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"A must-read for any parent of boys."—**DR. MEHMET OZ**, Professor and Vice Chairman,
New York Presbyterian Hospital, Columbia University

boys adrift

**THE FIVE FACTORS DRIVING THE GROWING EPIDEMIC OF
UNMOTIVATED BOYS AND UNDERACHIEVING YOUNG MEN**

video games • teaching methods
prescription drugs • environmental toxins
devaluation of masculinity

WITH A NEW AFTERWORD FROM THE AUTHOR

Leonard Sax, M.D., Ph.D.

Author of *Why Gender Matters*

5

THE FOURTH FACTOR

Endocrine Disruptors

Fish on the Wild Side

I live in one of the outer suburbs of Washington, DC.

- The medical office where I work is located only a few blocks from my home.
- Some mornings I indulge my taste for *SCHADENFREUDE* by listening to the traffic reports on the radio.
- The WOODROW WILSON BRIDGE is often featured on those reports.
- The Wilson Bridge is the longest bridge on the Capital Beltway, crossing the POTOMAC RIVER just south of Washington, DC.
- It's often a bottleneck.
 - "And of course, the approach to the WILSON BRIDGE is stacked up again this morning.
 - It's stop and go.
 - You can expect about a twenty-minute delay between Route 210 and the WILSON BRIDGE. ..."

In the fall of 2006, scientists studying fish in the POTOMAC RIVER reported an unsettling discovery.

- Collecting fish near the WILSON BRIDGE, the scientists found that the
 - females were normal, but the
 - males weren't.
- When the scientists examined the male sex organs,
 - they didn't find sperm,
 - they found eggs.
- This weird finding wasn't confined to the congested and polluted areas around the WILSON BRIDGE.
- The scientists collected fish at all seven *BOYS ADRIFT* TRIBUTARIES of the POTOMAC,
 - extending two hundred miles up the SHENANDOAH RIVER into VIRGINIA and
 - more than one hundred miles up both the MONOCACY RIVER and CONOCOCHIEGUE CREEK in MARYLAND.
- At every one of these seven sites, the scientists found that at least 80 percent of the male smallmouth bass they examined were feminized:
 - the sex organs in the male fish were making eggs instead of sperm.¹
- This news was reported on the front page of the Washington Post for the excellent reason that most of the readers of the Washington Post get their drinking water from the POTOMAC RIVER.

What's in the river water that's causing the male fish to become feminized?

- Could that something, whatever it is, affect boys and men in a similar way?
- What about girls and women?

VICKI BLAZER, a veterinary pathologist who specializes in fish, acknowledged that the results were “striking.”

- She concluded that the POTOMAC RIVER and its tributaries clearly have significant levels of “ENDOCRINE DISRUPTORS”:
 - substances that mimic the actions of hormones, specifically female hormones.
 - The hormones themselves are not present in the river.
- In fact, Dr. BLAZER and other scientists haven't been able to figure out exactly which chemical or combination of chemicals is causing the problem among the fish in the Potomac.
 - “There is this sort of widespread endocrine disruption in the Potomac, but we don't know still what are the causes,”
Dr. BLAZER told the *Post*.
- Local agency officials were quick to assure the public that the water is safe to drink.

But some consumers were skeptical.

“If they can't tell us what the problem is,”
said ED MERRITFIELD,
executive director of the environmental group
POTOMAC RIVERKEEPER,
“then how can they tell us that they've taken it out of the water?”²

The *Washington Post* previously reported

- —in a seemingly unrelated story—
- that more and more young men attending colleges and universities in and around Washington, DC, are struggling with impotence, and even losing interest in sex.³
- The fact that the POTOMAC RIVER now appears to contain a substance or substances that can emasculate males puts that story in a new light.
 - But at least those impotent young men aren't making eggs.
- If this problem had been observed only in the POTOMAC RIVER ESTUARY and POTOMAC RIVER TRIBUTARIES, we wouldn't be discussing it.

呵呵，他們能下蛋就好了

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS
101

- But this problem is far more widespread.
- Similar stories of feminized or emasculated wildlife, including a diverse array of mammals as well as fish, have now been described in
 - Idaho and
 - Washington,
 - in central Florida,
 - in the Great Lakes,
 - in Alaska,
 - in England, and even
 - in Greenland.⁴

What's going on?

