
Detoxification
theDr.com ©



PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American Academy of Pediatrics. Any conflicts have been resolved through a process approved by the Board of Directors. The American Academy of Pediatrics has neither solicited nor accepted any

abstract

FREE

The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace. It does not take into account the special vulnerabilities of children in attempting to protect the population from chemical hazards. Its

The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace.

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

INTRODUCTION

Over the past several decades, tens of thousands of chemicals have entered commerce and the environment, often in extremely large quantities (eg, multiple millions of pounds per year). There has also been an explosion of knowledge about special vulnerabilities and differential exposures that children and pregnant women have to environmental toxicants. A growing body of research indicates potential harm to child health from a range of chemical substances.

The primary federal law that governs chemical management in the United States, the Toxic Substances Control Act (TSCA) (Pub L No. 94-469 [1976]), is not protective of the health of children and pregnant women and has not undergone any meaningful revision since its passage almost 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American Academy of Pediatrics. Any conflicts have been resolved through a process approved by the Board of Directors. The American Academy of Pediatrics has neither solicited nor accepted any

abstract

FREE

The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace. It does not take into account the special vulnerabilities of children in attempting to protect the population from chemical hazards. Its

Its processes are so cumbersome that in its more than 30 years of existence, the TSCA has been used to regulate only 5 chemicals or chemical classes of the tens of thousands of chemicals that are in commerce.

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

INTRODUCTION

Over the past several decades, tens of thousands of chemicals have entered commerce and the environment, often in extremely large quantities (eg, multiple millions of pounds per year). There has also been an explosion of knowledge about special vulnerabilities and differential exposures that children and pregnant women have to environmental toxicants. A growing body of research indicates potential harm to child health from a range of chemical substances.

The primary federal law that governs chemical management in the United States, the Toxic Substances Control Act (TSCA) (Pub L No. 94-469 [1976]), is not protective of the health of children and pregnant women and has not undergone any meaningful revision since its passage almost 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American Academy of Pediatrics. Any conflicts have been resolved through a process approved by the Board of Directors. The American Academy of Pediatrics has neither solicited nor accepted any

abstract

FREE

The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace. It does not take into account the special vulnerabilities of children in attempting to protect the population from chemical hazards. Its

Costs of TSCA safety testing are often borne by the public sector. Manufacturers of chemicals are not required to test chemicals before they are marketed or to collect data from tests that may have been performed by others.

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

INTRODUCTION

Over the past several decades, tens of thousands of chemicals have entered commerce and the environment, often in extremely large quantities (eg, multiple millions of pounds per year). There has also been an explosion of knowledge about special vulnerabilities and differential exposures that children and pregnant women have to environmental toxicants. A growing body of research indicates potential harm to child health from a range of chemical substances.

The primary federal law that governs chemical management in the United States, the Toxic Substances Control Act (TSCA) (Pub L No. 94-469 [1976]), is not protective of the health of children and pregnant women and has not undergone any meaningful revision since its passage almost 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American Academy of Pediatrics. Any conflicts have been resolved through a process approved by the Board of Directors. The American Academy of Pediatrics has neither solicited nor accepted any commercial involvement in the development of the content of this publication.

abstract

FREE

The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace. It does not take into account the special vulnerabilities of children in attempting to protect the population from chemical hazards. Its processes are so cumbersome that in its more than 30 years of existence, the TSCA has been used to regulate only 5 chemicals or chemical classes of the tens of thousands of chemicals that are in commerce. Under the TSCA, chemical companies have no responsibility to perform

Without sufficient information on the safety or health effects of chemicals, it is impossible for the EPA to engage in appropriate regulation.

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2011 by the American Academy of Pediatrics

INTRODUCTION

Over the past several decades, tens of thousands of chemicals have entered commerce and the environment, often in extremely large quantities (eg, multiple millions of pounds per year). There has also been an explosion of knowledge about special vulnerabilities and differential exposures that children and pregnant women have to environmental toxicants. A growing body of research indicates potential harm to child health from a range of chemical substances.

The primary federal law that governs chemical management in the United States, the Toxic Substances Control Act (TSCA) (Pub L No. 94-469 [1976]), is not protective of the health of children and pregnant women and has not undergone any meaningful revision since its passage almost 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American Academy of Pediatrics. Any conflicts have been resolved through a process approved by the Board of Directors. The American Academy of Pediatrics has neither solicited nor accepted any commercial involvement in the development of the content of this publication.

abstract

FREE

The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the marketplace. It does not take into account the special vulnerabilities of children in attempting to protect the population from chemical hazards. Its processes are so cumbersome that in its more than 30 years of existence, the TSCA has been used to regulate only 5 chemicals or chemical classes of the tens of thousands of chemicals that are in commerce. Under the TSCA, chemical companies have no responsibility to perform

The TSCA places the burden of obtaining information about the potential toxicity of a chemical on the public rather than the manufacturer.

Copyright © 2011 by the American Academy of Pediatrics

INTRODUCTION

Over the past several decades, tens of thousands of chemicals have entered commerce and the environment, often in extremely large quantities (eg, multiple millions of pounds per year). There has also been an explosion of knowledge about special vulnerabilities and differential exposures that children and pregnant women have to environmental toxicants. A growing body of research indicates potential harm to child health from a range of chemical substances.

