kind of human health hazard is the relevant evidence under the FHSA, not that they have the same hazard.

My testimony from December 2015 and NRDC's responses to the Commissioner's Questions for the Record cover in great detail why the approach of considering related chemicals as a group, rather than as individual chemicals, is well-established in regulatory science. Since that time, additional studies supporting this approach have been published.[22,23] I would urge the CPSC to consider these submissions, as well as evidence in the open literature germane to this issue.

When there are data gaps on a chemical's toxicity, how can these be filled?
Responsive to: CPSC does not have guidelines that address the use of surrogate data for determining toxicity of a chemical where no toxicity data are available.[c]

As provided in my previous testimony and NRDC's answers to Commissioner's Questions for the Record, there are existing, well-established guidelines used in a regulatory context by other agencies on how to use Structure Activity Relationships (SAR), Quantitative Structure Activity Relationships (QSAR), read-across, chemical groupings, models, and other tools to fill data gaps. These references are listed again below.

> ECHA. Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.6: QSARs and Grouping of Chemicals (2008). Available: http://echa.europa.eu/documents/10162/13632/information_requirements_r6_en.pdf
>
> OECD Toolbox for carcinogenicity and mutagenicity: ISS Quantitative Structure

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[b] United States Consumer Product Safety Commission. Staff Briefing Package: In Response to Petition HP15-1, Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants. May 24, 2017. Pg. 6
[c] Id., Pg. 10

Activity Relationship (QSAR) model and Oncologic; Guidance documents available: http://www.oecd.org/chemicalsafety/risk-assessment/theoecdqsartoolbox.htm#Guidance_Documents_and_Training_Materials_for_Using_the_Toolbox.

OECD, 2014. Guidance on grouping of chemicals, Second Edition. Series on Testing and Assessment, (No. 194). Pg. 9 Available at: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=env/jm/mono(2014)4&doclanguage=en

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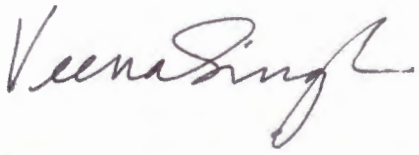
Conclusion

As described in detail in my previous testimony, the group of additive, non-polymeric organohalogen flame retardants should be considered together as a class under the FHSA. Because these types of flame retardants migrate out of products into indoor air and dust, consumers cannot protect themselves from the exposures that result when this class of flame retardants is used in the products specified in the petition. There is strong evidence that flame retardants used in furniture, children's products, mattresses and electronics contribute significantly to the levels of indoor air and dust contamination, and subsequent human exposures. The molecular characteristics of this class of flame retardants result in toxicity to humans, with pregnant women and children being especially vulnerable. These flame retardants used in the specified products have the capacity to produce illness and may cause harm to human health.

Thank you for the opportunity to testify on this important issue. Please do not hesitate to contact me if I can provide further information or answer additional questions.

Sincerely,



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Steven Taylor
Campaign for Healthier Solutions

Statement of Steve Taylor
Campaign for Healthier Solutions and Coming Clean
Before the U.S. Consumer Product Safety Commission
Organohalogen Flame Retardants Petition; Oral Presentation
[Docket No. CPSC-2015-0022]
Submitted by email: cpsc-os@cpsc.rog
August 31, 2017

Summary of Testimony to Be Presented on September 14, 2017

This is a summary of testimony to be delivered in full at the public hearing on September 14 (via telephone) and submitted in complete written form no later than that date.

1. Introduction. Steve Taylor, Campaigns Manager for Coming Clean, providing testimony on behalf of the Campaign for Healthier Solutions (CHS), a nonprofit environmental justice effort working to promote health and wellbeing in communities disproportionately exposed to toxic chemicals by supporting transition of discount retail stores (dollar stores) that these families rely on to safer and healthier products.

2. Background on the CHS. The CHS is effort led by and grounded in communities of color and low-income communities that are disproportionately exposed to toxic chemicals from many sources (including from household and children's products). We use research, partnerships, advocacy, and other approaches to reduce and eliminate exposure to harmful and untested chemicals from products sold at dollar stores, and support stocking of nontoxic products and healthy foods as strategies to improve community health.

3. Disproportionate Exposure of People of Color and Low-Income People to Hazardous Chemicals, Including Organohalogen Flame Retardants. Extensive evidence (including that summarized below, and that provided by the Petitioners and other commenters previously) shows that children of color and low-income children are not only exposed to harmful levels of organohalogen flame retardants, but are often **more** exposed to these chemicals than white children or children of higher incomes. As documented in our work (including A Day Late and A Dollar Short, attached to this testimony and available at http://ej4all.org/assets/media/documents/Report_ADayLateAndADollarShort.pdf), thousands of urban, suburban, and rural communities (especially low-income communities and communities of color) rely on the 20,000-plus US chain dollar stores as the primary – and sometimes only – source of household products and food for many miles. These chains lag behind many other national retailers in addressing the presence of potentially hazardous chemicals in the products they sell, and largely have no corporate policies to identify and phase out chemicals of concern (including organohalogen flame retardants).

4. Organohalogen Flame Retardants in Dollar Store Products. Because the major dollar store chains have not required their suppliers to report on the presence of organohalogen flame retardants in the products the chains purchase, or have not disclosed any

information they do have to the public, **customers have no assurance that the products they buy for their homes and families are free of these harmful chemicals,** which according to publicly available testing data continue to be widely used in products such as electronics enclosures and children's products.

In late 2014 and early 2015, our campaign tested a set of products purchased at the largest dollar store chains (Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only) for certain toxic chemicals. Although we were not primarily investigating flame retardant chemicals, many of the products we purchased contained levels of Bromine or Chlorine that likely indicate the presence of a halogenated flame retardant chemical, including:

- Many strings of mini lights;
- A toy race car;
- Costume jewelry pieces that would appeal to children;
- Spider Man toy dog tags.

5. Conclusion. Millions of families across the U.S., including those in urban, suburban, and rural areas, and especially communities of color and low-income communities, rely on dollar stores as their primary of only sources of household products and even food. Many of these families and communities suffer disproportionate exposure to hazardous chemicals, including organohalogen flame retardants, from sources including everyday products. Families in states such as Texas, West Virginia, Kentucky have little hope of their state government addressing these issues, which the largest dollar store chains have also failed to do, and so they are relying on federal agencies like the CPSC to protect them from unnecessary, hazardous chemicals – including organohalogen flame retardants – that endanger their children.

Evidence of Disproportionate Impact

In January 2016, a group of Environmental Justice (EJ) organizations submitted written comments supporting this Petition (see attached comment letter). That comment (which is part of the formal record supporting this Petition) included independent evidence documenting the disproportionate exposure of people of color and Indigenous people to halogenated flame retardants:

- *The bodies of Black and Latino children have been found to contain twice the level of commonly used toxic flame retardant chemicals known as PBDEs (polybrominated diphenyl ethers) as white children.*[1]

- *Mexican-American 7-year olds in California were found to have more PBDEs in their bodies than almost all other people tested worldwide.*[2]

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[1] http://articles.chicagotribune.com/2012-05-23/news/ct-met-flames-study-20120523_1_flame-retardants-latino-toddlers-minority-children

[2] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3230428/

- *Concentrations of polybrominated diphenyl ethers (PBDEs, often used as flame retardants) found in the blood serum of Yupik peoples of the Yukon-Kuskokwim Delta region of Alaska are the highest known human PBDE concentrations in the circumpolar Arctic.*[3]

Additional evidence of disproportionate and ongoing exposure of children, especially children of color and low-income children, to organohalogen flame retardants:

- The latest CDC report[4] found several PBDEs and 2,2',4,4',5,5'-hexabromobiphenyl (BB 153, known commercially as Firemaster® BP-6) at levels ranging from 1.2 to 28.2 ng/g lipid in human serum. Teenagers (ages 12 to 19) had higher body burdens than adults for all flame retardants measured. Mexican Americans and non-Hispanic blacks had higher levels than the non-Hispanic white population.

- The highest levels of harmful flame retardants in the general population are found in young children from communities of low socioeconomic status and communities of color. For instance, a North Carolina study of 80 toddlers found PBDEs in 100% of the blood samples, and the sum of BDE-47, -99 and -100 (three of the pentaBDE congeners) was negatively associated with the father's level of education.[5]

- Similarly, Zota et al. (2008), using data from the NHANES, found that individuals in lower income households (<$20,000/year) had significantly higher PBDE exposures.[6]

- Rose et al. (2010) also found higher body burdens of nearly all measured congeners (including BDE-47, -153, and -209) in 2-5 year-old Californian children in born to mothers with lower education.[7]

- In another study of ethnically diverse 6-8 year-old girls in California, measured pentaBDE levels were higher in children with less educated care-givers.[8] This study

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[3] AMAP. 2014. Trends in Stockholm Convention Persistent Organic Pollutants in Arctic Air, Human Media and Biota. AMAP Technical Report to the Stockholm Convention. AMAP Technical Report No. 7. Arctic Monitoring and Assessment Programme (AMAP), Oslo, Norway.

[4] Centers for Disease Control and Prevention (2015). *Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables, February 2015.* Retrieved March 4, 2015, from http://www.cdc.gov/exposurereport/.

[5] Stapleton, H.M., Serum PBDEs, *supra* note 97.

[6] Zota, A.R.; Rudel, R.A.; Morello-Frosch, R.A.; & Brody, J.G. (2008). Elevated house dust and serum concentrations of PBDEs in California: unintended consequences of furniture flammability standards? *Environmental Science & Technology*, 42(21), 8158-64. doi: 10.1021/es801792z.

[7] Rose, M.; Bennett, D.H.; Bergman, Å.; Fängström, B.; Pessah, I.N.; & Hertz-Picciotto, I. (2010). PBDEs in 2-5 year-old children from California and associations with diet and indoor environment. *Environmental Science & Technology*, 44(7), 2648-53. doi: 10.1021/es903240g.

[8] Windham, G.C.; Pinney, S.M.; Sjödin, A.; Lum, R.; Jones, R.S.; Needham, L.L.; Biro, F.M.; Hiatt, R.A.; & Kushi, L.H. (2010). Body burdens of brominated flame retardants and other persistent organo-halogenated compounds and their descriptors in US girls. *Environmental Research*, 110(3), 251-57. doi: 10.1016/j.envres.2010.01.004.

also found that black preadolescent girls had significantly higher levels than white girls.[9]

- Similarly, using NHANES data, Sjödin et al. (2008) showed that, after adjusting for age, levels of BDE-47 and BDE-99 (but not BDE-100 and BDE-153) were significantly lower in white children as compared to Mexican American and black children.[10]

Attached as Part of Testimony: A Day Late and A Dollar Short

[9] *Id.*

[10] Sjödin, A., Serum concentrations of polybrominated diphenyl ethers (PBDEs), *supra* note 98.

CAMPAIGN FOR HEALTHIER SOLUTIONS • FEBRUARY 2015

A DAY LATE AND A DOLLAR SHORT

Discount Retailers Are Falling Behind on Safer Chemicals

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Discount Retailers Are Falling Behind on Safer Chemicals

CAMPAIGN FOR HEALTHIER SOLUTIONS • FEBRUARY 2015

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The Campaign for Healthier Solutions seeks to work with discount retailers (dollar stores) to help them protect their customers and the communities in which they operate, and grow their own businesses, by implementing corporate policies to identify and phase out harmful chemicals in the products they sell.

The Campaign is a collaborative project including many partners that is led by:

Coming Clean, a national environmental health collaborative that unites community organizers, scientists, advocates, business leaders, communications specialists, and diverse issue experts in common work to transform the chemical and fossil fuel industries so they are sources of health, economic sustainability, and justice rather than of pollution, disease, and planetary harm. Visit *www.comingcleaninc.org*.

The Environmental Justice and Health Alliance for Chemical Policy Reform, a network of grassroots organizations throughout the country, supports diverse movement towards safe chemicals and clean energy that leaves no community or worker behind. Visit *www.EJ4All.org*.

The information and recommendations presented in this report do not necessarily reflect the views and opinions of the contributors or reviewers.

The ratings included in this report do not provide a measure of health risk or chemical exposure associated with any individual product, or any individual element or related chemical. HealthyStuff.org ratings provide only a relative measure of high, medium, and low levels of concern for several hazardous chemicals or chemical elements in an individual product in comparison to criteria established in the site methodology.

This report is available online at *www.nontoxicdollarstores.org*.

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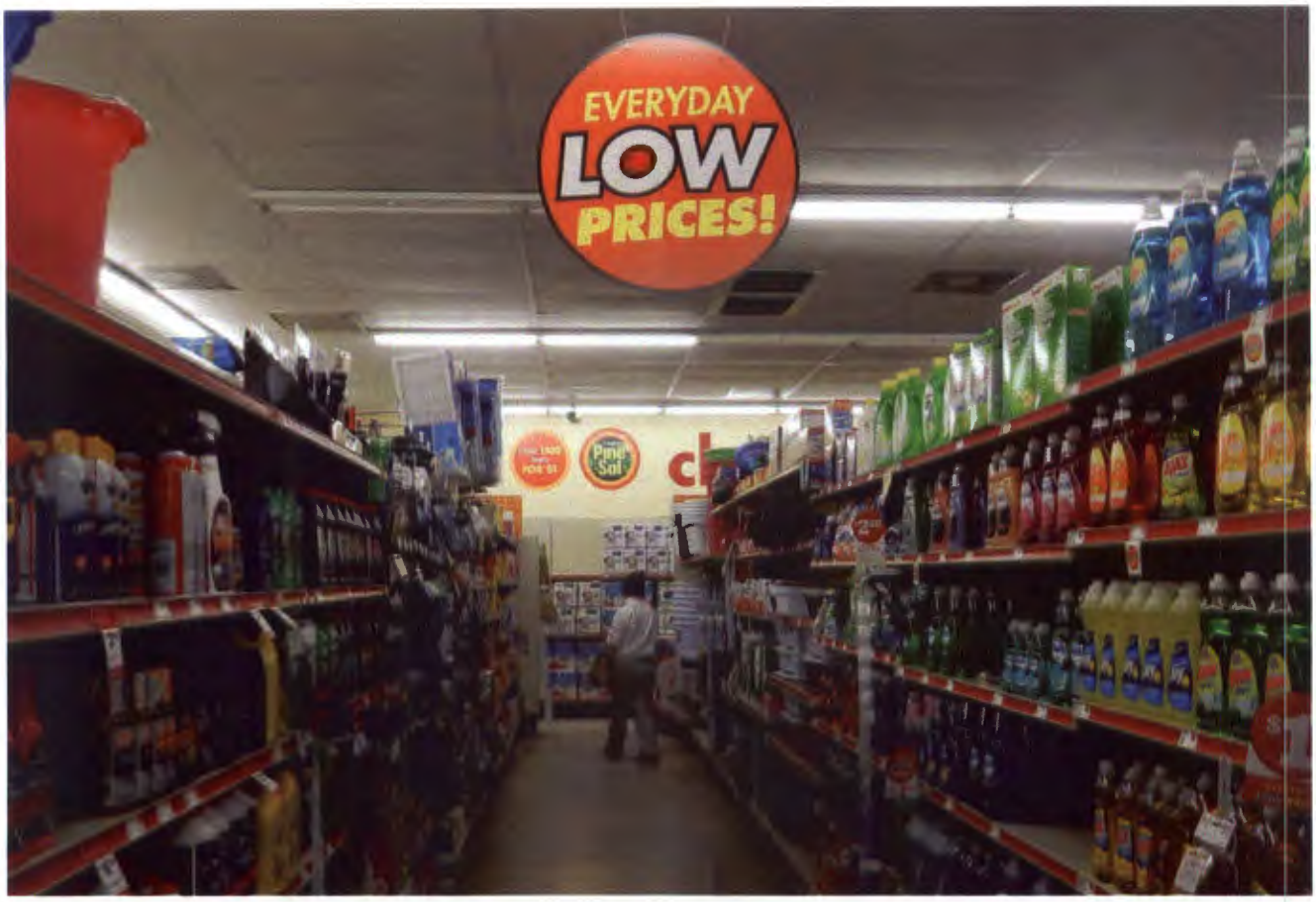
EXECUTIVE SUMMARY



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Discount retailers (commonly called "dollar stores") make up a significant portion of the U.S. retail sector. The four largest chains—Dollar General, Dollar Tree, Family Dollar (tentatively acquired by Dollar Tree on January 22, 2015), and 99 Cents Only—operate over 21,500 U.S. stores, more than Walmart, with total annual sales of more than $36 billion.

Many communities served by dollar stores are predominantly communities of color or low-income communities that are already disproportionately exposed to chemical hazards and health effects linked to chemical exposures. Residents in these areas often have reduced access to quality medical care, fresh and healthy food, and public services, which are critical to overall health and to withstanding chemical exposures. In many of these communities, dollar stores are often the only store selling essential household goods, including food. These factors place a higher level of responsibility on dollar stores to ensure they are not selling products that contain harmful chemicals.

Although the largest dollar store chains have taken some initial steps to address toxic chemicals in the products they sell, mostly in response to federal and state requirements, their failure to adopt and disclose comprehensive plans of action is leaving their customers, and their own businesses, at risk. Recent events, and new testing of dollar store products, show that these chains need to do more.

- A 2012 report found that 39% of vinyl packaging sold by discount retailers contained levels of cadmium or lead that violate state laws.[1]
- 99 Cents Only will pay over $2 million in 2015 for improper storage and disposal of hazardous products, and was fined $409,490 in 2010 by the U.S. Environmental Protection Agency (EPA) for selling unregistered and mislabeled pesticides in household cleaning products. In the latter case, EPA's Administrative Law Judge declared that the company's management has a "culture of indifference."[2]
- In 2014, Dollar Tree had to remove toy Clingy Darts from its stores after the product was found to contain high levels of a toxic phthalate chemical.[3]

Given the failure of the largest dollar store chains to join their competitors—including Walmart and Target—in adopting comprehensive policies to know, disclose, and address chemicals of concern throughout their supply chains, it is not surprising that new testing of 164 dollar store products for just a few hazardous chemicals found some disturbing results.

Key findings include:

- 81% of the products tested (133 of 164) contained at least one hazardous chemical above levels of concern, compared to existing voluntary toy standards and mandatory toy, packaging and electronics standards;[4]
- 38% of the products tested (63 of 164) contained the toxic plastic PVC (vinyl);
- 32% of vinyl products tested for phthalates (12 of 38) contained levels of regulated phthalates above the Consumer Product Safety Commission (CPSC) limit for children's products;[5]
- At least 71% of the products tested from each dollar store chain contained one or more hazardous chemicals above levels of concern.[6]

There is a growing movement by mainstream retail and manufacturing brands to adopt chemical management policies to identify, disclose, and replace chemicals of concern in the products they make or sell with safer alternatives.[7] Companies that are phasing out toxic chemicals reduce the risk of fines, lost sales, and reduced market share; create long-term value for shareholders; and remain competitive by responding to increasing consumer demand for safer products. Dollar stores are lagging in this shifting landscape, leaving their customers and investors exposed to potential harm and liability.

The largest dollar store chains are in a unique position to benefit the health and welfare of many communities of color and low-income communities where they operate, and grow and benefit their own businesses, by providing safer products. What has been missing in the discount retail sector so far—with the exception of a few important but limited actions—has been sustained focus on this issue at the top corporate leadership level and broad corporate policies to identify and phase out harmful chemicals across supply chains.

WHICH DOLLAR STORE CHAIN

will seize the opportunity to become the leader in providing safer products in the competitive discount retail sector?

As the market increasingly moves to full disclosure of chemicals in products and to safer chemicals, one or more dollar store chains will likely emerge as the leaders in providing nontoxic products and therefore best positioned to thrive in the competitive discount sector. **The question is: which dollar store chain will seize the opportunity?**

Successful strategies to replace harmful chemicals in everyday products with safer alternatives are already well documented, and are already being implemented by many companies, states, or municipalities. Model policies, technical resources, and expert assistance are available to help the dollar store chains identify and disclose chemicals in their supply chains, and require vendors to move to proven safer alternatives.

Simple, common-sense actions can better protect dollar store customers and their families from the most hazardous chemicals, while positioning discount retailers as sustainability leaders committed to safe products and vibrant local economies.

CHAPTER ONE

TOXIC CHEMICALS AND OUR HEALTH

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Rates of chronic diseases and health conditions linked to chemical exposures have risen sharply across the United States over the past several decades, especially for children. Some of the most striking increases are:

- Attention-deficit/hyperactivity disorder (ADHD) in children increased by 50% from 1997–2010, and autism spectrum disorders increased by 1,000%.[8]
- Leukemia in children increased by 55% between 1975 and 2005, and primary brain cancer in children increased by 39%;[9]
- The prevalence of asthma in children has more than doubled (100% increase) since 1980;[10]
- Major birth defects are now the leading cause of infant death; the rate of some birth defects are increasing, e.g. hypospadias (birth defect of the urethra in males) has doubled;[11]
- Incidence of breast cancer in adults has increased by 40%;[12]
- Difficulty in conceiving and maintaining a pregnancy affected 25% more women in 2002 than in 1982; from 1982 to 1995, the incidence of reported difficulty almost doubled in younger women, ages 18–25.[13,14]

The President's Cancer Panel concluded in its 2010 report that "the true burden of environmentally induced cancer has been grossly underestimated."[15]

Many of these health issues, including asthma, learning disabilities linked to lead poisoning, and heart disease linked to arsenic exposure, disproportionately affect communities of color and low-income communities—exactly the consumers who are most likely to use dollar stores as their primary source of household products.

MANY OF THESE HEALTH ISSUES disproportionately affect communities of color and low-income communities—exactly the consumers who are most likely to use dollar stores as their primary source of household products.

Diseases with links to environmental exposures are not only harmful and often devastating to the people and families affected, but trigger huge costs to our health care system, local school budgets, the economy, and governments. Just four childhood diseases linked to chemical exposures—asthma, cancer, lead poisoning, and learning disabilities—cost the U.S. $55 billion every year.[16] Many of these impacts and costs are preventable.

Many businesses have suffered serious costs for failing to address toxic chemicals in the products they make or sell, including fines, lost sales, reduced market share, lower stock price, and even bankruptcy. (See page 15.)

The U.S chemical safety system that should ensure that chemicals used in commerce are safe is badly broken. In thirty-nine years since the passage of the federal law that should require chemicals used in consumer products to be safe (the Toxic Substances Control Act, or TSCA), only about 200 chemicals out of 80,000 registered for commercial use have been fully screened for health and safety, and only 5 chemicals have ever been restricted. When passed into law, TSCA approved more than 60,000 chemicals that were in existence prior to 1976. The law allows chemical manufacturers to keep the ingredients in some chemicals secret—nearly 20 percent of the 80,000 chemicals are secret, according to the U.S. Environmental Protection Agency (EPA). TSCA has failed to provide basic health and safety screening of most chemicals or protect public health from even the most hazardous chemicals, leaving consumers, manufacturers, and retailers to fend for themselves.

In the face of the chemical industry's insistence on business as usual and Congress' failure to fix TSCA, states, consumers, and some consumer products companies and retailers have stepped forward to protect children and adults from exposure to unnecessary toxic chemicals in products. Over the past decade, at least 35 states have enacted more than 150 policies addressing specific chemicals in everyday products (including Bisphenol-A or BPA, flame retardants such as polybrominated diphenyl ethers or PBDEs, and some phthalate chemicals), and five states (California, Maine, Minnesota, Vermont, and Washington) have passed comprehensive policies to identify and/or phase out hazardous chemicals.[17,18] Many consumers are intentionally seeking out safer products free of hazardous chemicals and patronizing businesses that provide them. Smart companies have taken swift actions to replace some of the worst chemicals in many products, and in some cases adopt broad corporate policies that encourage their supply chains to phase out many hazardous materials.

"CHEMICALS ARE A HOT TOPIC right now in consumers' minds."[19]

Kate Heiny, Target's Director of Sustainability

While some companies are making progress, limited responses to one chemical of concern[20] at a time aren't protecting children, businesses, or our economy. Most manufacturers continue to use, and most retailers continue to sell, products containing chemicals that are either hazardous or not tested for health and safety. Dozens of toxic chemicals continue to be found every year in consumer products; in homes, schools, and workplaces; and in the bodies of babies, children, and adults.[21]

CHAPTER TWO

DOLLAR STORES AND ENVIRONMENTAL JUSTICE

Dollar stores are often located in small rural towns or in urban neighborhoods where they might be the only place to buy essential household items, including food. Family Dollar specifically targets "food deserts" where they may be the only store selling food.[22]

Many communities served by dollar stores are predominantly communities of color or low-income communities that have reduced access to quality medical care, fresh and healthy food, and public services, which are critical to overall health and to withstanding chemical exposures. These factors place a higher level of responsibility on dollar stores to ensure they are not selling products that contain harmful chemicals.

Communities of color and low-income communities are already disproportionately exposed to chemical hazards and health effects linked to chemical exposures.[23] An extensive literature documents disproportionate exposure to toxic chemicals, and to health impacts linked to chemical exposures, among people of color and low-income people. For example:

- African-American children have rates of asthma double that of White, Hispanic, and Asian children;[24]
- African-American children and Mexican-American children are much more likely to be lead poisoned than White children;[25]
- Low-income Mexican-Americans and African-Americans are more highly exposed to a potentially carcinogenic chemical found in household products (including cheap toilet deodorizers);[26]
- Mexican-American 7-year-olds in California have more PBDEs (polybrominated diphenyl ethers), which are widely used as flame retardants in consumer products, in their bodies than almost all other people tested worldwide;[27]
- A Massachusetts study found that communities where 15% or more of the population is non-White bear more than 20 times the environmental burden of White communities, more than 10 times as much chemical pollution released into the environment every year, and 48 hazardous waste sites per square mile as opposed to an average of just two in White communities.[29]

"A LARGE BODY OF RESEARCH has established that racial and ethnic minorities and low-income households in the United States tend to face higher pollution burdens than non-Hispanic whites and higher-income households."[28]

James K. Boyce, Klara Zwickl, and Michael Ash, Three Measures of Environmental Inequality

Nationally, the percentage of Blacks and Latinos living in fenceline zones near facilities using extremely hazardous chemicals is significantly higher than for the U.S. as a whole, and the poverty rate in these zones is significantly higher than for the U.S. as a whole.[30]

Unequal exposures to toxic pollution—whether from industrial sources or from household products—not only violate human rights to a clean and safe environment, they reduce opportunities to lead healthy and productive lives and cause economic harm to individuals and communities.[31]

Low-income communities and communities of color, from which dollar stores draw much of their profits, cannot afford additional toxic exposures. These stores are in a unique position to significantly benefit the health and welfare of their customer base, and grow and benefit their own businesses, by providing products free of dangerous chemicals.

To date, the major discount retail chains have been slow to respond to consumer and market movement to safer

products, even while their mainstream competitors have acted to disclose chemicals in products and replace hazardous chemicals with safer alternatives. The largest dollar store chains don't even appear to have policies requiring disclosure of chemicals or use of safer chemicals in their own "house" brands.

As the market increasingly moves to full disclosure of chemicals in products and to safer chemicals, one or more dollar store chains will likely emerge as the leaders in providing nontoxic products and therefore best positioned to thrive in the extremely competitive discount sector. The question is: which dollar store chain will seize the opportunity?

BOX 2

Affordability Doesn't Mean We Can Afford to Skimp on Safety and Health

Dee Treviño

t.e.j.a.s. barrios
Houston, Texas

© Dee Treviño

I use dollar stores quite frequently when it comes to household items, celebrations and my son's school assignments. The convenience and affordability allows my family to stock up on the items we need at an affordable price. I've lived in many areas around Houston, so when I find myself in an area far from dollar stores I usually end up spending money on household items that cut into my grocery budget. Like most working families, we try to get deals on products that help us save money to put aside for emergencies. The savings I aim for does not mean I will invest in products that I know are harmful to my family. Take for instance a recall on peanut butter: I won't buy recalled peanut butter simply because it is cheaper, because at the end of the day it is harmful or has the potential to be harmful.

Likewise, if I know a product contains a compound that can harm my family in the future, why would I invest in such a product? This is why we stopped buying cooking pans with Teflon, BPA plastic and some terra cotta pottery known to have a high lead content. My family is already exposed to pollutants and other environmental dangers, so why would I add onto that? Seeing illnesses in my own extended family and lack of access to healthcare, why would I increase my family's chances of developing something due to my poor choices when buying products? My family relies on the products that I bring home, so if I buy something that will harm them in the future they weren't at fault for exposure, I am, and I could not live with my conscience.

As a mother, and now an expectant mother, I am especially careful about the things I consume and allow my family to consume. I also want to support the businesses in my community rather than circulating income outside of our area. When we invest money in our own community we support the circulation of our local economy. When businesses in my community don't offer the items I need to make conscious choices for the health of my family, I'm forced to go elsewhere. I want these businesses like dollar stores to invest in products that will not make my family sick, now or in the future. I want to know these companies care about my family and my community.

Affordability doesn't mean we can afford to skimp on safety and health. It means we can afford to buy the items we need to live and be assured they will not harm our bodies or minds. Families that can't afford to spend freely on high end products shouldn't have to settle for toxicity at the counter. My family and other families have the right to access toxic-free products in neighborhoods with little to no resources, like any other community.

I WANT THESE BUSINESSES LIKE DOLLAR STORES to invest in products that will not make my family sick, now or in the future. I want to know these companies care about my family and my community. Affordability doesn't mean we can afford to skimp on safety and health.

BOX 3

We Have a Right to Know What Is Being Sold in These Stores

Helga Garza

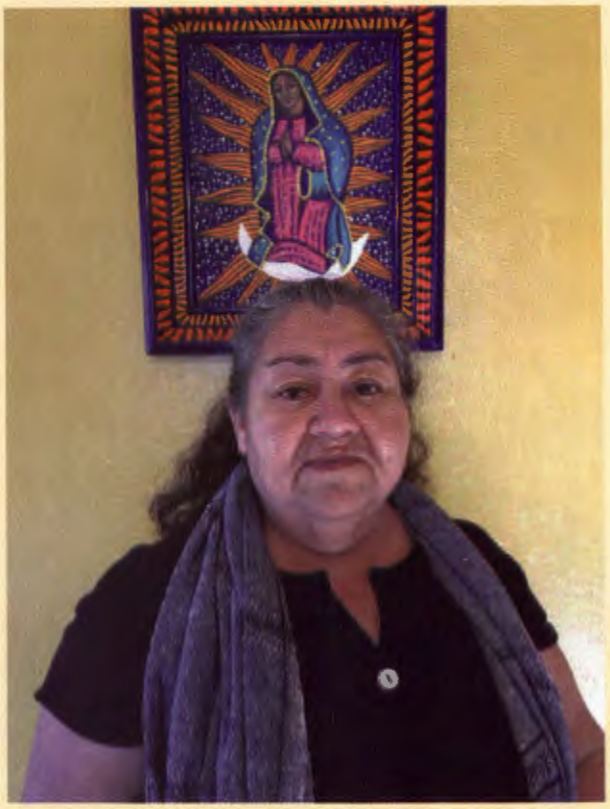
Los Jardines Institute
Albuquerque, New Mexico

I shop at the dollar store because of economics and short-term convenience. These stores are located primarily in our low-income and working-class, Spanish-speaking communities. My community needs social services, infrastructure such as paved roads and sidewalks, education and recreation programs for children, a community center, and health services. None of these basic needs have been met or brought into our rural community in more than 30 years. In 2014, Dollar General opened its doors on prime property located in our vulnerable community.

Locally, we found toxic chemicals in headbands and other products from the dollar stores used by school-aged children, exposing our children to health hazards like learning disabilities linked to the chemicals found in the products. The retail discount stores are less expensive than Walmart and create a huge economic incentive for low-income people to shop at. What we are lacking is the knowledge of how toxic these products are and the long-term effects the chemicals have on our health and the environment.

Your everyday dollar store shopper is often already overburdened with environmental and economic injustices. The dollar stores make billions of dollars a year by selling cheap toxic products to our burdened communities. We have a right to know what is being sold in these stores, and we have a right to act to keep these toxic chemicals out of our communities.

I have been making everyday healthy, organic products for over 20 years. This includes soaps, shampoos, body wash, scented oils, salves, tinctures, and ointments. The seed money that is needed to sustain a growing business while finding and creating a market to sell the products



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has been one of my biggest challenges as a low-income woman of color competing with discount retail stores, such as the dollar stores. Our method of production respects the vision of what is being produced and maintains our traditional customs, which counters the global market approach used by the dollar stores that exploits environmental resources to produce and transport these products across the world, the labor of those who produce the products, and the health of the consumers. Some of these stores have been in business for a very long time, and have a history of selling toxic products.

"THE RETAIL DISCOUNT STORES are less expensive than Walmart and create a huge economic incentive for low-income people to shop at. What we are lacking is the knowledge of how toxic these products are and the long-term effects the chemicals have on our health and the environment."

CHAPTER THREE

HAZARDOUS CHEMICALS FOUND IN DOLLAR STORE PRODUCTS

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We tested 164 products purchased at the four largest dollar store chains (Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only) in six states (California, Kentucky, Maine, New Mexico, Texas, and West Virginia) for several chemicals of concern, including lead and other hazardous metals, phthalates, and polyvinyl chloride plastic (PVC or vinyl). Exposure to these chemicals has been linked to health effects by independent scientific evidence, and each chemical, and some additives to PVC plastic, is addressed by government and/or corporate policies on hazards in consumer products.

RESULTS

Key findings include:

- 81% of the products tested (133 of 164) contained at least one hazardous chemical above levels of concern, compared to existing voluntary toy standards and mandatory toy, packaging and electronics standards;
- 49% of products tested (80 of 164) contained two or more hazardous chemicals above levels of concern;

CHEMICALS OF CONCERN ARE THOSE "which, due to their inherent hazardous properties, present a known or reasonably suspected risk to human health and/or the environment."[32] Levels of concern for each chemical were established by HealthyStuff.org by reviewing levels restricted in one or more of the most protective government, corporate or third-party standards on hazards in consumer products.[33]

81 PERCENT OF THE DOLLAR store products tested contained at least one hazardous chemical.

- 38% of the products tested (63 of 164) contained the toxic plastic PVC (vinyl);
- 32% of vinyl products tested for phthalates (12 of 38) contained levels of regulated phthalates above the Consumer Product Safety Commission (CPSC) limit for children's products;
- At least 71% of the products tested from each dollar store chain contained one or more hazardous chemicals at levels of concern.

The good news is that our testing results suggest that consumer demand, government regulations, and corporate actions targeting lead appear to have reduced the presence of lead in children's products sold by the largest discount retail chains. We did find several products that, while mostly not regulated as children's products, could expose children to lead and contained levels of lead above the limit that would be allowed in a children's product. We found two products, one of which might be considered a children's product under CPSC regulations, that contained levels of lead ten times and 65 times the limit for children's products.

Of the 38 vinyl plastic (PVC) products screened for phthalates, we found 12 (32%) that exceeded the CPSC limit for these chemicals in children's products. Although most of the products tested would not be considered as "children's products" under CPSC regulations, the CPSC standard serves as an important benchmark because these products could still expose children to the toxic phthalates in homes, schools, or vehicles.

Unfortunately, compliance with minimal federal requirements limiting lead and some phthalates in the narrow group of products specifically marketed to children won't protect kids and their families from these chemicals in thousands of other household products, or from hundreds of other chemicals of concern used in consumer products (particularly given that scientists are especially concerned about exposure to chemicals in the womb during critical windows of development).

We found that 81% of the dollar store products tested (133 of 164) contained at least one hazardous chemical above levels of concern compared to existing voluntary toy standards and mandatory toy, packaging, and electronics standards. Forty-nine percent of products tested contained two or more, despite the fact that we tested for just a small group of the many hazardous chemicals often found in consumer products. At least 71% of the products tested from each chain contained one or more of the chemicals of concern for which we screened.

Thirty-eight percent of the products tested (63 of 164) contained the toxic plastic polyvinyl chloride (PVC or vinyl), and 32% of the subset of vinyl products tested for phthalates (12 of 38) contained levels of regulated phthalates above the CPSC limit for children's products. Testing results for all products, and explanation of how levels of concern were identified, are available online at *www.healthystuff.org.*

THE CHEMICALS, HEALTH CONCERNS, AND ALTERNATIVES

Chemicals used in everyday household products often don't remain in the product, but are released into homes, vehicles, schools, and workplaces. People can be exposed to chemicals released from products in many ways, including: through food and beverages packaged in materials containing chemicals; by inhaling and ingesting particles (often referred to as "house dust") that have been released from home products or materials that contain chemicals; or by absorbing chemicals through the skin (especially when using cosmetics or personal care products containing chemicals).[34]

Children are at greatest risk from exposure to toxic chemicals, because they eat, drink, and breathe more per pound of body weight than adults, their bodies do not process many toxic chemicals in the same way that adult bodies do, and children's bodies are changing and developing rapidly.[35] In additional to fetal development, babies, infants, and toddlers are especially vulnerable to chemical exposures during the first 1,000 days of growth. In addition to chemical exposures from personal care products and inhalation or ingestion, small children may also mouth or chew on toys or on other products. Many children crawl on, sit or sleep on, play with, or put into their mouths items that are not specifically toys or childcare products (and so may not be regulated for exposure to children).

