

HIGH FRUCTOSE CORN SYRUP • PLASTIC TOYS • ANTIFUNGAL PAI

**Why We Eat Less and Exercise More**

TOOTHPASTE • SYNTHETIC CARPET • SHOE TRACKED CONTAMINAN

**but Still Struggle to Lose Weight**

UNWASHED HANDS • SHAMPOO • NON-ORGANIC MEAT • CANNED FO

SOME PRESCRIPTION MEDICINES • MERCURY IN FISH • LAUNDRY DETERGE

**THE**

PLASTIC WATER BOTTLES • TRIBUTYL TIN • PLASTIC COATINGS • CAN

MICROWAVE POPCORN BAG • BOTTLE LOTION • NON-ORGANIC BABY WIPES

**OBESOGEN**

NON-ORGANIC COCAINE • NON-ORGANIC FRUITS AND VEGETABLES • SUNSCRI

PLASTIC MILK JUGS • SWORN FISH • AEROSOL DEODORANTS • AIR FRESHENE

**EFFECT**

INSECT REPELLANT • FLAME RETARDANTS • PESTICIDES • FUNGICID

**BRUCE BLUMBERG, PHD**

BLUE LIGHT • FOAM CUSHIONS • VINYL PLASTICS • NON-STICK PA

*with* **Kristin Loberg**

FRAGRANCE • POOR SLEEP • PLASTIC CONTAINERS • PREDATORY FI

# THE OBESOGEN EFFECT

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Why We Eat Less and Exercise More  
but Still Struggle to Lose Weight

*Featuring a 3-Step Plan to Prevent and Counter  
the Effects of Silent Exposures*

Bruce Blumberg, PhD  
*with* Kristin Loberg

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*For Dejoie and Arielle*

What if everything you thought you knew about the biology of body weight  
is *wrong*?

# Contents

Introduction: Fat: An Unrequited Love Story	1
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## PART I

### In the Fatlands: The New Science of Obesity

1. Why Are We So Fat Despite Our Best Efforts? <i>The Hidden Factor No One Is Talking About</i>	11
2. A Modern Chemistry of Fat <i>How We Gain and Lose Weight in the Twenty-First Century</i>	40
3. The Science of Obesogens <i>Why Chemicals—Not Willpower—Could Be Holding the Remote Control to Your Weight</i>	66
4. The Power of Epigenetics <i>What Obesity and Other Non-communicable Diseases Have in Common</i>	100
5. It Gets Complicated <i>Other Fat-Inducing Factors</i>	127

## CONTENTS

### PART II

## In the Real World: How to Take Control in 3 Simple Steps

6. Step 1: It Really Does Start with Food <i>Cleaning Up Your Diet</i>	159
7. Step 2: Purge the Plastic <i>Reducing the Plastic in Your Life</i>	191
8. Step 3: Rethink Your Personal Space <i>Your Simple Household Makeover</i>	205
9. Extra Credit <i>Noise, Light, and Other Sources of Obesogenic Pollution Sabotaging Your Weight Loss Efforts</i>	233
Conclusion: Warning: May Cause Obesity	248
Acknowledgments	255
References	263
Image Credits	287
Index	289
About the Authors	305

THE  
OBESOGEN  
EFFECT

## INTRODUCTION

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# Fat: An Unrequited Love Story

When you think about the causes of overweight and obesity, conditions that now affect the majority of Americans, two factors likely come to mind immediately: dreadful dietary habits and lack of exercise. This is what I call the “orthodox wisdom” that we hear all the time. But what if I said you are wrong? Well, at least not 100 percent right. You’re missing a huge influence that has been driving our epidemic for the last half century, and it has nothing to do with a penchant for sitting on the couch eating potato chips and drinking regular soda. It has to do with obesogens—chemicals in our environment that promote weight gain.