The primary federal law that governs chemical management in the United States, the Toxic Substances Control Act (TSCA) (Pub L No. 94-469 [1976]), is not protective of the health of children and pregnant women and has not undergone any meaningful revision since its passage almost 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

PEDIATRICS Volume 127, Number 5, May 2011

American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

FROM THE AMERICAN ACADEMY OF PEDIATRICS

Organizational Principles to Guide and Define the Child Health Care System and/or Improve the Health of all Children

Policy Statement—Chemical-Management Policy: Prioritizing Children's Health

COUNCIL ON ENVIRONMENTAL HEALTH

KEY WORD
environmental health

ABBREVIATIONS
TSCA—Toxic Substances Control Act
EPA—Environmental Protection Agency

This document is copyrighted and is property of the American Academy of Pediatrics and its Board of Directors. All authors have filed conflict of interest statements with the American

abstract

FREE

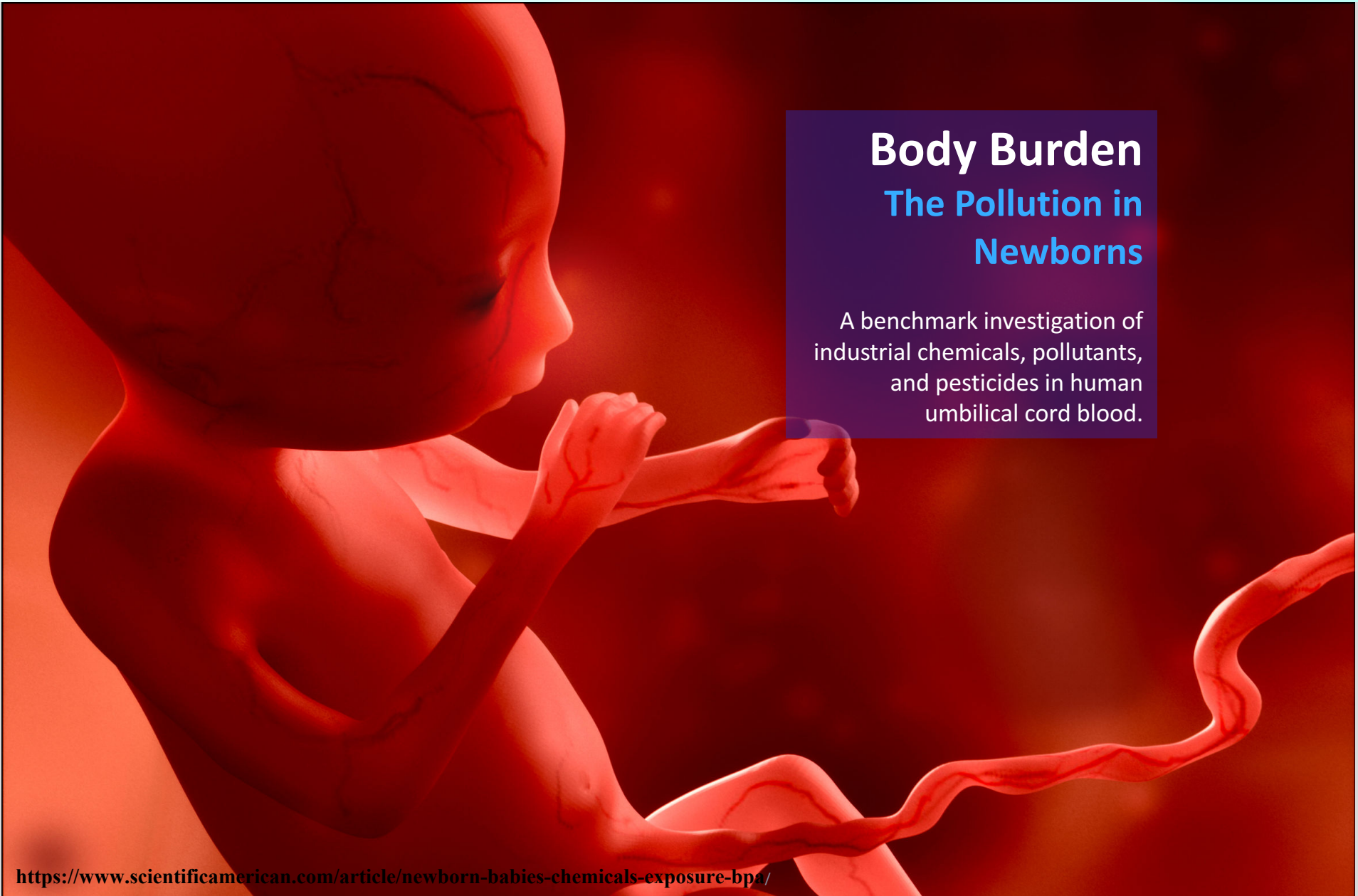
The American Academy of Pediatrics recommends that chemical-management policy in the United States be revised to protect children and pregnant women and to better protect other populations. The Toxic Substance Control Act (TSCA) was passed in 1976. It is widely recognized to have been ineffective in protecting children, pregnant women, and the general population from hazardous chemicals in the market-

Under the EPA Inventory Update Reporting program, the chemical manufacturing industry estimated that approximately 27 trillion pounds of chemicals are produced in or imported into the United States per year, which is the equivalent of approximately 74 billion pounds/day (nearly 250 pounds per person) and does not include fuels, pesticides, pharmaceuticals, or food products.

most 35 years ago. Since then, of the tens of thousands of chemicals that are in commerce, the TSCA has been used to regulate only 5 chemicals or chemical classes: polychlorinated biphenyls (PCBs); fully halogenated chlorofluoroalkanes; dioxin; asbestos; and hexavalent chromium.[1] The TSCA is so ineffective that it took a separate act of

Downloaded from www.aappublications.org/news by guest on October 3, 2018

The average baby has over 200 chemicals in their cord blood



https://www.scientificamerican.com/article/newborn-babies-chemicals-exposure-bpa/



© www.theDr.com

The Origins of BPA

Although bisphenol A (BPA) has been getting a lot of media attention in recent years, scientists have known for nearly 80 years that BPA acts like a synthetic estrogen. BPA was first synthesized in the 1890s. It was identied as a synthetic estrogen in the 1930s and considered for pharmaceutical use, but it was ultimately not pursued due to the identification of DES as a stronger synthetic estrogen.

Decades later millions of women had been prescribed DES in a misguided attempt to prevent miscarriages, doctors discovered its link to a rare form of cancer and reproductive problems in women whose mothers took the drug. These studies went on to determine that more than 90 percent of DES daughters (those exposed to DES while in the womb) have abnormalities of the reproductive tract.

http://nosilverlining.org/downloads/NoSilverLining-Report.pdf

Daily Estimated Exposure to BPA Reaches Levels Shown to Cause Harm in Laboratory Studies

To better understand how a person's health might be impacted by consuming a normal diet that includes canned foods, the table below shows three days of meals and the BPA exposures that could result based on the data from these product tests.

