



# CAPPED WITH TOXICS

**Toxic chemicals found in the  
plastic liners of bottle caps from  
glass-bottled beverages**

*More action needed to rid packaging of dangerous chemicals  
to protect public health and ensure environmental justice*

A REPORT BY

**Defend Our Health AND Ecology Center**

ON BEHALF OF THE

**Toxic-Free Food Campaign**

JULY 2021

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## Acknowledgements

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This report is sponsored by the Toxic-Free Food Campaign ([www.toxicfreefood.org](http://www.toxicfreefood.org)), a national alliance of nonprofit organizations working to protect public health and the American food supply by persuading major food manufacturers to eliminate phthalates and other chemicals of high concern from materials used to process, package and serve food and beverage products.



## ⇒ Thank You

We are grateful to several funders for their support of the Toxic-Free Food Campaign and its member organizations working to improve the safety of food contact materials:

Broad Reach Fund  
Cedar Tree Foundation  
Cloud Mountain Foundation  
Forsythia Foundation

John Merck Fund  
Leon Lowenstein Foundation  
New York Community Trust  
Passport Foundation

# Executive Summary

Testing of the plastic liners of 273 metal bottle caps revealed that **most of the glass-bottled beverages we sampled were capped with toxic chemicals** that could expose consumers to harm and contribute to environmental injustice. The plastic liners (also known as cap gaskets) are used to seal metal bottle caps to the rim of glass bottles. We sampled bottle caps from 141 unique brands of soda, kombucha, juice, water, dairy, and ready-to-drink tea and coffee—all sold in glass bottles.

In our testing, the plastic cap liners from forty-nine beverage brands (one-third of the brands sampled) contained **ortho-phthalates**, a class of chemicals of high concern known to harm reproductive health and brain development in babies and young children. Three different phthalates (the short name for *ortho*-phthalates) were identified in bottle cap liners: DEHP, DINP and DIDP.

Studies have shown that phthalates can migrate from cap gaskets into food and beverages that are packed in glass containers. The chemicals may also leave a residue on the rim of the bottle that's washed down as you sip your favorite beverage, and pollute the environment when bottle caps are discarded.

The beverage types we tested that most frequently contained phthalates in bottle cap liners were soda (52% of the brands tested), smaller company brands (42%), organic products (41%), kombucha (40%), and ready-to-drink coffee (38%).

Overall, the cap liners from ninety brands, or nearly two-thirds of those tested, were made of **polyvinyl chloride (PVC or vinyl)**, which has been dubbed the “poison plastic” due to toxic hazards created across its lifecycle during production, use and disposal. Vinyl plastic requires large amounts of chemical additives known as “plasticizers,” such as *ortho*-phthalates or relatively less toxic alternatives, to keep the plastic soft and pliable. These plasticizers make up about 40% of the vinyl plastic by weight and are continually shed into their surrounding environment.

Of the beverages tested, vinyl plastic was most frequently found in the bottle cap liners from ready-to-drink coffee (100% of brands tested) and tea (74% of brands), juices and juice drinks (76%), and brands purchased at dollar stores (75%).

**Beverage packaging is an environmental justice issue.** People of color are already disproportionately exposed to phthalates, in general. They are also over-represented among purchasers of sweetened beverages and customers of dollar stores, both of which showed a frequent use of toxic bottle caps in our testing.

In good news, **more than one-third of the brands (51) tested “clean.”** They use cap gaskets made of non-vinyl plastic, which is more environmentally sustainable and requires no plasticizers at all, preventing all exposure to phthalates or their alternatives. Several market leaders have recently transitioned to phthalate-free cap liners, including Brew Dr Kombucha, Whole Foods Markets, Keurig Dr Pepper, and Maine Root, and are in various stages of transitioning to non-vinyl plastic in their beverage packaging, too.

**Fortunately, alternatives to both vinyl plastic and ortho-phthalates are widely available.** Six non-vinyl plastics, which require no added chemical plasticizer, were found in use in bottle cap liners. In cap liners made of vinyl plastic, four safer alternatives to *ortho*-phthalates were identified in use as a plasticizer (ATBC, DEHA, DEHT, and ESBO).

The Toxic-Free Food Campaign strongly recommends that all beverage brands immediately end any use of phthalates in cap liners. In fact, after January 1, 2022, beverage packaging containing *ortho*-phthalates can no longer be lawfully sold in the State of Maine. Beverage brands should also transition to non-vinyl plastic cap liners as soon as practicable.

# Action Needed for Safer Beverage Bottle Cap Liners

We tested the plastic liners from 273 metal bottle caps sampled from 141 brands of soda, kombucha, juice, water, dairy, and ready-to-drink tea and coffee sold in glass bottles. The results show that many of these brands should take immediate action to phase out the use of toxic phthalates and/or PVC (vinyl) plastic in favor of safer chemicals and more environmentally sustainable materials. NOTE: Beverages and food products cannot be legally sold in the State of Maine if their packaging contains intentionally-added *ortho*-phthalates, beginning on January 1, 2022.

