



CHILDREN & ENVIRONMENTAL TOXINS

WHAT EVERYONE NEEDS TO KNOW®

PHILIP J. LANDRIGAN and
MARY M. LANDRIGAN

CHILDREN AND ENVIRONMENTAL TOXINS

WHAT EVERYONE NEEDS TO KNOW®

CHILDREN AND ENVIRONMENTAL TOXINS

WHAT EVERYONE NEEDS TO KNOW®

**PHILIP J. LANDRIGAN, MD, MSC, FAAP
MARY M. LANDRIGAN, MPA**

OXFORD
UNIVERSITY PRESS

OXFORD

UNIVERSITY PRESS

Oxford University Press is a department of the University of Oxford. It furthers the University's objective of excellence in research, scholarship, and education by publishing worldwide. Oxford is a registered trade mark of Oxford University Press in the UK and certain other countries.

"What Everyone Needs to Know" is a registered trademark
of Oxford University Press.

You must not circulate this work in any other form
and you must impose this same condition on any acquirer.

Published in the United States of America by Oxford University Press
198 Madison Avenue, New York, NY 10016, United States of America.

© Oxford University Press 2018

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Oxford University Press, or as expressly permitted by law, by license, or under terms agreed with the appropriate reproduction rights organization. Inquiries concerning reproduction outside the scope of the above should be sent to the Rights Department, Oxford University Press, at the address above.

Library of Congress Cataloging-in-Publication Data

Names: Landrigan, Philip J., author. | Landrigan, Mary M.

Title: Children and environmental toxins : what everyone needs to know /
Philip J. Landrigan, Mary M. Landrigan.

Description: Oxford ; New York : Oxford University Press, 2018. |

Series: What everyone needs to know |

Includes bibliographical references and index.

Identifiers: LCCN 2017025622 | ISBN 9780190662639 (paperback) |

ISBN 9780190662646 (hardcover)

Subjects: LCSH: Environmentally induced diseases in children—United States. |

Pediatric toxicology—United States. | Children—

Health and hygiene—United States. | BISAC: HEALTH & FITNESS /

General. | MEDICAL / Public Health.

Classification: LCC RA1225 .L35 2017 | DDC 616.9/80083—dc23

LC record available at <https://lcn.loc.gov/2017025622>

This material is not intended to be, and should not be considered, a substitute for medical or other professional advice. Treatment for the conditions described in this material is highly dependent on the individual circumstances. And, while this material is designed to offer accurate information with respect to the subject matter covered and to be current as of the time it was written, research and knowledge about medical and health issues is constantly evolving and dose schedules for medications are being revised continually, with new side effects recognized and accounted for regularly. Readers must therefore always check the product information and clinical procedures with the most up-to-date published product information and data sheets provided by the manufacturers and the most recent codes of conduct and safety regulation. The publisher and the authors make no representations or warranties to readers, express or implied, as to the accuracy or completeness of this material.

Without limiting the foregoing, the publisher and the authors make no representations or warranties as to the accuracy or efficacy of the drug dosages mentioned in the material. The authors and the publisher do not accept, and expressly disclaim, any responsibility for any liability, loss or risk that may be claimed or incurred as a consequence of the use and/or application of any of the contents of this material.

1 3 5 7 9 8 6 4 2

Paperback printed by LSC Communications, United States of America

Hardback printed by Bridgeport National Bindery, Inc., United States of America

*To our children,
Mary and Jacob; Chris and Clare; and Lizzie and Raphael;*

*To their children,
Jack, Ryan, Mary Katya, Sara, Gabriel, Aelish, and Isaac;*

And to their children's children

CONTENTS

ABOUT THE AUTHORS	XV
INTRODUCTION	XVII

1. The Changing Patterns of Disease in Children 1

<i>How have patterns of disease in children changed over the past century?</i>	1
<i>What are the predominant diseases of children today?</i>	3