We based our calculations on the weight of an average 20 to 29year-old woman, according to the CDC (71kg or 156.5 lb), and imagined this woman was in the first trimester of pregnancy since exposure to BPA in the womb is of particular concern.

We divided the amount of BPA in micrograms (µg) by her weight (kg) to obtain a weight-adjusted exposure value. These hypothetical diets show that a pregnant woman may be exposed to potentially harmful levels of BPA that have been shown to alter fetal development in laboratory animals

© www.theDr.com

DAY 1

BREAKFAST	LUNCH	DINNER	SNACK & DESSERT	
0.94 µg	19.48 µg	62.01 µg	4.85 µg	TOTAL µg BPA = 87.28
Peaches (one serving), two eggs, one piece of toast	Lentil Soup (whole can), crackers, apple	Tuna Casserole (tuna 0.35 µg, peas 41.16 µg, cream of mushroom soup 16.17 µg ,vegetable broth 4.33 µg)	Snack: Cheese and crackers. Dessert: Bananas with Coconut milk (one serving)	**BPA consumed = 1.23 µg BPA/kg bodyweight**
				Level linked to reproductive and cancer effects in animals

DAY 2

BREAKFAST	LUNCH	DINNER	SNACK & DESSERT	
0.94 µg	9.14 µg	21.58 µg	43.74 µg	TOTAL µg BPA = 75.4
Peaches (one serving), cereal with milk	Ravioli (whole can)	Chili: kidney (4.19 µg), pinto (3.74 µg) and pink (8.67 µg) Beans, tomatoes (0.8 µg), corn (4.2 µg) (one serving of each), tortilla chips	Snack: Chicken noodle soup (whole can) (38.89 µg), crackers. Dessert: Cake with coconut milk (one serving of milk) (4.85 µg)	**BPA consumed = 1.06 µg BPA/kg bodyweight**
				Level linked to reproductive and cancer effects in animals

DAY 3

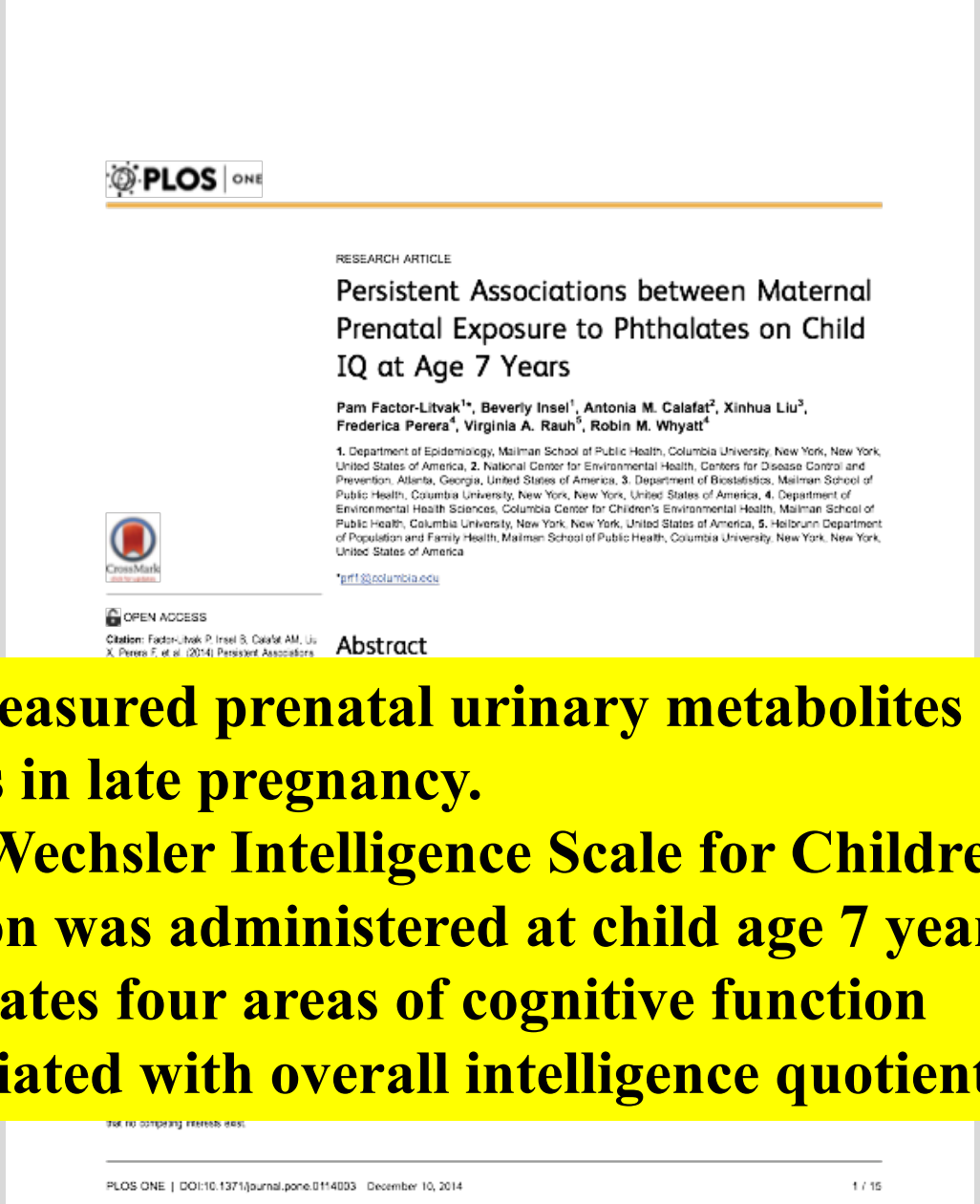
BREAKFAST	LUNCH	DINNER	SNACK & DRINK	
0 µg	0 µg	137.94 µg	0.25 µg	TOTAL µg BPA = 138.19
Ceral and milk, banana	Sandwich with fresh ingredients, carrots	Chicken breast, green beans (one serving), rice	Snack: Apple. Drink: Diet Coke (12 oz. can)	**BPA consumed = 1.94 µg BPA/kg bodyweight**
				Level linked to changes in prostate and increased aggression in animals