<p><b>HAZARD SPECTRUM</b></p> <p>Our test results for all bottle cap liners sampled show the:</p> <ul style="list-style-type: none"> <li>• Type of plastic used</li> <li>• Chemicals added as a plasticizer, if any</li> </ul>	<p><b>Summary of Test Results for Plastics and Chemicals Used in Bottle Cap Liners of Beverage Brands</b></p> <p>NOTE: Each brand was assigned to a single hazard category based on the test results for a majority of its cap liners. If an equal number of caps tested into two categories, that brand was assigned to the higher hazard box. Results may not represent the chemical content of all cap liners currently used by any brand.</p>
<p><b>TOXIC:</b> PVC (vinyl) plastic with <i>ortho</i>-phthalates added</p>	<p><b>49 brands (35% of those tested), including:</b></p> 
<p><b>CAUTION:</b> PVC (vinyl) plastic with other chemical plasticizers added "Phthalate-free"</p>	<p><b>41 brands (29%), including:</b></p> 
<p><b>BETTER:</b> Non-vinyl plastic with no chemical plasticizer needed "PVC-free and Phthalate-free"</p>	<p><b>51 brands (36%), including:</b></p> 

View the complete list of all brands tested and their test results here: [www.ToxicFreeDrink.org](http://www.ToxicFreeDrink.org)

# What are the Hazards of Bottle Cap Liners?

Metal bottle caps are lined with a plastic material that may also contain chemical additives. Bottle cap liners were sorted into three hazard categories, after being tested to identify the type of plastic used and whether chemicals known as “plasticizers” were added:

Hazard Category:	TOXIC:	CAUTION:	BETTER:
Plastic Type	PVC (Vinyl)	PVC (Vinyl)	Non-Vinyl
Chemical Additives	<i>ortho</i> -Phthalates	Other Plasticizers	NO Plasticizer

These plastic liners seal the underside of metal bottle caps to glass bottles. Plasticizers, which may include *ortho*-phthalates, must be added to polyvinyl chloride (PVC or vinyl) to make the plastic flexible. These additives make up about 40% of vinyl plastic by weight and are continually shed during use and disposal. Non-vinyl plastics require no plasticizers.

## PLASTICS

The hazards of two classes of plastic used as cap liners include:

### Toxic Hazard Level:



#### POLYVINYL CHLORIDE (PVC OR VINYL)

*Vinyl poses toxic hazards across its lifecycle:*

- Production requires toxic chemicals to make chlorine and vinyl chloride
- Use may release harmful additives
- Disposal may create toxic byproducts
- Less than 1% of PVC is ever recycled
- Higher carbon footprint (on climate)

### Better Hazard Level:



#### NON-VINYL PLASTICS

*Non-vinyl plastics have these advantages:*

- Avoid all exposure to plasticizers, which are not required for these
- Have both a lower chemical footprint and carbon footprint than vinyl
- Six non-vinyl plastics were in use
- Polyethylene is the least toxic choice

## PLASTICIZERS

The hazards of two classes of plasticizers in vinyl liners include:

### Toxic Hazard Level:



#### ORTHO-PHTHALATES

*Strong scientific evidence shows that human exposure to phthalates harms:*

- Brain development
- Reproductive health

*Some groups of people are more exposed and/ or more susceptible to harm, including:*

- People of color
- Babies and young children
- Women of child bearing age
- Plastics and rubber workers

### Caution Hazard Level:



#### OTHER PLASTICIZERS

*Generally safer than ortho-phthalates, BUT:*

- Human exposure is increasing
- Some data gaps remain on their hormone-disrupting properties

A similar pattern of environmental injustice from exposure to non-phthalate plasticizers may likely affect these same groups. The other plasticizers identified in vinyl plastic bottle cap liners were ATBC, DEHA, DOTP (also known as DEHT), and ESBO.

# Market Leaders are Moving to Less Toxic Packaging

The good news: 36% of all brands tested “clean” with neither *ortho*-phthalates nor vinyl plastic found present in their bottle cap liners, according to our test results. Even better, after offering a briefing to all the brands on their bottle cap test results, we saw some dramatic market leadership toward environmentally healthier and sustainable packaging.



## BREW DR KOMBUCHA

Brew Dr is one of the top five U.S. producers of this popular fermented tea beverage. Its ingredients are organically sourced. Brew Dr is the first kombucha company to become a Certified B Corporation, demonstrating its commitment to meeting the highest standards of social and environmental performance.

This brand owner has proven that change can happen quickly. Immediately after being alerted to test results that found *ortho*-phthalates in the vinyl plastic cap liners of the metal bottle caps on the glass bottles of kombucha, founder and CEO Matt Thomas swung into action. Working with its supplier, Brew Dr quickly switched to a phthalate-free, non-vinyl plastic liner for its bottle caps.