And could it be relevant to your son?

- This issue obviously affects girls as well as boys.
- One of the best documented recent stories about endocrine disruptors concerns their effects on girls.

Let's take a look at that story, and then see how or whether it's relevant to boys.

She's Only Eight Years Old,

But She Could Pass for Twelve or Fourteen

Doctors in [SAN JUAN, PUERTO RICO](#), began noticing something strange as early as 1980.

- Girls as young as seven and eight years of age were going through puberty.
- Those girls' breasts were developing in ways that would be more typical of twelve- and thirteen- and fourteen-year-old girls.
- As reports of these physically [PRECOCIOUS](#) girls spread around the city, and as [the number of girls reported grew from the dozens to the hundreds and then the thousands, pediatric endocrinologists in San Juan](#) joined together to try to discover the cause of the girls' early development.

They tested many hypotheses.

- Hormones in beef?
- One of the first ideas the specialists considered was the notion that hormones in the meat the girls were eating might be partly responsible.
- For [more than thirty years](#) now, Americans have been eating meat that comes from cattle that have been fed [ANABOLIC STEROIDS](#)
 - —sex hormones—
 - to make the cattle more meaty.

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- These are, in many cases, the same steroid hormones that human athletes are prohibited from using because of the health risks.
- The doctors conjectured that perhaps these hormones were causing the girls' breasts to develop.⁵
- The [U.S. DEPARTMENT OF AGRICULTURE](#) joined with the [PUERTO RICO DEPARTMENT OF HEALTH](#) to investigate this notion thoroughly, but they found no evidence to support this hypothesis.
- [Compared to normal girls, the girls with premature breast development didn't have higher levels of any hormones linked to the hormones given to cattle.](#)

102

BOYS ADRIFT

- And, it wasn't clear how the synthetic hormones fed to the cattle
 - —which are usually male hormones—
 - would cause precocious puberty in girls but not in boys.

Genetics?

- The next hypothesis the specialists tested was genetic.
- Maybe ethnic Puerto Rican girls are just more prone to precocious puberty than girls from other ethnic and racial groups
 - —or so they hypothesized.

呵呵，什麼都可以怪上基因
Brue Lipton 一直告訴你，
所有可以直接歸因基因的毛病少於5%
- The doctors then carefully compared the frequency of precocious puberty among Puerto Rican girls living in Puerto Rico with Puerto Rican girls living in Philadelphia.
 - They found that the Puerto Rican girls living in Philadelphia were not at risk.
 - Only the girls in Puerto Rico were at risk.
 - Furthermore, girls in Puerto Rico were showing early breast development regardless of their race or ethnicity.
 - Genetics didn't seem to have anything to do with it.⁶
- The cause of the problem wasn't in the girls' chromosomes:
 - it had to be something in the environment, something in San Juan.

Plastics.

- Then the doctors heard about feminized alligators in central Florida.
- Scientists with the U.S. FISH AND WILDLIFE SERVICE had found **emasculated male alligators** in the wildlife preserves around LAKE APOPKA in CENTRAL FLORIDA.
- **The alligators had shriveled testicles and high female hormone levels.**
- The scientists had linked the emasculation of those male alligators to phthalates.⁷
- Clear plastic bottles
 - —the type used for most bottled water in the United States, as well as for soda beverages such as Coke, Pepsi, and Dr. Pepper—
- are made with plasticizers called phthalates, in particular polyethylene terephthalate (PET).
- Have you ever left a plastic bottle in your car on a summer day?
- Did the bottle contain Coke or Pepsi or Sprite or was it just plain bottled water?
- Did you take a drink from the bottle?
- Did you notice that it tasted just a little funny?
 - Just a little
 - —plasticky?
- **What you were tasting was PET, polyethylene terephthalate.**
- **When you let one of these clear plastic bottles get warm, the phthalate starts to leach into the beverage.**
- **The higher the temperature, and the more acidic the beverage, the more phthalate will leak into the beverage.**
- Lake Apopka is in the same watershed that serves Orlando.
 - We're talking Disney World.

