PFAS in Fibre-based Food Contact Packaging

8 June 2022

Important tips for today's webinar:

- Use headphones/earphones for clarity of sound.
- Use the chat box to say hello - enter your full name and organisation.
- Use the Q&A function to submit questions for the group discussion.

Please note: This session will be recorded and made available in the coming weeks

Agenda

- Introduction
- The Big Picture
  Paul Klymenko, Planet Ark CEO
- PFAS in Fibre-based Food Packaging
  Dr Roy Tasker, Planet Ark Chief Scientific Advisor
- APCO and PFAS
  Jayne Paramor, APCO Sustainability Manager
- Panel Discussion Q&A
  Keith Chessell, Australian Institute of Packaging
  Jayne Paramor, APCO Sustainability Manager
  Dr Roy Tasker, Planet Ark Chief Scientific Advisor
  Paul Klymenko, Planet Ark CEO
- Next Steps

Introduction

Jayne Paramor, APCO Sustainability Manager

Our Experts

Paul Klymenko
Planet Ark CEO

Dr Roy Tasker
Planet Ark Chief Scientific Advisor

Keith Chessell
AIP Education Team

Background on PFAS

The focus in PFAS in Fibre-based Food Packaging

Jayne Paramor, APCO Sustainability Manager

PFAS Position Statement

This **National PFAS Position Statement** establishes that transitioning away from PFAS should be the ultimate goal in Australia

> *"All Australian governments agree that further release of **PFAS** into the environment from ongoing use should **be prevented where practicable**, and that actions to reduce or phase out the use of PFAS should be nationally consistent."*

2021 PFAS in Fibre-Based Packaging report

May 2021 – **DAWE funded** study to:

pilot a scientific methodology **to identify the presence of PFAS in fibre-based food packaging** in Australia

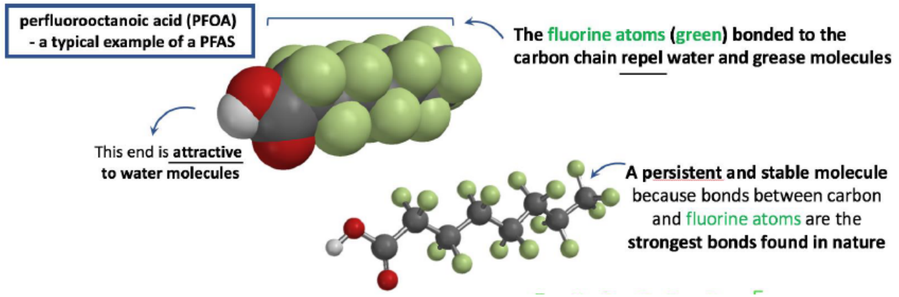
identify if PFAS is present in packaging placed on the Australian market

Planet Ark analysis of test results highlighted over a **quarter of the study samples contained high levels of fluorine**, indicating the presence of PFAS.

A quarter of the samples tested **had no detectable fluorine**.

All categories of packaging, with the exception of Bagasse packaging, had at least some samples with low or no detectable PFAS.

Bagasse, also known as sugarcane pulp, is a fibrous material left behind in the sugarcane harvesting process.



Drivers for Phase out Action

Increasing use of fibre-based packaging

Action on single-use plastics

- 2025 National Packaging Targets
- State and territory-led phase outs and bans

PFAS in fibre based recyclable or compostable **packaging have the potential to contaminate recovery systems over time**.

If composted, **most of these chemicals will not break down**, and those that do will form other PFAS.

If recycled, **these chemicals may transfer to recycled products**.

Impacts on composting systems

Collection systems

Contamination

PFAS in fibre-based food packaging

presented by

Paul Klymenko

CEO

&

Dr Roy Tasker

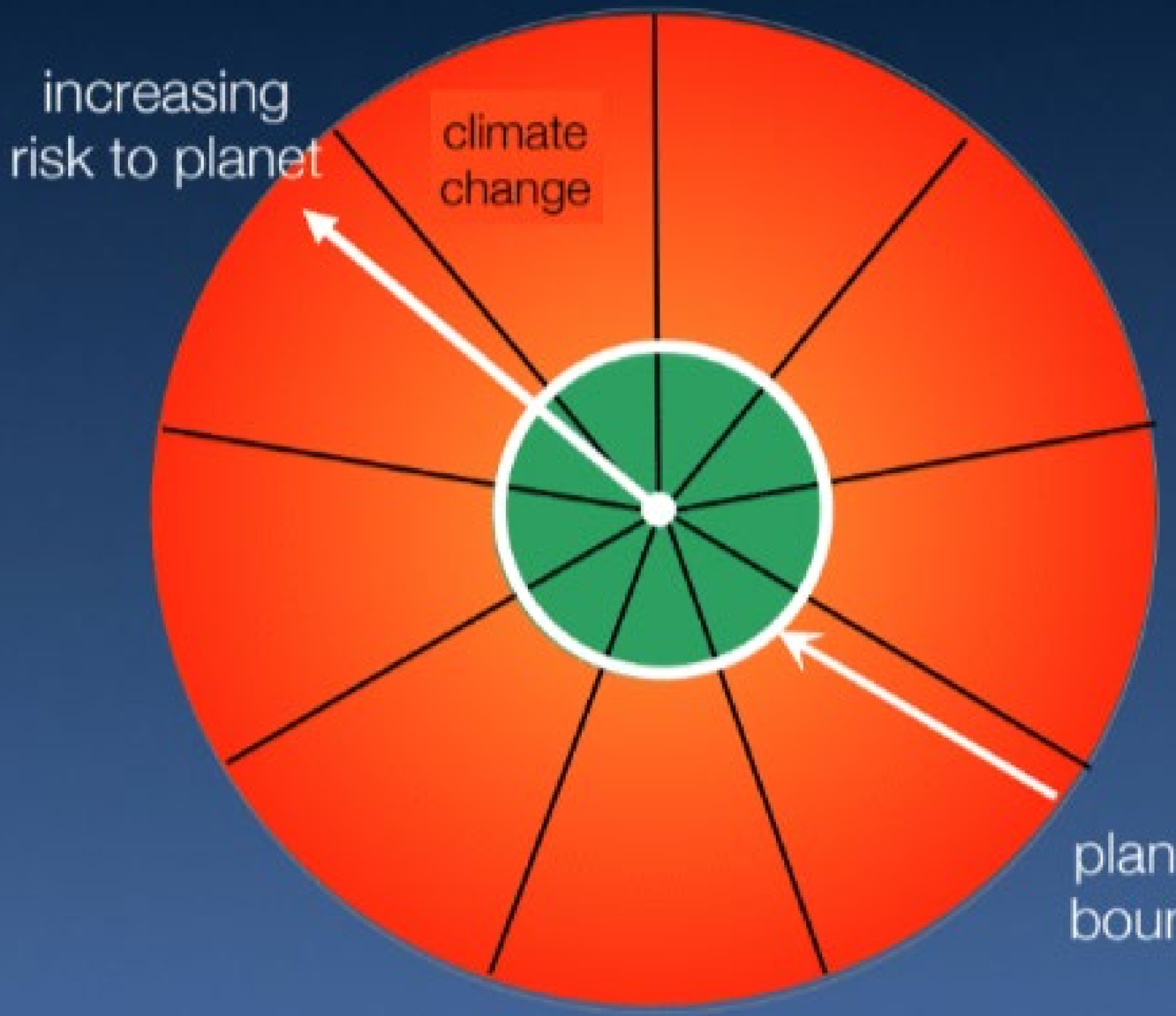
Chief Scientific Advisor

PLANET ARK™


PLANET ARK™
Positive environmental actions, for everyone.
OUR VISION
A world where we thrive in balance with nature
by creating a carbon neutral and circular economy

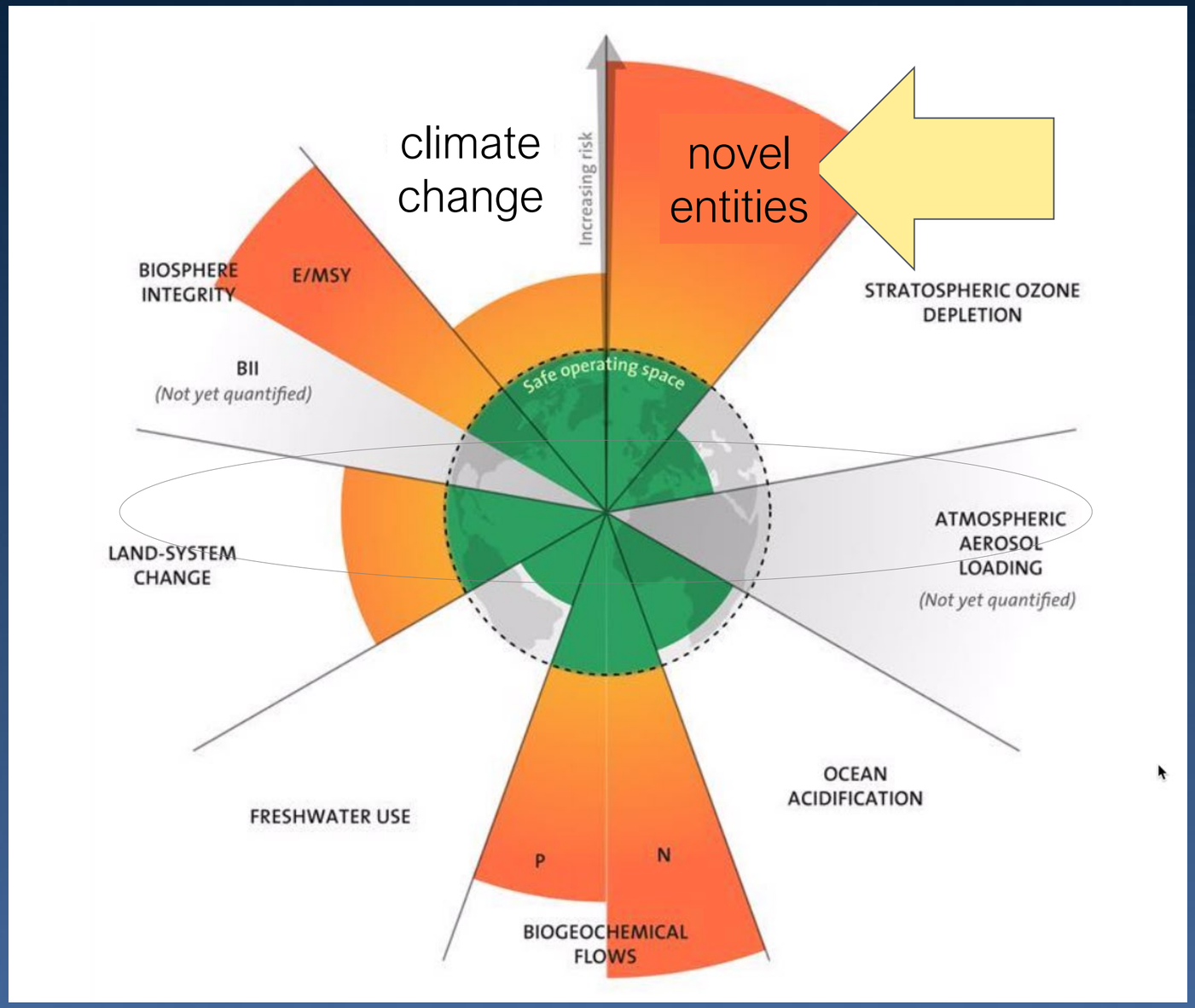
The Big Picture — the planetary boundary framework