*“There really wasn't a decision to make. It's not like we could even consider continuing to use caps that we had learned could pose a potential toxics risk. I would hope that any food manufacturer would feel the same way,”* said Matt Thomas, founder of Brew Dr Kombucha. ***“You have to always put safety first, and build a business around that.”***

The biggest frustration for the company was not knowing it had options and not receiving any financial credit for previously purchased toxic bottle caps, but the company whose mission statement reads: “Through our responsible brewing process and business practices, we’re committed to better choices for people, communities, and our planet,” made the decision to prioritize the health of the consumer.



## WHOLE FOODS MARKET

Once we shared our bottle cap test results with Whole Foods Markets, now owned by Amazon, the company worked with its suppliers of private-label mineral water to immediately switch to a non-phthalate plasticizer in its vinyl cap liner.

Whole Foods Markets has pledged to work toward transitioning to a non-vinyl solution for its bottle cap liners, with the goal of phasing out vinyl plastic from all of its packaging.



## KEURIG DR PEPPER

The fifth largest soda company in the world, Keurig Dr Pepper says it eliminated the use of phthalates in the cap liners of **IBC** and **Stewart's** in the third quarter of 2020. It plans to eliminate the use of vinyl plastic in its **Snapple** and **Nantucket Nectars** brands by switching from a metal cap lined with vinyl to an all-plastic polyethylene closure. The company pledged to develop a chemical policy for all its products and packaging later in 2021 and will consider transitioning away from all uses of vinyl plastic in beverage packaging.



# Introduction

Toxic chemicals used in food and beverage packaging may threaten human health and the environment and worsen environmental injustice. Sustainable packaging should be free from harmful chemicals, toxic plastics, and unjust burdens on communities of color.

For beverage packaging, we investigated the use of polyvinyl chloride (PVC or vinyl) plastic and chemical plasticizers added to make vinyl soft and pliable. Several plasticizers are used in flexible vinyl plastic, including *ortho*-phthalates, a class of chemicals of high concern.

Flexible vinyl makes up some plastic liners (known as cap gaskets) that seal the underside of metal bottle caps to glass bottles. Plasticizers typically account for one-third to one-half of flexible vinyl plastic by weight. These additives are not chemically bound to the plastic and are continually shed into the surrounding environment during use and disposal.

## Three potential exposure scenarios raise environmental health concerns:

- **PRODUCT CONTAMINATION** – Research studies have detected the presence of phthalates in food and beverage products packaged in glass containers that use vinyl cap gaskets known to contain phthalates<sup>1</sup>
- **TOXIC RIM RESIDUE** – Vinyl cap gaskets may leave a residue of phthalates on the rim of a beverage bottle that is washed down when you sip your favorite beverage
- **ENVIRONMENTAL RELEASES** – Bottle caps with vinyl liners will continually release phthalates or other plasticizers when disposed; and when metal caps are recycled or waste incinerated, toxic byproducts of combustion of vinyl plastic, such as highly toxic chlorinated dioxins and furans, will be created.

Vinyl plastic is not an environmentally sustainable material. Often dubbed the “poison plastic,” vinyl creates toxic hazards and environmental injustice across its lifecycle, from production, use and disposal. Less than 1% of vinyl is ever recycled, compared to less than 10% for all plastics.

Among beverage containers, vinyl plastic and toxic phthalates are only an issue for some glass bottles. But that doesn't imply that plastic bottles are a safer choice. Most beverage products are packaged in plastic bottles rather than glass. But fewer chemicals of potential concern are known to migrate from glass containers compared to plastic. Further, plastic bottles and plastic caps create huge waste problems due to improper disposal and unjust burdens on people of color who are more likely to live near the chemical plants that make plastic.

All findings in this report are based on testing of metal bottle cap liners using an FTIR spectrometer with subsamples confirmed by chemical analysis at an independent laboratory. We sampled beverages representing 141 brands purchased between October 2019 and March 2021 from 12 U.S states, Washington DC, and Toronto. One to seven samples were obtained for each brand. Test results may not represent caps currently in use or the majority of caps in use by each brand. Our sampling may have missed some brands that also contain vinyl plastic or phthalates. Test results for eight brands showed that the chemical composition of their cap liners varied among bottle caps used by the same brand.

<sup>1</sup>Page BD & Lacroix GM (1995). The occurrence of phthalate ester and di-2-ethylhexyl adipate plasticizers in Canadian packaging and food sampled in 1985-1989: a survey. *Food Additives & Contaminants*. 12(1):129-51. <https://doi.org/10.1080/02652039509374287>; Pedersen GA et al. (2008). Migration of epoxidized soybean oil (ESBO) and phthalates from twist closures into food and enforcement of the overall migration limit. *Food Additives & Contaminants: Part A*, 25(4):503-510. <https://doi.org/10.1080/02652030701519088>

# Toxic Hazards of Phthalates, the Everywhere Chemicals

Nearly every American has measurable levels of *ortho*-phthalates in their bodies. Dubbed the “everywhere chemicals,” phthalates are widely used to soften vinyl plastic and rubber in food contact materials and in many consumer and commercial products. Phthalates are also added to fragrance in beauty products, adhesives, printing inks, and coatings.<sup>2</sup>

Phthalates are well known hormone-disrupting chemicals that shut down production of male sex hormones such as testosterone and alter thyroid function. Also, health studies on humans and other animals and laboratory research associate exposure to phthalates to a wide variety of disabilities and disease.