© www.theDr.com

http://nosilverlining.org/downloads/NoSilverLining-Report.pdf

DAILY BPA EXPOSURE IN (µg/kg body weight)	HEALTH EFFECTS OBSERVED IN LABORATORY STUDIES[51]
0.0001	Alternations in cell signaling pathways [52]
0.025	Persistent changes to breast tissue, predisposes cells to hormones [53]
0.025	Permanent changes to genital tract[54]
0.2	Decreased antioxidant enzymes[55]
0.25	Altered development of fetal mammary glands[56]
1	Long-term adverse reproductive and carcinogenic effects[57]
2	Increased prostate weight[58]
2	Increased aggression[59]
2.4	Weight gain and early onset of puberty[60]
2.4	Signs of early puberty, increased anogenital distance[61]
2.4	Decline in testicular testosterone[62]
2.5	Predisposes breast cells to cancer[63]

http://nosilverlining.org/downloads/NoSilverLining-Report.pdf



PLOS ONE

RESEARCH ARTICLE

Persistent Associations between Maternal Prenatal Exposure to Phthalates on Child IQ at Age 7 Years

Pam Factor-Litvak[1]*, Beverly Insel[1], Antonia M. Calafat[2], Xinhua Liu[3], Frederica Perera[4], Virginia A. Rauh[5], Robin M. Whyatt[4]

1. Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York, United States of America, 2. National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America, 3. Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, New York, United States of America, 4. Department of Environmental Health Sciences, Columbia Center for Children's Environmental Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America, 5. Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America

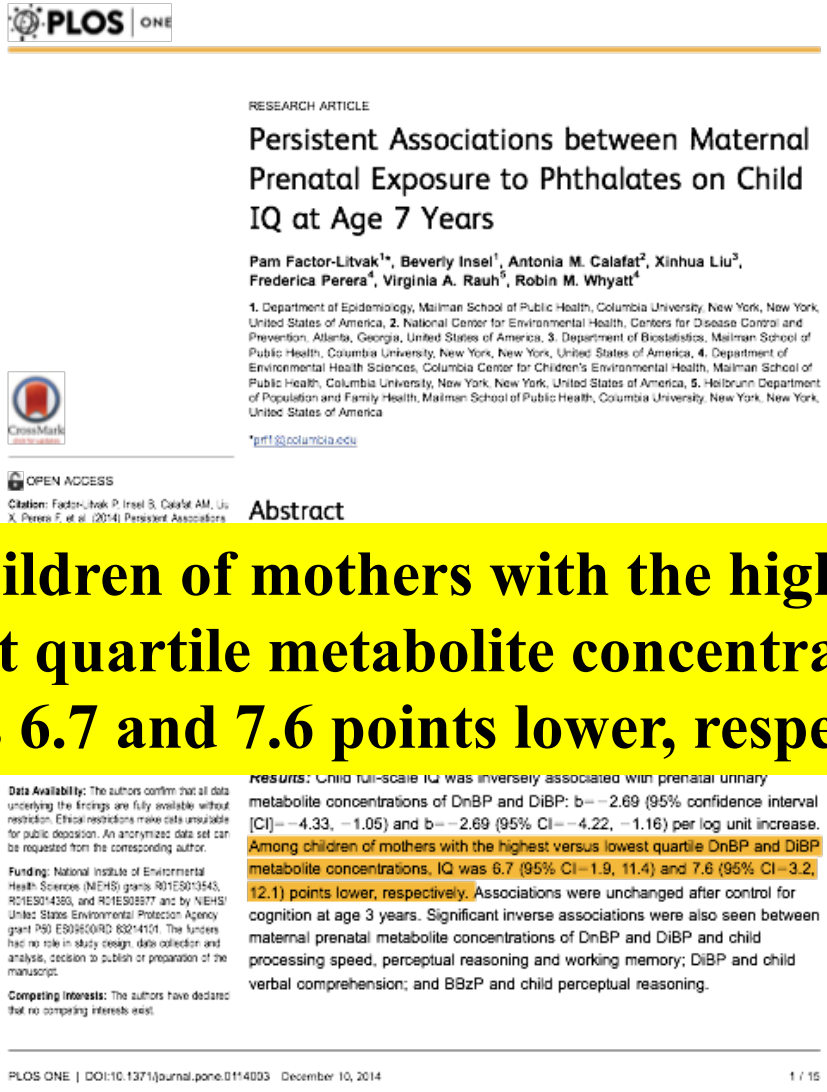
*pf1@columbia.edu

OPEN ACCESS

Citation: Factor-Litvak P, Insel B, Calafat AM, Liu X, Perera F, et al. (2014) Persistent Associations

Abstract

- **we measured prenatal urinary metabolites of 5 PCBs in late pregnancy.**
- **The Wechsler Intelligence Scale for Children, 4th edition was administered at child age 7 years and evaluates four areas of cognitive function associated with overall intelligence quotient (IQ).**



PLOS ONE

RESEARCH ARTICLE

Persistent Associations between Maternal Prenatal Exposure to Phthalates on Child IQ at Age 7 Years

Pam Factor-Litvak[1]*, Beverly Insel[1], Antonia M. Calafat[2], Xinhua Liu[3], Frederica Perera[4], Virginia A. Rauh[5], Robin M. Whyatt[4]

1. Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **2.** National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America, **3.** Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **4.** Department of Environmental Health Sciences, Columbia Center for Children's Environmental Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **5.** Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America

*prf1@columbia.edu

OPEN ACCESS

Citation: Factor-Litvak P, Insel B, Calafat AM, Liu X, Perera F, et al. (2014) Persistent Associations

Data Availability: The authors confirm that all data underlying the findings are fully available without restriction. Ethical restrictions make data unsuitable for public deposition. An anonymized data set can be requested from the corresponding author.