- our planet is exposed to nine major risks

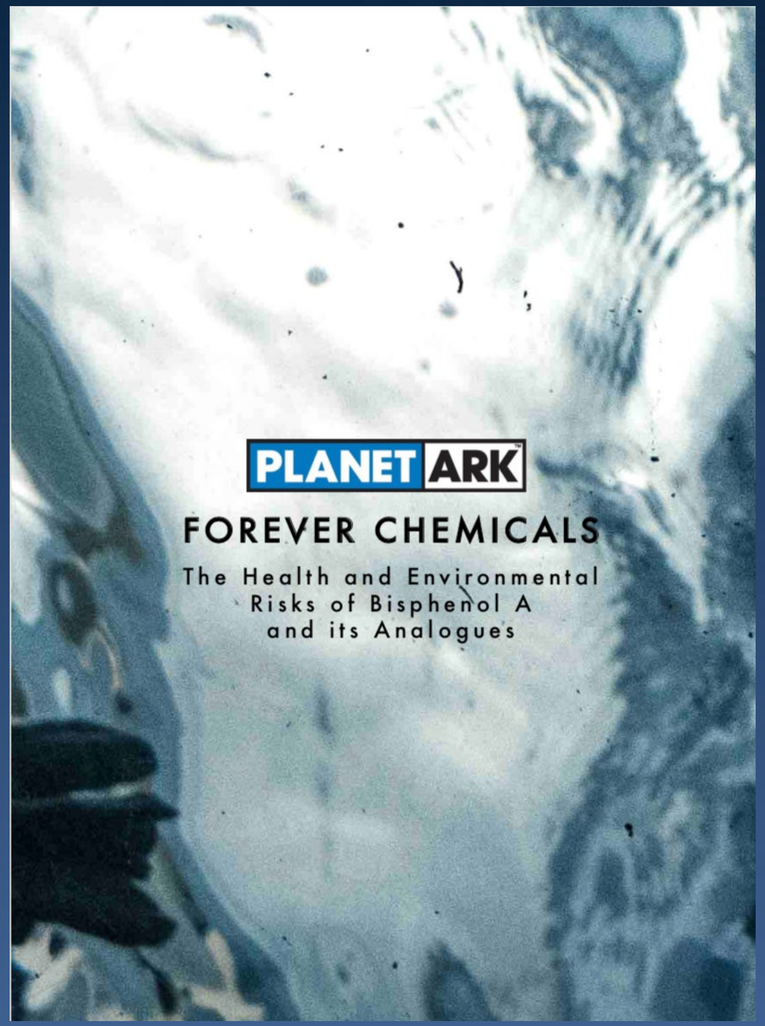


The Big Picture — the NE planetary boundary is transgressed

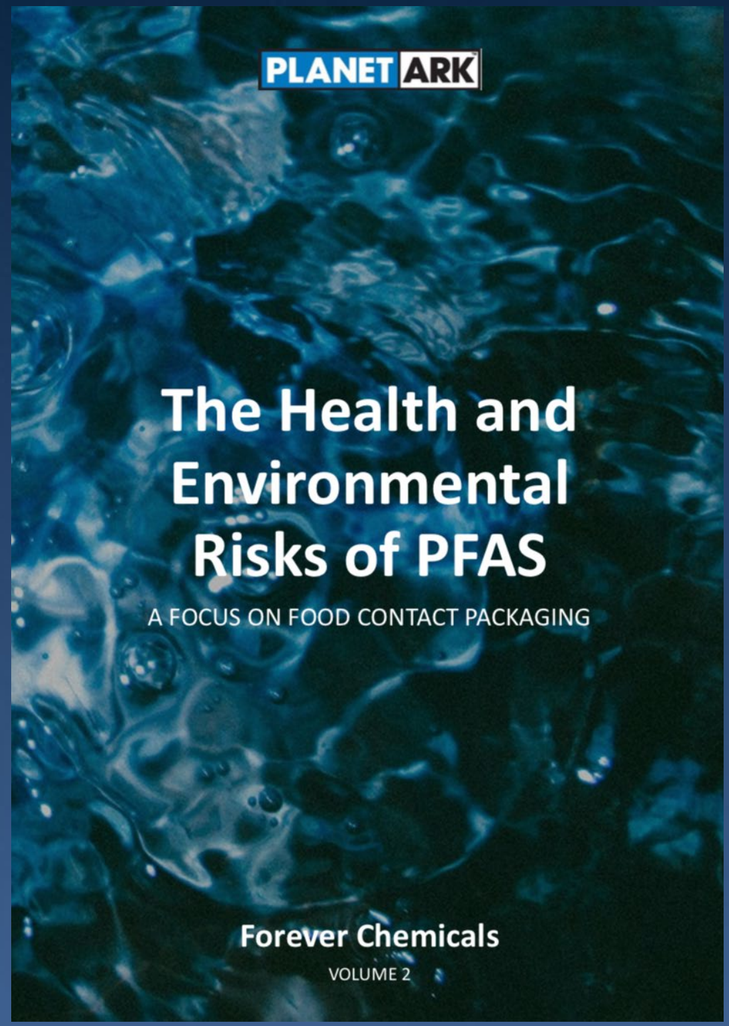
- novel entities are defined as new substances, new forms of existing substances and modified life forms. They include chemicals and other new types of engineered materials or organisms **not previously known to the Earth system as well as naturally occurring elements (for example, heavy metals) mobilized by anthropogenic activities**.
- characterised by persistence, mobility, and accumulation in the biosphere



Planet Ark Research Reports: planetark.org/newsroom/research



Bisphenol A and its Analogues



PFAS: A focus on food contact packaging

PFAS in fibre-based food packaging

- Why are these chemicals used, and what are they anyway?
- What are their health and environmental risks?
- How easily can we identify if packaging contains them?
- When they are phased out, what are the alternatives?

Movement away from plastic to fibre-based food packaging

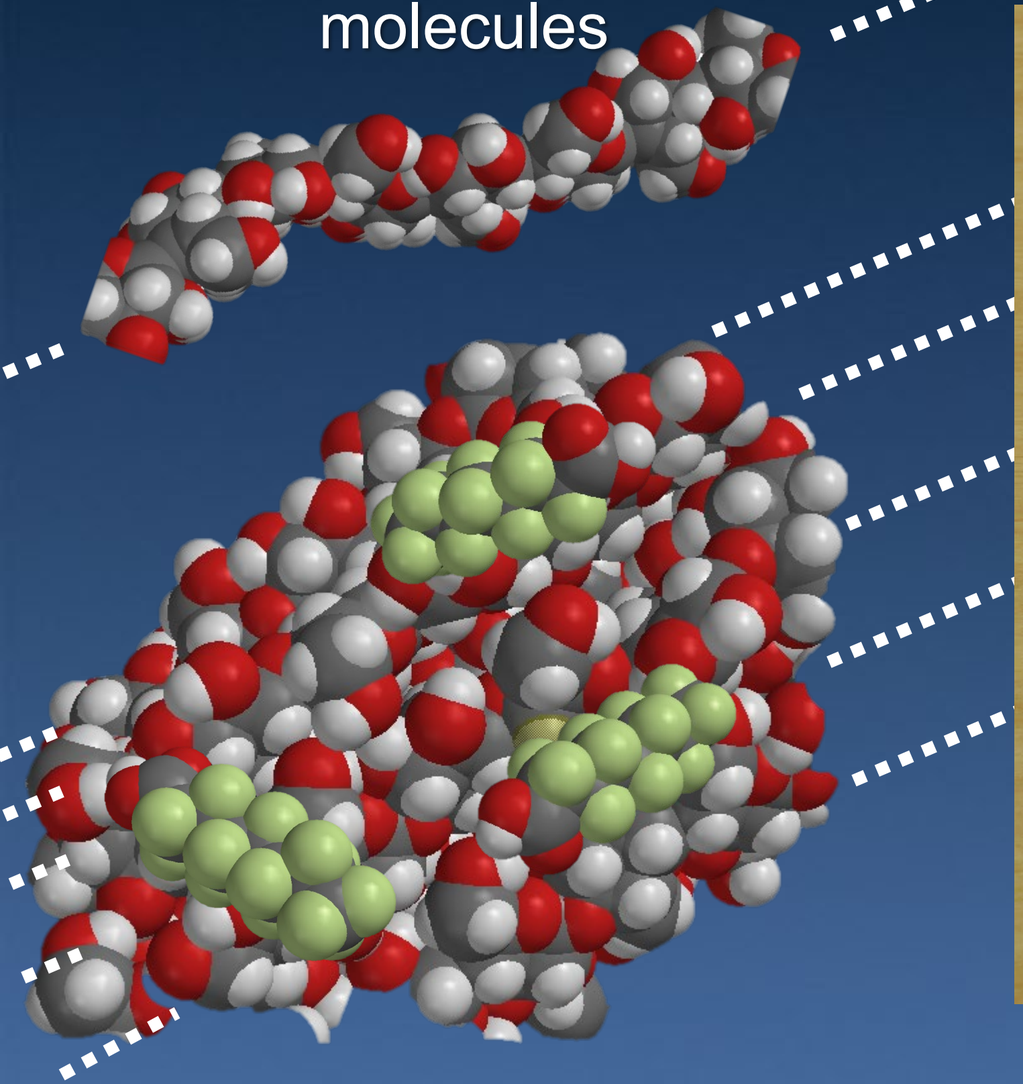
- light
- cheap
- water- and grease-resistant

