



**CHEM**Trust

Protecting humans and wildlife  
from harmful chemicals

**Briefing**

## **Analysis of PFAS chemicals in takeaway food packaging from UK high street retailers**

**CHEM Trust briefing – May 2021**

### **Key messages**

- The results from this study show that **PFAS chemicals are used to treat disposable paper bags used by high street UK retailers** to sell takeaway food.
- These findings demonstrate that **the use of PFAS in disposable food packaging has not been discontinued in the UK** since the previous survey performed by the Scottish NGO Fidra in 2019<sup>1</sup>.
- **The packaging tested came from popular fast food and takeaway restaurants visited by people daily in the UK.** The presence of PFAS in the food packaging is therefore a source of repeated direct exposure.
- **Food packaging paper bags are disposable items** meant to be used once and then thrown away. This contrasts **with the extreme persistence of PFAS chemicals.**
- Disposable food packaging are **high turnover items.** When treated with PFAS, they **contribute to environmental emission of PFAS chemicals at every stage of their life cycle**, from production to disposal. This is contributing to the build up of these highly persistent chemicals in the environment, and to human and wildlife exposure via the contamination of the food chain and drinking water.
- Our results show that cardboard pizza boxes not intentionally treated with PFAS have measurable levels of PFAS chemicals. This highlights the **contamination of the food packaging production and supply chain with PFAS chemicals**, which is a barrier to achieving a clean and safe circular economy.
- **Regulations are an effective tool to protect people from exposure to harmful chemicals and to push industry players to find safe replacements.** The same item was sampled in Denmark, Czech Republic and in the UK. In Denmark, where the use of PFAS in paper and board food packaging has been banned since July 2020, the item exhibited no PFAS treatment. This is in contrast to the results for the same item sampled in the Czech Republic and the UK.
- **CHEM Trust is calling on the UK government to restrict the use of all PFAS chemicals in all non-essential uses, including disposable food packaging and tableware, in order to protect people and wildlife from exposure to these harmful chemicals.**

## Credits

This briefing is a UK summary of the European wide study:

Straková, J., Schneider, J., Cingotti, N. et al., 2021. [Throwaway Packaging, Forever Chemicals: European wide survey of PFAS in disposable food packaging and tableware](#). 54p

The European study was produced in collaboration with the following organisations: [Arnika](#), [BUND](#), [Danish Consumer Council](#), [Generations Futures](#), [the Health and Environment Alliance \(HEAL\)](#), [the International Pollutants Elimination Network \(IPEN\)](#), and [Tegengif-Erase all Toxins](#).

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**CHEM Trust** is a collaboration between [CHEM Trust](#), a UK registered Charity and [CHEM Trust Europe eV](#), a charity based in Germany. Our overarching aim is to prevent synthetic chemicals from causing long term damage to wildlife or humans.

For more about our work, including our regularly-updated blog, see <https://chemtrust.org/>

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## Background

During 2020, the Czech organisation Arnika coordinated a study involving eight non-profit organisations, including CHEM Trust, to investigate the presence of PFAS chemicals in disposable food packaging, available in six European countries: The Czech Republic, Denmark, France, Germany, the Netherlands and the United Kingdom.

In total, 99 disposable food packaging and tableware items made of paper, board and moulded plant fibre were sampled in the six countries between May and December 2020 (e.g., sandwich and bakery bags, pizza boxes). CHEM Trust provided multiple samples from 8 different food packaging items from popular fast food chains, takeaway restaurants as well as a supermarket from the UK high street.

The full list of UK samples can be found in Table 1.

### An insight into the UK public's view regarding the presence of hazardous chemicals in products

- **81%** of people in the UK would stop buying a product (eg. specific cosmetics, cookware, furniture, clothing etc.) if they find out that by using the product they would be exposed to harmful chemicals.
- **78%** would stop buying a product if they find out that by using it or disposing of it, wildlife would be exposed to harmful chemicals.
- **66%** think the UK Government should be the one taking action to ensure hazardous chemicals are not present in food packaging.

