The Weston A. Price Foundation

Living in the "Plasticene": The Plastic Age

FEBRUARY 1, 2023 BY DR. ANTHONY JAY (HTTPS://WWW.WESTONAPRICE.ORG/AUTHOR/AJAY/)

Print post

Plastic! In 1980, a wacky "new wave" band called The Buggles put out an album titled *The Age of Plastic*. Forty-plus years later, this album title still accurately characterizes our current era. The album featured a single bearing the same name, "The Age of Plastic," in which vocalist Trevor Horn feverishly chanted about plastics and imminent illness. Bon Jovi also wrote a rock song four years after *The Age of Plastic* album called "Runaway." Here are the introductory lyrics: "On the street where you live girls talk about their social lives, they're made of lipstick, plastic, and paint, a touch of sable in their eyes."

Plastic has become part of modernity's make-up (literally). Scientific discoveries relating to plastics have earned a number of Nobel Prizes. Plastic permeates our culture, our personal care products, our environment and our awards. But do plastics adversely affect our health?

BPA AND DES

Let's start with bisphenol A (BPA). A 2012 article in the *Journal of the National Cancer Institute* pointed out that of over two thousand five hundred lab-tested urine samples, 93 percent contained BPA.[1] That's virtually everyone. Yet it gets even worse. The urine samples under scrutiny were from children six years of age and younger.

Are children adversely affected by BPA exposures? Undoubtedly. It has been well established that childhood BPA exposures are harmful on many levels. For instance, in a 2017 scientific review called "Bisphenol A exposure and children's behavior: a systematic review," the authors noted that higher BPA in urine is associated with higher levels of

anxiety and depression in children aged twelve years and younger.[2] I don't know about you, but I find childhood depression particularly heartbreaking because children don't have adult burdens like mortgages or bills. Children should be carefree, imaginative, playful and caught up with living in the moment and developing a love of learning. Children should not be depressed.

The health damage from BPA extends far beyond behavioral changes and pediatrics, however. Infertility,[3-5] weight gain,[6] breast cancer,[7,8] lower testosterone,[9,10] and toxicity to the immune system[11] are well-established issues related to BPA exposures. The complete list of problems is long, painful and ever-expanding.

At this point, we all know BPA is bad for our health, but why exactly is it bad? Simple—it acts like estrogen in our bodies, disrupting our natural sex hormone activities. Natural estrogen, at proper levels, is incredibly healthy. But ordinarily, estrogen is present at nanogram levels in the bodies of both men and women. (Just as a reference, a nanogram is 0.000000001 grams.) In men, estrogen is generally around thirty nanograms per liter (ng/L). In women, estrogen ranges between about thirty and three hundred ng/L, depending on age and/or the time of the month. These minuscule hormone levels are maintained in a delicate balance that is easily disrupted.

Enter BPA, which "was first developed as a synthetic estrogen in the 1890s and was reported to have the efficacy of estrone in stimulating the female reproductive system in rats in the 1930s."[12] Estrone is one of three natural forms of human estrogens and very potent.[13] Basically, BPA was specifically designed and intentionally researched as an artificial birth control drug. The main scientist who performed the pioneering BPA birth control studies, British researcher Edward Charles Dodds, also developed DES (diethylstilbestrol). Dodds called DES the "mother substance" of BPA.[14]

If you're at all familiar with DES, you undoubtedly know about the horrendous health damage this estrogen-mimicking drug has caused. Briefly, licensed medical doctors legally prescribed DES to some ten million women between 1940 and 1970 for things like morning sickness, hot flashes, estrogen deficiency, "risk of miscarriage" and other related issues.