Funding: National Institute of Environmental Health Sciences (NIEHS) grants R01ES013543, R01ES014393, and R01ES08977 and by NIEHS/United States Environmental Protection Agency grant P50 ES09600/RD 83214101. The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

Abstract

Results: Child full-scale IQ was inversely associated with prenatal urinary metabolite concentrations of DnBP and DiBP: b = −2.69 (95% confidence interval [CI] = −4.33, −1.05) and b = −2.69 (95% CI = −4.22, −1.16) per log unit increase. Among children of mothers with the highest versus lowest quartile DnBP and DiBP metabolite concentrations, IQ was 6.7 (95% CI = 1.9, 11.4) and 7.6 (95% CI = 3.2, 12.1) points lower, respectively. Associations were unchanged after control for cognition at age 3 years. Significant inverse associations were also seen between maternal prenatal metabolite concentrations of DnBP and DiBP and child processing speed, perceptual reasoning and working memory; DiBP and child verbal comprehension; and BBzP and child perceptual reasoning.

Among children of mothers with the highest versus lowest quartile metabolite concentrations, IQ was 6.7 and 7.6 points lower, respectively.



PLOS ONE

RESEARCH ARTICLE

Persistent Associations between Maternal Prenatal Exposure to Phthalates on Child IQ at Age 7 Years

Pam Factor-Litvak[1]*, Beverly Insel[1], Antonia M. Calafat[2], Xinhua Liu[3], Frederica Perera[4], Virginia A. Rauh[5], Robin M. Whyatt[4]

1. Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **2.** National Center for Environmental Health, Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America, **3.** Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **4.** Department of Environmental Health Sciences, Columbia Center for Children's Environmental Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America, **5.** Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, New York, New York, United States of America

*prf1@columbia.edu

OPEN ACCESS

Citation: Factor-Litvak P, Insel B, Calafat AM, Liu X, Perera F, et al. (2014) Persistent Associations between Maternal Prenatal Exposure to Phthalates on Child IQ at Age 7 Years. PLoS ONE 9(12): e114003. doi:10.1371/journal.pone.0114003

Abstract

Background: Prior research reports inverse associations between maternal

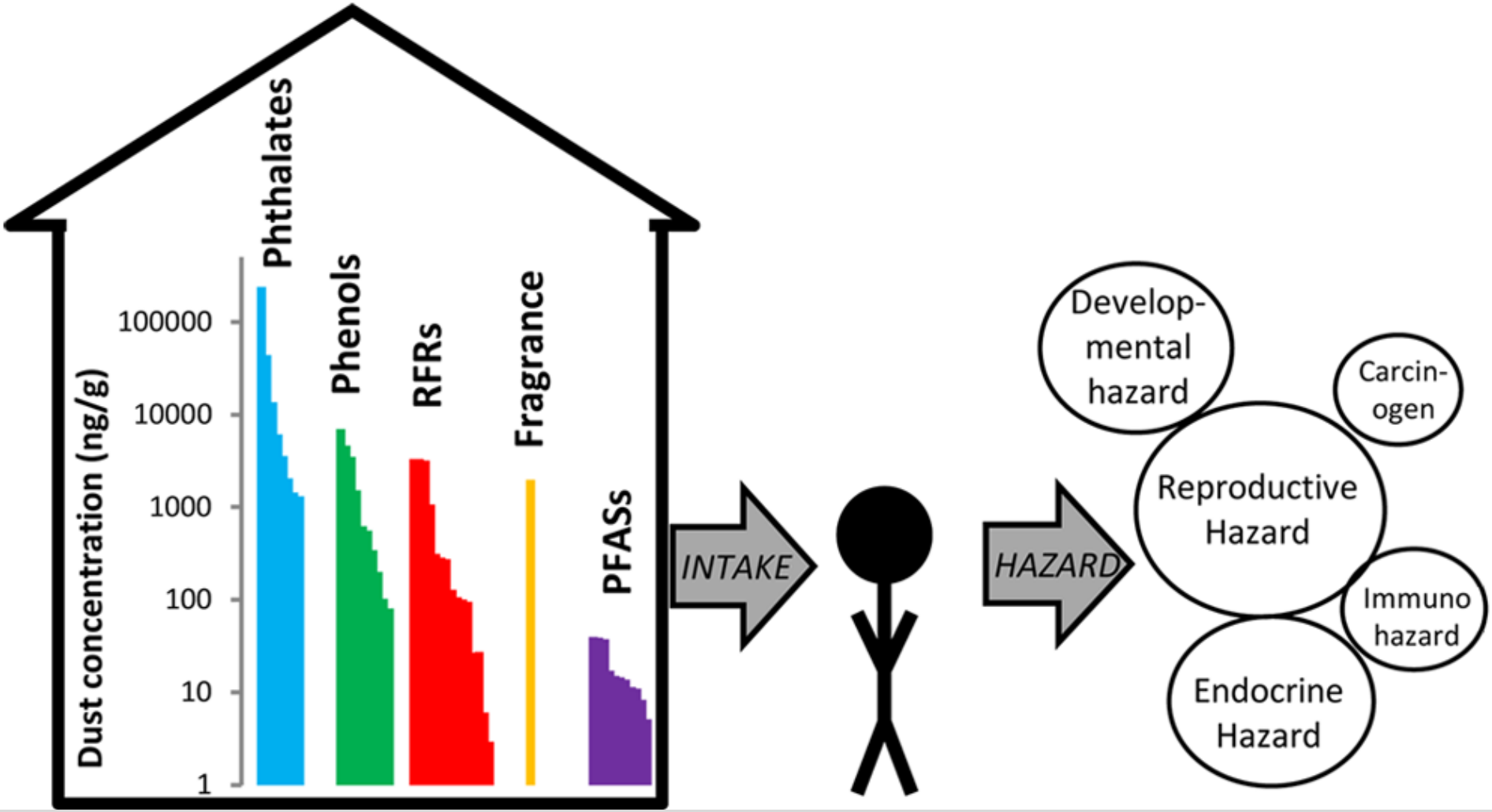
cognition at age 3 years. Significant inverse associations were also seen between maternal prenatal metabolite concentrations of DnBP and DiBP and child processing speed, perceptual reasoning and working memory; DiBP and child verbal comprehension; and BBzP and child perceptual reasoning.

