



PFCs - Approaches to address the concerns for men and the environment

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and the Transition to Safer Alternatives
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Poly- and Perfluorinated Chemicals

1. Short chain fluorinated hydrocarbons, gaseous
2. Long chain fluorinated hydrocarbons:
 - Perfluoroalkyl sulfonates (PFAS)
 - Perfluorocarboxylic acids (PFCA)
 - Fluorotelomeric alcohols (FTOH)
3. Fluoropolymers: long-chain, huge molecules, solid, chemical and thermic stable, e.g. PTFE (Polytetrafluorethylene)
4. Fluorinated Polymers: „normal“ polymers with fluorinated side-chains

Concerns about PFAS and PFCAs

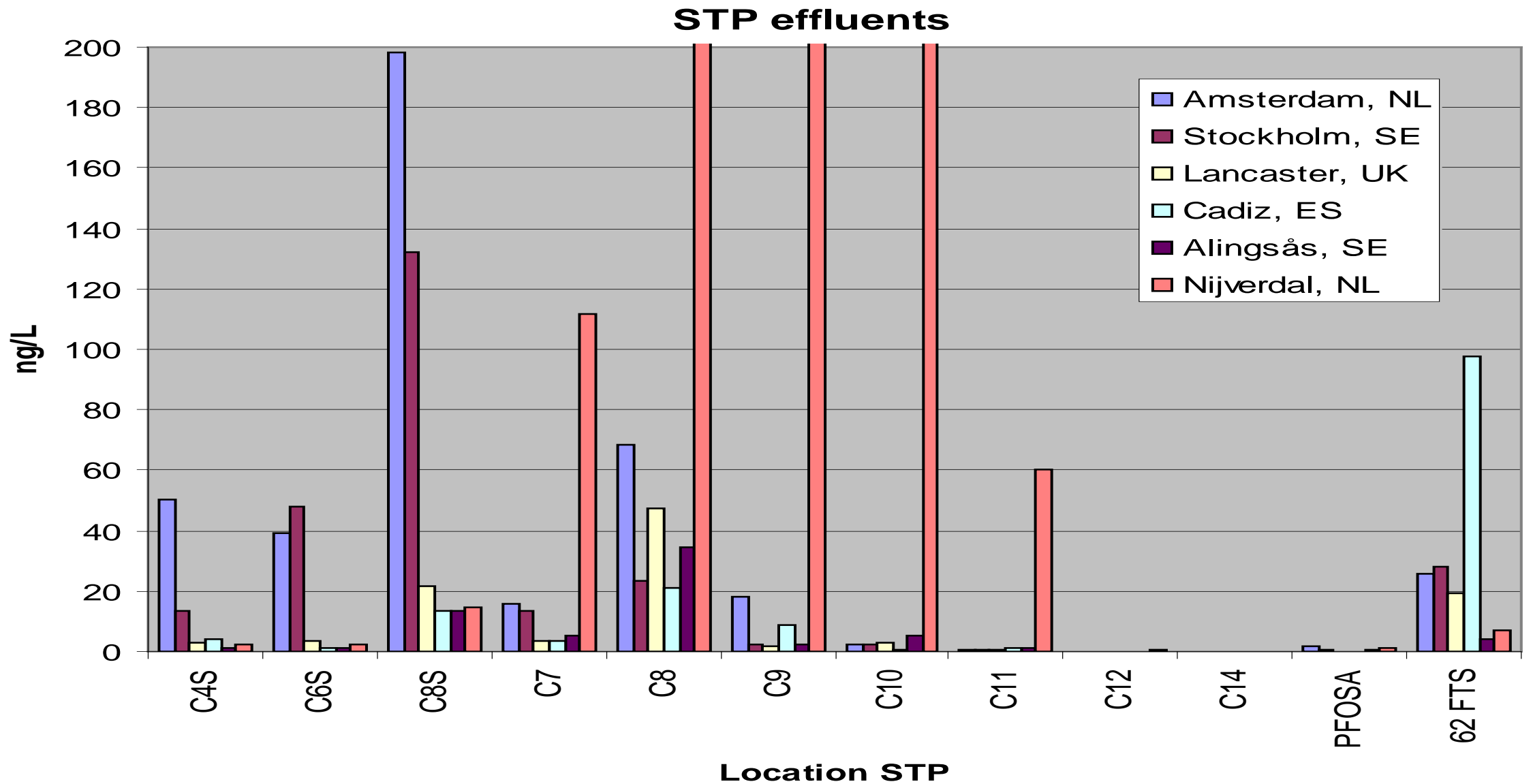
1. Environmental persistence
2. Findings and distribution in surface water
3. Findings and accumulation in food webs and top predators
4. Long-range transport and findings in remote areas
5. Occurrence in blood samples and breast milk of the general population (& long elimination half lives)
6. Findings in food and (increasingly) drinking water
7. Toxicological profile (PFOA: Reprotoxic Cat. 1 B)