*Survey carried by Ipsos MORI for CHEM Trust on 2100 nationally representative UK adults aged 16-75 between 05/05/21 - 06/05/21. Full results in the Annex.*

## Health and environmental concerns about PFAS

PFAS are a large family of over 4,500 synthetic chemicals<sup>2</sup>, which are known as the “Forever Chemicals” due to their extreme persistence in the environment. They are used in a wide variety of consumer products and industrial applications<sup>3</sup>, including food packaging, in which their ability to repel both grease and water have been considered highly useful. However, studies have shown that **PFAS can migrate from the packaging into the food<sup>4</sup>, adding to the overall PFAS exposure of the general population.**

Scientific studies have associated exposure to a number of PFAS with severe adverse health effects, including cancer, impacts on the immune, reproductive and hormone systems, as well as reduced response to vaccinations<sup>5</sup>. The more we learn about these chemicals, the more reason there is for concern, and the more urgent it becomes to minimise emissions and exposure. By way of illustration, between 2008 and 2020, **the European Food Safety Authority lowered the recommended safe levels of exposure to some PFAS by more than 99%<sup>6,7</sup>.**

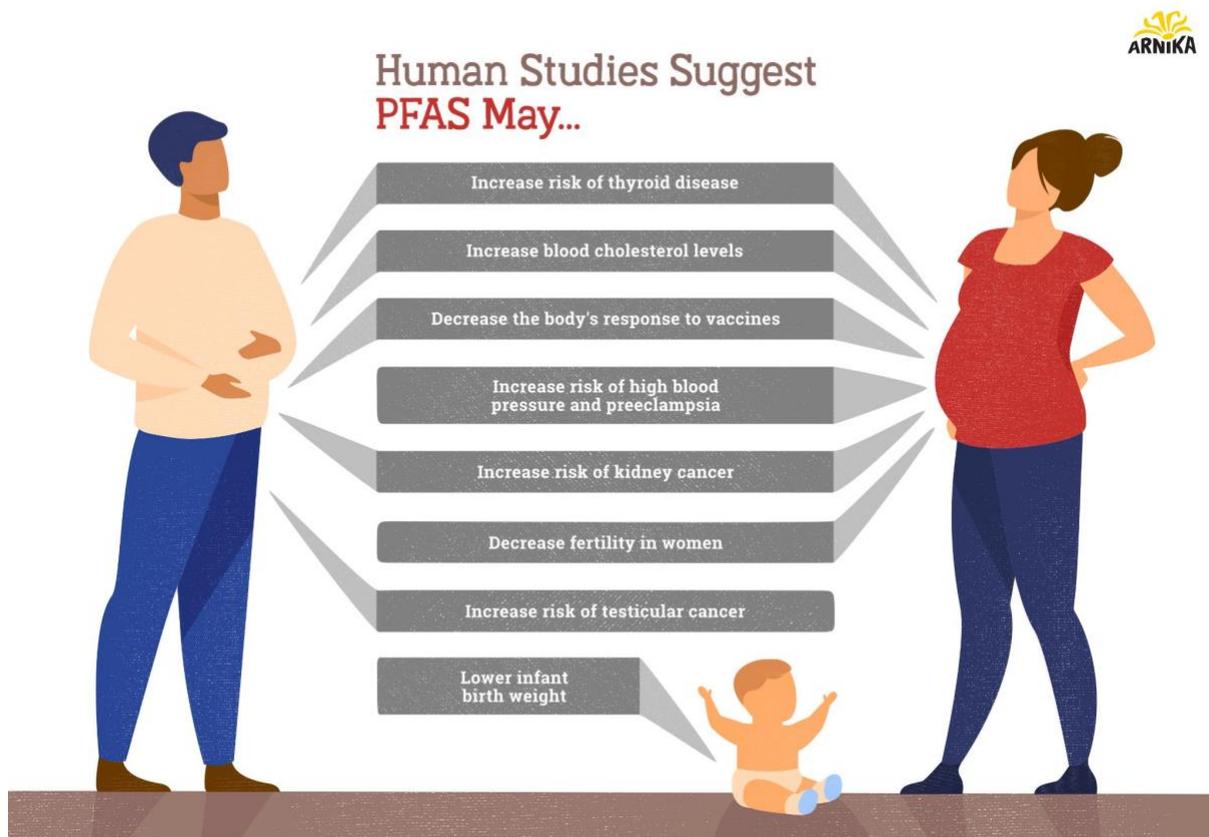


Figure 1: Effects of PFAS on human health. Credit: Martin Vimr, Arnika

PFAS are causing increasing concern due to their impacts on health and their widespread presence in our environment. A 2019 assessment by the Environment Agency has shown that PFOS, one of the PFAS chemicals, was widespread in English rivers and estuaries at levels often exceeding environmental standards<sup>8</sup>. PFAS are the most persistent synthetic chemicals known to date. **Some PFAS emitted today could still be present in the environment in several centuries. This represents a threat for both current and future**