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS
- Just imagine how many plastic bottles end up in the water, one way or another.
- And it's hot in central Florida.
- The alligators are getting a hefty dose of phthalates.
- That appears to be the best explanation for their shriveled testicles, according to the U.S. FISH AND WILDLIFE SERVICE.
- Phthalates **mimic the action of female hormones**
 - (more about that below).

The doctors in Puerto Rico wondered whether **phthalates** might be disrupting and accelerating the girls' endocrine development.

- So they tested the levels of **phthalate** in the girls' blood and compared their levels to the levels in **Puerto Rican** girls who didn't have early breast development.
- **Bingo.**
- **The girls whose breasts had developed early had high levels of phthalates, about six times higher than the levels in girls whose breasts had not yet developed:**
 - an average of 512 parts per billion in girls with premature breast development, compared with 86 parts per billion in normal girls.⁸
- This story is an extreme case, but many studies now suggest that something like this may be taking place right now, more subtly, among girls throughout the United States and Canada.
- Girls are going through puberty earlier than ever before.
- In the United States, the number of girls beginning puberty at age eight has become so great that pediatric endocrinologists
 - —doctors who specialize in problems of the endocrine system and hormones—
- called a special conference to decide what should be done about the problem.
- Just think of all the options the specialists might have considered.
- They could have called for an ongoing study to determine whether girls who develop adult breasts at age eight are at increased risk for developing breast cancer twenty or thirty years later, as some have suggested.⁹

They could have called for a **MORATORIUM** on clear plastic bottles for beverages served to prepubescent children.

- **They could at least have called for an all-out effort to study the problem.**
- **But the American endocrinologists did none of those things.**
- **Instead they decided simply to redefine what's normal.**
- **The experts decided that a girl who needs to wear a bra at age eight should no longer be considered an anomaly.**¹⁰

美國人啊！很正常啊！

But this is a book about boys.
So why are we talking about girls?

Puberty Out of Synch

太有趣了，從來沒想過女人和男人的性成熟期是配套的

The overwhelming **majority of modern chemicals that mimic the action of human sex hormones**, curiously, **mimic** the action **only** of **female hormones**.

- Synthetic industrial chemicals that mimic the action of male hormones are rare.
- 為什麼
- As a result, the average child today is practically awash in synthetic chemicals that have the effect of accelerating a girl's sexual development.
- **The effects on boys are more subtle.**
- **The net effect** appears to be **a slowing and/or warping of boys' sexual development.**

There is now substantial evidence that the very same endocrine disrupting chemicals that accelerate puberty in girls may delay or disrupt the process of puberty in boys.¹¹

- As a result, middle school has become a very strange place.
- There has always been a DISPARITY between the sexual development of girls and boys, but thirty or forty or fifty years ago the gap was measured in months rather than years.
- In that bygone era, girls began puberty around age twelve or thirteen, boys around age thirteen or fourteen.
- If you attended a BAR MITZVAH PARTY thirty years ago, you might recall seeing tall, almost adult-looking thirteen-year-old girls standing next to boys the same age who were six inches shorter than them.
 - Three decades ago, the months right around the thirteenth birthday were the period when the disparity was most noticeable.
書是2007寫的, 所以已經近半世紀了
- Today, the duration of that disparity has lengthened.
- Today, girls commonly begin puberty around age nine, boys seldom earlier than age twelve and sometimes as late as fourteen or fifteen.
- Girls have completed the process of puberty by age eleven or twelve
 - —an age when most of the boys are just getting started.
- Enter any middle school.
- Ask to see a sixth-grade class.
 - Most of the girls are sexually mature.
 - They're only eleven or twelve years old, but many could pass for fourteen, fifteen, or sixteen.
- The boys are the same age as the girls, but they don't look it.
- You'll see a similar gap in physical appearance among seventh-graders.
- By eighth grade, some of the boys have started to catch up.
- Others haven't.
- Even when you enter a ninth grade class, you'll still find a significant cohort of boys who could pass for fifth-graders.

- I've seen this myself at many of the schools I've visited over the past five years.

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS

105

- Most of the ninth-grade girls could walk into a classroom with college freshmen and pass for college students themselves.
- Few ninth-grade boys could do that.
- There's growing evidence that exposure to synthetic chemicals may disrupt or slow puberty in boys —and only in boys.

Consider endosulfan, a pesticide used widely in the United States and throughout the world.

