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AND ENVIRONMENT

CCIM PFAS Working group report

– DGEM DPPC MRBC

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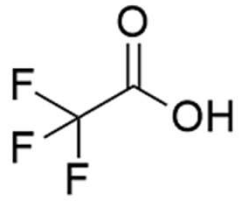
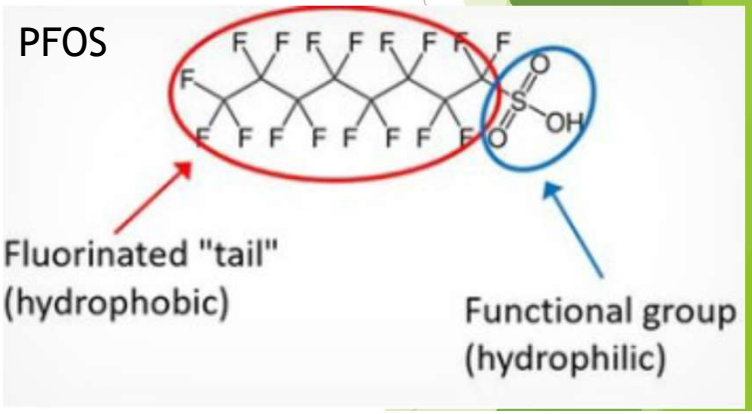
PFAS: Per- and Polyfluoroalkyl substances

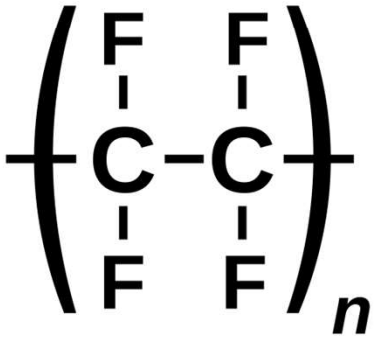
PFASs are defined as fluorinated substances that contain at least one **fully fluorinated methyl or methylene carbon atom (without any H/Cl/Br/I atom attached to it)**, i.e. with a few noted exceptions, any chemical with at least a perfluorinated methyl group ($-CF_3$) or a perfluorinated methylene group ($-CF_2-$) is a PFAS.

- Man-made chemicals
  - Produced since 1950s
- Defined by Carbon Fluor bond (C-F)
  - One of the strongest chemical bonds
  - → "forever chemicals"
- Large group of substances
  - Over 4000 according to OECD

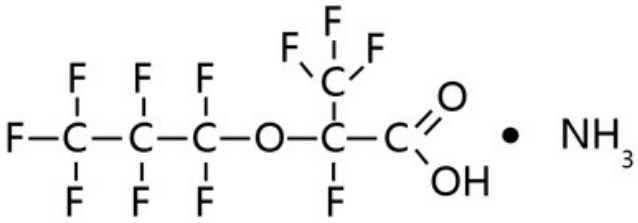


trifluoroacetic acid





PTFE (Teflon)