BUT

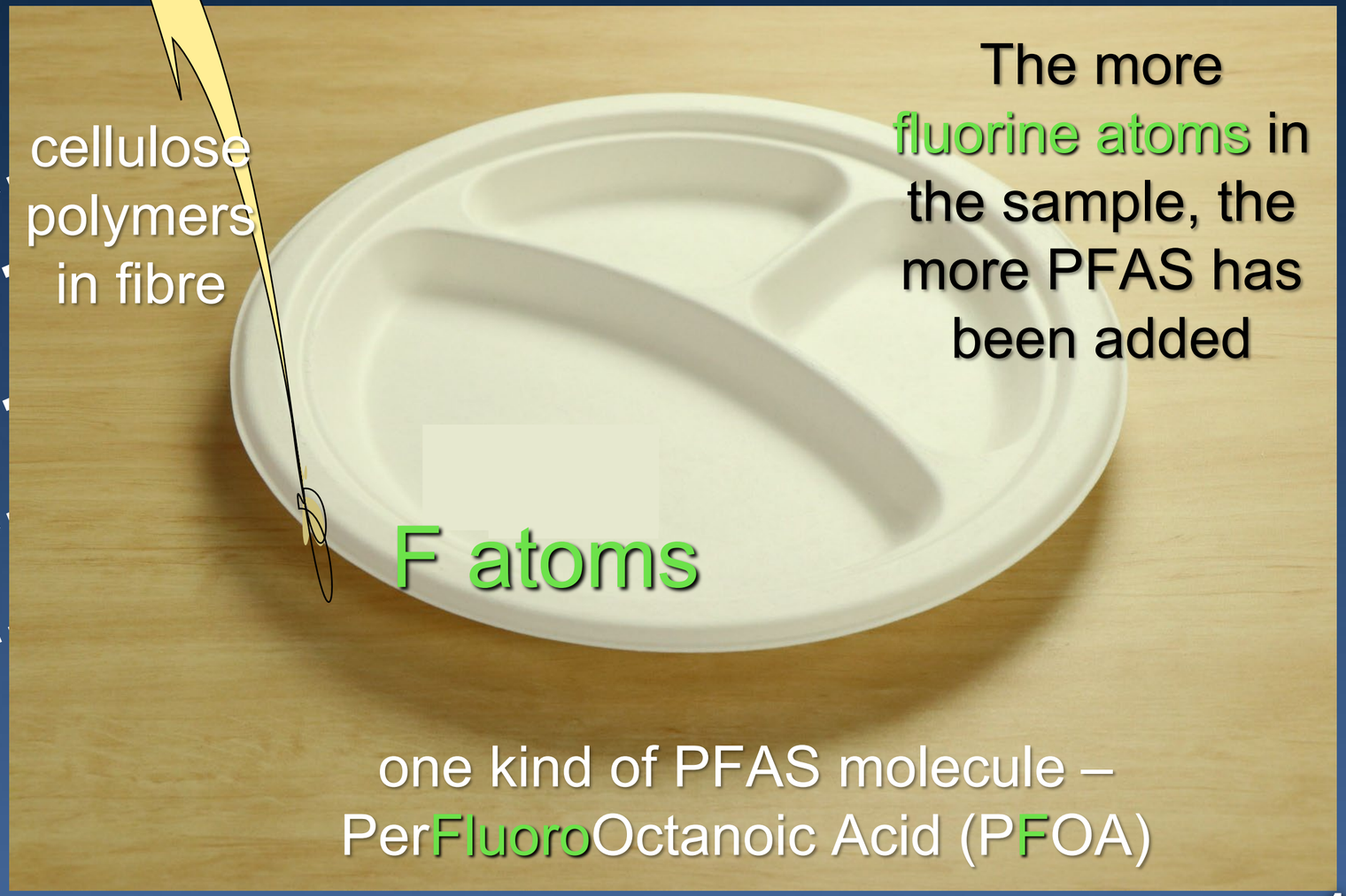
- a persistent pollutant
- with unacceptable health and environmental risks of waste plastics

How can you make fibre-based food packaging fit for purpose?

cellulose molecules attract water and grease molecules

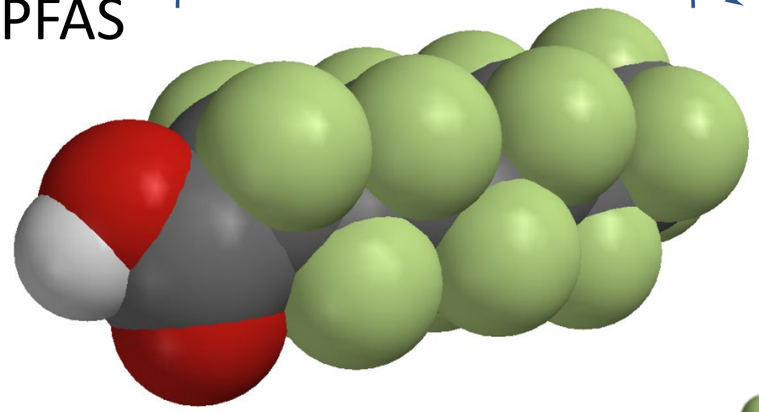


cellulose polymers in fibre



Per- and Polyfluoroalkyl Substances (PFAS)

perfluorooctanoic acid (PFOA)
- a typical example of a PFAS

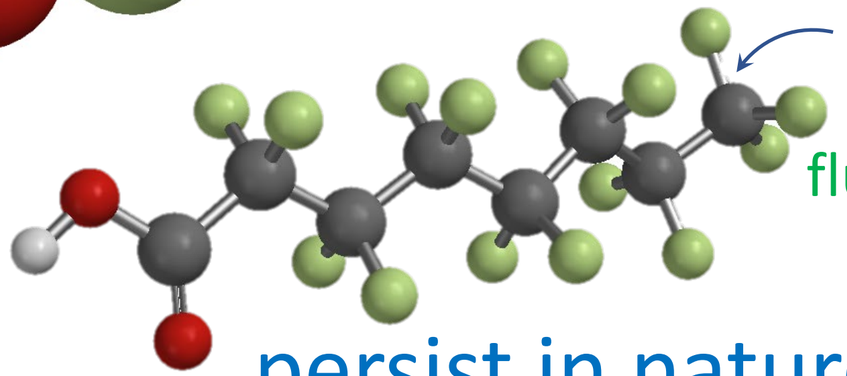


water/grease repelling
low friction, slippery

The fluorine atoms (green) bonded to the carbon chain repel water and grease molecules

This end is attractive to cellulose and water molecules

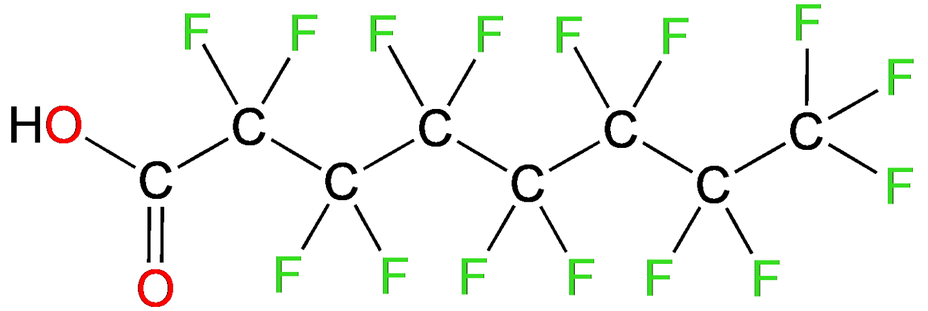
mobile in water



A stable molecule because bonds between carbon and fluorine atoms are the strongest bonds found in nature

persist in nature

accumulate in animal and plant tissues



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There are over 4700 types of PFAS