2. The Chemical Environment 7

<i>What are the origins of the chemical manufacturing industry?</i>	7
<i>When were environmentally caused diseases first observed?</i>	8
<i>How many untested chemicals are in commercial production today?</i>	9
<i>Have some manufactured chemicals benefited children's health?</i>	10
<i>How are new chemicals developed and brought to market?</i>	11
<i>Have there been there early warnings of chemical problems?</i>	12
<i>How many of today's chemicals have been tested for safety or toxicity?</i>	13
<i>Why have chemicals not been tested for safety or toxicity?</i>	14
<i>What is the Safe Chemicals Act?</i>	14
<i>What are countries outside of the United States doing to promote chemical safety?</i>	15

<i>What is the impact of REACH, the European chemical safety law, on children in the United States?</i>	17
<i>How do we know that children are being exposed to untested chemicals in the environment?</i>	18
<i>What are the dangers of failure to test chemicals for safety and toxicity?</i>	18
<i>Are there other chemicals in wide use today that are harming children's health?</i>	20
<i>If nothing is done, is it likely that this problem will continue to grow?</i>	22

3. Children's Unique Vulnerability to Toxic Chemicals in the Environment **25**

<i>Are children more vulnerable than adults to toxic chemicals in the environment?</i>	25
<i>What historical evidence supports the argument that children are vulnerable to toxic chemicals in the environment?</i>	25
<i>Why are infants and children so sensitive to toxic chemicals?</i>	27
<i>What changes in public policy resulted from the NAS Pesticides in the Diets of Infants and Children report?</i>	32
<i>What has happened in the two decades since release of the NAS report Pesticides in the Diets of Infants and Children?</i>	33
<i>What are international agencies doing about children's environmental health?</i>	34
<i>Is the World Health Organization involved in protecting children against environmental threats to health?</i>	34

4. The Links Between Toxic Chemicals in the Environment and Disease in Children **35**

<i>What caused the recent surge in research into the effects of toxic chemicals on children's health?</i>	35
<i>Can a toxic chemical cause problems in children who show no symptoms or minimal symptoms?</i>	37
<i>What is the impact of subclinical toxicity on society?</i>	38

<i>What research methods are used to identify links between chemical exposure and childhood disease?</i>	40
<i>What new tools are used in current research in children's environmental health?</i>	42
<i>What is a biomarker of a disease?</i>	42
<i>What is an example of a biomarker of exposure to a toxic chemical?</i>	43
<i>What childhood diseases are currently linked to toxic environmental exposures?</i>	44
<i>What are the most pressing questions about the links between environmental chemicals in use in commercial products today and childhood disease?</i>	67
<i>What are the next frontiers of research in understanding how environmental exposures can cause disease in children?</i>	68
<i>Is there evidence that harmful environmental exposures in early life cause disease in adult life?</i>	70
<i>What are the economic costs of childhood diseases caused by toxic chemicals in the environment?</i>	70
<i>Conversely, what are the economic benefits of preventing disease in children caused by toxic chemicals in the environment?</i>	71

5. Lead in the Home **73**

<i>How do I know if my home has lead in it?</i>	74
<i>Where is lead typically found in a home?</i>	76
<i>What do I do if I find evidence of lead paint in my home?</i>	77
<i>What is the correct way to remove lead paint?</i>	78
<i>Can children or pregnant women stay in a home during lead abatement?</i>	79
<i>How does lead get into drinking water?</i>	79
<i>Can lead exposure be tested for medically? Should I have my child tested for lead?</i>	81
<i>I have lead in my home. What do I do in the interim between discovery and abatement?</i>	82
<i>Do children's toys contain lead?</i>	83
<i>What other imported items contain lead?</i>	84

6. Allergens and Respiratory Irritants at Home 87

<i>Is the air in my home polluted?</i>	88
<i>What are the effects of smoking indoors on air quality?</i>	89
<i>Do everyday household products pollute the air in a home?</i>	91
<i>Is wall-to-wall carpeting an allergen?</i>	95
<i>Does my pet pollute my home's air?</i>	96
<i>Do I need a mattress cover?</i>	96
<i>Are stuffed animals okay to have around?</i>	97