PHTHALATES

Phthalates (pronounced "thal-ates") are a class of chemicals that are used in many inks, paints, and other materials. They are found in hundreds of consumer and commercial products including toys, childcare articles, cosmetics and personal care products, food wrap, shower curtains, blinds, product packaging, medical devices, and building materials.[36,37] Approximately 90% of phthalates used are added to polyvinyl chloride (PVC or vinyl) plastics to make them softer and increase their flexibility.[38]

Among their various hazardous properties, some phthalates are endocrine disrupting chemicals that interfere with the body's hormone system. Scientific studies have linked phthalates to many serious health effects, including birth defects, reduced fertility, prostate and testicular cancer, learning disabilities, asthma and allergies, and diabetes.[39]

In February 2009, the U.S. Consumer Product Safety Improvement Act (CPSIA) restricted the use of six phthalates (DEHP, DBP, BBP, DINP, DIDP, and DnOP) above designated threshold amounts in children's toys and some childcare articles. Unfortunately, the CPSIA failed to address the hundreds of products that expose children to these phthalates but are not specifically toys or childcare products (including soaps, shampoos, and other personal care products; school supplies; clothing; food; product packaging; building materials; and "adult" plastic products that children might put in their mouths). The law also failed to require that any chemicals used to replace the six phthalates be screened for health hazards and be clearly safer.[40] In 2014, an expert advisory panel recommended that CPSC restrict additional phthalates, and that CPSC and other agencies act to identify and address risks from phthalate exposure from other products.[41]

METALS

Some metals, including "heavy metals," are toxic and can impact people's health.

Lead (Pb)—Lead is still widely used in consumer products, especially as a pigment, as a stabilizer in PVC (vinyl), and in castings for metal products such as jewelry. Lead harms brain development, leading to learning disabilities, lower IQ, inattention, and behavior problems. There is no safe level of lead exposure for children.[42]

Other hazardous metals, including Arsenic (As), Cadmium (Cd), Chromium (Cr), Mercury (Hg), Antimony (Sb), and Tin (Sn) in the form of organotins, are also widely used in consumer products for different purposes.[43]

POLYVINYL CHLORIDE PLASTIC (PVC OR VINYL)

As the American Public Health Association points out, PVC products are ranked among the most hazardous of plastic materials. The production, use and disposal of products made with PVC plastic uses and releases harmful chemicals including chlorine gas, mercury, ethylene dichloride, vinyl chloride, dioxins and furans, and other persistent bioaccumulative toxic (PBT) chemicals. PVC products often contain additives such as phthalates, lead, cadmium and/or organotins that pose risks to infants, children and other vulnerable populations. The chemical plants where PVC is manufactured are often located in or near low-income neighborhoods and communities of color. The impact on the communities near facilities that produce PVC is a major environmental justice concern.[44]

SAFER ALTERNATIVES

The toxic chemicals found in the dollar store products tested are likely not essential to those products. Safer chemicals could likely have been used instead by the manufacturers, or similar products made without toxic chemicals could have been sourced by the retail chains that sold them.

Alternatives to phthalates that may be safer are widely available and are already in use in many products.[45] Alternative plastics (including both petroleum based and biobased plastics) that do not require as many harmful additives as PVC are also widely available.[46] Alternatives for consumer product applications of many toxic metals exist, including for lead and cadmium.[47,48]

Many resources are available to manufacturers and retailers to help them identify and move to safer alternatives to chemicals of concern, including those listed on page 22.

Testing of 164 products purchased at dollar stores in six states for several hazardous chemicals produced striking results. These are some of the most concerning products that we found.

"MY GRANDCHILD DOESN'T care if the product he is crawling on, sitting on, sleeping on, or putting in his mouth was intended for children or not."

Helga Garza, Albuquerque, NM

CHILDREN'S BODIES CAN'T TELL WHICH PRODUCT RELEASED A HAZARDOUS CHEMICAL

Some laws and regulations, including the U.S. Consumer Product Safety Improvement Act (CPSIA) administered by the Consumer Product Safety Commission (CPSC), restrict chemicals of concern only in products specifically intended for or marketed to children.

But thousands of other household and consumer products—including carpets, mattresses, furniture, shower curtains, electronics, and others—can release chemicals of concern into homes and schools that expose children to these hazards. Children's developing bodies don't distinguish between lead, phthalates, or other chemicals released from toys, flooring, school supplies, tablecloths, or other products.

The only way to protect children from chemicals of concern is to replace them with demonstrably safer alternatives in all products that may expose children to the chemicals.

Flannel Back Tablecover
BRAND: Christmas House
STORE: Dollar Tree, Albuquerque, NM
UPC CODE: 639277214966
MANUFACTURER: Greenbrier International, Inc.
Made in China
CHEMICALS OF CONCERN: Lead (1,028 ppm), Chromium (204 ppm), Antimony (130 ppm), Tin 112 ppm)

Earrings
BRAND: Mix & Co.
STORE: Family Dollar, Bath, ME
UPC CODE: 32251095016
MANUFACTURER: Midwood Brands, LLC
Made in China
CHEMICALS OF CONCERN: Lead (6,548 ppm)

PHOTOS © ECOLOGY CENTER

Spider Man Dog Tags
BRAND: Marvel
STORE: Dollar Tree, Topsham, ME
UPC CODE: 639277964540
MANUFACTURER: Greenbrier International, Inc.
Made in China
CHEMICALS OF CONCERN: Lead (153 ppm), Bromine (11,510 ppm), PVC, Antimony (3,063 ppm), Tin (139 ppm)

Headbands
BRAND: None listed
STORE: Dollar General, Albuquerque, NM
UPC CODE: 731351969332
MANUFACTURER: Dolgencorp, LLC
Made in China
CHEMICALS OF CONCERN: Phthalates (DiBP 18.9%), PVC, Chromium (153 ppm), Antimony (1,002 ppm)

Vinyl Floor Runner
BRAND: Interiors by Design
STORE: Family Dollar, Albuquerque, NM
UPC CODE: 32251059810
MANUFACTURER: Midwood Brands, LLC
Made in USA
CHEMICALS OF CONCERN: Phthalates (DEHP 2.88%, DINP 18.54%, DIDP 3.15%), PVC

Silly Straws
BRAND: None listed
STORE: Dollar Tree, Charleston, WV
UPC CODE: 639277438225
MANUFACTURER: Greenbrier International, Inc.
Made in China
CHEMICALS OF CONCERN: Phthalates (DEHP 1.5%), PVC

Pencil Pouch
BRAND: jot
STORE: Dollar Tree, Albuquerque, NM
UPC CODE: 639277024398
MANUFACTURER: Greenbrier International, Inc.
Made in China
CHEMICALS OF CONCERN: Phthalates (DEHP 13.7%), PVC

Bath Tub Appliques
BRAND: Interiors by Design
STORE: Family Dollar, Houston, TX
UPC CODE: 32251068188
MANUFACTURER: Family Dollar Services, Inc.
Made in China
CHEMICALS OF CONCERN: Phthalates (DiBP 12.3%, DEHP 6.9%), PVC

CHAPTER FOUR

DOLLAR STORES ARE BIG BUSINESS

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Discount retailers (commonly known as "dollar stores") comprise a very significant portion of the retail sector in the U.S. Just the four largest chains —Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only—operate a combined 21,500 U.S. stores, more than Walmart, and total annual sales of more than $36 billion.[49,50]

The dollar store business model – selling products priced at or around $1—first emerged in the 1950s. Dollar General, founded in Kentucky, and Family Dollar, founded in North Carolina, grew steadily throughout the southeast. Dollar Tree (headquartered in Virginia) and 99 Cents Only (headquartered in California) followed in the 1980s. For many years, the dollar store chains focused on closeout merchandise and irregular items, salvage products, returned and liquidated items, damaged goods, and bankruptcy inventories,[51] and have long kept overhead costs low by siting their stores in cheaper spaces than other retailers and employing fewer people, who each perform many different functions.

More recently, the largest chains have begun to stock more mainstream products, including no-frills versions of some products made by major manufacturers, and even their own "house" brands, that often bring in a higher profit margin. Even as the recent economic downturn has driven more middle-class customers to dollar stores, their core customer base (42%) is still lower-income people who make less than $30,000 a year.[52] Forty percent of dollar store customers rely on public assistance of some type.[53]

CHAPTER FIVE

SMART COMPANIES ARE RESPONDING

Consumers, investors, and regulators are increasingly demanding safer products free of toxic chemicals, leading to rapid growth in the sale of safer and more sustainable products.[54] Safer chemicals and products benefit not just consumers, but workers, businesses, governments, and the economy as a whole. The American Sustainable Business Council, a national network of businesses and associations representing 200,000 businesses and 325,000 business executives, owners, and investors, has identified many ways in which the transition to safer chemicals benefits business and the economy, including:

- Expanding markets for safer and greener chemicals and products;
- Reducing the costs and risks associated with managing chemicals in products and across supply chains;
- Lowering expenses from chemically-induced employee illness and enhancing productivity from improved employee health;

FIGURE 1
Ripples of Responsibility

Source: Rossi, Peele, and Thorpe (2012). BizNGO and Clean Production Action. The Guide to Safer Chemicals.

> **"WALMART AND SAM'S CLUB** believe that customers/members should not have to choose between products that they can afford and products that are better for them and the environment."[55]
>
> *Walmart's Policy on Sustainable Chemistry in Consumables*

- Identifying chemicals of high concern to human health or the environment;
- Increasing trust among consumers, employees, communities, and investors;
- Improving transparency and communication throughout the supply chain, leading to increased confidence for downstream users;
- Creating a more competitive, innovative and economically sustainable chemical industry in the U.S.[56]

Costs and liabilities triggered by hazardous chemicals in products can be significant. Even when regulators don't act, consumers and investors may avoid companies that allow toxic chemicals into the products they make or sell. A few recent cautionary tales:

- In January 2015, Safeway was required to pay almost $10 million for illegally disposing of hazardous waste from cleaners, aerosols, hair dyes, electronic devices, and other products it sells;[57]
- Costco, CVS, Target, Walgreens, and Walmart paid $138 million in fines over a three-year period due to chemicals of concern found in their products;[58]
- Sony lost over $150 million in costs and sales from a recall of its PlayStations for illegal levels of cadmium;[59]
- Mattel's toy recall for lead caused an 18% stock price drop and $110 million in costs, and RC2's recall for lead in toy trains cut its stock price in half and cost $48 million;[60]

- Johnson & Johnson's baby products market share in China dropped 10% after toxic chemicals were found in some of its U.S. products;[61]
- Water bottle manufacturer Sigg USA went bankrupt largely because it failed to disclose the presence of bisphenol-A (BPA) in its bottles.[62]

Both niche and mainstream companies are responding, in different ways, to increasing market, regulatory and consumer demands that they understand, disclose, and eliminate chemicals of concern from their products, and ensure that substitutes are truly safer.

Some mainstream retailers—including Staples, Target, Walmart, Whole Foods, buybuy BABY and others—have acted to address chemicals in their supply chains. Major brands such as Apple, Adidas, Clorox, HP, Levi Strauss, and SC Johnson have adopted significant chemical disclosure policies and targeted measures to replace priority hazardous chemicals. The health care organizations Kaiser Permanente and Dignity Health have required that their suppliers report on many chemicals in their products. Companies following "green building" principles—including Google and the Durst Organization—are also demanding disclosure of chemicals in building materials, and supporting safer materials that will not expose building occupants to harmful chemicals.

Although the largest discount retail chains (Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only) have worked to comply with minimum legal requirements governing chemicals in the products they sell, and some have taken specific actions to remove a few harmful products from their shelves or test some of their products, none of the largest chains have yet adopted comprehensive chemical management policies, leaving their customers workers, and investors exposed to possible harm and liability. It's time for that to change.

BOX 1

Safe and Healthy Products for All: It's Just Good Business

Health impacts linked to exposure to toxic chemicals, and the often higher cost of healthier products sold by some companies, can both impose substantial burdens on the economic well-being of low-income communities and communities of color. Retailers must consider how to make safe and healthy products affordable to all.

On the one hand, low-income communities may be exposed to chemicals in household products, children's toys, and food purchased from the discount stores. The low cost of these products creates the perception that the consumer is getting a bargain. But once impacts on health are quantified, such as long-term diseases like cancer or diabetes, it may not a bargain at all.

On the other hand, healthy alternatives to toxic products are often sold at high-end stores, such as Whole Foods and Trader Joe's, located in better-resourced communities. The prices of safer products are often not realistic prices for an everyday dollar store shopper. Organic produce, chemical-free cosmetics, and phthalate-free toys are often priced beyond what a low-income person can afford.

For these reasons, *economic justice* has equal importance in the environmental and economic justice movement in the United States. Many veterans of the environmental and economic justice movement today are engaged in intergenerational projects throughout the country, creating local economies and models of economic self-sufficiency, such as urban farming, locally-made beauty & health products, and worker cooperatives.

MANY VETERANS OF THE environmental and economic justice movement today are engaged in intergenerational projects throughout the country, creating local economies and models of economic self-sufficiency.

CHAPTER SIX

BABY STEPS AREN'T ENOUGH

Dollar Stores Are Falling Behind on Chemicals

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The largest dollar store chains have taken some minimal initial steps to address chemicals of concern in their supply chains, but their failure to adopt and disclose comprehensive plans of action is leaving their customers, and their own businesses, at risk.

In 2006 and 2007, Dollar General, Dollar Tree, and Family Dollar all experienced product recalls due to the highly toxic heavy metal lead, while mainstream retailers experienced similar problems. As reflected in new testing of dollar store products released in this report (see page 4), this experience, the resulting consumer backlash, and adoption of new state and federal regulations on lead in children's products seem to have encouraged the dollar store chains to ensure that their vendors largely removed lead from children's products.

Dollar Tree claims to have gone further than minimum federal requirements, saying in its 2013 Sustainability Report that the company has advised vendors to not "use heavy metals in any products supplied to Dollar Tree." The report also states that Dollar Tree began testing for phthalates in PVC plastic in 2008, "advised" vendors not to use PVC plastic in rainwear or BPA in products and drinking containers designed for infants (and more recently in all food and beverage containers), tests for cadmium in its products, and tests products in its stores for compliance with state Toxics in Packaging legislation.[63]

In its 2010 Sustainability Report, Family Dollar notes that the company "established a higher set of requirements" than required by the 2008 Consumer Product Safety Improvement Act (which restricted lead and six phthalates in products intended for children under 12) and met the new requirements earlier than required by the law.[64]

TESTING OF 164 PRODUCTS

purchased from the four largest dollar store chains in six states for just a few hazardous chemicals found that 133 of 164 products contained one or more of these chemicals at levels of concern.

These targeted actions demonstrate recognition by the dollar store chains that they must comply with the minimal legal requirements adopted by states and the federal government, or in some cases slightly exceed them. But the failure of these chains to adopt and publish comprehensive policies to address the many other chemicals of concern throughout their supply chains continues to expose their consumers to possible harm and leave their businesses vulnerable to the type of consumer and investor backlash, and regulatory actions, experienced by Mattel, Johnson & Johnson, Sigg USA and other companies.

Recent developments also show that the major dollar store chains continue to struggle with toxic chemicals in their products.

As noted on page 4, new testing of 164 products purchased from the four largest dollar stores chains in six states for just a few hazardous chemicals found that 133 of 164 products tested (or 81%) contained one or more of these chemicals at levels of concern (compared to existing voluntary toy standards and mandatory toy, packaging and electronics standards).

A 2012 report found that 39% of vinyl plastic packaging sold by discount retailers contained levels of cadmium or lead that violate state laws.[65]

99 Cents Only will pay over $2 million in 2015 for improper storage and disposal of hazardous products and was fined $409,490 in 2010 by the U.S. Environmental Protection Agency (EPA) for selling unregistered and mislabeled pesticides in household cleaning products.[66] In the latter case, EPA's Administrative Law Judge declared that the company's management has a "culture of indifference."[67]

California's Proposition 65 law requires companies to disclose products they sell that contain chemicals known to the state to cause cancer or reproductive toxicity. All four major dollar chains may sell such products, in California and elsewhere. 99 Cents Only provides a notice on its web site in order to comply with the law, warning consumers that certain products sold in its stores contain Cocamide Diethanolamine (or Cocamide DEA) or Diethanolamine (or DEA), which are chemicals known to the State of California to cause cancer.[68]

Why would 99 Cents Only or any other dollar store chain continue selling products that contain chemicals proven to cause cancer, birth defects, or other reproductive harm? Isn't this endangering not only their workers and customers, but their businesses as well, given the steep price paid by many other companies found to be selling products that contain toxic chemicals?

OUR COMMUNITIES DESERVE

to know what's hidden in these stores and to act in our best interest, that is, a life of wellbeing and dignity for all.

Suguet Lopez, Executive Director Organizacion en California de Lideres Campesinas

In 2014, Dollar Tree had to remove toy Clingy Darts from its stores after the product was found to contain high levels of a regulated phthalate chemical.[69] Various dollar store products have been found to be mis-labeled, including medications, toothpastes, and cleaning products.[70]

It's time for the dollar store chains to address the presence of hazardous chemicals in their products comprehensively, by adopting chemical management policies based on best practices identified by sustainability experts and by other retailers.

CHAPTER SEVEN

ESSENTIAL ELEMENTS OF A CORPORATE CHEMICAL POLICY

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© Suguet Lopez

The best corporate policies to address chemicals of concern in products include several common elements:

- KNOW what chemicals are in products and supply chains;
- DISCLOSE those chemicals publicly;
- NAME priority hazardous chemicals for replacement;
- IDENTIFY alternatives that are effective and safer;
- REPLACE harmful chemicals with proven safer alternatives.

To assess the major dollar store chains' chemical management practices, we compared publicly available information on their policies, and the policies of Walmart and Target, to the "Five Essential Practices for Retailers, Brand Owners and Suppliers," a framework developed by the Coming Clean Workgroup for Safe Markets that builds on the BizNGO Principles of Safer Chemicals.[71] (For a summary of the Five Essential Practices, see Appendix B.) The principles of good chemicals management policy emphasize the need for disclosure of chemical information and informed substitution practices for the replacement of hazardous chemicals in products with safer alternatives.

"WHAT IS MEASURED, IMPROVES."

Management Guru Peter Drucker

Table 1 compares Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only to the chemical management policies of Walmart and Target, using the following questions drawn from the Five Essential Practices.

1. Does the company have a publicly available chemical management plan that establishes a goal of reducing and eliminating chemicals of concern and includes metrics and timeframes to measure progress?
2. Does the company know and disclose the chemical ingredients in its products (including packaging)?
   a. Does the company require disclosure of chemicals from suppliers to the retailer or a third party on behalf of the retailer?
   b. Does the company require or encourage suppliers to disclose chemical ingredients online and/or on product packaging?
3. Has the company publicly identified a set of chemicals of concern for reduction or replacement with safer alternatives?
4. Does the company conduct, or require suppliers to conduct, "alternatives assessments" of chemicals of concern to identify safer alternatives and ensure informed substitution?
5. Has the company committed to continuous improvement, including public reports on its progress in implementing its chemical management plan?

While Walmart's and Target's policies both have some weaknesses, both companies have taken the initiative to adopt publicly available policies that include most of the elements of good corporate chemical management systems and identify broad groups of chemicals for action through specific processes.

None of the four major dollar store chains have any publicly available plan or policy to comprehensively address chemical hazards in the products they sell, even in their "house" brands over which they have full control.

Given this reality, it is not surprising that new testing of products purchased at the four largest dollar store chains for just a few toxic chemicals found some disturbing results. (See page 4.)

TABLE 1

Comparison of Publicly Available Chemical Management Policies Based on the "Five Essential Practices for Retailers, Brand Owners and Suppliers"

Essential Practice	Dollar General	Dollar Tree	Family Dollar	99-Cents Only	Walmart	Target
1. Public chemical management plan with metrics and timeframes?	No	No	No	No	Yes	Partly
2. Disclosure of chemical ingredients in multiple product categories:						
a. From suppliers to the retailer?	No	No	No	No	Yes	Yes
b To consumers online or on packages?	No	No	No	No	Yes	Yes
3. Chemicals of concern publicly identified for reduction or elimination?	No	No	No	No	Partly	Yes
4. Conduct or require alternatives assessment and informed substitution?	No	No	No	No	Partly	No
5. Continuous improvement and public reporting?	No	No	No	No	Yes	Yes

Source: Information publicly available on the relevant corporate websites, including the Walmart Policy on Sustainable Chemistry in Consumables and the Target Sustainable Product Standard.

CHAPTER EIGHT
OUR RECOMMENDATIONS: COMMON-SENSE SOLUTIONS

Successful strategies to replace harmful chemicals in everyday products with safer alternatives are already well documented, and are already being implemented by leading retailers, manufacturers, and some states and municipalities. What has been missing in the discount retail sector—with the exception of a few important but limited actions by some chains—has been sustained focus on this issue at the top corporate leadership level and comprehensive plans of action to identify and phase out harmful chemicals across supply chains.

Common-sense actions can begin to protect dollar store employees, customers, and their families from some of the most hazardous chemicals, while positioning discount retailers as sustainability leaders committed to safe products and vibrant local economies.

DISCOUNT RETAILERS SHOULD:

- Immediately remove children's products found to contain regulated phthalates and lead from store shelves, and from storage and distribution systems.
- Commit to phase out phthalates, lead, and PVC plastic (vinyl) from all products they sell.
- Adopt comprehensive corporate chemical management policies based on the "Five Essential Practices" (see page 26) to identify, disclose, and remove hazardous chemicals (starting with the Hazardous 100+) from their supply chains and from all products in their stores, beginning with their house brands.
- Build relationships with local and regional manufacturers and vendors of safer products to support vibrant local economies while improving product safety.

LOCAL, STATE, AND FEDERAL GOVERNMENTS SHOULD:

- Ensure that discount retailers comply with all relevant laws and regulations.
- Adopt public policies (such as Maine's Kid-Safe Products Law and Washington's Children's Safe Products Act) that require manufacturers and retailers to disclose hazardous chemicals in products, research alternatives, and remove hazardous chemicals when alternatives are available, effective, and safer.
- Expand or enact restrictions on toxic phthalates to include all products that can expose children and women of childbearing age to these highly hazardous chemicals.

FAMILIES AND COMMUNITIES SHOULD:

- Exercise individual purchasing power by buying more locally made products, and buying less-toxic products when available on the shelves of dollar stores.
- Communicate their need for safe products free of harmful chemicals to store managers, corporate leadership, and government officials, by joining local and national efforts advocating for nontoxic products.
- Get involved in local environmental and economic justice organizations.

RESOURCES

FOR BUSINESSES

American Sustainable Business Council—Offers policies and practices that can help the economy become more sustainable. *http://asbcouncil.org*

BizNGO—A unique collaboration of businesses and environmental groups working together for safer chemicals & sustainable materials. *http://bizngo.org*

Chemical Footprint Project—A tool for benchmarking companies as they select safer alternatives and reduce their use of chemicals of high concern. *http://www.chemicalfootprint.org*

Clean Production Action—Designs and delivers strategic solutions for green chemicals, sustainable materials and environmentally preferable products. *http://cleanproduction.org*

Green Chemistry and Commerce Council—A cross sectoral, business-to-business network of companies and other organizations working collaboratively to advance green chemistry across sectors and supply chains. *http://greenchemistryandcommerce.org*

GreenScreen® for Safer Chemicals—A method for comparative chemical hazard assessment. *http://www.greenscreenchemicals.org*

Guide to Safer Chemicals—A hands-on-guide that charts pathways to safer chemicals in products and supply chains. *http://bizngo.org/safer-chemicals/guide-to-safer-chemicals*

Hazardous 100+ Chemicals—Recognized by at least two governmental authorities to be hazardous, or they pose hazards similar to chemicals on an authoritative list. *http://saferchemicals.org/chemicals*

Meeting Customers' Needs for Chemical Data: A Guidance Document for Suppliers—*http://www.greenchemistryandcommerce.org/downloads/GC3_guidance_final_031011.pdf*

Pharos Project—An independent and comprehensive database for identifying health hazards associated with building products. *https://www.pharosproject.net*

SUBSPORT Substitution Support Portal—A free-of-charge, multilingual platform for information exchange on alternative substances and technologies. *http://www.subsport.eu*

FOR FAMILIES AND COMMUNITIES

GoodGuide—A comprehensive, authoritative resource for information about the health, environmental and social performance of consumer products and companies. *http://www.goodguide.com*

HealthyStuff.org—Includes test results for over 5,000 products and ranks them according to chemical hazards. *http://www.healthystuff.org*

Environmental Working Group's Skin Deep Cosmetics Database—Includes more than 70,000 cosmetic and personal care proucts. *http://www.ewg.org/skindeep*

Workgroup for Safe Markets Resources Page—Links to over fifty resources on chemicals, health, and products. *http://safemarkets.org/resources-to-promote-safer-chemicals-and-products*

ENDNOTES

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APPENDIX A
METHODS

Products were purchased at retail locations of Dollar General, Dollar Tree, Family Dollar, and 99 Cents Only in California, Kentucky, Maine, New Mexico, Texas, and West Virginia and shipped to HealthyStuff.org in Ann Arbor, Michigan for testing. Researchers selected products based on our research interests and consumer interest. The sampling was intended to represent a diverse group of products, but was not random or necessarily designed to be representative of all products on the market.

HealthyStuff.org analyzed the products using two spectro-scopic methods, High Definition X-ray Flourescence (HDXRF) and Fourier Transform Infrared Spectroscopy (FTIR). HDXRF and FTIR are non-destructive methods that allow the user to rapidly screen for toxic chemicals in consumer products. XRF technology is widely used by both product manufacturers and government regulators, including by the CPSC, to test consumer products for hazardous metals and other chemical elements. The elemental composition of the materials reveals the presence of potentially hazardous chemicals, such as metals, and also allows researchers to infer the possible presence of toxic chemicals or materials, including brominated flame retardants (BFRs), polyvinyl chloride (PVC) and possibly phthalate plasticizers. We have translated the research results into a HealthyStuff.org product rating system to allow users to easily compare the chemical levels of a variety of consumer products.

The ratings included in this report do not provide a measure of health risk or chemical exposure associated with any individual product, or any individual element or related chemical. HealthyStuff.org ratings provide only a relative measure of high, medium, and low levels of concern for several hazardous chemicals or chemical elements in an individual product in comparison to criteria established in the site methodology.

There are a number of chemicals of concern that cannot be detected by XRF technology. XRFs, like all test methods, have limitations.

The samples were first analyzed with HDXRF for elements such as lead, cadmium, chlorine, bromine, arsenic, mercury, tin, and antimony. Next, FTIR was used to determine which samples contained vinyl plastic (polyvinyl chloride). Thirty-eight identified vinyl plastic products were then tested for phthalates by a third party CPSC-certified laboratory according to CPSC Test Method CPSC-CH-C1001-09.3, which uses gas chromatogratphy/mass spectrometry.

The XRF methods used, background materials on the XRF, and limitations in the XRF methodology are detailed here: *http://www.healthystuff.org/about.methodology.php*

APPENDIX B

FIVE ESSENTIAL PRACTICES FOR RETAILERS, BRAND OWNERS AND SUPPLIERS

Transitioning to Safer Chemicals and Materials Through Increased Disclosure of Chemical Information and Informed Substitution of Hazardous Chemicals

Government mandates, consumer demand, and pressure from public health advocates are increasingly pushing brand owners, retailers and suppliers to identify and eliminate hazardous chemicals and materials in the products they make and sell. Companies that phase out hazardous chemicals position themselves as innovators and consumer-friendly, while reducing reputational and financial liabilities and reporting requirements. Unfortunately, substitutes for phased out chemicals are far too often not disclosed, and substitutes for hazardous chemicals have often not been comprehensively screened for health and environmental hazards. These failures diminish the public's faith that reformulated products are actually safer, and leave companies exposed to new liabilities and new government or consumer demands.

These **Five Essential Practices** will ensure that brand owners, suppliers, and retailers transition away from hazardous chemicals of concern by ensuring that any substitutes have been fully screened for health and environmental hazards and disclosed to consumers and governments:

1. Retailers, brand owners and suppliers will establish a goal of reducing and eliminating the use of chemicals and materials of concern in products and manufacturing processes, and replacing them with alternatives that are transparently safer. Their publicly available chemicals management plans will include metrics and clear timeframes to measure continual progress towards this goal. As a priority, retailers and brand owners will identify relevant chemicals of high concern in products and supply chains, volume of those chemicals, and set goals for reducing both the number and volume of these chemicals.

2. Retailers and brand owners will know and publicly disclose the chemical ingredients in their products, product packaging and manufacturing processes. They will do this by requiring their suppliers to give full chemical disclosure including of fragrances, additives, contaminants, raw materials, colorants, flavorings and chemical by-products and they will make this information publicly available online and/or on product packaging. A good first step is to disclose all chemicals of high concern in products including those under proprietary agreements.

3. Retailers, brand owners and suppliers will identify chemicals and materials in their products and/or supply chains for chemicals of concern for substitution with safer alternatives that have undergone comprehensive hazard screening. The hazard profile of a chemical will be determined using comprehensive human health and environmental endpoints and all data gaps for chemical information will be clearly stated.

4. Retailers, brand owners and suppliers will conduct or require alternatives assessment for chemicals of concern as set out in the Business-NGO Principles of Alternatives Assessment. Alternatives will include a wide range of options ranging from simple elimination to informed substitution for safer chemical, material and non-chemical alternatives.

5. Retailers, brand owners and suppliers will commit to continuous improvement in eliminating all chemicals and materials of concern in their supply chain and will support innovation and public policies that

promote green chemistry, sustainable product design and manufacturing processes that protect human health and the environment. Retailers, brand owners and suppliers will publicly report on their progress in transitioning to safer chemicals and materials on their websites and in their shareholder reports.

A comprehensive description of the Five Essential Practices, including methods, measures, and tools, is available from the Coordinators of the Workgroup for Safe Markets.

These Five Essential Practices were developed jointly by partners in the Workgroup for Safe Markets, including: Breast Cancer Fund, Center for Food Safety, Center for Environmental Health, Clean and Healthy New York, Clean Production Action, Commonweal, Healthy Building Network, International Campaign for Responsible Technology, Learning Disabilities Association of Maine, Natural Resources Defense Council, Safe Minds, Safer Chemicals Healthy Families, and Women's Voices for the Earth.

A DAY LATE AND A DOLLAR SHORT

Discount Retailers Are Falling Behind on Safer Chemicals

© Yudith Nieto

Major retail and manufacturing brands are protecting their customers' health and reducing the risk of fines, lost sales, and reduced market share by responding to the increasing demand for safer products. Smart companies are adopting chemical management policies to identify, disclose, and replace chemicals of concern in the products they make or sell with safer alternatives.

The four largest dollar store chains—Dollar General, Dollar Tree, Family Dollar and 99 Cents Only—operate over 21,500 U.S. stores, with annual sales of more than $36 billion. These chains are in a unique position to benefit the health and welfare of many communities of color and low-income communities where they operate, and also grow their own businesses, by providing safer products. But so far they have failed to follow their competitors—such as Walmart and Target—by adopting broad action plans to identify and phase out hazardous chemicals.

Which dollar store chain will seize the opportunity to become the leader in providing nontoxic products and best positioned to thrive in the competitive discount sector?

CAMPAIGN FOR Healthier Solutions

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Matthew Vinci
International Association of Fire Fighters

Testimony of
The International Association of Fire Fighters to the
U.S. Consumer Product Safety Commission

Good morning Commissioners and thank you for allowing the International Association of Fire Fighters (IAFF) to testify today before the U.S. Consumer Product Safety Commission on the Petition Requesting Rulemaking on Products containing Organohalogen Flame Retardants (Docket No. CPSC-2015-0022). I am Matthew Vinci, Director of Education, Training and Human Relations for the IAFF.

The IAFF is an international union that represents over 307,000 paid professional fire service employees in the United States and Canada. The IAFF has been actively involved in improving the health and safety of fire fighters for more than 90 years. This is a critical activity for a workforce in which fatalities and early retirement due to work-related injuries and illnesses occur regularly.

I would like to begin by stating that the IAFF objects to the staff report. The theory behind including flame retardants in consumer products is to protect consumers from fire-related injuries and death. CPSC's jurisdiction clearly covers consumer injury from fires

and we know that the primary cause of injury in home fires is from smoke inhalation. There is strong evidence which has been submitted to the Commission showing that flame retardants do not in fact protect consumers from fire-related injury. But given that the CPSC is considering fire risks to consumers, it should also take into account the hazard to consumers and fire fighters from smoke inhalation during a home fire. At a minimum, the CPSC should look at the very high cancer rates experienced by fire fighters as strong evidence of the toxicity faced by consumers who experience a fire in their home.

Fire fighters dying from occupational-related cancers now account for more than half of our members line-of-duty deaths each year. This is the largest health-related issue facing the firefighting profession. We must reduce this number and removing the class of non-polymeric organohalogen flame retardants in products is a positive step forward in protecting first responders from the harmful effects of these toxic flame retardants.

In the vast majority of US workplaces, occupational exposure levels have greatly declined in the past 2-3 decades. Improved workplace conditions can be attributed to many factors including governmental occupational safety and health agencies, legislation, training programs for occupational health professionals, and good business practice including the need to keep highly skilled workers healthy and working.

Unfortunately, fire fighters have not benefited from this overall improvement. They are still entering uncontrolled, hazardous environments regularly. Studies of the chemicals

contained within the complex mixture of the smoke that fire fighters commonly encounter have a clearly documented reason for concern about these exposures. Recent studies have shown that fire fighters have higher levels of flame retardant chemicals in their body than the general population.

Fire fighters come into contact with toxic flame retardants in their daily lives, just like the rest of the population. But fire fighters have a much higher risk of suffering the negative, cancer-causing effects of carcinogenic flame retardants as those chemicals burn in a fire – whether it's in the air they breathe, exposure during the overhaul of fires, the absorption through their skin during and after working at a fire, or after the incident as they are exposed to the toxic soot that covers their turnouts and equipment. It is the IAFF's position that this exposure contributes to the reason that our members have a significantly higher incidence rate of certain types of cancer.

The National Institute for Occupational Safety and Health (NIOSH) recently conducted a landmark study of cancer among U.S. fire fighters that included data from over 30,000 career fire fighters employed between 1950 and 2010. The research found that fire fighters compared to the general United States population had statistically significant increases in both diagnosis and death from certain cancers.

The IAFF supports banning the use of toxic flame retardants that are known to, or found to be carcinogens that contribute to cancer and have additional negative effects on the health of our members. The IAFF also supports efforts to remove toxic flame retardants from

upholstered furniture and other products, and supports efforts requiring manufacturers of such products to utilize alternative technologies in lieu of toxic chemicals.

Given the increasing body of evidence that indicates the persistence, bio-accumulation and potential health concerns of these fire retardants, we believe the health risks associated with the use of these chemicals is greater than the fire risk without using these chemicals. This is even more factual with the use of advanced fire safety technology that is in place today to include sprinkler systems, smoke and fire detection systems, and modern early warning devices. In addition, it's widely known that there has been a significant reduction in the use of tobacco products across the United States which has contributed to the reduction in fires across the United States.

There are two key ways to impact the use of toxic flame retardants in products. One is through the standard-setting process, since flame retardant chemicals are commonly used as a means of complying with these test requirements. The other is through regulation of the chemicals themselves, by banning or restricting the use of specific flame retardants. These strategies can be most effective in combination, since restricting use of one hazardous flame retardant cannot guarantee that future flame retardants will be safe for human and environmental health.

As you are aware, there has been several State's that have passed meaningful legislative and regulatory reforms to ban and restrict the use of toxic flame retardants. One of the most broad-based reforms has been the adoption of the smoldering standard California TB-117-2013. The IAFF and our California State Affiliate, the California Professional Fire

Fighters, have actively advocated for years to change the California Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation Technical Bulletin 117. We strongly support the change to TB-117 2013 which now creates a toxic free fire safety option. This new testing option mirrors today's fire safety problem, utilizing barriers to slow the spread of a smoldering fire. Several manufacturers and distributors are now offering furniture that's free of flame retardants to include Ikea, Create and Barrel, Ashley Furniture and Macy's, and several health care institutions to include Partners Healthcare and Kaiser Permanente have pledged to only purchase upholstered furniture that's free of flame retardants.

However, there is an effort on the horizon at the National Fire Protection Association (NFPA) that could potentially impact this modern toxic free option. We are concerned with the approach that's being taken at NFPA to create a new open flame standard. The Main Task Group that is working on this draft standard is moving towards proposing to adopt California TB-133, a large open flame test that would require the application of an increase in the use of flame retardants in residential upholstered furniture.