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molecular monomers

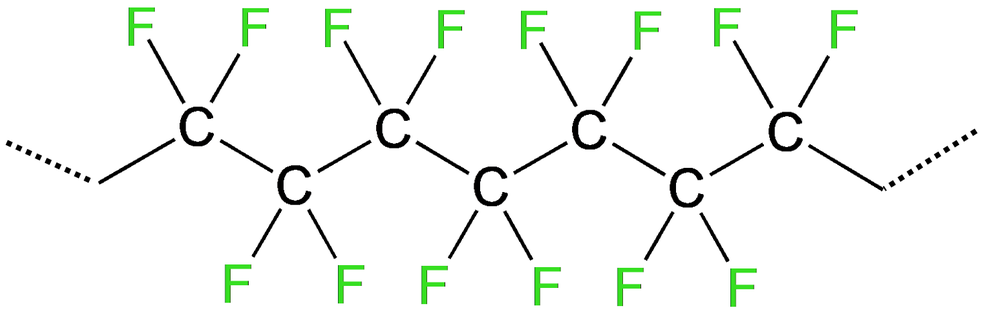
simple PFAS molecules

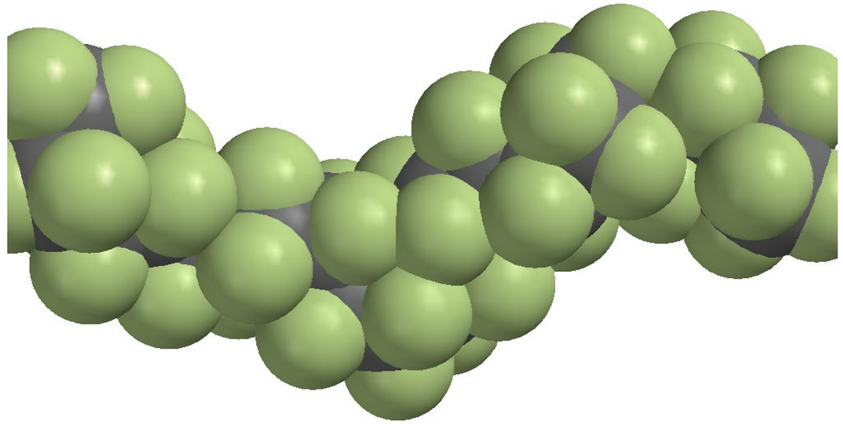
complex PFAS precursor molecules

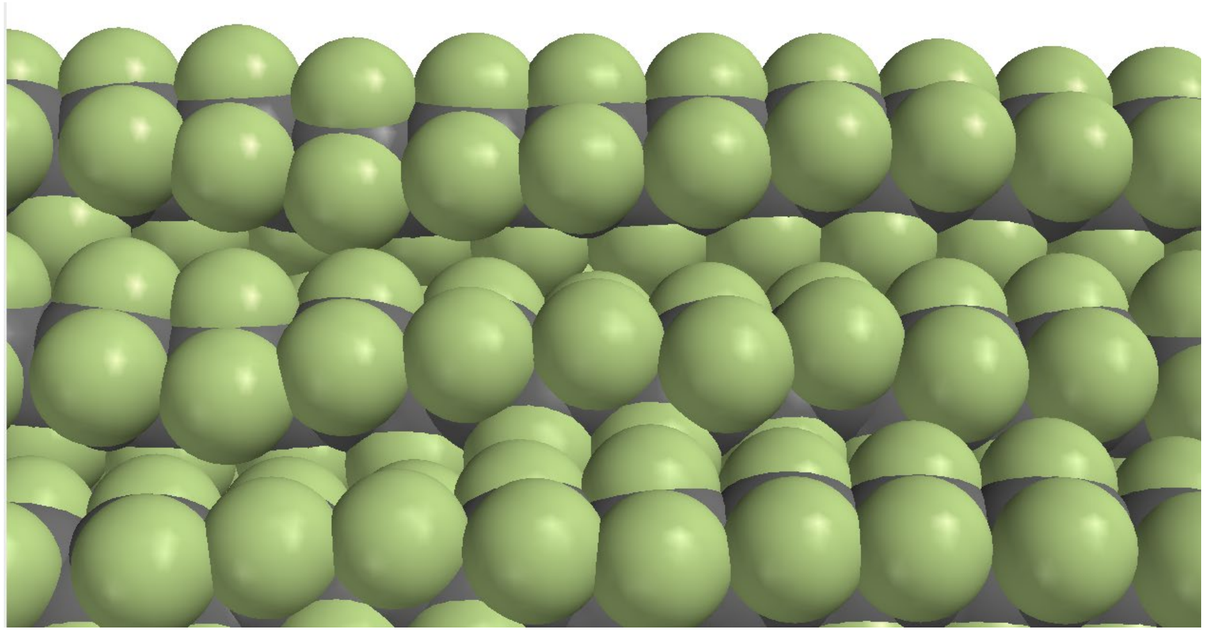
polymers (molecular chains)

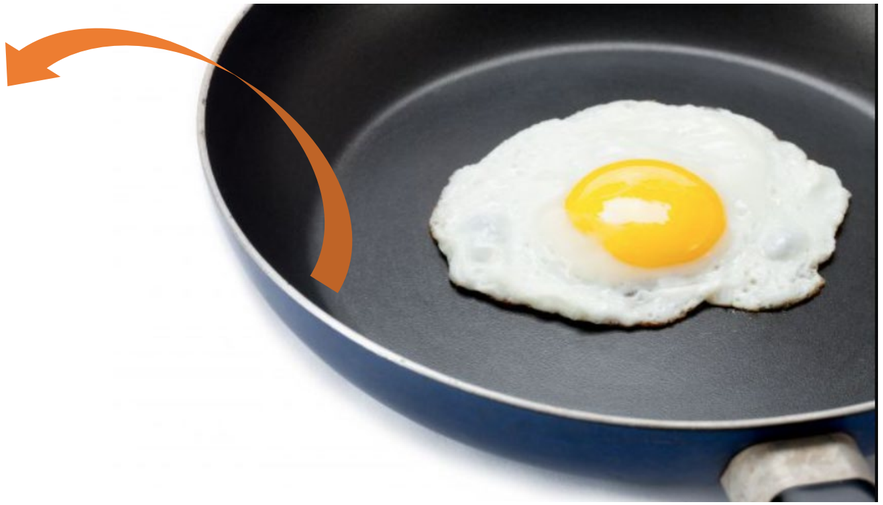
Teflon – a polymer coating that is stable to heat, and is not sticky to fats, oils or water