7. Endocrine Disruptors in the Home 99

<i>What are the most common endocrine disruptors?</i>	100
<i>Are there other chemicals in commercial use that are endocrine disruptors?</i>	102
<i>So do plastics contain endocrine disruptors?</i>	103
<i>Can I microwave foods in plastic containers or with plastic wrap?</i>	104
<i>Do water bottles contain endocrine disruptors?</i>	104
<i>Is cold water safer than hot water for cooking and drinking?</i>	105
<i>Are all baby bottles safe?</i>	105
<i>Why do we recommend silicone for nipples and pacifiers?</i>	106
<i>What types of food packaging contain endocrine disruptors?</i>	106
<i>Does cookware contain endocrine disruptors?</i>	106
<i>Are there furniture and carpet components that are toxic?</i>	107
<i>Do flame retardants pose the same threats as stain repellants?</i>	107
<i>Are endocrine disruptors present in soaps?</i>	108
<i>Do air fresheners contain endocrine disruptors?</i>	109
<i>So does perfume contain endocrine disruptors, too?</i>	
<i>What about cosmetics?</i>	110

8. Pesticides and Herbicides 111

<i>What's wrong with pesticides?</i>	111
<i>What are organophosphate pesticides?</i>	112
<i>Is pesticide use increasing or decreasing?</i>	113
<i>Are there safe, effective ways to get rid of pests without using pesticides?</i>	114
<i>I am using an exterminator. What can I do to minimize chemical exposure from pesticides?</i>	115
<i>Are lawn chemicals toxic?</i>	116
<i>I don't use lawn chemicals or other pesticides. How is it possible that my household is still exposed to these toxic chemicals?</i>	116
<i>How can I tell if a yard has been treated with pesticides?</i>	117
<i>How can I have a nice lawn without chemical fertilizers and pesticides?</i>	118
<i>My home has termites. How bad are the various options for extermination in terms of toxicity?</i>	119
<i>My home has roaches. Are nontoxic extermination options available?</i>	122
<i>Do most flea and tick collars on pets contain toxic chemicals?</i>	123

9. Food 125

<i>Which foods are the most likely to contain toxic pesticide residues?</i>	125
<i>Are some fruits and vegetables more likely than others to carry pesticide residues?</i>	127
<i>Do terms like local and in season really matter when it comes to fruits and vegetables?</i>	128
<i>What are food additives, and do they have health consequences?</i>	129
<i>What's the deal with genetically modified (GM) foods?</i>	130
<i>So do I buy GM foods or not?</i>	132
<i>What is processed food, and does it contain toxic chemicals?</i>	133

<i>What is pasteurization, and does it have anything to do with toxic chemicals in food?</i>	134
<i>What's the difference between organic and nonorganic dairy products?</i>	134
<i>How do I know which fish is safe to eat?</i>	135
<i>Does ground beef contain E.coli?</i>	137
<i>Are peanuts toxic for children?</i>	138
<i>What precautions should be taken to prevent toxic chemicals from getting into a home garden?</i>	140

10. Toxic Chemicals and Other Hazards in the Home 143

<i>What is the most effective way to prevent children from ingestion or exposure to toxic chemicals in the household?</i>	143
<i>What is the best thing to do if a child ingests or is otherwise exposed to a toxic chemical?</i>	145
<i>How do I safely dispose of unwanted chemicals?</i>	146
<i>Are all baby products safe and nontoxic?</i>	146
<i>Is baby powder safe?</i>	148
<i>Are there negative effects of using antibacterial cleaning products?</i>	148
<i>Which insect repellants are safe?</i>	149
<i>Is the radiation emitted by mobile phones unhealthy?</i>	150
<i>What is radon and should I have my home tested for it?</i>	150
<i>What is asbestos and how do I know if it's in my home?</i>	152
<i>Is it okay to have exposed fiberglass insulation in the less-inhabited parts of my home?</i>	153
<i>Are houseplants toxic?</i>	153

11. Daycare 155

<i>Does the daycare facility meet fire-safety codes?</i>	155
<i>Does the daycare facility meet health codes?</i>	157
<i>Does the daycare facility have a lead problem?</i>	157
<i>Does the daycare provider lock up all medications?</i>	157