- In the United States alone, roughly one-and-a-half million pounds of ENDOSULFAN are applied to food crops every year.
- But it wasn't until December 2003 that scientists discovered that this common pesticide can slow and disrupt the process of puberty in boys
 - —only in boys—
- apparently because it blocks the action of testosterone and other androgens.¹²
- Despite this discovery, there has been no change in the use of this pesticide in the United States.
- It's being applied right now to food that your family may soon be consuming.

Bottled Water,

Pacifiers, and Baby Bottles

What could be healthier than a pregnant woman drinking bottled water?

- What's wrong with a baby sucking on a pacifier?
- What's wrong with Mom putting some of her pumped breast milk into a clear plastic bottle so that Dad can feed the baby?

- In the past five years, scientists have found that each of these activities introduces chemicals
 - —bisphenol A or phthalates—
 into the baby's system that may actually damage a boy's brain.

- **Rigid plastic bottles**

- —the sort commonly used worldwide
 - to feed babies infant formula
 - or pumped breast milk—

leach bisphenol A into the milk or formula.*

- That's because those bottles are usually made of **polycarbonate**, which is in very wide use in all developed countries.
- It is made from **bisphenol A**.
- When you put anything to drink
 - —such as breast milk or water—
 into a **polycarbonate** bottle or container, a small amount of **bisphenol A** will get into that drink.

*Some parents use a soft flexible plastic liner within the bottle.

106 BOYS ADRIET

In December 2005, a team of researchers at the **UNIVERSITY OF CINCINNATI** published research showing that the low levels of **bisphenol A** that leach into milk or formula from such bottles **IRREVERSIBLY DISRUPT BRAIN DEVELOPMENT IN LABORATORY ANIMALS**.

- And, even though **bisphenol A** mimics the action of the female hormone estrogen, the effects on the brain are not confined only or even primarily to the areas involved in reproduction or sexuality.
- Instead, brain areas involved in memory and motivation are disrupted.¹³

These toxins do not affect girls and boys in the same way.

- A collaborative investigation by researchers from **HARVARD UNIVERSITY** and **OXFORD UNIVERSITY** recently demonstrated that environmental factors “resulted in **more dramatic neurodevelopmental and behavioral changes in male neonates**.”¹⁴
- Researchers in **ITALY** have made a similar discovery.
- They found that when laboratory animals are exposed to these chemicals when they are young, the animals seem less curious about their environment when they are grown up.
- **Male animals that have been exposed to these chemicals when very young subsequently behave less like males**; their activity profile is “feminized, strongly resembling that of control females.”¹⁵
- The same team of **ITALIAN** researchers discovered in **2005** that these chemicals may damage the **nucleus accumbens**
 - —the same area of the brain we discussed in THE PREVIOUS CHAPTER—
 the vital pivot for motivation, the place where emotion gets translated into sustained and purposeful action.¹⁶
- **Female animals exposed to these substances at a very early age grow up to be more curious and more active** than females who are not exposed to these substances;
 - but **males** exposed at the same age grow up to **be less curious** than males who were not exposed.¹⁷
- A different team of investigators found that females who were exposed early in life to these chemicals actually **learn** some **tasks better** and **faster** than females who were not exposed;
 - whereas **males** exposed at the same age **learn** those tasks significantly **less** well, and more **slowly**, than males who were not exposed.¹⁸

Endocrine Disruptors, ADHD, and Motivation

Scientists have just begun to recognize the pernicious effects these chemicals have on the brain

—particularly on the brains of boys—
in ways not previously imagined.

ADHD may be one result.

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS
107

The soaring rates of ADHD among NORTH AMERICAN boys in the last twenty years have only recently been linked to these chemicals.

- It wasn't until recently that neuroscientists recognized the mechanism by which phthalates and bisphenol A might actually cause ADHD.
- In 2004, neuroscientists identified a crucial link between endocrine disruptors and ADHD.
- When young laboratory animals were exposed to tiny doses of endocrine disruptors
 - —including bisphenol A and various phthalates—
- the scientists found that the endocrine disruptors appear to damage a brain system built around a substance known as PACAP (pituitary adenylate cyclase-activating polypeptide).
 - These laboratory animals were, quite literally, hyper.
 - They just couldn't slow down.¹⁹
- Many researchers have pointed out that ADHD, which is very common in North America, is rare in India and China.
- The usual explanation has to do with differences in the
 - educational system,
 - culture, and
 - parenting stylesin NORTH AMERICA compared with INDIA or CHINA.
- Many of those arguments have considerable merit.²⁰
- But they do not exclude another possibility that also deserves investigation.