No one wants to be fat, but most of us are, despite working hard to eliminate unwanted pounds. Something is wrong with this narrative. I coined the term “obesogens” in 2006 to describe chemicals that can make you fat.<sup>1</sup> This sounded the alarm and spurred a flurry of scientific research studying the phenomenon of chemical-induced obesity. My team found that a chemical we were studying for other reasons had the ability to make mice fat. That started me thinking that there might be an alternative

## INTRODUCTION

explanation for our irrepressible fatness other than calories in versus calories out. And I was right.

Take a moment to consider this from a purely logical standpoint: If weight were simply determined by calories eaten minus calories burned (more formally called the energy balance equation), don't you think we would be able to easily manage our weight? Why can we balance our bank checkbooks, but not our caloric checkbooks? In arithmetic, one plus one equals two no matter what language you speak. But one plus one can equal more than two when it comes to the weight equation of the human body. I will explain how this is possible in the book.

Observational studies in humans have pointed to a strong link between exposure to certain environmental chemicals and greater body mass index (BMI).<sup>2</sup> The BMI is a general measure that relates your weight in kilograms to your height.<sup>3</sup> BMI is often used as an indicator of obesity on one end of the spectrum and underweight on the other. In 1997, the World Health Organization (WHO) convened for its first meeting on the rising obesity epidemic and adopted new criteria for “normal weight” (BMI of 18.5–24.9), “overweight” (BMI of 25–29.9), and “obese” (BMI of 30 or higher).<sup>4</sup> The easiest way to measure your BMI is to use an online calculator, which will divide your weight in kilograms by the square of your height in meters to arrive at the number.

An important 2016 study showed that average BMI today is higher than it was a little more than a generation ago, even when our caloric intake and physical activity is about the same.<sup>5</sup> Put another way, adults today find it harder to maintain the same weight than did adults twenty to thirty years ago, even at the same levels of food intake and exercise. These days people are about 10 percent heavier than people in the 1980s, even if they

eat and exercise as they did back in the heyday of leg warmers and Sony Walkmans. And despite what you hear, we exercise *more* than we did in the 1980s—not less. There is another explanation that will unfold chapter by chapter.

The time has come to present the untold story of obesogens with the hope that you can take better control of your waistline, your health, and especially the well-being of your children and future generations. After all, nowhere is the obesity epidemic more painfully disturbing to witness and acknowledge than in our young. In January 2016, the World Health Organization released a statement declaring that the number of obese children worldwide today is “alarming.”<sup>6</sup> I will add the words “disheartening” and “unacceptable.”

I don’t mean to minimize poor diet and physical inactivity; these remain leading causes of overweight and obesity. But we in the scientific community are increasingly finding that exposure to chemicals in our diet and environment may be an under-recognized risk factor. In the last decade, other researchers and I have identified dozens of chemicals that can increase susceptibility to becoming obese in animals and trigger cells grown in a lab (cultured cells) to become fat cells.<sup>7,8</sup> The narrative about our obesity epidemic, which is now a severe public health crisis, continues to be stuck in the conversation about our modern lifestyles—too much food (especially the wrong kind) and not enough sweating. When doctors address patients who are overweight, they resort to the same old questions: “What are you eating? How much are you exercising?” Doctors rarely ask about what their patients may be exposed to (even unwittingly) in daily life. Indeed, many are hostile to the idea that chemical exposure may have effects on health. The quiz coming up shortly will begin to clue you in to what kinds of exposures

## INTRODUCTION

I am talking about, many of which may surprise you because you never knew there was a connection to your weight. Losing weight is no longer only about putting down the doughnuts and hopping on a treadmill.

What is missing from the never-ending conversation about weight and how to control it is the role played by obesogens and how these little-acknowledged yet potent and deleterious substances that we encounter daily—in our food, households, workplaces, and even medicine cabinets—are severely impacting our waistlines and overall health. Obesogens contribute to obesity by disrupting the normal development and balance of fat metabolism—how your body creates and stores fat. Obesogens can reprogram stem cells in the body to develop into more fat cells. Obesogen exposure also changes how your body responds to dietary choices and handles calories. So even though you have bought into the latest trends—Paleo, low-carb, gluten-free, Zumba, or CrossFit gyms—you can still struggle mightily with weight because of what is in your environment (broadly defined).