GenX Chemical Structure

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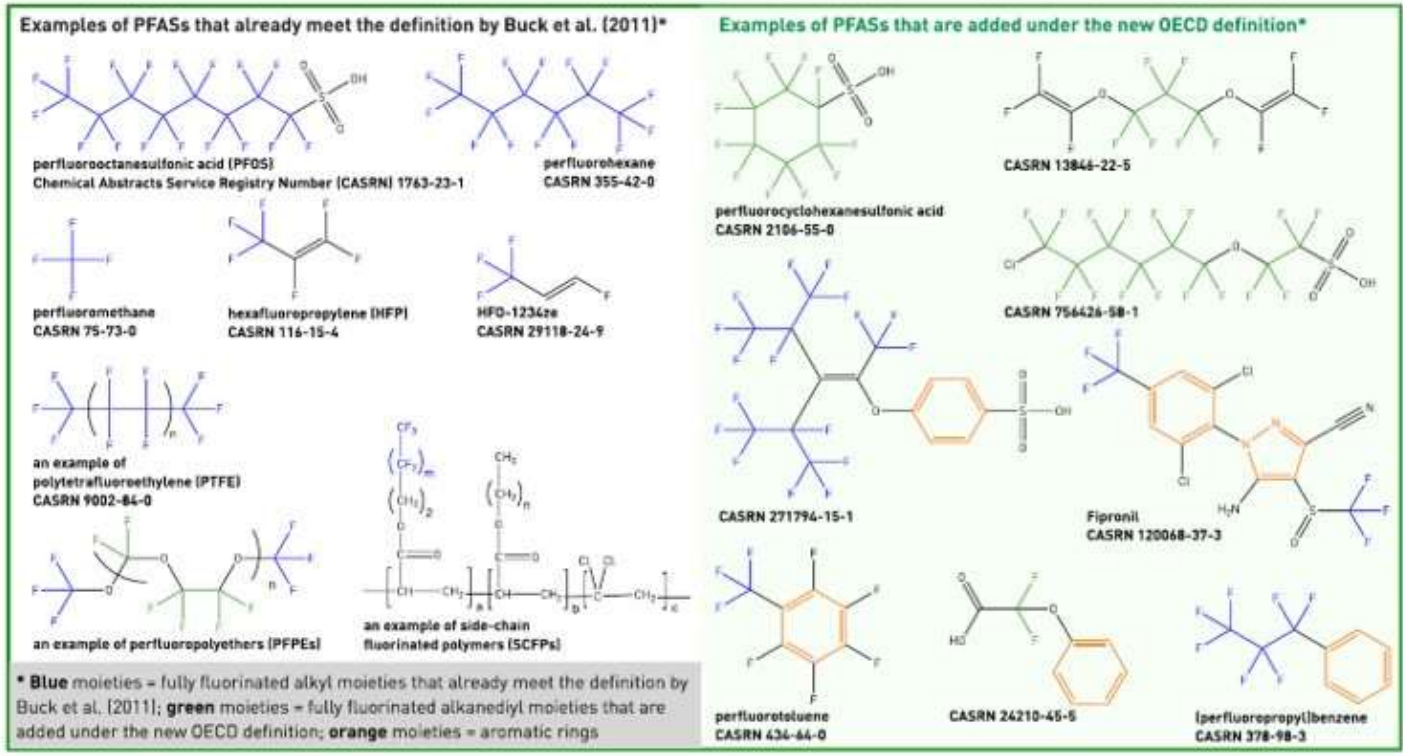
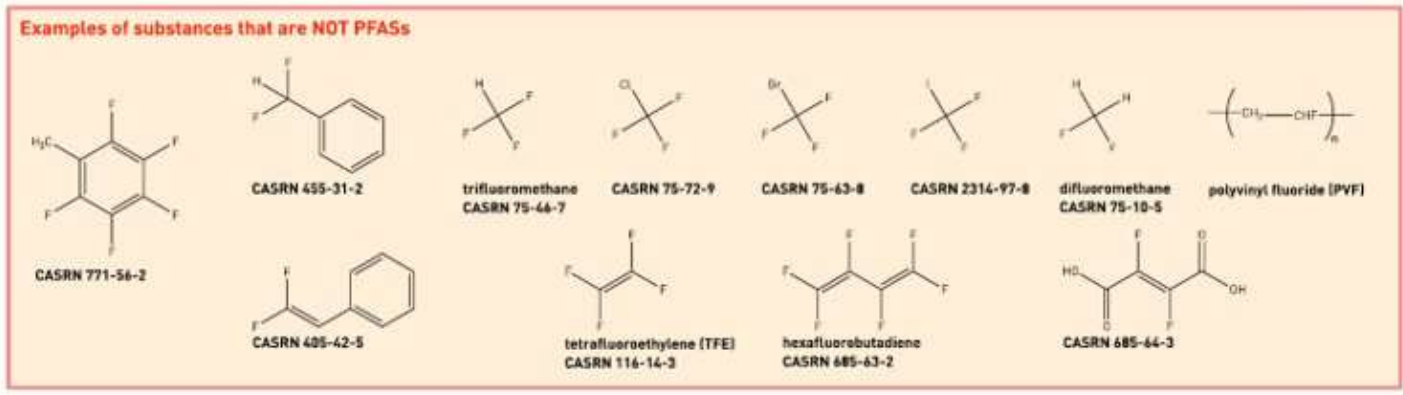
- Definition changed over the years





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Very large group of substances

- Very large group of substances
- Over 4000 substances
- Several large groups
  - Classically known PFAS (PFOS, PFOA, etc.)
  - Fluorinated polymers
    - Fluoropolymers
    - Side-chain fluorinated polymers
    - Fluorocarbons
  - F-gases
  - …

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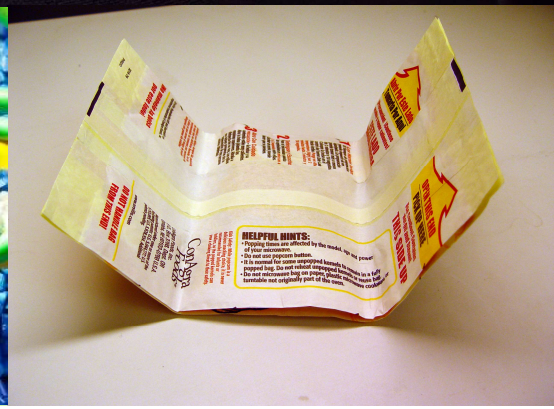
PFAS use

- C-F bond is very strong → very stable molecules → interesting characteristics
  - Stability and thermo resistance (can withstand high temperatures)
    - Electrical wire coating
    - Use in Personal Protection equipment (fire fighting gear)
    - Fire fighting foams
  - Water and grease repellent characteristics
    - Outdoor gear like tents, shoes and raincoats (for example Gore-Tex)
    - Non-stick pots and pans (Tefal)
    - Food contact materials (popcorn bags, pizza boxes, …)



Essential uses?

Airconditioning | Fire extinguishers | Heat pumps | Refrigeration

PLASTICS EUROPE
Enabling a sustainable future
Fluoropolymers Product Group

ONE-OF-A-KIND POLYMERS

Fluoropolymers are unique chemical substances used across numerous technologies, industrial processes and everyday applications from the aviation industry to transportation, medical devices and energy production and technical apparel.

With a unique set of properties, they are durable, chemically inert and mechanically strong. Fluorpolymers help to keep us safe and enable innovation.

WHY DO WE USE FLUOROPOLYMERS?