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## Evidence shows that phthalates harm:

- **REPRODUCTIVE HEALTH** – Maternal exposure during pregnancy shortens anogenital distance (AGD) in baby boys, a marker for feminization that’s also associated with a birth defect of the penis, undescended testicles, lowered male fertility, increased risk of testicular and prostate cancer, heart disease and early death.<sup>3</sup>
- **BRAIN DEVELOPMENT** – Exposure to phthalates during pregnancy and early childhood has been linked in several studies to higher rates of attention deficit hyperactivity disorder (ADHD) and impulsive anti-social behavior in children.<sup>4</sup>

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In 2014, an expert science panel concluded that daily exposure to five phthalates posed a significant health risk to 5% to 10% of pregnant women and infants in the United States.<sup>5</sup> Despite a gradual decline in use of one phthalate known as DEHP, a federal agency concluded in 2017 that up to 725,000 American women of reproductive age were still exposed to phthalates at levels that could harm their child should they be pregnant.<sup>6</sup>

Nearly every American has measurable levels of *ortho*-phthalates in their bodies.

People of color, young children and women bear the heaviest burden of phthalate exposure across the U.S. population. These racial, age and gender disparities are well documented.<sup>7</sup>

Eating food is the major way that most people are exposed to most phthalates.<sup>8</sup> More exposure occurs in the home from household dust, indoor air and skin contact. Some workers in the chemical industry are exposed to even higher levels of phthalates.<sup>9</sup>

Although daily exposure to phthalates is widespread, these chemicals do not build up in our bodies over time. That means that reductions in phthalate use will immediately reduce human exposure and improve environmental health. Fortunately, alternatives are widely available, including non-vinyl plastics that require no plasticizer chemicals at all.

<sup>2</sup>McCoy M (2015). A Reckoning for Phthalates. Chemical & Engineering News, 93(25), June 22. <https://cen.acs.org/articles/93/i25/Reckoning-Phthalates.html>

<sup>3</sup>U.S. Consumer Product Safety Commission (2014). Chronic Hazard Advisory Panel (CHAP) on Phthalates. Final Report, July 18. <https://www.cpsc.gov/s3fs-public/CHAP-REPORT-With-Appendices.pdf>

<sup>4</sup>Engel SM et al. (2021). Neurotoxicity of *Ortho*-Phthalates: Recommendations for Critical Policy Reforms to Protect Brain Development in Children. American Journal of Public Health, 4 (April 1):687-695. <https://doi.org/10.2105/AJPH.2020.306014>

<sup>5</sup>Op. cit. Footnote 3.

<sup>6</sup>U.S. Consumer Product Safety Commission (2017). Estimated Phthalate Exposure and Risk to Women of Reproductive Age as Assessed Using 2013-2014 NHANES Biomonitoring Data. February 9. [www.cpsc.gov/s3fs-public/Estimated%20Phthalate%20Exposure%20and%20Risk%20to%20Women%20of%20Reproductive%20Age%20as%20Assessed%20Using%202013%202014%20NHANES%20Biomonitoring%20Data.pdf](https://www.cpsc.gov/s3fs-public/Estimated%20Phthalate%20Exposure%20and%20Risk%20to%20Women%20of%20Reproductive%20Age%20as%20Assessed%20Using%202013%202014%20NHANES%20Biomonitoring%20Data.pdf)

<sup>7</sup>U.S. Department of Health and Human Services (2019). Centers for Disease Control and Prevention. Fourth National Report on Human Exposure to Environmental Chemicals, Updated Tables, Volume 1, [https://www.cdc.gov/exposurereport/pdf/FourthReport\\_UpdatedTables\\_Volume1\\_Jan2019-508.pdf](https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Jan2019-508.pdf)

<sup>8</sup>Serrano SS et al. (2014). Phthalates and diet: a review of the food monitoring and epidemiology data. Environmental Health, 13(1):43. <https://doi.org/10.1186/1476-069X-13-43>

<sup>9</sup>Hines CJ et al. (2011). Estimated daily intake of phthalates in occupationally exposed groups. Journal of Exposure Science and Environmental Epidemiology, 21(2):133-141. <https://doi.org/10.1038/jes.2009.62>

# PVC, the Poison Plastic: Toxic, Unjust, Unsustainable

Polyvinyl chloride, also known as PVC or vinyl, is the most environmentally harmful plastic in high volume use, creating toxic hazards across its lifecycle from production, use and disposal.<sup>10</sup> Consider this brief summary of vinyl's impact:

## VINYL PRODUCTION

- About 57% of PVC consists of chlorine, which is produced as a deadly gas by chemical plants, many of which use asbestos or mercury-based technologies
- Two chemicals known to cause cancer are used to make vinyl plastic, ethylene dichloride and vinyl chloride
- Domestic production of chlorine and PVC plastic is concentrated in the Gulf Coast where lower income communities of color are heavily burdened by air pollution<sup>11</sup>
- The ExxonMobil chemical plant in Baton Rouge, LA, which is surrounded by communities of color, manufactures *ortho*-phthalates for use in vinyl plastic<sup>12</sup> (Featured in photo below)
- Vinyl plastic production emits more greenhouse gas emissions than other plastics due to the energy intensive process of making chlorine and the polymer itself<sup>13</sup>

## VINYL USE

- Chemical additives may be continually released during the use of vinyl plastic
- Flexible vinyl requires plasticizers, such as phthalates, often present in very high percent amounts, as well as antioxidants such as bisphenol A
- Stabilizers added to vinyl plastic include organotin, which are endocrine active

## VINYL DISPOSAL

- Less than 1% of vinyl plastic is recycled<sup>14</sup> due to high chlorine and additive content
- Vinyl plastic in landfills may release additives to leachate and ground water
- Building and vehicle fires release highly toxic byproducts of vinyl combustion known as chlorinated dioxins and furans
- Open burning and waste incineration will also produce dioxins and furans
- Landfills and incinerators are often located in over-burdened communities that are home to lower income families and people of color



<sup>10</sup>Thornton J (2002). Environmental Impacts of Polyvinyl Chloride Building Materials.

<https://s3.amazonaws.com/hbnweb.dev/uploads/files/environmental-impacts-of-polyvinyl-chloride-building-materials.pdf>; Belliveau M & Lester S (2004). PVC: Bad News Comes in 3's: The Poison Plastic, Health Hazards and the Looming Waste Crisis. <http://chej.org/wp-content/uploads/PVC%20-%20Bad%20News%20Comes%20in%203%27s%20-%20REP%20005.pdf>

<sup>11</sup>Vallette J (2018) Chlorine and Building Materials: A Global Inventory of Production Technologies, Markets and Pollution. Phase 1: Africa, The Americas and Europe.

Healthy Building Network. July. <https://s3.amazonaws.com/hbnweb.dev/uploads/files/wnxz/Chlorine%20%26%20Building%20Materials%20Phase%201%20-%20v2.pdf>

<sup>12</sup>Louisiana Bucket Brigade, Earthjustice, Environmental Integrity Project, Sierra Club (2021). Petition to the U.S. Environmental Protection Agency to Object to the Title V Operating Permit for the Utilities Unit at ExxonMobil Fuel and Lubricant Company's Baton Rouge Refinery,

<https://www.epa.gov/sites/production/files/2021-02/documents/exxonbatonrougeutilitiesunitpetition2021.pdf>

<sup>13</sup>Alsabri A & Al-Ghamdi SG (2020). Carbon footprint and embodied energy of PVC, PE and PP piping: Perspective on environmental performance. Energy Reports, 6(8):364-370.

<https://doi.org/10.1016/j.egyr.2020.11.173>

<sup>14</sup>U.S. Environmental Protection Agency (2020). Advancing Sustainable Materials Management: 2018 Tables and Figures. Table 8: Plastics in Products in MSW, 2018. p.11.

[https://www.epa.gov/sites/production/files/2021-01/documents/2018\\_tables\\_and\\_figures\\_dec\\_2020\\_fnl\\_508.pdf](https://www.epa.gov/sites/production/files/2021-01/documents/2018_tables_and_figures_dec_2020_fnl_508.pdf)

## FINDING #1

### Many glass-bottled beverages tested were capped with toxic chemicals

We tested the plastic liners from the underside of 273 metal bottle caps from 141 beverage brands bottled in glass and purchased across the U.S. and in Canada.

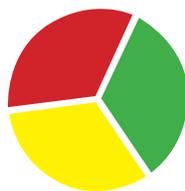
#### Here’s what we found:

- Nearly two-thirds of all brands tested (64%) had cap liners made of polyvinyl chloride (PVC or vinyl), dubbed “poison plastic” due to toxic lifecycle hazards from production through disposal.

*The beverage types with the most frequent use of vinyl plastic cap liners were ready-to-drink coffee (100%), juice & juice drinks (76%), and ready-to-drink tea (74%).*

- More than one-third of all the brands tested (35%) had cap liners that also contained ortho-phthalates, chemicals of high concern that escape from vinyl plastic liners, and may expose consumers and the environment.

*The beverage types with cap liners that most often tested positive for phthalates included soda (52%), kombucha (40%) and ready-to-drink coffee (38%).*



**Results of Bottle Cap Liner Testing**

- PVC (vinyl) with ortho-phthalates
- PVC (vinyl) with other plasticizers
- Non-vinyl plastic, no plasticizers

- Cap liners tested from more than one-third of the brands (36%) were “clean,” that is they were free of both phthalates and vinyl plastic.