Meanwhile, taking the drug DES literally increased risk of miscarriages,[15] blood clots, immune system dysfunction, weight gain and depression.[16] This list is eerily similar to the adverse effects of modern artificial estrogen birth control drugs, in case you're not versed in those adverse effects. Moreover, DES led to a variety of birth defects that can be damaging to multiple generations.[17] So-called "DES babies" or "DES daughters" were ultimately what drove the drug off the market for pregnant women, but only after thirty years of being sold with a stamp of approval by the medical establishment. "First, do no harm"?

PLASTICS AND LEACHING

As for BPA, research into this synthetic estrogen compound shifted away from reproductive manipulation and artificial birth control when scientists discovered that BPA could be linked together into chains (polymers) and used to make plastic. The timing was perfect because the birth control market for BPA was contracting. At that time, DES appeared to be a better candidate. Meanwhile, the market for plastics was exploding.

By the early 1950s, BPA was in commercial production for plastics of all sorts, including food and liquid storage products.[14] The good news, consumers were told, was that BPA, like cigarettes, was safe! In 1962, for example, researchers deemed it ethical to put BPA-containing skin patches on people—similar to hormone skin patches—to see whether the patches caused skin reactions.[18] (Spoiler alert: they did.) The lesson: don't put BPA directly on skin. Thankfully, although many clothes are made from polyester (plastic), no BPA clothing is currently on the market.

Part of the apparent good news was that when you made plastics with BPA by linking it up into long, connected chains, the polymers "obviously would not leach." At least this is what people were and are told. When I was writing my book *Estrogeneration*,[19] I spoke to a number of plastics researchers who still insisted that it was "absurd to think that BPA leaches" because "all the molecules are linked together as chains." As recently as 2012, authorities such as Denmark's Environmental Protection Agency were still assuring us that BPA "appears to be effectively retained within the polymer matrix of materials such as polycarbonates and therefore losses through leaching from the product surface are expected to be limited."[20]

From the 1950s to 2012, scientists barely investigated the “unlikely” phenomenon of BPA leaching. Crazy people (like myself) who suggested that it would be wise to avoid BPA plastics for liquid storage, due to leaching, were laughed at and patronizingly told that we just “didn’t understand science.” The party line was, “BPA is all linked together so it doesn’t leach, silly.”

Except it does. It leaches because there are always free, unlinked (monomer) molecules of BPA in BPA-containing plastic. When the fact of leaching became too obvious to ignore, supposedly educated people started saying BPA only leaches when it is heated. I’ve also often been told that the leaching dose is so low that it doesn’t affect our health. Neither of these claims has held up, but we still hear them today.

I don’t want to launch into the long history of BPA because there are currently over twelve thousand scientific studies on the topic, and you’re probably on board already with avoiding BPA. I do want to summarize some key points: BPA leaches; extremely low levels are damaging; health impacts can take many years to appear; most scientific studies are very short-term so they miss the health issues; and even room-temperature water stored in BPA bottles leaches to levels well above the levels of our own natural estrogen levels within one day (see Figure 1).

“BPA-FREE” MEANS LITTLE

The latest bit of “good news” is that now that we know how bad BPA is for our health, corporations no longer use BPA in plastics that come in contact with our food and beverages. Just kidding! In fact, BPA is frequently present in the plastic linings of many metal food or metal beverage cans. The federal government has done virtually nothing to stop BPA use in food products, although seventeen states have at least made it illegal in baby products like pacifiers. In a recent study comparing people who ate canned soup with people who did not, canned soup eaters showed an immediate 229 percent increase in urinary BPA.[22]

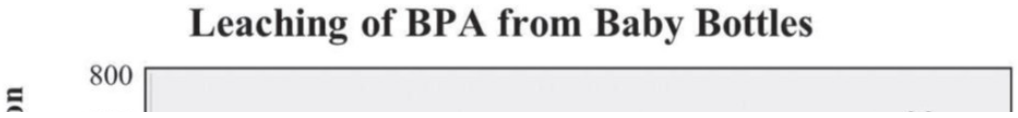
When something is labeled “BPA-free,” is that enough of a safeguard? The troublesome fact is that even if we make BPA illegal (which we have not done), there remains an entire alphabet of BPA-mimics. They’re called “BPA analogues.” BPS, commonly used as a replacement for BPA, is one example: other examples of BPA analogues are BPF and BPAF.