<i>Does the daycare provider use nontoxic cleaning products?</i>	158
<i>Does the daycare provider have a strict hand-washing policy?</i>	158
<i>Does the daycare use lead-free and asbestos-free crayons?</i>	159
<i>Does the daycare provider apply pesticides anywhere in the facility?</i>	160
<i>Does the play area contain toxic materials or pressure-treated lumber?</i>	160

12. Schools 163

<i>How can I find out if my child's school has had lead or asbestos problems in the past?</i>	163
<i>What are the implications and complications of lead in school buildings?</i>	165
<i>What are the implications of asbestos being present in a school building?</i>	166
<i>Should asbestos be removed from a school building?</i>	166
<i>What if my child has already been exposed to asbestos in his school?</i>	167
<i>What can parents do to demand action or transparency related to asbestos?</i>	168
<i>How can I make sure that the drinking water in my child's school is lead-free?</i>	169
<i>What precautions should be in place for a school science lab?</i>	170
<i>What precautions should be in place for art studios?</i>	172
<i>What is a hazardous spill plan and do schools need them?</i>	174
<i>Is artificial turf safe?</i>	175
<i>Can school buildings be worked on structurally (i.e., roof repair) while school is in session?</i>	176

EPILOGUE 179

RESOURCES AND REFERENCES 181

INDEX 195

ABOUT THE AUTHORS

Philip J. Landrigan, MD, MSc, is a pediatrician, epidemiologist, and internationally recognized pioneer in children's environmental health. His studies of childhood lead poisoning catalyzed the removal lead from gasoline—an action that reduced childhood lead poisoning in the United States by over 90% and has raised the IQ of children around the world. His studies on children's vulnerability to pesticides triggered passage of the Food Quality Protection Act, the federal pesticide law, the only US environmental law with standards explicitly protecting the health of children. He has been a leader in the US National Children's Study. He has consulted to the World Health Organization, published seven books, and written over 600 scientific articles.

Mary M. Landrigan, MPA, is a nationally known public health educator and former health care administrator with 25 years of experience at the Westchester County Department of Health. Her special expertise is translating current scientific and medical research into health messages for parents and community members. She is co-author of *Raising Healthy Children in a Toxic World* (Rodale Press, 2002) together with Dr. Philip Landrigan and Dr. Herbert Needleman. She has been active in local environmental advocacy and legislative issues in New York State and is a former president of the New York Public Health Association.

INTRODUCTION

Children today live longer, healthier lives and suffer less disease than children at any previous time in history. A child born this year in the United States, Canada, Great Britain, Germany, France, Australia, Italy, or Japan can expect to live for 80 years and more—nearly double the 45- to 50-year life span that was the norm only 100 years ago at the beginning of the 20th century.

This unprecedented gain in health and longevity is a triumph for modern medicine and public health. It reflects the success of vaccines and antibiotics, the widespread availability of healthy food and safe drinking water, a 90% reduction in infant mortality, and control of the ancient infectious diseases—cholera, smallpox, typhus, yellow fever, scarlet fever, tuberculosis, measles, malaria, pertussis, and polio—that previously decimated the world's children. It is a great step forward for humanity.

But two negative developments overshadow this extraordinary progress and threaten to undo it.

First is the invention and wide dissemination into the modern environment of tens of thousands of new chemicals—new materials that never before existed in nature nor were found in the earth's environment. These man-made, synthetic chemicals are used today in millions of consumer products. They have migrated to the most remote corners of the planet. Some are

highly persistent and will remain in soil and water for decades, if not centuries. These chemicals get into people, including infants and children. Surveys conducted in the United States by the Centers for Disease Control and Prevention (CDC) routinely detect more than 200 synthetic chemicals in the bodies of nearly all Americans, even in the breast milk of nursing mothers and in the umbilical cord blood of newborn infants.