- Ensure , reliability and performance across a variety of sectors
- Low-risk polymer for human health & environment
- Help drive EU industry competitiveness and innovation
- Critical to numerous technologies enabling the Green Deal, reducing waste and emissions
- Few, if any, viable alternatives

Uses of fluoropolymers

- Promoting sustainable and smart mobility through electric vehicles.
- Extending the lifespan of medical equipment and devices, reducing the need for replacements, risk of failure and cross infections.
- Enabling a data driven economy though the manufacturing of microprocessors and semi-conductors.
- Facilitating the Renovation Wave and the construction of energy efficient buildings.
- Driving innovation and helping decarbonise the aviation industry.
- Assisting the chemicals industry in preventing corrosion in harsh environments.
- Ensuring food and pharmaceuticals remain fresh and uncontaminated.
- Protecting workers in professional protective and high-performance clothing.

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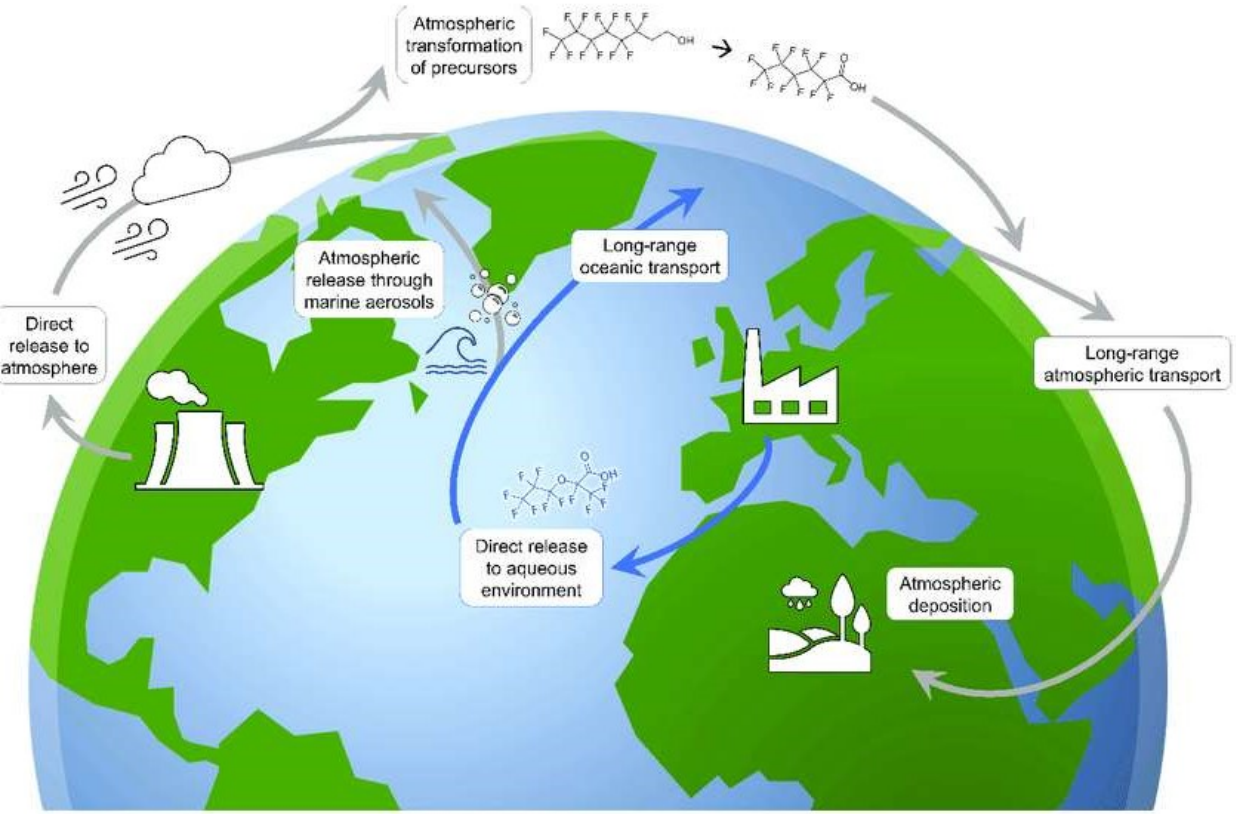
Environmental fate and exposure to PFAS

