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# Government's Unfounded War on BPA

## Taxpayer-Funded Scare Campaign Threatens Consumer Interest and Safety

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During the past decade, the chemical Bisphenol A (BPA) has become a target of environmental activists who make a host of unfounded claims about the chemical's risks to humans. For example, the Environmental Working Group's (EWG) June 2015 report, *BPA in Canned Food: Behind the Brand Curtain*, advises consumers to buy canned food labeled "BPA-free" and makes the ominous claim: "BPA is a synthetic estrogen that scientists have linked to breast cancer, reproductive damage, developmental problems, heart disease and other illnesses."[1] Federal agencies have continued to fund questionable research that fuels such scare-mongering campaigns, which are designed to advance a host of unwarranted and potentially dangerous public policies. Members of Congress would be wise to review and consider oversight of such funding to ensure taxpayer dollars are not wasted on misleading and agenda-driven research.

**What is BPA?** BPA is used to make hard clear plastics (polycarbonate plastics) and epoxy resins that are used in food packaging, such as for lining inside steel and aluminum cans, and other products. After more than five decades of use, there are no verified cases of anyone suffering ill effects from BPA exposure from consumer products. But activists focus on largely theoretical risks based on select research studies that find associations—which do not demonstrate cause and effect—between BPA and various health ailments and tests that show health effects in rodents dosed with massive amounts of BPA. However, scientific panels around the world have assessed the full body of research on BPA risks, and all find that human exposure is too low to pose a significant risk.

**Government-Funded Alarmism.** The activist campaigns against BPA have been fueled by taxpayer-funded research of questionable value, much of it supported by grants from the National Institutes of Health (NIH). According to a tally compiled by Citizens against Government Waste (CAGW), between 2000 and 2014, NIH doled out $172.7 million for BPA research grants.[2]

Seventy percent of those funds, according to CAGW, were spent between 2010 and 2014, coinciding with the appointment of Linda Birnbaum as director of NIH's National Institute of Environmental Health Sciences (NIEHS). A former official for the Environmental Protection Agency (EPA), Birnbaum is also well known for her environmental activism, which has attracted congressional attention.[3]

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In an article for *Environmental Health Perspectives*, Birnbaum and her colleagues explain that the NIEHS began a program to assess BPA risks "starting in the mid-2000s."[4] They describe their BPA project as "consortium-based science" that involves collaboration between government agencies as well as collaboration between government bodies and government-funded academic research. NIEHS notes on its website that it has spent $30 million for BPA-related research grants, but the number is much higher as CAGW's tally reveals.[5]

Birnbaum et al. note that the "impetus" for this "multipronged" effort to fill in "research gaps" was an NIEHS-organized "workshop" involving 38 "experts" in BPA science who met in Chapel Hill, North Carolina, in 2007 where they developed what has become known as the "Chapel Hill Consensus Statement."[6] As Birnbaum et al., explain:

> "Chapel Hill consensus statement" (vom Saal et al. 2007), along with five review articles … concluded that human exposure to BPA is widespread and that the adverse health effects observed in animal studies raised significant concerns about the potential for similar effects in humans. The report also outlined research gaps and needs. [7]

Although often presented as an official "government" review of the science, the consensus document does not reflect the work of any official governmental panel. Instead the conference was organized by researchers with an interest in gaining funding for their own BPA research, much of which has proven highly controversial with a focus on activism rather than applying the best scientific principles.

For example, its organizing committee members included Frederick S. vom Saal of the University of Missouri and John Peterson Myers, both of whom peddle alarmist rhetoric about BPA and other alleged "endocrine disrupting" chemicals.[8] For example, Myers, along with Theo Coburn and Dianne Dumanoski, is a co-author of the alarmist book, *Our Stolen Future*. As former Vice President Al Gore explains in the preface, this book picks up where the anti-chemical biologist Rachel Carson, author of *Silent Spring* (1962), "left off."[9] Like *Silent Spring*, *Our Stolen Future* masquerades as science, but offers mostly fear-inducing rhetoric to push regulations and bans on chemicals in the absence of scientific evidence that these chemicals actually cause harm when used appropriately.