The second negative development is the rise of noncommunicable disease. Over the past 50 years, noncommunicable diseases and disorders have become epidemic among the world's children. They have replaced the infectious diseases as major causes of disability and death. And they are on the rise. Here are some key statistics:

- Childhood asthma has nearly tripled in frequency since the early 1970s.
- Learning disabilities affect 1 child in 6. One of every 68 children born in America is now diagnosed with autism spectrum disorder, according to the CDC.
- Leukemia and brain cancer, the two main types of pediatric cancer, have both increased in incidence by nearly 40% since the early 1970s. Despite tremendous advances in cancer treatment, cancer is now the leading cause of disease death among children.
- Certain birth defects have doubled in frequency, and birth defects have become the leading cause of death in infancy.
- Childhood obesity has more than tripled since the 1970s—today nearly 1 child in 5 in America is obese.
- Type 2 diabetes, previously an adult disease, has become epidemic among children and is diagnosed at ever earlier ages.

The epidemic of noncommunicable disease in children began in North America, Western Europe, and other highly developed countries, but it is now spreading worldwide. Rising

rates of asthma, cancer, birth defects, and obesity are seen today among children in India and China and also in parts of Latin America and Africa that only a generation ago knew starvation and famine. The global pandemic of noncommunicable disease in the world's children is one of the great health problems of our time. If it is not checked, it threatens to undo all of the great gains that medicine and public health have made in the past century.

Toxic chemicals are important causes of noncommunicable disease in children. Toxic chemicals in air, water, soil, household products, and breast milk expose children to health threats that can cause lifelong damage. Research in children's environmental health and epidemiology shows us that infants and children are exquisitely vulnerable to toxic chemicals. Exposures during pregnancy and in early childhood to even very low levels of lead, methylmercury, organophosphate pesticides, and polychlorinated biphenyls (PCBs) have all been proven to cause damage to children's developing brains that presents as IQ loss, shortened attention span, and disordered behavior. Early-life exposure to air pollution causes asthma, pneumonia, impaired lung growth, and sudden infant death. Prenatal exposures to solvents and pesticides are linked to childhood cancer. Endocrine disruptors, such as phthalates and bisphenol A, are associated with birth defects, diminished reproductive function, and disordered behavior. Toxic chemical exposures cause disease in children at exposure levels far lower than in adults.

Despite great recent gains in knowledge of the effects of toxic chemicals on children's health, there is an enormous amount we still do not know. For example, many of the chemicals in widest use today have never been tested for safety or toxicity. Fewer still have been assessed for their potential to disrupt early human development. Without safety testing data, there is no way to know whether a chemical may injure children or how it may do so.

Although many of us rely on governmental regulations to protect us from the harms of chemicals, the reality is that

in many countries the protections are inadequate and do not protect children against dangers of toxic chemicals. Most governments around the world, including the United States, have simply presumed that new chemicals are safe until they are conclusively proven to cause harm, and these countries have required little or no premarket testing of most chemicals. Only a few governments, notably the European Union, through its 2007 REACH legislation, have attempted to establish chemical safety legislation designed to protect children's health and the environment.

After many years of debate, the United States passed chemical safety legislation in 2016—the Senator Frank R. Lautenberg Chemical Safety for the 21st Century Act. As of this writing, the new law is only beginning to be implemented—time will tell whether it will protect our children or be diluted and made ineffective, as were earlier efforts to control toxic chemicals in the United States.

In rapidly developing low- and middle-income countries where chemical pollution has become rampant, controls are even weaker, and children's exposures are severe. Consider, for example, urban air pollution in Beijing and New Delhi and arsenic contamination of drinking water in Bangladesh.

As a consequence of the weak chemical control policies that exist today in most countries, people around the world and especially children are exposed on a daily basis to scores of chemicals of unknown hazard. The extent to which toxic chemicals in the environment are contributing to rising rates of autism, childhood cancer, birth defects, learning disabilities and decreased fertility is only beginning to be discerned. And perhaps even more disturbing, we are beginning only now, more than a century after the rise the chemical manufacturing industry, to realize that exposures to toxic chemicals in early life may cause disease and disability not only in childhood, but across the entire life span. Early-life exposures to toxic chemicals are now beginning to be linked to adult-onset hypertension, heart disease, stroke, and cancer, as well as to

neurodegenerative diseases, such as Parkinson disease and dementia.