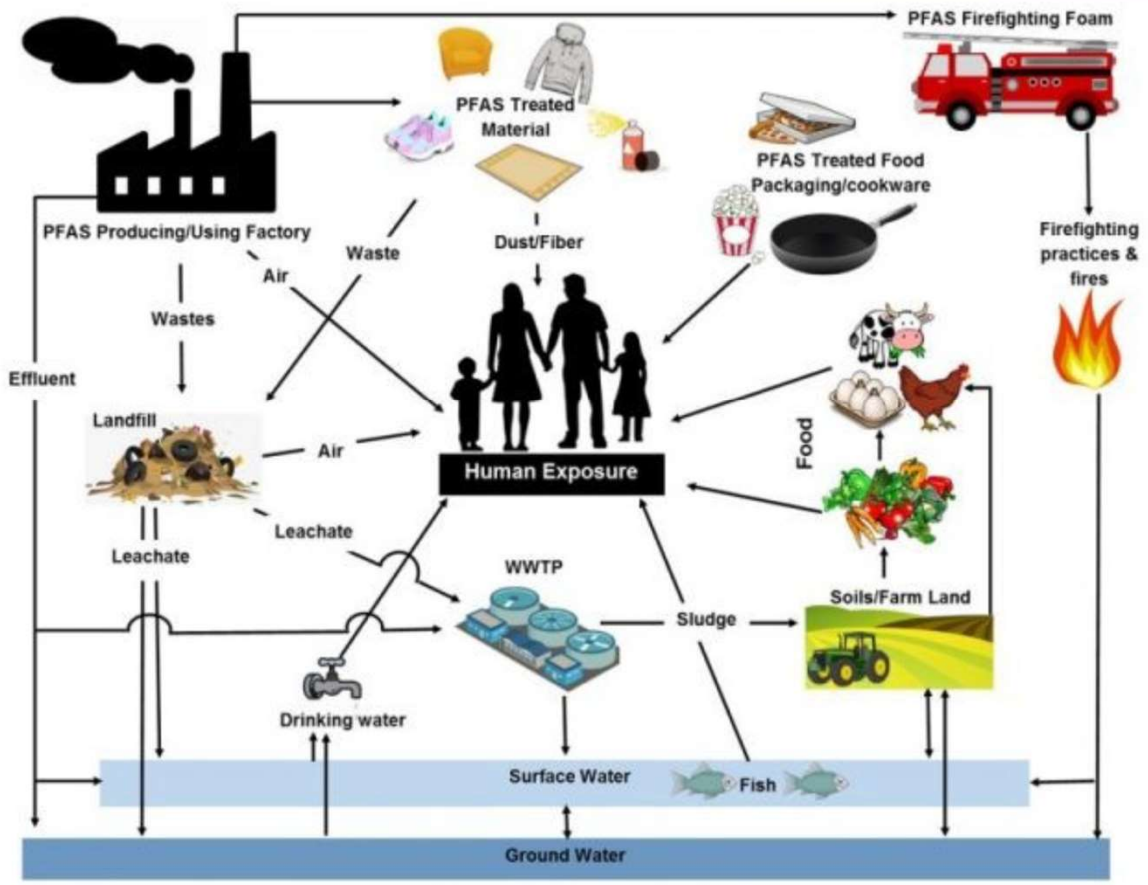


- Many different points of exposure to humans.

Source: Brase et. al 2021

Environmental fate and exposure to PFAS

- C-F bond is extremely persistent in the environment
  - Irreversible environmental contamination
  - Very hard to remove from water, soil and air
- Widespread use in consumer products (textiles, food contact materials, cosmetics)
- Landfill leachate
- Incomplete incineration → release of PFAS to atmosphere
- …

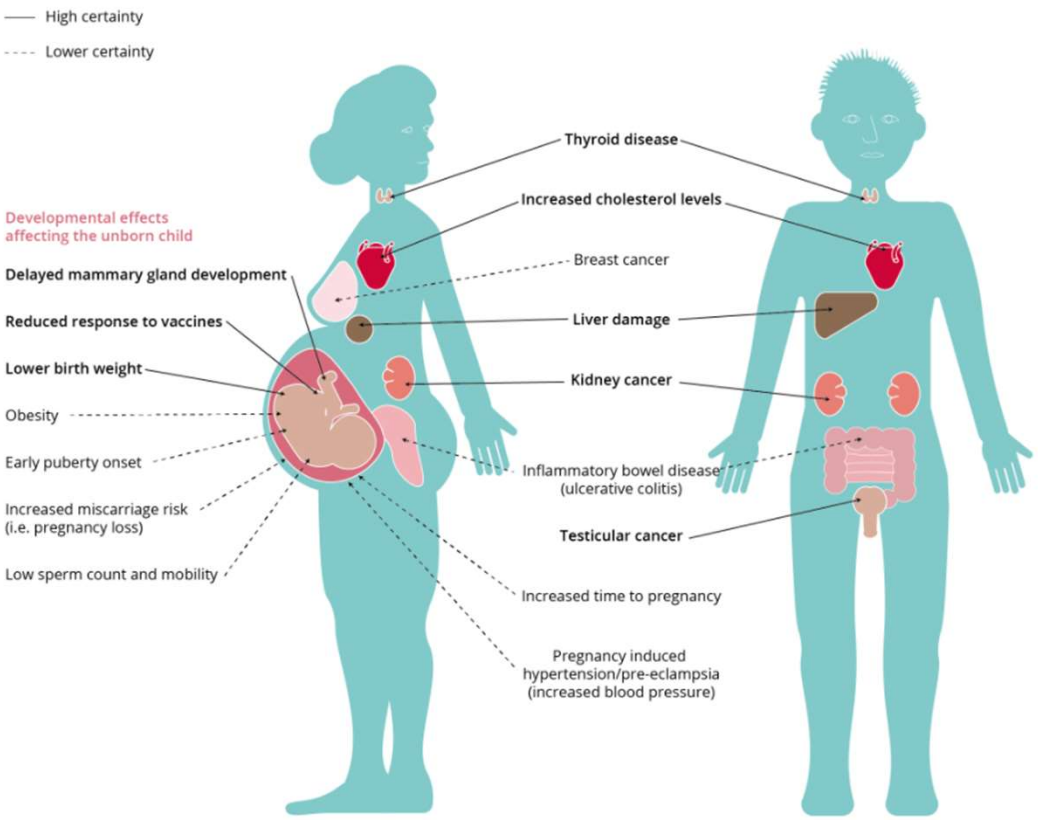


Human Exposure and sources of PFAS
Image: DWP, adapted from Oliaei et al. 2013.

