TAKE OUT TOXICS

PFAS CHEMICALS IN FOOD PACKAGING

Safer Chemicals Healthy Families

SAFER CHEMICALS HEALTHY FAMILIES fights for strong chemical policy, works with retailers to phase out hazardous chemicals and transform the marketplace, and educates the public about ways to protect our families from toxic chemicals.

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TOXIC-FREE FUTURE fights for strong health protections for people and the environment, using the powerful combination of science, advocacy, and grassroots organizing.

Mind the Store

MIND THE STORE campaign challenges big retailers to eliminate toxic chemicals and substitute them with safer alternatives.

Authors

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EXECUTIVE SUMMARY

Per- and polyfluoroalkyl substances, or PFAS, are highly persistent, mobile, and toxic chemicals whose use has resulted in widespread contamination of drinking water. In fact, some PFAS are so persistent that they don't degrade at all in the environment—so levels will only get higher over time if their use continues. PFAS are used to treat paper used to serve, display, or package food, to stainproof furniture, carpets, and clothing, in firefighting foam, and in many industrial uses. Exposure has been associated with liver damage, harm to the immune system, developmental toxicity, and cancer.

Paper products used for food packaging are often treated with PFAS for water and grease resistance. In previous testing, sandwich wrappers, french-fry boxes, and bakery bags have all been found to contain PFAS. At the same time, many of the same types of items have tested free of PFAS, indicating alternatives are widely available and competitively priced. Since the chemicals can migrate into food, and contaminate landfills and compost after disposal, the use of PFAS to treat food packaging can lead to unnecessary long-term exposure to harmful chemicals. People are exposed to PFAS from multiple sources, including the uses named above, and through multiple routes, including food, dust, air, and water.

A number of major U.S. retailers operating grocery stores have taken action to address the use of other toxic chemicals in items they sell. So far, however, none has publicly committed to ensuring products in use at the store (such as wrappers for deli sandwiches) or products sold at the store are free of PFAS. To investigate the extent to which grocery stores are using and selling PFAS-containing food packaging, we tested food-contact papers from five of the nation's largest grocery chains and their subsidiaries: Ahold Delhaize (parent of Food Lion, Stop and Shop, and Hannaford); Albertsons; Kroger; Trader Joe's; and Whole Foods Market (Amazon). See the table below for a summary of our test results for each retailer.

We tested 78 samples collected from 20 stores in 12 states. In testing those samples for the presence of fluorine, with high levels indicating likely PFAS treatment, we found the following:

1. **Likely PFAS treatment in 10 of the 78 samples of food contact materials.** The most common items likely treated with PFAS were take-out containers and bakery or deli papers.
2. **In many cases, retailers use or sell packaging that is free of PFAS treatment, indicating that PFAS-free alternatives are widely available and competitively priced**.
3. **Our tests of packaging for cook-at-home food and home baking supplies, including microwave and oven-cook food trays, butter wrappers, baking cups, and rolls of parchment paper, did not find any items likely treated with PFAS.**

While the majority of products tested were PFAS-free, some of the items found to have likely PFAS treatment, such as take-out containers, are very widely used. In other words, PFAS use in a single item type, found in multiple stores across the country, can translate into large quantities of PFAS-treated paper used and disposed of. The results are intended to highlight opportunities for retailers to phase out PFAS, switch to safer alternatives, and provide a guide for where they should focus their attention.

TABLE 1: RESULTS OF SCREENING RETAILER FOOD-CONTACT MATERIALS FOR LIKELY PFAS TREATMENT

ITEM CATEGORY	Ahold Delhaize	Albertsons	Kroger	Trader Joe's	Whole Foods (Amazon)	TOTAL BY PRODUCT CATEGORY
Take-out container		0/2	1/1		4/5	5/8
Bakery or deli paper	1/6	1/7	1/11	0/6	1/8	4/38
Single-use plate	1/3	0/2	0/1	0/1		1/7
Tray for cook-at-home food	0/1	0/1	0/1	0/3	0/2	0/8
Baking or cooking supplies	0/4	0/5	0/4	0/2	0/2	0/17
TOTAL BY RETAILER	2/14	1/17	2/18	0/12	5/17	10/78

Summary of total fluorine screening results by item category and retailer. The number of samples with high fluorine content (indicative of intentional PFAS treatment) is shown relative to the total number of samples tested.

This summary does not intend to grade retailers in relation to one another or provide a guide that a particular product at a given retailer is likely PFAS-treated or PFAS-free.