**generations of people and wildlife. This raises legitimate questions about their multiple consumer and industrial uses, including their use in disposable products such as disposable food packaging.**

Only a few compounds of this large chemical family have been restricted at the global, regional and/or national levels. Thousands more PFAS chemicals exist and are available for use in industrial applications and/or in consumer products. In the past decades, the industry has been replacing banned PFAS with other PFAS chemicals, for which less information is usually available regarding their toxicological profile<sup>9</sup>. In the context of food contact applications, **Denmark is the only country who has banned PFAS for use in paper and card food packaging<sup>10</sup>.**

## Methodology

**Step 1 - Sampling:** For each food packaging item, several samples were collected in order to have the critical amount of material to perform the chemical analysis (eg. 28 McDonald's french fries' bags were needed to achieve the critical amount for all chemical analysis). In the UK, 5 different greaseproof paper bags for bakery goods, pastries and fries were sampled, as well as 3 cardboard pizza boxes (Figure 2).

The full list of UK samples can be found in Table 1.



*Figure 2: Types of takeaway food packaging sampled in this study. On the left, greaseproof takeaway paper bags. On the right, cardboard pizza boxes.*

**Step 2 - Oil beading test:** The food packaging items were screened using a simple oil beading test<sup>1</sup> to inform the selection of samples for further chemical analysis. This test indicates if an item material is oil repellent, a characteristic of packaging that has been treated with PFAS (Figure 3). Both oil-beading items and items showing no oil repellency,

were selected for chemical analysis. The former as likely candidates for intentional PFAS treatment and the latter to assess the level of background contamination in food packaging products.

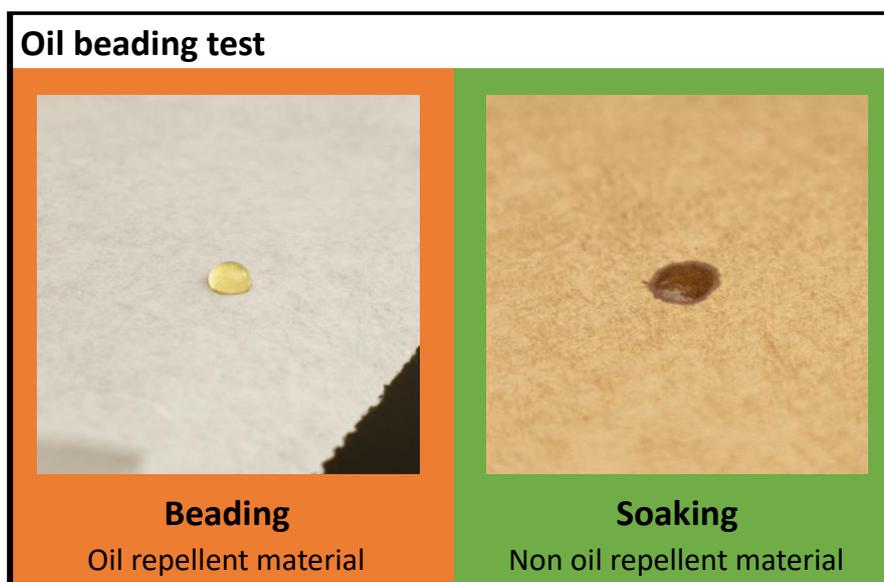


Figure 3: Oil beading test developed by Fidra<sup>1</sup>.