PFAS Hazards

- Overarching concern: persistence
- Health concerns defined for some PFAS are:
  - Bioaccumulation
  - Carcinogenicity
  - Toxicity to reproduction
  - Effects on immune system
    - link with COVID vaccine efficiency
  - …
- Only a few PFAS are extensively studied

- Emerging concerns
  - Low-dose effects
  - Non monotonic dose response
  - Mixture effects



Sources: US National Toxicology Program, (2016); C8 Health Project Reports, (2012); WHO IARC, (2017); Barry et al., (2013); Fenton et al., (2009); and White et al., (2011).

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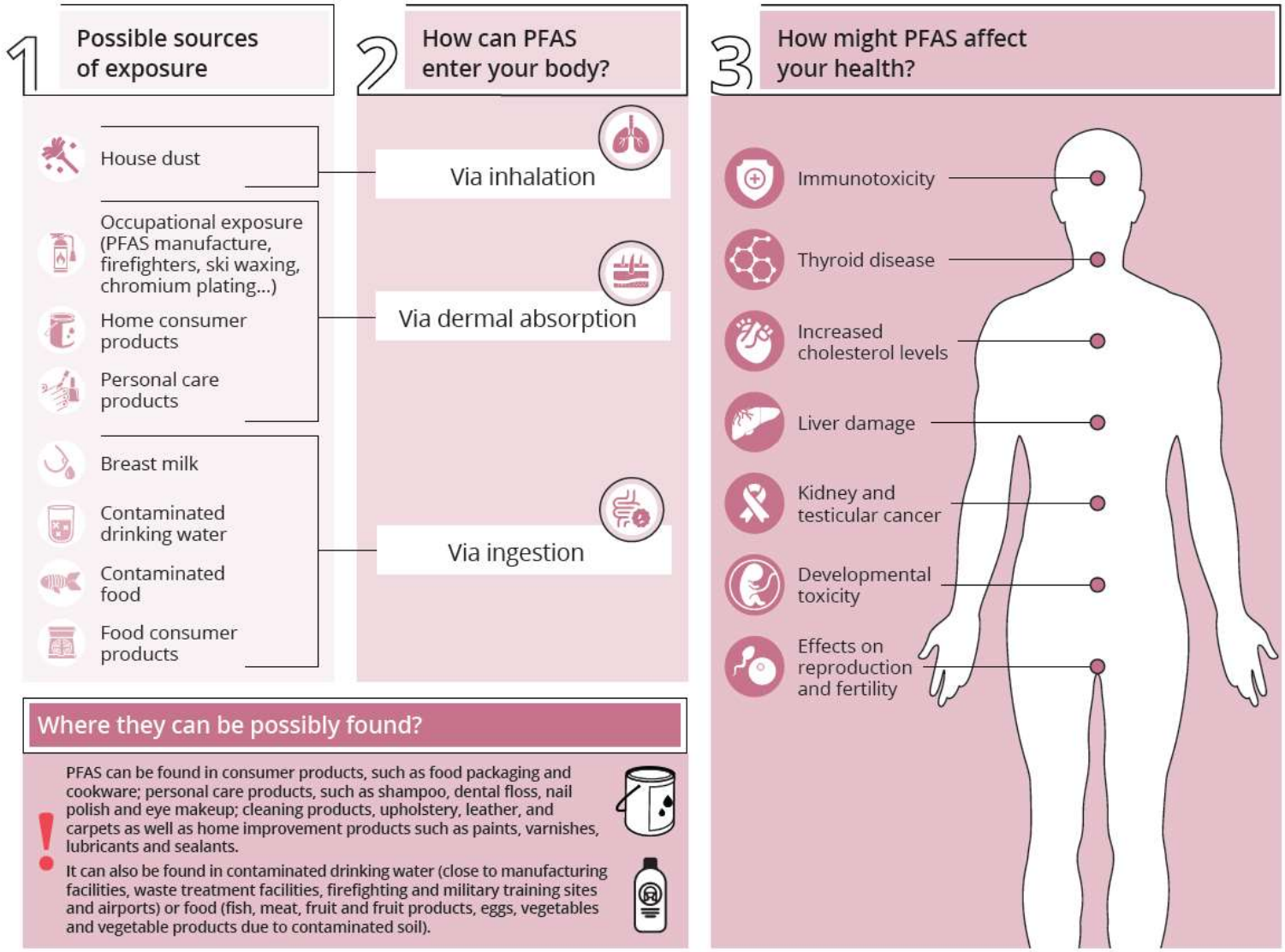
Figure 1. Overview of exposure sources, pathways and health effects associated with PFASs