Products labeled “BPA-free” can still have BPF. BPA and BPF are basically the same thing, with minor tweaking, but one is called BPA and the other one (technically) is not called BPA. That technicality is massive. BPF plastic is, therefore, “BPA-free.” Yay. Scientists do this type of manipulation when they design steroids to pass drug tests. They slightly manipulate the structure of the testosterone molecule, but it acts in the same way in the human body.

Here is what a 2016 study published in *Environmental Science and Technology* discovered about all these BPA-analogue chemicals:

> “Whereas BPA was still the major bisphenol analogue found in most environmental monitoring studies, BPF and BPS were also frequently detected. Elevated concentrations of BPAF, BPF, and BPS (i.e., similar to or greater than that of BPA) have been reported in the abiotic environment and human urine from some regions. *Many analogues exhibit endocrine disrupting effects, cytotoxicity, genotoxicity, reproductive toxicity, dioxin-like effects, and neurotoxicity in laboratory studies*. BPAF, BPB, BPF, and BPS have been shown to exhibit *estrogenic and/or antiandrogenic activities similar to or even greater than that of BPA*.”[23] [Emphasis added]

In other words, these “backup” BPA-mimicking plastics are not only in use but are just as bad—or worse—than BPA in terms of their impact on our health.



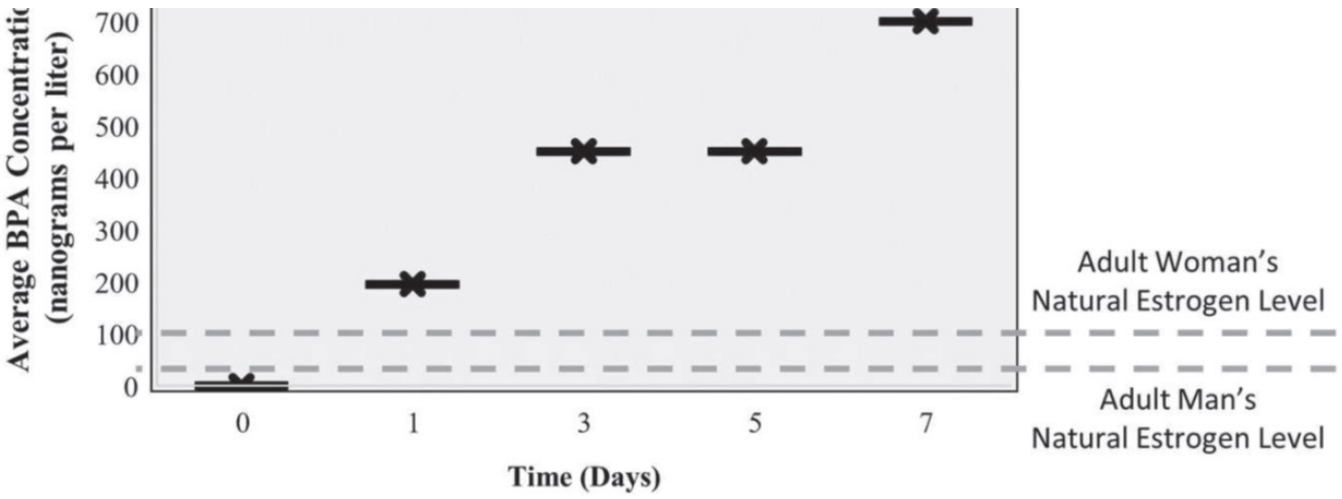


FIGURE 1: Leaching of BPA from baby bottles Adapted from Hoekstra EJ, Simoneau C. Release of bisphenol A from polycarbonate: a review. Crit Rev Food Sci Nutr. 2013;53(4):386-402.21

Anyone who takes issue with me calling these plastic chemicals "toxins" clearly doesn't have a grasp of the current research. For example, what does the "cytotoxicity" mentioned by these scientists mean? It means these BPA-like chemicals are toxic to cells. And "genotoxicity" means toxic to DNA. And what are "dioxin-like effects"? "Dioxin-like effects" is a fancy way of saying, "It acts like Agent Orange." The notorious herbicide and defoliant Agent Orange is the quintessential dioxin.