- a polymer made from reactions with PFOA










PFAS
FIDRA.org.uk animation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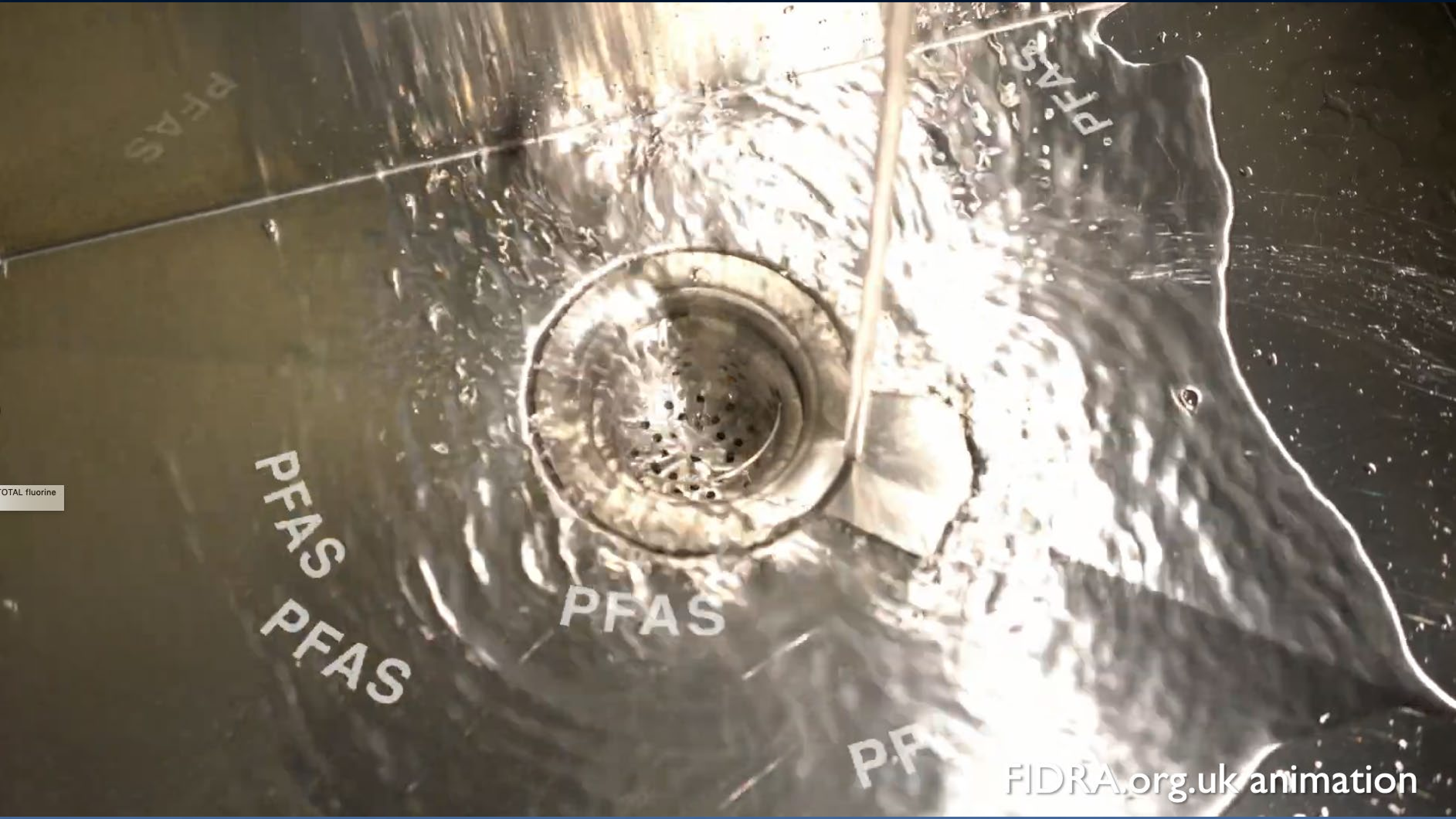
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TOTAL fluorine
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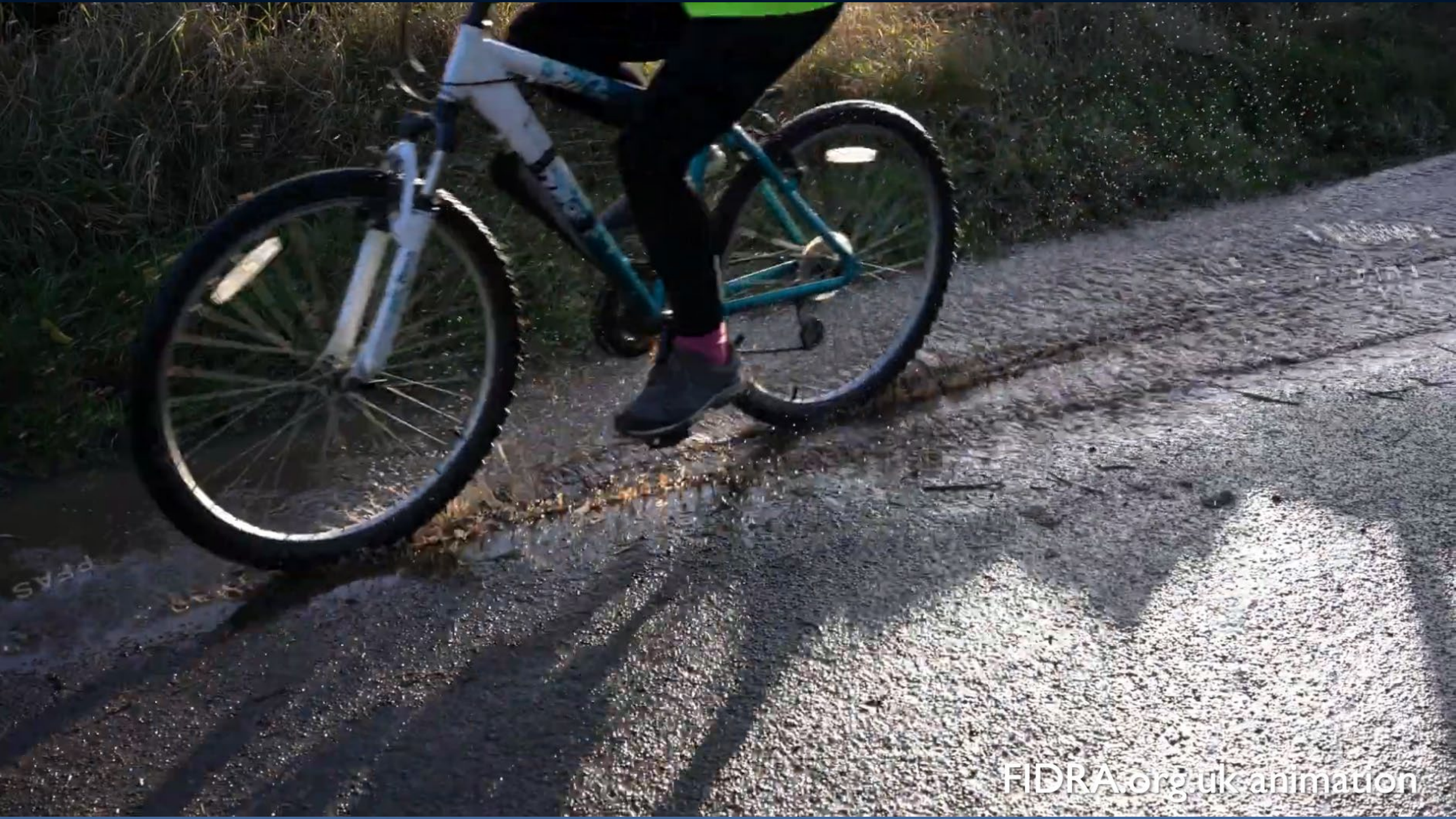
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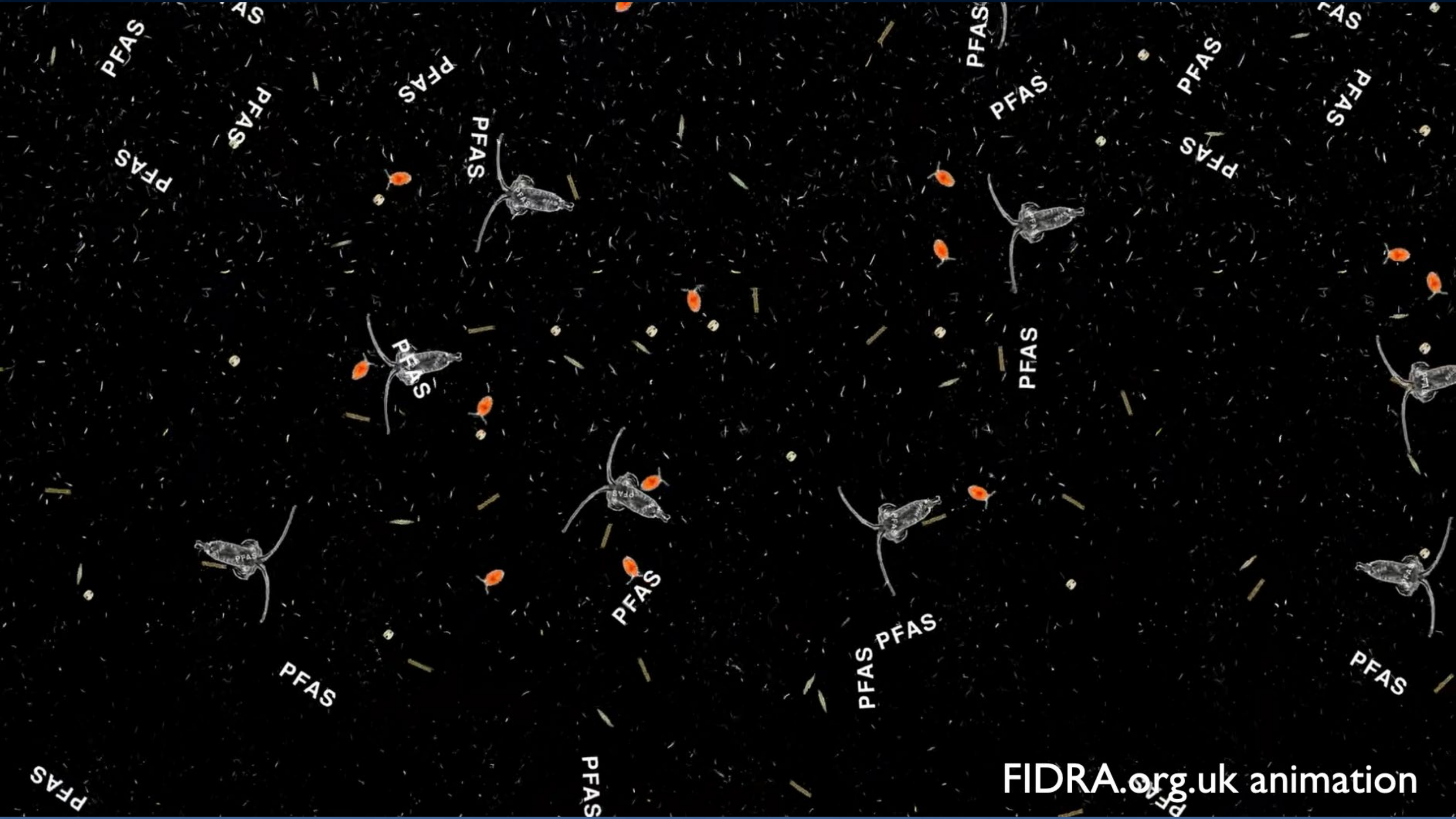
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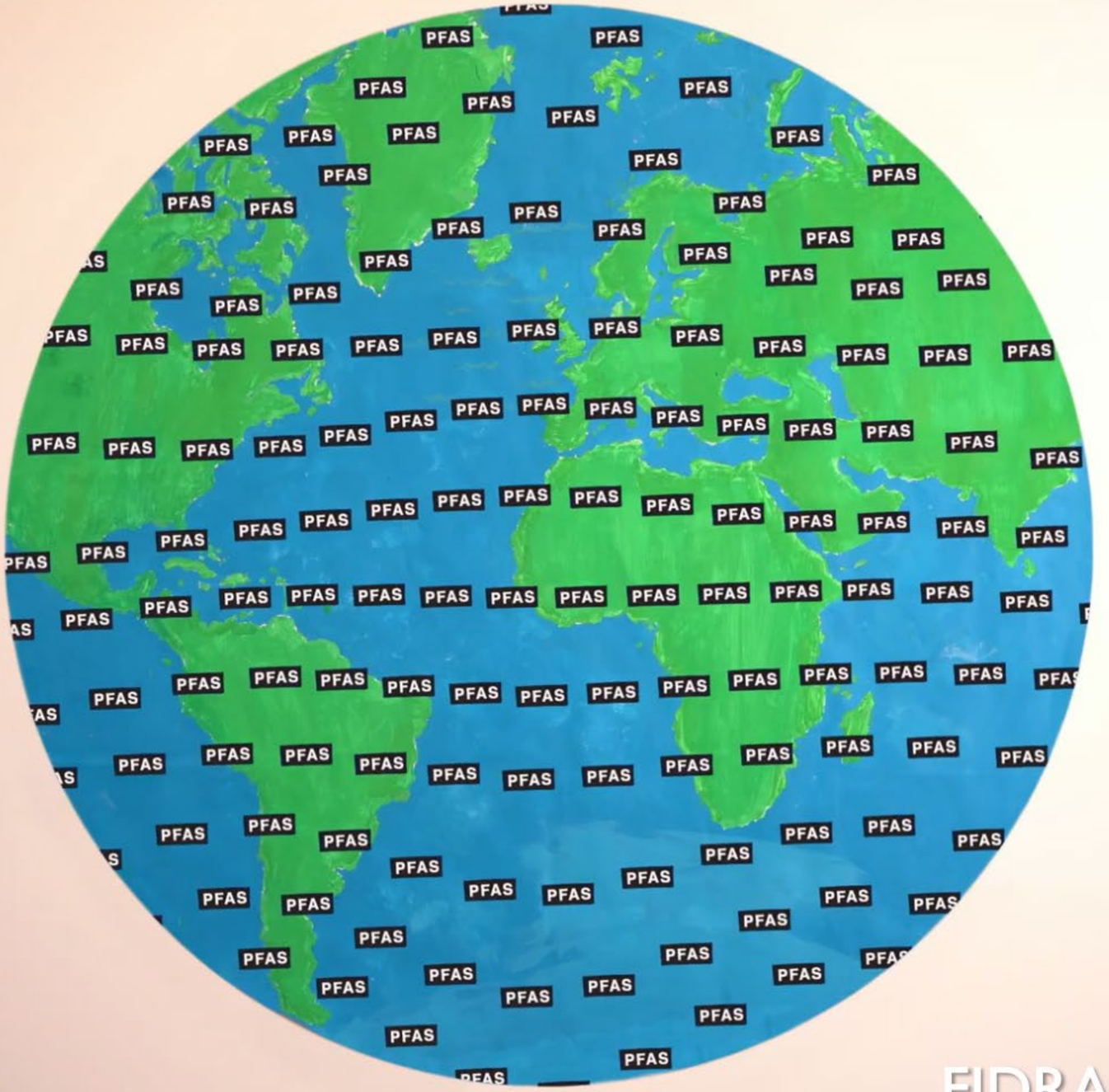

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PFAS

are *everywhere*,

and *in everyone*!