Both books have been rebuked by more mainstream scientists for falling short on science, while scoring high on inflammatory rhetoric. For example, in 1996 when *Our Stolen Future* was published, a critical review published in the journal *Science* pointed out:

> The critical response to *Our Stolen Future* is also strongly reminiscent of the response to Carson's book. In both cases, some segments of the scientific community have come out swinging. For instance, in 1962, a review of *Silent Spring* in *Chemical and Engineering News* (40, 60) stated, "In view of the mature, responsible attention which this whole subject receives from able, qualified scientific groups ... (whom Miss Carson chooses to ignore); in view of her scientific qualifications in contrast to those of our distinguished scientific leaders and statesmen, this book should be ignored." In 1996, a discussion of *Our Stolen Future* in the *Washington Post* (31 March, p. C3)

quoted John Giesy, past president of the Society of Environmental Toxicology and Chemistry as saying, "Frankly, Colburn doesn't know very much. She reads the entire literature and picks and chooses things that support her preconceived views." It also quotes Larry Lipshultz, professor of urology at Baylor College of Medicine: "Something is missing in *Our Stolen Future* and that's called science."

Similarly, Frederick vom Saal has built his career on making a host of health claims about BPA using questionable techniques and exaggerating the results.[10] In fact, vom Saal is a vocal advocate of a BPA ban, and is on "a quest to get endocrine disrupters, such as BPA, out of daily use," as described by a University of Missouri-affiliated newspaper article profiling him.[11]

Perhaps not coincidentally, at least 21 of the Chapel Hill Consensus contributors have worked on NIEHS-funded studies addressing BPA risk, including NIEHS Director Linda Birnbaum while she was at the EPA and Frederick vom Saal, who has coauthored at least 14 such studies.[12] There is an apparent conflict of interest among the Chapel Hill Consensus scientists who stood to gain financially by exaggerating BPA risks in order to build momentum for government support.

Having authored many small and largely meaningless studies that allege BPA dangers, the Chapel Hill Consensus researchers, along with some others, have taken issue with the larger, more comprehensive and scientifically robust research on BPA.[13] That research shows that at current exposure levels, BPA poses little risk and its benefits outweigh any alleged health risks. This is the position of numerous governmental and other scientific panels that have written exhaustive reviews of the entire body of research that places greater weight on the best research. These reviews and findings include:

- U.S. Food and Drug Administration (FDA) Safety Assessment: "FDA's current perspective based on its most recent safety assessment is that BPA is safe at the current levels occurring in foods. Based on FDA's ongoing safety review of scientific evidence the available information continues to support the safety of BPA for the currently approved uses in food containers and packaging."[14]
- European Food Safety Authority (EFSA): "In January 2015 EFSA published its latest comprehensive re-evaluation of BPA exposure and toxicity. EFSA's experts concluded that BPA poses no health risk to consumers of any age group (including unborn children, infants, and adolescents) at current exposure levels."[15]
- Health Canada: "Health Canada's Food Directorate has concluded that the current dietary exposure to BPA through food packaging uses is not expected to pose a health risk to the general population including newborns and infants."[16]
- Japanese National Institute of Advanced Industrial Science and Technology (AIST): "Since both the human health risk assessment (Chapter IV) and ecological risk assessment (Chapter V) concluded that the risks posed by BPA were below the levels of concern it will be unnecessary to prohibit or restrict the use of BPA at this time."[17]
- U.S. National Toxicology Program (NTP). Although NIEHS states on its website that the NTP review of BPA supports their call for research and regulation, that 2008 review did not find any direct evidence of any harm over decades of use in food

> packaging and plastics. The NTP expressed minimal to negligible concern for almost all factors. It called for more research in one area and expressed only "some concern" (more significant findings would state "concern" or "serious concern") because rodent studies showed some association of potential effects on behavior. Yet as the NTP report noted: "These studies in laboratory animals provide only limited evidence for adverse effects on development and more research is needed to better understand their implications for human health."[18] Since then, we have had plenty of more research, but little compelling evidence of any problems.

Much of the NIEHS-funded research represents smaller scale studies with generally weak findings that weigh little when considering the larger body of research.[19] Yet these researchers still garner headlines[20] by claiming that the more weighty research is defective, although they have been rebuked.[21] So much for "consortium-based science."