These findings indicate that retailers could reduce the flow of PFAS into our food, bodies and the environment by replacing treated items with PFAS-free items, and that action by policymakers and others can reduce PFAS contamination.

Grocery chains and other food retailers should do the following:

1. **Adopt and implement a public policy with clear quantifiable goals and timelines for reducing and eliminating PFAS in ALL private label and brand name food contact materials.** Retailers should publicly report on progress and announce when their products are PFAS-free.
2. **Agree to meet the new Washington State ban on PFAS use in food packaging not just in Washington, but in every state in the U.S.**
3. **Develop a comprehensive safer chemicals policy to reduce and eliminate other toxic chemicals, such as ortho-phthalates, in food contact material.**

Other parties also have a role to play:

1. **States should ban PFAS in food contact materials and ensure safer alternatives are used.**
2. **State and local governments should specify PFAS-free food serviceware in contracts.**
3. **Commercial composting facilities should immediately ban all PFAS-treated materials.**
4. **Individuals should call on food retailers and elected officials to ban PFAS in food contact materials.**

INTRODUCTION

For many U.S. shoppers, grocery stores have evolved from a place to stock up on staples to an easy solution for a take-out lunch or prepared dinner. Almost all supermarkets now offer full-service delis and bakeries, and many also offer salad bars and/or hot bars for a healthier meal option. An important part of a healthier meal that can be overlooked, however, is the packaging material it comes in, and grocers may not be choosing the safest packaging when serving and selling food.

Recent research has found that a significant percentage of paper packaging for convenience food is likely treated with harmful chemicals known as PFAS (per- and polyfluoroalkyl substances).[1] These chemicals are used to impart water and grease resistance in paper food packaging and serviceware such as sandwich wrappers, takeout boxes, and molded-fiber plates. But even though the packaging may only be in use for minutes before disposal, the PFAS treatment poses a long-term threat to public health and the environment. PFAS treatments break down into extremely persistent, mobile compounds that can contaminate soil and move easily into groundwater.[2] Persistent PFAS have been detected in public water systems all around the U.S., and testing continues to uncover additional contaminated sites.[3] Communities are concerned about the compounds' health impacts, which can include liver, immune, and developmental toxicity.[4]

Building on the previous testing of convenience food packaging and other testing of single-use food service items, Safer Chemicals, Healthy Families' Mind the Store campaign and Toxic-Free Future set out to investigate whether PFAS chemicals are present in food packaging used and sold by key grocery retailers. We tested food packaging from five of the largest dedicated grocery chains and their subsidiaries: Ahold Delhaize, Albertsons, Kroger, Trader Joe's, and Whole Foods Market (Amazon). We tested food-contact materials that the previous research found likely treated with PFAS, such as sandwich papers, as well as materials found in Europe to be PFAS-treated but with little to no previous testing in the U.S., such as butter wrappers.[1, 5] In each store, we focused our sampling on items the retailer had direct control over, such as packaging used to serve in-store deli items, along with store-branded shelf items such as parchment paper. We did not screen all paper food-contact items in the store, including some types, such as microwave popcorn bags, previously found to be commonly PFAS-treated.[6]

We chose to focus on these dedicated grocery chains for three reasons.

1. **These companies have the market power to reduce and eliminate the use of PFAS in their supply chain.** As major grocery chains, they can play a critical role not only in ensuring their customers are provided with safe food packaging, but also in moving the market as a whole toward safer alternatives. With state, local, and federal governments beginning to take action on PFAS, these companies have the opportunity to be leaders in making safer choices.

2. **Most of these chains have already taken major steps toward tackling a major chemical in their food packaging.** In recent years, grocery retailers have significantly reduced the percentage of private-label cans that contain bisphenol-A (BPA).[7] Now it is time for them to address another avoidable health and environmental hazard in food packaging: PFAS.

3. **We have already alerted these retailers to our concerns about PFAS and asked them to take action.** In November 2017, the Mind the Store campaign issued its second annual *Who's Minding the Store? report card.*[8] This assessment ranked and evaluated the safer chemicals policies of thirty of the nation's largest retailers, including the retailers whose items we tested for this report. In the report card, we urged these grocery chains to completely eliminate PFAS in food packaging and use safer alternatives. More recently, in June 2018 the campaign sent letters to these and dozens of other top grocery and fast-food restaurant chains urging them to take action on PFAS and hormone-disrupting phthalates in the food supply.