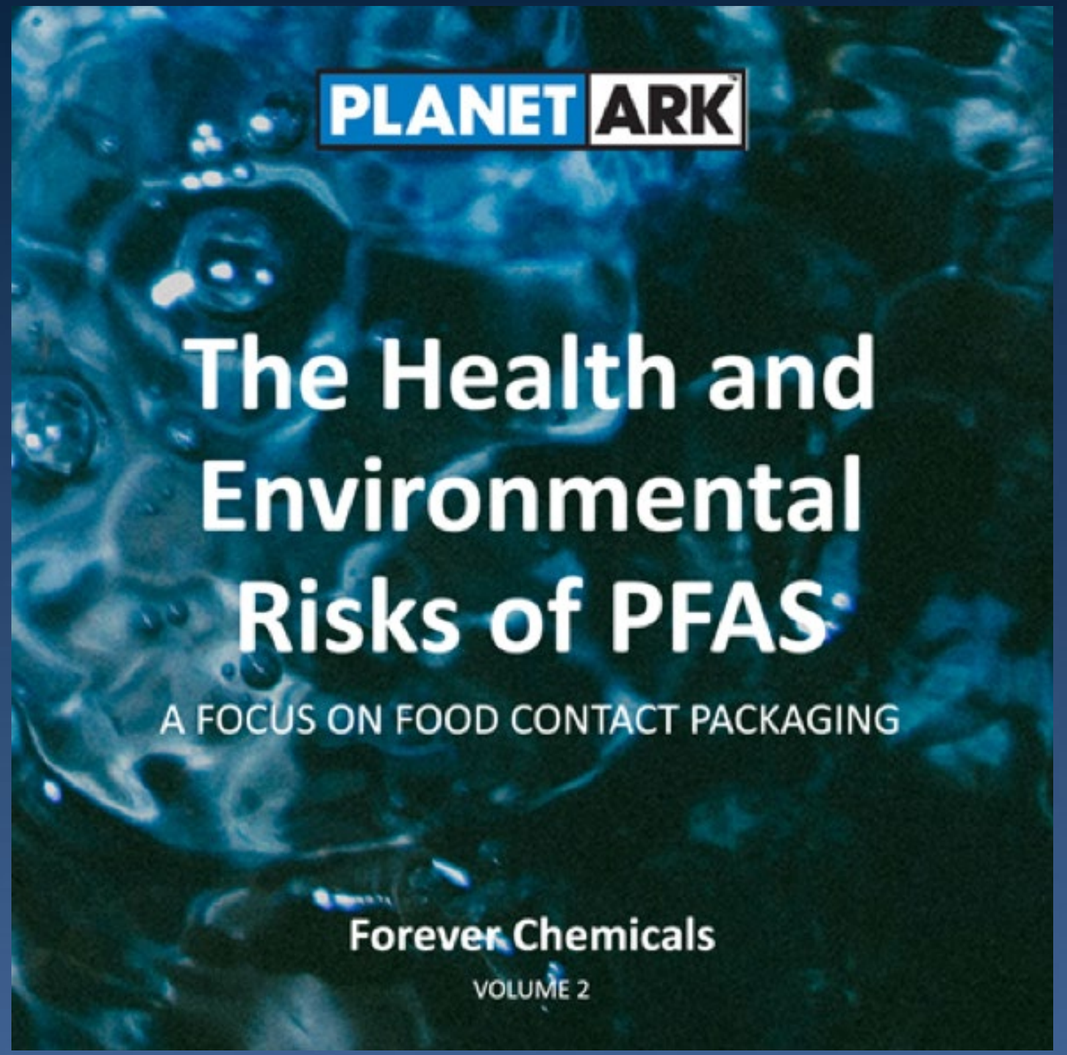
The health and environmental risks of PFAS — see our review

Health risks

- linked to cancers
- reproductive health problems
- reduced vaccine effectiveness
- neurodevelopmental impairment
- elevated cholesterol

Environmental risks

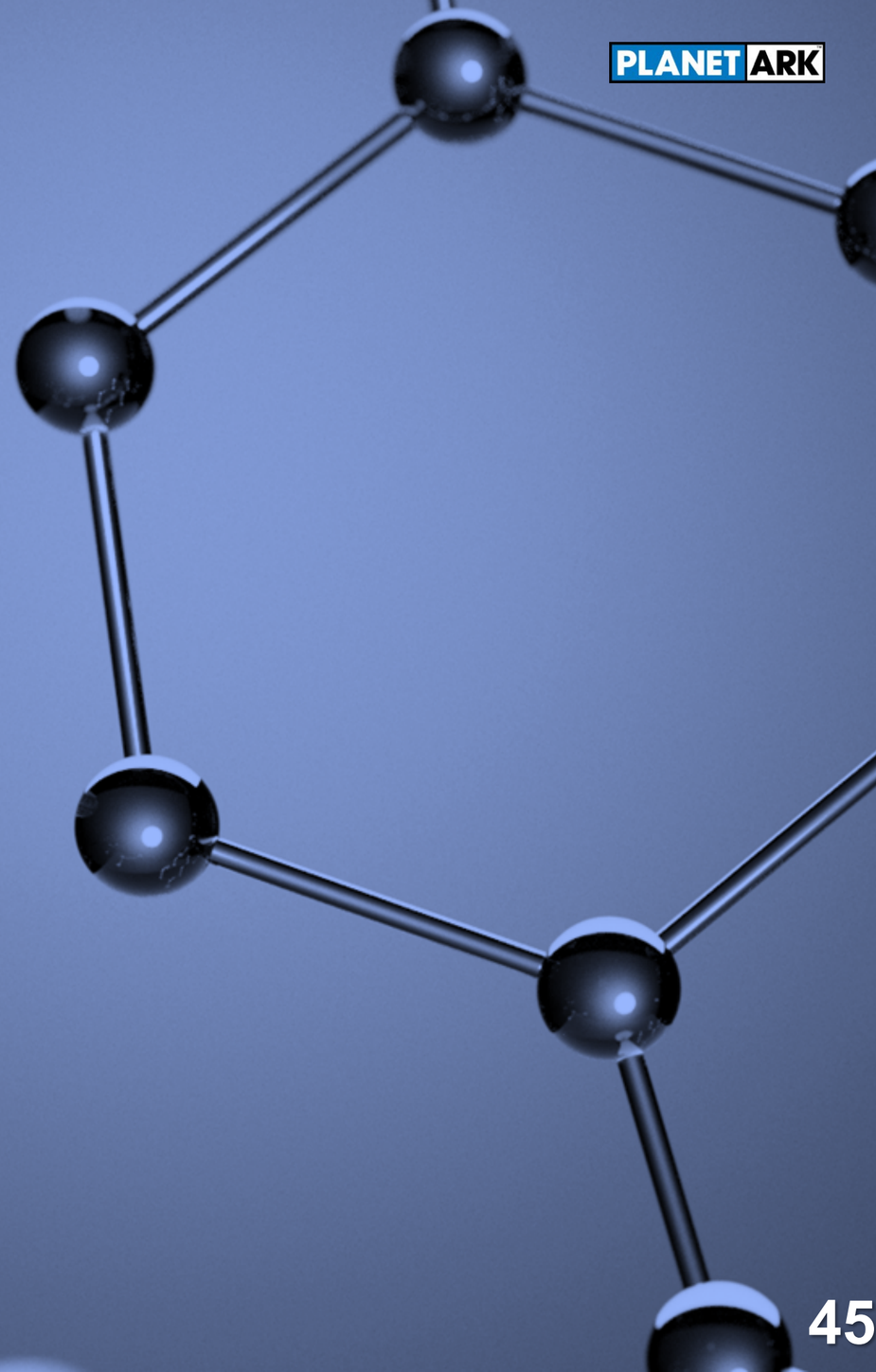
- persistent, mobile, bioaccumulative in animals and plants
- toxicity leads to food web disruption



https://bit.ly/39XbMck

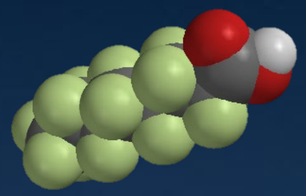
The Precautionary Principle

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken, even if some cause-and-effect relationships are not fully established scientifically.



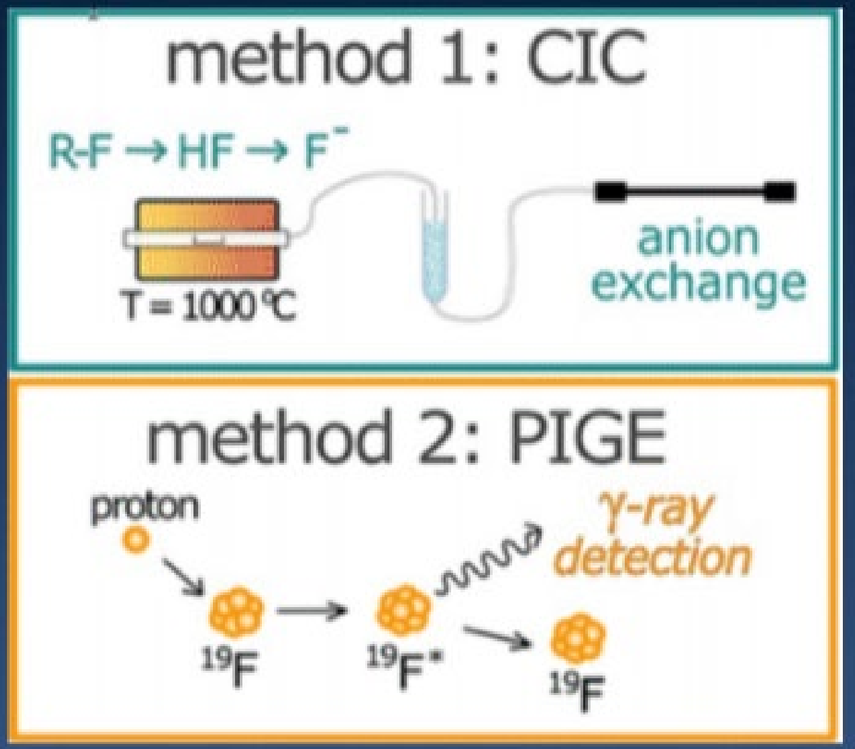
Testing fibre-based food contact packaging

TESTING



Total fluorine concentration

- Combustion ion chromatography (CIC)
- Particle-induced gamma-ray emission (PIGE)



Targeted PFAS identification and quantification

- liquid chromatography–tandem mass spectrometry (LC–MS/MS)
- gas chromatography–mass spectrometry (GC– MS)