The IAFF has one representative on the NFPA Fire Tests Committee. This committee has been developing a draft standard titled NFPA 277, Standard Methods of Tests for Evaluating Fire and Ignition Resistance of Upholstered Furniture Using Ignition Source. We have made our positon clear that due to the known and unknown health hazards associated with the chemicals used to meet an open flame test, the Fire Test Committee and Main Task Group will need to consider the health and safety of Fire Fighters and the public within the process of this proposed standard. We have made both the Main Task

Group and the Fire Test Committee aware of our positon on Toxic Free Fire Safety by utilizing a modern approach to include a combination of barriers on upholstered furniture, residential and commercial sprinkler systems, and modern early warning fire and smoke and fire detection systems.

In addition, we have voiced our concern to NFPA with the representative make-up of both the Technical Committee and the Main Task Group, which are comprised of committee members that have a long history of ties to the flame retardant and fire testing industry. We will continue to attempt to participate in this process that is heavily weighted towards proposing the adoption of a new open flame test for upholstered furniture.

The NFPA September 2013 White Paper on Upholstered Furniture Flammability is being cited as one the justifications to create a new open flame standard for upholstered furniture. The National Fire Incidence Reporting System (NFIRS) data that is sited in this report is questionable. We are in agreement with the following three basic conclusions of the recently completed report that was prepared for the Fire Prevention Alliance by the Brattle Group titled *A Review of the National Fire Incidence Report System and the National Fire Protection Association Upholstered Furniture Fire Statistics.*

1. NFIRS based statistics generated by NFPA and the Consumer Product Safety Commission (CPSC) are subject to substantial uncertainty making them of limited usefulness for policy making purposes.

2. The degree of uncertainty is not widely recognized and is not reported in NFIRS, NFPA, and CPSC documents.

3. The confidence intervals we estimate are large, but still understate the extent of the uncertainties associated with the NFIRS data because of data reporting limitations.

Because of the flaws with the NFIRS database national organizations throughout the Fire Service Industry have joined forces for development of a new national data fire operations reporting system. For the last four years this collation supported by the Department of Homeland Security has created the new data system and is being implemented and tested in more than 125 fire departments throughout the U.S. This national joint effort and the overwhelming desire for change from major fire departments across the country is clear evidence that NFIRS is not a viable data source for fire service decision making.

In closing, over the years deceptive practices and misuse of data by the companies that produce toxic flame retardants have mislead the public in the name of fire safety. The IAFF will continue to fight for the elimination of these toxic chemicals. I thank the Commission for allowing first responders to have a voice in protecting our job environment while still maintaining the highest level of fire protection for the citizens we protect every day.

Ansje Miller
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Testimony of Ms. Ansje Miller, Director of Policy and Partnerships, Center for Environmental Health

The Center for Environmental Health (CEH) is a nonprofit national organization dedicated to protecting the public from exposure to harmful chemicals in air, water, food and consumer products. One of the ways that CEH accomplishes our mission is through extensive testing of consumer products for key chemicals of concern. For the last 5 years, CEH has been involved with the testing of consumer products for the presence of flame retardant chemicals, and testing for the presence of organohalogen flame retardants has been a large focus of our work. CEH has conducted testing efforts on a wide range of children's products and on furniture (both child and adult sized).

While CEH has been heartened to see a decrease in the number of products that contain flame retardants chemicals, we are very concerned by CEH and others' recent test findings (2016 and 2017) that correspond closely to the CPSC findings and other studies that show approximately 25% of furniture and children's products still contain unnecessary flame retardant chemicals.

In 2016 CEH tested 29 new foam-containing children's products that were purchased from major retail stores from across the United States. Products included changing pads, child-sized furniture, bassinet pads, highchairs and more. Of the 29 products tested, analytical laboratory testing found that 7 of the 29 children's products tested (approximately 25%) still contained flame retardant chemicals and more than one-half of the products with flame retardants contained organohalogens. One of the oddest findings was a foam baby bath tub, a product that is designed to be immersed in water that contained added halogenated flame retardant chemicals. Flame retarding a water product highlights that flame retardants are being added to products pointlessly.

We are very concerned that we are still finding flame retardants in children's products because these products were exempted from having to meet any flammability standard in January 2014 and no flame retardants have been needed in any of these products for the past three years. CEH's finding of flame retardants in children's products mirrors the CPSC's own finding that 22% of the children's products tested still contained flame retardant chemicals as well as Clean and Healthy New York's testing of children's products which also found one quarter of products containing flame retardant chemicals.

CEH has also conducted four rounds of testing on children's nap mats as used in day care centers over the past four years. Despite the fact that children's nap mats have *never* had to comply with TB 117 (the California flammability standard in effect until January 2014), in our most recent testing of nap mats last year, we still found 16% of the nap mats tested contain organohalogen flame retardant chemicals.

The relatively new California furniture flammability standard, Technical Bulletin 117-2013, allows furniture manufacturers to comply with California regulation without using flame retardant chemicals although there is nothing in the regulation that *prohibits* their use. CEH serves on the Advisory Council of the California Bureau that oversees the furniture flammability regulations. In BEARHFTI's July 2017 Advisory Council materials the Bureau reported that while 75% of the furniture labels they checked indicated that

the product did not contain added flame retardant chemicals, 22% of furniture products were labeled as containing added flame retardant chemicals. The remaining 3% failed to label the flame retardant content of the product at all. Again, while it is heartening to see the shift in the market away from furniture with added flame retardant chemicals, almost one quarter of furniture still contains these unnecessary chemicals; that is far too many Americans being exposed to unnecessary and harmful chemicals.

Additive organohalogen flame retardants are not required to satisfy performance requirements in any of these products and it is apparent that there is still a significant portion of the market that contains these harmful chemicals. We were surprised that the CPSC staff briefing suggested that the lack of a mandatory flammability standard requiring flame retardants shows that there is no reason to regulate flame retardants in these products. This is faulty reasoning. The reason there is no mandatory flammability standard that requires the use of flame retardants is because flame retardant chemicals serve no meaningful fire safety benefit in these products. And the fact that we cannot rely on these industries to remove these chemicals from *all* products is why it is up to the CPSC to step in and stop the flow of these chemicals in the products identified in the petition.

In the CPSC staff briefing, the staff correctly acknowledges that humans are exposed to organohalogen flame retardants and that these chemicals are found in human biomonitoring studies. In fact virtually every living being on the planet that has been tested for the presence of flame retardant chemicals, has been found to have them in their bodies. The staff however incorrectly states that that human exposure to these flame retardants cannot be linked to specific products and that the presence of these chemicals in household dust cannot be linked to the four product categories that the petition identifies. There are many studies that demonstrate a connection between children's products, televisions and furniture and OFRs as measured in dust and I know scientists will be sharing those with you, but I would like to highlight just one as it relates to children.

Dr. Asa Bradman from the Center for Environmental Research and Children's Health (CERCH), School of Public Health at University of California, Berkeley, and his team of researchers studied 40 early childhood learning centers for the presence of flame retardant chemicals. Children are estimated to spend as much as 50 hours per week in childcare and pre-school. Of the 40 facilities surveyed, 29 had upholstered furniture and 17 had napping equipment that contained foam. Dust samples were taken from the childcare room where the upholstered furniture and nap mats were present. Dr. Bradman found that dust concentrations of some organohalogen FRs were higher in the 29 facilities with upholstered furniture or foam napping equipment present. Dr. Bradman found that levels of two commonly used FRs (TCEP and TDCIPP) were significantly higher in facilities with foam napping equipment present compared to facilities without foam napping equipment. [i] TCEP and TDCIPP are both carcinogens noted on the California Proposition 65 list.

There can be no doubt that organohalogen FRs continue to be used in a significant proportion of products in these categories, that these chemicals migrate out of the products and find their way into people's bodies and are associated with serious health problems. The CPSC has a duty to protect consumers, and especially children, from these hazards.

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i Asa Bradman et al. Flame Retardant Exposures in California Early Childhood Education Environments, Chemosphere, volume 116, December 2014, pages 61-66.

Abigail Zapote
League of United Latin American Citizens

Statement of Abigail Zapote
Vice President for Young Adults, League of United Latin American Citizens (LULAC)
U.S. Consumer Product Safety Commission
Organohalogen Flame Retardants Petition; Oral Presentation [Docket No. CPSC-2015-0022]
Submitted by email: cpsc-os@cpsc.gov
August 31, 2017

Thank you for the opportunity to address you today.

With approximately 132,000 members throughout the United States and Puerto Rico, the league of United Latin American Citizens (LULAC) is the largest and oldest Hispanic Organization in the United States. Headquartered in Washington, DC, with 1,000 councils nationwide, our programs, services and advocacy address the most important issues for Latinos, meeting critical needs of today and the future.

On July 18, 2009, thousands of LULAC members from across the country gathered for our National convention. At this event, our membership voted for and adopted a resolution on environmental justice which among many things affirms that environmental justice demands the right for Latinos and all communities, to participate as equal partners at every level of decision making.

Furthermore, the resolution asserts that Latino communities in the United States have: a right to be safe from harmful exposure; a right to prevention; a right to know what we're exposed to; a right to participate in decision making processes that have implications for our communities; and a right to protection and enforcement of policies that promote and safeguard the well-being of workers, families and communities.[1]

As of 2013, there are 54 million Hispanics in the U.S. which comprise 17 percent of the total U.S. population. The average age of a Latino(a) is 28 years old.[2] While our community is young, robust and growing, from the local to the national level, we are consistently under attack by efforts that seek to deprive our children, workers and families of dignity and justice and the right to participate in and influence the democratic process.

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[1] LULAC, Resolution - Declaration of the Principles of Environmental Justice and Environmental Bill of Rights in Latino Communities in the United States. Available at http://www.lulac.net/advocacy/resolutions/2009/resenv03.html
[2] Statistical Portrait of Hispanics in the United States, 1980 – 2013. Pew Research Center. Available at: http://www.pewhispanic.org/2015/05/12/statistical-portrait-of-hispanics-in-the-united-states-2013-key-charts/

Whether it's Sheriffs that racially profile our community, lawmakers that propose to deprive our U.S. born children of citizenship and the right to be counted, or Governors that want to suppress our right to vote, at a minimum, and on so many fronts, we have been able to identify and challenge our adversaries.

I sit before you today, not just on behalf of LULAC but with a tremendous responsibility to millions of Latinos who cannot be here today to take a stand against toxic exposure. This time we are dealing with an invisible and insidious assailant that threatens the sanctuary that is our home and hinders our community's ability to defend itself.

As an organization that advances the economic condition, educational attainment, political influence, housing, health and civil rights of Hispanic Americans, we are increasingly concerned about exposure to toxic chemicals and its impact on the health and quality of life of Latinos. From the womb to households, workplaces and communities, fighting to reduce toxic exposure in our communities is intrinsically tied to our mission.

The science indicates that the highest human levels of harmful flame retardant chemicals in the general population have been found in young children from low-income communities and communities of color.[3]

In particular, the 2003-2004 National Health and Nutrition Examination Survey ("NHANES") conducted by the Centers for Disease Control and Prevention ("CDC"), found at least one form of organohalogen flame retardants in 97 percent of the study participants.[4] This biomonitoring study also showed that:

- Mexican Americans and non-Hispanic blacks had higher levels of flame retardants than the non-Hispanic white population.
- Teenagers (ages 12 to 19) had higher body burdens than adults for all flame retardants measured.

What we know is that exposure to organohalogen flame retardant chemicals can lead to serious health problems such as reduced IQ, disruption of hormones, cancer and reproductive impairments. These exposures threaten the health and educational

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[3] Quirós-Alcalá, L.; Bradman, A; Nishioka, M.; Harnly, M.E.; Hubbard, A.; McKone, T.E.; & Eskenazi, B. (2011). Concentrations and loadings of polybrominated diphenyl ethers in dust from low-income households in California. Environment International, 37(3):592-96. doi: 10.1016/j.envint.2010.12.003.

[4] Sjödin, A.; Wong, L.; Jones, R.S.; Park, A.; Zhang, Y.; Hodge, C.; Dipietro, E.; McClure, C.; Turner, W.; Needham, L.L.; & Patterson Jr., D.G. (2008). Serum concentrations of polybrominated diphenyl ethers (PBDEs) and polybrominated biphenyl (PBB) in the United States population: 2003-2004. Environmental Science & Technology, 42(4), 1377-84. doi: 10.1021/es702451p.

attainment of our children and in doing so, their prospects for the future and economic condition. Education is a key to social mobility yet exposure to flame retardant chemicals is robbing our children of their potential.

A 2012 study of Mexican-American children in the state of California found that children who live in areas with limited access to safe outdoor play spaces tend to have higher levels of the toxic flame retardant chemicals in their blood.[5] While this information may be new to us, what isn't new is the fact that nearly half (45%) of the nation's Latino population lives in 10 metropolitan areas in the states of California, New York, New Jersey, Texas, Illinois, Florida and Arizona.[6]

When you consider the urban areas where nearly half of our community lives, and combine that with findings that show that racial/ethnic minorities and low-income people have less access to green spaces like parks, or recreational programs than those who are White or more affluent,[7] what that signals to us is that minority and low-income children are spending more time indoors, and instead of being safe, their exposure to flame retardants chemicals is heightened.

For Latino households, immigrant and non-immigrant alike, what good does it do to operate under the assumption that if you work hard and study, you will change your circumstances and be able to provide yourself and future generations with more opportunities and an improved quality of life.

If we continue to allow toxic flame retardant chemicals to invade our home, we are deluding Latinos and all families into believing that we are safe in our home and on equal footing as those who can afford to "live green" and purchase their way out of toxic products.

This is not an option for Latinos who have a median annual personal income of $21,900 and $41,000 in median household income. Furthermore, despite increases in health coverage, Latinos continue to have the highest uninsured rate of any racial or ethnic group within the U.S., at 19.9 percent compared to 11.8 percent for Blacks, 9.3 percent for Asians and 7.6 percent for non-Hispanic Whites. When you take into account economic status with health insurance coverage, you can begin to imagine how our community is

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[5] Bradman, A.; Castorina, R.; Sjödin, A.; Fenster, L.; Jones, R.; Harley, K.; Chevrier, J.; Holland, N.; Eskenazi, B. (2012). Factors Associated with Serum Polybrominated Diphenyl Ether (PBDE) Levels Among School-Age Children in the CHAMACOS Cohort. Environmental Science & Technology, 2012. 46 (13), 7373-7381. doi: 10.1021/es3003487

[6] Motel, S.; & Patten, E. Characteristics of the 60 Largest Metropolitan Areas by Hispanic Population. Pew Research Center. 19 September 2012. Available at: http://www.pewhispanic.org/2012/09/19/characteristics-of-the-60-largest-metropolitan-areas-by-hispanic-population/

[7] Abercrombie, L. C., Sallis, J., Conway, T., Frank, L. D., Saelens, B. E., & Chapman, J. E. (2008). Income and racial disparities in access to public parks and private recreation facilities. American Journal of Preventative Medicine, 34(1), 9–15.

already limited in its ability to protect itself from toxic exposure and deal with the health impacts associated with it. [8]

Our families should not have to know what "organohalogen flame retardants" are or that there are toxic chemicals that do not stay inside the products manufacturers put them in.

We shouldn't have to worry about flame retardant chemicals "off-gassing" from children's products, furniture, mattresses and the casings around electronics into our homes, entering our bodies and persisting in our system.

When you look at our demographics and the range of socioeconomic factors affecting us, I am hopeful that I've provided you with a deeper understanding of our community and the sense of urgency I feel as I sit before you today.

Our members have submitted public comments on this petition and I have done my part. Now it is up to you.

You have the power to protect our community and the League of United Latin American Citizens (LULAC) urges you to take swift action to ban these harmful and pervasive chemicals.

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[8] For information on the uninsured, see Table 5, P15, *Health Insurance Coverage in the United States: 2014* at: https://www.census.gov/content/dam/Census/library/publications/2015/demo/p60-253.pdf

Rick Goss
Information Technology Industry Council
and the Consumer Technology Association

ITI-CTA-IPC Oral Comments on docket ID number CPSC-2015-0022;
Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants

September 14, 2017

The electronics industry, represented by the Information Technology Industry Council (ITI), the Consumer Technology Association (CTA™), and IPC – Association Connecting Electronics Industries®, appreciates the opportunity to provide comments on the Petition Requesting a Rulemaking on Products Containing Organohalogen Flame Retardants (OFRs).

ITI, CTA, and IPC are trade associations representing numerous manufacturers of a wide range of components, computers, televisions, video display devices, wireless devices, MP3 players, printers, printed circuit boards, and other electronic equipment. Essentially, our members are the manufacturers of "electronic devices" referred to in the petition.

ITI, CTA, and IPC support the Consumer Products Safety Commission's (CPSC) staff conclusion and recommendation that the CPSC deny this petition. The CPSC has done an exceptionally careful and thorough analysis of the petition, and the electronics industry agrees with the analysis and conclusions in the staff briefing package. We continue to believe this petition to ban OFRs is overly broad and insufficiently justified in its claims, a conclusion also reached by the CPSC staff. The petition fails to provide the data to meet a key legal requirement to initiate a rulemaking under the Federal Hazardous Substances Act (FHSA): data showing a connection between the exposure to a substance and personal injury or harm from that exposure.

Given the unprecedented regulatory challenges that would be posed by a rule banning OFRs in electronic enclosures, in the absence of additional evidence to contradict the CPSC staff analysis and recommendations that have been presented, this petition should be denied.

The Electronics Industry Supports the Staff Recommendations, Analysis and Conclusions

The CPSC assessed the health, chemical and economic impacts related to the petition: the risk of the continued use of the OFRs; ability for the CPSC to test for the presence of these substances and enforce any potential rulemaking; the economic impact of a potential ban; and the history of adverse health effects related to exposure from the products listed in the petition.

In each of their analyses, the associated CPSC directorates found that the data were insufficient to draw specific conclusions, and that there was no evidence to suggest that a rulemaking would provide any consumer benefit:

- In their analysis, the Directorate for Health Sciences Response noted that the "...available data indicate that one cannot consider OFRs as a class under the FHSA because every OFR

cannot be concluded to meet the toxicity prong of the FHSA's definition of "hazardous substance."[1]

- The Health Science Directorate further found that "...although there are studies demonstrating human exposure to OFRs...it is not possible to determine that adverse health effects result from exposure to OFRs in the specific products in these categories that the petitioners identify."[2]

- Additionally, the Division of Laboratory Sciences Chemistry is concerned that "Due to the breadth of the four product categories covered by the Petition, it would take multiple years and significant staff resources to collect, analyze, and interpret the resultant data."[3]

The electronics industry agrees with these conclusions.

The CSPC staff briefing package lists several other valid reasons to deny the petition, including: the need for an extensive economic analysis of the ban; the fact that the petition does not consider whether voluntary standards could meet the needs of the proposed rulemaking; and the overlap with other agencies' efforts to reduce the health risks of these substances.

The Fire Safety in Electronics Continues to be a Primary Concern

The risk of fire in electronics is real. Of the products listed in the petition, electronic products are unique in that a majority of them have a potential ignition source via the electric currents in the product. There are limited approaches available to electronics manufacturers to reduce the risk of fire. The use of flame retardant chemicals is one of the most effective method for plastics used in electronics enclosures. If these chemicals are banned from use in electronics, the entire system of fire safety management in electronic products may be compromised.

When designing products, we strive to balance safety, performance, durability, environmental performance, and feasibility, which includes costs to the consumer. The electronics industry is continually reviewing the use of chemicals in our products in an effort to balance the sometimes competing goals of reducing the use of chemicals of concern and fire prevention. Flame retardants continue to be an important part of the system in place to ensure safe products.

The petitioners posited that most flame retarding chemicals do not, in fact, reduce the occurrence of fires in products. While we cannot speak for the other classes of products in the petition, the use of flame retardant chemicals in the plastics used in electronics has been shown to significantly enhance the fire performance of the material, making the products significantly safer.[4]

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[1] Tab A of staff recommendation, Directorate of Health Science Response – page 115
[2] Tab A of staff recommendation, Directorate of Health Science Response – page 119
[3] Tab E of staff recommendation, Division of Laboratory Sciences Chemistry response – page 144
[4] See page 77 of NIST (formerly National Bureau of Standards) Special Publication 749: http://fire.nist.gov/bfrlpubs/fire88/PDF/f88003.pdf

Conclusion

In summary, ITI, CTA, and IPC agree with the CPSC staff recommendation to deny the petition.

The petition improperly attempted to combine an overly broad group of chemicals with highly varied and unique characteristics into a single class with only cursory discussion of the chemical and physical properties of the substances involved. The petition failed to provide data showing a connection between the exposure to a substance and personal injury or harm from that exposure. Further, the petition did not recognize the contribution of these chemicals as an integral tool in maintaining the fire safety of electronics.

We continue to believe, as we stated in our previous testimony, that the petition being considered is overly broad and fails to justify the need for the commission to initiate a rulemaking. Therefore, the electronics industry continues to request that the commission deny this petition and not initiate a rulemaking on the products and chemicals listed in the petition.

Please do not hesitate to contact Rick Goss, ITI; Katie Reilly, CTA; or Fern Abrams, IPC should you have any questions.

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Statement of Maureen Swanson, Learning Disabilities Association of America
On the Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants
Docket No. CPSC-2015-0022
U.S. Consumer Products Safety Commission Public Hearing

August 31, 2017

Thank you Chairman Kaye and Commissioners for the opportunity to comment on the Petition requesting rulemaking on products containing organohalogen flame retardants. My name is Maureen Swanson and I direct the "Healthy Children Project" for the Learning Disabilities Association of America (LDA). LDA is the oldest and largest national volunteer organization advocating for children and adults with learning disabilities, with chapters in more than 40 states.

One in six children in the United States has a reported learning or developmental disability including autism, attention deficit hyperactivity disorder, and other learning and developmental delays. Much like halogenated flame retardants, learning and developmental disabilities persist – with lasting impacts on children, families and society. On average, it costs twice as much to educate a child with a learning or developmental disability as to educate a child without a disability.

I am also co-director of Project TENDR (Targeting Environmental Neuro-Developmental Risks). TENDR is an alliance of more than 50 leading scientists, health professionals, and children's health advocates, who in July 2016 published a consensus statement as a national call to reduce widespread exposures to chemicals that interfere with fetal and children's brain development. In the statement, the TENDR experts named PBDEs as a prime example of toxic chemicals that are increasing children's risks for neurodevelopmental disorders, including ADHD, learning disabilities, intellectual impairments and autism. https://ehp.niehs.nih.gov/ehp358/

Based on the extensive toxicological and epidemiological evidence, and in light of widespread exposures, particularly to pregnant women and children, there is now scientific agreement that PBDEs have the capacity to harm brain development, and that even low-level exposures may result in learning, behavioral or intellectual deficits.

The consequences of prenatal exposures to PBDEs appear permanent. Since 2010, three separate studies of hundreds of pregnant women and children – in New York, Ohio and California – have resulted in strikingly similar findings: children more highly exposed to PBDE flame retardants prenatally have lower IQ scores, cognitive delays and attention problems. The decrements in IQ scores persist through the children's school years.

The TENDR statement also outlines the scientists' concerns with halogenated flame retardants that are replacing PBDEs, noting that the replacement flame retardants are similar in structure to PBDEs, and emerging evidence shows they are similarly neurotoxic.

Halogenated flame retardants look like thyroid hormones and can disrupt thyroid function. Thyroid hormone is essential to healthy brain development. In 2015, researchers with the Endocrine Society reviewed evidence on PBDEs and neurodevelopmental outcomes and concluded that PBDE exposure interferes with thyroid hormone and contributes to neurodevelopmental disorders. Recent studies of halogenated flame retardants that have replaced PBDEs show these chemicals also can interfere with thyroid hormone and alter brain development.

So here is what we know: the science is in, and is even clearer now that it was at the first CPSC hearing on this petition. Halogenated flame retardants change babies' brains and can result in life-long intellectual and developmental impairments.

How are children exposed to halogenated flame retardants?

Halogenated flame retardants cross the placenta to the fetus and are detected in umbilical cord blood and in breast milk. Halogenated flame retardants migrate from furniture, baby and children's products, electronics enclosures and mattresses into household dust. The U.S. EPA estimates that children ages 1–5 ingest on average approximately 100–200 mg dust/day, which is four to five times more than adults ingest.

A 2011 study of baby products found that 80% of the items tested contained halogenated flame retardants. A 2014 study of 40 daycare facilities and preschools in California found halogenated flame retardants, specifically tris phosphate, Firemaster 550 and PBDEs, in 100% of dust samples from the facilities. Levels of these flame retardants in dust were significantly higher in facilities using nap mats made from foam.

A 2012 study found that toddlers were significantly exposed to polybrominated diphenyl ether (PBDE) flame retardants due to transfer of house dust particles from their hands, and objects such as toys, to their mouths. There was a strong correlation between the PBDE levels on the children's hands and the levels measured in their blood. It is likely that other halogenated flame retardants commonly detected in house dust are similarly ingested by babies and young children.

Because of their size and weight, rapid rate of growth and development, metabolism and behaviors, babies and children are likely to experience higher chronic exposures to halogenated flame retardants than adults. In the U.S., 97% of children have PBDEs in their bodies.

Well, so what? Maybe those levels are so low they don't matter much – after all, we're talking about parts per billion. Here's what I want the Commission to understand: Research in the neurosciences has identified "critical windows of vulnerability" during fetal development and early childhood, when the brain is especially at risk from toxic chemicals, even at extremely low exposure levels. Parts per billion sounds deceptively small. But consider chemicals that are designed to alter behavior, like Ritalin. The prescribed dose of Ritalin for a child with ADHD is active in the child's body at about the same or even lower levels than the level of flame retardants found in children's blood.

Here is what we know: We know that the fetus, infants and children are regularly exposed to halogenated flame retardants, in part because these chemicals migrate from products into house dust and are ingested. We know halogenated flame retardants are active in children's bodies at levels that can disrupt thyroid hormone and function, which in turn disrupts brain development and function. And we know that the resulting harm to children's minds is permanent.

As an advocate for children and adults with learning disabilities, and as a parent, what I cannot understand is that based on everything we know, why would the Commission allow this class of toxic chemical to continue to be used in products that are in our homes, schools and child care centers?

Restricting a few flame retardant chemicals at a time is a failed approach that results in unreasonable and increased risks to children's health and development. We urge the CPSC to issue the proposed rule and end the cycle whereby chemical makers replace one toxic halogenated flame retardant with another.

Thank you.

A Section 508–conformant HTML version of this article is available at http://dx.doi.org/10.1289/EHP358.

Project TENDR: Targeting Environmental Neuro-Developmental Risks. The TENDR Consensus Statement

http://dx.doi.org/10.1289/EHP358

SUMMARY: Children in America today are at an unacceptably high risk of developing neurodevelopmental disorders that affect the brain and nervous system including autism, attention deficit hyperactivity disorder, intellectual disabilities, and other learning and behavioral disabilities. These are complex disorders with multiple causes—genetic, social, and environmental. The contribution of toxic chemicals to these disorders can be prevented. APPROACH: Leading scientific and medical experts, along with children's health advocates, came together in 2015 under the auspices of Project TENDR: Targeting Environmental Neuro-Developmental Risks to issue a call to action to reduce widespread exposures to chemicals that interfere with fetal and children's brain development. Based on the available scientific evidence, the TENDR authors have identified prime examples of toxic chemicals and pollutants that increase children's risks for neurodevelopmental disorders. These include chemicals that are used extensively in consumer products and that have become widespread in the environment. Some are chemicals to which children and pregnant women are regularly exposed, and they are detected in the bodies of virtually all Americans in national surveys conducted by the U.S. Centers for Disease Control and Prevention. The vast majority of chemicals in industrial and consumer products undergo almost no testing for developmental neurotoxicity or other health effects. CONCLUSION: Based on these findings, we assert that the current system in the United States for evaluating scientific evidence and making health-based decisions about environmental chemicals is fundamentally broken. To help reduce the unacceptably high prevalence of neurodevelopmental disorders in our children, we must eliminate or significantly reduce exposures to chemicals that contribute to these conditions. We must adopt a new framework for assessing chemicals that have the potential to disrupt brain development and prevent the use of those that may pose a risk. This consensus statement lays the foundation for developing recommendations to monitor, assess, and reduce exposures to neurotoxic chemicals. These measures are urgently needed if we are to protect healthy brain development so that current and future generations can reach their fullest potential.

A Call to Action

The TENDR Consensus Statement is a call to action to reduce exposures to toxic chemicals that can contribute to the prevalence of neurodevelopmental disabilities in America's children. The TENDR authors agree that widespread exposures to toxic chemicals in our air, water, food, soil, and consumer products can increase the risks for cognitive, behavioral, or social impairment, as well as specific neurodevelopmental disorders such as autism and attention deficit hyperactivity disorder (ADHD) (Di Renzo et al. 2015; Gore et al. 2015; Lanphear 2015; Council on Environmental Health 2011). This preventable threat results from a failure of our industrial and consumer markets and regulatory systems to protect the developing brain from toxic chemicals. To lower children's risks for developing neurodevelopmental disorders, policies and actions are urgently needed to eliminate or significantly reduce exposures to these chemicals. Further, if we are to protect children, we must overhaul how government agencies and business assess risks to human health from chemical exposures, how chemicals in commerce are regulated, and how scientific evidence informs decision making by government and the private sector.

Trends in Neurodevelopmental Disorders

We are witnessing an alarming increase in learning and behavioral problems in children. Parents report that 1 in 6 children in the United States, 17% more than a decade ago, have a developmental disability, including learning disabilities, ADHD, autism, and other developmental delays (Boyle et al. 2011). As of 2012, 1 in 10 (> 5.9 million) children in the United States are estimated to have ADHD (Bloom et al. 2013). As of 2014, 1 in 68 children in the United States has an autism spectrum disorder (based on 2010 reporting data) (CDC 2014).

The economic costs associated with neurodevelopmental disorders are staggering. On average, it costs twice as much in the United States to educate a child who has a learning or developmental disability as it costs for a child who does not (Chambers et al. 2004). A recent study in the European Union found that costs associated with lost IQ points and intellectual disability arising from two categories of chemicals—polybrominated diphenyl ether flame retardants (PBDEs) and organophosphate (OP) pesticides—are estimated at 155.44 billion euros ($169.43 billion dollars) annually (Bellanger et al. 2015). A 2009 analysis in the United States found that for every $1 spent to reduce exposures to lead, a potent neurotoxicant, society would benefit by $17–$221 (Gould 2009).

Vulnerability of the Developing Brain to Chemicals

Many toxic chemicals can interfere with healthy brain development, some at extremely low levels of exposure (Adamkiewicz et al. 2011; Bellinger 2008; Committee on Improving Analysis Approaches Used by the U.S. EPA 2009; Zoeller et al. 2012). Research in the neurosciences has identified "critical windows of vulnerability" during embryonic and fetal development, infancy, early childhood and adolescence (Lanphear 2015; Lyall et al. 2014; Rice and Barone 2000). During these windows of development, toxic chemical exposures may cause lasting harm to the brain that interferes with a child's ability to reach his or her full potential.

The developing fetus is continuously exposed to a mixture of environmental chemicals (Mitro et al. 2015). A 2011 analysis of the U.S. Centers for Disease Control and Prevention's (CDC) biomonitoring data found that 90% of pregnant women in the United States have detectable levels of 62 chemicals in their bodies, out of 163 chemicals for which the women were screened (Woodruff et al. 2011). Among the chemicals found in the vast majority of pregnant women are PBDEs, polycyclic aromatic hydrocarbons (PAHS), phthalates, perfluorinated compounds, polychlorinated biphenyls (PCBs), perchlorate, lead and mercury (Woodruff et al. 2011). Many of these chemicals can cross the placenta during pregnancy and are routinely detected in cord blood or other fetal tissues (ATSDR 2011; Brent 2010; Chen et al. 2013; Lien et al. 2011).

Prime Examples of Neurodevelopmentally Toxic Chemicals

The following list provides prime examples of toxic chemicals that can contribute to learning, behavioral, or intellectual impairment, as well as specific neurodevelopmental disorders such as ADHD or autism spectrum disorder:

- Organophosphate (OP) pesticides (Eskenazi et al. 2007; Fortenberry et al. 2014; Furlong et al. 2014; Marks et al. 2010; Rauh et al. 2006; Shelton et al. 2014).
- PBDE flame retardants (Chen et al. 2014; Cowell et al. 2015; Eskenazi et al. 2013; Herbstman et al. 2010).
- Combustion-related air pollutants, which generally include PAHs, nitrogen dioxide and particulate matter, and other air pollutants for which nitrogen dioxide and particulate matter are markers (Becerra et al. 2013; Clifford et al. 2016; Jedrychowski

et al. 2015; Kalkbrenner et al. 2014; Suades-González et al. 2015; Volk et al. 2013).
- Lead (Eubig et al. 2010; Lanphear et al. 2005; Needleman et al. 1979).
- Mercury (Grandjean et al. 1997; Karagas et al. 2012; Sagiv et al. 2012).
- PCBs (Eubig et al. 2010; Jacobson and Jacobson 1996; Schantz et al. 2003).

The United States has restricted some of the production, use and environmental releases of these particular chemicals, but those measures have tended to be too little and too late. We face a crisis from both legacy and ongoing exposures to toxic chemicals. For lead, OP pesticides, PBDEs and air pollution, communities of color and socioeconomically stressed communities face disproportionately high exposures and health impacts (Adamkiewicz et al. 2011; Engel et al. 2015; Zota et al. 2010).

Policies to ban lead from gasoline, paints and other products have been successful in lowering blood lead levels in the American population (Jones et al. 2009), yet lead exposure continues to be a preventable cause of intellectual impairment, ADHD and maladaptive behaviors for millions of children (CDC 2015). Scientists agree that there is no safe level of lead exposure for fetal or early childhood development (Lanphear et al. 2005; Schnur and John 2014), and studies have documented the potential for cumulative and synergistic health effects from combined exposure to lead and social stressors (Bellinger et al. 1988; Cory-Slechta et al. 2004). Thus, taking further preventive actions is imperative.

Epidemiological, toxicological, and mechanistic studies have together provided evidence that clearly demonstrates or strongly suggests neurodevelopmental toxicity for lead, mercury, OP pesticides, air pollution, PBDEs, and PCBs. The level and type of available evidence linking exposures to toxic chemicals with neurodevelopmental disorders, including the examples in this statement, vary both within and among chemical classes. In light of this extensive evidence and continued widespread exposure, the risks for learning and developmental disorders can likely be lowered through targeted exposure reduction, starting with these example chemicals.

Majority of Chemicals Untested for Neurodevelopmental Effects

The examples of developmental neurotoxic chemicals that we list here likely represent the tip of the iceberg. Of the tens of thousands of chemicals on the U.S. Environmental Protection Agency (EPA) chemical inventory, nearly 7,700 are manufactured or imported into the United States at ≥ 25,000 pounds per year (U.S. EPA 2012). The U.S. EPA has identified nearly 3,000 chemicals that are produced or imported at > 1 million pounds per year (U.S. EPA 2006).

Only a minority of chemicals has been evaluated for neurotoxic effects in adults. Even fewer have been evaluated for potential effects on brain development in children (Grandjean and Landrigan 2006, 2014). Further, toxicological studies and regulatory evaluation seldom address combined effects of chemical mixtures, despite evidence that all people are exposed to dozens of chemicals at any given time.

Need for a New Approach to Evaluating Evidence

Our failures to protect children from harm underscore the urgent need for a better approach to developing and assessing scientific evidence and using it to make decisions. We as a society should be able to take protective action when scientific evidence indicates a chemical is of concern, and not wait for unequivocal proof that a chemical is causing harm to our children.

Evidence of neurodevelopmental toxicity of any type—epidemiological or toxicological or mechanistic—by itself should constitute a signal sufficient to trigger prioritization and some level of action. Such an approach would enable policy makers and regulators to proactively test and identify chemicals that are emerging concerns for brain development and prevent widespread human exposures.

Some chemicals, like those that disrupt the endocrine system, present a concern because they interfere with the activity of endogenous hormones that are essential for healthy brain development. Endocrine-disrupting chemicals (EDCs) include many pesticides, flame retardants, fuels, and plasticizers. One class of EDCs that is ubiquitous in consumer products are the phthalates. These are an emerging concern for interference with brain development and therefore demand attention (Boas et al. 2012; Ejaredar et al. 2015; Mathieu-Denoncourt et al. 2015; Miodovnik et al. 2014; U.S. Consumer Product Safety Commission 2014).