It appears that many of the NIEHS scientists will only accept research that conforms to the findings they desire. For example, several of them have complained that the FDA's assessment of BPA is defective because the agency placed too much weight on studies that relied upon the "wrong" strain of rat—one that was less sensitive to BPA. But as *Forbes* journalist Trevor Butterworth points out, these researchers have no problem using this rat when it produces positive results in their own studies.[22] In any case, other researchers have pointed out that their claim that these rodents are less sensitive is incorrect.[23]

In an article for *Environmental Health Perspectives*, Myers and other Chapel Hill Consensus researchers complain that the FDA's assessment of BPA is faulty because the agency placed greater weight on studies that complied with government-established "good laboratory practices" (GLP).[24] Specifically, Myers et al. complain that GLP-compliant studies are inferior because they do not undergo the type of peer review conducted before publication in academic journals. But the opposite is true: GLP-compliant studies meet higher standards in terms of study design, implementation, and peer review, which is why they should bear more weight in regulatory decisions.

GLPs were originally established by the FDA in 1978 to address fraudulently produced results submitted by industry to government agencies for the drug approval process. The Organisation for Economic Co-operation and Development (OECD) issued its own GLP guidelines and other world bodies and government agencies, including the U.S. EPA, followed suit. Thus, GLPs have become an internationally recognized method of ensuring data quality control. The World Health Organization's handbook on GLP explains:

> Good Laboratory Practice is defined in the OECD Principles as: "a quality system concerned with the organisational process and the conditions under which non-clinical health and environmental safety studies are planned, performed, monitored, recorded, archived and reported." The purpose … is to promote the development of quality test data … The Principles may be considered as a set of standards for ensuring the quality, reliability and integrity of studies, the reporting of verifiable conclusions and the traceability of data.[25]

As a result, it is common worldwide that industry must apply GLPs when conducting research for submission to regulatory bodies for the purpose of ensuring, "uniformity, consistency, reliability, reproducibility, quality, and integrity of chemical (including pharmaceuticals) nonclinical safety tests."[26]

GLP studies undergo a different, more rigorous form of peer review than is common for journal-published studies. For GLP studies, research labs must establish a "quality control unit"—a team of researchers independent of the individuals implementing the study. The quality control unit reviews study design protocols and then continues to monitor and review the research as it proceeds.[27] In addition, government agencies conduct further reviews of the final study once it is submitted. These procures ensure that the data for GLP studies is transparent and allow for reproducibility. If the results are presented in a paper submitted for publication, the journal conducts another round of peer review.

Journal peer review of non-GLP compliant studies, in contrast, usually involves an after-the fact examination of the article describing the study by a handful of outside researchers, without any monitoring, data review, or oversight. Generally, there is no pre-study design protocol to review, no ongoing monitoring, and no review of data after completion of the study. For these reasons, such peer review has its limits, and it does not make the data or research methods particularly transparent. Yet transparency and the ability to reproduce studies are essential criteria for validating research findings.

In an article addressing the relative merits of journal peer review and GLP, Lynn S. McCarty et al., point out that journal peer review involves "relatively unstructured, confidential comments from a few scientists knowledgeable in the general research area."[28] In contrast, GLP compliance "gives clear and detailed a priori guidance to practitioners concerning what information to collect and how to collect and report it."[29] It is certainly appropriate to place greater weight on such studies because, as McCarthy et al. explain, "GLP serves certain regulatory purposes exceedingly well, and undoubtedly better than journal peer review processes could."[30]

That said, complaints such as those by Myers et al. about GLP represent more of a straw man than any justified concern. Many academic studies are dismissed for reasons other than the fact that they do not apply GLPs. For example, findings are often dismissed because they are "weak associations," the data and methodologies are not transparent, the results have not been reproducible, or the results are contradicted by newer and stronger research.

If Myers and colleagues want their studies to be given greater weight, they should provide greater transparency of their data and methodologies and work to employ more robust designs with larger samples. It is true that the official government guidelines for GLP do not apply to all kinds of studies, and in some cases where they might apply, the fastidious recordkeeping may be too time consuming or costly for individual researchers in the "publish or perish" world of academia, where regulatory consequences are not given much consideration. But where possible, academic researchers may employ some version of GLP, or elements thereof, if they want their studies to be accorded more weight with regulators.[31] In fact, some academic researchers are involved with a GLP-compliant initiative that

includes research among a "consortium" of 12 NIEHS grantees under an initiative called Consortium Linking Academic and Regulatory Insights on BPA Toxicity (CLARITY-BPA). CLARITY-BPA research is ongoing.[32]