**Step 3 - Total Organic Fluorine analysis:** The selected food packaging items were analysed by an accredited laboratory for their Total Organic Fluorine (TOF) content, an accepted proxy for total PFAS content. The TOF values were compared to the TOF guiding indicator value set by the Danish Veterinary and Food Administration to help companies assess whether organic fluorinated substances have been added to paper and board food packaging<sup>10</sup>. TOF values above 20 mg/kg dry weight of sample are indicative of an intentional PFAS treatment.

**Step 4 - Targeted PFAS analysis:** The food packaging items were sent to an independent laboratory for targeted analysis of 55 individual PFAS chemicals in order to seek more information regarding the specific nature of the PFAS present in the packaging. The list of the 55 PFAS analysed can be found in Annex 2 of the [main report](#).

For more details about the methodology consult the [main report](#).

## Results for the UK samples

Brand	Item	Sampling date	Number of samples	Sample ID	Oil beading test	TOF mg/kg dw	TOF µg/dm <sup>2</sup> dw	6:2 FTOH ng/g	10:2 FTS ng/g
McDonald's	White paper bag for french fries	December 2020	28	FasF-UK-5a	beading	480	157	16.9	<26.0
Pret A Manger	White paper bag for bakery products	June 2020	16	FastF-UK-2	beading	440	177	<1.60	34.4
Subway	White paper bag for cookies	June 2020	32	FastF-UK-4	beading	390	125	248	<26.0
Co-op	Brown paper bag for cookies	June 2020	20	FastF-UK-3	beading	340	162	317	<26.0
Greggs	White paper bag for rolls	June 2020	30	FastF-UK-1	beading	220	76.3	168	<26.0
Papa John's	Cardboard pizza box	June 2020	4	PizzaB-UK-2	soaking	23	83.0	<1.60	34.4
Domino's	Cardboard pizza box	June 2020	4	PizzaB-UK-1	soaking	21	67.2	15.8	43.2
Pizza Hut	Cardboard pizza box	June 2020	4	PizzaB-UK-3	soaking	17	55.0	<1.60	35.1

Table 1: List of disposable food packaging items sampled in the UK and results of oil beading test and chemical analysis. TOF = total organic fluorine.

**Oil beading test:** The oil beading test indicated oil repellency for the 5 different greaseproof paper bags (formation of an oil bead on the surface of the paper) and no oil repellency for the 3 pizza boxes (soaking of the oil drop into the cardboard).

**Total Organic Fluorine analysis:** The 5 different greaseproof paper bags have TOF contents between 220 and 480 mg/kg dry weight (Figure 4). This is indicative of an intentional PFAS treatment according to the Danish indicator value.

The 3 pizza boxes have TOF contents between 17 and 23 mg/kg dry weight (Figure 4). These values are close to the Danish indicator value. Taken together with the results of the oil beading test, they are interpreted as not indicative of an intentional PFAS treatment, but rather of background contamination with PFAS chemicals. The contamination could be related to cross contamination during the production stage and/or the presence of PFAS-contaminated recycled cardboard.

**Targeted PFAS analysis:** Among the 55 different PFAS chemicals analysed, only two were detected in the UK food packaging items analysed. The PFAS 6:2FTOH was found in 4 out of the 5 greaseproof paper bags and 1 out of 3 pizza boxes. With concentrations ranging from 16.9 to 317 ng/g in the paper bags and at 15.8 ng/g in the pizza box. 10:2FTS was found in 1 greaseproof paper bag at 34.4 ng/g and all 3 pizza boxes, ranging from 34.4 to 43.2 ng/g.

The sum of the PFAS identified and quantified in the food packaging items accounts for less than 1% of the total organic fluorine quantified by TOF analysis. The nature of over 99% of the PFAS present in the food packaging items remains unidentified.