Regrettable Substitution

Under our current system, when a toxic chemical or category of chemicals is finally removed from the market, chemical manufacturers often substitute similar chemicals that may pose similar concerns or be virtually untested for toxicity. This practice can result in "regrettable substitution" whereby the cycle of exposures and adverse effects starts all over again. The following list provides examples of this cycle:

- When the federal government banned some uses of OP pesticides, manufacturers responded by expanding the use of neonicotinoid and pyrethroid pesticides. Evidence is emerging that these widely used classes of pesticides pose a threat to the developing brain (Kara et al. 2015; Richardson et al. 2015; Shelton et al. 2014).
- When the U.S. Government reached a voluntary agreement with flame retardant manufacturers to stop making PBDEs, the manufacturers substituted other halogenated and organophosphate flame retardant chemicals. Many of these replacement flame retardants are similar in structure to other neurotoxic chemicals but have not undergone adequate assessment of their effects on developing brains.
- When the federal government banned some phthalates in children's products, the chemical industry responded by replacing the banned chemicals with structurally similar new phthalates. These replacements are now under investigation for disrupting the endocrine system.

Looking Forward

Our system for evaluating scientific evidence and making decisions about environmental chemicals is broken. We cannot continue to gamble with our children's health. We call for action now to prevent exposures to chemicals and pollutants that can contribute to the prevalence of neurodevelopmental disabilities in America's children.

We need to overhaul our approach to developing and assessing evidence on chemicals of concern for brain development. Toward this end, we call on regulators to follow scientific guidance for assessing how chemicals affect brain development, such as taking into account the special vulnerabilities of the developing fetus and children, cumulative effects resulting from combined exposures to multiple toxic chemicals and stressors, and the lack of a safety threshold for many of these chemicals (Committee on Improving Analysis Approaches Used by the U.S. EPA 2009). We call on businesses to eliminate neurodevelopmental toxicants from their supply chains and products, and on health professionals to integrate knowledge about environmental toxicants into patient care and public health practice.

Finally, we call on policy makers to take seriously the need to reduce exposures of all children to lead—by accelerating the clean up from our past uses of lead such as in paint and water pipes, by halting the current uses of lead, and by better regulating the industrial processes that cause new lead contamination.

We are confident that reducing exposures to chemicals that can interfere with healthy brain development will help to lower the prevalence of neurodevelopmental disabilities, and thus enable many more children to reach their full potential.

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Organizations that Endorse or Support the TENDR Consensus Statement

American College of Obstetricians and Gynecologists (ACOG)
ACOG supports the value of this clinical document as an educational tool (March 2016)

Child Neurology Society

Endocrine Society

International Neurotoxicology Association

International Society for Children's Health and the Environment

International Society for Environmental Epidemiology

National Council of Asian Pacific Islander Physicians

National Hispanic Medical Association

National Medical Association

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D.B. has served as an expert witness in civil litigation cases and criminal cases involving exposures to environmental chemicals. He has been paid for these activities. He has provided opinions for plaintiffs and for defendants, depending on the facts of the case. He also served as a paid expert witness to a Commission of Inquiry into lead contamination in Hong Kong's drinking water. A.B. has served as a consultant to nonprofit organizations developing environmental health educational curricula for child care programs and has participated as a volunteer member on the Board of the Organic Center, a nonprofit organization that provides information for scientific research about organic food and farming. C.K. is employed by The Endocrine Disruption Exchange (TEDX), a U.S. 501(c)3 organization that occasionally provides consultation, legal assistance, or expert testimony on the topic of endocrine-disrupting chemicals. Neither C.K. nor TEDX stands to gain or lose financially through the publication of this article. This work was supported by private foundations that did not have scientific or editorial input or control. J.S. is employed by the Natural Resources Defense Council, an environmental nongovernmental organization (NGO) that routinely engages in public advocacy, lobbying, and litigation to expand protections for the environment and public health and to enforce existing environmental laws regulating toxic chemicals, including some of the chemicals identified in this manuscript. I.H-P. has received travel reimbursements for her service on the Scientific Advisory Committee of Autism Speaks, in which she provided comments on broad directions for the organization's research programs. She also received payment for reviewing grant proposals for the Research Screening Committee of the California Air Resources Board, which is a branch of the California state government involved in air quality regulation. E.M. works at Pesticide Action Network, an NGO advocating for a farming system that is not reliant on pesticides. M.S. is the Director of the Healthy Children Project for the Learning Disabilities Association of America. Her position is funded by the John Merck Fund, which also contributed some of the funding for Project TENDR.

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Union of Concerned Scientists

Union of Concerned Scientists

Organohalogen Flame Retardants Petition; Oral Presentation
Genna Reed, Union of Concerned Scientists
August 31, 2017

My name is Genna Reed. I am the science and policy analyst at the Center for Science and Democracy at the Union of Concerned Scientists and have a B.A. in Biology and a M.A. in Environmental Policy. With more than 500,000 members and supporters across the country, we are a nonpartisan, non-profit group, dedicated to improving public policy through rigorous and independent science. The Center for Science and Democracy at UCS advocates for improved transparency and integrity in our democratic institutions, especially those making science-based public policy decisions.

The Union of Concerned Scientists stands with other members of the scientific community in supporting this petition calling upon the Consumer Product Safety Commission (CPSC) to declare organohalogen flame retardants (OFRs) as a hazardous class of chemicals and to ban their use in children's products, furniture, mattresses and the casings surrounding electronics. The scientific evidence laid out in the petition supports this regulatory change.[1] The CPSC has the authority to protect children from toxic substances that "may cause substantial personal injury or substantial illness."

Since the Center's inception, we have worked to protect scientific integrity within the federal government and called attention to incidences of special interests mischaracterizing science to advocate for specific policy goals. The American Chemistry Council's work to sow doubt about the science revealing harms about chemicals' impacts on our health, including its dogged defense of flame retardants, is an egregious example of this inappropriate behavior.

The companies that manufacture OFRs have put significant time and money into distorting the scientific truth about these chemicals. As a 2012 *Chicago Tribune* investigative series noted, the chemical industry "has twisted research results, ignored findings that run counter to its aims and passed off biased, industry-funded reports as rigorous science." In one case, manufacturers of flame retardants repeatedly pointed to a decades-old government study, arguing the results showed a 15-fold increase in time to escape fires when flame retardants were present. The lead author of the study, however, said industry officials "grossly distorted" the results and that "industry has used this study in ways that are improper and untruthful," as the amount of flame retardant used in the tests was much greater than would be found in most consumer items.[2] The ACC has further misrepresented the science behind flame retardants by creating an entire website to spread misleading ideas about flame retardants as safe and effective, even though research has consistently shown their limited effectiveness.[3] In doing so, the ACC and its member companies has promoted the prevalent use of OFRs at the expense of public health.

Looking at these chemicals through a strictly objective lens illustrates the need for CPSC's swift action. Toxicity and exposure data support the assessment of organohalogen flame retardants as a class of chemicals under the Federal Hazardous Substances Act (FHSA). Properties that are shared by OFRs include their semivolatility and ability to migrate from consumer products into house dust and exposure has been associated with a range of health impacts including reproductive impairment, neurological impacts, endocrine disruption, genotoxicity, cancer, and immune disorders.[4] As a class, there is an adequate body of evidence supporting the conclusion that these chemicals have the "capacity to cause personal illness" and therefore meet the definition of "toxic" under FHSA.[5] Perhaps most egregiously, biomonitoring data have revealed that communities of color and low-income communities are disproportionately exposed to and bear high levels of flame retardant chemicals,[6] adding to the cumulative chemical burden that these communities are already experiencing, from increased fine particulate matter from power plants or refineries in their neighborhoods to higher levels of contaminants in their drinking water.

I've seen firsthand the persistence of the earliest form of flame retardants, polychlorinated biphenyls (PCBs), that still plague the sediment and water of the Hackensack Meadowlands just a couple of miles from where I grew up in New Jersey. One of my first jobs was working in the chemistry division of the Meadowlands Environmental Research Institute where I spent my days extracting PCBs and organochlorine pesticides from the soil and sediment of the Meadowlands and analyzing that data. Despite being banned in 1977, these chemicals are still found in dangerously high amounts all over industrial hotspots of the country, and continue to bioaccumulate in a range of species. The ban of PCBs happened decades ago and we are still managing the damaging impacts of the chemical's prevalence across the country. The next generation of these chemicals, organohalogen flame retardants, are inside of our own homes in a range of products, thanks largely in part to the disinformation campaign sowed by special interests. The fact remains that the science does not support their continued use.

Seeing firsthand the persistence of PCBs in my local environment inspired me to use my scientific training to work to design or improve policies that minimize public health and environmental risks to prevent future scenarios of chemicals overburdening ecosystems or households. That is why I'm here today to ask the CPSC today to act with urgency to grant this petition and further regulate OFRs to protect our children and future generations.

Thank you.

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[5] 15 U.S.C. § 1261(f)(1)(A).

[6] Centers for Disease Control and Prevention. 2015. *Fourth National Report on Human Exposure to Environmental Chemicals*, Updated Tables. Online at *http://www.cdc.gov/exposurereport/*, Accessed August 30, 2017; Zota, A.R., R.A. Rudel, R.A. Morello-Frosch, and J.G. Brody. 2008. Elevated house dust and serum concentrations of PBDEs in California: unintended consequences of furniture flammability standards? *Environmental Science & Technology*, 42(21), 8158-64. doi: 10.1021/es801792z; Stapleton, H.M., S. Eagle, A. Sjödin, and T.F. Webster. 2012. Serum PBDEs in a North Carolina toddler cohort: associations with handwipes, house dust, and socioeconomic variables. *Environmental Health Perspectives*, 120(7), 1049-54. doi: 10.1289/ehp.1104802.

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COLUMBIA UNIVERSITY | MAILMAN SCHOOL of PUBLIC HEALTH ENVIRONMENTAL HEALTH SCIENCES

Julie Herbstman, Ph.D. Sc.M.
Department of Environmental Health Sciences

Organohalogen Flame Retardants Petition; Oral Presentation
By Phone
Julie Herbstman, PhD
August 31, 2017

1. I am an environmental epidemiologist, currently holding the position of Associate Professor in the Department of Environmental Health Sciences at the Columbia University Mailman School of Public Health. I completed a master's of science (ScM) and a doctoral degree (PhD) in environmental epidemiology from the Johns Hopkins Bloomberg School of Public Health. I completed a postdoctoral fellowship in environmental health at the Columbia Mailman School of Public Health before joining the faculty. At Columbia, I am affiliated with the Columbia Center for Children's Environmental Health, the Columbia Center for Environmental Health in Northern Manhattan, and the Cancer Epidemiology Program at the Herbert Irving Comprehensive Cancer Center at the Columbia University Medical Center.

2. Since 2002, I have been studying the impact of prenatal exposure to polybrominated diphenyl ether (PBDE) flame retardants on children's thyroid hormone levels and neurodevelopment. In my research, I have collected umbilical cord blood and have worked with the Centers for Disease Control and Prevention (CDC) to measure PBDE components (congeners) associated with the penta-brominated diphenyl ether (penta-BDE) mixture. I have found that all the neonates in my research studies in Baltimore and in New York City (NYC) had detectable levels of at least one penta-BDE congener in their cord blood [1, 2]. We found evidence suggesting that prenatal exposure to penta-BDE congeners may impact perinatal thyroid hormone levels [3]. We also found that children who were exposed prenatally to higher concentrations of penta-BDE congeners (relative to children in the study with lower exposure) scored significantly lower on cognitive tests, including such tests as full-scale, verbal, and performance intelligence quotient (IQ) at ages 4 and 7 and reported more attention problems [4]. Based on my research and the research of other investigators in the field [5-7], there is ample evidence indicating that prenatal exposure to penta-BDEs is associated with lower scores on indices of both cognition (e.g., IQ) and increased number of behavior problems throughout childhood.

3. Since PBDEs have been phased out of use in new consumer products, new compounds have been used instead. Some of these compounds are also organohalogen flame retardants, meaning they are in the same chemical family as PBDEs and other flame retardants that have been banned or phased out (e.g., brominated tris). We recently studied homes in NYC where women and their 3-5 year old children reside. Among all the women and children we studied, everyone was exposed to detectable levels of PBDE as well as brominated flame retardant chemicals that are used as PBDE replacements--including 2-ethylhexyl-2,3,4,5- tetrabromobenzoate (TBB) and bis(2-ethylhexyl) 2,3,4,5-tetrabromophthalate (TBPH). While TBB and TBPH were detectable on the hands of all the women and children we studied, children generally had higher concentrations on their hands as compared to their mothers (after accounting for differences in hand size). We also found a significant positive association between the amount of TBB and TBPH in house dust and on the hands of the mothers and children [8].

4. Toxicological data demonstrate that PBDE replacements TBB and TBPH may be biologically active. Studies from other researchers in the field have shown that these compounds can interact with the nuclear receptor peroxisome proliferator-activated receptor gamma (PPARG), which is involved in adipogenesis and relevant to obesity [9, 10]. Another study in rats demonstrated that exposure during pregnancy altered maternal thyroid hormones and induced hepatotoxicity [11].

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Department of Environmental Health Sciences

5. Based on my own research and that of other researchers in the field, I conclude that in households in the US where pregnant women and children live, there are detectable levels of both PBDE and their halogenated replacements. Children, infants, and fetuses are more vulnerable to health effects resulting from exposure to a variety of environmental chemicals, including halogenated flame retardants [12]. It is my professional opinion that there is reason to be concerned that the entire class of organohalogen flame retardants may cause injury or illness to humans, particularly to fetuses and young children. Therefore, I support regulations designed to prevent human exposure to these chemicals from consumer products.

Sincerely,
Julie Herbstman, Ph.D., Sc.M

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Daniel Rosenberg
Natural Resources Defense Council

NRDC

NATURAL RESOURCES DEFENSE COUNCIL

August 31, 2017

Organohalogen Flame Retardants Petition; Oral Presentation
Daniel Rosenberg, Senior Attorney
Natural Resources Defense Council

On the Petition Requesting Rulemaking on
Products Containing Non-polymeric Additive Organohalogen Flame Retardants,
Docket No. CPSC-2015-0022

Submitted by email to **cpsc-os@cpsc.gov**

Thank you for this opportunity to testify today in support of the Organohalogen Flame Retardant Petition submitted by Earthjustice, the American Academy of Pediatrics and several other health, environmental and consumer protection organizations.

My name is Daniel Rosenberg and I am a Senior Attorney in NRDC's Health and Environment Program and the Director of NRDC's Toxics and Community Health Project.

Today you will receive compelling testimony from scientists and other experts on the health threats posed by exposure to Organohalogen Flame Retardants, and the need to treat them as a class, and to remove them from specific categories of uses as outlined in the Earthjustice petition. This testimony provides valuable updated information for the Commission, since the previously held hearing in December 2015.

The purpose of my testimony today is to disabuse the Commission of the notion that actions sufficient to protect the public from these toxic flame retardants have been, or are likely to be, taken by EPA in the foreseeable future under the Toxic Substances Control Act (TSCA).

When the Commission previously held a hearing on this petition, TSCA legislation was still being considered and crafted by Congress. However, in June 2016, final legislation to revise TSCA was enacted and signed into law.

Now, approximately 15 months since the revised law took effect, the chances are exceedingly remote that EPA will take any meaningful action to protect the public from organohalogen flame retardants in the foreseeable future. Such action is, at best, years away, and truly may never happen at all, making it all the more critical for the CPSC to act to protect the public, by granting the pending petition.

While the revisions to TSCA are a potentially positive step toward improving the assessment and regulation of chemicals by EPA, the truth is that the scope and pace of the new law, relative to the

number of chemicals in commerce, is exceedingly modest. For example, under the revised TSCA, EPA was required to identify by December 2016 the 10 "Workplan" chemicals that would be the first to undergo risk evaluation (and potential restriction). EPA met this deadline and identified 10 chemicals only one of which – HBCD -- is a flame retardant. EPA now has approximately 3 years to complete its risk evaluation of HBCD and the other nine chemicals, and then an additional two years in which to propose and adopt any restrictions on HBCD, if the Agency concludes that it poses an unreasonable risk to health or the environment under its conditions of use. A potential restriction imposed by EPA could be delayed from taking effect for up to 5 years after the Agency finalizes the restriction. In short, it could be another decade before any EPA-initiated action to address the health threat posed by HBCD takes effect, and it is uncertain whether EPA will actually take any such action.

After identifying and evaluating the first 10 chemicals, the next major milestone for EPA under the revised TSCA is the end of 2019, at which time the Agency is required to have initiated risk evaluations of the first 20 chemicals deemed "high priority" under the prioritization process mandated under the new law. Each of those 20 high priority chemicals will be subject to a similar statutory timeline as the first 10 Workplan chemicals: 3 years to complete the evaluation, two years to propose and finalize any restriction deemed necessary, and up to 5 years before the restriction may take effect. Thus, for those first 20 High Priority chemicals, the earliest one might reasonably expect to see restrictions in place and in effect is 2025, and 2030 is a more likely estimate. Moreover, there is no reason to assume that one or more organo-halogen flame retardants will be included among the first 20 high priority chemicals. And, even if one or more organohalogen flame retardants is actually selected as one of the first 20 high priority chemicals, it is by no means certain that EPA will choose to evaluate or regulate the organohalogen flame retardants as a class, as the Earthjustice petition asks the CPSC to do.

Although EPA has selected HBCD as one of its first 10 Workplan chemicals for evaluation and potential restriction under the revised TSCA, that is a wholly insufficient basis for the CPSC to choose not to take action under its independent existing authority. HBCD is only one flame retardant, and it is one whose primary use is not in the consumer products for which the petition seeks CPSC action. Rather, most of HBCD's use is in building materials, a product category not covered by the Earthjustice petition.

Thus, the Commission should reject any suggestion that because EPA is in the very earliest stages of evaluating HBCD, or because a newly revised TSCA is on the books, the CPSC should not grant the petition and take the steps necessary to protect the public from exposure to toxic flame retardants from key product categories.

Although chemical industry advocates would have you believe that the revised TSCA is the "gold standard" for evaluating and regulating chemicals, and therefore no action is needed by the CPSC, the reality is that the new TSCA has several significant limitations and that it is highly unlikely to adequately address the threats posed by toxic flame retardants within any meaningful timeframe. And, while chemical industry advocates may call on the CPSC to withhold from taking action and defer to EPA, there is little doubt that those same advocates will fight tooth and nail to ensure that EPA itself takes no meaningful action to protect the public from toxic flame retardants.

Proof of the chemical industry's success in preventing meaningful action to address frame retardants under TSCA is the Agency's continued failure to finalize a Significant New Use Rule (SNUR) for PBDE flame retardants, which was initially proposed in April *2012*. The proposed rule would have required notice of new uses of the PBDEs in articles, including furniture, being imported into the U.S. EPA would then have an opportunity to consider whether the use of the PBDEs in imported articles posed an

unreasonable risk to health or the environment. EPA's failure to finalize the Significant New Use Rule means that PBDEs may still be imported in furniture and other articles, without any notice to EPA or the public, and no protection from these additional exposures.

In short, the CPSC cannot and should not pass the buck to EPA, it should grant the petition and take the steps necessary to eliminate the use of non-polymeric additive organohalogen flame retardants from the consumer product categories requested by the petitioners.

Thank you again for the opportunity to speak with you today.

Elena Rios, M.D., MSPH, FACP
National Hispanic Medical Association

Testimony of Dr. Elena Rios
President
National Hispanic Medical Association (NHMA)
U.S. Consumer Product Safety Commission
Organohalogen Flame Retardants Petition; Oral Presentation [Docket No. CPSC–2015–0022]
Submitted by email: cpsc-os@cpsc.rog
August 31, 2017

On behalf of the National Hispanic Medical Association (NHMA), I want to thank you for providing us with the opportunity to comment on a petition crucial to the health and well-being of Latino families, and that of the country at large.

Established in 1994, the National Hispanic Medical Association is a non-profit association representing the interests of 50,000 licensed Hispanic physicians in the United States. NHMA's vision is to be the national leader to improve the health of Hispanic populations. Our mission is to empower Hispanic physicians to lead efforts to improve the health of Hispanic and other underserved populations in collaboration with 7 the state Hispanic medical societies, resident and medical student organizations, and other public and private sector partners.

As physicians and health care providers that serve underserved populations in rural and urban communities, we are party to this petition because we have unique expertise as to the challenges and health disparities facing Latinos communities across the country.

The Hispanic population in the United States has more than doubled in size, to approximately 45 million. More than one-fourth of Hispanic Adults in the United States lack a health care provider, and a similar number reported not visiting a doctor for a checkup in the past year.[1] Our communities have a very serious problem accessing services and care that they need because they do not know about it or because it is too expensive.

And when we look at the more vulnerable segments of our population, we are alarmed by the fact that we are allowing fetuses and newborn infants to be exposed to toxics such as organohalogen flame retardants when they are an especially at risk subpopulation because their brains and organ systems are in a critical developmental window. The fact that communities of color bear disproportionately high levels of flame retardant chemicals,

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coupled with the disproportionate exposure and toxicity borne by children (and developing fetuses) presents serious environmental justice concerns. [2]

Of particular concern are the studies have documented exposure of pregnant women to organohalogen flame retardants, which is of particular concern because there are strong links between prenatal exposures to these chemicals and reduced IQ and greater hyperactivity in children.[3]

Furthermore, the 2003-2004 National Health and Nutrition Examination Survey ("NHANES") conducted by the Centers for Disease Control and Prevention ("CDC"), found at least one form of organohalogen flame retardants in 97 percent of the study participants. This biomonitoring study also showed that Mexican Americans and non-Hispanic blacks had higher levels than the non-Hispanic white population.[4] All pregnant participants in the 2003-2004 NHANES(CDC) study had measurable levels of at least one organohalogen FR in their bodies.[5]

Looking at the same NHANES/CDC data, researchers have found that individuals in lower income households (<$20,000/year) had significantly higher organohalogen flame retardant exposures.[6]

Flame retardant chemicals are transferred from the mother to the baby during breastfeeding, a potentially major route of exposure for infants.[7] A study of 416

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predominantly immigrant pregnant women living in Monterey County, California, detected organohalogen flame retardants in 97% of serum samples.[8]

Overall, the highest levels of harmful flame retardants in the general population are found in young children from communities of low socioeconomic status and communities of color. For instance, a North Carolina study of 80 toddlers found organohalogen flame retardants in 100% of the blood samples.[9]

Hispanic families have a lot to worry about nowadays—from ensuring that their children are receiving a quality education to making sure they are eating a well-balanced meal; they should not have to worry about the chemicals that could be harmful in the mattress they sleep in and products they use every day around their home. Given the overwhelming scientific evidence pointing to the harm that these chemicals pose on the Latino and minority communities, we urge you to take immediate action to grant the requests of this petition and ban these toxic chemicals from consumer products.

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Organohalogen Flame Retardants Petition: Oral Presentation

Statement of Kathleen A. Curtis, LPN, Executive Director, Clean and Healthy New York
U.S. Consumer Product Safety Commission
Docket No. CPSC-2015-0022

31 August 2017

Thank you Chairman Kaye and Commissioners. Thank you for the opportunity to provide additional input in support of the petition regarding additive organohalogen flame retardants. Though more than a year and a half has passed since we last testified before this body on this subject, we remain convinced that it is important for the Consumer Product Safety Commission to approve the ban of organohalogen flame retardants in consumer products.

About Clean and Healthy New York's work on Flame Retardant Chemicals
Clean and Healthy New York has focused on chemicals used as flame retardants throughout our decade of existence, and my personal work on the issue significantly predates that. I have led work to pass the New York State law banning penta- and octaBDE and creating Task Force on Flame Retardant Safety to explore availability of safer, cost- and performance-effective alternatives to decaBDE. CHNY led the work to pass first-in-nation ban on TCEP, a carcinogenic chlorinated tris, and subsequent expansion of law to include TDCPP in New York State. I coordinated the Alliance for Toxic Free Fire Safety 2006-2014 (toxicfreefiresafety.org), helped shepherd federal decaBDE phase-out, advanced significant market shifts, and helped coordinate several state-level bans. I served on the EPA Design for the Environment Alternatives Assessment Partnerships for both decaBDE and HBCD. I was one of two advocates (with NYS PFFA) appointed to NYS Taskforce on Flame Retardant Safety from 2005-2013. I continue to connect fire fighters with health advocates around flame retardant concerns, most recently in the State of Tennessee and the City of Washington DC.

What States are Doing
When I spoke in January 2016, I told you about the 12 states taking action on flame retardant chemicals. Since that time, two additional states have taken action. As of today, fourteen states have adopted a total of 33 policies, fifteen states have 22 pending policies in 2017, with a total of 23 states having enacted laws or pending legislation[1]:

1. Alaska: two bills pending
2. California: four policies enacted
3. Hawaii: two policies enacted
4. Idaho: one policy enacted in 2017
5. Illinois: one policy enacted
6. Iowa: one bill pending
7. Maine: four laws, one executive order enacted, including one in 2017
8. Maryland: four laws enacted, one bill pending
9. Massachusetts: two bills pending

[1] As compiled by Safer States. See: http://www.saferstates.org/toxic-chemicals/toxic-flame-retardants/

10. Michigan: two laws enacted
11. Minnesota: two laws enacted, one bill pending
12. Mississippi: one bill pending
13. New Jersey: one bill pending
14. New Mexico: one bill pending
15. New York: three laws enacted, five bills pending
16. North Carolina: one bill pending
17. Oregon: two laws enacted
18. Rhode Island: one law enacted, one bill pending
19. Tennessee: one bill pending
20. Vermont: two laws enacted
21. Virginia: one bill pending
22. Washington: two laws and one executive order enacted, including two in 2016, one bill pending
23. West Virginia: one bill pending

The states with multiple laws enacted continue the pattern of taking action on specific chemicals following earlier restrictions, as the chemicals used by manufacturers are determined to pose public health threats. Replacement chemicals and combinations continue to be less tested than banned chemicals, yet have similar structure and thus hazard profiles.

The states that did alternatives assessments in the years between 2006 and 2013 (Illinois, Maine, Minnesota, and New York) all concluded that decabromodiphenyl ether (decaBDE) was harmful to human health and the environment, and that safer alternatives were available. Many of these were made without organohalogens.

Continued use of Flame Retardant Chemicals in Home Goods

In December 2015, the Safe Sofas and More campaign released the report, Flame Retardants in Furniture, Foam, and Floors: Leaders, Laggards, and the Drive for Change. We found that, of the top furniture, mattress, and carpet padding manufacturers, there was a range of use of flame retardant chemicals. In part because of California regulation, 10 of the 17 companies we surveyed reported sourcing flame retardant-free materials. Five of the 14 mattress companies reported being free of flame retardant chemicals. Since the publication of that document, none of the mattress manufacturers disputed our findings.

Of the seven carpet padding manufacturers surveyed, two offered flame retardant-free lines of foam padding (not recycled), and two sell rubber pads made without flame retardants. The challenges of offering flame-retardant free foam padding comes from the high rates of recycling in the carpet padding industry, which results in already banned chemicals returning to homes in new products, where they will remain in use for an average of 10-15 years.

Continued use of Halogenated Flame Retardants in Infant and Children's products

Since January 1, 2016, companies reporting to Washington State under their Children's Safe Products Act have reported 110 instances of flame retardant use. This includes[2]:

- four reports of decaBDE usage (one by Little Tykes/ at levels above 10,000 parts per million),

[2] Results reported by Washington State:
https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=FunctionReport#P8992fcf969aa417084f1667f18924d7a_6_25iT0

- two instances of hexabromocyclododecane,
- two instances of tetrabromobisphenol A,
- one instance of Tris(1,3-dichloro-2-propyl)phosphate
- one instance of Tris(2-chloroethyl) phosphate

Further, unpublished third-party laboratory testing by the Getting Ready for Baby campaign, which CHNY coordinates, and the Center for Environmental Health, in 2016 and 2017 have found halogenated flame retardants in polyurethane foam used in infant products. The flame retardants include tris(2-butoxyethyl)phosphate, and tris (1-chloro-2-propyl) phosphate.

Conclusion

State actions to ban certain flame retardants, while important, are not enough to avoid exposure and protect public health. State taskforce reports clearly show there are alternatives to halogens that are affordable, available and effective. Additive flame retardants are still being reported in upholstered furniture, mattresses, infant and toddler products, and electronics, the four categories covered under the petition request. Markets may be shifting, but have not fully made the transition to safer methods of fire protection.

For these reasons and those stated by other supporters today, Clean and Healthy New York strongly supports a decision by the Consumer Product Safety Commission to protect the health of consumers by prohibiting the sale of products that contain halogenated flame retardant chemicals.

Liz Hitchcock
Safer Chemicals Healthy Families

Organohalogen Flame Retardants Petition; Oral Presentation.

Good morning, thank you for the opportunity to testify today. My name is Liz Hitchcock, and I am the Government Affairs Director for Safer Chemicals Healthy Families.

Safer Chemicals Healthy Families is a nationwide campaign to reduce Americans' exposure to toxic chemicals. Our membership includes many of the organizations that are petitioners here today, and is reflective of the multiple ways Americans are exposed to and harmed by toxic chemicals. From national environmental and consumer groups to health professional organizations and health affected groups, from organized labor to sustainable businesses – we all share concerns about the increase in negative health outcomes associated with our exposure to toxic chemicals.

In addition to the work that Safer Chemicals Healthy Families does in the public policy arena, we are the organizers of a market campaign called Mind the Store – which calls on the nation's largest retailers to recognize the growing consumer demand for safer products. Through Mind the Store, we have worked with retail giants like Target and Walmart to adopt and implement safer chemicals policies.

I'd like to thank the commissioners for the opportunity to testify today in support of a petition by Earthjustice, Consumer Federation of America and several of our coalition partners to the commission to adopt rules to protect consumers and children from the health hazards caused when toxic flame retardant chemicals are used in four categories of household products, and to promulgate regulations under Federal Hazardous Substance Act declaring that children's products, furniture, mattresses and the casings surrounding electronics are banned hazardous substances if they contain any non-polymeric additive organohalogen flame retardants.

In my comments today, I will touch on our concerns about the negative health effects of toxic flame retardant chemicals, but would like to focus on the movement in the marketplace away from these dangerous chemicals, and why that should encourage the commission to act favorably on the petition.

For years, the vast majority of couches and upholstered furniture across the U.S. contained high levels of toxic flame retardant chemicals. Since 1975, furniture

foam sold across the U.S. has been laden with these substances to meet the standards of a California "technical bulletin" called TB117. Despite being called "flame retardants," research by the U.S. Consumer Product Safety Commission and other groups has found that these chemicals are not necessary to ensure that furniture is fire safe.

Couches and other pieces of upholstered furniture across the U.S. contain high levels of toxic chemicals. 85% of couches tested in a Duke University study contained toxic or untested flame-retardants. And the newer the couch, the more likely it was to contain toxic chemicals. The use of flame-retardants has increased over the years and now more than 94% of new couches contain one or more of these toxic chemicals.

These chemicals aren't just in our living rooms. They're also found in our children's rooms – in nap mats, in children's furniture with kid friendly images like Elmo and Mickey Mouse.

Flame retardants are also found in electronics such as TV components, mobile phones, fax machines, remote controls, video equipment, printers, photocopiers, toner cartridges, scanners, and in such household items as kitchen appliances, fans, heaters or hair dryers, curtains and drapes, water heaters, and lamp sockets.

Recent changes to the California flammability standard now provide better fire safety without the use of these toxic chemicals. The new standard, which became mandatory as of January 1, 2015, can be met without the addition of flame retardant chemicals. It does not prevent the use of toxic flame retardants, however, so they may still be used in furniture foam. Nonetheless, in response to the changes to the standard, many leading furniture manufacturers and retailers have eliminated the chemicals in upholstered furniture.

In daily use, toxic flame retardants do not stay in the furniture. They migrate out of the products and collect in indoor dust where they enter people's bodies by being inhaled, ingested, and touched. Some toxic flame retardants do not break down easily, and have been found to persist and travel to waterways and ecosystems virtually everywhere. Studies show that more than 90 percent of American women of childbearing age have toxic flame retardants in their bodies. In a fire, firefighters are exposed to these harmful chemicals and the highly toxic byproducts that result when they burn.

We're learning more and more about the links between exposure to toxic flame retardants and a variety of health concerns like cancer, hormone-disruption, and harm to the developing brain. Many of these chemicals are persistent, meaning they stay in our bodies and the environment.

Children are uniquely vulnerable to the effects of these chemicals because they have a completely different physiology and metabolism than adults. They absorb more chemicals through their skin, they breathe in and swallow more toxic chemicals on a body weight basis when compared to the adults around them. Their brain, kidneys and other organs are still developing and are overwhelmed, to the point where even low dose exposures to certain chemicals can have life long consequences. In a recent report from the Environmental Working Group and Duke University, children's level of exposure was nearly five times the average level found in their mothers. In the most extreme case, a child had 23 times the level of the mother.

Fire fighters are uniquely exposed to a variety of toxic chemicals including flame retardant chemicals. When a house is burning, the chemicals used to make our household products are released and create high rates of exposures. In addition, the burning of many products creates harmful byproduct chemicals including one of the most toxic substances known, dioxin.

What's already happening in the states and the marketplace?

Since 2003, legislatures in a number of states have taken action to ban some of these chemicals. The state of California adopted a new flammability standard for furniture (TB 117-2013) that no longer requires the use of toxic flame retardants. In 2014 the California legislature voted to require labels on furniture containing flame retardants.

In 2014, health care giant Kaiser Permanente announced an effective ban on chemical flame retardants from the furniture it buys for its hundreds of facilities across the country, putting its $30 million in annual purchasing power for furniture behind its health and safety commitments. Other health care providers have followed suit.

Leading furniture manufacturers and retailers are already bringing to market furniture without toxic flame retardants, demonstrating that a ban on their use can be accomplished without a major adverse effect on the marketplace. For example,

- **Ashley Furniture**, the largest manufacturer and retailer of furniture in the country, worked with its supply chain to eliminate flame retardant chemicals from all upholstered furniture at the beginning of 2015.

- Other major furniture retailers including **Walmart, Macy's, Pier 1 Imports, Ikea, Crate & Barrel, Room & Board, the Futon Shop, La-Z-Boy, Williams Sonoma (Pottery Barn, West Elm), Ethan Allen,** and **Restoration Hardware** have either eliminated or committed to eliminate flame retardants in furniture.

- Big office furniture purchasers, like **Facebook, Dignity Health,** and **Yahoo!** have also signed a pledge to buy office furniture without toxic flame retardants.

- A recent survey by the Center for Environmental Health shows that **20 office furniture companies** and **37 residential furniture companies representing almost 60 brands** are offering furniture made without toxic flame retardants.

- Major retailer **Macy's** stated in October that they were instructing all suppliers to cease using flame retardant chemicals.
- Attached to my written testimony is a list of retailers and manufacturers of residential furniture that have announced that they will no longer use toxic chemical flame retardants.

These are positive developments that might even tempt us to say that voluntary measures work, the market is doing a bang up job and should just handle the problem. Tempting, but not so fast.

Many of the companies reporting that they still use toxic flame retardants in their products are not commonly known, with many based in China. I have attached to my written testimony a recent list of products by manufacturers who report still using flame retardant chemicals.

We've done a number of surveys of major retailers about their plans to discontinue the use of these chemicals. Among the U.S. companies who have not responded to our inquiries, and who may well still be using these chemicals, include

Company	**State**	**Sales (2013)**
Raymour & Flanigan	NY	1150 million
Rooms to Go	Florida	1780 million
Mattress Firm	Texas	1387 million
American Signature	OH	942 million
Haverty	GA	746 million
Art Van Furniture	MI	555 million
Mathis Brothers Furniture	OK	417 million

Declining use and movement in the marketplace, however encouraging, should not be a reason for inaction on the part of the Commission. These chemicals are still being used in products that our children come in daily contact with, that expose our families to unnecessary hazard, that expose first responders to additional danger. These chemicals are hazardous, and they are hazards that we can do something about.

On behalf of the millions of consumers represented by the 450 organizations and businesses affiliated with Safer Chemicals Healthy Families and our Mind the Store Campaign, we urge the commissioners to approve the petition.

Retailers and Manufacturers Eliminating Toxic Flame Retardants in Furniture
As of April 5th, 2017

As consumers clamor for safer products and states improve standards, the market shifts to provide toxic flame retardant free furniture. These furniture retailers and brands, which include most of the nation's largest, have pledged to eliminate toxic flame retardants in their products.

Retailers

Ashley Furniture
Bob's Discount Furniture
Crate and Barrel
Ethan Allen
The Futon Shop
IKEA
La-Z-Boy
Macy's
Mitchell Gold + Bob Williams
Pier 1 Imports
Rent-A-Center
Room & Board
Restoration Hardware
Sam's Club
Scandinavian Designs
Select Comfort
Walmart
Williams-Sonoma (Pottery Barn, West Elm)

Manufacturers

AICO
American Furniture Manufacturing
Ashley Furniture
Best Home Furnishings
Bradington Young
Broyhill
Century
COCO-MAT
Comfort Design
Compendium
Craftmaster
CR. Laine
Crate and Barrel
Dania
David Edward
Drexel Heritage
Dwell Studio
EcoSelect
Ekla Home
Endicott Home
EQ3
Ethan Allen
Fairfield Chair
Flexsteel Inds.
Furnature
Gus Design Group
Henredon
Heritage Home Group Brands
Hickory Chair
Hickory White
Highland House
Homeware
Hooker Furniture
IKEA
Kevin Charles Fine Upholstery
Kincaid Furniture
Klaussner
Kristin Drohan Collection
Lane
La-Z-Boy
Lee Industries
Lillian August
Maitland Smith
McCreary Modern
Michael Weiss
Mitchell Gold + Bob Williams
MotionCraft
Mr. and Mrs. Howard
Pacific West Furniture
Palliser Furniture
Pearson
Pine St. Interiors/EcoTerric
Plummers
Precedent Furniture
Roger + Chris
Sam Moore
Scandinavian Designs
Select Comfort
Sherrill Furniture
Soma Ergonomics
Southern Enterprises
Southern Furniture
Southern Motion
Stitch NYC
Taylor King
The Futon Shop
Thomasville
Thom Filicia
United Furniture Industries
Vanguard Furniture
Viesso
Whittemore Sherrill Ltd.