TESTING RESULTS for Plastic Bottle Cap Liners:		Percent (and Number) of Brands Tested Across the Hazard Spectrum:		
Beverage Type	Brands Tested	TOXIC:	CAUTION:	BETTER:
Soda	48	52% (25)	10% (5)	38% (18)
Kombucha	15	40% (6)	13% (2)	47% (7)
Coffee, RTD	8	38% (3)	62% (5)	0
Tea, RTD	19	26% (5)	47% (9)	26% (5)
Juice	34	21% (7)	56% (19)	24% (8)
Water	20	15% (3)	5% (1)	80% (16)
Dairy	1	0	100% (1)	0
<b>TOTALS</b>	<b>141</b>	<b>35% (49)</b>	<b>29% (41)</b>	<b>36% (51)</b>

*NOTE: The number of brands in each column may not equal the totals because two beverage types were sampled for each of four brands.*

## FINDING #2

### Environmental justice demands least-toxic beverage packaging

People of color and young children often experience the worst health threats from toxic chemicals.

In the case of *ortho*-phthalates, this unjust burden results from two factors:

#### Higher Exposure

Across the U.S. population, people who are Asian, Latinx, or Black are all more highly exposed to phthalates overall than their white counterparts. Racial disparities are compounded by age and gender disparities. Young children are more exposed to phthalates than teenagers and adults, and women more than men.<sup>15</sup>

#### Greater Susceptibility

The combined effects of racism, poverty, poor access to health care and healthy food, and other risk factors increase the likelihood that toxic chemical exposures will damage people's health.<sup>16</sup> The greatest harm to children's health results from phthalate exposure during pregnancy and in early childhood.<sup>17</sup>

**Differences in food and beverage consumption by racial group may worsen the environmental injustice associated with toxic chemical exposure.** On average, for example, people who are Black or Latinx drink 60% more sweetened beverages than white people; Latinx consume more fruit juice than any other racial group.<sup>18</sup> In our tests, bottle cap liners from sweetened beverages frequently tested positive for phthalates. Soda, a highly sweetened beverage, had the highest detection rate for phthalates, found in cap liners from 52% of brands. Caps from other sweetened beverage brands, such as juice, and ready-to-drink tea and coffee, tested positive for phthalates 21% to 38% of the time.

**Customers of dollar stores, who are disproportionately people of color<sup>19</sup>, may have fewer choices for least-toxic beverage packaging.** Testing of bottle caps from 8 beverage brands purchased at dollar stores, showed that three-quarters (75%) of those brands had cap liners made of vinyl plastic, compared to only 64% for all brands tested. For the four brands that were purchased exclusively from dollar stores, 100% of the cap liners were made of vinyl plastic, with half of those (50%) containing phthalates compared to only 35% for all brands tested.

**However, in our testing, brands purchased from ethnic retailers or imported, had fewer cap liners that were made of vinyl plastic or contained phthalates than all other brands tested.** Thirty beverage brands were purchased from three Asian grocers, a Mexican restaurant, and from retailers that sold imported brands from non-European countries. In our testing, 23% of those brands had toxic bottle caps (with phthalates) and 21% had vinyl plastic liners with other plasticizers, compared to 38% and 32%, respectively, for all of the other brands tested.

<sup>15</sup> Op. cit. Footnote 7.

<sup>16</sup>Morello-Frosch R & Shenassa ED (2006). The Environmental "Riskscape" and Social Inequality: Implications for Explaining Maternal and Child Health Disparities. *Environmental Health Perspectives*, 114(8):1150-1153. <https://doi.org/10.1289/ehp.8930>

<sup>17</sup>Swan SH (2008). Environmental phthalate exposure in relation to reproductive outcomes and other health endpoints in humans. *Environmental Research*, 108(2):177-184. <https://doi.org/10.1016/j.envres.2008.08.007>

<sup>18</sup>U.S. Department of Health and Human Services (2020). Nonalcoholic Beverage Consumption Among Adults: United States, 2015-2018. Centers for Disease Control and Prevention, National Center for Health Statistics, NCHS Data Brief, No. 376, September. <https://www.cdc.gov/nchs/data/databriefs/db376-h.pdf>

<sup>19</sup>Numerator, InfoScout OmniPanel (website). Search for Dollar Tree, Dollar General and 99 Cents Only at <https://snapshot.numerator.com/nodashboard/>

## FINDING #3

### Many of the tested beverages marketed as “healthy” choices had toxic bottle caps

Our testing showed that even beverages that are commonly marketed to health-conscious consumers were capped with a toxic plastic and phthalates. But consumers expect better, especially from brands often marketed as healthy choices, such as those identifying their products as organic.

**ORGANIC beverages used toxic bottle caps more often than conventional ones, in our testing.** We found phthalates in 41% of the bottle cap liners we tested from organic brands, versus a 33% detection rate in caps from conventional (non-organic) brands. Vinyl plastic was used in 82% of the organic brand cap gaskets, but in only 58% from conventional brands.

Consumers often pay a premium for organic products with an expectation that they will be free from harmful toxic chemicals. Yet the National Organic Standard Board has failed so far to restrict the use of toxic food contact chemicals for processing and packaging of certified organic food and beverage products.