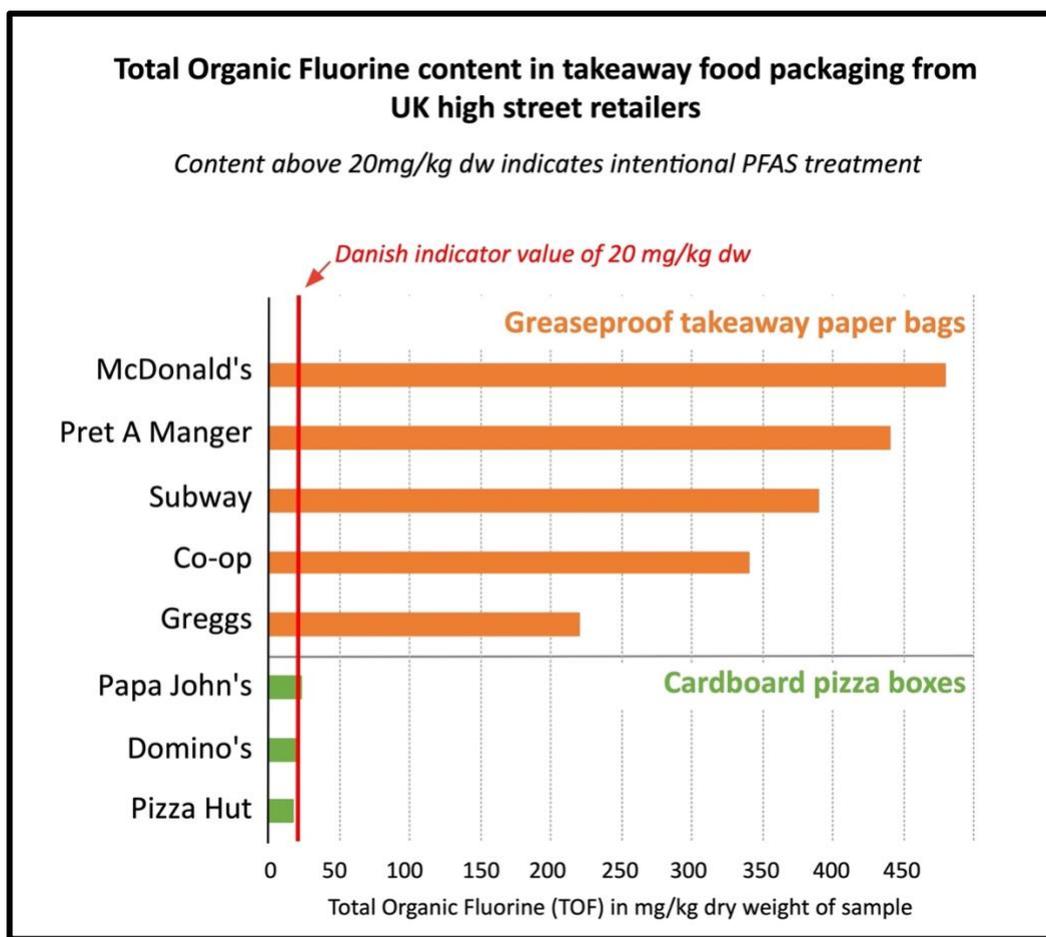


Figure 4: Total Organic Fluorine (TOF) content in takeaway food packaging items from UK high street retailers acquired in 2020. In mg/kg dry weight of samples.

### Key findings and concerns

- **PFAS chemicals are used to treat disposable paper bags used by high street UK retailers to sell takeaway food.**
- **These findings demonstrate that the use of PFAS in disposable food packaging has not been discontinued in the UK since the previous survey performed by the Scottish NGO Fidra in 2019<sup>1</sup>.**
- **These findings are also in contradiction with the view from the Food Standards Agency that “industry in the UK has moved away from their [PFAS] use in favour of alternatives”, suggesting that PFAS uses in food packaging in the UK might be limited to “a minority of speciality application”<sup>11</sup>.**
- **The presence of PFAS in food packaging is of concern for human health as PFAS chemicals can migrate from the packaging into food.** The packaging tested come from popular fast food and takeaway restaurants visited by people daily in the UK and the presence of PFAS in the food packaging is therefore a source of repeated direct exposure.