One of the most pernicious ramifications of obesogens is that their effects can be passed on to future generations. That's right: the effects of obesogen exposure can be *heritable*. The havoc that obesogens wreak on our bodies can be passed down to our biological children, grandchildren, and beyond. This is why understanding the science of obesogens and knowing how to avoid them is particularly important for women who intend to become pregnant, are already pregnant, or have young children. The developmental years are a sensitive period in one's life, during which the body can be more vulnerable to, and affected by, chemical exposure. Our children, grandchildren, and beyond deserve to have the best possible chance to live long, healthy,

and lean lives without being saddled with a predisposition to the burden of obesity and its related consequences. My hope with this book is to show you how to make it more likely that your children will succeed rather than fail to control their weight, as well as to help you reduce the impact of obesogens in your own life.

Now, before we begin the journey, I will share a little bit about me. I didn't start my doctoral life searching for obesogens. As happens with so many discoveries in science, I stumbled upon them while exploring other areas in biology. When I arrived at UCLA as a new PhD student in 1982, I wanted to study developmental biology—how organisms grow and develop from a single cell into complex, multicellular organisms such as humans. At that time, all of the developmental biologists at UCLA were exploring the genetics and development of the fruit fly, *Drosophila*, which I didn't find particularly appealing. Instead, I ended up studying the biochemistry of the extracellular matrix—the connective tissue that helps hold the body together. When I became a postdoctoral fellow at UCLA, I finally studied vertebrate developmental biology, looking for embryonic inducers—molecules that play critical roles in directing embryonic cells to form new tissues and tell the developing embryo where the head, arms, legs, and so on should go. Most everyone else in the field was studying peptide growth factors (proteins that stimulate cell growth) as embryonic patterning molecules, but my background with the extracellular matrix led me to look for small, fat-soluble molecules that could move freely through the sticky matrix around cells, whereas growth factors cannot. Small, fat-soluble molecules such as steroid hormones are ideal candidates for such molecules and were already known to be important for development. As you will soon learn, hormone levels can control how

## INTRODUCTION

you behave and how your body develops and functions, even including your metabolism and risk for obesity. The receptors that these hormones bind to are powerful molecular switches that control the activity of many other genes. Since quite a few apparent receptors were then known for which no hormones had been identified (these are called “orphan receptors”), I set out to find new receptor-hormone combinations.

Later, I moved to the Salk Institute for Biological Studies in the Gene Expression Laboratory of Dr. Ron Evans, the world leader in hormone receptor research, to improve my chances of identifying new hormones. In 1996, while I was busily developing methods to identify new hormone-receptor combinations, I got a call from my colleague Dave Gardiner at the University of California–Irvine about deformed frogs that were being found in Minnesota. Dave and a few other scientists thought that the cause could be a retinoid (a chemical related to vitamin A) in the water and wanted to know how difficult it would be to test their hypothesis. I applied the same methods we developed to identify new hormones to find chemicals in the water that might be activating retinoid receptors to cause the types of deformities observed in the Minnesota frogs. That got me started on the path toward looking for environmental chemicals that disrupt hormonal signaling and thereby alter development (so-called endocrine disrupting chemicals, or EDCs). The rest is history that I will share in the book.

Fasten your seat belt. What you are about to learn will stun you on one level but inspire you on another (and make you feel a little better about yourself if you have struggled with your weight). You are not alone when it comes to matters of weight and the emotional toll of being on a seemingly endless diet to achieve and maintain weight loss. It *is* an uphill battle. You

## Fat: An Unrequited Love Story

are also not alone if you answer “yes” to any of the questions coming up in the first chapter that will help you to grasp how many things in your environment could be making you fat—and keeping you fat despite your best efforts. Together we can identify the hidden factors that are sabotaging your health and weight loss efforts. Let’s begin.