With the help of partner organizations from around the U.S., we collected samples from 20 stores in 12 states, for a total of 78 samples. This study was designed to provide retailers with information on food-contact papers commonly available at their stores; in most cases, items were collected from a single store, and there may be variation between stores. The results of this study can help retailers take steps to identify, reduce, and eliminate the use of PFAS in food contact items they use and sell, and then replace these substances with safer alternatives.

THE PROBLEM WITH PFAS IN FOOD PACKAGING AND CONTACT MATERIALS

With the use of PFAS in so many products, from carpets to food packaging to firefighting foam, these chemicals have become an indelible part of our lives—literally. Today, virtually all U.S. residents have PFAS in their bodies, and babies are born with PFAS in their umbilical cord blood.[9-12] We are exposed through our food, through contamination of the dust and air in our homes from carpet and furniture treatments, and via drinking water that has been polluted by industrial releases or use of firefighting foam.[4] While companies like DuPont and 3M have profited from producing these persistent, mobile, and toxic chemicals, communities around the U.S. are struggling to remove them from their drinking water sources at great expense.

The use of PFAS in food packaging presents a potential hazard for people who eat food served with treated paper. It also creates a long-term problem when these papers are disposed of in compost or garbage, because as the packaging breaks down, it releases its PFAS into the environment, leading to contamination of soil, air, and water.

Several types of PFAS can be used to treat paper to make it water and grease resistant, but the most commonly used are believed to be the "side-chain polymers," so-called because they have a carbon-based backbone with fluorinated side chains.[13, 14] These polymers are known to degrade during and after use, as the side chains are able to detach and ultimately degrade to the highly persistent, highly mobile toxic compounds that are already found in drinking water.[15] This has been called the "PFAS factory" effect, in which the polymers are a source of problematic compounds in our food and become a long-term source in the environment.[16] Already, water sources for an estimated six million U.S. residents are contaminated at levels exceeding federal standards —the pollution from treated paper only adds to the problem.[3]

More specifically, compounds known as fluorotelomer alcohols (FTOHs) detach from the side-chain polymers. These FTOHs are known to degrade to the well-known persistent PFAS such as PFHxA. How do we know that this is a concern for food packaging treatments? Researchers in Europe found FTOHs in 100% of papers that tested positive for fluorine, or likely PFAS-treated papers, with FTOH levels up to 40 parts per million (ppm).[17, 18] Tests of papers purchased in the United States found the dominant compound was 6:2 FTOH.[19] Scientists also found that these FTOHs actually migrate into food during use, and levels that wind up in the food can even exceed those originally in the paper—likely due to the PFAS factory effect.[20] PFAS, including FTOH and the final degradation compounds such as perfluorooctanoic acid (PFOA), have also been found in vapor from microwave popcorn bags, and PFAS have been detected in microwave popcorn after cooking.[6, 21]

Short Use, Long Life

Most PFAS-treated paper spends a minute portion of its lifespan in actual use. Once the food is gone from the sandwich wrapper or cake plate, the food packaging most commonly goes into a landfill or into feedstock for compost. Either way, it becomes a long-term source of harmful chemicals in the environment and can make its way back to people in drinking water, food, and air.

PFAS are known to escape landfills via the water that drains from the landfill (leachate) and via the gas that escapes. In fact, landfill leachate has higher PFAS levels than almost any other environmental medium; researchers testing leachate estimated annual PFAS releases at 8.5 to 25 kg from a single landfill.[22, 23] And, since the polymers applied to paper and textiles degrade in the landfill into the volatile FTOHs, they also escape the landfill in vapor to become sources of air pollution: total FTOH levels in the air above an active landfill were found to be 5 to 36 times those in areas upwind of the landfill.[24] Since FTOHs travel a long distance in the atmosphere, this is a likely source of PFAS in areas away from point sources.

PFAS are also found in compost, particularly when it is made with food waste that contains paper food packaging. Recent testing of ten compost samples from five U.S. states included three composts made solely from yard waste and seven that included residential and commercial food waste along with compostable food packaging and serviceware.[25] Analysis of the compost for PFAS found much higher levels in the samples that included food packaging, suggesting the PFAS treatment is contributing to contamination of compost.

Because certain PFAS are highly persistent and mobile, their presence in compost can translate into their presence in food crops. Researchers have found that crops including lettuce and tomatoes take up PFAS when they are present in soil, accumulating them in edible portions.[26] The new-generation compounds currently in use to replace the phased-out PFAS are more mobile than the phased-out PFAS and were found in the highest concentrations in food crops.[27]

Why Worry?