- **The emission of these chemicals into the environment is also of concern.** Disposable products meant to be used once and then thrown away have a high turnover rate and production volume. The use of PFAS in such products is a source of environmental emission at every stage of their life cycle, from production to disposal. This is contributing to the build-up of these highly persistent chemicals into the environment, and to human and wildlife exposure via the contamination of the food chain and drinking water.
- **Our results show that pizza boxes, not intentionally treated with PFAS, have measurable levels of PFAS chemicals.** This highlights the contamination of the food packaging production and supply chain with PFAS chemicals, which is a barrier to achieving a clean and safe circular economy.
- **The ubiquity of PFAS chemicals in food packaging which have not been intentionally treated with PFAS, echoes the ubiquity of PFAS chemicals in the wider environment and people's body worldwide.** Some of the PFAS contaminants identified in this study have been found in the Arctic air, snow and wildlife<sup>12</sup>.

## PFAS-free alternatives exist, and regulation is a strong incentive for companies to move away from PFAS - McDonald's case study

The same packaging item, a paper bag for french fries from the brand McDonald's, was bought in December 2020 in Denmark, the Czech Republic and the United Kingdom. The UK and Czech samples had similar TOF content of 480 and 470 mg/kg dw respectively. Whereas the Danish sample had the lowest TOF content of all food packaging items analysed, at 5.5 mg/kg dw (Figure 5).

These results highlight two things:

1. **Alternatives to PFAS-treated takeaway packaging exist and are available on the market.**
2. **Where regulation has been put in place, it has worked effectively to incentivise companies to move away from the use of PFAS. In Denmark, the use of PFAS in paper and board food packaging has been banned since July 2020<sup>10</sup>.**

This shows that regulation can and does have an impact to protect people from exposure to harmful chemicals and drive safe replacements by companies. In Denmark, McDonald's has been able to replace PFAS-treated packaging and comply with the regulation.

Since the samples were collected and analysed, McDonald's has announced their commitment to remove all added fluorinated compounds from their customer packaging materials globally by 2025<sup>13</sup>.