United States Environmental Protection Agency grant P50 ES09600/RD 83214101. The funders had no role in study design, data collection and analysis, decision to publish or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

Because phthalate exposures are ubiquitous, and concentrations seen here within the range previously observed among general populations, results are of public health significance.

Environ. Sci. Technol. 2016, 50, 10661−10672



This is an open acce
copying and redistr

Environ. Sci. Technol. 2016, 50, 10661−10672

ENVIRONMENTAL Science & Technology

Article

pubs.acs.org/est

Consumer Product Chemicals in Indoor Dust: A Quantitative Meta-analysis of U.S. Studies

Susanna D. Mitro,[†] Robin E. Dodson,[‡] Veena Singla,[§] Gary Adamkiewicz,[∥] Angelo F. Elmi,[†] Monica K. Tilly,[§,⊥] and Ami R. Zota[*,†]

[†]Milken Institute School of Public Health, George Washington University, Washington, D.C. 20052, United States
[‡]Silent Spring Institute, Newton, MA 02460, United States
[§]Health and Environment Program, Natural Resources Defense Council, San Francisco, California 94104, United States
[∥]Harvard T. H. Chan School of Public Health, Boston, Massachusetts 02115, United States
[⊥]Occupational and Environmental Medicine Program, University of California San Francisco, San Francisco, California 94143, United States

Supporting Information

Dust can provide critical information on consumer product chemicals in the indoor environment.

- **First, it is a window into which chemicals are present indoors.**
- **Second, dust concentrations can be used in equilibrium partitioning models to estimate air concentrations and characterize total residential intake with reasonable accuracy.**

widely detected in the U.S. general population, including vulnerable populations such as pregnant women and children.[4−8]

Exposure to one or more of these chemical classes has been associated with adverse health effects including reproductive toxicity, endocrine disruption, cognitive and behavioral impairment in children, cancer, asthma, immune dysfunction, and chronic disease.[7−9]

Many emerging and current use consumer product chemicals of concern are semivolatile organic compounds (SVOCs), which

class are reviewed in the following sources: phthalates,[16,23−26] flame retardants,[25,27,28] environmental phenols,[25,26,29,30] synthetic fragrances,[29,31,32] and PFASs.[25,33,34]

Received: April 22, 2016
Revised: July 29, 2016
Accepted: August 5, 2016
Published: September 14, 2016

ACS Publications © 2016 American Chemical Society

DOI: 10.1021/acs.est.6b02023
Environ. Sci. Technol. 2016, 50, 10661−10672

This is an open acce
copying and redistr

Environ. Sci. Technol. 2016, 50, 10661−10672

ENVIRONMENTAL Science & Technology

Article

pubs.acs.org/est

Consumer Product Chemicals in Indoor Dust: A Quantitative Meta-analysis of U.S. Studies

Susanna D. Mitro,[†] Robin E. Dodson,[‡] Veena Singla,[§] Gary Adamkiewicz,[∥] Angelo F. Elmi,[†] Monica K. Tilly,[§,⊥] and Ami R. Zota*[,†]

[†]Milken Institute School of Public Health, George Washington University, Washington, D.C. 20052, United States
[‡]Silent Spring Institute, Newton, MA 02460, United States
[§]Health and Environment Program, Natural Resources Defense Council, San Francisco, California 94104, United States
[∥]Harvard T. H. Chan School of Public Health, Boston, Massachusetts 02115, United States
[⊥]Occupational and Environmental Medicine Program, University of California San Francisco, San Francisco, California 94143, United States

Finally, characterizing exposures from indoor dust may have important implications for children's health. Young children are particularly vulnerable to chemical exposures from dust since they crawl, play on the floor, and frequently put their hands in their mouths. Increased dust contact likely plays a role in the higher body burden of i.e. flame retardants in young children compared to their parents.

wall coverings contain chemicals that can leach, migrate, abrade, or off-gas from products resulting in human exposure.[2,3] Consequently, chemicals such as phthalates, phenols, flame retardants, and polyfluorinated alkyl substances (PFASs) are widely detected in the U.S. general population, including vulnerable populations such as pregnant women and children.[4−8]

Exposure to one or more of these chemical classes has been associated with adverse health effects including reproductive toxicity, endocrine disruption, cognitive and behavioral impairment in children, cancer, asthma, immune dysfunction, and chronic disease.[7−9]

Many emerging and current use consumer product chemicals of concern are semivolatile organic compounds (SVOCs), which

significant contributor to exposure,[18−20] while the contribution of the indoor environment to total exposure of PFASs is less well characterized.[21,22] The chemical properties, sources, exposure pathways and major health effects associated with each chemical class are reviewed in the following sources: phthalates,[16,23−26] flame retardants,[25,27,28] environmental phenols,[25,26,29,30] synthetic fragrances,[29,31,32] and PFASs.[25,33,34]

Received: April 22, 2016
Revised: July 29, 2016
Accepted: August 5, 2016
Published: September 14, 2016

ACS Publications © 2016 American Chemical Society

DOI: 10.1021/acs.est.6b02023
Environ. Sci. Technol. 2016, 50, 10661−10672

This is an open acc
copying and redistr

Environ. Sci. Technol. 2016, 50, 10661−10672

ENVIRONMENTAL Science & Technology

Article

pubs.acs.org/est

Consumer Product Chemicals in Indoor Dust: A Quantitative Meta-analysis of U.S. Studies

Susanna D. Mitro,[†] Robin E. Dodson,[‡] Veena Singla,[§] Gary Adamkiewicz,[∥] Angelo F. Elmi,[†] Monica K. Tilly,[§,⊥] and Ami R. Zota[*,†]

[†]Milken Institute School of Public Health, George Washington University, Washington, D.C. 20052, United States
[‡]Silent Spring Institute, Newton, MA 02460, United States
[§]Health and Environment Program, Natural Resources Defense Council, San Francisco, California 94104, United States
[∥]Harvard T. H. Chan School of Public Health, Boston, Massachusetts 02115, United States
[⊥]Occupational and Environmental Medicine Program, University of California San Francisco, San Francisco, California 94143, United States

Supporting Information

ABSTRACT: Indoor dust is a reservoir for commercial consumer product chemicals, including many compounds

The indoor environment is a haven for chemicals associated with reproductive and developmental toxicity, endocrine disruption, cancer and other health effects. Additionally, despite the observed variability across studies, the existing dust literature has allowed us to identify the chemicals and chemical classes found at the highest levels indoors (phthalates and phenols), with the highest estimated intakes (phthalates and replacement flame retardants (RFRs)), and associated with the most hazard traits (phthalates and PFASs).