Kathryn Rodgers
Silent Spring Institute

SILENT SPRING INSTITUTE
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August 31, 2017
U.S. Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD 20814

Dear members of the Consumer Product Safety Commission,

We are submitting this testimony regarding the petition filed in June 2015 to ban organohalogen flame retardants (OFRs) from consumer products, including children's products, furniture, mattresses, and casings around electronics. We submitted an affidavit as part of the 2015 petition describing our research findings related to the exposures and harm of OFRs to the public (attached), and we are writing now to update our statement from 2015.

All OFRs that have been studied for toxicity, as well as other structurally-related organohalogen chemicals, such as DDT and dioxin, show adverse health effects in laboratory animals. When epidemiological studies have been conducted to look for health effects from these exposures, effects have been reported in humans as well. In many cases, scientists aren't able to detect these effects in humans for many years after exposure even though toxicity data from animal studies indicates likely harm to humans. For example, researchers recently found that women exposed to the organohalogen pesticide DDT in the 1940s have increased risk of breast cancer, and also their daughters' risk is elevated (Cohn, La Merrill et al. 2015). There are many other examples where regulatory protections have been inadequate to protect the general population against harm from chemical exposures from consumer products, including lead, asbestos, formaldehyde, and others, especially flame retardants.

Several of the organohalogen chemicals that have been most commonly incorporated into consumer products to reduce flammability are vivid examples of regrettable choices that have seriously harmed US consumers. It is also worth noting that these harms could have been anticipated based on laboratory evidence and based on analogy to other "bad actor" chemicals with similar chemical structures. Specifically:

- Polybrominated diphenyl ethers (PBDEs) were added in large quantities to foam furniture despite their structural similarity to the PCBs, which were banned in the 1970s from many uses. A recent Consensus Study Report from the National Academies of Sciences concluded that PBDEs are presumed to affect intelligence in humans based on animal and human evidence. What that "human evidence" actually means is that levels of PBDEs in children in the general US population were high enough that scientists could measure reductions in their IQ. It's a tragedy when we have that kind of evidence. The NAS report "found a decrease of 3.70 IQ points in children per 10-fold increase in serum PBDE concentration" (National Academy of Sciences

2017). Children in the US had some of the highest exposures in the world. A recent analysis of the economic costs of exposures to endocrine disrupting chemicals estimated that 11 million IQ points were lost due to PBDE exposures, with an associated $266 billion in medical costs, in 2010 (Attina, Hauser et al. 2016).

- In the case of organohalogen flame retardant TDCIPP (chlorinated Tris), manufacturers selected it as a substitute for the PBDEs around 2004 despite the following evidence: It was shown to be carcinogenic in animals and a mutagen several decades earlier by the US National Toxicology Program, and it was removed from children's pajamas in 1978 along with the structurally similar and also mutagenic and carcinogenic "brominated Tris." A recent publication found that higher levels of TDCIPP in women undergoing in vitro fertilization (IVF) were less likely to achieve successful implantation, pregnancy, and birth (Carignan 2017). In our own research measuring levels of TDCIPP in dust in homes and college dorms, we have documented levels above EPA cancer risk screening levels, indicating an unacceptable cancer risk from these exposures (Dodson, Perovich et al. 2012; Dodson, Van den Eede et al. 2014; Dodson, Rodgers et al. 2017). In fact 41% of college dorm rooms in our study had TDCIPP dust levels above cancer risk screening levels.

As scientists, we are well aware that toxicity data available at the time these chemicals were introduced for use as flame retardants in consumer goods could have been used to anticipate these outcomes and we don't understand why regulatory approaches have not been effective at preventing these harms to US consumers. We are tired of discovering these preventable harms when it's too late.

The CPSC staff suggests that each chemical proposed for use as flame retardants in consumer goods should undergo a risk assessment to determine whether it is safe to use. This is the approach that has been used for several decades and –unfortunately - it hasn't been effective in preventing harms to consumers. Based on the entire body of evidence on the toxicity of organohalogens, it is difficult to imagine one that won't pose significant toxicity problems. There are near infinite number of chemical variants, and in theory a risk assessment could be done for each one, but that approach is impractical and in the past hasn't been effective at protecting consumers. There is enough evidence about the toxicity and harms to consumers of OFRs to regulate them collectively.

Manufacturers and regulators haven't effectively predicted exposures or risks from added OFRs to consumer products in the past, and so we encourage the CPSC to adopt a more effective approach to protecting consumers from chemical hazards.

Sincerely,

Kathryn Rodgers

Ruthann Rudel

SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

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SILENT SPRING INSTITUTE

RESEARCHING THE ENVIRONMENT AND WOMEN'S HEALTH

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I, Ruthann Rudel, am writing this statement to provide information relevant to the Petition to the CPSC to regulate four categories of household products containing non-polymeric additive organohalogen flame retardants.

1. I, Ruthann Rudel, am Director of Research at the Silent Spring Institute, and Adjunct Research Associate in the Brown University Department of Pathology and Laboratory Medicine. I have a B.A. in chemistry and neuroscience from Oberlin College, and an M.S. in environmental management and policy from Tufts University. I have served on the US National Toxicology Program Board of Scientific Counselors and the Regulatory Affairs and Legislative Assistance Committee of the Society of Toxicology, and have participated in numerous environmental regulatory reviews for the US EPA, Health Canada, Toxicology Excellence for Risk Assessment, and others. I have attached my CV and list of publications.

2. For almost 20 years, I have been co-leading Silent Spring Institute's exposure and toxicology research programs focusing on endocrine active chemicals and on the mechanisms by which chemicals may influence breast cancer risk. I also direct Silent Spring Institute's Household Exposure Study, which was described by Environmental Science & Technology as the "most comprehensive analysis to date" of exposures in homes. I have expanded the initial study to include indoor and outdoor air, house dust, urine, blood, and self-reported exposure data from 170 participants in California and Massachusetts, leading to over 30 highly-cited peer-reviewed exposure-related papers.

3. Our 2003 Household Exposure Study was the first to test US homes for the flame retardant PentaBDE (a commercial mixture of polybrominated diphenyl ethers (PBDE)), which was then used as flame retardant in furniture foam. We found that levels of PBDEs in US homes were ten times higher than in Europe. In 2006, we discovered that, due to unique furniture flammability standards, exposures to PentaBDE congeners (BDE 47, 99 and 100) were 4 to 10 times higher in California than in the rest of the US, and two orders of magnitude higher than in Germany and the UK. Californians also had nearly twice as high blood levels of PBDEs (sum of BDE-28, -47, -99, -100, -153, and -154 congeners) compared to other US residents[1]. These results show that flammability standards influence exposures and risks[2].

5. In 2011, we tested again the same 16 California homes from the 2006 study, to understand exposure to a wider range of flame retardants. This time we screened for 49 flame retardants (organohalogens and organophosphates), chosen due to evidence for their widespread use and potential harmful health effects.

6. We found that the current levels of exposure to the organohalogen flame retardants are often above health based guidelines[3]. House dust concentrations of six chemicals, including the carcinogens TCEP (Tris (2-chloroethyl) phosphate) and TDCPP (chlorinated "Tris"), were higher than EPA health risk guidelines in at least one home, and levels in 13 of 16 homes exceeded at least one health guideline level. TCEP and TDCPP (both listed as carcinogens under California's Proposition 65) were found at levels of up to 0.01% in dust, higher than previously reported in the US. Our study was also the first to detect TDBPP (brominated "Tris") in house dust, in 75% of the homes studied.

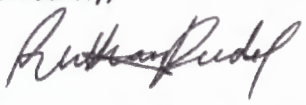
7. Our 2011 study also showed that exposure to flame retardants from house dust had changed since 2006, after the phase out of PentaBDE and OctaBDE. PentaBDE levels decreased in homes that added new furniture, electronics, and flooring. Similarly, households that reported purchasing new electronics had lower levels of TBBPA in 2011 compared to 2006. Instead, households that added new furniture and other flame retardant products between 2006 and 2011 had higher levels of tris(1-chloro-2-propyl) phosphate (TCPP), suggesting its use as PentaBDE replacement[4].

8. Our 2003, 2006 and 2011 study results prove that, if added to consumer products in additive form (i.e. not chemically-bound to the material), organohalogen flame retardant chemicals migrate out of products and get into dust. This house dust is thought to be a major source of flame retardants in people's bodies, especially in children[5].

9. In particular, I wish to point out that our 2011 study indicated that banning individual flame retardants is ineffective because manufacturers tend to replace them with other chemicals with similar structures and hazards, including chemicals with uncharacterized toxicity. Some of the chemicals found in homes at the highest levels are carcinogenic, and are structurally similar to banned chemicals. Many of the chemicals detected in households show evidence of hormone disruption. The attached table from the Silent Spring study by Dodson et al. (2012)[6] summarizes the known health concerns and the data gaps for some of the high production volume flame retardants we found in homes.

10. Based on these findings, my professional opinion is that, in order to reduce people's exposure to hazardous chemicals in homes, it is best to use inherently non-flammable materials or smolder-resistant flammable materials. Continued use of non-polymeric additive organohalogen flame retardants would lead to continued exposure and may cause adverse health effects, particularly to vulnerable populations.

Sincerely,



Ruthann Rudel, MS
Director of Research, Silent Spring Institute

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[3] Dodson R.E., BFR 2013.

[4] Dodson R.E., Perovich L.J., Covaci A., den Eede N.V., Ionas A.C., Dirtu A.C., Brody J.G., Rudel R.A. (2012). After the PBDE phase-out: A broad suite of flame retardants in repeat house dust samples from California. *Environ. Sci. Technol.* 46(24):13056-66. doi: 10.1021/es303879n.

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Jennifer Sass, Ph.D.
Natural Resources Defense Council

NRDC

NATURAL RESOURCES DEFENSE COUNCIL

August 31, 2017

Organohalogen Flame Retardants Petition;
Oral Presentation

Jennifer Sass, Ph.D.
Senior Scientist, NRDC
Professorial Lecturer, George Washington University

Public meeting September 14, 2017
CPSC Docket No. CPSC–2015–0022

Submitted by email to cpsc-os@cpsc.gov

Thank you for the opportunity to present comments to the Consumer Product Safety Commission (CPSC or Commission) to support the Petition HP15-1.

I am a senior scientist at NRDC in the Environmental Health Program, a job I have had for sixteen years, and on faculty at George Washington University, Environmental and Occupational Health Department. NRDC is a non-profit environmental organization of some 500 lawyers, scientists, and policy advocates. NRDC presents these comments on behalf of our over 2 million members and online activists. NRDC does not have any financial interest in the topic of these comments.

The petition is requesting that the Commission initiate rulemaking under the Federal Hazardous Substances Act (FHSA) to protect consumers from the health hazards that result from the use of non-polymeric, additive form, organohalogen flame retardants (OFRs) in children's products, furniture, mattresses and the casings surrounding electronics.

The petition was filed by Earthjustice and the Consumer Federation of America, which are joined by American Academy of Pediatrics, American Medical Women's Association, Consumers Union, Green Science Policy Institute, International Association of Fire Fighters, Kids in Danger, Philip Landrigan, M.D., M.P.H., League of United Latin American Citizens, Learning Disabilities Association of America, and Worksafe.

These comments respond to the CPSC staff briefing package in response to the petition.[1] The CPSC staff recommends that the Commission deny the petition (Staff report, p. 25). Here I provide rebuttal of its reasoning.

CPSC staff reasons that the limited toxicity data on OFRs does not support assessing the OFRs as a single class of hazardous chemicals under the FHSA (Staff report, p. 25).

The CPSC staff are fully aware that the replacement chemicals for the PBDEs have been OFRs in furniture foam and children's products, and that many of these alternative chemicals can be released from the product, "leading to potential human and environmental exposures" (Staff report, p. 100). Moreover, the staff report acknowledges that it lacks toxicity and exposure information for the alternative OFRs, or even the most basic market information regarding what products they are used in (Staff report, p. 100). This is an unforgivable lack of information for chemicals that are used at millions of pounds annually in products found in every home in America.

CPSC staff confess to having "not performed a comprehensive review of the toxicity of TBB or TBPH", the two OFR chemicals that make up FireMaster™ 550 (FM550). Failing to even assess the data that is available is a shocking abdication of CPSC staff responsibility to consumer protection! Nonetheless, after listing a number of study results, but without any systematic review or cogent analysis of any of them, CPSC staff manage to come up with the following rather garbled hazard identification conclusion for FM550:

> "FM550 is considered toxic under the FHSA [See footnote 26 of the report: 16 C.F.R. § 1500.3 (b) (5). LD50 range 50-5000 mg/kg]; however, it is not considered highly toxic. On a preliminary basis, CPSC staff concludes that FM550 may be considered "possibly toxic in humans," based upon limited evidence of developmental toxicity in animal studies for the FM550 mixture. A finding of "possibly toxic" does not meet the definition of "toxic" under the FHSA. This does not mean that this chemical is "safe," only that there are not sufficient data to satisfy the regulatory definition of "toxic." (Staff report, p. 101-102)

Similarly, for TBBPA:

> "CPSC staff has not completed a comprehensive toxicity review of TBBPA. TBBPA is the most widely produced and used brominated FR.... CPSC staff has not performed an in-depth review of TBBPA toxicity... Preliminarily, CPSC staff concludes that TBBPA may be considered "possibly toxic to humans," based on limited evidence of carcinogenicity in animals. A finding of "possibly toxic" does not meet the definition of "toxic" under the FHSA. However, these conclusions are based on limited data. This does not mean that this chemical is "safe," only that there are not sufficient data to satisfy the regulatory definition of "toxic." (Staff report, p. 102-103)

CPSC staff failed to provide a reasoned and defensible systematic review as recommended by the National Academies (2017), the National Toxicology Program (2015), and other government and expert bodies.[2] CPSC staff failed to provide defensible and consistent definitions of key terms like "toxic", "highly toxic", "possibly toxic", or even "safe". Nonetheless, it seems clear that the CPSC staff determined that FM550 and other OFRs are toxic under the FHSA – period. Everything after that reads like a desperate attempt to duck and run from the inevitable political storm that must have followed.

Insufficient data (i.e. data gaps) should not be used to rationalize the failure to protect consumers from OFRs. The petition lays out a strong scientific basis for addressing data gaps and uncertainties using established methods such as QSAR models. In fact, all members of the organohalogen class of chemicals that have been adequately tested have been shown to have adverse effects on systems that are critical to normal human development and function.[3]

As detailed in the petition, Dr. David Eastmond's research concluded that, "*all of the non-polymeric OFRs [organohalogen flame retardants] that we have screened using the QCAT® and related methodologies were found to be either of high concern or toxic ...*". His team used standard search strategies to identify any publicly available toxicity date on all the chemicals, including published studies, government

databases, and industry data submissions under the European chemical assessment regulations. US EPA, Health Canada, and European regulatory agencies use these same data based and the information is generally considered reliable.

Dr Eastmond conducted a literature search for data on approximately 90 organohalogen flame retardants, about 85 of which were non-polymeric, and then used modeling to fill data gaps. The work of Dr. Eastmond and colleagues demonstrates that there are sufficient data – either by individual chemical testing, or by applying standard read-across techniques – to show that the whole class is hazardous and may cause substantial personal injury or illness. Dr. Eastmond's team applied a standard screening tool developed by the Washington State Department of Ecology called Quick Chemical Assessment Tool (QCAT).

Dr. Eastmond's declaration in the petition concluded that, "*The results of our screening show that critical toxicological data are lacking for many OFRs, and that those for which data are available have the potential to pose significant hazards for human or environmental health*." (see Eastmond declaration in petition). This work is the most thorough hazard screen of organohalogen flame retardants of which we are aware, and should have been considered by CPSC as either affirmative evidence of toxicity or plausible evidence of toxicity.

CPSC staff reasons that the limited exposure data on OFRs does not support assessing the OFRs as a single class of hazardous chemicals under the FHSA (Staff report, p. 25).
All available exposure data demonstrates that population exposure to OFRs is widespread across the American population. These hazardous chemicals are measured in the blood of all US residents (Human exposure is discussed in the Petition at pages 36-41). Young children have even higher levels than adults; a study of 2-18 month old infants in North Carolina reported that they had the flame retardant TDCPP at levels that were on average 3 times greater than adults.[4] In the study, some infants had levels 50-100 times higher than adults, and very high levels were correlated with a higher number of baby products in the home.

Widespread population exposure is expected because OFR compounds are not covalently bound to the matrix of the construction material, so they migrate out of consumer products and into the home environment, house dust, foods, indoor air, and the surfaces of products where people are exposed.[5]

Exposure is also consistent with the chemical characteristics of OFRs. Many are lipophilic and persistent in adult human adipose tissue for years. [6] These characteristics make this class of chemicals especially prone to contaminating our body tissues including critical organs such as the brain, fetal cord blood, and breast milk.[7] [8] This also means that labeling is inadequate and the chemicals are unavoidable.

Only by taking meaningful actions can CPSC prevent harmful exposures and avoid health harms.

CPSC staff reasons that variability across data sets does not support assessing the OFRs as a single class of hazardous chemicals under the FHSA (Staff report, p. 25).
Variability across data sets will always occur to some degree and should not be used to dismiss evidence of harm without a properly reasoned scientific basis. The CPSC staff should have conducted a robust systematic review of the data to assess the quality and reliability of each study, as recommended by the National Academies (2017), the National Toxicology Program (2015), and other government and expert bodies.[9] This should have included a consideration of risk of bias, unexplained inconsistency, indirectness in the relationship between a measured outcome and a health effect, imprecision, and

publication bias serious enough to significantly decrease confidence in the body of evidence. Ultimately, the CPSC conclusions should have been based on the whole body of literature, excluding very low-confidence studies.

Unfortunately, the CPSC staff failed to use a coherent and consistent systematic review process to select which studies to base the assessment on, or provide scientifically-vetted definitions of the level of evidence for health effects, or how different types of evidence (animal studies, mechanistic studies, epidemiologic studies, pharmacokinetic models, etc) contributed to the overall determination. The CPSC include over nine pages of study references that it claims to have relied upon, but fails to provide a reasoned explanation for how it chose to list some and not others, or what contribution each study made to the final recommendations, and why (Staff report, p. 120-129). In short, CPSC staff has no credible or defensible hazard identification system.

Based on the scientific evidence Dr. Linda Birnbaum – the Nation's preeminent toxicologist and author of over 700 peer reviewed scientific papers, book chapters, and reports[10] - emphasized in her 2015 testimony to this Commission that it is appropriate to consider all additive OFRs as a class as the petition proposes because all of them have the potential to cause adverse effects.[11] The CPSC staff should make their recommendations consistent with Dr. Birnbaum and her staff of respected toxicologists and hazard assessment experts.

The CPSC staff report notes that there are insufficient data in CPSC's databases to evaluate consumer incidents associated with OFR use in these categories (Staff report, p. 6, 16).
Endocrine disrupting chemicals like the OFRs wreak havoc on complicated biological systems, sending them into directions they were never meant to go, and ultimately creating chaos where precise coordinated order was meant to occur. The harmful outcomes often aren't as instantaneous and acute as a blinded eye or third-degree facial burns, such as may occur from the lawn darts and firecrackers that are more typical of CPSC's product recalls.[12] But, ask yourself if you'd rather suffer a burn or your ability to become a parent. While chronic and systemic effects such as growth and metabolic abnormalities or reproductive fitness are more difficult to attribute to a specific cause, particularly when the exposure and outcome may be separated by years, they nonetheless should be considered a "substantial personal injury or substantial illness" as defined by the FHSA.

Awaiting consumer incidents is a failure of our federal agencies to protect consumers from such incidents. It is collecting data in the form of human pain and suffering, and then presenting the cold numbers with the tears wiped away. In the words of DC Circuit Court of Appeals, "There is no indication in the language of the [FHSA] or its legislative history that the Commission was bound to develop a precise 'body count' of actual injuries that will be reduced by each regulatory provision".[13]

It is a strength of the FHSA that it is a hazard based standard, rather than a much less protective risk based standard.[14] That is, the FHSA intends to prevent harm, rather than calculate some acceptable level of harm across a statistical population. Risk calculations are inherently unjust in that real harm, unlike statistical harm, is never distributed equally across a population – after all, each person doesn't have 1/millionth or even 1/10th of a cancer. In reality some people have cancer, and someone don't. Taking protective action based on evidence of hazard is using the available evidence to predict a problem and prevent harm – we wear seatbelts and bike helmets using the same logic. In other contexts, CPSC understands this. CPSC staff do not accept that it is ok that a certain number of kids will drown in badly designed baby tubs or that it is ok for some % of kids to get their heads stuck between crib bars. However, in the case of OFRs the CPSC staff have veered off the path of consumer protection.

The staff report cites as other reasons for its recommendation the lack of use of these chemicals in the product categories, current regulatory measures for OFRs, economic burden, and staff resources. We address these speculative and unsupported claims here:

- **The lack of use** is not a mandatory legal restriction, so it will not prevent OFRs including PBDE's from being imported into the US. Only regulatory measures can provide the backstop to prevent the stealth re-introduction of these toxic chemicals onto the market.
- **Current regulatory measures** do not address the OFRs that have replaced the discontinued use of PBDEs. This is a problem because many of the same properties as PBDEs: they are semi-volatile and migrate out of products into the environment, causing human exposures during normal use, and they have been shown to be toxic, such as chlorinated Tris (TDCPP), Firemaster 500™, and decabromodiphenyl ethane (DBDPE) which replaced decabromodiphenyl ether (decaBDE) (Petition p. 12-14). Only regulatory action to restrict the whole class of OFR's can prevent the regrettable substation of one toxic OFR for another.
- **Economic burdens** are routinely over-estimated by industry. For example, the vinyl chloride industry issued dire predictions of job losses and plant closures if OSHA finalized regulations to reduce workplace exposure limits from 500 ppm to 1 ppm within the year, 1975.[15] Industry cried economic hardship even though internal corporate documents showed that industry leaders well knew at the time that the 500 ppm limit was excessive and unsafe.[16] When the regulations came into force, not only did the industry meet the new standards by the end of the year, but it saved money by making the polymerization process more efficient. There is no evidence that moving markets away from OFRs will add significantly to anyone's production costs. In contrast, moving away from toxic chemicals can save money by reducing the need for worker protections, workplace monitoring, handling of hazardous waste, insurance claims and potential liabilities.

In contrast to the large body of data demonstrating exposure and hazard from OFRs, we are not aware of data showing consumer benefits from the use of non-polymeric additive organohalogen flame retardants in the four product categories covered by the Petition for Rulemaking.

Dr. Ronald Melnick, a government toxicologist retired from the National Institutes of Environmental Health Sciences (NIEHS), warned of serious public health consequences if chemicals are misclassified as less hazardous or non-hazardous based on untested hypotheses, poorly validated tests, or incomplete data sets "Declaring a chemical as not hazardous, or reducing a level of health protection, should require validation, not speculation" (Melnick et al 2003). Instead, the CPSC staff report treats data gaps and uncertainties as if they were affirmative evidence of safety, leaving the public unprotected from anything that doesn't explode or ignite.

We respectfully request that CPSC grant the petition, and protect consumers from continuing exposure to these toxic chemicals.

Thank you for the opportunity to provide comments.

Respectfully,

Jennifer Sass

Jennifer Sass, Ph.D.

[1] The CPSC briefing package is here: https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISJMHFEdWKZ7

[2] Lam, J., B. Lanphear, D. Bellinger, D.A. Axelrad, J. McPartland, P. Sutton, L. Davidson, N. Daniels, S. Sen, and T. Woodruff. 2016. Systematic review and meta-analysis of association between PBDE exposure and IQ or ADHD.

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Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24758

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Woodruff, T.J., and P. Sutton. 2014. The Navigation Guide systematic review methodology: A rigorous and transparent method for translating environmental health science into better health outcomes. Environ. Health Perspect. 122(10):1007-1014

[3] Petition page 11, 12; Costa and Giordano, 2007; Chevrier et al, 2010; Betts 2010; Herbstman et al 2010; Gascon et al 2011; Stapleton et al, 2011; Eskenazi et al 2013

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[6] Mitro, S.D., Johnson, T. & Zota, A.R., 2015. Cumulative Chemical Exposures During Pregnancy and Early Development. Current Environmental Health Reports. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26341623

[7] Mitro, S.D., Johnson, T. & Zota, A.R., 2015. Cumulative Chemical Exposures During Pregnancy and Early Development. Current Environmental Health Reports. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26341623

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National Academies of Sciences, Engineering, and Medicine. 2017. Application of Systematic Review Methods in an Overall Strategy for Evaluating Low-Dose Toxicity from Endocrine Active Chemicals.

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[11] Birnbaum, L. Testimony and response to questions. Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants: Panels 1 & 2. See minutes 20-25. December, 2015. https://www.youtube.com/watch?v=0R2HIELLtHw

[12] http://fox8.com/2017/06/27/cpsc-recalls-fireworks-sold-at-ohio-walmart-target-stores/

[13] *Forester v. CPSC*, 559 F.2d 774, 788 (D.C. Cir. 1977) as referenced in testimony to the CPSC from Rachel Weintraub, Consumer Federation of America, December 9, 2015. Available online http://consumerfed.org/wp-content/uploads/2015/12/12-9-15-Flame-Retardants-Hearing_Testimony.pdf

[14] In the FHSA, 15 U.S. Code § 1261 - Definitions, a 'hazardous substance" is described as follows: (f) The term "hazardous substance" means: (1) (A) Any substance or mixture of substances which (i) is toxic, (ii) is corrosive, (iii) is an irritant, (iv) is a strong sensitizer, (v) is flammable or combustible, or (vi) generates pressure through decomposition, heat, or other means, if such substance or mixture of substances may cause substantial personal injury or substantial illness during or as a proximate result of any customary or reasonably foreseeable handling or use, including reasonably foreseeable ingestion by children.

[15] Sass JB, Castleman B, Wallinga D. Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation. *Environmental Health Perspectives*. 2005;113(7):809-812. doi:10.1289/ehp.7716.

[16] Sass JB, Castleman B, Wallinga D. Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation. *Environmental Health Perspectives*. 2005;113(7):809-812. doi:10.1289/ehp.7716.

Avery E. Lindeman, M.S.c.
Green Science Policy Institute

Organohalogen Flame Retardants Petition
Request for Oral Presentation
Avery Lindeman, MSc will testify by phone.

I am the Deputy Director of Green Science Policy Institute, a nonprofit organization based in Berkeley, California whose mission includes facilitating more responsible use of chemicals in consumer and building products. Since 2008, Green Science Policy Institute (GSP) has worked to improve flammability standards for products and materials in order to provide fire safety while also reducing exposures to and health risks from hazardous flame retardant chemicals. I have an MSc in Chemistry from the University of California at Berkeley and have been with the Institute for four years.

My presentation will discuss flammability standards and how such standards necessitate federal action on hazardous flame retardant chemicals.

In the U.S., organohalogen flame retardant chemicals (FRs) have been widely used in the product categories addressed by the Organohalogen Flame Retardants Petition ("the Petition"). Recent policy changes have enabled a reduced use of flame retardants in furniture and children's products.[1] But contrary to the staff's conclusion[2], this recent reduction does not justify denial of the Petition. Furniture and children's products containing organohalogen flame retardants continue to be sold in the United States: CPSC's own product testing found added organohalogen flame retardants in approximately 20% of children's products tested.[3] In the absence of federal action, this remaining – and sizeable – market segment will continue to expose children and families to harmful or potentially harmful flame retardant chemicals, even though the flame retardants are not providing a fire safety benefit in these products.

Furthermore, while use of organohalogen flame retardants has declined in certain products, this progress could easily be reversed as a result of changing flammability standards. There are at least two mechanisms through which flame retardant use could increase in the product categories addressed in the Petition:

(1) **As a result of voluntary standards**, which may be developed at any time and are updated on a regular basis. For example, The National Fire Protection Association, a voluntary standards organization, is currently developing a new fire test method for upholstered furniture called NFPA 277. In its current draft form, NFPA 277 is a large open-flame test for upholstered furniture. While some argue that this kind of test could be met without the use of flame retardants, furniture that complies with open-flame test methods[4] usually contains flame retardants in the foam, the cover fabric, or both and could therefore be a significant source of indoor flame retardant emissions.[5,6,7]

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[1] Cooper EM et al. (2016) *Environ. Sci. Technol.* 50(19):10653-10660.

[2] CPSC Staff recommend that the Commission deny the Petition, in part based on "ongoing market and regulatory changes affecting the potential presence of OFRs in these four product categories" (pp. 6).

[3] CPSC Staff Briefing, pp. 14.

[4] Some examples include: the U.K. standard for residential upholstered furniture, British Standard 5852; and California's standard for unsprinklered high-occupancy buildings, Technical Bulletin 133.

[5] Luedeka RJ for the Polyurethane Foam Association (2012). Flexible Polyurethane Foam Waste Management and Recycling. United Nations Industrial Development Organization Guidance Document.

[6] Kajiwara N, Takigami H (2013) *Environ Sci Process Impacts.* 15(10):1957-1963.

[7] Rauert C et al. (2014) *Sci Total Environ.* 493:639-648.

(2) **As a result of international flammability standards,** which can impact manufacturing processes abroad and therefore indirectly lead to the presence of flame retardants in products in the U.S. For example, the European standard for children's cot and crib mattresses was recently updated to include an open flame test component. It is not yet clear how this change will impact use of flame retardants in children's mattresses in Europe; but it could easily lead to an increased use of flame retardants.

It is essential for the Commission to recognize that these standards can lead to new or increased use of flame retardants, as described above. The suggestion that the Petition should be denied because these standards are performance-based and do not specifically require organohalogen flame retardants[8] is deeply flawed. Furthermore, the Staff Briefing recommends continued CPSC staff participation in development of voluntary standards.[9] **As I have presented, this recommendation is in direct conflict with the goal of reducing exposures to hazardous flame retardant chemicals.**

Despite assertions made in the Staff Briefing that a prohibition on organohalogen flame retardant treatments could impact product performance and safety[10], there is clear evidence that these chemicals are not needed for fire safety in the product categories addressed by the petition. The fact that approximately 80% of products tested by the CPSC were found to not contain added organohalogen flame retardants[11] further demonstrates that manufacturers can meet current safety standards without these chemicals.

As I have presented, there are numerous ways in which existing or future flammability standards could lead to increased exposures to hazardous organohalogen flame retardant chemicals. These chemicals do not provide a meaningful fire safety benefit as used in the product categories addressed by the Petition. CPSC should act to prevent ongoing exposures to unnecessary and hazardous flame retardants.

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[8] CPSC Staff Briefing, pp. 5 and CPSC Staff Briefing Tab C.
[9] CPSC Staff Briefing, pp. 25
[10] CPSC Staff Briefing pp. 138 states that "CPSC staff would need to conduct extensive research to … discern how any ban would affect performance and safety."
[11] CPSC Staff Briefing pp. 14

R. Thomas Zoeller, Ph.D.
University of Massachusetts, Amherst

Text of Oral Statement
R. Tom Zoeller, Ph.D.
Organohalogen Flame Retardants Petition; Oral Presentation **by Telephone**

Docket No. CPSC–2015–0022

I am a professor of biology at the University of Massachusetts, Amherst, where I direct the Laboratory of Molecular and Cellular Neurobiology. My research focuses on understanding the mechanisms by which thyroid hormone affects brain development and function, and the consequences of thyroid disruption by environmental chemicals.

I have authored or co-authored more than 150 articles in peer-reviewed scientific and medical journals, many on the impacts of environmental chemicals on thyroid hormones and brain development and on endocrine disruption in general. My CV is attached to this statement.

I am submitting this written outline of my remarks in anticipation of testifying by telephone at the September 14, 2017 hearing of the Consumer Products Safety Commission regarding the petition requesting rulemaking on products containing organohalogen flame retardants. In January 2016, I was among a group of scientists who submitted written comments in support of this petition.

My testimony will focus on the overwhelming scientific evidence showing that halogenated flame retardants can increase children's risks for neurodevelopmental disorders, and my own research demonstrating the potential effects of halogenated flame retardants on thyroid hormone, and thus on children's brain development and function. I also have examined the high costs resulting from the ubiquitous use of halogenated flame retardants in consumer products. While our children pay the price in loss of IQ and struggles with learning, attention and behavior, our society pays billions of dollars annually as the result of intellectual deficits and learning, attention and behavior disorders that can be attributed to exposures to PBDEs.

<u>Thyroid, Brain Development and Halogenated Flame Retardants</u>

- Thyroid hormones play a key role in brain development; thyroid hormone is essential for normal brain development.
- There are important differences in aspects of thyroid endocrinology between the fetus, infants and adults. Age-dependent vulnerability to thyroid toxicants requires higher levels of safety and protection for infants and children.
- We know from clinical studies that small changes in thyroid hormone levels during key periods of development produce a lifetime of cognitive deficits.
- Toxicological and epidemiological studies show evidence of adverse effects of prenatal flame retardant exposures on thyroid and brain development.

- These halogenated flame retardants are structurally similar and are long-lived in the environment and in people. They can be modified by our bodies to produce a truly dizzying array of chemicals that have clear effects on children's brains, but also untold effects on human health.

Economic Costs Associated With Halogenated Flame Retardants

- My role as one of lead authors and Steering Committee scientist on the extensive Endocrine Society analysis of the health and economic costs attributable to the endocrine disrupting effects of toxic chemical exposures in the EU.
- I was also a lead editor on the UNEP/WHO State of the Science document that highlighted the adverse effects of these chemicals.
- Quantifying the health and economic costs of PBDE exposures: We estimated that exposures to PBDEs were associated with 873,000 lost IQ points annually in the EU and costs of 9.59 billion euros.
- Implications of cost study for halogenated flame retardants and burden of neurodevelopmental disorders in the U.S.

Thank you for the opportunity to provide this statement.

Attachment

CURRICULUM VITAE

R. Thomas Zoeller, Professor
Department of Biology
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Email: tzoeller@bio.umass.edu
http://www.bio.umass.edu/biology/zoeller/

Research: To explore the molecular mechanisms of thyroid hormone action in the developing brain, and the consequences of disruption by thyroid disease or environmental chemicals.

Education:

B.S.	1977	Indiana University, Bloomington (Biology)
M.A.	1979	Oregon State University, Corvallis (Endocrinology)
Ph.D.	1983	Oregon State University, Corvallis (Neuroendocrinology)
Postdoctoral	1984-7	National Institute of Mental Health, NIH, Bethesda
	1987-8	National Institute of Neurological Disorders and Stroke, Bethesda Molecular Neuroendocrinology

Academic Appointments:

1988 – 1994	Assistant Professor, Department of Anatomy and Neurobiology, University of Missouri School of Medicine, Columbia, MO.
1994 – 2001	Associate Professor, Department of Biology, University of Massachusetts-Amherst
2001 – Present	Professor, Department of Biology, University of Massachusetts-Amherst
2004 – 2007	Professor and Chair, Department of Biology, University of Massachusetts-Amherst.
2008 - 2009	Visiting Professor, Department of Anatomy, University of Otago School of Medicine, Dunedin New Zealand.
2016-	Visiting scientist, Swetox (Sweden)

Affiliations:

Endocrine Society
International Brain Research Organization
UMass Molecular and Cellular Biology Program
UMass Organismal and Evolutionary Biology Program
UMass Neuroscience and Behavior Program

Honors/Awards:

Endocrine Society Laureate Award for Outsanding Public Service – 2016

This award recognizes the individuals who best demonstrate dedication to public awareness or public service in support of the field of endocrinology and the patients who suffer from endocrine disorders. This year, the Society is honoring a group of scientists who have led the way in educating policymakers and the public about the effects that chemicals found in household, personal care, industrial and agricultural products can have on hormones and health.

UMass Distinguished Community Engagement in Research Award – 2015.
This award is given at the University level in recognition of outstanding contributions to community engagement in research.

UMass Chancellor's Medal, 2012-2013.
For more than 35 years, UMass Amherst has recognized outstanding faculty achievements by sponsoring the Distinguished Faculty Lecture Series. The series honors individual faculty members and their achievements and celebrates the value of academic excellence. Lecturers are presented with a Chancellor's Medal – the highest recognition bestowed to faculty on the campus - at the conclusion of each talk.