Bottled water

—water sold in plastic bottles—

is rare in

INDIA and CHINA.

- Where it is available, it's sold mainly to NORTH AMERICAN tourists.²¹
- Soda beverages sold in plastic bottles were until recently also rare in these countries.
- Is it possible that the dramatically higher rates of ADHD in the UNITED STATES and CANADA compared with INDIA and CHINA may be due in some part to an effect of environmental estrogens such as bisphenol A and the phthalates on the developing brain?
- The damaging effects of environmental estrogens on AMERICAN boys may well cause harm beyond increases in the rates of ADHD.

In recent years scientists have begun to understand that the FOUNTAINHEAD OF DRIVE AND MOTIVATION IS VERY DIFFERENT IN GIRLS AND BOYS.

In boys,

- testosterone fuels more than just sexual interest:
- it fuels the drive
 - to achieve,
 - to be the best,
 - to compete.
- Successful, high-achieving boys have higher testosterone levels than boys who are content to come in last.
- Girls can be just as competitive as boys are, but competitive GIRLS DON'T RELY ON HORMONES FOR THEIR DRIVE.
- Competitive, high-achieving girls do not have higher testosterone levels than less competitive girls have.²²

108
BOYS ADRIET

This sex difference may be one reason why the flood of estrogenic chemicals in which today's children are immersed has not impaired the drive or motivation of girls.

But the boys, increasingly, are lazy.

INFANTS, TODDLERS, AND YOUNG CHILDREN DON'T MAKE SEX HORMONES

THEIR BODIES AND BRAINS ARE NOT MEANT TO BE EXPOSED TO THEM UNTIL PUBERTY BEGINS.

- When young children are exposed to substances that act like sex hormones
 - —**exogenous mimics**, as the chemicals are sometimes called—the delicate balance is upset, with unpredictable results.
- **ROCKEFELLER UNIVERSITY** Professor **BRUCE MCÉWEN** noted years ago that “**exogenous mimics can play havoc with brain development and differentiation.**”²³
- More recently, Professor **NEIL MACLUSKY** at Yale has called attention to the long term effects of these substances on the ability of children to learn.
- **MacLusky** and his colleagues found high levels of the endocrine disruptor bisphenol A in the blood of pregnant women.
- Similar levels in pregnant laboratory animals have now been shown to cause learning disabilities in their offspring, leading Professor **MacLusky** to express concern that exposure at levels that people are currently being exposed to in the United States may have “long-term effects on children’s learning ability.”²⁴
- Recent research suggests that **young children are far more sensitive to these substances than was previously thought, and that the “safe” levels of exposure established by the FDA in the 1990s may be dangerously high.**
- **Until recently, concerns about these chemicals centered on the risk of cancer.**
- In fact, they rarely cause cancer in the amounts to which most of us are exposed.

But we now know **they may disrupt brain development even at very low doses.**²⁵

Why Have Kids Gotten So Fat?

Environmental estrogens often have profoundly different effects on girls and boys, as we have seen.

- But the effects of these **endocrine disruptors** are not confined to the brain.
- They may also be contributing to one of our most serious health problems:
 - childhood obesity.
- **Environmental estrogens** appear to make kids fat
 - —both girls and boys.
- **Teenagers today are four times more likely to be obese and overweight compared with teenagers in the 1960s.**²⁶

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS
109

Of course, many blame the increase in the number of chubby teens on teenagers' fondness for

- pizza,
- french fries, and
- potato chips.
- But **teenagers have always been fond of pizza, french fries, and potato chips.**
- Why are teenagers so much more likely to be fat today than they were **forty years ago**?
- You might answer that teenagers are less active today, and that's true
 - —if you're talking about boys.
- But it's not true for girls.
- **Girls are much more likely to play competitive sports today than they were forty years ago.**
- **Forty years ago, we didn't have soccer leagues for seven-year-old girls.**
- Likewise at the high school level:
 - **forty years ago**, before **TITLE IX**,
 - girls' high school sports at most schools consisted of
 - badminton,
 - softball, and
 - basketball
 - —and **not many girls participated.**
- Girls' involvement in serious competitive sports has soared over the past forty years
 - —while boys' participation over the same era has remained relatively flat.²⁷
- Yet both girls and boys are more likely to be overweight today, compared with forty years ago.
- **The increase in the risk of overweight affects girls and boys about equally.**

Why are so many kids getting so fat?