The topics covered in this book span a wide range. The first four chapters offer a crash course for professionals and parents who want to understand how children's bodies are particularly sensitive to their chemical environment. The rest of the book is an individual's guide to understanding chemical toxins in one's own environment: what you can do at home to minimize threats from toxic chemicals in household products; what actions you can take to protect your own reproductive health before and during pregnancy; how you can make your baby's room safe; tips about avoiding allergy and asthma attacks; and cautions about pesticides. You will learn how to choose safer foods and household cleaning agents. These details can be applied to both the home and to places like schools and daycare facilities, and will help to minimize toxic exposures for both children and adults while more permanent societal protections are pursued.

1

THE CHANGING PATTERNS OF DISEASE IN CHILDREN

How have patterns of disease in children changed over the past century?

In 1900, a baby born in the United States could be expected to live to about 45 to 50 years of age. One in three children died before his or her first birthday. Almost all of childhood deaths were due to infectious diseases: now-preventable illnesses like pneumonia, dysentery, cholera, smallpox, typhoid fever, pertussis, and measles.

Figure 1-1 shows that the death rate (the number of deaths per 1,000 people per year) in New York City in 1800 was twice as high as it is today. The reason? Because, on average, in 1800 people could expect to live only about half as long as they live today. To be sure, some people back then lived to a ripe old age, but many babies died in infancy, children died during childhood, and young mothers died in giving birth. Thus the average life span was relatively short.

Life expectancy began to increase during the late 19th and early 20th centuries. The great cities saw dramatic changes in their environments that brought about enormous improvements in health. Engineers constructed reservoirs and aqueducts to bring clean water to the cities, with projects such as the Croton Aqueduct in New York City and the Quabbin Reservoir serving Boston. Sewage systems were constructed

The Conquest of Pestilence in New York City

...As shown by the Death Rate as Recorded in the Official Records of the Department of Health and Mental Hygiene.

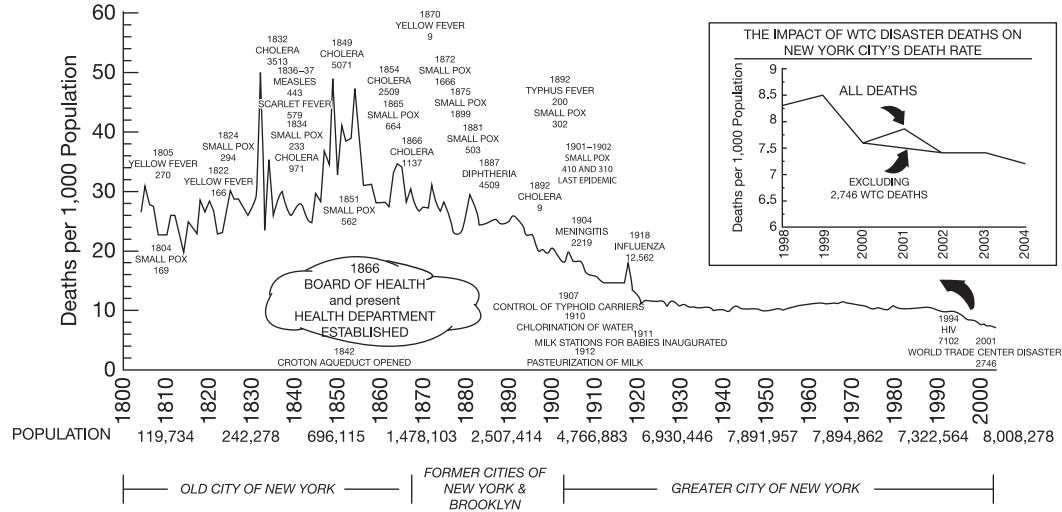


Figure 1-1 Patterns of Disease Change with Development—Environmental Change is the Driving Force