

# Chemicals of Concern in Food Contact Materials on the Irish Market

Report and recommendations - September 2021



**voice**

## About VOICE

VOICE is a member-based Irish environmental charity that empowers individuals and local communities to take positive action to conserve our natural resources. VOICE advocates for the government and the corporate sector to adopt environmentally responsible behaviours, and for the development of strong national policies on waste and water issues

## Authors

Mindy O'Brien, Chief Executive

Angela Ruttledge, Policy Researcher

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## Contact Details

VOICE Ireland

9, Upper Mount Street

Dublin 2

Ireland

Tel : (+353) 01 642 5741

Email : [info@voiceireland.org](mailto:info@voiceireland.org)

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## Executive Summary

VOICE has established, using chemical analysis (see **Section B** and **Annex 1** of this report), the presence of chemicals of concern in commonly available food contact materials (FCMs), with implications around contamination of waste streams and the integrity of the circular economy here in Ireland.

The chemicals of concern, per- and polyfluorinated alkyl substances (PFAS), are a group of more than 4,700 persistent chemicals used by manufacturers of many products, including FCMs, for their repellency or non-stick properties. All PFAS chemicals are highly persistent in the environment, some are bioaccumulative in organisms and many are toxic.<sup>1</sup>

In 2020, Denmark banned the use of all PFAS in paper and board FCMs, noting that these chemicals are persistent, that some accumulate in humans and animals, and that several are suspected to be carcinogenic, harmful to the immune system and endocrine disruptors.<sup>2</sup> VOICE has carried out some initial research on this issue in an Irish context.

**We are calling on the government to implement, among other measures, an immediate ban on the manufacture or use of PFAS in FCMs on the Irish market. Further recommendations are set out in Part E of this report.**

In addition to our study, three recent studies carried out in the UK and across Europe have highlighted the same alarming levels of PFAS in FCMs.

In all cases the levels are particularly high in certain moulded plant fibre products that are marketed as compostable. EN13432 is the European standard for industrial composting, which sets a limit of 100ppm total fluorine content. Many of the moulded plant fibre FCMs tested have levels of PFAS well in excess of that limit. These products have become ubiquitous on the Irish market, chosen by businesses for their seemingly superior sustainability credentials, and excellent liquid repellency.

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<sup>1</sup>Trier, X et al., 2017, PFAS in paper and board for food contact – options for risk management of poly-and perfluorinated substances, Denmark, p 9.

<sup>2</sup> Danish Veterinary and Food Administration, February 2020, Ban on fluorinated substances in paper and board food contact materials fact sheet.

## Cause for Concern

There are two issues with regard to the presence of PFAS in food packaging:

1. PFAS in FCMs are potentially a source of direct human exposure. In certain circumstances some PFAS can migrate from the packaging into the food we eat<sup>3</sup> and get into our system. This adds to our burden of PFAS exposure from other sources such as drinking water and food. Our repeated exposure to them through FCMs is a cause for serious concern and more study is required in this field.<sup>4</sup>
2. When packaging materials break down in landfill, PFAS can leach into the environment where they build up in our soil and water due to their high persistence.<sup>5</sup> In the case of FCMs labelled or disposed of as compostable the result is that the compost is contaminated with chemicals that may take hundreds of years to break down. If this compost is used to grow crops, then the PFAS may ultimately find their way into our food chain as some PFAS accumulate in plants and vegetables.<sup>6</sup> If FCMs containing PFAS end up in general waste, we do not have the facility to treat the waste water run off to remove them from it. Again, PFAS contaminate our water and our food chain in this way.

## Our Study

We used a preliminary 'oil bead' test to identify which samples might contain PFAS. Oil 'beading' (as opposed to 'soaking' or 'spreading') indicates oil repellency which suggests that the packaging has been treated with PFAS. Based on the results of the studies (mentioned in further detail below), the oil bead test was considered a strong indicator of the use of PFAS in paper, board and moulded plant fibre food packaging. 100% of the oil beading samples in these studies had intentional PFAS treatment confirmed by chemical analysis.