Laboratory-based and epidemiological research has linked PFAS exposure to a number of serious health concerns. Primary among them are cancer and effects on lipid metabolism, but they also include immune suppression, thyroid disease, and harm to reproduction.

The U.S. Agency for Toxic Substances and Disease Registry (ATSDR) recently updated its toxicological profile for PFAS.[4] In the new draft document, the agency identified associations between human exposure to PFAS and the following health concerns:

- pregnancy-induced hypertension/pre-eclampsia
- liver damage
- increases in serum lipids, particularly total cholesterol and LDL cholesterol
- increased risk of thyroid disease
- decreased antibody response to vaccines
- increased risk of asthma diagnosis

PFOA is also considered a possible carcinogen by the International Agency for Research on Cancer, and a highly exposed population had a higher incidence of testicular and kidney cancer.[28, 29]

In laboratory animals, PFAS exposure leads to liver, developmental and immune toxicity, and cancer. The effects seen at the lowest exposure levels, identified by ATSDR, include changes in nervous system development, decreased survival of young, suppressed immune response, liver degeneration, and decreased fetal and birth weights.[4]

A Classic Case of Regrettable Substitutions

Old generation PFAS chemicals were manufactured and used in products for decades, and the bulk of the information available on PFAS toxicity relates to these older compounds. However, when industry replaced these compounds it moved to very similar PFAS, and the existing health and safety information on the new generation chemicals is enough to generate concern that their substitution provides no improvement in safety.

Under Food and Drug Administration (FDA) rules, there are dozens of PFAS chemicals approved for food contact materials. As these new-generation PFAS are more mobile than the old generation PFAS, they migrate more readily into food.[19, 30]

Studies on the new-generation PFAS have found health effects similar to those caused by the older compounds that have largely been phased out.

Reproductive and developmental toxicity: laboratory tests found offspring of mice exposed prenatally had delayed development, disrupted reproductive cycles, and more incidences of full litter loss.[31] [32]

Liver and kidney effects: exposed laboratory animals had increases in liver and kidney weights, liver lesions, kidney degeneration, and changes in liver parameters indicating damage to liver function.[33-36]

Systemic toxicity: laboratory animals exposed to 6:2 FTOH suffered convulsions, tremors, labored breathing, and death; PFHxA caused reduced body weight with a single oral dose.[34, 37]

Endocrine disruption: epidemiological and experimental evidence associates several PFAS with disrupted thyroid signaling, important for proper neurodevelopment; 4:2 and 6:2 FTOH are estrogenic in laboratory tests; and multiple PFAS activate a key nuclear receptor involved in lipid metabolism.[38-46]

A recent analysis concluded that the new generation compounds were as potent in their toxicity as the old generation chemicals in their effects on liver weight, contradicting industry assertions that the newer compounds are less toxic.[47]

Because these compounds came into widespread use relatively recently, most information about their toxic effects comes from laboratory studies, and overall much less research has been conducted. Taken together with the compounds' very high degree of persistence, along with their mobility, however, these studies provide enough evidence that they are a regrettable substitute and should be avoided.

METHODS

Products were screened for total fluorine content as an indicator of likely PFAS treatment, as in previous research.[48, 49] We selected specific products to test after researching the offerings from each retailer. Working with partner organizations, we collected and processed the items, which were then sent to the University of Notre Dame for fluorine content testing by Dr. Graham Peaslee's laboratory.

Product Selection

The study focused on five of the largest grocery retailers in the U.S. Most of these retailers also have several subsidiaries, so we and our partner organizations in 15 states visited multiple stores to assess the types of convenience food packaging and baking supplies used or sold. After assessing availability, we selected products from each retailer to include the food contact materials most commonly available or in use at the retailers' stores and subsidiaries around the country.[1] These

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[1] For example, one store type that we researched and collected items from was Safeway, an Albertsons subsidiary.

included types of convenience food packaging previously found to commonly have PFAS treatment along with items that had not been widely tested in the U.S.[2] For the latter, we chose items that tested positive for fluorine in European testing or our own pilot testing, that advertised grease resistance, or that we thought likely to be treated because of an apparent need for water or grease resistance (such as packaging for microwavable meals). Availability of items varied among retailers, and between 12 and 18 items were selected for each retailer.