#### Organic Brands with Phthalates Found in Sampled Beverage Bottle Cap Liners\*

Baba’s Bucha kombucha	Humm kombucha	Peloton tea
Chameleon coffee	Lucky Jack coffee	Simple Truth Organic soda
Guayaki yerba mate	Martinelli’s sparkling juice	Tea Horse Road Seven tea
Harney & Sons tea	O Organics soda	Wild kombucha

*\* Two other organic brands recently eliminated phthalates, Brew Dr kombucha and Maine Root sodas, and Nestlé says it has since transitioned their Chameleon brand to phthalate-free cap liners.*

**In our tests, several KOMBUCHA brands were capped with toxic chemicals.** Six out of fifteen kombucha brands (40%) tested positive for phthalates in vinyl plastic cap liners, including Live and Rise in addition to those listed above. Kombucha is a popular fermented tea beverage that is often marketed as possessing health benefits. But because kombucha is commonly bottled in glass with metal bottle caps, most consumers will encounter cap gaskets in the packaging.

## ⇒ Good News

**In good news, WATER had the cleanest bottle caps.** For water packed in glass bottles, only 15% of the brands tested had plastic liners containing phthalates. And just one additional brand (5%) had cap liners made of PVC plastic with non-phthalate plasticizers. The frequency of both results was the lowest of any major beverage type tested.



## FINDING #4

### The smaller brands tested were nearly four times more likely to use bottle caps containing phthalates

Small businesses are major contributors to the economy, yet they often lack access to information and resources necessary to stay ahead of emerging public concerns. **In our test, bottle caps with phthalates were used almost four times more often by smaller beverage brands compared to large brand owners.**

Our testing revealed that smaller companies used vinyl plastic containing phthalates in 43% of the brands they own, while only 11% percent of the brands owned by large companies used phthalates. Vinyl plastic containing any type of plasticizer was used more often by small versus large brand owners. For purpose of this report, “large” means a company with more than \$100 million in sales of non-alcoholic beverages in 2018.

#### Small Companies Own More Brands that Use Toxic Bottle Caps

Beverage Brand Owners	# Brands Tested	TOXIC:	CAUTION:	BETTER:
Large	37	4 (11%)	15 (41%)	18 (49%)
Small	104	45 (43%)	26 (25%)	33 (32%)
<b>TOTALS</b>	<b>141</b>	<b>49 (35%)</b>	<b>41 (29%)</b>	<b>51 (36%)</b>

#### MAINE ROOT

Maine Root beverages use organic cane sugar obtained from fair trade in Brazil to make tasty root beer, ginger brew, lemonades and sodas. When we provided them with our test results for their cap liners, the president of the company took immediate action. Maine Root promptly switched to a phthalate-free plasticizer for the vinyl cap liners for all its bottles. Now they are searching for a vinyl-free alternative that meets their exacting performance specifications. That’s social responsibility and market leadership.



#### ⇒ Smaller Brands

Several smaller brand owners we talked to were completely unaware of the type of plastic or chemical plasticizer used in their beverage packaging. This lack of knowledge suggests revealed the need for greater technical assistance and government regulation to level the playing field for small businesses.

## FINDING #5

### Retailers and large brand owners should improve packaging

**In our tests, the majority of private-label beverage brands of retailers used toxic bottle caps.** We tested cap liners from nine private-label beverage brands owned by six major retailers. Six brands (67%) tested positive for vinyl with phthalates (see chart below). Three brands (33%) tested used vinyl plastic with non-phthalate plasticizers, including Nature's Promise (owned by Ahold Delhaize), Circle K (Alimentation Couche-Tard) and 7-Select (Seven Eleven).

#### Private-Label Brands Tested with Toxic Bottle Cap Liners (containing Phthalates):

Albertsons:	O Organics; Open Nature; Signature Select (1 of 2 caps)
Ahold Delhaize:	Giant (1 of 2 caps)
Kroger:	Simple Truth Organic (soda)
Whole Foods:	Whole Foods (Italian sparkling mineral water, 2 of 4 caps)*

\* Whole Foods has since worked with its suppliers to eliminate the use of phthalates in cap liners

**Two companies' tested caps appear to violate the companies' packaging policies.** Ahold Delhaize, a major retail grocer, adopted a chemical policy in 2019 to end use of phthalates<sup>20</sup>, which were found in one of two cap gaskets from Giant soda, one of its private-label brands. Nestlé S.A., the world's largest food company, prohibits the use of phthalates<sup>21</sup> or vinyl plastic<sup>22</sup> in packaging, both of which were found in a cap liner from its Chameleon Cold Brew Coffee. (Nestlé told us later that they have since transitioned Chameleon caps to phthalate-free but still use vinyl plastic for its cap liners.)

**In our tests, Coke beats Pepsi on bottle caps for phthalates and vinyl plastic,** with 70% of its sampled brands testing with "clean" caps (no phthalates, no vinyl) compared to only 25% of Pepsi's brands. Other large brand owners, such as Nestlé and Keurig Dr Pepper, have reportedly since ended their use of phthalates in cap liners. They also appear to be on a path toward eventually phasing out the use of vinyl plastic in their packaging, which remains a challenge for Starbucks and Unilever, among other large beverage companies.