Findings in biota

Organism	PFOS* [ng/kg]	PFOA* [ng/kg]
Polar bear Canadian Arctic (1990)	454 – 1,474	0.04 – 14
Polar bear Canadian Arctic (2006)	2,108 – 3,868	12 – 18
Seal Canadian Arctic (2005)	8.0 – 44	12 – 16
Eel, European rivers (2010)	≤ 498	≤ 23

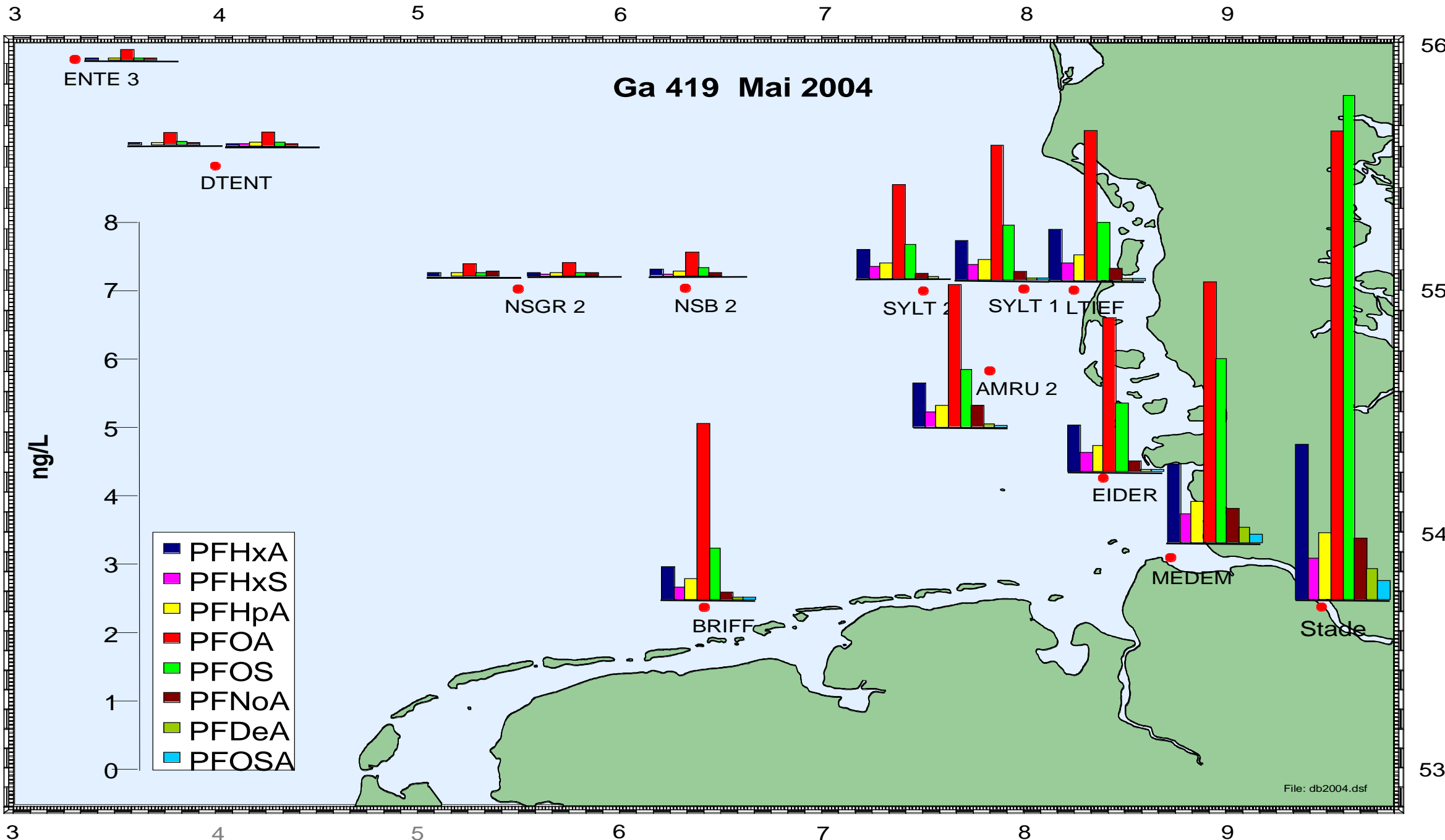
*in liver samples

Municipal STP effluents



De Voogt et al. (2006)