For our study, conducted in August 2021, we collected 23 samples of paper and board, moulded plant fibre and other takeaway packaging available on the Irish market. Of these, 12 produced a positive bead test result. We sent 11 samples for total organic fluorine analysis (TOF), an accepted proxy for total PFAS content (see results in **Annex 1**). In 2020, Denmark banned PFAS in paper and board FCMs and the Danish Veterinary and Food Administration (DVFA) reference value for intentional use of PFAS (i.e., part of the manufacturing process and intended to make the material grease / water repellent) is 20 microgram organic fluorine per gram of paper. This corresponds to 10 microgram organic fluorine per square decimeter of paper, when the paper has a weight of 0.5 gram per square

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<sup>3</sup> Ramírez Carnero, A et al., 2021, Presence of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) in food contact materials (FCM) and its migration to food, *Foods* 2021, p10.

<sup>4</sup> Trier, X et al., p79.

<sup>5</sup> Stoiber et al., 2020. Disposal of products and materials containing per- and polyfluoroalkyl substances (PFAS): A cyclical problem, *Science Direct*, Volume 260, 2020, 1277659, ISSN 0045-6535.

<sup>6</sup> Lesmeister et al., 2021, Extending the knowledge about PFAS bioaccumulation factors for agricultural plants – A review, *Science of The Total Environment*, Volume 766, 2021, 142640, ISSN 0048-9697.

decimeter.<sup>7</sup> Detection of values higher than 20 microgram organic fluorine per gram of paper (20 mg/kg dry weight (dw)) suggests that the product has intentionally been treated with PFAS, while values lower than that is called 'unintentional' or 'background' contamination.

We carried out TOF analysis on 9 oil beading samples and 2 (Vegware paper container and Dominoes pizza box) samples which did not bead. Detectable levels of TOF were found in all of the samples, with 10 out of 11 of the samples displaying levels above that expected from background contamination (based on the DVFA reference value). 8 of the 9 oil beading samples had intentional PFAS treatment confirmed by the TOF analysis.

The highest TOF content was found in moulded plant fibre packaging which is advertised as compostable. Values of 6600-1200 mg/kg dw were found in these, which is 6.5-12 times the 100 ppm set in EN13432.

Intentional PFAS treatment of packaging in which food may be cooked/heated or kept in contact with the food for a prolonged period of time raises the concern of direct migration by PFAS from that packaging into the food we eat.<sup>8</sup> Both the bake in the box (76 mg/kg dw) and one of the greaseproof paper (1,100 mg/kg dw) samples showed intentional treatment of PFAS.

Further, while one brand of greaseproof paper was intentionally treated by PFAS (1,100 mg/kg dw), the other greaseproof paper sample was the only sample that would pass the DVFA reference test with (12 mg/kg dw). This shows that it is possible to produce products serving the same purpose without intentional PFAS treatment.

## Research Review

Fidra's **Forever Chemicals in the Food Aisle** report<sup>9</sup> used the 'oil bead' test to identify which samples might contain PFAS. Fidra tested 92 samples from takeaways and supermarkets in the UK. 30% of the products produced an oil bead. In total 20 samples were sent forward for chemical analysis. Fidra sent 14 oil beading samples to confirm intentional PFAS treatment and 6 non-oil beading samples to check whether there was nonetheless contamination with PFAS. Detectable levels of TOF were found in 19 of the 20 samples, with 18 of those displaying levels above that expected from background contamination (based on the DVFA reference value). All 14 oil beading samples had intentional PFAS treatment confirmed by the TOF analysis. Again, the highest TOF content by far was found in moulded plant fibre packaging.

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<sup>7</sup> Danish Veterinary and Food Administration, February 2020, Ban on fluorinated substances in paper and board food contact materials fact sheet.

<sup>8</sup> Ramírez Carnero, A et al., p 10-11.

<sup>9</sup> Dinsmore, K.J., 2020, Forever Chemicals in the Food Aisle PFAS content of UK supermarket and takeaway food packaging, Fidra, United Kingdom.

The **Throwaway Packaging Survey**<sup>10</sup>, published in May 2021, was a joint European wide project by 8 non profit organisations which found widespread use and contamination of food packaging in high street fast food chains and other takeaways. The survey collected 99 samples of disposable food packaging and tableware in six different countries in 2020. The samples collected were in three categories: (1) moulded plant fibre compostables, (2) takeaway paper (e.g., bakery and fries bags) and (3) other paper and board packaging (e.g., pizza boxes). Again, the samples were screened using the oil beading test. 28 oil beading samples were sent for chemical analysis, along with 14 samples which showed no oil repellent properties.