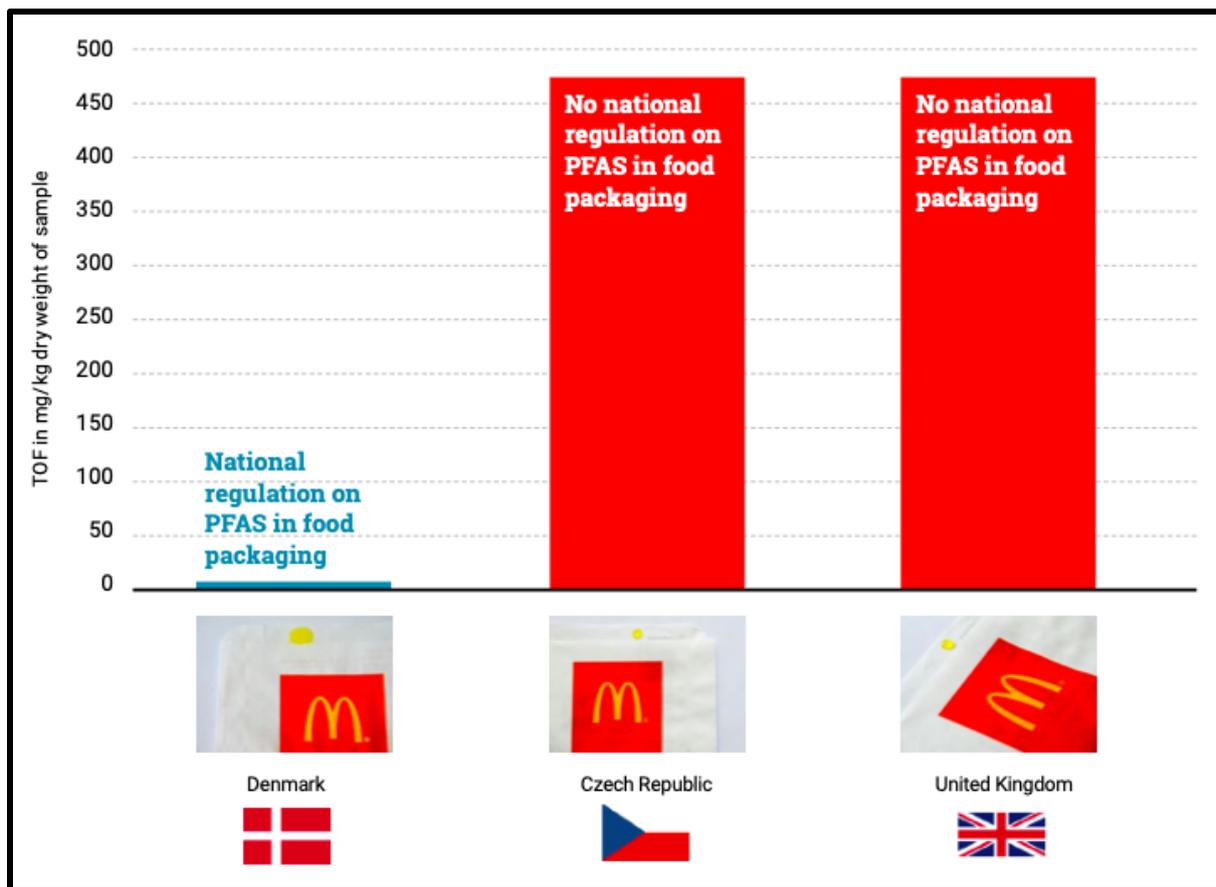


Figure 5: Comparison of the Total Organic Fluorine (TOF) content of three similar items bought in countries with different regulation regarding PFAS in food packaging. TOF in mg/kg dry weight of samples. Credit: Martin Vimr, Arnika

## CHEM Trust recommendations at UK level

The findings from this study highlight the intentional use of and contamination by PFAS chemicals in disposable food packaging from UK high street retailers. These items are by definition and design meant to be used for very short durations. This contrasts with the extreme persistence of PFAS chemicals. Because alternatives to PFAS treatments exist, and even more importantly because safe, durable and reusable packaging and tableware are widely available, the treatment of disposable items with PFAS is a typical example of unnecessary and avoidable chemical use that runs counter to the achievement of a clean circular economy.

It is high time for the UK government to phase out all such unnecessary uses of PFAS and to manage these substances as a group. It is the only way to:

- Prevent emissions of all PFAS chemicals.
- Stop the accumulation of these highly persistent chemicals in the environment and our bodies.
- Protect UK citizens and wildlife from exposure to these harmful substances.

## CHEM Trust recommendations at UK level

### For UK policy makers:

1. **Restrict the use of all PFAS chemicals, including fluorinated polymers, in all non-essential uses, including disposable food packaging and tableware by 2025.**
2. **Ban the use of all PFAS chemicals, including fluorinated polymers, in disposable food packaging and tableware by 2022.**

### For UK food retailers:

1. Adopt and implement a **public policy with clear quantifiable goals and timelines for reducing and eliminating PFAS** in all food contact materials in their shops/restaurants and supply chain.
2. Display their commitment towards moving away from hazardous chemicals by **joining the [‘No to PFAS’ corporate movement organised by ChemSec](#).**
3. **Ensure substitutes are safer**, at a minimum free of any [GreenScreen](#) Benchmark 1 or [SINLIST](#) chemicals.
4. **Provide safe reusable food serviceware for in-store dining** and train staff to make this the default for customers dining in.
5. **Publicly report on progress** and announce when their food contact materials are PFAS-free.

### For the public:

1. **[Ask the UK government](#) to phase out all non-essential uses of PFAS chemicals in the UK.**
2. **[Urge food retailers](#) to phase out PFAS from their food packaging in the UK.**
3. **Take your own reusable food containers when visiting fast food chains and takeaway restaurants;** in order to avoid paper, board and moulded fibre food packaging that could be treated with PFAS chemicals.
4. **Do not dispose of moulded plant fibre compostable packaging and tableware into the compost waste bins or your home compost,** as they are heavily treated with PFAS chemicals.

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## Annex - Opinion poll survey 2021

Survey carried by Ipsos MORI for CHEM Trust on 2100 nationally representative UK adults aged 16-75 between 05/05/21 - 06/05/21

### Q1 - To what extent do you agree or disagree with each of the following statements?



### Q2 - Who, if anyone, do you think should take action to ensure hazardous chemicals are not present in food packaging? Please select all that apply