Brand Owners	Sales Rank	# Brands Tested	TOXIC:	CAUTION:	BETTER:	Notes
Nestle SA	1	4	1	0	3	Company reports phthalate use ended in 2020
The Coca-Cola Co.	2	10	0	3	7	30% of Coke's tested brands used PVC
PepsiCo, Inc.	3	4	1	3	1	The Izze brand caps tested into two categories
Starbucks Corp.	6	2	0	2	0	Tested samples used vinyl plastic
Unilever Group	7	1	0	1	0	Tested samples used vinyl plastic
Keurig Dr Pepper	8	7	2	3	2	Company reports phthalate use ended in 2020
Danone Group	11	1	0	0	1	Tested samples used non-vinyl plastic
<b>Total for Large Brand Owners:</b>		<b>29</b>	<b>4</b>	<b>12</b>	<b>14</b>	

Sales rank based on total beverage sales among companies that sold any non-alcoholic beverages in 2018.

<sup>20</sup> Ahold Delhaize USA (2019). Ahold Delhaize US Brands Announce Commitment to Sustainable Chemistry, Transparent Products and Packaging. September 19. <https://www.globenewswire.com/news-release/2019/09/19/1918074/0/en/Ahold-Delhaize-USA-Brands-Announce-Commitment-to-Sustainable-Chemistry-Transparent-Products-and-Packaging.html>

<sup>21</sup> Nestlé (2018). Summary/Abstract of Nestlé Standards on Materials in Contact with Food. Version 5.0, October.

[https://www.nestle.com.pe/sites/g/files/pydnoa276/files/nosotros/informacion-proveedores-nestle/documents/actualizacion%202019/nestle%20standards%20abstract%20\(version%205.0,%202018\).pdf](https://www.nestle.com.pe/sites/g/files/pydnoa276/files/nosotros/informacion-proveedores-nestle/documents/actualizacion%202019/nestle%20standards%20abstract%20(version%205.0,%202018).pdf)

<sup>22</sup> Nestlé (2020). The Negative List: Materials to be Removed. May.

<https://www.nestle.com/sites/default/files/asset-library/documents/media/press-release/2019-january/nestle-action-tackle-plastic-waste-negative-list.pdf>

# Conclusions and Recommendations

## Our investigation of beverage bottle cap liners supports three general conclusions:

- ✓ **Vinyl plastic and *ortho*-phthalates may commonly be used in the bottle caps of beverages sold in glass bottles.** Two-thirds of all bottle cap liners tested were made of PVC or vinyl, the 'poison plastic.' One-third of all cap liners tested contained *ortho*-phthalates, a class of chemicals of high concern that are largely banned in toys and childcare articles.
- ✓ **Alternatives to vinyl plastic and phthalates are widely available.** These include more environmentally sustainable plastics, such as polyethylene, which require no added plasticizer and are already in widespread use. In the interim, safer plasticizers are commercially available to replace *ortho*-phthalates in vinyl plastic.
- ✓ **Glass remains a superior packaging material, but plastic cap liners need action.** In general, fewer chemicals migrate from glass than from plastic containers, and glass is recycled at more than three times the rate of plastic. Glass bottles should continue to be used, providing that cap liners are only made from non-vinyl plastic.

## To improve the safety and sustainability of glass-bottled beverages, we recommend that:

- 1. Food and beverage companies** should immediately end any use of phthalates and phase out any vinyl plastic as soon as practicable in cap gaskets for glass bottles and jars. **IMPORTANT:** Food and beverage packaging containing intentionally-added *ortho*-phthalates cannot be sold in the State of Maine beginning January 1, 2022;
- 2. Trade associations** should provide technical assistance to their members and small companies to make the same transition and to comply with Maine state law;
- 3. State legislators and agencies** should ban the use of *ortho*-phthalates in food and beverage packaging, and phase out the use of vinyl plastic in all packaging;
- 4. The U.S. Congress** should ban the use of *ortho*-phthalates in all food contact materials and hold manufacturers responsible for packaging at the end of its life;
- 5. The U.S. Department of Agriculture** should prohibit the use of *ortho*-phthalates in processing or packaging of food and beverages under its National Organic Program;
- 6. The U.S. Food and Drug Administration** should revoke its permission to use any *ortho*-phthalates in food contact materials in response to pending petitions.

## Methodology for Testing of Bottle Cap Liners

The Ecology Center screened all cap liners for type of polymer and plasticizer using a Fourier Transform Infrared (FTIR) spectrometer with Attenuated Total Reflection (ATR). Contract laboratories analyzed a subsample using a gas chromatograph/mass spectrometer (GC/MS) to identify and quantify chemical species. For more on methods, visit: <https://www.ecocenter.org/healthy-stuff/pages/test-method-bottle-cap-gaskets>.



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## Thank you partners:



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