Still, grants for additional research are unlikely to do much to change our current understanding of BPA. Toxicologist Richard Sharp explains:

> Fundamental, repetitive work on bisphenol A has sucked in tens, probably hundreds, of millions of dollars from government bodies and industry which, at a time when research money is thin on the ground, looks increasingly like an investment with a nil return. All it has done is to show that there is a huge price to pay when initial studies are adhered to as being correct when the second phase of scientific peer review, namely, the inability of other laboratories to repeat the initial studies, says otherwise. If this short opinion piece does nothing else, I hope that it will remind us all of the central importance to be attached to the repeatability of experiments and how we should react when a study proves to be unrepeatable. As scientists, we all like our ideas and hypotheses to be proved correct; yet, there is equal merit in being proved wrong. The ideal hypothesis is one that can be shot at, and in most cases, it ends up full of holes (at best). This is the tried and trusted way via which scientific understanding moves onward, and ultimately, our own convictions and presumptions cannot stand in its way.[33]

BPA research funding for activist-minded research has become a fruitless exercise that provides no benefits to society. It does, however, benefit researchers with an agenda that includes continued financial support for their own livelihood and for activist campaigns that capture headlines and attention by exaggerating and mischaracterizing BPA risks.

**BPA Science.** The science on BPA is not as complicated and full of "gaps" as the Chapel Hill Consensus researchers maintain. In particular, as the FDA and the European Food Safety Authority have both repeatedly pointed out, human exposure through consumer products is simply too low to have any health effects, particularly since humans metabolize BPA quickly and it passes through the body before it can have an impact. And in response to constant claims to the contrary, reviews by scientific panels around the world have continually confirmed those realities.

The EPA has estimated that a safe human dose is 0.05 milligrams per kilogram of body weight per day (mg/kg body weight/day), which agency researchers derived based on levels found safe for rodents, and then extrapolated that to a safe level for humans.[34] Michael A. Kamrin, professor emeritus at Michigan State University, points out that consumers are most likely exposed to BPA at levels that are 100 to 1,000 times lower than the EPA's excessively cautious estimated safe exposure levels. He further notes that the research on BPA also shows that the exposure levels per body weight are similar for adults and children, which indicates that infant exposure is not significantly higher.[35] The European Food Safety Authority makes a similar observation, noting that current BPA exposure levels pose little risk to children and even infants.[36]

Moreover, the risk to humans is probably much lower than these estimates suggest. Humans metabolize BPA much better than do rodents, as demonstrated in an EPA-funded study by Justin G. Teeguarden and colleagues—one of the few informative government studies on the topic.[37] This study demonstrated BPA exposure from traces found in food is quickly metabolized and expelled from the body in urine before it can have any affect. Similarly, the EFSA points out:

> BPA as parent compound is less bioavailable in humans than in rodents, raise considerable doubts about the relevance of any low-dose observations in rodents for humans. The likely high sensitivity of the mouse to estrogens raises further doubts about the value of that particular species as a model for risk assessment of BPA in humans.[38]

Despite this reality, NIEHS continues to fund BPA studies alleging health effects in humans based on yet more rodent tests, often dosing the animals with BPA levels that far exceed human exposure. These tests tell us little about BPA risks to humans and amount to little more than gratuitous rodent harm.

Much of the BPA research focuses on BPA as an "endocrine-disrupting chemical." Yet as the NTP points out, BPA is "weakly estrogenic," which means it is hardly potent enough to have health effects at existing consumer exposure levels.[39] Humans are regularly exposed to estrogen-mimicking compounds produced by plants—so-called phytoestrogens—in our everyday diet, and these are much more potent and exposure is much higher. Yet we suffer no ill effects because none of those chemicals, like BPA, are as potent as human hormones. Phytoestrogens, for example, are found in legumes, with a particularly high level found in soy. Exposure to natural phytoestrogens is 100,000 to 1 million times higher than exposure to estrogen-mimicking substances found in BPA, according to data from a 1999 National Academy of Sciences study.[40] "Given the huge relative disparity between the exposure to phytoestrogens as compared to BPA concentrations, the risk of BPA in consumer products appears to be about the same as a tablespoon of soy milk," notes researcher Jonathan Tolman.[41] We have little to fear from soy milk, so we have even less to fear from BPA and similar synthetic compounds.