- Increasingly, investigators are pointing the finger at **environmental estrogens**.
 - **Scientists have known for decades that estrogens regulate the size of fat cells.**
 - Young children
 - — whether girls or boys—
 - don't make estrogens.
 - Exposure to **environmental estrogens** in childhood “may have long-lasting consequences” that increase the tendency to overweight and obesity, according to **RETHA NEWBOLD**, a biologist with the **NATIONAL INSTITUTE OF ENVIRONMENTAL HEALTH SCIENCES (NIEHS)**.
 - These chemicals may directly affect fat cells (adipose cells), or they may disrupt the signals between fat cells and the **pituitary** and **hypothalamus** (endocrine feedback loops).
 - “We’re still trying to determine if it’s a direct effect on the adipose cells and how they differentiate or proliferate, or whether it’s a disruption of the endocrine feedback loops,”
Dr. **NEWBOLD** says.²⁸
 - Either way, exposure to these chemicals in childhood appears to increase substantially the risk that a child will be overweight.
 - Professor **FREDERICK VOM SAAL** at the **UNIVERSITY OF MISSOURI** has highlighted the risk of obesity associated with exposure to **bisphenol A**.
 - **Even very low-dose exposure can activate fat cells, causing them to get bigger**, Professor **VOM SAAL** warns.
- 110
BOYS ADRIFT
- He has found that **low-dose exposure to bisphenol A early in life**
 - **causes both male and female laboratory animals to be fatter as adults; it also**
 - **causes the females, but not the males, to begin puberty at an earlier age.**²⁹

Environmental estrogens may lead to overweight.

- In girls, overweight may accelerate the onset and tempo of puberty.
- In March 2007, investigators at the UNIVERSITY OF MICHIGAN reported that if a girl is overweight as early as three years of age, she will be significantly more likely to undergo puberty earlier than a girl who is normal weight at three years of age.³⁰
 - So what is the cause and what is the effect?
- If environmental estrogens do contribute to the earlier onset of puberty in girls,
 - do they do so via a direct effect
 - —as a result of their endocrine disrupting action—
 - or do they do so via an indirect effect,
 - by causing overweight
 - —or both?
- We have seen how exposure to environmental estrogens can lead to overweight, in both girls and boys.

And while exposure to synthetic endocrine disruptors may accelerate puberty in girls,

- we've seen that exposure to the same synthetic substances can disrupt or slow the process of puberty in boys.
- We now know that these substances may cause ADHD.
- How about a triple WHAMMY:
 - all three together?
- Scientists are now reporting that these three conditions
 - —delayed puberty,
 - overweight, and
 - ADHD—occur together much more often than would be expected by chance
 - —but, again, only in boys.
- Researchers at HARVARD MEDICAL SCHOOL and CHILDREN'S HOSPITAL IN BOSTON found that almost one in five boys who were late to begin puberty also were diagnosed with ADHD, compared with fewer than one in thirty girls in the same study.³¹
- We're seeing a substantial increase in the number of boys who are
 - overweight,
 - inattentive, and
 - late to begin puberty.

Are Boys Now the More Fragile Sex?