The 42 samples were tested for the presence of PFAS with TOF analysis. This study again used the DVFA reference value and 32 of the 42 samples analysed indicated the use of intentional PFAS treatments. 100% of the oil-beading samples had intentional treatment confirmed by the TOF analysis.

This study also included specific analysis of 55 individual PFAS to try and identify which PFAS were used. Less than 1% of the TOF in the PFAS-treated samples could be assigned to specific PFAS chemicals through targeted analysis, so over 99% of the total load of PFAS in the samples was unidentified.

**Again, of particular concern are the PFAS in the moulded plant fibre products that are designed and marketed as being suitable for composting.** Values of 560-1200 mg/kg dry weight were found in these, which is 5-12 times the 100 ppm set in EN13432.

*'The **highest concentrations were consistently found in moulded fibre products, such as bowls, plates, and food boxes advertised as biodegradable or compostable disposable products.** However, the presence of non-degradable PFAS chemicals clearly contradicts this claim and this loophole should urgently be addressed....*

*Even though less than 1% of the PFAS present in the samples tested could be identified, **the nature of the PFAS identified is already in itself enough to be a source of concern for human health.** The PFAS chemicals identified have been found to migrate from the food packaging into the food, and are associated with adverse health effects such as cancer, liver toxicity, and impacts on the reproductive and hormonal systems... [Our ecotoxicity test showed that the PFAS present in some of the food packaging samples tested had the potential to impair thyroid activity... ]*

*By definition and design, disposable food packaging and tableware are intended to be used only once and then thrown away after the food has been consumed. **They are produced in high volumes and have very high turnover rates.** PFAS can be emitted into the environment at every stage of these items' life cycle, from production to disposal. **This contributes to the buildup of these highly persistent chemicals in the environment, and to continuous human and wildlife exposure, via the contamination of the food chain and the drinking water.**'<sup>11</sup>*

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<sup>10</sup> Straková J, Schneider, J Cingotti N. et al, 2021, Throwaway packaging, forever chemicals, a European wide survey of PFAS in disposable food packaging and tableware.

<sup>11</sup> ibid, pp 9-10.

Also in May 2021, BEUC, The European Consumer Organisation published its **Towards Safe and Sustainable Food Packaging** report.<sup>12</sup> The report refers to a study by Italian, Danish, Spanish and French consumer organisations which tested 41 single use food contact items for fluorinated compounds. This study also used the DVFA indicator for TOF. 23 moulded plant fibre products were tested and all contained fluorinated compounds above the reference value. 11 different paper straws were tested, 4 contained more than the reference value, and 7 straws contained close to the reference value.

There was a report by the FSAI on PFAS in the food chain published in 2010<sup>13</sup>, which indicated low levels of contamination with PFOA, PFOS and 9 other PFAS compared to the accepted safety threshold. NUI Galway has published studies on PFAS in waste and human milk.<sup>14</sup> Overall, however, there seems to be very little Irish data on PFAS, and there is none that we found on the contribution of PFAS in FCMs to environmental contamination.

## Regulatory Background and Relevant Authorities

The EU REACH Regulation<sup>15</sup> regulates, evaluates, authorises and restricts certain named chemicals, including sub groups of PFAS. It operates on an opt in basis, restricting certain named chemicals.

There are two main pieces of EU legislation on FCMs are:

- Regulation (EC) 1935/2004, the Food Contact Materials Regulation requires any material or article intended to come into contact with food should be sufficiently inert to preclude substances being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition or a deterioration in the organoleptic properties of the food, i.e. a taint in the food. Regulation 1935/2004 requires that FCMs are manufactured in compliance with good manufacturing practice. It also specifies labeling and traceability (one step forward and one step back) requirements for FCMs.
- Regulation (EC) 2023/2006, the Good Manufacturing Practices Regulation, sets out rules around manufacturing of materials and articles intended to come in contact with food.

Notably, under the current legislation the FSAI doesn't have to certify compliance, it is up to companies to gather the information and documentation and to ensure the product's safety. The FSAI carries out audits and inspections.

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<sup>12</sup> BEUC The European Consumer Organisation, 2021, Towards Safe and Sustainable Food Packaging, Belgium.