Samuel F. Conti Faculty Research Fellowship, University of Massachusetts, 2007-2008.
This fellowship is based on demonstrably outstanding accomplishments and potential for continued excellence in research or creative activity. Recommendations are made to the Chancellor by a faculty committee who reviews the dossier including outside references.

Scientist of the Year: 2002-2003. Learning Disabilities Association.
This was the third time the LDA had made such a designation in its then-50 year history. Previous recipients included Dr. Herb Needleman and Professor Bernie Weiss.

Individual Resident Research Associateship (1987-1988), NINDS. Awarded by the National Research Council of the National Academy of Sciences

Individual National Research Service Award (1984-1987), NINDS, NIH.

Oregon State University Bayley Graduate Fellow, '82-'83.

Invited Talks and Workshops

2017

Feb	Scientific Advisory Group member, DG Environment, EC Commission Brussels
Mar	Invited Symposium Speaker, Society of Toxicology, Baltimore
Mar	Invited KeyNote Workshop on Thyroid and Public Health, Paris

2016

Jan	Member expert panel, International Agency for Research on Cancer, Lyon France
Feb	Invited Research Seminar, Department of Developmental Biology, University of California, Irvine.
Feb	Invited participant, Targeting Environmental Neurodevelopment Risks (1). Monterey California.
Mar	Endocrine Grand Rounds, Boston University Sch Medicine.
Mar	Invited symposium speaker, Society of Toxicology, New Orleans, La
Apr	Organizer and invited participant, Consensus Meeting on Endocrine Disruptors, German Risk Assessment Agency, Berlin, Germany
May	Invited speaker, Pediatric Academic Societies, Baltimore, MD
May	Invited speaker, EDC Symposium, Stockholm, Sweden
Sep	Advisory Committee and Session Chair, *History of EDCs*, NIH Bethesda.
Oct	Advisory Committee and invited participant, *Revisiting Bradford-Hill Criteria for Establishing Causality*, Royal Academy of Medicine, London, UK
Oct	Invited speaker, Food Packaging Forum Workshop, Zurich, Switzerland.
Nov	Invited Research Speaker, University of Karlstad, Sweden.

Nov Invited Research Speaker, University of Southern Denmark, Copenhagen
Dec Invited Research Speaker, University Gothenburg, Sweden
Dec Member Scientific Expert Group, DG Environment, EU Commission, Brussels

2015

May Research seminar, UC Davis
Public seminar at *Stowe Weekend of Hope* (a cancer patient weekend)
Jun Invited talk, European Commission, Brussels, Bg
Jun Invited key-note talk, Stockholm, Sweden
Jun Invited speaker, TEDX (Webinar)
Jun Invited discussant, TENDR project of LDA, Warrenton, VA
Jul Meeting at EPA HQ for the Endocrine Society, Washington DC
Jul Invited panel member, FIFRA SAP, Research Triangle Park, NC
Sep Invited research seminar, University of Liége, Belgium
Oct Invited speaker, 1st Chinese Open Workshop on Endocrine Disruptors – 2015 Shanghai, China

2014

Jan Roundtable Discussion on EDCs, Brunel University, London, UK
Mar Research Seminar, University of Missouri Columbia
Mar Endocrine Society and the European Parliament, Brussels Bg
Apr Endocrine Society Task Force on EDCs, Washington, DC
Apr Workshop on the economic impact of EDCs in Europe, Paris Fr
May *Organizing Committee/Session Chair,* 2014 GRC on EDCs, Il Chiocco, Italy
May Workshop on Obesity, Parma, IT
Jun Workshop on Weight of Evidence Analysis, London, UK
Oct One of 5 member working group on Economic Impact of EDCs in Europe, Copenhagen, DK
Oct Invited Presentation, 8th International Workshop on PCBs, Wood Hole, MA
Nov Chair, Endocrine Society Workshop on EDCs, Open Parliament, Brussels, BG
Dec Invited Presentation, Mexican Society for Nutrition and Endocrinology, Merida, MX.
Dec Member, UNEP Advisory Group on EDCs, Geneva, Switzerland
Dec Chair, Endocrine Society delegation to the Open Ended Working Group, SAICM, Geneva Switzerland

2013

Jan *Research Seminar*, Tufts University School of Medicine, Boston MA
Invited Lecture on ToxCast for the 21st Century. Environmental Defense Fund and Pew Charitable Trusts, Washington, DC
Invited Lecture, 5th Expert ED Meeting, European Commission, Ispra Italy.
Invited Workshop, European Union Parliamentarians, Brussels, Italy
Feb *Chancellor's Distinguished Faculty Lecture,* University of Massachusetts.
May *Invited Presentation:* NIEHS Council, RTP, North Carolina.
Aug *Invited Workshop:* Pew Charitable Trusts, Washington DC.
Invited Speaker: UNEP/WHO workshop on EDCs, Mexico City, Mexico
Sep *Invited Speaker:* BayPath College, Springfield, MA

Oct *Invited Speaker:* Kaleidoscope Evening Speaker, BayPath College, Springfield MA

2012

Jan Invited Participant, Center for Progressive Reform, Washington DC

Feb Required Participation, CLARITY BPA Consortium, Little Rock AR

Mar Invited Participant, Navigation Guide Workshop, San Francisco, CA. This is a group funded by the National Toxicology Program and the US EPA to explore improvements in the methodology of weight-of-evidence evaluation of literature in the Environmental Health Sciences.
Required Participation, ViCTER Consortium, Bodega Bay, CA. This was a face-to-face meeting with the laboratories of Tracey Woodruff (UCSF) and Martin Privalsky, UC Davis. The three of us have a joint NIH grant.
Science Advisory Board, US EPA, Washington DC.

Apr Pew Charitable Trust, Washington DC. Invited Lecture on the Principles of Endocrinology applicable to Food Safety determination for FDA.

May Invited Speaker, Florida Atlantic University. Scripps-Howard Institute on Environmental Journalism.
Chair, Exposure and Human Health Committee of the Science Advisory Board of the US EPA. Review of ToxCast.

June Gordon Conference on Environmental Endocrine Disruptors
Invited Speaker, European Commission, Brussels, Belgium.
Invited Speaker, Swedish Chemical Agency, Stockholm, Sweden
Invited Speaker, Green Chemistry Conference, Washington DC
Invited Speaker, Endocrine Society Annual Meeting, Houston, TX

Oct Invited Participant, Green Chemistry Workshop, New York, New York

2011

Jan Invited Research Seminar, Boston Univ School of Public Health, Boston, MA

Feb Invited Participant and science advisor to Pew Charitable Trusts, Washington, DC
ViCTER Workshop, UCSF Sch Medicine
Research Seminar, Smith College, Northampton, MA

Mar Invited Speaker, Workshop on Green Chemistry, Cavalho Point, CA

Apr Session Chair, Copenhagen Workshop on Endocrine Disruptors, Copenhagen, DK

Apr Senate Briefing on Hormones and Chemicals, Washington, DC

May Invited Speaker, Developmental Neurotoxicology-3, Varese, Italy

May Invited Speaker, Providence High School, Clarksville, IN

June Invited Speaker, American Chemical Society Annual Meeting, Washington, DC

June Invited Participant, Green Chemistry Institute, Yale University, Washington, DC

July Joint meeting of the Science Advisory Board and Board of Scientific Counselors, Research Triangle Park, NC

Sep Invited Speaker, Conference on EDCs, Sicily, Italy
Science Advisory Board, Washington, DC

Oct Invited Speaker and Co-Organizer, Neurotoxicology Conference on Environmental links to Autism, Research Triangle Park, NC

Nov Invited Speaker, SAICM meeting in Belgrade, Bosnia
Invited Speaker and scientific advisor, Pew Charitable Trust, Washington DC

Dec Face-to-face meeting with UNEP/WHO writing group (I am one of the lead editors) for a document, "State of the Science of Endocrine Disruptors, 2012", Geneva, Switzerland.
Research Seminar at the Environmental Institute, Brunel University, London, UK. By invitation of Susan Jobling and Andreas Kortenkamp

2010

Feb: Congressional Briefing on Endocrine Disruptors, Washington DC
April Invited Speaker, Colombian Endocrine Society, Bogatá, Colombia.
May Gordon Research Conference Co-Chair, GRC on Environmental Endocrine Disruptors, Les Diablarets, Switzerland May, 2010
Sep Congressional Briefing on the Science of Endocrine Disruption, Washington, DC
Oct Workshop on EPA's NexGen program, RTP, North Carolina
Nov United National Environmental Program (Geneva) Committee member to develop a "Global Assessment of the State-of-the-Science of Endocrine Disruptors". First meeting in Stockholm, Sweden.
Nov Invited Speaker, Fondation IPSEN, Paris France
Nov Invited Speaker, Neuroscience Department, University of Liége, Belgium.
Dec Invited participant, Center for Progressive Reform, Washington DC

2009

Mar Invited Speaker, Bowling Green State University, Ohio, Brain Awareness Week.
Apr Invited Speaker, American Thyroid Association. Washington DC
Apr Invited Lecture, Department of Pathology, Brown University, Providence RI
May Invited Lecture and Session Chair, Postgraduate Course and 5th Annual Copenhagen Workshop on Endocrine Disruptors, Copenhagen, Denmark.
Jun Invited Lecture, Department of Veterinary Biosciences, University of California at Davis.
Aug Invited Speaker, U.S. EPA BOSC Review. RTP, NC.
Oct Invited Lecture, Hormones Symposium, Athens, Greece.
Oct Invited Lecture, TSCA Reform, Pew Charitable Trust, Washington DC
Nov Invite Participant, REACH Reform, EU Parliament, Berlin, Ger
Nov Invited Lecture, Dept Ob/Gyn, UCSF, San Francisco.

2008

May Invited Lecture, National Academy of Sciences Workshop on Human Health Risk Assessment.
Jun Invited Lecture, Neurobehavioral Teratology Society, Monterey California.
Jun Invited Course, Teratology Society, Monterey California.
Oct Invited lecture, Canadian Diabetes Association.
Nov Invited Lecture, Department of Biochemistry, University of Otago, Dunedin NZ.

2007

Jan Invited Lecture, UCSF-CHE Summit on Environmental Challenges to Reproductive Health and Fertility, Mission Bay, San Francisco CA.
Feb Invited Speaker, National Council for Science and the Environment, Annual Meeting, Washing, DC.
Mar Invited Symposium, Society for Toxicology Annual Meeting, Charlotte SC.

May Invited Lecture, Learning and Developmental Disabilities Initiative's National Conference, Atlanta, GA.

May Invited Lecture, OEHHA, California EPA Conference on Risk Assessment. Monterey, CA.

Jul Invited Lecture, Neuroscience lecture series, Neurowissenschaftliches Forschungszentrum der Charité, Berlin.

Jul Invited Lecture, Institute for Inland Fisheries, Mugelsee Lake, Berlin, Germany.

Sep Invited Key Note Speaker, University of Illinois, Toxicology Program Open House

Oct Invited Lecture, American Thyroid Association Annual Meeting, New York.

Oct Invited Lecture, Conference on Thyroid Resistance Syndrome, Sao Miguel, Azores.

2006

May Key-Note Address, American College of Veterinary Internal Medicine. Louisville, KY

May Oregon Health Sciences Center, Portland, OR

May California EPA (OEHHA Annual Meeting on Children's Health) Berkeley, CA.

Jun Invited Lecture, Teratology Society Annual Meeting, Tucson, Az.

Jun Invited Lecture, American Endocrine Society Annual Meeting, Boston, MA.

Aug State of the Art Lecture, 23rd Conference of European Comparative Endocrinologists, Manchester, UK.

Oct Grand Rounds, Baystate Medical Center, Springfield, MA.

Oct Thyroid Health and the Environment: Threats and Effect. CME Conference sponsored by the American Thyroid Association and the American Association of Clinical Endocrinologists (Program Co-Chair).

2005

Jan Society for Risk Analysis, Palm Beach, CA.

Feb White Matter Think Tank, Cure Autism Now Foundation – a working group invited to discuss effective research to make significant contributions to our understanding of autism. Malibu, CA

Apr Department of Environmental Medicine, University of Rochester, Rochester, NY.

Apr Pittsburgh Environmental Health Conference funded by the Heinz Philanthropies.

May League of Women Voters, Acton

Aug 3rd International Scientific Conference of the Collegium Ramazzini, Bologna, IT

Aug Department of Environmental Medicine, University of Rochester School of Medicine

Aug 9th District Federal Court, San Jose, CA.

Sep Mealey's Water Quality Conference, Sponsored by Lexus-Nexus, Los Angeles, CA

Oct Massachusetts Water Quality Conference, University of Massachusetts

Dec Press Briefing sponsored by the U.S. Endocrine Society, New York, New York.

2004

Jan The Impact of Maternal Thyroid Diseases on the Developing Fetus: Implications for Diagnosis, Treatment, and Screening. Organized by the CDC, Atlanta.
Feb Department of Ob/Gyn, CS Mott Center for Human Reproduction, Wayne State University
Feb Graduate Program in Neuroscience and Behavior, Wayne State University
Feb Department of Animal Science and Veterinary Medicine, UMass Feb, 2004).
Apr The Impact of Maternal Thyroid Status: Pregnancy, Fetal and Childhood Development, Alexandria, VA.
Apr *Keynote Address* - 1st International Conference on Molecular Research in Environmental Medicine, Düsseldorf, Germany
May Graduate Program in Neuroscience, Upstate Medical University School of Medicine, Syracuse, NY
May Learning and Developmental Disabilities Initiative Conference, National Institutes of Health, Bethesda, MD
Jun Gordon Research Conference on Endocrine Disruptors,
Jun Drug Information Association, Bethesda MD
Sep European Teratology Society, Thessaloniki Greece
Oct American Thyroid Association Vancouver BC
Nov Health Canada, Ottawa, CA
Dec Annual Meeting, Society for Risk Assessment, Palm Springs, California
Dec 7th International Conference on Endocrine Disrupters, Nagoya, Japan

2003

Jan Neuroscience Division, Johns Hopkins University
Feb University of Michigan Ann Arbor
Feb *Keynote Address* Genetic and Environmental Compromises to Essential Thyroid Receptors and Function During Fetal Development and the Outcome in Abnormal Human Development. *National Meeting, of the Learning Disabilities Association*, Chicago, IL
Mar Biology Department, Boston University
Mar Dept Medicine, University of Massachusetts-Worcester
Apr CERHR Workshop Thyroid Toxicants: Assessing Reproductive Health Effects, Alexandria, VA
Jun Annual meeting of the Teratology Society; Philadelphia
Oct *Keynote Address* - Annual meeting, Learning Disabilities Association of Michigan, East Lansing, MI.
Nov "Exploring Opportunities for Interdisciplinary Linkages between Neurodevelopment and Environmental Exposures. Boston, MA.
Dec World Health Organization Workshop on Endocrine Disrupters, Tokyo, Japan
Dec 6th Annual International Symposium on Endocrine Disrupters, Sendai, Japan

2002

Jun Creating Standards for Cleanup: Perchlorate Case Study, ISIS annual meeting
Sep PCB Effects on Thyroid Hormone Action in the Fetal Brain. *Thyroid Hormone and Brain Development: Translating Molecular Mechanisms to Population Risk.*
Oct Thyroid Hormone and the Environment, "Meet the Professor" luncheon, American Thyroid Association
Dec University of Toronto Sch Medicine

Dec Hospital for Sick Children, Toronto, CA

2001

Feb "Challenges Confronting a Screening and Testing Program for Thyroid Disruptors". Workshop: TestSmart – Endocrine Disruptors. Johns Hopkins School of Medicine and Public Health, Baltimore, MD

Mar Molecular and Cellular Biology Program, Colorado State University, Ft. Collins, CO.

Mar Department of Biochemistry and Molecular Biology, University of Louisville School of Medicine

Apr Thyroid Hormone, Brain Development and Environmental Health. *Children's Environmental Health – Developing a Framework"* Office of Environmental Health Hazard Assessment, California EPA

May Biology Department, Long Island University, Brooklyn, NY

Jun "Thyroid Hormone-Nutrition Interaction on Brain Development" – Nutrients, Toxicants and Brain Development Rochester University School of Medicine

Sep Thyroid Hormone, Brain Development and the Environment. World Conference on Endocrine Disruptors, Erice, Italy.

Dec Thyroid Hormone, Brain Development and the Environment. Fourth International Conference on Endocrine Disrupters. Tsukuba, Japan.

2000

Feb Workshop on Children's Health-2000. Mt. Sinai Univ. Sch. Med.

Apr "Thyroid Hormone of Maternal Origin Regulates Fetal Brain Development" 2000 Steroid Hormone Workshop, Breckenridge, CO.

Apr "Polychlorinated Biphenyls as Disruptors of Thyroid Hormone Action", PCB Workshop: Recent Advances in the Environmental Toxicology and Health Effects of PCBs. Lexington, KY.

Jun PCBs and Thyroid Hormone Action in the Developing Brain. Gordon Conference on Endocrine Disruptors

Sep Program in Environmental Toxicology, University of Illinois, Champaign-Urbana

Sep Maternal Thyroid Hormone Affects Fetal Brain Development. 18th International Neurotoxicology Conference, Children's Health and the Environment 2000. Colorado Springs, CO

1999

Jan University of Pittsburgh School of Medicine

Sep "Effects of Developmental Exposure to PCBs on Thyroid Hormone Action in the Developing Brain are not Consistent with Effects on Circulating Thyroid Hormone" 17th International Neurotoxicology Conference, Little Rock, AR.

Sep "Thyroid Hormone of Maternal Origin Directly Affects Fetal Brain Development", 17th International Neurotoxicology Conference, Little Rock, AR.

Oct *Keynote Speaker* "Thyroid Hormone, PCBs, and Brain Development", 26th New England Endocrinology Conference, University of Rhode Island.

Dec Workshop on Endocrine Disruptors, Congress Corporation, Kyoto, Japan

1998

Mar EPA, Neurotoxicology branch, Research Triangle Park, NC.

Dec "Prenatal Environmental Exposures", convened by the Centers for Disease Control, Atlanta, GA
Dec NIEHS, Research Triangle Park, NC.

1996

Mar Department of Environmental Sciences, University of Illinois, Urbana March 22, 1996
Apr The Shriver Center for Research and Harvard University, Boston, MA April 24, 1996
Apr BayState Hospital, Springfield, MA, April 11, 1996
Nov NIEHS, Research Triangle Park, NC. November 22, 1996

1995

Apr Department of Zoology, University of Rhode Island, Kingston, RI
Apr Session on "Thyroid Hormones and Brain Function" Steroid Hormone Workshop, Breckenridge, CO

1994

Apr Department of Pharmacology and Toxicology, Albany Medical College, New York
May Instituto De Biotecnologia, Universite Nacional Autonoma Mexico, Cuernavaca, Mexico

1993

Feb Department of Biology, University of Massachusetts Amherst
Mar C.S. Mott Research Center, Wayne State University, Detroit, MI
Apr Division of Biological Sciences, University of Missouri-Columbia

1992

Apr Department of Biology, Georgia State University, Atlanta, GA

1991

Jun Mo-Kan symposium on Reproductive Endocrinology, University of Missouri-Columbia
Aug Neuroendocrine Section, National Institute of Environmental Health Science, Research Triangle Park, NC
Oct Department of Anatomy, University Medical School Pécs, 7643 Pécs Szigeti u.12, Hungary
Oct Ciba Foundation Symposium #168, "Functional Anatomy of the Neuroendocrine Hypothalamus", Budapest, Hungary.
Dec Department of Biology, City University of New York at Brooklyn, New York
Dec Department of Anatomy, University of Nebraska School of Medicine

1990

May Yerkes Regional Primate Center, Emory University School of Medicine, and Georgia State University, Atlanta, GA
Oct Department of Pharmacology, University of Missouri School of Medicine

Nov Department of Physiology and Biophysics, University of Tennessee School of Medicine

Dec "Reproductive Neuroendocrinology, New Approaches to Old Questions", San Antonio, TX, 27

1989

Feb GRECC, Veterans Administration Medical Center, Tacoma, Washington

Mar Department of Pharmacology, St. Louis University School of Medicine

Mar Department of Microbiology, University of Missouri-Columbia School of Medicine

May Department of Zoology, University of Maryland, College Park, Maryland

Sep Department of Veterinary Biomedical Science, University of Missouri Sch Vet Med

1987

Jul Department of Anatomy and Cellular Biology, Tufts University Medical School, Boston, Massachusetts.

Oct Department of Anatomy, University of Maryland School of Medicine, Baltimore, Maryland

Oct Section on Comparative Studies of Brain and Behavior, Laboratory of Clinical Science National Institute of Mental Health, Poolsville, Maryland

Dec Department of Anatomy, University of Missouri School of Medicine, University of Missouri-Columbia, Columbia MO

1986

May Department of Zoology, University of New Hampshire, Durham, New Hampshire, May, 1986.

Sep Department of Gerontology, Veterans Administration Hospital, Seattle, Washington, September, 1986.

Sep Department of Obstetrics and Gynecology, University of Washington Medical School, Seattle, Washington, September 1986.

Sep Department of Zoology, Oregon State University, Corvallis, Oregon. September, 1986.

1984

Jul Department of Neurology, Massachusetts General Hospital and Harvard Medical School, Boston, MA.

1981

Sep Department of Zoology, University of Washington, Seattle, Washington.

Military Service (U.S. Army)

Drafted June 14, 1972, Honorable Discharge (Sp4) June 13, 1974.

Service to Discipline:

Editorial Board: Environmental Toxicology and Pharmacology (Jan 1, 2000-Present)

Endocrinology (Jan 1, 2004 – Dec 31, 2007).

Professional Advisory Board: Learning Disabilities Association of America (Jan 1, 2000 to Dec 31, 2003).

Chair, Exposure and Human Health Committee of the Science Advisory Board, U.S. EPA (2010-1013).

Member, Chartered Scientific Advisory Board, U.S., EPA (2010-2013).

Standing Member, Integrative and Clinical Endocrinology and Reproduction NIH Study Section (ICER) 2006-2010

Standing Member US EPA Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) Screening and Testing Workgroup (1996-1998). (see: http://www.epa.gov/scipoly/oscpendo/history/finalrpt.htm).

Member, EPA's Scientific Advisory Board for PFOA (January 2005).

Member, U.S. EPA Public Health Assessment for Perchlorate peer review committee, 1999 (San Bernadino, CA).

Member, U.S. EPA Public Health Assessment for Perchlorate peer review committee, 2002 (Sacramento, CA).

Member Program Committee, American Thyroid Association

Member Scientific Advisory Board, Environmental Media Services Science Communication Network.

Member Scientific Advisory Board, The Organic Center, Washington DC

Co-Chair Endocrine Society EU EDC Task Force (2012 – present)

Co-Chair Endocrine Society Global EDC Task Force (2012 – present)

Ad Hoc Reviewer for the following journals:

American Journal of Physiology	*Brain Research*
Molecular Brain Research,	*Developmental Brain Research*
Development	*Endocrinology*
Molecular Endocrinology	*Endocrine*
General and Comparative Endocrinology	*Journal of Neuroendocrinology*
Histochemistry	*Journal of Experimental Zoology*
Journal of Neuroscience	*Regulatory Peptides*
Neuroscience Journal	*Environmental Health Perspectives*
Molecular and Cellular Endocrinology	*Journal of Clinical Investigation*
Science	*Nature*

Ad hoc Reviewer for the following funding agencies

National Science Foundation	US Veteran's Administration
Human Frontier Science Program	EPA RFP study section
Italian Science Foundation	US-Israel Science Foundation.

Strategic Environmental Research and Development Program

Meetings Organized

Thyroid Hormones and Brain Function, a session at the 1995 Workshop on Steroid Hormones and Brain Function, Breckenridge, CO.

23rd New England Endocrinology Conference, Amherst, MA (September, 1995).

Advisory Committee, 18th International Neurotoxicology Conference (September, 2000)

Co-Chair, NIEHS-sponsored Workshop: Thyroid Hormone and Brain Development: Translating Molecular Mechanisms to Population Risk. (see entire videocast at http://videocast.nih.gov/PastEvents.asp?c=1)

27th New England Endocrinology Conference, Amherst MA (September, 2002).

Co-Chair, ATA-sponsored CME Conference on Thyroid hormone and the Environment. March, 2006.

Chair, Endocrine Society Symposium on Endocrine Disruptors, June, 2009.

Co-Chair, 2010 Gordon Research Conference on Environmental Endocrine Disruptors. Les Diablerets Switzerland. May 30 – June 4, 2010.

Research Support History:

Oregon State University

Bayley Graduate Fellow (Oregon State Univ., 1983-1984). Fellowship awarded to two graduate students, University-wide, within a single academic year.

National Institutes of Health

Individual National Research Service Award (MH09104; 1984-1987)

Individual Fellow of the National Research Council (1987-1992). "Molecular Analysis of Neuroendocrine Peptide Gene Expression"

University of Missouri School of Medicine

Graduate Research Council, "Molecular Analysis of Neuroendocrine Peptide Gene Expression" (University of Missouri, 1988-1989, $25,000)

Medical Research Council, "Neuroendocrine Peptide Gene Expression in Rat Brain" (University of Missouri, 1989-1990, $25,000)

American Heart Association, "Cardiovascular Elements within the CNS: The Role of TRH Neurons" (T. Zoeller, PI, 1990-1991, $25,000)

Graduate Research Council, *UMC* "Central Regulation of Cardiovascular Function" (1990-1991, $5,000)

NIH, "Molecular Basis for Ethanol Induced Hypothyroidism" (T. Zoeller, PI; RO1 AA 08887; 1991-1995, $450,000 direct)

NIH, "IP3 metabolism and Ca++ homeostasis in cerebral ischemia (GY Sun, PI; T.Zoeller, RO1 NS30178; 1992-1995, $850,000 direct)

NIH, "Ethanol and Hypothalamic-Pituitary-Thyroid Axis" (1993-1996) NRSA to Dr. Heather Scott; Sponsored by RT Zoeller

University of Massachusetts-Amherst

Graduate Research Council, Univ. Massachusetts, "Identification of Thyroid Hormone-Regulation Genes in CNS Development" (1994-1995, $5,000)

NIH, "Molecular Mechanisms Underlying Fetal Alcohol Syndrome" (T.Zoeller, PI, RO1 AA10418; 1996-1999, $300,000 direct)

NSF, "Functional Organization of Hypophysiotropic TRH Neurons" (T.Zoeller, PI; IBN-9514835; 1996-1999, $105,000 direct)

NIH, "PCBs and Thyroid Hormone Action in Developing Cochlea" (T. Zoeller, PI; ES083330; 1996-1999, $300,000 direct)

Faculty Research Grant-Umass Amherst, "Hormone-Responsive Genes in Blood" (1999-2000, $5,000)

STAR Graduate Fellowship to Carolyn Herzig (2002-2003).

NIH, "PCB Disruption of Thyroid Hormone Action in Development" (T. Zoeller, PI, 2000-2005, $900,000 direct; 2008-2013, $1.2M direct).

NIH PO1 with Michele Marcus (Emory University). (T. Zoeller and S. Petersen, Co-PIs). Effects of Polybrominated biphenyls on Endocrine Mechanisms of Development. Submitted June 1, 2004 with a total cost of $11,280,430. (The Umass project has a requested budget of $956,080 direct cost and received a priority score of 126). The overall project received a priority score of 124; not funded.

EPA STAR predoctoral fellowship to David Sharlin, "Effects of Maternal Exposure to Polychlorinated Biphenyls on Thyroid Hormone Action in the Fetal Brain" 2004.

EPA STAR, "Low Dose Effects of Thyroid Toxicants on Neurodevelopment" (T. Zoeller, PI, 20%) 12/1/04 – 11/31/07, $740,000 total.

NIH R21 Gene Targets of Thyroid Hormone in the Developing Brain.

NIH R01 PCB Disruption of Thyroid Hormone Action in Development (2000 – 2015). ViCTER supplement (2010-2015). This grant is funding a collaboration between my lab, and the labs of Drs. Tracey Woodruff (UCSF) and Martin Privalsky (UC Davis) ($500,000 direct).

Passport Foundation – Biomarkers of Thyroid Hormone Action in Human Placenta.

NIH U01ES020908 Bisphenol-A and Thyroid Hormone Signaling During the Life Cycle (2011-2015). $122,800 direct

NIH 1R21ES026228 Molecular Biomarkers of Thyroid Disruption in Human Placenta (2016-2018). $440,000 total.

Research

Students and Postdoctoral Research Associates

Postdoctoral Research Associates

Heather C. Scott, Ph.D. (1991-1994), Currently, Professor, University of Seattle.

Agnes Simonyi, Ph.D. (1992-1994), Currently, Associate Professor, University of Missouri School of Medicine.

Olimpia Butnariu, M.D. (1992-1994) Currently Attending Physician, University of Virginia School of Medicine.

Anna Hrabovszky, M.D. (1999-2000) Currently, Attending Physician, Budapest General Hospital, Hungary.

Olga Sidileva, Ph.D. (2008-2009) Currently Research Assistant Professor, University of Vermont.

Jintao Wang, Ph.D. (2009-2010) Currently Assistant Professor, Sichuan University, Cheng-du, China.

Ambika Sharma Ph.D. (2009-2012) Postdoctoral Associate.

Judy Brewer, Ph.D. (2010 – 2013) Postoctoral Associate

Doctoral Students

Amy L.S. Dowling, Ph.D. (1995-2000). University of Massachusetts-Amherst. Molecular and Cellular Biology Program in May, 2000. Dissertation Title: "The Role of Thyroid Hormone in Fetal Brain Development". *Presently a Research Associate Professor at the University of Kentucky.*

Jun Yang (1996-2001). University of Massachusetts-Amherst. Molecular and Cellular Biology Program in May, 2000. Dissertation Title: "Molecular Basis of Fetal

Alcohol Syndrome in a Rat Model". *Currently Assistant Professor, University of Utah School of Medicine.*

Eric Iannacone (1998-2005). University of Massachusetts-Amherst. Molecular and Cellular Biology Program in 2002. Dissertation title: "Effects of Polychlorinated Biphenyls on Thyroxine Actions in the Developing Brain". *Currently an Associate Professor at Fairleigh Dickinson University.*

Kelly Gauger (2001- 2005) University of Massachusetts-Amherst. Molecular and Cellular Biology Program. Dissertation title: "Actions of Polychlorinated biphenyls on Thyroid Hormone Receptors". *Currently Research Assistant Professor, Pioneer Valley Life Science Institute, Springfield, MA.*

David Sharlin (2002-2007). Dissertation Title: "Polychlorinated Biphenyls as Disruptors of Thyroid Hormone on White Matter Development". *Currently Assistant Professor of Biology at the University of Minnesota after a Postdoctoral fellowship at the NIDDK, National Institutes of Health.*

SeoHee You (2002-2007). Dissertation Title: "Discovery of Direct Gene Targets of Maternal Thyroid Hormone in The Fetal Cortex; Genome-wide approach". *Currently a Postdoctoral fellow at the University of Pennsylvania.*

Stefanie Giera (2008 - 2012). Dissertation Title: "Individual PCB Congeners Interact to Disrupt Thyroid Hormone Action in Development". *Currently a Postdoctoral Fellow at Harvard University, Boston MA.*

Master's Students

Xiaohui Zhang, M.D., M.S. (1992-1994). University of Missouri School of Medicine. Thesis Title, "Cerebral Ischemia and IP3 Receptor".

Alisa Croci, B.S., M.S. (1999-2000). University of Massachusetts-Amherst. Thesis Title: "Development of the Hypothalamic-Pituitary-Thyroid Axis".

Carolyn Herzig, B.S., M.S. (2001-2002) University of Massachusetts-Amherst. Thesis Title: "PCB Effects on Thyroid Hormone Signaling in Fetal Brain".

Dan Tighe, B.S., M.S. (2006-2007) University of Massachusetts-Amherst. Thesis Title: "Effects of Polybrominated Diphenyl Ethers on Mammalian Brain Development".

Graduate Student Committees

Student Name	Program	Committee Type	Role on Committee	Eff Date
Giera,Stefanie	MCB	Ph.D.	Chair	7/18/12
Geromini,K	MCB	MS	Master's Committee Chair	
	12/12/11			
Shen,Erica Yibei	NSB	Ph.D.	Outside Member	6/9/10
Shinday,Nina M.	NSB	Ph.D.	Outside Member	2/8/10
Cadena,Juan G.	MCB	Ph.D.	Member of Committee	4/27/09
Iwanowicz,Luke R	Fisheries	Ph.D.	Outside Member	11/6/08
Aggison,Leah Kay	MCB	Ph.D.	Member of Committee	10/6/08
Cao,Jinyan	MCB	Ph.D.	Member of Committee	9/24/08
Krishnan,Sudha	MCB	Ph.D.	Member of Committee	5/23/08
Lopez,Veronica	NSB	Ph.D.	Outside Member	11/13/07
Monette,Michelle Y.	OEB	Ph.D.	Member of Committee	11/5/07
You,Seohee	MCB	Ph.D.	Chair	10/29/07

Hudgens,Edward D	NSB	MS	Master's Member	9/26/07
Sharlin,David Scott	MCB	Ph.D.	Chair	9/1/07
Vella,Kristen R	MCB	Ph.D.	Member of Committee	5/16/07
Nieves-Puigdoller, Katherine	OEB	Ph.D.	Outside Member	5/9/07
Ditzian,Lauren Rebecca	NSB	MS	Master's Member	3/22/07
Lerner,Darren T.	OEB	Ph.D.	Outside Member	3/16/07
Gauger,Kelly J	MCB	Ph.D.	Chair	3/27/06
Molenda,Heather A	NSB	Ph.D.	Outside Member	3/27/06
Iannacone,Eric A	MCB	Ph.D.	Chair	9/1/05
Symington Jr,Steven B	MCB	Ph.D.	Member of Committee	4/1/05
Yilmaz,Eser	MCB	MS	Master's Member	10/13/04
Laws,Amy M	MCB	Ph.D.	Outside Member	5/22/04
Brissette,Christina H	ANS	MS	Master's Member	2/9/04
Cheng,Lihong	MCB	Ph.D.	Member of Committee	6/26/03
Monette,Michelle Y.	OEB	MS	Master's Member	4/21/03
Lu,Shaolei	MCB	Ph.D.	Outside Member	2/2/03
Mcreynolds,Alison M	NSB	Ph.D.	Outside Member	5/25/02
Han,Tina M	NSB	Ph.D.	Member of Committee	2/1/02
Yang,Jun	MCB	Ph.D.	Chair	9/1/01
Curran,Meredith A	NSB	Ph.D.	Member of Committee	5/26/01
Hu,Yanhui	MCB	Ph.D.	Member of Committee	2/1/01
Pelis,Ryan M	OEB	MS	Master's Member	2/1/01
Dowling,Amy L.S.	MCB	Ph.D.	Chair	5/20/00
Ma,Yue	NSB	Ph.D.	Member of Committee	5/20/00
Luszcz,Jason M	Biology	MS	Master's Member	2/1/00
Auger,Catherine J	NSB	Ph.D.	Outside Member	5/22/99
Collins,Lucille M.	NSB	Ph.D.	Outside Member	5/22/99
Blain,Robyn B.	Public Health	Ph.D.	Outside Member	2/1/99
Ma,Yue	NSB	MS	Master's Member	5/23/98
Wang,Xiwei	MCB	Ph.D.	Outside Member	9/1/97
Mcmeekan,John M	MCB	MS	Master's Member	5/24/97
Sun,Danhui	MCB	Ph.D.	Member of Committee	5/25/96
Shearman,Lauren P	NSB	Ph.D.	Outside Member	2/1/96
Chiluvuri,Venkata	Comp Sci	Ph.D.	Member of Committee	5/27/95
Hudgens,Edward D	Pol Sci	MS	Master's Member	4/3/92

Undergraduate Honors Students

Justin Harder, B.S. (1996). Honors thesis submitted to the Neuroscience Program, Amherst College. Thesis Title: "Regulation of Glucocorticoid Receptor Gene Expression in the Rat Brain".

Karen Terry, B.S. (2000). Honors thesis submitted to the Honors College, University of Massachusetts, entitled "Thyroid Hormone-Responsive Genes in Rat White Blood Cells".

Arthur Yan, B.S. (2000). Honors thesis submitted to the Neuroscience Program, Amherst College, entitled "Role of Thyroid Hormone in Development of Cortical Lamina in the Rat".

Carolyn Herzig, B.S. (2001). Honors thesis submitted to the Honors College, University of Massachusetts-Amherst entitled, "Effects of Polychlorinated Biphenyls on Thyroid Hormone Action in the Developing Rat Brain".

Erica Gross, B.S. Biology and Legal Studies, submitted to the Honors College, University of Massachusetts-Amherst entitled, "PCBs and Phantom Risk".

Tina Ling, B.S. (2002). Department of Biochemistry. Honors thesis to be submitted to the Honors College, University of Massachusetts-Amherst entitled, "Thyroid Hormone Receptor Expression in Monocytes".