Like Agent Orange, it can take time for the ugly hormone-disrupting effects of these toxic plastic chemicals to surface, but they eventually cause problems. Sometimes, the health impacts are even passed to future generations.

WHAT ABOUT PHTHALATES?

What about plastics that are free of BPA, BPS, BPF and the entire alphabet of possible bisphenols? Generally, these plastics are identified by the #1 inside the recycling arrow-triangle. (Check the plastics in your fridge.) These plastics are called polyethylene terephthalate (PETE) and contain phthalates.

Currently, there is a massive effort to convince people that PETE is safe and does not leach phthalates. Dr. Ken Berry and I recently completed a YouTube video on this topic. Later, he

emailed me to say his phone is now presenting advertisements to him specifically saying plastic #1 is safe! Apparently, his phone "heard" our podcast discussion and created some customized ads as part of the phthalates-are-safe corporate push. And they say phones aren't listening!

But we've heard the same claims of safety before with BPA—"it's safe," "it doesn't leach" and "the BPA molecules are all linked together so they can't leach." Yet we found BPA is not safe, it does leach and, even though the molecules are supposed to be 100 percent linked together, there are always free molecules that escape and leach into liquids. We're now hearing these same familiar arguments to convince us that PETE is safe.

To get to the bottom of the leaching question, I emailed one of the best third-party lab testing companies in the country, which measures chemicals leaching into liquids. I decided I would fund my own study and test the PETE leaching for myself. I've seen scientific studies, but I wanted to test some standard grocery-store bottled water (from plastic bottles, of course). My "experiment" was as follows: I would buy several types of popular bottled water from my local grocery store. It would be at room temperature. Some bottles were PETE plastic, and a few other bottles were not. I would have this third party test for phthalates and BPA, in case there was residual BPA.

Upon inquiry, here is the email I received back from a top-tier testing company:

> "Thank you for contacting [our company] with your request for BPA and phthalates testing. You've come to the right place! [our company] is approved by the CPSC [Consumer Product Safety Commission], accredited by A2LA, and we've been in the business of testing since 1967. The cost for testing is as follows: BPA analysis is $400 for the first sample & $350 for each additional. Limit of detection is 100 ppt. Phthalate analysis is $300 for the 1st sample and $250 for each additional. Limit of detection is 50 ppm."

As you can see, the cost was painfully high, given that I was doing this out of pocket. Nevertheless, I thought I'd take one for the team and finish the experiment so I could learn and publicize what I learned. But I balked when I saw the limits of detection for phthalates.

For BPA, one hundred ppt (parts per trillion) was a respectable detection limit. Because we usually measure estrogen in ng/L (nanograms per liter), I did a little math and found that one hundred ppt is equivalent to 0.1 ng/L. This is good. Our natural estrogen is usually around twenty to two hundred ng/L, so measuring down to 0.1 ng/L is useful. In other words, they were testing for BPA levels that were at or above 0.1 ng/L, which would be well below our natural levels of estrogen. Since BPA is a known estrogenic (or "estrogen mimicking") chemical, it was a relief to see that the lab would actually measure levels that are relevant to our natural hormone levels.