Despite these basic realities about BPA science, NIEHS-funded studies continue to suggest that BPA is responsible for a host of health problems. How is this possible? The studies themselves are often small, with weak associations and other flaws that render their findings largely meaningless. Yet researchers often exaggerate the "findings" to gain headlines and more funding. Consider just a few examples.

***BPA and Miscarriages*.** A study that captured headlines—even before it was published—claimed that BPA might increase risk of miscarriage among women who already were high risk. But the study suffered from many problems.

First, the authors did not find a cause-and-effect relationship. Rather, they simply found a very weak, mostly meaningless association. Researchers express the strength of such associations numerically as a "risk ratio." In this study, the risk ratio for the highest risk

group was 1.83, which is low and suggests that the result may have arisen by accident or researcher bias. "Although any measure of risk would follow a continuous distribution and there are no predefined values that separate 'strong' from 'moderate' or 'weak' associations, relative risks below 3 are considered moderate or weak," points out Paolo Boffetta of the Tisch Cancer Institute at Mount Sinai School of Medicine.[42]

Second, the sample size here is very small, which greatly increases the probability that the weak association is little more than accidental. Larger samples by definition are more representative of the larger population. Accordingly, if this study was 10 or 20 times larger, a statistical association would have greater meaning.

Third, the BPA was measured only once. Yet, one-time measures cannot reveal which women really have higher exposures, because BPA levels in the body can fluctuate considerably over time. Accordingly, the data going into the study is not good enough to draw conclusions.[43]

***BPA and Breast Cancer.*** This study by Tufts University researchers was featured in a *USA Today* video to promote breast cancer awareness month.[44] The authors write: "Our findings suggest that developmental exposure to environmentally relevant levels of BPA during gestation and lactation induces mammary gland neoplasms in the absence of any additional carcinogenic treatment. Thus, BPA may act as a complete mammary gland carcinogen."[45] Interestingly, they use the word "suggest" because they did not actually *find anything*. The authors originally included a bolder statement in the study in the advance publication version, but they were forced to revise their paper after *Forbes* journalist Trevor Butterworth pointed out that the data did not support those claims.[46] Changes to the report downgraded the researchers' claims to merely "suggestive" results.[47] Yet, the report still made headlines despite the findings not being particularly compelling and despite the existence of conflicting findings from other more robust studies on the topic.[48]

***BPA and Cash Register Receipts*.** In this study, researchers measure BPA levels in blood and urine after 24 subjects cleaned their hands with hand sanitizer and then handled cash register receipts.[49] They then ate French fries. Because hand sanitizer is known to increase absorption of chemicals in the body, the subjects had trace amounts of BPA in their blood from handling receipts and BPA in their urine from eating the fries. This was pretty much a foregone conclusion. But the question is: Does it matter? These researchers did not demonstrate that BPA reached dangerous levels, but instead used the study to infer that BPA from cash register receipts poses risks. They note in the paper's abstract: "The elevated levels of BPA that we observed due to holding thermal paper after using a product containing dermal penetration enhancing chemicals have been related to an increased risk for a wide range of developmental abnormalities as well as diseases in adults." How could they draw that conclusion? Their study did not actually measure any risk, just exposure. In his critique of this paper, scientist Geoffrey Kabat notes:

> If this paper were about science, the authors would have restricted themselves to conducting careful experiments that tested whether exposure to BPA from cashier receipts resulted in concentrations of the active compound of a magnitude consistent

with physiologic effects and, importantly, how this source of exposure compares with other sources of exposure (i.e., consuming canned food). They would have resisted the temptation to assert a link between this exposure and serious adverse health effects. But that would have meant foregoing the appeal to fear that makes these underwhelming experiments newsworthy.[50]

***BPA-Relevant Doses*.** Many NIEHS studies dose lab animals with high-levels of BPA to produce adverse health effects and then claim that the exposures to the rodents are analogous to human exposures. Never mind that humans metabolize BPA well, while rodents do not, or that rodent exposures are not at all similar to human exposures. In an article published in Science.2.0, the American Chemistry Council's toxicologist Steve Hentges points out that 26 NIEHS-funded studies wrongly claim that they apply human-relevant doses to lab animals. These studies, he notes, "rely on data considered by the world's experts to be questionable at best, and all ignore the most reliable measures of human exposure. The result is that the studies are of very limited relevance to human health since the reported effects occur at doses far above typical human exposures, not at human-relevant doses as claimed."[51]

**Impacts of BPA Alarmism.** Government-funded alarmist studies on BPA have both public policy and market impacts, including government bans and "voluntary" phase-outs of useful products by businesses that want to avoid negative publicity.