My patient, a ten-year-old boy I'll call STEVEN,

- tripped and fell on the grass in his own backyard.
- No big deal, right?
- Kids fall all the time, right?
- But STEVEN was screaming in pain when he stood up,
 - cradling his right arm in his left.
- And the right forearm was bent horribly,
 - in a way no forearm should bend.
- STEVEN had broken both bones in his forearm
 - — the mid-shaft of both the radius and the ulna—
- from a trivial injury.
- He had to have surgery to set the bones in place.
THE FOURTH FACTOR: ENDOCRINE DISRUPTORS¹¹¹
- Doctors call such injuries pathologic fractures, because they suggest underlying pathology.
- A boy should be able to fall on the grass without sustaining a complex fracture that requires surgery.
- In the past, a fracture like STEVEN's might signify some rare underlying bone disease such as osteogenesis imperfecta or hyperparathyroidism.
- No longer.
 - STEVEN doesn't have any underlying disease.
 - He's a normal American boy
 - — which has come to mean, he's a boy who can break his bones just by tripping and falling.³²
- By their fifteenth birthday, almost two-thirds (63.7 percent) of boys have now had at least one broken bone, compared with 39.1 percent of girls.³³
- The risk of fracture for boys roughly doubled between the 1960s and the 1990s.³⁴

Why are the bones of American boys more brittle today than they were thirty or forty years ago?

- Some of this change has been attributed to changes in diet, which is reasonable.
- Boys today drink less milk and more cola beverages than they did thirty years ago.³⁵
- But that change alone can't account for the dramatic increase in the rate of fractures among teenage boys.
- There's a real possibility that **environmental estrogens** may be the missing factor.
- Whereas **environmental estrogens** may strengthen bones in girls, they have a more complex effect on boys.
- We now know that environmental estrogens (particularly phthalates) appear to **cause lower testosterone levels in young men**.³⁶

Those lower testosterone levels will likely impair bone mineralization.

- In other words, **young men will have bones that are more brittle than the bones of young men a generation ago**.
- The disruptive effect of these chemicals on bone density has now been **demonstrated in species as diverse as monkeys and alligators**.³⁷
- We can't say for sure that these chemicals are to blame for declining bone density in boys.
- But it's a possibility that merits a closer look.

Neither Male nor Female

Sex differences are not unique to humans.

- Almost all higher mammals show sex differences in behavior.
- These differences are particularly pronounced among primates,
- the mammalian class to which we humans belong.
- These differences are present as early in life as behavior can be reliably tested.³⁸

Here's what's scary:

- scientists are finding that exposure to **environmental estrogens** early in life, particularly in utero and in early infancy, blunts or eliminates sex differences in behavior.
- Females become less feminine.**
- Males become less masculine.**
- For example, when young laboratory animals were exposed to extremely low doses of these chemicals
 - comparable to the doses you might get by drinking bottled water or Sprite or Coke or Sierra Mist or Pepsi from a clear plastic bottle—
- the males stopped acting like males.**
- They stopped engaging in the rough and-tumble play characteristic of males, for example.
- Instead, they demonstrated “play characteristic of females rather than untreated males.”³⁹

In the fall of **2006** researchers at **TUFTS UNIVERSITY** reported that when young laboratory animals were exposed to very low doses of **bisphenol A**

—doses comparable to what a baby might get if her mother is in the habit of drinking bottled water—

the distinctive sexual differentiation of female and male brains was eliminated.

- Brains of female and male animals that had been exposed to the chemical were no longer distinguishable from one another, unlike the brains of unexposed animals.
- Likewise, the characteristic sex differences in the behavior and play of the animals were eliminated as well.⁴⁰
- There's growing evidence that the end result of our increasingly toxic environment is **girls who are both masculine and feminine, and boys who are neither masculine nor feminine**.
- The **DELETERIOUS** effects on girls is a complex topic beyond the scope of this book.
- Right now, we need to consider the possibility that the very hardware that makes a boy a boy may be in jeopardy.

Private Parts

Your son may be less than half the man your father was.

- American boys today are three times more likely to be born with genital abnormalities such as an undescended testicle compared with American boys thirty years ago.
- Young men today have lower testosterone levels than their grandfathers had,⁴¹ and there is growing concern that male infertility is on the rise.⁴²

THE FOURTH FACTOR: ENDOCRINE DISRUPTORS

443

Over the past thirty years, according to one comprehensive study, there has been a synchronized increase in the incidence of male reproductive problems, such as

- testicular cancer,
- genital abnormalities,
- reduced semen quality and
- subfertility.
- Temporal and geographical associations, as well as frequent combination of more than one problem in one individual, strongly suggests the existence of a PATHOGENETIC link.
- The association of male reproduction problems is probably not coincidental but reflects the existence of a common underlying cause. . . .
- These authors conclude that the most likely underlying causes are “adverse environmental factors such as hormone disruptors.”⁴³
- The problem may start very early.
- I’ve suggested that if a woman drinks water or soda from a clear plastic bottle while she’s pregnant, the baby boy growing in her womb may be adversely affected.
- That’s a testable hypothesis.