Their limit of detection for phthalate analysis, unfortunately, was abysmal. The limit given, fifty ppm (parts per million), is far less than parts per trillion. Doing the same math I did for BPA, this translated to fifty million ng/L! In other words, the levels of phthalates that this top-tier testing company looks for don't even come close to our natural levels of hormones. They won't detect phthalates unless they are above fifty million ng/L. I mentioned that our natural estrogen is in the range of twenty to two hundred ng/L, so this is like looking for pounds of lead in our blood before worrying about it! I want to know if I have a tiny amount of lead in my blood, not pounds! So, don't tell me my blood is "lead-free" if all you can measure is one pound or higher!

This leads me to believe that many people deny phthalates leach from plastics because they aren't measuring small enough units. Phthalates leach. I wrote about these details in my book *Estrogeneration*. It's obviously easier to deny leaching if you limit your detection to fifty million ng/L and don't go below fifty million ng/L.

The next important question is, how harmful are phthalates to our health? First of all, phthalates aren't one simple chemical. The term "phthalate" refers to a class of chemicals, and there are hundreds of phthalates. Some are worse than others, but they definitely can disrupt our natural sex hormones and our health. Since I've written an entire book on this topic, I'll drop this quote from a scientific study and leave it at that:

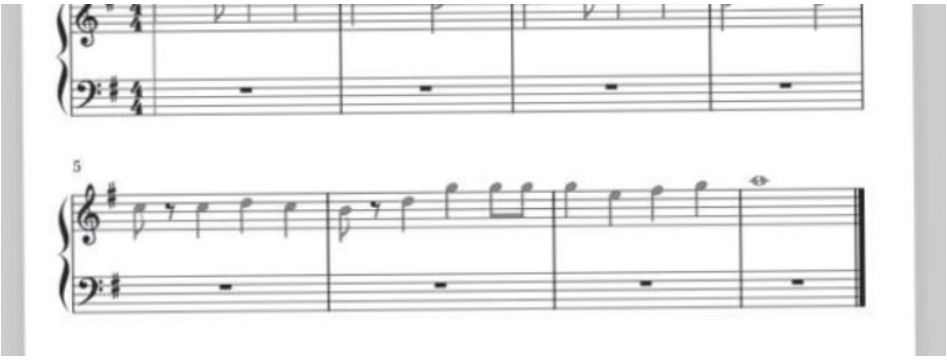
> "Epidemiological studies have suggested associations between phthalate exposure and shorter gestational age, shorter anogenital distance, shorter penis, incomplete testicular descent, sex hormone alteration, precocious puberty, pubertal gynecomastia, premature thelarche, rhinitis, eczema, asthma, low birth weight,

attention deficit hyperactivity disorder, low intelligence quotient, thyroid hormone alteration, and hypospadias in infants and children. Furthermore, many studies have suggested associations between phthalate exposure and increased sperm DNA damage, decreased proportion of sperm with normal morphology, decreased sperm concentration, decreased sperm morphology, sex hormone alteration, decreased pulmonary function, endometriosis, uterine leiomyomas, breast cancer, obesity, hyperprolactinemia, and thyroid hormone alteration in adults."[24]