Such restrictions on the use of BPA plastics put all of its benefits—recyclability, reusability, energy efficiency, and durability—at risk. BPA makes polycarbonate plastics exceptionally strong and resistant to breakage and to relatively high heat. It is remarkably durable and easily sterilized, making it well suited for reuse and recycling. Given these benefits, BPA has replaced glass containers in many cases including glass baby bottles, because plastics are less expensive and lighter and eliminate the hazards associated with glass breakage.

BPA has been particularly useful in making five-gallon water cooler jugs, which offer sanitary transport of bulk supplies of bottled water. Few of these bottles ever enter a landfill, as they are reused on average 35 to 50 times and then are recycled. They are a true private-sector recycling and reuse success story. Yet they are now being replaced with less durable plastic bottles that break easily and are more likely to end up in landfills.[52]

Similarly, in 2010 the Canadian government banned BPA use to make baby bottles even after issuing a report stating that exposure levels were safe.[53] The Canadian Environment Minister explained that the ban was designed to address fears—not actual risks—raised by mothers about BPA in baby bottles.[54] The FDA soon followed suit, banning BPA use for baby bottles in response to an industry request after plastics companies decided to switch to an alternative. Apparently, the companies believed that a ban would restore confidence in their products, but it simply affirmed irrational fears about BPA risks. Ironically, activists complained about the BPA-Free substitutes, which use a similar chemical called Bisphenol S.[55] Some even advocate going back to glass baby bottles, even though children are at a greater risk from broken glass.[56]

The transparency of polycarbonate plastics also has critical value in hospitals, where it is important to have a clear view of contents in various containers. BPA is used in kidney dialysis equipment, cardiac surgery products, surgical instruments, connection components to transport fluids to and from patients, and many other vital applications. One chemist representing the medical division of Bayer Corporation notes the importance of polycarbonate plastics in providing good medical treatment:

> [P]olycarbonate offers an unusual combination of strength rigidity and toughness that helps prevent potentially life-threatening material failures. In addition it provides glasslike clarity a critical characteristic for clinical and diagnostic settings in which visibility of tissues blood and other fluids is required.[57]

Yet some politicians have even discussed banning medical applications of BPA. In 2008 Rep. Rosa DeLauro (D-Conn.) called on the FDA to review the issue while Congress looked into regulatory measures on BPA. She remarked in a letter to the FDA: "The potential risks posed to patients by BPA leaching from medical devices especially implantable ones would be very significant. … I strongly urge you to expand your request and have the Science Board also assess the safety of BPA in medical devices."[58]

BPA-based resins, which are used to coat the inside of steel and aluminum food cans, are also at risk. In 2104, Senator Edward Markey (D-Mass.) and Rep. Lois Capps (D-Calif.) introduced the Ban Poisonous Additives Act (S. 2572, H.R. 5033), which would eliminate BPA use in food packaging.

Calls to ban BPA resins ignore the reason we have them in the first place. Originally, steel cans were lined with tin, which still works well for some fruits. But with other foods, tin lining can corrode, compromising the packaging and eventually letting in air and potentially dangerous pathogens such as *Clostridium botulinum,* which produces deadly toxins.[59]

Thankfully, canning technology vastly improved during the second half of the 20th century. A key innovation emerged in the 1960s, when the FDA approved epoxy resins made with BPA to line the inside of cans. These BPA resins and coatings prevent food contamination from bacteria and rust, reduce food spoilage, maintain food flavor and quality, and extend shelf life. Today, unless serious dents perforate a seam and let in air, risks from contamination in canned foods are very low. In fact, during the past 30 years, there have been no cases of foodborne illness outbreaks related to the failure of can packaging.[60]

Not surprisingly, BPA-based epoxy resins have won the largest market in the canned food industry share because they far outperform other options. Researcher Judy S. LaKind, Ph.D. of LaKind Associates, examined various can lining options in 2013. Her study, published in the *International Journal of Technology, Policy and Management*, shows that BPA-based epoxy resins are strong and flexible, can be used for the widest range of food products, and do not add color or flavor to the food.[61]