Carolyn O'Donnell (2003). Department of Biochemistry. Honors thesis to be submitted to the Honors College, University of Massachusetts-Amherst.

Rebecca Burch (2003). Department of Biology. Honors thesis to be submitted to the Honors College, University of Massachusetts-Amherst.

Michele Schroeder (2003). Department of Biology. Honors thesis submitted to the Honors College June, 2003.

Terese Frazier (2004) Department of Biology. Honors thesis submitted to the Commonwealth College, University of Massachusetts-Amherst.

John Stenglein (2004) Department of Biology, 21st Century Leader Awardee. Honors thesis submitted to the Commonwealth College, University of Massachusetts-Amherst.

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Articles Published

Papers in Refereed Journals or Edited Volumes:

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Sharlin D, Bansal R, Zoeller R. (2005) PCB induced hypothyroxinemia alters oligodendrocyte numbers in two white matter tracts of the developing rat brain. Annual Meeting of the Society of Toxicology, New Orelans, LA.

Teaching

University of Missouri

M205:	"Medical Histology"
AN491:	"Reproductive Neuroendocrinology" Special Topics
DBS490	"Neurobiology Seminar" (for graduate students).

University of Massachusetts

Biol 325	"Introduction to Human Physiology"
Biol 564/5	"Human Physiology " ("Experimental Animal Physiology I" in 1995).
Biol 797B	"Gene Expression in the Nervous System"
Biol 568/9	"Endocrinology".
Biol 297A	"Human Physiology".
Biol 105	"Biology of Social Issues"
Biol 795A	"Environmental Endocrine Disruptors"

See teaching statement

Administrative

University of Missouri

Graduate Faculty Senate from Anatomy/Neurobiology ('89-'94). Secretary of GFS ('93-'94)
Director of Graduate Studies, Department of Anatomy/Neurobiology ('90-'94)
Vice President, Mid-Missouri Chapter of the Society for Neuroscience ('90-'91)
President, Mid-Missouri Chapter of the Society for Neuroscience ('93-'94)
Member of Medical School Task Force on Assessment, ('92-'94)
Member of Curriculum Committee on Endocrinology, ('93)

University of Massachusetts

Biology Personnel Committee (Elected '95-'98, '99-'02, '08-'10; **chair** '96-'01)
Biology Department Executive Committee '98-'01, '01-'04, '09-Present
Departmental Space Committee (Elected '95-00)
Dean's advisory committee on CNSM organization, March, '94.
NSB steering committee (Elected '95-'98)
MCB admissions committee ('96, '98, '99; chair '99, '00)
Chair, Animal Care Office Review, 1999-2000
College of Natural Science and Mathematics Personnel committee. ('02-'05)
Provost Search Committee '04.
Biology Department Chair (2004-2007)
Search committee for the Dean of the School of Public Health (2010)
Selection Committee for the Conti Faculty Research Award

Eve Gartner
Earthjustice Northeast Office

EARTHJUSTICE

Text of Oral Presentation Submitted August 31, 2017

Organohalogen Flame Retardants Petition; Oral Presentation

Public meeting September 14, 2017
CPSC Docket No. CPSC–2015–0022
Submitted by email to cpsc-os@cpsc.gov

Eve C. Gartner
Earthjustice
Counsel for Petitioners

I am an attorney at Earthjustice, and co-counsel with Consumer Federation of America representing the Petitioners[1] in this matter. I appreciate the opportunity to provide comments today.

Petitioners strongly urge the Consumer Product Safety Commission ("CPSC" or "Commission") to reject the staff's analysis and grant the petition. Harm from the use of additive organohalogen flame retardants ("OFRs") is harder to see and harder to measure than the harm from exploding firecrackers or body parts entangled in a window covering cord. But that does not make the harm less likely to occur, or less injurious. There is no doubt that exposure to OFRs puts children in harm's way. Even at low levels these chemicals impact children's brain development and function, and can impact their reproductive capacity later in life. The Federal Hazardous Substances Act ("FHSA" or "Act") is an excellent tool for addressing these harms because it is a precautionary statute that authorizes CPSC to regulate based on *the potential for harm*.

Staff's approach rests on fundamental misconceptions about the Commission's authority and mandate to protect children from the potential harm from exposure to toxic chemicals like OFRs. I will briefly describe four of these errors.

[1] Petitioners in the matter are: American Academy of Pediatrics, American Medical Women's Association, Consumer Federation of America, Consumers Union, Green Science Policy Institute, International Association of Fire Fighters, Kids in Danger, Philip J. Landrigan, M.D., M.P.H., League of United Latin American Citizens, Learning Disabilities Association of America, National Hispanic Medical Association, and Worksafe.

First: ***The staff recommendation ignores the legal requirements for a rule under the FHSA. It would be clear error for the Commission to deny the Petition on the basis of staff's flawed analysis.***

Under the FHSA, a product is "hazardous" based on toxicity, if it meets two criteria:

- It must have ***"the capacity to produce . . . illness*** *...*through ingestion, inhalation, or absorption through any body surface," and
- it "***may cause"*** *substantial illness* as a result of customary use.[2]

The key point is that a "hazardous substance" is one that has the ***capacity*** **and** ***potential to cause harm*** **based on exposure from customary use**. According to the CPSC's Office of Compliance, the Act requires hazardous household products "to bear labeling that alerts consumers to *the potential hazards* that ... products present."[3]

But if labeling is not adequate to protect against the potential hazard, or in the case of children's products, the FHSA allows CPSC to declare the product banned.[4]

The staff's recommendation repeatedly misses the critical point that products are hazardous under the FHSA based on the *potential* to cause harm. Three examples of this erroneous reading of the FHSA follow:

- The Briefing Package argues that the petition should be denied because the FHSA requires a connection between toxicity, exposure and "*resulting* substantial personal injury or substantial illness associated with the exposure."[5] But the terms of the FHSA do not require any "resulting illness or injury." Indeed, the premise of the FHSA's precautionary approach is that CPSC should regulate to prevent injury from occurring.[6]

- The Briefing Package's description of the analytic process for determining if a substance is "hazardous" does not match the language of the FHSA. Staff states: "[i]f a substance is determined to be 'toxic' under the FHSA..., *then a quantitative assessment of exposure and risk is performed to determine whether the chemical may be a 'hazardous substance'*

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[2] 15 U.S.C. § 1261(g); *id.*§ 1261(f)(1)(A) (emphases added).

[3] CPSC, Federal Hazardous Substances Act (FHSA) Requirements (Dec. 4, 2012), 2012 WL 12332534 [hereafter "FHSA Requirements"], at *1 (emphasis added).

[4] *Id.* at *4; 15 U.S.C. § 1261(q)(1).

[5] Briefing Package at 6; *see also id.* at 17 (FHSA requires connection between substance, exposure and "resultant injury or illness").

[6] FHSA Requirements, 2012 WL 12332534, at *1 (the FHSA "requires precautionary labeling").

under the FHSA, which includes consideration of dose response, bioavailability, and exposure."[7] Staff's statement contrasts with the text of FHSA, which states that if a product is toxic (meaning it has the "capacity" to cause harm), then the only remaining question is whether the product "may cause" substantial illness or injury as a result of customary use. The FHSA does not suggest that CPSC must quantify the risk in order to conclude that a product "may cause" harm. Indeed, there is no justification for exposing children to *any* risk from exposure to OFRs given the overwhelming evidence that these chemicals do not provide meaningful fire safety benefit in the uses addressed in this Petition.

- Staff concludes that because "[m]any commenters stated that a risk-based approach should be taken when examining each member in this class of chemicals," it "therefore" should adopt such approach.[8] There is no justification for relying on comments rather than the terms of the Act.

Second: ***The staff's rationales for recommending inaction are flawed***

The Briefing Package argues that the CPSC should not grant the Petition for a range of policy reasons, all of which rely on incorrect premises.

A. Staff argues that OFR use is changing and "OFRs may not be as pervasive ... as the petitioners' state."[9]

- Even if OFR use has declined and is less ubiquitous than it was when the Petition was filed, it is still unacceptably high. Staff report recent testing of children's products indicating that 22% of tested products still contain OFRs. Given that most children have many products, there is a reasonable chance that more than 22% of children are exposed to OFRs that are needlessly being added to their toys and furniture. If one-quarter of children were at risk of injury from a badly designed crib, the CPSC would likely not consider that number too low to require action.

- History shows that the voluntary shifts in the market may not be permanent in the absence of federal regulation. For example, chlorinated tris was phased out of baby pajamas in the 1970s and then re-appeared ten years ago in our furniture.

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[7] Briefing Package at 11 (emphasis added).

[8] Briefing Package at 18

[9] Briefing Package at 13, 14.

- If the National Fire Protection Association or other private standard-setting entities adopt an open-flame flammability standard, use of OFRs could increase significantly in the absence of a federal prohibition.

- Mandatory federal action is needed to finally close the door on the use of OFRs in consumer products.

B. Staff argues that other regulatory bodies are stepping in to regulate.[10]

- While *some* states are regulating *some* OFRs in *some* products, these actions will not protect consumers in all states from all of the products covered by the Petition. On the other hand, action at the state level – such as a recent law adopted in the State of Maine that bans all flame retardants in furniture[11] – shows that the use of OFRs is unnecessary and removing these chemicals from products is feasible.

- Under the Toxic Substances Control Act, the U.S. Environmental Protection Agency ("EPA") is conducting a risk assessment of a single OFR chemical – HBCD.[12] This chemical is not used extensively in consumer products. EPA is not currently developing regulations that would address any other OFR chemicals. The OFR chemicals that are now used extensively in consumer products are unlikely to be regulated under TSCA in the coming decade or more.

- There are gaping holes in current federal regulations governing OFRs in consumer products. For example, nothing in federal law prevents the import of consumer products containing PBDE flame retardants even though there is extensive data showing that this group of flame retardants contributes to intellectual impairment. Authority to ensure the safety of imported products falls squarely on the CPSC. EPA proposed a rule that would prevent import of products containing PBDEs in 2012,[13] but it has never been finalized. There is no reason for CPSC to expect that EPA will address this problem.

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[10] Briefing Package at 5, 13.

[11] *See* 38 MRSA § 1609-A, available at http://www.mainelegislature.org/legis/bills/getPDF.asp?paper=HP0138&item=9&snum=128. This law prohibits all OFRs and other flame retgardants in upholstered furniture.

[12] https://www.epa.gov/newsreleases/epa-names-first-chemicals-review-under-new-tsca-legislation.

[13] Proposed Rule, Certain Polybrominated Diphenylethers; Significant New Use Rule and Test Rule, 77 Fed. Reg. 19,862 (April 2, 2012).

C. Staff argues that there are no mandatory, voluntary, or international standards for the four product categories in the Petition.[14]

- The absence of such standards shows that adding OFRs to these consumer products is unnecessary.

- On the other hand, such standards are in the works here and in the EU. If adopted they could lead to renewed use of OFRs in the absence of a regulation under the FHSA.

D. Staff notes that it does not have sufficient information to evaluate the societal cost of injuries or illnesses associated with the use of OFRs.

- This is not a reason to deny the Petition. If the Petition is granted, CPSC can develop this data. We note that a recent study showed that the disease cost of exposure to endocrine-disrupting chemicals, including some OFRs, in the European Union is significant, with estimates in the range of $209 billion annually. *See* Leonardo Trasande et al., *Estimating Burden and Disease Ccosts of Exposure to Endocrine-Disrupting Chemicals in the European Union*, 100 J. Clin. Endocrinol. Metab. 1245 (2015).

E. Staff notes that the CPSC does not have guidelines that address the use of surrogate data for determining toxicity of a chemical where no toxicity data are available.[15]

- This is not a valid reason to deny the Petition. CPSC can rely on guidance from other agencies and bodies who have developed these methodologies. For example, the Food & Drug Administration ("FDA") recently withdrew approval for use of 3 long-chain perfluorinated compounds ("PFCs") the toxicity of which had not been studied, based on data for other long-chain PFCs, which the FDA found to be "applicable to long-chain PFCs on a general basis." See Indirect Food Additives: Paper and Paperboard Components, 81 Fed. Reg. 5 (Jan. 4, 2016), *available at* https://www.federalregister.gov/articles/2016/01/04/2015-33026/indirect-food-additives-paper-and-paperboard-components

- The Answers to QFRs submitted by Natural Resources Defense Council describes these methodologies in detail. The Briefing Package does not refer to this information.

Third: The *Staff Recommendation ignores the scientific evidence in the record supporting the class approach to regulation*

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[14] Briefing Package, at 5, 15.

[15] Briefing Package, at 10, 13, 23.

The Briefing Package repeatedly states that the CPSC lacks data that would be needed to regulate OFRs under the FHSA. Yet Staff overlooks expert testimony on the very subjects on which they claim a lack of information, such as whether it is appropriate to consider OFRs as a class. For example:

- Staff do not mention the witnesses who testified at the December 2015 hearing in support of the class approach, including Linda Birnbaum, Director of the National Institute of Environmental Health Sciences.

- Staff do not mention the hazard assessment of the OFR class performed by Dr. David Eastmond, Professor and Chair of the Department of Cell Biology and Neuroscience, and a Research Toxicologist at the University of California, Riverside.

- Staff do not mention the expert statements of Drs. Miriam Diamond, Rolf Halden or Dr. Terence J. Collins, submitted with the Petition.[16] These statements explain why OFRs should be considered a single chemical class.

Fourth: ***The staff recommendation for efforts the CPSC should take*** **in lieu** ***of granting the Petition would not protect children and other consumers.***

Staff recommends that rather than grant the Petition, they should "continue: (1) assessing FRs in children's products; (2) working with voluntary standards organizations that already exist for upholstered furniture, children's products, and electronic devices; (3) monitoring mattress compliance with federal flammability standards; and (4) working closely with EPA to coordinate activities on FR chemicals, including OFRs."[17] These actions would not protect children from OFRs, and could well lead to increased exposure.

- Merely "assessing FRs in children's products" will not protect children. At a minimum, if the CPSC determines that further study is needed, it should Grant the Petition and refer the matter to a Chronic Hazard Advisory Panel pursuant to 15 U.S.C. § 2077.
- Working with voluntary standards organizations could result in increased use of OFRs. The record is replete with information confirming that flame retardant chemicals are not needed in the products subject to the Petition. The National Fire Protection Association is working to develop open flame flammability standard for furniture that would *increase* use of toxic flame retardant chemicals.
- Monitoring mattresses for compliance with federal flammability standards will do nothing to limit OFR use in mattresses. While the federal flammability standard does not

[16] These statements are attached to the Briefing Package at 214, 342, and 180, respectively.
[17] Briefing Package at 25.

require use of OFRs in mattresses; it does not prohibit such use. Mattresses can be in compliance with the federal flammability standard and yet still contain OFRs.

- Working closely with EPA will not reduce exposure to OFRs from children's products, furniture, electronics or mattresses in the next decade or more, as EPA has not prioritized OFRs used in these consumer products for review under TSCA.

In conclusion, ***the CPSC should grant the Petition***. The Record on this Petition strongly supports the conclusion that the entire class of OFRs meets the "capacity to cause harm" and "may cause harm" based on customary use definition of 'hazardous substance."

- All OFRs for which there are data have been associated with long-term chronic health effects including reproductive impairment (e.g., abnormal gonadal development, reduced number of ovarian follicles, reduced sperm count, increased time to pregnancy); neurological impacts (e.g., decreased IQ in children, impaired memory, learning deficits, altered motor behavior, hyperactivity); endocrine disruption and interference with thyroid hormone action (potentially contributing to diabetes and obesity); genotoxicity; cancer; and immune disorders.
- Inherent physical, chemical, and biological characteristics of organohalogen chemicals suggest that the entire class of organohalogen flame retardants have (or are very likely to have) adverse health effects and therefore should be regulated as a class.
- Additive OFRs by their nature are semi-volatile and therefore will migrate out of products in which they are used
- Once these additive OFRs migrate out of products they will persist in the indoor environment, adhere to products and adsorb into house dust and people will be exposed to the chemical on the product and in the house dust through ingestion, inhalation and dermal exposure.
- Virtually all people living in this country already have OFRs in their bodies.
- Studies show evidence of adverse effects of exposure to OFRs on thyroid and brain development. Small changes in thyroid hormone levels during key periods of development can produce a lifetime of cognitive deficits
- Labeling is inadequate because migration of these semi-volatile chemicals from household products cannot be prevented, and knowledge that these toxic chemicals migrate from products into the indoor environment does not give consumers the ability to take meaningful measures to avoid exposures.

Thank you for the opportunity to comment.

Nancy Buermeyer
Breast Cancer Prevention Partners
(formerly known as the Breast Cancer Fund)

Breast Cancer Prevention Partners
Exposing The Cause Is The Cure

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U.S. Consumer Product Safety Commission
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Re: **Organohalogen Flame Retardants Petition; Oral Presentation**

The Breast Cancer Prevention Partners would like the opportunity to testify at the September 14th hearing on the "Staff Briefing Packaging in Response to the Petition Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants (OFRs)."

The Breast Cancer Prevention Partners (BCPP) is a national non-profit organization committed to preventing breast cancer by reducing exposure to chemicals and radiation linked to the disease. A strong and growing body of sound, peer-reviewed science shows a connection between exposure to chemicals, such as carcinogens and endocrine-disrupting compounds (EDCs), and an increased risk of certain cancers, including breast cancer. We are very concerned about consumer products that expose the public to these chemicals.

Organohalogen flame retardants are among the chemicals of serious concern to our organization, as we outlined in our testimony and "Responses to Questions for the Record" submitted to the Commission in January 2016.

Organohalogen flame retardants have been associated with serious health problems such as cancer, neurological impacts, reproductive impairments, endocrine disruption and more. Studies show that these chemicals migrate out of products into our homes, and into our bodies. Biomonitoring studies have found toxic chemicals in urine, blood, breast milk and even in the umbilical cord blood of newborns.

In reviewing the Staff Briefing Package, we have identified shortcomings in the analysis that have contributed to a recommendation to deny the underlying petition. Denying the petition would result in a failure by the Commission to adequately protect public health. We look forward to the opportunity provide more detailed comments regarding our concerns with the Staff Briefing at September 14th hearing. As BCPP is in San Francisco, we will be participating via phone.

Respectfully,

Nancy Buermeyer
Senior Policy Strategist
Breast Cancer Prevention Partners

Pamela Miller
Alaska Community Action on Toxics

From: Pamela Miller <pamela@akaction.org>
Sent: Thursday, August 31, 2017 5:03 PM
To: CPSC-OS
Subject: Organohalogen Flame Retardants Petition; Oral Presentation

To Whom It May Concern -

I will provide testimony on behalf of Alaska Community Action on Toxics during the September 14, 2017 public hearing on the **Organohalogen Flame Retardants Petition**. I will testify by phone. Because I will be calling from Alaska, I'd appreciate if my timeslot were no earlier than noon ET. If necessary, I will testify at an earlier time.

An outline of my testimony is as follows:

Particular concerns about the accumulation of organohalogen flame retardants (FRs) in northern/Arctic homes and health effects of exposures. Northern and Arctic homes are less well-ventilated due to the need for greater insulation against the cold.

Review of Alaska Community Action on Toxics community-based participatory research in the Arctic demonstrating presence of organohalogen flame retardants in household dust, blood serum, fish, and traditional foods of Indigenous peoples.

Support for the petition based on the lack of controls in the US that would prevent the "dumping" of products with unsafe levels of flame retardants into U.S. markets.

Review of the evidence of the north/Arctic as a hemispheric sink for persistent, bioaccumulative FRs.

Evidence of downstream impacts associated with the disposal of products with FRs.

Sincerely,

Pamela Miller
Executive Director
Alaska Community Action on Toxics
Co-Chair, International POPs Elimination Network

Pamela Miller
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Please donate to support environmental health and justice. Join in support of our work!
We believe that everyone has the right to clean air, clean water, and toxic-free food.

Rachel Weintraub
Consumer Federation of America

Consumer Federation of America

September 14, 2017
Statement of Rachel Weintraub,
Legislative Director and General Counsel, Consumer Federation
Before the
U.S. Consumer Product Safety Commission
Oral Presentation of Comments on the Petition Requesting Rulemaking on Products Containing Organohalogen
Flame Retardants [Docket No. CPSC–2015–0022]

I appreciate the opportunity to provide comments to you on the petition of the American Academy of Pediatrics, American Medical Women's Association, Consumer Federation of America, Consumers Union, Green Science Policy Institute, International Association of Fire Fighters, Kids in Danger, Philip J. Landrigan, M.D., M.P.H., League of United Latin American Citizens, Learning Disabilities Association of America, National Hispanic Medical Association, Earth Justice and Worksafe submitted to the Consumer Product Safety Commission (CPSC) requesting the CPSC to initiate rulemaking under the Federal Hazardous Substances Act to protect consumers from the health hazards caused by the use of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

I am Rachel Weintraub, Legislative Director and General Counsel at Consumer Federation of America (CFA). CFA is a non-profit association of approximately 280 pro-consumer groups that was founded in 1968 to advance the consumer interest through advocacy and education.

In my testimony, I will discuss the CPSC's legal authority to adopt standards under the Federal Hazardous Substances Act (FHSA) and why labeling under the FHSA is not adequate to protect consumers. I will be responding to statements made in the Staff Briefing Package[1] about the CPSC's legal authority under the FHSA. We urge the CPSC to grant the petition.

I. CPSC's Legal Authority to Adopt Mandatory Standards Under the Federal Hazardous Substances Act to Protect Children from the Health Hazards Caused by the use of Non-Polymeric, Additive Form, Organohalogen Flame Retardants in Children's Products, Furniture, Mattresses and the Casings Surrounding Electronics

A. Federal Hazardous Substances Act (FHSA)

[1] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7.

The CPSC has clear authority to take the actions requested in this petition. The Petition requests that the CPSC adopt mandatory standards under the FHSA to protect consumers from the health hazards caused by the use of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

The FHSA gives the CPSC the authority to require precautionary labeling on hazardous consumer products and to ban products that pose a hazard to consumers when labeling would not adequately protect consumers from the hazard.

The FHSA establishes that in order to ban a product, the CPSC "may by regulation declare to be a hazardous substance . . . any substance or mixture of substances,"[2] which is "toxic,"[3] if such substance "may cause substantial personal injury or substantial illness during or as a proximate result of any customary or reasonably foreseeable handling or use."[4] The FHSA defines "toxic" to mean any substance that has "the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any body surface."[5]

A critical aspect of this definition of a "hazardous substance" is that the determination is based on the capacity and potential to cause harm based on exposure from customary use. Notably, the Staff Briefing Package does not focus on the "may cause" aspect of the FHSA's definition of toxicity, nor does it reiterate the FHSA's definition of toxicity to include a substance that has "the capacity to produce" personal injury.[6] The failure to include and consider this statutory language in the Staff Briefing Package not only misconstrues the FHSA's standard for what is a hazardous substance but also leaves out the critical legal analysis that clarifies the CPSC's authority to take action consistent with the FHSA.

The CPSC's regulation explains that "[s]ubstantial personal injury or illness means any injury or illness of a significant nature. It does not have to be severe or serious but it cannot be an "insignificant or negligible injury or illness."[7] A household product that is determined to be a "hazardous substance" cannot be sold without a warning label, and if a warning label is not adequate – as it is not here – the product cannot be sold. A warning would not be adequate here because the migration of these semi-volatile chemicals from household products cannot be prevented, and knowledge that these toxic chemicals migrate from products into the indoor environment does not give consumers the ability to take meaningful measures to avoid exposure.

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[2] 15 U.S.C. § 1262(a)(1).

[3] 15 U.S.C. § 1261(f)(1)(A)(i).

[4] 15 U.S.C. § 1261(f)(1)(A).

[5] 15 U.S.C. § 1261(g).

[6] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 5.

[7] 16 C.F.R. § 1500.3(c)(7)(ii).

The FHSA specifically focuses on children's products. The FHSA includes that any "article intended for use by children, which is a hazardous substance, or which bears or contains a hazardous substance in such manner as to be susceptible of access by a child," is automatically deemed a "banned hazardous substance."[8] In the case of a household article classified as a "hazardous substance," but not intended for use by children, the CPSC may classify it as a "banned hazardous substance "despite its labeling, if the CPSC determines that

> notwithstanding [any] cautionary labeling . . . , the degree or nature of the hazard involved in the presence or use of such substance in households is such that the objective of the protection of the public health and safety can be adequately served only by keeping such substance, when … intended or packaged [for use in the household], out of the channels of interstate commerce.[9]

The CPSC has recognized that the FHSA "defines the term 'toxic' very broadly," and "[t]his broad statutory definition covers both acute and chronic toxicity."[10] While the CPSC regulations and guidelines discuss the particular chronic hazards of cancer, neurotoxicity, and developmental or reproductive toxicity, "*the definition is not limited to these hazards, but includes other chronic hazards.*"[11] The determination of what is "toxic" under the FHSA "is a complex matter requiring the assessment of many factors."[12] There is no formula for what is "toxic," and no requirement that risks meet any particular threshold before regulation is warranted. As the Court of Appeals for the D.C. Circuit has explained: "There is no indication in the language of the [FHSA] or its legislative history that the Commission was bound to develop a precise 'body count' of actual injuries that will be reduced by each regulatory provision."[13]

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[8] 15 U.S.C. § 1261(q)(1)(A). Special rules apply to articles like chemical sets that are inherently hazardous if they are appropriately labeled and are intended for use by mature children. *Id.*

[9] 15 U.S.C. § 1261(q)(1)(B).

[10] *Labeling Requirements for Art Materials Presenting Chronic Hazards; Guidelines for Determining Chronic Toxicity of Products Subject to the FHSA; Supplementary Definition of "Toxic" under the Federal Hazardous Substances Act*, 57 Fed. Reg. 46,626, 46,656 (Oct. 9, 1992).

[11] *Id.* at 46657 (emphasis added).

[12] 57 Fed. Reg. 46,626, 46,657. In 2008, the FHSA was amended to make it easier for the CPSC to issue regulations finding that a substance is a "hazardous" or "banned hazardous" substance. Prior to the 2008 amendments, proceedings for the issuance of regulations under the FHSA were governed by section 701 of the Federal Food, Drug and Cosmetic Act ("FFDCA"). 21 U.S.C. § 371. Some case law suggested that the FFDCA set a high bar for regulation. *Cf. Consumer Fed'n of Am., v. CPSC*, 883 F.2d 1073 (D.C. Cir. 1989) (upholding the CPSC's denial of a petition to ban the use of methylene chloride in household products because it did not meet the FFDCA standard). Since that case was decided, Congress dropped the requirement that FHSA regulations meet the FFDCA's "reasonable grounds" standard. *See* Pub. Law 110-314 § 204(b)(2) (Aug. 14, 2008). Instead, proceedings to ban a "hazardous substance" are governed solely by provisions of the FHSA. 15 U.S.C. § 1261(q)(2) ("Proceedings for the issuance . . . of regulations [related to banning a "hazardous substance"] shall be governed by the provisions of subsections (f) through (i) of section 1262 of this title," except in the event of imminent hazard when more streamlined procedures may apply). The 2008 amendment signifies Congressional intent to make it easier for the CPSC to regulate under the FHSA.

[13] *Forester v. CPSC*, 559 F.2d 774, 788 (D.C. Cir. 1977).

Non-polymeric, additive form, organohalogen flame retardants pose chronic hazards to consumers because of their physical, chemical and biological properties. These hazards are well documented and include reproductive impairment, neurological impacts, endocrine disruption and interference with thyroid hormone action, genotoxicity, cancer and immune disorders. These adverse health impacts meet the standard established in the FHSA for a toxic substance that has the capacity to produce personal injury or illness to man through ingestion, inhalation, or absorption through any body surface. In addition, through the reasonably foreseeable handling or use of children's products, furniture, mattresses and electronics, consumers can be exposed to these chemicals since they migrate out of the product.

1. CPSC Briefing package does not consider scientific evidence supporting the Petition

    a. Flawed interpretation of "mere presence" of a chemical

In the Staff Briefing Package, CPSC states, numerous times that the mere presence of organohalogens in the blood or urine of individuals does not indicate harm.[14] This misunderstands our argument and the factual analysis required under the FHSA. The fact that measurable levels of organohalogens are present in virtually the entire population indicates exposure to these chemicals. The additive nature of organohalogens renders them semi volatile, meaning that they will migrate out of products in which they are used. Our Petition included numerous scientific studies that document the harms of organohalogens. These adverse health impacts include reproductive impairment; neurological impacts; endocrine disruption; interference with thyroid hormone action; genotixicity; cancer; and immune disorders.

This argument in the Staff Briefing Package, that the "mere presence" of organohalogens in humans is not indicative of harm ignores the cumulative impacts of multiple chemicals acting on the same endpoints. This also fails to consider the science of low dose exposures. For example, organohalogens can harm children even at very low doses. Finally, this argument fails to consider the legal standard required by the FHSA requiring "capacity to cause personal illness" to meet the definition of toxicity.

    b. Failure to consider scientific evidence supporting class consideration

Further, in the Staff Briefing Package, staff reiterates that it cannot proceed with the Petition because it cannot consider organohalogens as a class.[15] The staff however, does not consider the

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[14] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 4.

[15] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 4.

comments provided by numerous eminent scientists[16] who support classifying organohalogens as a class. Staff also reiterates that toxicity data is incomplete but fails to consider data that provides an adequate basis for determining the toxicity of organohalogens. Such comments should be considered.

2. CPSC staff recommendation relies upon impermissible rationales

a. Regulation by other bodies renders CPSC action unnecessary

CPSC argues that various entities such as the European Union and some states have passed laws restricting organohalogen use and that has had an impact on decreasing exposure,[17] rendering such a rule unnecessary. We believe, rather, that this argument supports granting the petition because it indicates that such rules are effective and decrease potentially harmful exposure. Further, declining use is not a reason to fail to regulate as these chemicals are still used in consumer products. Importantly, the fact that some manufacturers are moving away from using these chemicals is evidence that some entities in the market would be supportive of CPSC action and that the use of organohalogens in not needed in these products.

b. Standards that do not require organohalogens indicate a lack of necessity for CPSC action

CPSC staff mentions the existence of fire safety standards that do not require the use of organohalogens,[18] which they determine indicates a lack of necessity for a rule to ban organohalogens. Organohalogens are used in consumer products to comply with fire safety standards. While not required, they are often the most cost effective way to comply with such standards. The fact that a standard does not require their use does not mean that organohalogens

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[16] For example, Statement of Terrence J Collins, Tab I, Exhibit A, United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 181 to 210; Statement of David Eastmond, Tab 1, Exhibit C United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 288- 315.

[17] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 14.

[18] United States Consumer Product Safety Commission Staff Briefing Package In Response to Petition HP 15-1. Requesting Rulemaking on Certain Products Containing Organohalogen Flame Retardants, May 24, 2017, available on the web at https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISjMHFEdWKZ7 at 134 and 138.

will not be used. The, CPSC should act to move forward with rulemaking to protect consumers from the health hazards caused by the use of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

Thus, due to the hazards posed by non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics, CPSC has the authority under the FHSA to declare these products a banned hazardous substance. The Staff Briefing Package failed to consider scientific data supporting the petition and relied upon impermissible rationales to justify the Petition's inability to meet the FHSA's legal standards.

B. Courts Interpretation of the FHSA

1. Deference to CPSC

Courts have not questioned the conclusion that a variety of household products containing chemicals, such as Drano (a drain declogger) and Liquid Wrench (a spray lubricant) are "hazardous substances" within the meaning of the FHSA.[19]

Courts have also given significant deference to the CPSC's determinations that a product is a "hazardous substance." For example, the Second Circuit Court of Appeals agreed with the CPSC that foam spray paint (essentially food-colored shaving cream) intended for use by children is a "hazardous substance" under the FHSA.[20] The court "defer[red] to the agency's interpretation of the substantial injury requirement" because it was not arbitrary, capricious or manifestly contrary to law.[21] The court emphasized that the statute only required that the product "may cause" substantial injury, and did not require that the product would "likely" cause injury.[22]

2. Precedent for Regulating Classes of Products Under the FHSA

The Petition requests that the CPSC ban a class of flame retardants in four product categories. There is solid precedent for regulating classes of products under the FHSA. The CPSC Staff Briefing Package does not consider this precedent. In *Toy Manufacturers of America, Inc. v. CPSC*, 630 F.2d 70 (2d Cir. 1980), a trade association of toy manufacturers challenged a rule issued under the FHSA, which banned toys intended for use by young children that present

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[19] *See Miles v. S.C. Johnson & Son, Inc.*, No. 00 C 3278, 2002 Westlaw 31655188, at *1 (N.D. Ill. Nov. 25, 2002) ("CPSC has determined that sodium hydroxide, the primary ingredient in Drano, is a hazardous substance."); *Wagoner v. Exxon Mobil Corp.*, 832 F. Supp. 2d 664, 668 (E.D. La. 2011) ("Defendant does not argue that its Liquid Wrench product contains a banned hazardous substance"); *cf. Leibstein v. LaFarge N. Am., Inc.*, 689 F. Supp. 2d 373, 381 (E.D.N.Y. 2010) (it is undisputed that cement product is a "hazardous substance" because it is corrosive).

[20] *United States v. Articles of Banned Hazardous Substances Consisting of an Undetermined Number of Cans of Rainbow Foam Paint*, 34 F.3d 91 (2d Cir. 1994).

[21] 34 F.3d at 97.

[22] *Id.* at 97-98.

choking hazards because of small parts. The toy industry argued that the FHSA was intended to deal only with specific, individual articles, and "not with a broad range of products at the same time."[23] The court soundly rejected this argument, saying: "Certainly, nothing in the FHSA explicitly limits the employment of its banning procedures to situations involving only individual products . . . ."[24] The court went on to note that "[t]he legislative history appears clear in favoring general prescriptive regulations of *the broadest, most comprehensive type* and would favor case-by-case proceedings only where such general prescriptive regulations prove impossible."[25] The court relied on language from the FHSA legislative history in which the Senate Report states:

> It is intended that most determinations made by the (CPSC) will be in the form of general prescriptive rules, further amplifying the definition of . . . hazardous substances where necessary.[26]

The class of organohalogen flame retardants in the product categories described in the Petition is like small parts in toys: these chemicals are intrinsically dangerous by virtue of their inherent characteristics. Consumer products in the four categories at issue pose hazards when they contain any organohalogen flame retardant because of the intrinsic tendency of these semi-volatile chemicals to migrate out of products and attach to other media, such as house dust. Thus, for purposes of being a "hazardous substance" under the FHSA, each foreseeable way that these four categories of products are used, including, handling, mouthing, lying on and within, sleeping on, sitting in, playing with, or watching (as in a television) can pose a risk of harm to consumers if organohalogen flame retardants are added to these product categories during manufacturing. Indeed, the products may cause substantial personal injury or substantial personal illness as a result of their mere presence in the household, which is plainly a foreseeable handling or use.

It doesn't make sense for CPSC to regulate a product containing one organohalogen flame retardant only to see the same product manufactured with another flame retardant with the same physico-chemical properties.[27] Based on the understanding that the FHSA "favor[s] general prescriptive regulations of the broadest, most comprehensive type and would favor case-by-case proceedings only where such general prescriptive regulations prove impossible,"[28] and that there is strong evidence documenting that all chemicals in this class – due to their physico-chemical properties – are toxic and may cause substantial injury or illness, consumer products containing

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[23] 630 F.2d at 74.

[24] *Id.*

[25] *Id.* (citation omitted) (emphasis added).

[26] S. Rep. No. 91-237, 91st Cong., 1st Sess. 5 (1969).

[27] The fact that sulfuric acid is a single chemical, not a chemical class, and that drain openers is a single product category are irrelevant distinctions for purposes of this Petition. The CPSC's expressed preference for remedying consumer risk without inviting a similarly risky product as its replacement is just as applicable here as with the drain openers.

[28] 630 F.2d at 74.

organohalogen flame retardants as a class must be understood as "hazardous substances" within the meaning of the FHSA.[29]

C. CPSC has a Documented History Under the FHSA of Addressing Chemical Hazards in Consumer Products

The CPSC has regulated certain products containing specific chemicals under the FHSA due to the hazards posed by those chemicals. The request in this petition is consistent with those previous actions. However, the CPSC Staff Briefing Package does not consider this history. CPSC found that a number of substances are determined to be "banned hazardous substances"[30] because "they possess such a degree or nature of hazard that adequate cautionary labeling cannot be written and the public health and safety can be served only by keeping such articles out of interstate commerce."[31]

CPSC banned "[m]ixtures that are intended primarily for application to interior masonry walls, floors, etc., as a water repellant treatment and that are extremely flammable,"[32] "[c]arbon tetrachloride and mixtures containing it (including carbon tetrachloride and mixtures containing it used in fire extinguishers), excluding unavoidable manufacturing residues of carbon tetrachloride in other chemicals that under reasonably foreseeable conditions of use do not result in an atmospheric concentration of carbon tetrachloride greater than 10 parts per million,"[33] "products containing soluble cyanide salts, excluding unavoidable manufacturing residues of cyanide salts in other chemicals that under reasonable and foreseeable conditions of use will not result in a concentration of cyanide greater than 25 parts per million,"[34] and [g]eneral-use garments containing asbestos (other than garments having a bona fide application for personal protection against thermal injury and so constructed that the asbestos fibers will not become airborne under reasonably foreseeable conditions of use).[35]

Therefore, it is clear that the CPSC has banned chemicals in consumer products that have posed various risks to consumers since labeling would have been inadequate to protect the public health.