Discharges into the Ocean



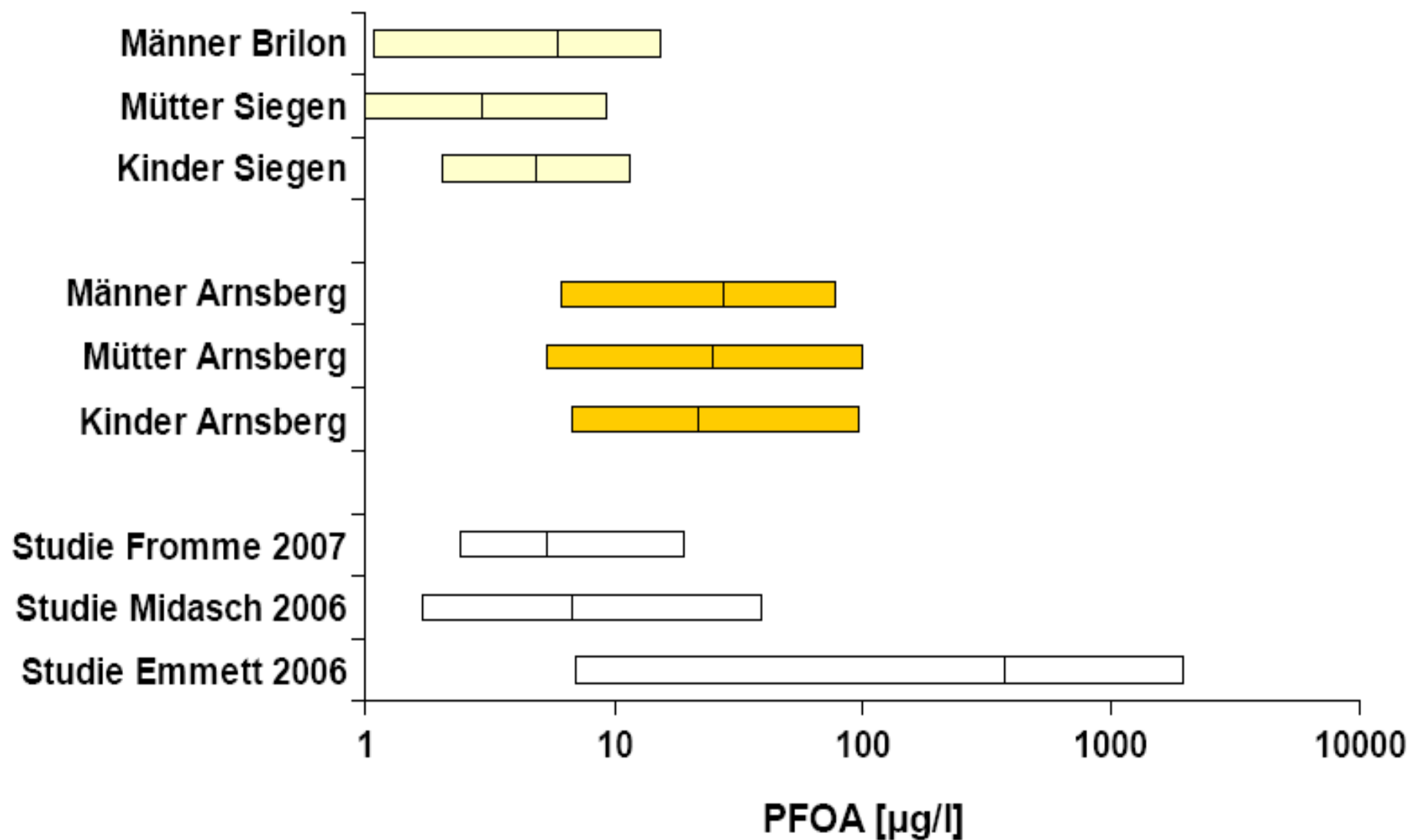
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Theobald und Caliebe (2006)