Elimination of BPA in food packaging poses serious problems because there are no good alternatives to BPA for these uses. Packaging manufacturers have been trying to remove

BPA from their products because of public pressure, but they are having a very difficult time finding safer alternatives. "We don't have a safe effective alternative and that's an unhappy place to be," one industry representative told *The Washington Post* in 2010. "No one wants to talk about that."[62]

Eden Foods, an organic food company, boasts that its cans are BPA-free, and that it uses cans lined with "non-corn-based oleoresin liners." Yet oleoresins are not a viable BPA resin substitute because they are much more expensive, they do not work for many products—they corrode if used for high-acid foods such as tomatoes—and they compromise food quality. In a review of the various resins, Dr. LaKind notes that oleoresins are "prone to corrosion … adhere poorly to the metal substrate and require long curing times" and "are not well-suited to modern high-speed can manufacturing." In addition, their "use is limited to non-aggressive foods (e.g. dried beans)," and they "do not retain colour, and tend to impart taste to foods."[63] For such reasons, Eden admits that it packages its tomatoes in glass with metal lids that contain BPA resins.[64]

Given that human exposure to BPA from all sources combined—food packaging, plastics, and even cash register receipts—remains far below levels of concern, such bans will simply cost consumers more money for inferior and potentially more dangerous products.

**Conclusion.** Political pressures should not lead to the removal of BPA products without a complete understanding of the value BPA brings and the serious risks associated with arbitrarily removing BPA from the marketplace. The current state of research on the topic offers enough information to understand that BPA risks at the trace levels found in food and consumer products are negligible. Funding yet more BPA research will simply add fuel to an already out-of-control fire, and lead to yet more misguided and counterproductive anti-BPA technology bans and "voluntary phase outs." The tax dollars dedicated to BPA research surely would do more good in programs focused on curing real illnesses or in the pockets of the workers who earned them.

## Notes

[1] Environmental Working Group, "BPA in Canned Food: Behind the Brand Curtain," June 3, 2015, http://www.ewg.org/research/bpa-canned-food/executive-summary.
[2] Elizabeth Wright, "Dueling Agencies," *WasteWatcher,* November 2014, http://cagw.org/media/wastewatcher/dueling-agencies.
[3] For example, Sen. David Vitter (R-La.) wrote to Birnbaum in 2013 to express dismay with her participation in a panel discussion hosted by environmental activists to promote the sensationalist, anti-chemical documentary, "Unacceptable Levels," Office of Senator David Vitter, "Vitter: Another Administration Official to Participate in Biased, Inappropriate Panel Discussion," news release, September 12, 2013, http://www.epw.senate.gov/public/index.cfm/press-releases-republican?ID=13A8CAB4-95EC-1831-B658-BB17026DC44B.
[4] Linda S. Birnbaum et al., "Consortium-Based Science: The NIEHS's Multipronged, Collaborative Approach to Assessing the Health Effects of Bisphenol A," *Environmental Health Perspectives* 120, no. 12 (December 2012): pp. 1640–1644, http://ehp.niehs.nih.gov/wp-content/uploads/120/12/ehp.1205330.pdf.
[5] National Institutes of Health, National Institute of Environmental Health Sciences, "NIEHS-supported Bisphenol A Research Articles," webpage accessed August 12, 2015, https://www.niehs.nih.gov/research/programs/endocrine/bpa_initiatives/bpa-related/index.cfm.

[6] Frederick S. vom Saal et al., "Chapel Hill Bisphenol A Expert Panel Consensus Statement: Integration of Mechanisms, Effects in Animals and Potential to Impact Human Health at Current Levels of Exposure," *Reproductive Toxicology*, Vol. 24, No. 2 (August-September 2010), pp. 131–138, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2967230.
[7] Linda S. Birnbaum et al., "Consortium-Based Science.
[8] Both vom Saal and Myers disclose that they were on the "organizing committee" of the workshop as part of a financial disclosure statement at the end of an editorial they authored the for a medical journal. Frederick S. vom Saal and John Peterson Myers, "Bisphenol A and Risk of Metabolic Disorders," *Journal of the American Medical Association*, Vol. 300, No. 11 (September 17, 2008), pp. 1353-1355, http://endocrinedisruptors.missouri.edu/pdfarticles/vomsaal/2008/vomsaal%20JAMA.%20NHANES%20BPA%20Editorial%202008.pdf.
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