SHANNA SWAN and her associates at the UNIVERSITY OF ROCHESTER, in association with colleagues at the UNIVERSITY OF MISSOURI, the UNIVERSITY OF IOWA, and at UCLA, set out to test it.

- They analyzed the urine of pregnant women to see which women had high levels of phthalates in their system and which women didn’t.
- They then studied the sons born to those women a few weeks or months later.
- The researchers were careful to recruit women from diverse areas of the country
 - —MINNEAPOLIS,
 - Missouri, and
 - Los Angeles—
- to make sure their results were not confounded by regional effects.
- Dr. SWAN and her colleagues found what they had feared.
- Mothers who had high levels of phthalates in their system were roughly ten times more likely to give birth to boys whose genitals showed subtle anomalies.
- The most common malformations in American boys were
 - smaller-than normal penises;
 - undescended testicles; and
 - hypospadias, a condition in which the opening at the tip of the penis isn’t at the tip, but is farther down the shaft of the penis⁴⁴
 - —leading Dr. SWAN to conclude that in these boys, “the process of masculinization was incomplete.”⁴⁵
- Dr. SWAN’s findings did not come as a surprise, because previous research had already clearly demonstrated a causal association between phthalate exposure and genital malformations in laboratory animals
 - —but only in males.⁴⁶

BOYS ADRIFT

444

- Dr. SWAN was already well known in this field because she had previously published some of the most important work demonstrating that in many industrialized countries, including the United States, there has been a decline in sperm counts over the past fifty years.⁴⁷

- Dr. [SWAN](#) has also shown that
 - men living in communities with low exposure to fertilizer and pesticides have the highest sperm counts, while
 - men living in communities with high exposure to these chemicals have the lowest sperm counts.
- Curiously, the urban vs. rural distinction doesn't seem to play much of a role.
- Farmers living in the country
 - —where they are often heavily exposed to pesticides and fertilizer—
 - have lower sperm counts than men living in some big cities.⁴⁸
- Other scholars have reported a direct association between exposure to **phthalates** and sperm quality.⁴⁹
 - Moving to the country, then, is not the solution.
 - You have to fix this problem where you are.
- Dr. [JANE FISHER](#) at the [UNIVERSITY OF LONDON](#), in consultation with Dr. [NIELS SKAKKEBAEK](#) and his colleagues in [DENMARK](#), has assembled a disturbing array of evidence indicating that boys today just aren't growing up to be the men their fathers and grandfathers were.
 - They are more likely to have problems with fertility than their fathers and grandfathers had;
 - they are more likely to have congenital abnormalities, and
 - they may be as much as ten times more likely to develop testicular cancer.
- Even to day, the risk of testicular cancer in [DENMARK](#)
 - —a highly developed country with lots of plastics—
- is almost ten times higher than the risk in [LITHUANIA](#), a less developed country.⁵⁰

Here are some suggestions that Dr. [SWAN](#) has prepared to help you safeguard your children, and yourself, from the damaging effects of environmental estrogens:

- Don't give your son soft vinyl toys or pacifiers made with **phthalates**
 - —look for products labeled “PVC-free”.
 - Don't microwave food for your children in plastic containers.
 - Use glass or ceramic instead.
- THE FOURTH FACTOR: ENDOCRINE DISRUPTORS*
45
- When heating or reheating a meal in the microwave, use a bowl rather than a plate.
 - You can use Saran Wrap or a similar wrap over the top of the bowl, but
 - make sure that the food does not come into contact with the plastic wrap.
 - Avoid plastic bottles for your own beverages and for your children's beverages.
 - Use glass instead.
 - Don't use clear plastic baby bottles.
 - Use glass instead.
 - Don't allow your dentist to put sealants on your children's teeth unless the dentist can assure you that the sealants are **phthalate-free**.⁵¹
 - In the [CLOSING CHAPTER](#), I will put Dr. [SWAN](#)'s recommendations in the context of an overall program for safeguarding your son.