- Source: HBM4EU Policy brief

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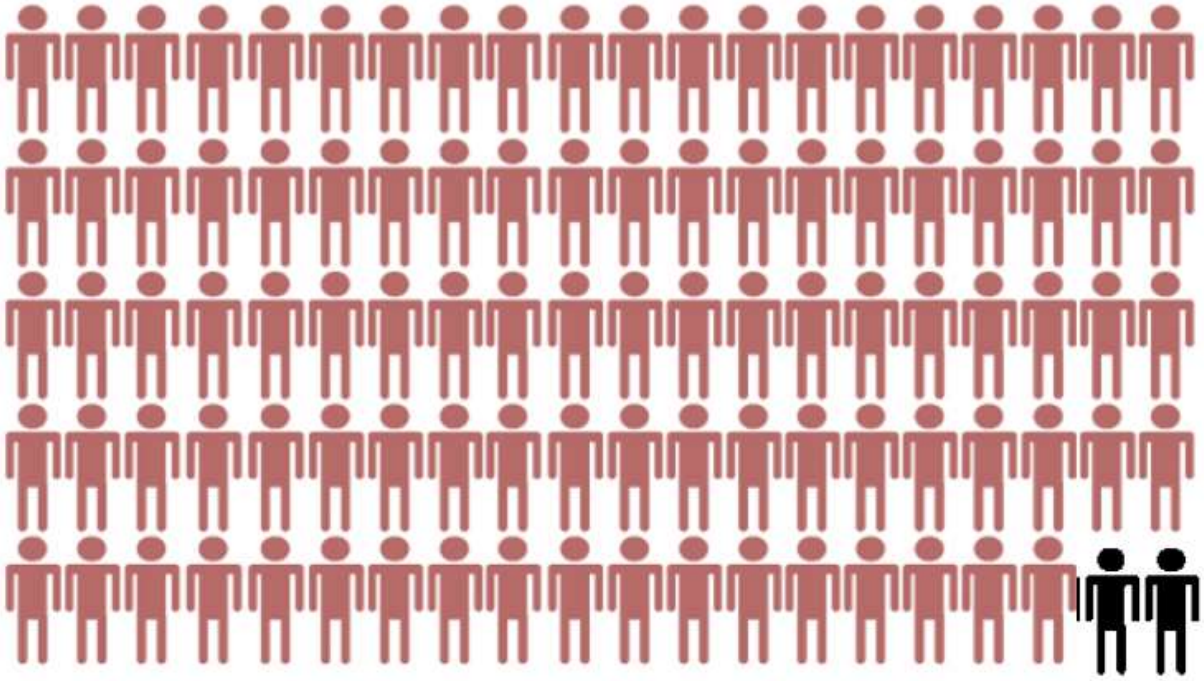
- PFAS detected in blood serum in approximately 98% of the population
- HBM show large portion exceeding the guideline values
- PFOS and PFOA levels are decreasing
  - Not the case for other PFAS!



Detectable serum PFASs

Non-detect

- Body of knowledge is increasing
  - But still a lot of knowledge gaps!
  - Impossible to fill in all gaps in a reasonable time

PFAS tox database

The numbers in the heat map indicate the number of studies, not the number of significant effects. Click to select studies, click again to deselect.

Colors correspond to the study type: human in green, animal in blue, in vitro in orange.

PFAS	Total	Metabolic & Digestive System	Body Weight, Size & Growth	Endocrine System	Systemic/ Nonspecific/ Other	Reproductive System	Cell Toxicity / Mortality	Circulatory System	Nervous System & Behavior	Immune System	Urinary System	Respiratory System	Musculoskeletal System	Genotoxicity	Sensory System	Cancers
PFNA	631	119 63 32	16 57 1	129 49 35	22 29 40	133 20 8	1 26 47	62 9 12	43 15 4	46 14 4	41 9 3	23 1	8 9	5 3 6	15 4 1	14 1
PFHxS	578	125 24 23	16 33 1	125 19 37	23 14 29	134 10 3	1 15 35	61 8 8	39 14 8	49 8 1	41 7	21 3 1	8 6 2	7 4	15 1	16
PFDA	506	70 100 36	88 71	75 35 31	9 55 47	88 14 3	17 49	29 14 11	23 13 3	30 22 5	20 16 1	16 3 1	5 7	2 4 7	9 1	10 2 3
PFUnDA	297	54 22 19	67 28	59 15 25	10 7 18	60 9 1	8 22	26 6 7	13 7 2	17 8 2	11 4 1	13 1	2 4	1 1 9	9 1	9 1
PFAS mix	204	40 35 11	39 31	49 24 14	5 22 10	29 15 2	2 19 18	12 14 1	7 17 2	9 12 1	7 9	5 4	4 7	2 4	4 2	9 2
PFDoDA	203	20 26 18	29 28	29 17 24	5 12 28	32 14 3	8 23	7 4 7	9 8 2	12 4	6 4 1	7 2 1	1 5	2	6 1	6 1
PFBS	150	10 18 19	12 21	14 13 28	5 18 19	16 15 2	21 25	3 9 7	4 18 4	5 5 2	5 5 1	6 2 2	1 3 1	4 3	2 6	3 1
PFHpA	143	25 14 17	27 9	22 9 20	5 7 17	32 4 1	6 20	12 3 4	5 3 2	8 5 2	3 3 1	4 1	1 1	1	6 1 1	6
PFHxA	120	12 14 26	13 12	10 5 27	11 25	7 8 2	14 29	3 6 7	9 2	2 4 1	5 5 1	4 4	1 5 1	5	1 4 1	2 1
PFBA	99	9 13 22	9 17	6 5 29	2 14 18	7 4 1	13 25	1 6 5	4 2	3 4	5 4 1	1 2	1 3 1	1 2	1 2	1
PFTrDA	90	11 13 7	16 18	14 13 8	2 5 7	13 6	3 5	3 3 2	1 5	3 3	3 3 1	1	4	2 1	2
PFTeDA	67	9 7 12	6 13	5 7 11	2 3 11	4 3 1	2 11	1 1 1	3 1	2 2	3 2 1	3	2	1	1
MeFOSAA	66	15 1	20	15 1	1 1	19	5	10	1	8	1	3	4	3
PFAS + other	59	1 23 7	2 15	4 16 10	16 4	4 10	1 9 10	2 5	2 10 2	4 1	1 2	1	3	3	1	1
PFHpS	58	11 2 1	19 3	15 3 2	1 1 1	20 1	2	5 1	5 1 1	4 2	2 1	3	1	3	1
PFPeA	57	6 5 12	8 5	6 1 11	1 3 18	6 3	4 11	1 1 2	2	1 1 1	3 1 1	2	1 1	1	1 1 1
EtFOSAA	49	11 1	10 1	10	2 2	14	4	9	1	6	1	1	3	4
6:2 Cl-PFESA	44	6 10 4	10 12	6 10 4	1 11 2	8 5	11 5	4 3 2	1 3	3 3	3 2	1	2
GenX	29	10 9	10	8 9	9 7	6 2	10 11	5 2	4	2 1	4	1	2	2	1
PFDS	24	5 5 1	6 4	2 2 2	1 1 2	1 1	1 1	1 1	1	1 2	3 1	1	1 1	1	1
8:2 Cl-PFESA	13	3 1 1	5	3 1 2	1	3 1	2 2	2	1	1	1
6:2 FTSA	11	3 3	5	1	2 1	1	4 1	1	1	1
HFPO-TA	6	1 1 2	1	1 1 2	1	1 2	1	1
ADONA	5	1 1	1	1 2	2	1	2 2	1 1	2	1	1	2	1 1	1
PFO4DA	5	1 2 1	2	1 2 1	2 1	1	1 1	1 1	1	1	1 1	1
PFO5DoDA	5	1 3	2	1 3	3	1	1	1 2	1	2	1 2	1
PFPeS	5	2 1	1	1	1 1	1	1	1	1
Nafion BP2	2	2	1	1	1	1	1	1
PFNS	1	1	1