Environ. Sci. Technol. 2016, 50, 10661−10672

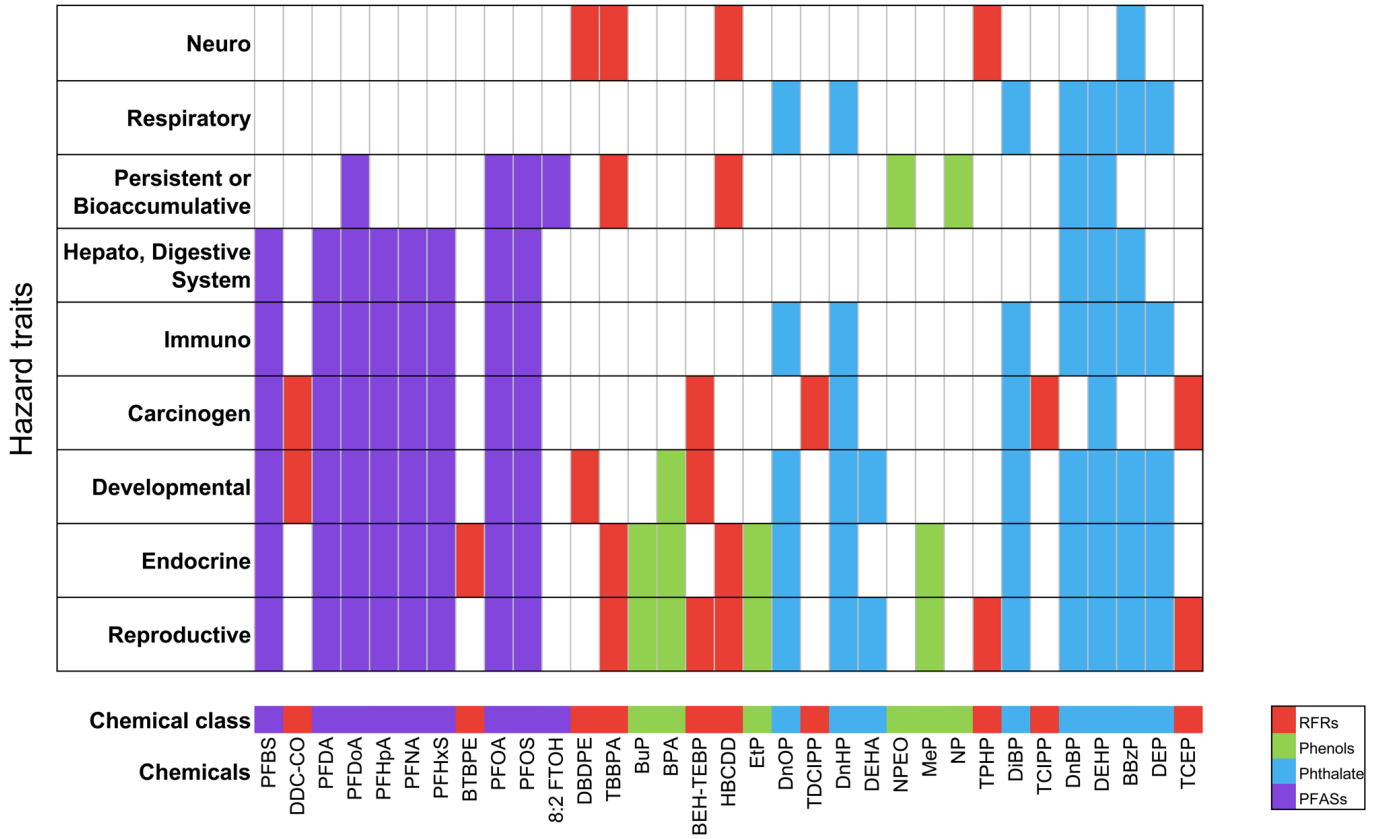


Figure 4. Each row on the chart represents potential chemical hazard traits, and each column represents a chemical. Chemicals are listed in order of estimated adult daily residential intake (lowest intake on the left-hand side). For hazard traits associated with a mixture rather than individual chemicals (HBCDD, DDC−CO, NPEO) the intakes of the chemicals composing the mixture were added to generate the mixture's position in the intake ranking. The hazard traits associated with each chemical, according to the SCP CC list are represented by filled cells; hazard traits not associated with the chemical are left blank. Chemicals not included in the intake assessment and those not listed in SCP CC list are not shown in the chart.