Collection and Processing

With the help of partner organizations around the U.S., we collected 78 samples from 20 stores in 12 states.[3] The following items were collected from one or more stores, in the store's own brand or used to hold prepared food sold directly by the store:

- Bakery or deli papers
- Baking or cooking supplies
- Single-use plates
- Take-out containers
- Trays for cook-at-home food

Please refer to Appendix I (Table 2) for a full list of the products collected. For each item, we provide the corresponding item category, subcategory (e.g. type of take-out container), retailer parent company, store name and state.

During collection, items were minimally handled and each item was placed in its own sealable plastic bag as soon as possible (i.e. immediately after collection or after purchase). Items were processed in California by Center for Environmental Health, in Massachusetts by Silent Spring Institute, in Michigan by Ecology Center, and in Washington State by Toxic-Free Future. Small pieces (approximately 2" x 2") were cut from each item using instruments cleaned with isopropyl alcohol after each sample and placed in a Ziploc® bag for shipment and total fluorine analysis. For items that had been in contact with food (such as parchment paper under a bakery item), if a clean section was not available, an untreated paper towel was used to gently wipe food that would come off easily. Samples that had food contact were mailed within a day of purchase.

Two types of replicate samples were collected; the laboratory was blind to their identity. Seven of the same items were collected from two separate stores to evaluate how fluorine treatment varied by location or store type; these results are reported as separate samples. Duplicate samples were also processed from eight items for analysis (i.e. two samples were cut from a single item and submitted as separate samples); these results are reported as a single sample. In addition, to

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2 Items tested may not be representative of all items offered at the stores.

3 Samples were collected in Alaska, California, Connecticut, Idaho, Maine, Maryland, Massachusetts, Michigan, Minnesota, New York, North Carolina, and Washington.

measure variation in analytical results, the laboratory ran duplicate tests of 20 samples; we report the mean value of these tests.

Fluorine Analysis

All samples were sent to the University of Notre Dame to be screened for total fluorine as an indicator of likely PFAS treatment. Dr. Graham Peaslee, at the University of Notre Dame Department of Physics, measured the total fluorine content of paper products using particle-induced gamma-ray emission (PIGE) spectroscopy. Details of this procedure can be found in Ritter *et al*. 2017. This technique has been used in other studies of papers and textiles (Schaider *et al*, 2017, Lang *et al*, 2016), and validation of the technique with more expensive LC-MS/MS methods including Total Oxidizable Precursor assay can be found in Robel et al. 2017.[48, 50-52] Dr. Peaslee classified products as either a) high fluorine content or "F" (likely treated with fluorinated compounds), b) low fluorine content or "low F" (possibly recycled paper content containing fluorine or low levels of contamination in the product manufacturing process), or c) no detectable fluorine ("No F"). These ranges are intended to screen for products intentionally treated with PFAS. For this study, these ranges were established to be:

Non-fluorinated: Products that had both surfaces register total fluorine counts per microCoulomb of beam of less than 125 were characterized as non-fluorinated.

Low fluorine: Products that had at least one surface register total fluorine counts per microCoulomb of beam of greater than 125 and less than 450 were characterized as low fluorine. In all cases the fluorine signature had to be statistically significant at three times higher than the background signature. Products with total fluorine counts in this range were not considered likely PFAS treated.

High fluorine: Products that had at least one surface register total fluorine counts per microCoulomb of beam of greater than 450 were characterized as fluorinated. In all cases the fluorine signature had to be statistically significant at three times higher than the background signature.

Products that were identified as high fluorine, that is likely PFAS-treated, had on average fivefold higher levels of fluorine than those identified as low fluorine.

RESULTS OF REPLICATE ANALYSIS

Duplicate tests of the same sample agreed within a range of 1 to 230 counts (mean percent difference 44%). Tests of items for which two samples of the same item were submitted had differences in total counts ranging from 0 to 22 counts (mean percent difference 25%). In all of the above cases, results from the two tests resulted in the same classification of the item (i.e. no, low, or high fluorine). Finally, our tests in which the same sample was collected from two different stores found some variation; specifically, one item was tested as high fluorine content from one location, and low fluorine from another (details below, see Take-out container).

RESULTS

Our tests found high levels of fluorine, indicating likely PFAS treatment, in 10 of the 78 samples of food contact materials. As shown in Table 1 below, the most common items we tested that were likely treated with PFAS were take-out containers and bakery or deli papers.