Our study of PFAS in fibre-based food contact packaging

TESTING of 74 food packaging samples

Total fluorine concentration

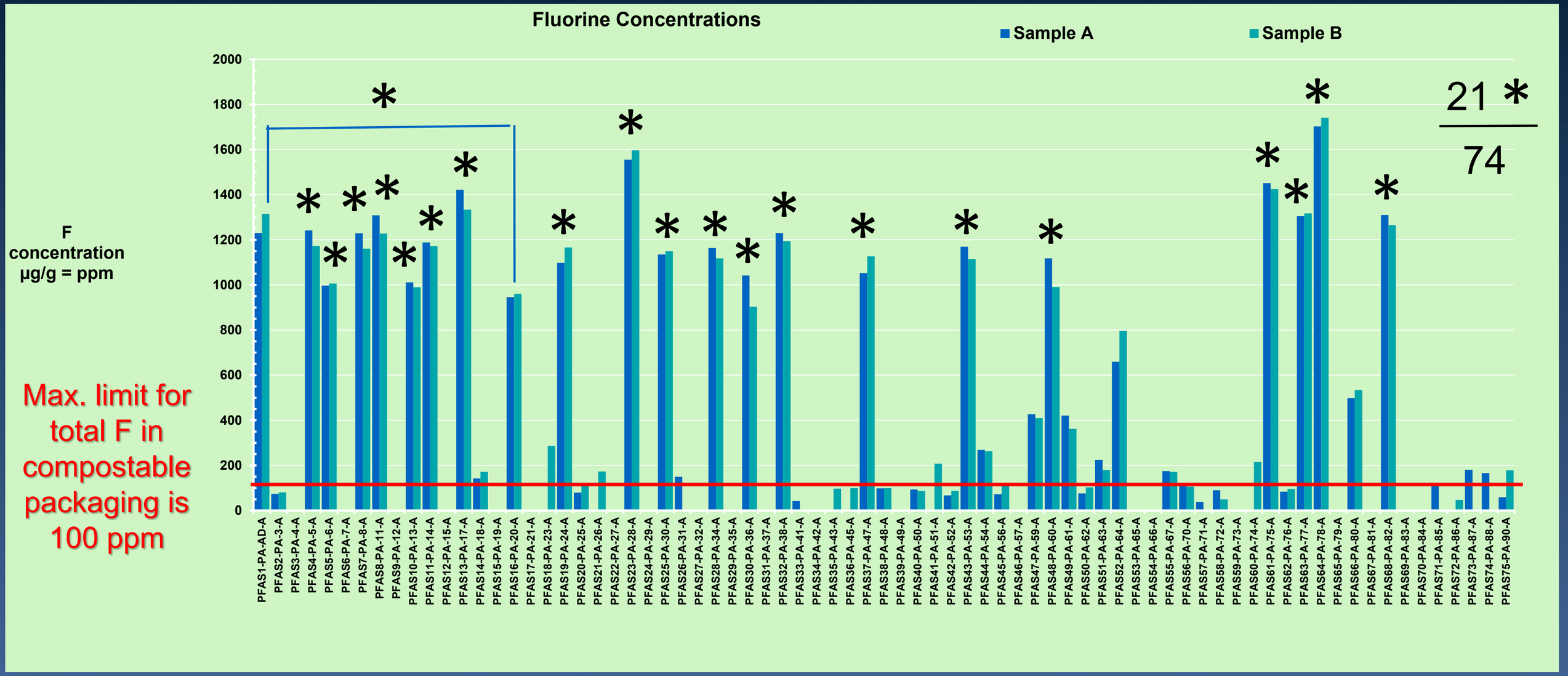
- Particle-induced gamma-ray emission (PIGE) at ANSTO, Lucas Heights, Sydney

Targeted PFAS identification and quantification

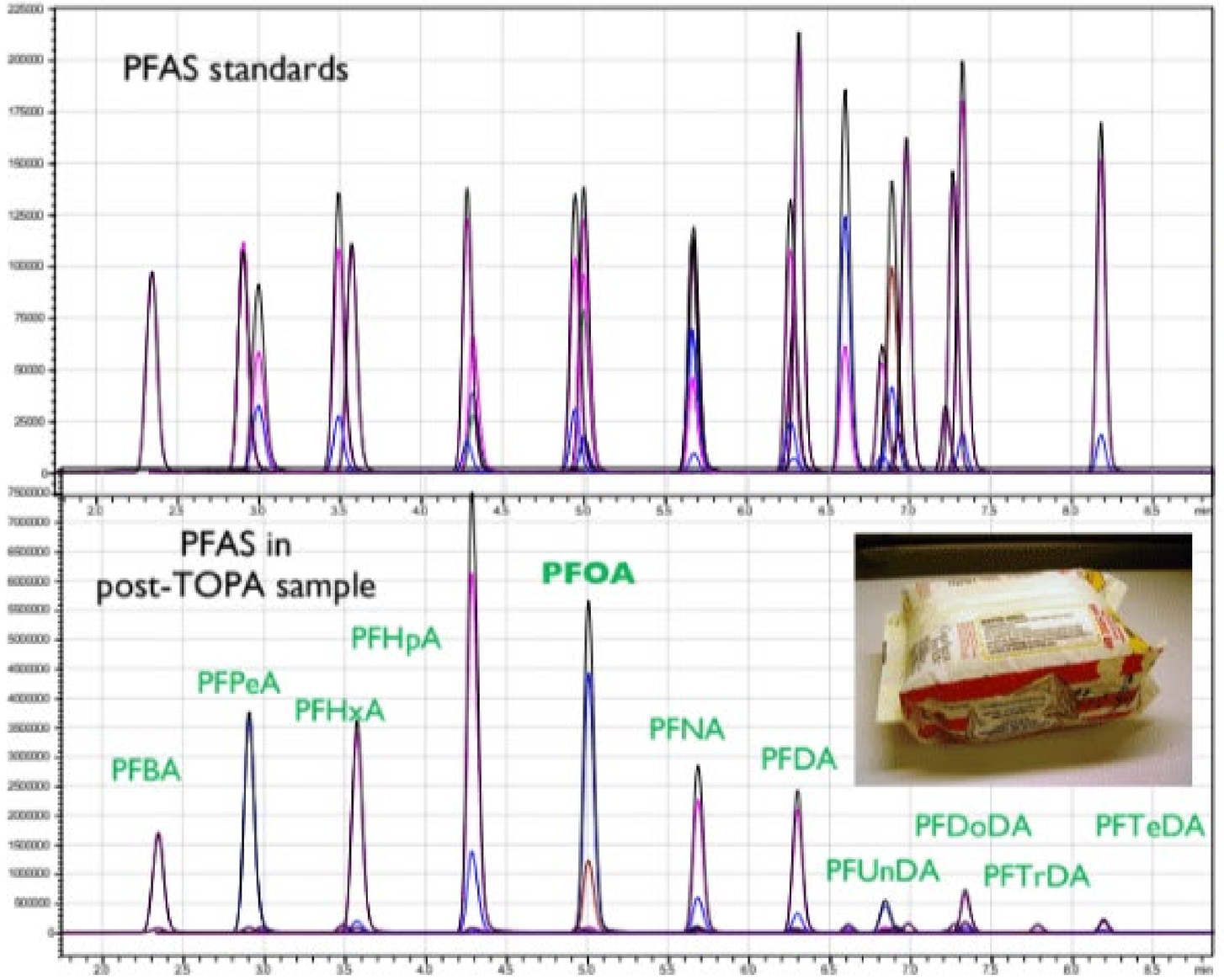
- liquid chromatography–tandem mass spectrometry (LC–MS/MS) at Envirolab

https://documents.packagingcovenant.org.au/public-documents/PFAS+in+Fibre-Based+Packaging

ANSTO PIGE data showing TOTAL fluorine concentrations



Targeted PFAS identification and quantification (LC-MS/MS)



Compounds	Acronym
Perfluorobutane sulfonic acid	PFBS
Perfluoropentane sulfonic acid	PFPeS
Perfluorohexane sulfonic acid (short suite)	PFHxS
Perfluoroheptane sulfonic acid	PFHpS
Perfluorooctane sulfonic acid (short suite)	PFOS
Perfluorodecane sulfonic acid	PFDS
Perfluorobutanoic acid	PFBA
Perfluoropentanoic acid	PFPeA
Perfluorohexanoic acid	PFHxA
Perfluoroheptanoic acid	PFHpA
Perfluorooctanoic acid (short suite)	PFOA
Perfluorononanoic acid	PFNA
Perfluorodecanoic acid	PFDA
Perfluoroundecanoic acid	PFUnDA
Perfluorododecanoic acid	PFDoDA
Perfluorotridecanoic acid	PFTrDA
Perfluorotetradecanoic acid	PFTeDA

Top total F and PFAS results from Planet Ark/APCO study

Sample Description	Average Total F (ppm)	Post-TOPA Total PFAS (ppm)
natural large snack ctn	**1722**	**39.8**
Butter wrap	**1576**	< detection limit
oval plate B-pl-16-1 (slv)	**1438**	**29.4**
bowl - darker bagasse	**1378**	**12.7**
natural dinner large slv	**1311**	
Salted butter wrap	**1287**	
Bagasse bakery tray	**1268**	**13.0**
light-coloured rectangular take-out container	**1212**	**11.9**
square clamshell bagasse, light-coloured	**1207**	**26.1**
Small Trays x 5 wheat stalk pulp	**1195**	**23.8**

Note the considerable gap between the total fluorine concentrations and the total identified PFAS concentrations.

What are the missing PFAS?

Alternatives to PFAS in fibre-based food contact packaging

MATERIAL	ITEMS AFFECTED
Bamboo or palm leaf	
Biowax-coated paper	
Polylactic acid–coated paper	
Paper coated with unknown alternatives	

Bags, wrappers, and liners | Bowls | Plates | Take-out containers

Source: Cancer Free Economy Network.

Alternatives to PFAS as outlined in the APCO Action Plan:

Physical barrier (non-chemical alternative that confers repellence): elephant grass, cellulose pulp, bamboo, vegetable parchment, Clay, wheat straw, microfibrillar cellulose (MFC), cellulose nanocrystals (CNCs), cellulose nanofibrils (CNFs).