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[29] Under the authority of the FHSA, products containing several chemical substances have been found to be "hazardous substances," requiring labeling. These include: diethylene glycol; ethylene glycol; products containing 5% or more benzene; methyl alcohol; turpentine; toluene, and xylene. When the FDA (which administered the FHSA at the time these regulations were adopted) first proposed to regulate products containing these chemicals as "hazardous substances," it said it was doing so based on "human experience" and "together with opinions of informed medical experts." 28 Fed. Reg. 2686, 2686 (Mar. 19, 1963).

[30] 16 CFR 1500 17

[31] 16 CFR 1500 17

[32] 16 CFR 1500 17(1)

[33] 16 CFR 1500 17 (2)

[34] 16 CFR 1500 17(5)

[35] 16 CFR 1500 17(7)

This Petition requests that the CPSC follow that precedent and use its authority under the FHSA to ban children's products, furniture, mattresses and the casings surrounding electronics containing non-polymeric, additive form, organohalogen flame retardants due to the hazards they pose to consumers.

II. Labeling Products Indicating that they Contain Non-Polymeric, Additive Form, Organohalogen Flame Retardants Would Not Adequately Protect the Public Health

Under the authority of section 2(q)(1)(B) of the FHSA, the Commission may "declare" as "banned hazardous substances" "articles because they possess such a degree or nature of hazard that adequate cautionary labeling cannot be written and the public health and safety can be served only by keeping such articles out of interstate commerce."[36] The FHSA clearly provides the CPSC with the authority to ban products containing a toxic hazardous substance if a label would not be adequate. Our request in the petition meets this threshold. The CPSC Staff Briefing Package did not consider this analysis.

The hazards posed by non-polymeric, additive form, organohalogen flame retardants could not be effectively addressed by a label. First, consumers are not aware of the potential hazard and when the hazard is not obvious, a warning label would not be effective. More importantly, there is no particular type of use, condition, or behavior that a consumer could take to avoid adverse health impacts from exposure to these flame retardants. Knowledge of a potential health hazard, alone, without a clear alternative, will not provide consumers with sufficient information nor options to effectively limit their exposure. Knowledge could increase consumer awareness of health impacts but without clear alternatives to products, may lead to consumer confusion in this context.

Significantly, when addressing a product safety hazard, "the safety hierarchy" establishes a recommended approach. "The basic sequence of priorities in the hierarchy consists of three approaches: first to design it out, second to guard, and third to warn."[37] If a product poses a safety hazard to consumers, the first and most effective step is to eliminate the hazard from the product. The second step in the hierarchy is to guard a consumer from the hazard posed by the product. "Personal protective equipment such as rubber gloves and goggles, barricades on the highway, and bed rails on the side of an infant's crib are examples of physical guards."[38] It is unlikely that guarding against the migration of flame retardants from consumer products is feasible.

The lowest level of the hierarchy is warning consumers of the potential hazard. "Warnings are third in the priority sequence because they are generally less reliable than design or guarding

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[36] 16 CFR 1500.17(a)

[37] Kenneth R. Laughery, Michael S Wogalter, "The Safety Hierarch and Its Role in Safety Decisions," available on the web at http://www.safetyhumanfactors.org/wp-content/uploads/2011/12/314LaugheryWogalter2010.pdf

[38] Ibid at 1.

solutions."[39] "Warnings are generally most effective when the user is new to the task and especially when the user already believes that risk exists. On the other hand, warnings are least effective when there is no perceived risk. In other words, they are most likely to fail in the very circumstances where they are most needed."[40]

Consumers do not perceive that there is a risk of flame retardant exposure when they are using consumer products. This is the circumstance determined to be the least effective to warn against. Thus, addressing the adverse health impacts from the use of certain flame retardants in children's products, furniture, mattresses and the casings surrounding electronics through the use of warning labels would not adequately serve the public health and safety of consumers.

III. Conclusion

In conclusion, under the FHSA, the CPSC has explicit authority to protect consumers from the health hazards caused by the use of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

The FHSA gives the CPSC the authority to require precautionary labeling on hazardous consumer products and to ban products that pose such a significant hazard to consumers that labeling would not adequately protect consumers from the hazard. Warning consumers of hazards would not adequately protect consumers from the adverse health impacts of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

Courts have deferred to the CPSC when the CPSC has acted to ban substances in consumer products under the FHSA and courts have affirmed that the CPSC not only has the authority but that it is preferential to regulate a class rather than an individual ingredient or product. Further, CPSC has a history of banning hazardous chemicals in consumer products.

The CPSC Staff Briefing Package, however, fails to consider scientific evidence supporting the Petition, uses impermissible rationales to justify denial of the Petition, and does not consider all aspects of the FHSA standard for hazardous products and toxicity. We urge the Commission to use their authority to grant the Petition and protect consumers from the documented hazards posed by the use of non-polymeric, additive form, organohalogen flame retardants in children's products, furniture, mattresses and the casings surrounding electronics.

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[39] Ibid.

[40] Marc Green, "Safety Hierarchy: Design Vs. Warnings," available on the web at http://www.visualexpert.com/Resources/safetyhierarchy.html

Ricardo Simmonds
United States Conference of Catholic Bishops

Statement of Ricardo Simmonds
Environmental Policy Advisor, United States Conference of Catholic Bishops
U.S. Consumer Product Safety Commission
Organohalogen Flame Retardants Petition; Oral Presentation [Docket No. CPSC–2015–0022]
Submitted by email: cpsc-os@cpsc.rog
August 31, 2017

RE: Petition for Rulemaking to Protect Consumers and Children from Toxic Flame Retardant Chemicals in Four Categories of Household Products

My name is Ricardo Simmons and I present before you today on behalf of the United States Conference of Catholic Bishops ("Conference") to comment on the petition to ban organohalogen flame retardants from consumer products.

The United States Conference of Catholic Bishops (USCCB) is an assembly of the hierarchy of the United States and the U.S. Virgin Islands, and the purpose of our organization is "to unify, coordinate, encourage, promote and carry on Catholic activities in the United States; to organize and conduct religious, charitable and social welfare work at home and abroad; to aid in education; to care for immigrants; and generally to enter into and promote by education, publication and direction the objects of its being."

Children, inside and outside the womb, are uniquely vulnerable to environmental hazards and exposure to toxic pollutants in the environment. Their bodies, behaviors and size leave them more exposed than adults to such health hazards. Because children are exposed to environmental hazards at an early age, they have more extended time to develop slowly-progressing environmentally triggered illnesses such as asthma, certain cancers, learning disabilities and other illnesses that adversely affect childhood development. Exposure to toxic chemicals is significantly more harmful to children, born and unborn.

In an effort to develop the leadership of Catholic organizations and networks to help address environmental hazards affecting children's health, a coalition of major Catholic organizations formed the Catholic Coalition for Children and a Safe Environment (CASE). In 2007, CASE members hosted a major conference on the effects of environmental toxins on unborn children, "Protecting Human Life and Caring for Creation," held at the United States Conference of Catholic Bishops (USCCB). This network of national Catholic institutions assists the bishops in sharing Church teaching on the environment, stewardship, justice, the common good, and the priority for the poor, and how these social teachings urge Catholics to care for creation and

protect the lives of children who are vulnerable to environmental threats. This unprecedented and groundbreaking event brought together prominent leaders from the Catholic community, government, and the public health sector to learn more about how unborn children are exposed to environmental harm, how this exposure affects them later in life, and what can be done to better protect them. Building on this collaboration, in July 2008 a convocation on "Life, Justice & Family: Partners in the New Evangelization" included a session on "Toxins, the Environment and the Child in the Womb."

To learn and disseminate information about environmental threats that may affect children's health, we are continuously monitoring information about the effect of environmental threats on children's health and to identify opportunities to strengthen policies that protect children, born and unborn, from exposure to harmful toxins and chemicals.

What we know about organohalogen flame retardant chemicals compels us to sit before you today. Among many things, this class of chemicals has been associated with serious human health problems, including cancer, increased time to pregnancy, decreased IQ in children, impaired memory, learning deficits, hyperactivity, hormone disruption and lowered immunity.

As Catholics, we are called to care for God's gift of creation and to protect the most vulnerable among us. Caught in a spiral of poverty and environmental degradation, the poor and the powerless bear a disproportionate burden of the effects of exposure to environmental problems, as their lands and neighborhoods are more likely to be polluted, to be near toxic waste dumps, or to suffer from water contamination. In the face of these challenges, the Catholic community is called to learn more, care more, and do more about the environmental threats to our children.

Commisioners, you have the unique opportunity and duty to protect our children and our families. You can help minimize the risks that our fire fighters face every day, when they put their lives on the line for us all. The Conference urges the CPSC to ban these toxic and pervasive chemicals from children's products, furniture, mattresses and the casings around electronics. Doing so would protect the health and welfare of all people, especially the most vulnerable members of our society, including unborn and other young children, from harmful exposure to these toxic chemicals. While we are not experts on organohalogen flame retardants, our support for a CPSC ban of these chemicals is guided by Catholic teaching, which calls us to care for God's creation and protect the common good and the life and dignity of human persons, especially the poor and vulnerable, from conception until natural death. As we articulated in Putting Children and Families First: "For generations, the Catholic community has reached out to children... We have defended their right to life itself and their right to live with dignity, to realize the bright promise and opportunity of childhood. We seek to bring new hope and concrete help to a generation of children at risk."

Arlene Blum, Ph.D.
Green Science Policy Institute

Organohalogen Flame Retardants Petition
Oral Presentation

Arlene Blum PhD, will present via phone (available all day)

I am the executive director of the Green Science Policy Institute and a Research Associate in Chemistry at UC Berkeley. The Institute brings together business, government, scientists and citizens groups to support chemical policies to protect human health and the global environment. Our research and policy work sharing peer-reviewed scientific research has contributed to preventing the unnecessary use of flame retardants and other harmful chemicals in children's sleepwear, furniture, electronics, and other products world-wide

During my presentation, I will briefly discuss the Chemical Class Approach, how it applies to flame retardants in consumer products and why this approach is necessary for protecting the health of our population from these harmful chemicals in consumer products.

As we know, most of the more than 80,000 registered chemicals in commerce lack adequate toxicological information. After a chemical begins to show adverse health outcomes, it can take many years for it to be phased out or banned. The replacement is often a closely related chemical, in a cycle of regrettable substitutions. Meanwhile, the incidence of health and ecological harm, including neurological, endocrine and immune disorders, reduced fertility, and cancer – all of which may be associated with chemical exposure – is increasing.

Rather than addressing these tens of thousands of chemicals on the market one at a time, the Chemical Class Approach provides an understanding of why some entire chemical families or classes commonly found in consumer products are all likely to be harmful. Reducing the use of entire classes of chemicals of concern, especially when their function is not essential, will prevent regrettable substitutions and lead to healthier consumer products.

Among the thousands of synthetic chemicals produced by industry, the class of organohalogens (compounds in which carbon is bonded to bromine, chlorine, or fluorine) is uniquely problematic. These chemicals are often toxic, lipophilic (fat-loving), and resistant to degradation, leading to their persistence and bioaccumulation in our bodies and the environment. All 24 chemicals globally banned as Persistent Organic Pollutants under the Stockholm Convention are organohalogens.

One major use of organohalogens is as flame retardants that are added to furniture, baby products, electronics, mattresses, and other home products. These retardants have been found to cause adverse reproductive, genotoxic, immunotoxic, neurotoxic, and/or carcinogenic outcomes in many hundreds of in vitro, animal, and juman studies. In humans they are associated with reduced IQ (similar to lead poisoning), reduced fertility, birth defects, and hormonal changes. Many are similar in structure or even identical to banned chemicals such as DDT, Mirex, and PCBs. Harmful flame retardants have been found at pound levels in consumer products a typical home.

The retardants are semi-volatile and continuously escape from products into house dust which is ingested by humans and pets. Biomonitoring studies find organohalogen flame retardants in the blood and body tissues of nearly all Americans tested. If we can reduce human exposure to this class of harmful chemicals, we can similarly reduce health problems and have a safer, healthier environment for all.

The use of these retardants can be greatly reduced without impacting fire safety. Flame retardants, as they had used to meet in furniture, baby products, mattresses and electronics cases for example do not increase overall fire safety. They delay ignition a few seconds and then burn to produce toxic gases that are related to most fire deaths.

Beginning with the removal of Tris or TDCPP from children's pajamas in 1977, a series of organohalogen flame retardants have been banned, only to be replaced by others with similar structures and properties. Although safer alternatives exist, organohalogen chemical additives are the usual way for manufacturers to comply with flammability standards for home products. When one is phased out, manufacturers usually replace it with another organohalogen. Continuing to evaluate and ban these chemicals one at a time, currently the standard means of regulating industrial chemicals, is like "whack-a-mole" and could lead to in prolonged exposure and harm to our health and the environment for decades to come.

According to Terry Collins, the Teresa Heinz Professor of Green Chemistry in the Department of Chemistry, and the Director of the Institute for Green Science at the Carnegie Mellon University, whose statement begins on page 180 of the Briefing Package text (182 of pdf) :

"Organohalogen flame retardants have highly persistent and toxic combustion by-products, readily bioaccumulate and can resist breakdown inside cells, can modify the DNA or disrupt its function, and can act as endocrine disruptors. To the best of my knowledge, there is no sound evidence showing a lack of health harm for any organohalogen flame retardants studied to date."

Rolf Halden, Director of the Center for Environmental Security at the Biodesign Institute and Professor in the Ira A. Fulton School for Sustainable Engineering and the Built Environment, Arizona State University, whose statement begins on page 340 of the Briefing Package, states:

"I strongly believe that there is a need to regulate hazardous chemicals, such as organohalogen flame retardants, as classes or compound families. The mass manufacture of toxic chemicals that lack effective routes of degradation creates unnecessary problems for current and future generations. The solution to this problem ultimately depends on curtailing the use and production of chemicals sharing structural and functional similarity to known hazardous compounds, rather than making minor modifications to the carbon backbone or halogen substitution pattern, and then hoping for a different, better outcome."

Given the weight of the evidence showing the toxicity and persistence of organohalogen flame retardants, it is necessary to regulate the use of these organohalogen chemicals in consumer products following the Chemical Class Approach.

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Given the weight of the evidence showing the toxicity and persistence of organohalogen flame retardants, it is necessary to phase out the use of these organohalogen chemicals in consumer products following the Chemical Class Approach.

Arlene Blum, PhD
arlene@arleneblum.com
Research Associate in Chemistry, UC Berkeley
Executive Director, Green Science Policy Institute

Michael Walls
American Chemistry Council

Outline of ACC Remarks on Petition 15-1

Before the Consumer Product Safety Commission

September 14, 2017

Chair Buerkle and Commissioners, my name is Michael Walls, Vice President of Regulatory and Technical Affairs for the American Chemistry Council.

The ACC appreciates the opportunity to testify today and look forward to additional opportunities to provide information to the Commission on overall chemical safety and chemical regulation.

I am speaking today in support of the Staff Briefing Package in response to *Petition HP 15-1 Requesting Rulemaking on Products Containing Organohalogens*, and the staff recommendation that the Commission deny the petition.

Overall my testimony emphasizes three key points:

1. **The substances that are the subject of the petition have already been or are currently being reviewed for their safety by EPA under a comprehensive regulatory system in place to assess and regulate chemicals.**

    - The CPSC has a clear role to play in regulating consumer products, but this petition would have the CPSC duplicate the existing work of EPA to assess the safety of chemicals.

    - The chemical industry is one of the most heavily regulated in the United States. In the U.S., more than a dozen federal laws govern the safe manufacture and use of chemicals, primary among them is the Toxic Substances Control Act (TSCA). Flame retardants on the market today, like all chemicals, are subject to review by the U.S. Environmental Protection Agency (EPA) under the recently modernized TSCA, as well as by other national regulatory agencies around the world.

    - Furthermore, new developed substances are subject to rigorous evaluation under the recently modernized TSCA before they can be manufactured commercially.

2. **The federal regulatory system and the new Lautenberg Chemical Safety Act already provide an effective system for regulation chemicals.**

    - More than a dozen federal laws govern the safe manufacture and use of chemicals in the U.S. Primary among these is the Toxic Substances Control Act (TSCA). In June 2016, Congress overwhelmingly passed the bipartisan Frank R. Lautenberg Chemical Safety for the 21st Century Act (LCSA) to modernize TSCA. This legislation had broad support from environmental groups, public health organizations, labor unions and business and was signed into law by President Obama. This new regulatory program significantly enhances the way we assess and regulate chemicals in the U.S. We are submitting an overview of the requirements of the modernized TSCA but some highlights regarding the regulation of new and existing chemicals include:

- New Chemicals – New substances are subject to rigorous evaluation before they can be manufactured commercially. In the U.S. this includes requirements for companies to submit "pre-manufacture notices" under TSCA with information on physical/chemical characteristics, any available health or environmental effects data, and anticipated use and exposure information, including any information on potential byproducts and disposal. EPA must conduct a review and make an affirmative determination that a substance does not present an unreasonable risk before a new chemical can come to market. As part of this process, the EPA can prohibit the manufacture of the new substance entirely, impose restrictions on its use, or require additional testing at any time.
- Existing Chemicals – TSCA provides a broad range of regulatory authority to EPA for the management of existing chemicals and EPA has already prioritized several flame retardant chemicals for both regulation and further assessment. Overall the The new modernized TSCA:
  - Provides for a risk-based review of all chemicals in commerce.
  - Requires EPA to review and identify high and low priority chemicals that considers a chemical's inherent hazards; uses; typical exposures to people, including vulnerable groups, and the environment; proximity to drinking water sources; and other relevant information.
  - Requires EPA to consider vulnerable groups like infants, pregnant women, and the elderly when reviewing chemicals for safety
  - Requires EPA to complete a thorough risk evaluation on all chemicals designated as "high priority."
  - Mandates that safety reviews consider potential harm, uses, and exposures so conclusions reflect real-world circumstances.
  - Makes it easier for EPA to require more safety testing of chemicals.

3. **The petition advances an inappropriate and troubling application of the FHSA and should be rejected, and the staff recommendation recognizes this in its assessment.**

   - The petition is overly broad. The petition addresses <u>at least</u> 25 distinct chemicals and four types of products that include not dozens but hundreds of product categories. The hazard and risk profile of each of these chemicals is different and grouping them together into categories is neither appropriate nor scientifically accurate.

   - The petition does not meet criteria outlined in the Federal Hazardous Substances Act (FHSA) to ban products.

- The CPSC is to regulate products that result in injury and death because of the product's design, and because of the product's *foreseeable* use by consumers in real life settings.

Conclusion

Thank you for your time and we would be happy to answer any questions.

Robert Simon
American Chemistry Council/North
American Flame Retardant Alliance

Outline of NAFRA Remarks on Petition 15-1
Before the Consumer Product Safety Commission
September 14, 2017

Chair Buerkle and Commissioners, my name is Robert J. Simon, and I am here today representing the American Chemistry Council and its North American Flame Retardant Alliance.[i] NAFRA members include Albemarle Corporation, Lanxess, and ICL Industrial Products who are the leading producers of flame retardants (including, but not limited to, organohalogenated flame retardants) that are used in a wide variety of industrial and consumer applications.

NAFRA members companies represent the cutting edge of fire-safety chemistry and technology, and are dedicated to improving fire safety performance in a myriad of end uses.

We would like to emphasize that our industry has a strong commitment to safety and product stewardship. As members of the American Chemistry Council, NAFRA companies implement Responsible Care®, the chemical industry's world-class environmental, health, safety and security performance initiative. This includes third party verification and implementation of the new ACC Responsible Care Product Safety Code which goes beyond regulatory requirements and obligates chemical manufacturers to manage the safety of their chemical products, from inception to end-of-life. Overall, we support a strong and transparent regulatory system that provides both strong fire protection and chemical safety.

We appreciate the opportunity to testify today.

I am speaking today in support of the Staff Briefing Package in response to *Petition HP 15-1 Requesting Rulemaking on Products Containing Organohalogens*, and the staff recommendation that the Commission deny the petition.

Overall my testimony emphasizes three key points:

1. **Fire safety remains a critical objective for the CPSC and flame retardants are an important tool to help reduce fires, fire deaths and property damage.**

    - Fires have dropped significantly over the past 40 years and a major contributor to the decline in fires and fire deaths since the 1970s was the development of a comprehensive set of fire-safety measures that include flame retardants.

    - Fire, however, still represents a very real danger in the United States, with fire departments responding to a fire every 23 seconds (2015 data).[ii] As reported by the CPSC under the Chairman's 2015 Challenge, there were an estimated annual average of 360,400 fires, 2,170 deaths, 12,720 injuries and $6.49 billion in property loss.

    - The nature of today's consumer products present greater fire risks than ever before. Our homes and offices have more synthetic materials than they did 30 years ago. This has changed the nature of fire risk by increasing the potential flammability of products. So as the CPSC assesses this petition it is critical that it take into account both chemical safety and fire safety.

- Flame retardants have been proven effective in preventing fires or if a fire does occur, slowing the fire's progression, giving individuals and families extra time to escape from potentially dangerous fire situations and fire fighters more time to respond.

- As the CPSC knows, there are key existing fire safety standards that have been developed to ensure public safety. Regulation as requested by the petition could undermine the ability of product manufacturers to meet established fire safety standards and thus compromise fire safety.

2. **Flame retardants include a broad range of products with differing characteristics, formulations and intended uses, so it is not appropriate to make broad conclusions or impose a one-size fits all regulatory approach for this wide range of substances.**

- A variety of different chemicals, with different properties and structures, act as flame retardants. A variety of flame retardants is necessary because the materials that need to be made fire-resistant are very different in their physical nature and chemical composition, as are the end-use performance requirements of the final product.

- It is also important to note that flame retardants are not readily interchangeable. Their areas of application are often specific and substitution can be difficult.

- The hazard and risk profile of each individual flame retardant compound is different. It is scientifically incorrect to apply the same profile for all and this is recognized in the CPSC staff assessment.

- The petition asks for the restriction of substances that a.) have been assessed for their safety by other government agencies and b.) even those that haven't even been developed yet, without full consideration of their actual safety or risk.

3. **Flame retardants are reviewed for their safety by regulators around the world and the Petition would ban substances that government regulators have determined do not present a risk as well as new, innovative substances developed in the future that are approved by regulators for their intended use.**

- In the U.S. more than a dozen federal laws govern the safe manufacture and use of chemicals. Flame retardant chemicals on the market today, like all chemicals, are subject to review by the U.S. Environmental Protection Agency (EPA) and other national regulatory agencies around the world.

- This legislation would restrict a range of substances, including substances that government authorities have determined do not present a significant risk to human health or the environment.

- A good example of this is the fact that as part of its updated assessments of a broad range of flame retardants, US EPA has identified over 50 flame retardants that it says are unlikely to pose a risk to human health. For more information on the program, see http://www2.epa.gov/assessing-and-managing-chemicals-under-tsca/tsca-work-plan-chemicals

- This legislation would also restrict all new additive organohalogen flame retardant chemicals, including those not even developed yet and substances that government authorities have determined do not present a significant risk to human health or the environment. The approval process for new chemicals globally is extremely rigorous so it is unclear why the CPSC would want to prevent the development of new, innovative and sustainable products.

Conclusion

Our industry supports a strong, science-based, objective and transparent regulatory system. We urge the Commission to consider the information provided in the staff briefing and deny the petition.

Thank you for your time and we would be happy to answer any questions.

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[i] NAFRA members include Albemarle Corporation, Chemtura Corporation/Great Lakes Solutions, and ICL Industrial Products who manufacture flame retardants used in a wide variety of industrial and consumer applications.

[ii] National Fire Protection Association, "Fires in the U.S.," http://www.nfpa.org/research/reports-and-statistics/fires-in-the-us

Thomas Osimitz, Ph.D.
Science Strategies, LLC

Overview of Testimony of Thomas G. Osimitz, PhD, DABT, ERT
Testimony on Petition 15-1
Before the Consumer Product Safety Commission

September 14, 2017

Introduction

My name is Thomas Osimitz. By way of background, I have a doctorate degree in toxicology and am certified in toxicology by the American Board of Toxicology (DABT) and am also a European Registered Toxicologist (ERT). I am here to support the CPSC staff recommendation to deny the petition.

Key Points

I would like emphasis two important points with which I agree with the CPSC staff in recommending denial of the petition:

- Need to examine the flame retardants (FRs) as individual chemicals and not group them under the assumption that they have identical toxicological and environmental fate properties;
- Importance of considering exposure potential and risk before declaring an item hazardous under FHSA.

Need for Examination of Chemicals Individually

- FHSA requires that a substance be both "toxic" as well been shown to have "the potential to cause substantial personal injury or substantial illness during or as a result of customary and reasonably foreseeable handling or use,"
- Staff analysis concludes that differing physical and toxicological profiles make it impossible to treat the Oraganohalogen Flame Retardants (OFRs) as a group. Only some of the exemplary brominated or chlorinated (OFRs) meet that definition.

Consideration of Exposure and Risk as Required by FHSA

- I strongly support the CSPC staff in their position that the presence of a OFR in an article does not thereby make the item a "hazardous substance;
- Product specific and OFR-specific exposure and risk assessments need to be carried out to properly assess whether an item is "a hazardous substance" or not;
- Several published risk assessments demonstrate "reasonable certainty of no harm" for some of the OFRs that would be affected by the petition.

Written Comments

Written Comment
Chris Hudgins
International Sleep Products Association

International Sleep Products Association
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www.sleepproducts.org

August 31, 2017

Office of the Secretary
Consumer Product Safety Commission
4330 East-West Highway
Bethesda, MD 20814

Re: Comments on Products Containing Organohalogen Flame Retardants

The International Sleep Products Association provides these written comments for the record as part of the Consumer Product Safety Commission's (CPSC) public meeting regarding Earthjustice and Consumer Federation of America's petition (the Petition) requesting that certain organohalogen flame retardants be banned from a number of specific consumer products, including mattresses.[1] ISPA also refers the Commission to ISPA's comments filed in response to the Petition on January 19, 2016.

ISPA supports the conclusions reached by CPSC staff in the May 24, 2017 briefing package[2] that the petition should be denied on the basis that there is "[i]nsufficient toxicological and exposure data supporting the Petition."

CPSC staff notes that organohalogen flame retardants represent a broad and large class of compounds. Rather than ban the entire class of compounds as the petitioners request, individual compounds, or at most narrowly defined subclasses of them, should be examined to determine risk and exposure. ISPA is concerned that CPSC does not have the resources to undertake such a large assessment of an entire family of compounds, and to do so would divert attention from the agency's other goals. Such work is better suited for the Environmental Protection Agency under the recently updated Toxic Substance Control Act.

Staff also state there is not sufficient data to establish the toxicity of organohalogn flame retardants and the exposure posed by the products named in the petition to regulate them under the Federal Hazardous Substances Act. ISPA supports the staff conclusion and reiterates the following statement that we previously provided the CPSC in comments dated January 19, 2016 that we provided regarding the merits of the Petition:

> ISPA, however, is unaware of any U.S. manufacturers of new mattresses that use organohalogen flame retardants to meet the requirements of 16 C.F.R. Parts 1632 or

[1] 80 FR 50238 (Aug. 19, 2015).
[2] https://www.cpsc.gov/s3fs-public/PetitionHP15-1RequestingRulemakingonCertainProductsContainingOrganohalogenFlameRetardants.pdf?aTsa_sSaCiSMf1Z_2CfvISiMHFEdWKZ7

1633 (mattress flammability standards that address smoldering cigarette and open-flame ignition risks, respectively), product flammability standards that the Commission has promulgated under the Flammable Fabrics Act. Additionally, to the best of our knowledge, the Petition contains no chemical analysis of any new mattresses showing the presence of organohalogen fire retardants, and we are unaware of any other chemical analysis in the record in this regard.

Therefore, the Petition does not meet the requirement of 16 CFR 1051.5(a)(4) with regard to new mattresses manufactured in the United States. Furthermore, the Commission should initiate a rulemaking proceeding only when an actual or likely safety risk exists, and should refrain from initiating a rulemaking in those instances in which merely a theoretical or hypothetical risk exists. Accordingly, any rulemaking proceeding that the Commission may initiate in response to the Petition should exclude mattresses from its scope.

To the extent CPSC takes any further action on this subject, we reiterate our support for the CPSC taking a performance-based approach by regulating in a manner that provides sufficient flexibility to allow for the use of restricted chemicals in new ways, consistent with the requirements of the Federal Hazardous Substances Act, that either reduce the amount of the material used or eliminate or limit the risk of human exposure to it. By doing so, the Commission can improve consumer safety in the short term by limiting the current specific uses of given chemicals, while allowing future innovation and competition to develop other alternatives that can benefit consumers.

Please contact the undersigned should you have any questions regarding these comments.

Sincerely,

Ryan Trainer
President, ISPA

Written Comment
Bill Perdue
American Home Furnishings Alliance

August 31, 2017

Via Email: cpsc-os@cpsc.gov

Mr. ***Todd Stevenson***, Secretary
U.S. Consumer Product Safety Commission
Room 820, 4330 East West Highway
Bethesda, MD 20814-4408

Re: ***CPSC Docket No. CPSC–2015–0022-0214, Products Containing Organohalogen Flame Retardants***

Mr. Stevenson:

Please find enclosed comments by the ***American Home Furnishings Alliance*** (hereafter, AHFA) pertaining to ***CPSC Docket No. CPSC-2015-0022-0214***. The AHFA is the world's largest trade organization serving the home furnishings industry. AHFA member companies primarily operate residential upholstered furniture manufacturing facilities and comprise an extensive global supply chain that provides a wide variety of residential home furnishings to the US consumer. Member companies participate in a highly competitive market characterized by ever-changing style preferences, margin pressures, and the tendency of consumers to postpone big-ticket purchases if their perceptions of value and function are not satisfied.

The AHFA also has a supplier's division comprised of over 200 diverse companies that provide components and services to the global home furnishings industry. These 'Solution Partners' offer manufacturing equipment, and component parts (i.e. foam, fabric, frames for upholstered furniture).

Be advised that the AHFA is on record[1] respectfully requesting the ***Consumer Product Safety Commission*** (hereafter CPSC) to deny this petition with respect to its application to upholstered furniture. As previously stated:

1. The petitioners requested rulemaking is not reasonably necessary to eliminate or reduce the alleged risk of injury because the use of additive organohalogen flame retardants in residential upholstered furniture has steadily declined and is practically nonexistent today.
2. The manufacturers of residential upholstered furniture and its component suppliers, no longer require the use of flame retardants to achieve compliance with CA Technical Bulletin 117-13.
3. Most residential upholstered furniture manufacturers sell products in California and, as a result, are required to comply with CA Technical Bulletin 117-13.

[1] CPSC-2015-0022-0077

4. A rule declaring any subject product, including any article of residential furniture, containing additive organohalogen flame retardants a ***'banned hazardous substance'*** is not reasonably necessary to reduce the risk of alleged injury because labeling would be more effective.
5. The petition is overly broad and sets forth the invalid assumption that all additive organohalogen flame retardants, or all products containing additive organohalogen flame retardants, pose the same (if any) risk.
6. The petition also fails to set a threshold at and after which additive organohalogen flame retardants would be banned, and could therefore apply to any subject product which may contain background or very low, incidental levels of flame retardants.
7. The petition, which would be unduly burdensome on the regulated industry as well as the regulating Commission, is clearly evident that further study and research is required to better understand which flame retardants, and products to which manufacturers affirmatively (and not incidentally) add flame retardants, and at what maximum allowable dosage levels, pose the greatest risk prior to initiating any rulemaking proceeding.

California's well-established and broadly supported standard, CA Technical Bulletin 117- 13, offers proven repeatable and reproducible test methods that can be met for practically all furniture upholstery fabrics, polyurethane foam, and other covered components without the use of flame retardants. Consequently, the manufacturers of residential upholstered furniture and related components are, in general, no longer treating their products with flame retardants in order to meet CA Technical Bulletin 117-13's flammability standard, resulting in a decrease in flame retardant use nationwide. Due to this decrease, the overly broad requested rulemaking action is neither reasonably necessary, nor the least burdensome way of providing consumers who wish to purchase upholstered residential furniture that is not treated with organohalogen flame retardants the option to do so. Therefore, the AHFA again respectfully requests that the CPSC deny the petition with respect to is application to upholstered furniture.

Respectfully submitted,

Bill Perdue
VP Regulatory Affairs
The American Home Furnishings Alliance

Written Comment
Nancy A. Cowles
Kids In Danger

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KIDS IN DANGER

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September 14, 2017
Written Testimony of Nancy Cowles,
Executive Director, Kids In Danger to the
U.S. Consumer Product Safety Commission
on the Petition Requesting Rulemaking on Products Containing Organohalogen Flame Retardants [Docket No. CPSC–2015–0022]

The U.S. Consumer Product Safety Commission's mission is to safeguard consumers from unsafe products. Sometimes it is a design flaw, such as cribs that allow children to become entrapped – leading CPSC to adopt the world's strongest standards. At other times, the issue is one such as this, of chemical or toxic hazards. While it might be more difficult to see and measure long term impact of these chemical hazards, it does not make them any less dangerous. That is why Kids In Danger (KID) supports the petition to ban four categories of consumer products containing organohalogen flame retardants and urges CPSC to proceed with rulemaking.

KID is a nonprofit organization dedicated to protecting children by fighting for product safety. We were founded by parents who lost their son Danny in an unsafe crib. KID's work led to the provisions in the 2008 Consumer Product Safety Improvement Act known as Danny's Law, which requires mandatory standards for infant and toddler durable products, now known as the Section 104 rules.

Children and the elderly are at greatest risk in a fire. But children are also most at risk from these chemical compounds that come unknowingly into our homes, schools and child care facilities. There is a wealth of research demonstrating how organohalogen flame retardants are semi-volatile, and therefore migrate out of products into our homes. They are then easily ingested or inhaled as children move through the house, curiously touching things and putting their hands in their mouths, putting organohalogens into their bloodstream.

According to the Federal Hazardous Substances Act (FHSA) a substance must be regulated if there is *capacity* to cause personal illness. Evidence has conclusively shown the consequences of having organohalogen in consumer products. Organohalogen has been associated with a variety adverse health impacts, including: reproductive impairment (e.g., abnormal gonadal development, reduced number of ovarian follicles, reduced sperm count, increased time to pregnancy); neurological impacts (e.g., decreased IQ in children, impaired memory, learning deficits, altered motor behavior, hyperactivity); endocrine disruption and interference with thyroid hormone action (potentially contributing to diabetes and obesity); genotoxicity; cancer; and immune disorders.

Children who are exposed, even to low-doses, have reported thyroid disruption, early onset of puberty, and cognitive problems – health problems that will have a major impact on the rest of their lives. While CPSC staff note in their briefing package that there is "insufficient data" in CPSC's database to evaluate consumer

incidents, we must remember that chemical hazards often present themselves in ways that may not lead consumers to report to CPSC, such as sickness years later.

It is especially troubling that organohalogen flame retardants are used in products intended for these most vulnerable consumers – changing table pads, mattresses, children's furnishing, and more. There is no way for parents to know if a product contains organohalogen flame retardants or how to avoid the risk they pose. These chemicals should not be in our homes. KID supports the inclusion of juvenile products and other children's products in the categories of products prohibited to contain these flame retardants.

The CPSC has the evidence to determine that products in these categories are hazardous substances if they contain organohalogens. These chemicals *have the capacity* to cause personal illness, defining them as toxic by FHSA. While exposure alone may not cause immediate harmful effects, scientists documented how even low amounts can cause harm or lead to cumulative effects between organohalogens and other chemicals. These reasons serve as sufficient basis for regulation.

We understand that fire safety is extremely important; however, there are effective ways to prevent fire related injuries that do not expose children to toxic chemicals. Children's toys or furniture are rarely the *first item ignited* in a fire started with a small open flame, which is the only circumstance that flame retardants could even conceivably be of any use, and even then, their utility is questionable. Evidence shows that many products containing organohalogen flame retardants are still combustible, meaning that we are exposing consumers to these hazardous products that can have severe health effects for no reason. When these products do burn, they produce more smoke, toxic gases and carcinogenic combustion products. These emissions put residents, firefighters and other first responders at risk in the event of a fire. Again, putting more people at risk for no consumer benefit.

Organohalogen is hazardous based on FHSA's requirements, and outweigh any benefits of having flame retardants present. We must ban the use of these flame retardants in children's products. The longer CPSC waits, the more children will fall ill due to negligence and simple lack of action.