In many cases, retailers use or sell packaging that is free of PFAS treatment, indicating that substitutes are widely available and competitively priced. In packaging used for bakery or deli items, for example, while 11% of our samples tested positive for high levels of fluorine, 89% were likely not treated with PFAS.

We found no PFAS treatment in trays for cook-at-home food, including for microwaveable pasta or oven-bake pizza, and in baking or cooking supplies such as parchment paper. Our tests focused on store-brand rather than name-brand products, so they are not a complete survey of the market, but the results suggest that these types of packaging may not be PFAS-treated.

TABLE 1: RESULTS OF SCREENING RETAILER FOOD-CONTACT MATERIALS FOR LIKELY PFAS TREATMENT

ITEM CATEGORY	Ahold Delhaize	Albertsons	Kroger	Trader Joe's	Whole Foods (Amazon)	TOTAL BY PRODUCT CATEGORY
Take-out container		0/2	1/1		4/5	5/8
Bakery or deli paper	1/6	1/7	1/11	0/6	1/8	4/38
Single-use plate	1/3	0/2	0/1	0/1		1/7
Tray for cook-at-home food	0/1	0/1	0/1	0/3	0/2	0/8
Baking or cooking supplies	0/4	0/5	0/4	0/2	0/2	0/17
TOTAL BY RETAILER	2/14	1/17	2/18	0/12	5/17	10/78

Summary of total fluorine screening results by item category and retailer. The number of samples with high fluorine content (indicative of intentional PFAS treatment) is shown relative to the total number of samples tested.

This summary does not intend to grade retailers in relation to one another or provide a guide that a particular product at a given retailer is likely PFAS-treated or PFAS-free.

Please refer to Appendix I (Table 2) for a more complete analysis of products that were likely treated with PFAS, listed by subcategory and retailer subsidiary. Appendix II (Table 3) has a complete listing of each sample tested, along with the columns showing the item category and subcategory, a description of the product purchased or selected, the retailer parent company, store name and state, and result.

RESULTS FOR EACH RETAILER

2 of 14 products tested positive for high fluorine content

Ahold Delhaize offered one item in the bakery or deli category that tested positive for high fluorine content: a laminated gold plate under a cake. Sandwich wrapping paper (in the form of a bag) tested as having low fluorine content, indicating possible PFAS contamination from recycled content, processing, or another source. Ahold Delhaize offers a few types of store-brand packaged plates, and one of the three varieties tested was likely treated with PFAS: Nature's Promise Luncheon Plates, which are a molded fiber material made with bamboo. The Nature's Promise brand is a private-label line advertised as "Free from added dyes and chlorine whitening," as well as tree-free.

Ahold Delhaize stores were among the few that did not provide any paper or cardboard take-out containers. The retailer sells a large selection of baking supplies and has limited options for cook-at-home food on paper trays. Our testing found the supplies and paper trays were non-fluorinated and therefore free of PFAS.

1 of 17 products tested positive for high fluorine content

Albertsons stores collectively sold or provided to customers a wide array of items across different categories—brown paper take-out containers, store-brand packaged plates, bakery items like sandwich wrappers and cake plates, cook-at-home food with paper trays, and baking supplies. Out of all of these items, only one tested positive for high fluorine content: a gold-laminated cake board.

2 of 18 products tested positive for high fluorine content

Kroger companies offer a wide selection of bakery and deli papers. Of these, a paper bakery bag had high fluorine content and therefore likely PFAS treatment, while store-logo brown sandwich paper had low fluorine content. The stores visited offered only one type of paper take-out container—a clamshell—that also tested positive for high fluorine content.

Kroger stores had a diverse array of baking supplies, and a limited supply of food serviceware and cook-at-home food with paper trays. None of these items had likely PFAS treatment in our testing.

0 of 12 products tested positive for high fluorine content

Trader Joe's stores have a few unique characteristics that influenced the selection of items available for testing. There are no take-out containers or bakery bags because the deli and bakery areas of the store do not sell unpackaged food. However, one of the packaged baked goods was wrapped in white baking paper, and another was sold in a heavy-duty parchment carton. We tested the parchment and found it had low fluorine content. The stores do not have a wide selection of packaged cooking or baking supplies. The butter wrappers of two kinds of butter were both found to be non-fluorinated.

Trader Joe's is well known for its private-label products, including many frozen foods in cardboard bowls. None of the packaging for cook-at-home foods that we analyzed tested positive for fluorine. This retailer also has a sample counter at its stores, and one store provided a store-logo sample plate that had low fluorine levels.