Chemical alternative (a 'drop-in substitute' that performs the same chemical function): NGP plus additives, silicone materials, TopScreen formulations, Chitosan, copolymer dispersions, aqueous wax dispersions, starch, stone plus resin, hydroxyethyl cellulose (HEC), Polyvinyl alcohol (PVOH), Alkyl ketene dimer (AKD), Alkyl succinic anhydride (ASA).

Sustain paper: a safe alternative for greaseproof paper

Alliance paper

- ✓NO PFAS or any other chemicals of concern
- ✓Standard paper with a corn starch layer
- ✓Compostable

Alternatives to PFAS in fibre-based food contact packaging

Table 1. Physical and chemical alternatives to PFAS paper and board used in food packaging based on grease and water barrier performance identified in this study.

Product Category	Physical alternatives	Chemical alternatives
Baking paper	NGP	NGP plus additives*, silicone materials
Food trays/boats	Elephant grass, cellulose pulp	TopScreen™ formulations, clay
Boxes e.g. for French fries	Bamboo**	TopScreen™ formulations, biowax
Wrappers and liners (cold food)	Vegetable parchment	TopScreen™ formulations, biowax
Wrappers and liners (hot food)	None identified	TopScreen™ formulations,
Clamshells & take out containers	None identified	TopScreen™ formulations,
Pet food	NGP	TopScreen™ formulations.
Unattributed FCMs	Clay, wheat straw, MFC, CNCs, CNFs.	Chitosan, copolymer dispersions, aqueous wax dispersions, starch, stone plus resin, HEC, PVOHs, AKD, ASA.

Key:
** Both a physical and chemical alternative;*
*** Some products are marketed as bamboo, but are in fact composite plastic FCMs, since they consist of melamine plastic with a bamboo filler (EWGFCM, 2019[31]). Such composite plastic products are not truly non-plastic alternatives.*

OECD (2020), *PFASs and Alternatives in Food Packaging (Paper and Paperboard) Report on the Commercial Availability and Current Uses,* OECD Series on Risk Management, No. 58, Environment, Health and Safety, Environment Directorate, OECD.

Key points regarding PFAS alternatives

- Do you need ALL the performance features of PFAS for a specific product? Sometimes the standards are developed around a particular chemistry rather than required performance
- essential to avoid using or developing ‘regrettable substitutes’
- 12% to 32% additional cost is main problem, decreasing with scale-up

https://www.oecd.org/chemicalsafety/portal-perfluorinated-chemicals/

Key conclusions & recommendations from our study

- 30% fibre-based food packaging we tested contained very high fluorine concentrations due presumably to intentionally-added, *unknown PFAS*.
  This is incompatible with composting and recycling in a circular economy.
- Potential health impacts for humans are still based only on correlational epidemiological studies. However, studies based on animals, exposed populations and *in vitro* work strongly suggest we should use *the precautionary principle*.
- *Alternative PFAS-free treatments exist*, and others are being developed, and these should be assessed for impact and regulated.
  The estimated 12 – 32% increase in costs will decrease with scale.
- Both PIGE and CIC methods can measure total fluorine concentrations quickly, efficiently, and cheaply for determining PFAS in food packaging.
  A maximum 100 ppm concentration could be used as a compostability limit.
  Planet Ark could assist in developing a testing and certification system.

Any questions?

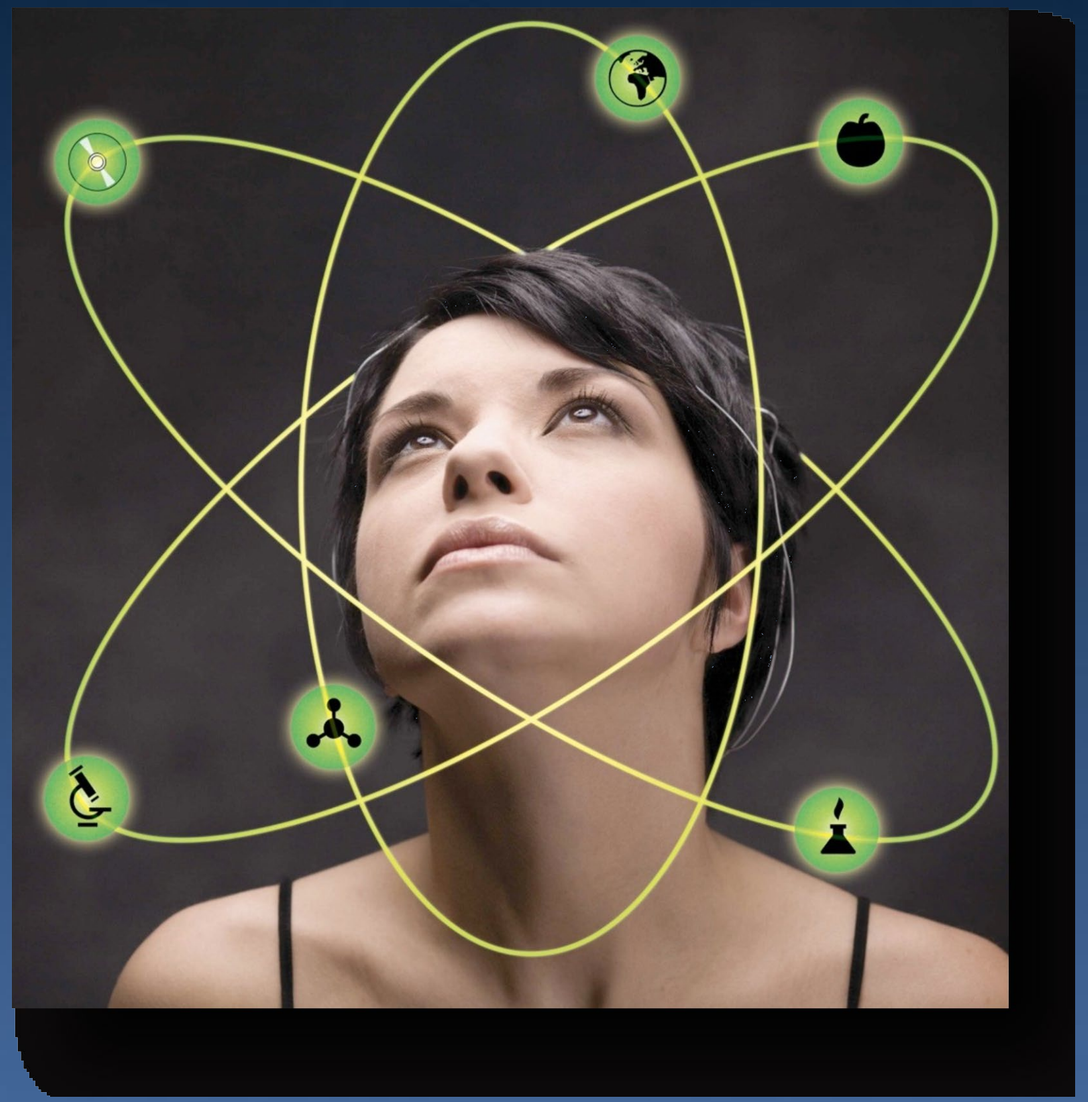
Contact:

Paul Klymenko

paul@planetark.org

Roy Tasker

roy@planetark.org



Next Steps:
APCO Action Plan to Phase out PFAS in Fibre-based Food Packaging

Action Plan Overview

Delivered by APCO.

Supports businesses to voluntarily phase out intentionally added PFAS in fibre-based food packaging by July 2024.

Follows a framework to drive action, providing a supported pathway for businesses, including:

- **A set threshold**, based on international standards, indicating intentionally-added total organic fluorine (indicative of PFAS)
- **How to test** for total organic fluorine
- **How to report** on the total organic fluorine levels present in packaging in scope
- Considerations for selecting alternatives

Developed in consultation with governments, industry and key relevant bodies.

Action Plan – Product Scope

The product scope is fibre-based food contact packaging.

The following applications are a particular focus (but not limited to):

Sector	Product examples	Packaging examples
Pre-packed foods	Baked goods – cakes, muffins, biscuits	Boxes, muffin cases, greaseproof paper
	Butter	Wrap
	Microwave popcorn, crisps, cake mix, sweets	Bags
Food service	Pizza, hot chips, hamburgers	Boxes, cups, clamshells, wrap
	Sandwiches, salads	Paperboard wedges, boxes, wrap
	Various hot and cold foods	Plates, bowls, boats, trays

Framework to Drive Action

	Action	When
Identify problem	Determine if your packaging is in scope	Aug 2022
	Determine the process and conduct testing for PFAS in your packaging	Dec 2022
Identify opportunities and analyse	Document all barriers and opportunities for alternatives using the alternatives criteria checklist	Early 2023
	Assess the viability of alternatives: eliminate, redesign, replace or innovate	Dec 2023
Collaborate and innovate	Collaborate with supply chains, business and community partners or industry networks to find/implement a solution.	Jan 2023 - 2024
Phase out intentionally added PFAS in fibre-based food packaging.		End 2023-Mid 2024
Communicate and report	Report on the PFAS levels present in your fibre-based food packaging in December 2022 and December 2024.	Testing 1: Dec 2022 Testing 2: 2024
Expand (not in scope of Action Plan currently)	Potential for industry to lead a focus on PFAS in plastic packaging and continue reporting beyond 2024 to monitor successes.	Post-2024

Q&A

Jayne Paramor
APCO Sustainability Manager

Keith Chessell
AIP Education Team

Dr Roy Tasker
Planet Ark Chief Scientific Advisor

Paul Klymenko
Planet Ark CEO

Next steps

APCO's Action Plan to Phase out PFAS in Fibre-Based Food Packaging will be **released in August 2022**.

Businesses who use, manufacture or sell fibre-based food packaging can begin to identify the scope of testing required.

Brand Owners can reach out to their packaging suppliers/manufacturers to determine if testing has been done, and to familiarise the relevant supply chain members with the Action Plan.

Thank you

Any questions? Get in touch!

Web: www.apco.org.au
Email: apco@apco.org.au
LinkedIn: www.linkedin.com/company/australian-packaging-covenant-organisation/

AUSTRALIAN PACKAGING COVENANT ORGANISATION