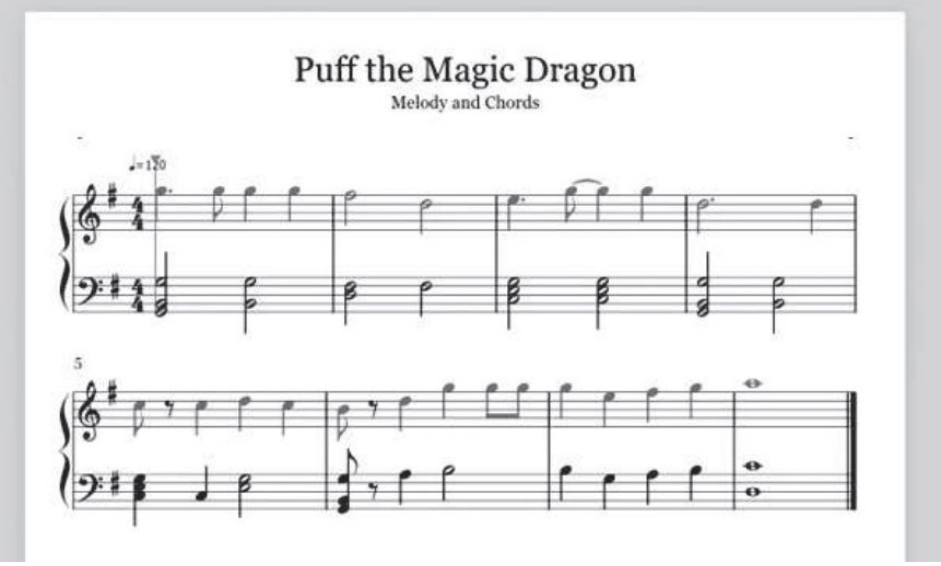
THE LONG GAME

In case it isn't enough to warn about "sex hormone alteration" (which can lead to issues such as weight loss, depression, anxiety and fatigue), let's end on the topic of epigenetics. Epigenetics literally means "marks on your DNA."

This sounds complicated, but if you think about a musical note analogy, epigenetics is easy to understand. Think about a song and the melody line from that song. Let's go with "Puff the Magic Dragon," since cannabis smoke can act like estrogen (a different topic for a different day). The melody line is very simple. It can be passed along to other musicians, and they can play that same song fairly simply. That's like your DNA. It's fairly simple code and can be passed along to future generations.



Melody Line



Notes added to the melody

Epigenetics still has that same song melody. The DNA is still present. Now, however, we've added more notes. It's "notes added to the melody" or "supporting harmonies on our DNA." The song is more complex and beautiful. Most importantly, this can be passed on to future generations, similar to DNA.

I want to mention two main points on the topic of epigenetics. First, sex hormones impact our epigenetics. If our sex hormone levels are strong, we can affect strong epigenetics to future generations. On the other hand, if our sex hormone levels are weak, this can be reflected and passed along to offspring as well. Second, artificial estrogen chemicals, such

as those found in plastics, are well known to cause detrimental epigenetic impacts. Over several generations, they can lower fertility. They can also increase cancer not just in the present but in future generations not even exposed to the chemicals.

Thus, we are playing a long game where plastics are concerned. You'll never be able to get them completely out of your life, but I suggest you minimize your exposure as much as possible. Here are some simple steps:

- Avoid liquids stored in plastics and certainly don't microwave liquids in plastics. It's okay to have some bottled water occasionally, but don't make it a regular occurrence. Best to buy beverages bottled in glass
- Avoid plastic chew toys for babies.
- Don't brew coffee in plastic coffee machines.
- Avoid "aluminum" soda cans, which are lined with PETE or BPA plastic.
- Avoid polyester (PETE phthalate-containing) pillowcases and bed sheets. You don't want all-night skin exposure to plastics.
- Avoid hot coffee in "paper" cups—they're not paper.

Awareness is a big step in the right direction regarding plastics. Bear in mind that scientific studies downplay the true health ramifications of plastics because the studies are usually only short-term. Remember, too, that these chemicals "bioaccumulate," meaning they store up inside our bodies. This amplifies their long-term health impacts. And these estrogen-mimicking chemicals are even additive, because they all act like estrogen in our bodies.

When researchers study estrogenic chemicals, they investigate only one chemical at a time, but our bodies aren't exposed to one chemical at a time—not in the current "Plasticene" era. As for me? I'm basically with George Bailey in the classic 1946 film, *It's a Wonderful Life*: "Now you listen to me! I don't want any plastics.

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This article appeared in *Wise Traditions in Food, Farming and the Healing Arts*, the quarterly journal of the Weston A. Price Foundation, Winter 2022 (https://www.westonaprice.org/journal-winter-2022-optimal-hormonal-development/#gsc.tab=0)

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