<sup>13</sup> FSAI, 2010, Investigation into levels of perfluoroalkylated substances (PFAs), in meat, offal, fish, eggs, milk and processed products,  
[https://www.fsai.ie/enforcement\\_audit/monitoring/surveillance/chemical\\_surveillance.html](https://www.fsai.ie/enforcement_audit/monitoring/surveillance/chemical_surveillance.html).

<sup>14</sup> <http://www.nuigalway.ie/safer/aboutthesaferproject/>

<sup>15</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), as amended.



Ireland is a party to the Stockholm Convention on Persistent Organic Pollutants (POPs) which aims to eliminate or restrict the most hazardous organic chemicals that are of global concern. The most studied and toxic PFAS, PFOA and PFOS, are now banned globally under the Stockholm Convention. As a party to the convention, Ireland is required to have a national implementation plan in relation to POPs, and the current plan is the National Implementation Plan<sup>16</sup> (SI 146/2020 the European Union (Persistent Organic Pollutants) Regulations 2020).

Irish authorities dealing with PFAS are the Environmental Protection Agency (EPA)<sup>17</sup> and the Food Safety Authority of Ireland (FSAI).

We made contact with both authorities. It is clear from their response to our queries that the risk of PFAS entering our waste streams via FCMs is one that is not being addressed. The EPA has advised that they are establishing a PFAS stakeholder group and we have asked to have representation at that group.

## What Others Are Doing

The relevant EU authorities are the European Chemicals Agency (ECHA) and the European Food Safety Authority (EFSA).<sup>18</sup> Both organisations have published positions warning about the danger of PFAS to humans and the environment. The ECHA states:

*'All PFAS are highly persistent in the environment. In fact, they are known to persist in the environment longer than any other man-made substance. As a consequence of this persistence, as long as PFAS continue to be released to the environment, humans and other species will be exposed to ever greater concentrations of PFAS. Even if all releases of PFAS would cease tomorrow, they would continue to be present in the environment, and humans, for generations to come.'*<sup>19</sup>

The EU Chemicals Strategy for Sustainability,<sup>20</sup> published in 2020, commits the EU to ban all non-essential uses of PFAS. This strategy, which will take years to fully implement states:

*'Per- and polyfluoroalkyl substances (PFAS) require special attention, considering the large number of cases of contamination of soil and water - including drinking water - in the EU and globally, the number of people affected with a full spectrum of illnesses and the related societal and economic costs. That is why the Commission proposes a comprehensive set of actions to address the use of and contamination with PFAS.'*

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<sup>16</sup> [https://www.epa.ie/publications/compliance--enforcement/waste/POP-Report\\_web.pdf](https://www.epa.ie/publications/compliance--enforcement/waste/POP-Report_web.pdf)

<sup>17</sup> <https://www.epa.ie/our-services/monitoring--assessment/waste/chemicals/pfas/>

<sup>18</sup> <https://www.efsa.europa.eu/en/topics/topic/food-contact-materials>

<sup>19</sup> <https://echa.europa.eu/de/hot-topics/perfluoroalkyl-chemicals-pfas>

<sup>20</sup> European Commission, 2020, *Chemicals Strategy for Sustainability Towards a Toxic-Free Environment* <https://ec.europa.eu/environment/pdf/chemicals/2020/10/Strategy.pdf>

*Those aim to ensure, in particular, that the use of PFAS is phased out in the EU, unless it is proven essential for society.<sup>21</sup>*

In 2020 Denmark prohibited PFAS in paper and board FCMs.<sup>22</sup> In relation to paper and board packaging, it is interesting to note that the Throwaway Packaging Survey found no intentional PFAS treatment in the Danish paper and board packaging bought after the entry into force of the ban; demonstrating both that regulation is a useful tool and that there are alternatives.

In addition, Denmark, the Netherlands, Germany, Norway and Sweden are working on a proposal for a PFAS group restriction for the manufacture and use of PFAS in Europe.

## Recommendations

VOICE is calling on the Irish government to:

1. Implement an immediate and total ban on all PFAS in FCMs. There are alternatives.
2. Mandate the EPA to find out more about PFAS exposure through FCMs in Ireland.
3. Join Denmark, Germany, Norway, Sweden, The Netherlands in working for a total ban on the manufacture and use of all PFAS in Europe.
4. Advocate for and support the speedy implementation of the objectives in the EU Chemicals Strategy for Sustainability, particularly a total ban on all non-essential uses of PFAS.