5 of 17 products tested positive for high fluorine content

Whole Foods stores place considerable emphasis on prepared foods available for take-out, and the retailer has largely chosen paper-based products as take-out containers (whereas some other chains offer plastic). These kinds of packages included a brown paperboard take-out box, a molded-fiber tub, a molded-fiber clamshell, and a molded-fiber plate. Four of the five take-out containers analyzed tested positive for high levels of fluorine, and one had low levels of fluorine. The manufacturer of the coating for one type of Whole Foods' take-out container, the brown paperboard take-out box, has now removed the fluorinated ingredient, as discussed in the next section.

Whole Foods fared better on bakery and deli items, the other category with items more often found to be likely treated with PFAS in this study. One of eight items, a sandwich wrapper, tested positive. A brown bakery sheet had low fluorine content. Bakery bags, a cake plate, and other items were free of PFAS treatment. Although the retailer does not appear to sell store-brand packaged plates, it does carry paper baking supplies and cook-at-home food on paper trays. The trays and baking supplies tested PFAS-free.

ANALYSIS BY ITEM CATEGORY

TAKE-OUT CONTAINER

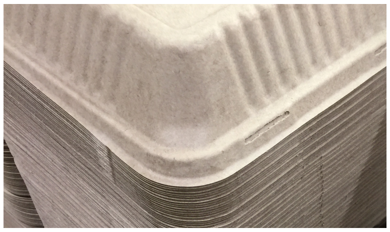
5 of 8 products tested positive for high fluorine content

Whole Foods Market provided the largest variety of paper take-out containers, and two of those types were also found at other stores as discussed below.

Coated brown paper carton with interlocking flaps

Whole Foods' brown paperboard takeout container is a Bio-Plus Terra II product with store branding. A small version of this container was collected from both Maryland and California stores. The Maryland version tested as having high fluorine content, while the California carton had low fluorine content. According to the webpage for Bio-Plus Terra II, this container uses Cascades Sonoco's FlexSHIELD™ proprietary coating technology and is compostable.[53] After previous testing of its product, Cascades Sonoco undertook an effort to eliminate fluorine and discovered an ingredient in its coating unexpectedly contained fluorine. According to the company, it is now manufacturing and applying a fluorine-free coating.[54] However, Fold-Pak, the company that creates the take-out container using the treated paperboard, anticipates the older product could remain in the marketplace up to two years.

The paper take-out containers available at two Albertsons stores were similar in shape, material, and appearance to the Bio-Plus Terra II at Whole Foods and were found to not be fluorinated. The brand of this container was InnoPak InnoBox Edge. The InnoBox Edge webpage states that the carton is "poly-lined," meaning polyethylene is used as a plastic liner to achieve water and grease resistance.[55]



<u>Molded-fiber clamshell</u>

Two retailers offered a molded-fiber clamshell. Both containers had high levels of fluorine indicative of PFAS treatment. Tests conducted by the Center for Environmental Health found that molded-fiber products consistently tested as fluorinated.[56]

BAKERY OR DELI ITEM

4 of 38 products tested positive for high fluorine content

<u>Paper for wrapping sandwiches</u>

Brown sandwich paper at one store was found to have high fluorine content and likely PFAS-treatment, while brown sandwich paper from other stores had no fluorine content. The paper section of a part-plastic, part-paper bag for a pre-packaged sandwich had low fluorine content.

<u>Paper bakery bag or cardboard box</u>

High fluorine content was found in a store-branded brown paper bakery bag. Other bags and boxes tested as fluorine-free.

<u>Plate under cake</u>

Out of the six cake plates tested, two gold-laminated cardboard plates were likely treated with PFAS.

Bakery paper including parchment cartons

A few different retailers provide Eco-Craft brown bakery sheets for customers to use in grabbing pastries. One store's sheet had low fluorine content, while sheets from two other stores had no fluorination.

One retailer sold dessert bread packaged with bakery paper of varying thickness. The heavy-duty parchment-like paper under carrot and zucchini bread had low fluorine content. A thinner white bakery paper, under organic chunky apple cinnamon bread, was classified as not fluorinated. In similar testing published in May of 2018, the Danish Consumer Council THINK Chemicals tested paper under 21 baked goods and found three were probably PFAS-treated.[57]

SINGLE-USE PLATES

1 of 7 products tested positive for high fluorine content

A few retailers sell an assortment of packaged store-brand disposable plates labeled as "grease resistant." Nearly all packaged paper plates tested were found to be free of PFAS. One brand of molded-fiber plates made with bamboo and advertised as "free from added dyes and chlorine whitening" was found to have likely PFAS treatment.