www.gymnastcollaborative.org



Photo Credit: Carie Minshall, USAG

Toxic Flame Retardants in Gymnastics Equipment

Environ Int. 2016 September ; 94: 362–368

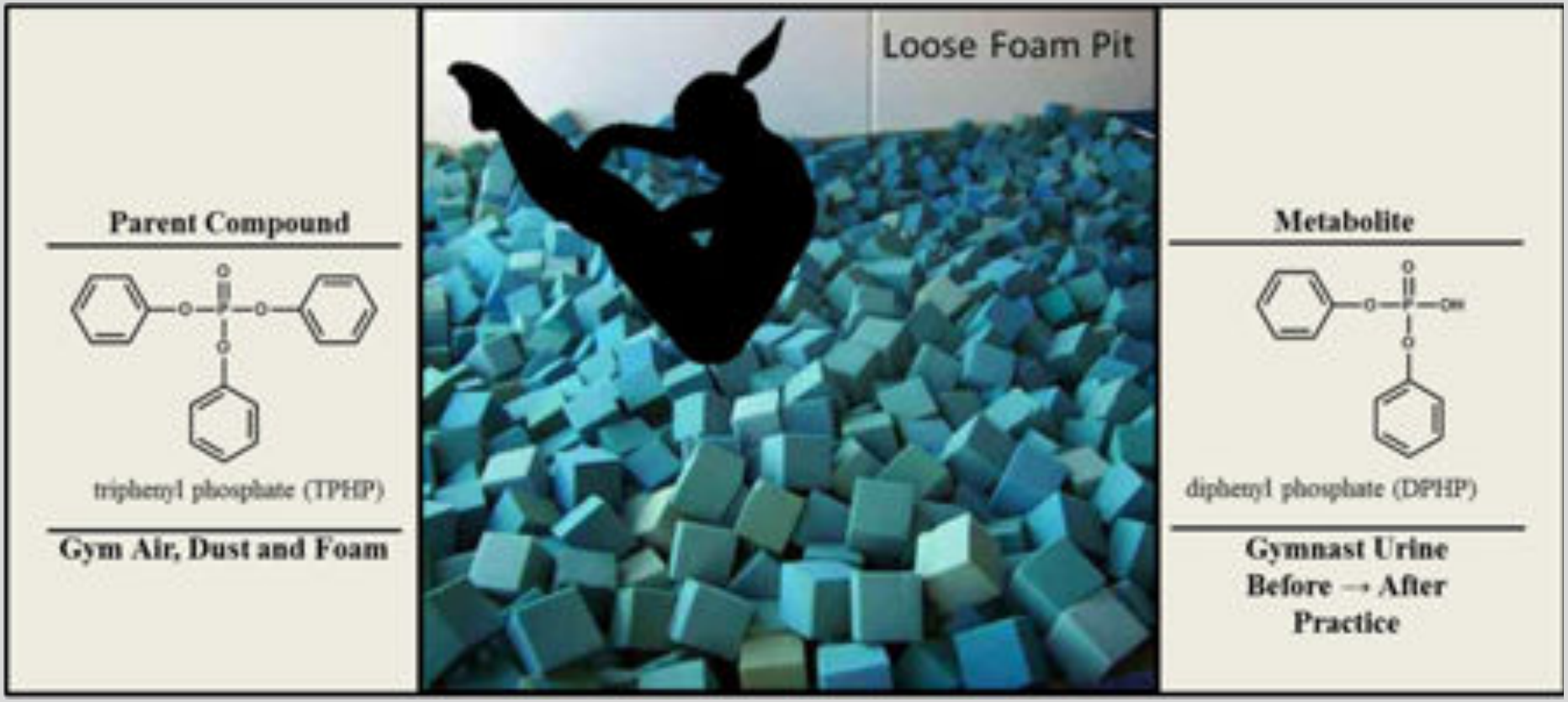


Table 2

GM (95% CI) concentrations of urinary metabolite (μg/L) in gymnasts and other populations.

Region (sample size)	Year	DPHP	BDCIPP	TBBA	Reference
US Gymnasts (n=11[a])	2012	9.0 (7.7-11.1)	0.67 (0.52-0.85)	0.018 (0.01-0.02)	This study
North Carolina (n=53)	2012	1.7 (1.36-2.18)[b]	0.63 (0.49-0.81)[b]	0.006 (0.004-0.008)[b]	Hoffman et al. (2015)
United States (n=9)	2011	3.0 (NR)	0.41 (NR)	NR	Cooper et al. (2011)
Massachusetts (n=29)	2009	1.9 (1.2-3.0)[c]	0.41 (0.28-0.59)	NR	Carignan et al. (2013)
Massachusetts (n=45)	2002-2007	0.31 (NR)	0.13 (NR)	NR	Meeker et al. (2013)
California (n=14)	2011	0.44[d] (NR)	0.09[d] (NR)	NR	Dodson et al. (2014)
Norway (n=48)[e]	2012	0.51[e] (NR)	0.12[e] (NR)	NR	Cequier et al. (2015)
Australia (n=35 and 100)[f]	2010-2013	24.4 and 63.4[f]	1.00 and 0.66[f]	NR	Van den Eede et al. (2015)

Normalized using a mean specific gravity of 1.024 unless otherwise indicated

NR=not reported

[a] Includes available data from all five time points among 11 participants (n=54 samples, n=53 for TBBA)

[b] Confidence intervals obtained from study authors, n=52 for TBBA

[c] Previously unpublished data obtained from the authors

[d] Not SG normalized, median concentrations

[e] Normalized using a mean SG of 1.015, 244 urine samples total

[f] Not SG normalized, 28 pools of 28 individuals and 44 pools of 7 individuals

HHS Public A
Author manuscript
Environ Int. Author manuscript; available in PMC 2017 September 01.

Environ Int. 2016 September ; 94: 362–368

Published in final edited form as:
Environ Int. 2016 September ; 94: 362–368. doi:10.1016/j.envint.2016.06.030.

Urinary biomarkers of flame retardant exposure among collegiate U.S. gymnasts

Courtney C. Carignan[1,2,*], **Mingliang Fang**[3,4], **Heather M. Stapleton**[3], **Wendy Heiger-Bernays**[1], **Michael D. McClean**[1], and **Thomas F. Webster**[1]

Courtney C. Carignan: carignan@hsph.harvard.edu; Mingliang Fang: fangmingliang0711@gmail.com; Heather M. Stapleton: heather.stapleton@duke.edu; Wendy Heiger-Bernays: whb@bu.edu; Michael D. McClean: mmcclean@bu.edu; Thomas F. Webster: twebster@bu.edu

[1]Department of Environmental Health, Boston University School of Public Health, Boston, Massachusetts, USA

[2]Department of Environmental Health, Harvard School of Public Health, Boston, Massachusetts, USA

[3]Nicholas School of the Environment, Duke University, Durham, North Carolina, USA

These preliminary results add to the evidence that the gymnastics training environment can be a source of exposure to flame retardants used in polyurethane foam and that pit cubes can commonly contain both brominated and organophosphate flame retardants.

Graphical abstract

[*]Current address: Harvard School of Public Health, 665 Huntington Ave, 14th Floor, Boston, Massachusetts 02115 USA

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.