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<sup>21</sup> *ibid*, p 9.

<sup>22</sup> <https://ec.europa.eu/growth/tools-databases/tris/en/search/?trisaction=search.detail&year=2019&num=520>

# Annex 1

## Bead Test Materials Available on the Irish Market

|     | Item   | Brand                          | Certification, statement, if any  | Bead test result | TOF result <sup>23</sup> | TOF value mg/kg DW |
|-----|--|--------------------------------|---|------------------|--------------------------|--------------------|
| 1.  | Compostable moulded plant fibre bowl         | Vegware                        | EN13432, BPI Industrial, TUV Austria, Compost Manufacturing Alliance Approved | Bead             | Fail                     | 660                |
| 2.  | Compostable moulded plant fibre              | Be Pulp                        | EN13432   | Bead             | Fail                     | 1,200              |
| 3.  | Bake in cake box                             | Purchased at Super Valu        | None  | Bead             | Fail                     | 76                 |
| 4.  | Greaseproof paper bag                        | Supplier Zeus                  | None other than suitable for food contact                                     | Bead             | Fail                     | 720                |
| 5.  | French fries bag                             | McDonalds                      | Recyclable  | Bead             | Fail                     | 780                |
| 6.  | French fries bag                             | KFC                            | Biodegradable   | Bead             | Fail                     | 690                |
| 7.  | Cookie bag                                   | Tesco                          | Recyclable  | Bead             | Fail                     | 580                |
| 8.  | Greaseproof paper                            | Bacofoil                       | Recyclable  | Bead             | Fail                     | 1,100              |
| 9.  | Baking paper                                 | If You Care                    | FSC, Compostable 7P2011, Vincotte S203, USDA Certified Biobased Product       | Bead             | Pass                     | 12                 |
| 10. | Compostable PLA lined paper bowl             | Vegware                        | EN13432, BPI Industrial, TUV Austria, Compost Manufacturing Alliance Approved | Spread           | Fail                     | 52                 |
| 11. | Pizza box                                    | Dominoes                       | Recyclable  | Spread           | Fail                     | 26                 |
| 12. | Compostable moulded plant fibre burger box   | Greenspirit                    | EN13432   | Bead             | Not tested               | Not tested         |
| 13. | Bake in cake box                             | Purchased from LawCo           | 'Produced out of 100% paper, environmentally sound and recyclable'            | Bead             | Not tested               | Not tested         |
| 14. | Greaseproof sandwich paper                   | Purchased at Circle K, Athlone | No information  | Bead             | Not tested               | Not tested         |
| 15. | Compostable kraft soup container             | Sustain                        | EN13432   | Spread           | Not tested               | Not tested         |
| 16. | Compostable salad box                        | Sustain                        | EN13432   | Spread           | Not tested               | Not tested         |
| 17. | Cereal wrap (mixed material, not recyclable) | Weetabix                       |   | Spread           | Not tested               | Not tested         |
| 18. | Ice cream cup                                | Supplier Zeus                  |   | Spread           | Not tested               | Not tested         |
| 19. | Compostable crepe cone                       | Vegware                        | EN13432, BPI Industrial, TUV Austria, Compost Manufacturing Alliance Approved | Soak             | Not tested               | Not tested         |

<sup>23</sup> 'Fail' indicates detection of values higher than 20 mg/kg dw, the TOF value reference set by the Danish Veterinary and Food Administration for intentional treatment with PFAS.

|     |                                     |               |            |      |            |            |
|-----|-------------------------------------|---------------|------------|------|------------|------------|
| 20. | Compostable clamshell<br>burger box | Greenspirit   | EN13432    | Soak | Not tested | Not tested |
| 21. | Spaghetti box                       | Barilla       | Recyclable | Soak | Not tested | Not tested |
| 22. | Bakery bag                          | Café Sol      |            | Soak | Not tested | Not tested |
| 23. | Bakery bag                          | Insomnia      |            | Soak | Not tested | Not tested |
| 24. | Bagel wrap                          | Bagel Factory |            | Soak | Not tested | Not tested |

# About VOICE

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