Filters

Refresh page to reset all filters

Study Type

Click for study type specific histograms, hover for study counts

human | animal | in vitro

Early Life Effects

Show All Effects

Financial Conflict of Interest

(All)

Selected Studies

Hover to see details, click for PubMed.

- Abe et al. 2017
- Abe et al. 2017
- Abercrombie et al. 2021
- Abraham et al. 2020
- Adinehzadeh and Reo 1998
- Adinehzadeh et al. 1999
- Ahmed et al. 2019
- Aimuzi et al. 2019
- Aimuzi et al. 2020
- Ait Bamai et al. 2020
- Akerblom et al. 2017
- Alderete et al. 2019
- Alkhalawi et al. 2016
- Allendorf et al. 2019
- Alves et al. 2016
- Ammitzboll et al. 2019
- Andersson et al. 2019
- Annunziato et al. 2019
- Annunziato et al. 2020

Download Study List

Federal level actions on PFAS

- DGEM
  - Substance evaluations of PFAS substances under REACH
  - Belgian Competent Authority of REACH: Belgian vote for authorisation and restriction doss
  - NAPED: research activities on PFAS substances envisaged under this plan
  - Follow-up of the CSS and the REACH and CLP revisions
  - Piloting the CCIEP group on PFAS (see next slides)
  - Inspection campaigns on PFAS
- Belgian Builds Back Circular
  - Substitution project on PFAS
    - To be developed by FOD Economie
  - Study on PFAS in textiles
    - With focus on PFAS in home textiles
- DG APF
  - BE position on EU Food Law actions and Food Contact Materials
  - Projects related to PFAS in food (PERFOOD and FLUOREX)

federale overheidsdienst
VOLKSGEZONDHEID, VEILIGHEID VAN DE VOEDSELKETEN EN LEEFMILIEU

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BELGIUM BUILDS BACK CIRCULAR

History of PFAS actions in chemical legislation

- 2006: EU restriction of PFOS (under Dangerous Substance Directive)
- 2009: PFOS added to the Stockholm Convention on Persistent Organic Pollutants (POP regulation in EU)
- 2011: PFOA and APFO identified as SVHC + CLP classification
- 2012: ICCM3 identifies PFAS as emerging policy issue
- 2016: PFNA identified as Substance of Very High Concern (SVHC) + CLP
- 2017: PFOA added to the REACH restriction list (Annex XVII)
- 2017: PFDA identified SVHC + CLP
- 2019: HFPO-DA (Gen-X) identified SVHC
- 2020: PFOA added to Stockholm Convention
- 2020: PFBS identified as SVHC
- 2021: C9-C14 added to the REACH restriction list (enters into force in 2023)
- 2023: PFHxS and related substances will be added to the Stockholm Convention

Well know PFAS get regulated → lesser known related PFAS replace them!
= regrettable substitution