One retailer provided small branded paper plates at the sample counter of one of its stores. Tests showed low fluorine content.

TRAYS FOR COOK-AT-HOME FOOD

0 of 8 products tested positive for high fluorine content

Items tested in this category included cardboard circles under refrigerated or frozen pizzas, and paper trays holding microwaveable pasta or other dishes. All of these items were fluorine-free.

BAKING OR COOKING SUPPLIES

0 of 17 products tested positive for high fluorine content

This category included store-brand packaged baking cups, rolls of parchment paper, rolls of non-stick aluminum foil, and wrappers for butter. Store-brand butter was the only item sold at every store. As with the trays for cook-at-home food, all of these items were fluorine-free. According to a European Union analysis of PFAS in food contact materials that was released in 2013, 24% of butter wrappers tested positive for fluorine.[5]

RECOMMENDATIONS

For Food Retailers

Grocery stores today sell a variety of products, and every one of them should be safe for their customers. We call on all grocery chains, as well as other retailers of food, to act on the following recommendations:

1. **Adopt and implement a public policy with clear quantifiable goals and timelines for eliminating PFAS in ALL private label and brand name food contact materials, and publicly report on progress.** Many items tested appeared free of PFAS treatment, so it should be straightforward to phase PFAS chemicals out of the remaining items. Retailers should adopt comprehensive safer chemical policies to eliminate PFAS in all food packaging and other food-contact materials. These policies should include clear goals and timeframes to reduce and eliminate PFAS in items used in-store as well as both private label and brand-name products. Our testing provides a starting point for retailers. Where test results reveal that a product is fluorinated, they should enter into discussions with suppliers to transition to safer alternatives. Retailers should prioritize phasing out items that are likely treated with PFAS (i.e. test as high fluorine). As a second step, they should investigate items with low fluorine content indicating likely unintentional contamination with PFAS. To ensure safe substitution, retailers should also create guidance for suppliers to evaluate the hazards of alternatives, encouraging them to use tools such as GreenScreen for Safer Chemicals®. Retailers should publicly report on their progress in phasing out and eliminating PFAS.
2. **Agree to meet the new Washington State ban on PFAS use in food packaging in every state in the U.S.** In March 2018, Washington State passed a new law to phase out PFAS in food packaging made of paper and paperboard by January 1, 2022. Retailers should comply with the Washington State ban in every state in the nation so that all U.S. consumers are protected.
3. **Develop a comprehensive safer chemicals policy to reduce and eliminate other toxic chemicals, such as phthalates, in food contact material.** PFAS in food contact materials is just one example a class of toxic chemicals in products and packaging sold by grocery and other food retailers. Other chemicals of concern, such as ortho-phthalates, are commonly found in food and other products sold by these companies. Retailers should develop comprehensive policies to identify, reduce, eliminate, and safely substitute chemicals of high concern. To augment this process, retailers should participate in and encourage their suppliers to participate in the Chemical Footprint Project, an initiative for measuring a company's progress in moving to safer chemicals.

For State and Local Policymakers

All states should follow Washington State's lead on policy action to prevent the use of PFAS in food packaging materials. To protect all their residents, states should ban PFAS in food-contact materials while requiring suppliers to assess and use safer alternatives. State and local governments should also specify that all food-contact materials purchased through their contracts should be PFAS-free.

For Commercial Composting Facilities

Composting PFAS-treated food-contact materials can result in contamination of air, water, and soil. Unfortunately, many of these materials are certified as compostable in commercial facilities and therefore accepted by those facilities. The most widely used resources are the Biodegradable Products Institute (BPI) Compostability Certification and Cedar Grove List of Accepted Products. While Cedar Grove is still updating its guidelines, BPI has established a policy of removing products with more than 100 ppm of fluorine from its certified list starting in 2019, then requiring companies to certify no intentionally added PFAS.[58] Composting facilities should only accept compostable products that are shown to be PFAS-free.

For Consumers

Consumers should speak up and call for change. They can contact manufacturers and retailers to ask whether the food products they sell contain PFAS. They can also call on food retailers and elected officials to ban PFAS in all food contact materials.

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