Other PFAS related policy topics

- Sector specific
  - Food Contact Materials (FCM)
  - Plant Protection Products (PPP)
- Water
  - Drinking water Directive (DWD)
  - Groundwater Directive (GWD)
  - Water Framework Directive (WFD)
  - …
- Product policy
  - Ecolabel
  - Sustainable Product Initiative (SPI)
- Food
  - EFSA opinion
  - Food contaminants regulation
- Industrial Emissions Directive (IED)
  - BAT
  - E-PRTR
- Waste
- Soil
- International
  - PIC
  - OECD PFC group
  - OSPAR
  - SAICM
- Research
  - Horizon Europe
- …

These competences in are divided Belgium

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2019: Creation of the “short-chain” PFAS working group

- EU and International policy actions shift from well known long-chain PFAS (PFOA and PFOS) to lesser known short-chain PFAS (PFHxA, PFBS, etc.)
  - Focus on “grouping approach” to tackle the large group of substances
    - Arrow-head approach: target degradation product of large group of substances
    - For example: PFHxA restriction process under REACH: group of substances with PFHxA as degradation product
    - Resulting in **a lot of different uses being tackled in risk management measures like restrictions**
- Need for coordinated information gathering and exchange of information between Belgium authorities to follow these policy actions

→ Resulted in the creation of a CCIEP short-chain PFAS working group

- As a subgroup of the CCIEP-Chemicals working group
- To share and collect data on short-chain PFAS in Belgium
- Report on the current knowledge of Short-Chain PFAS in Belgium

Renewal and extension of the CCIEP mandate

- May 2021: Historical pollution of PFOS near a production site in Zwijndrecht (Antwerp) gets media attention
- Results in political actions:
  - Federal: Joint-Interministerial Conference on Environment and Health (**JICEH**) of July 8 2021, which requested to:
    - Extend and expand on the mandate of the short-chain PFAS CCIEP working group
      - To inform and optimize different actions being taken in BE
      - Act as national expert body including all relevant authorities in order to share and collect PFAS related data

CCIEP PFAS Working Group

- New mandate negotiated and finalized in December 2021 includes:
  - Building of a BE databank on PFAS
    - Exchange of information between authorities to contribute to international actions (REACH restrictions, POPs, etc.)
  - Update the existing PFAS report
    - Expand from short-chain to all PFAS
    - Adding current challenges and perspectives
  - Exchange of information with other groups to enhance PFAS policy actions
  - Expansion of the composition → adding health competences

CCIM PFAS in Belgium report

- Initial goal: provide overview of the current situation regarding short-chain PFAS in Belgium
  - Identify the production, use, emissions of these substances in Belgium
  - Provide an overview of PFAS related projects in Belgium
  - To identify actions and perspectives

- Second version, focusing on PFAS in general, was finalized in September 2022
  - Some disclaimers:
    - The report has been developed as a living document and thus includes incomplete chapters that need completion
    - Intended to be a strategical document for BE position development and communication to the JICEH

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Structure

- Overview Hazards and Risk Management Measures
- BE data on PFAS
  - Import, Production, Uses and Emissions
  - Waste, recycling, re-use
  - Monitoring and research
  - BE risks, forecasts, evolutions
  - (Importance of PFAS in BE)
- Overview of BE PFAS policy
- Alternatives to PFAS
- Discussion and Perspectives

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Current discussion/conclusion of the report

- Large uncertainties remain on the production and use of PFAS in BE
- Lesser-known PFAS will be topics of discussion in regulatory actions
  - Especially F-gasses and Fluorinated polymers
- Research on PFAS hazards and risks needs to be generated
  - Especially on the lesser known and on mixture effects
- Innovation and substitution of PFAS across the life-cycle
  - Need to look at concepts like safe and sustainable by design for alternatives
  - Research and Development on PFAS remediation and destruction needs
- Regulatory actions on EU and international level are needed
  - Registration, Evaluation, Authorisation and Restrictions of CHemicals (REACH)
  - CLP revision (inclusion of PMT and vPvM hazard classes)
  - Development of concepts like Safe and Sustainable by Design and essential use

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Belgian Builds Back Circular (BBBC) – PFAS mapping study

BBBC, FLUOREX, PFASFORWARD, Regional studies, reports and (bio)monitoring

Chemical Strategy for Sustainability (CSS) and REACH PFAS restrictions

PFAS Challenges

- Large amount of substances
  - Impossible to have complete toxicological profile of all PFAS
  - Impossible to have regulatory action and risk management on substance-by-substance basis
- Large amount of uses
  - Strongly imbedded into current society
  - Hard to substitute due to advantageous characteristics
    - Medical uses, green technologies, Safety equipment, etc.
- Persistent characteristics
  - Don’t break down naturally + Very hard to remove from environment = concentrations will keep rising irreversibly
  - Even uncertainties on whether incineration can completely break down the C-F bond

Perspectives

- Large number of substances
  - Act on PFAS as a group → REACH restrictions and Stockholm Convention
    - Prevent need for substance-by-substance analysis
    - Prevent need for in depth toxicological analysis of all PFAS → grouping based on common hazard → persistence
  - Keep expanding the PFAS knowledge base (PFAS tox and PubChem database)
- Large number of uses
  - Ensure data flow throughout the supply chain
  - Look at concepts like essential use
  - Look into alternatives and Safe and Sustainable by Design concepts
- Persistent characteristics
  - Innovation on destruction and remediation techniques
  - Look into concepts like extended producer responsibility

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Thank you for your attention!

Any questions?