Findings in surface water

Source	PFOS [ng/l]	PFOA [ng/l]
Northern Atlantic	0.01 – 0.05	0.04 – 0.1
Tokyo bay, Japan	13 – 25	15 – 192
Resolute bay, Arctic	49 – 90	12 – 16
Po, Italy	2 – 12	2 – 337
Steinbecke, Germany	3,160 – 5,900	16,800 – 33,900
Lake Moehne, Germany	17	654

PFOA in blood samples



Hölzer & Wilhelm (2007)

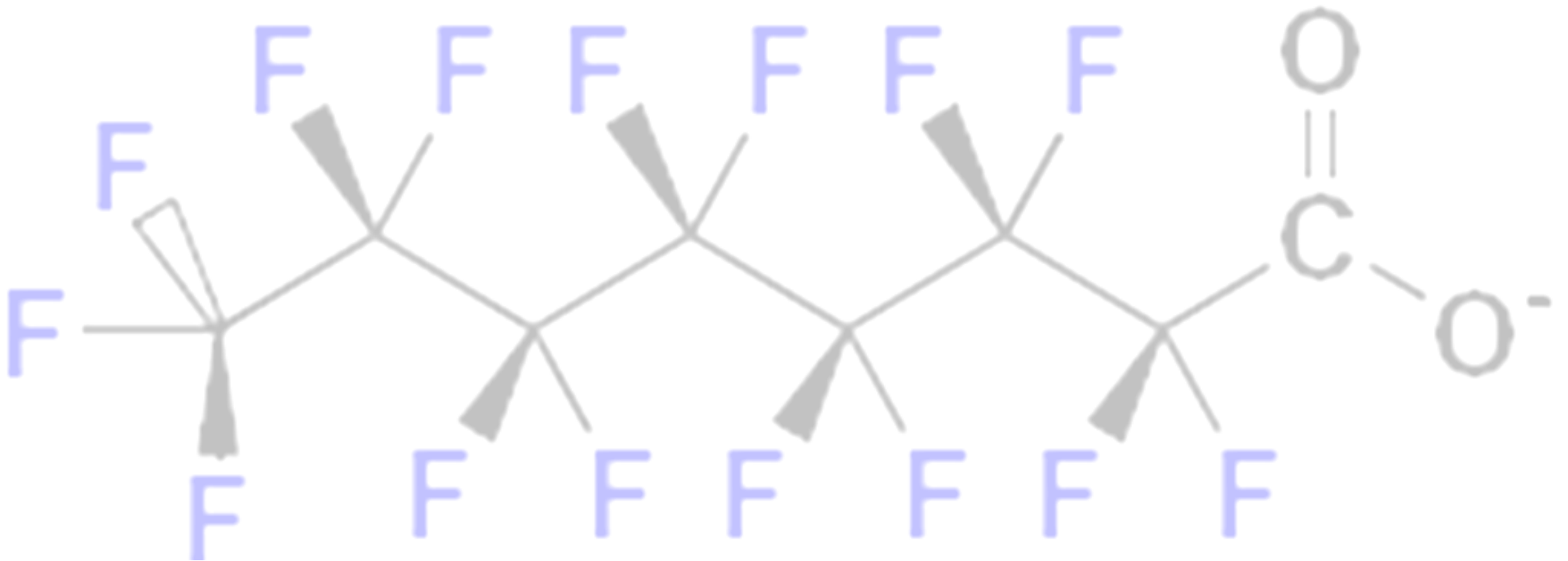
Concerns about PFAS and PFCAs

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Sources

- Production of PFCAs and PFAS
- Production of Fluoropolymers
- Releases from production and processing of fluorinated polymers
- Production of other PFCs
- Downstream users, e.g. Textile & Paper Industry
- Residues in products
- Transformation of volatile precursors (e.g. FTOH)
- Degradation of fluorinated Polymers
- Sludge disposal

Objectives for regulatory activities



Objectives for regulatory activities

- PFOA is ubiquitously present in the environment
- PFOA and its precursors are detected in consumer products (carpets, paper packaging, textiles, ..)
- PFOA & precursors are released from fluoropolymer and fluoroelastomer manufacturing or processing facilities, effluent releases from wastewater treatment plants and landfill leachates
- PFOA or its precursors might be present as residual or impurity in fluoropolymers and fluorotelomers used for a variety of products

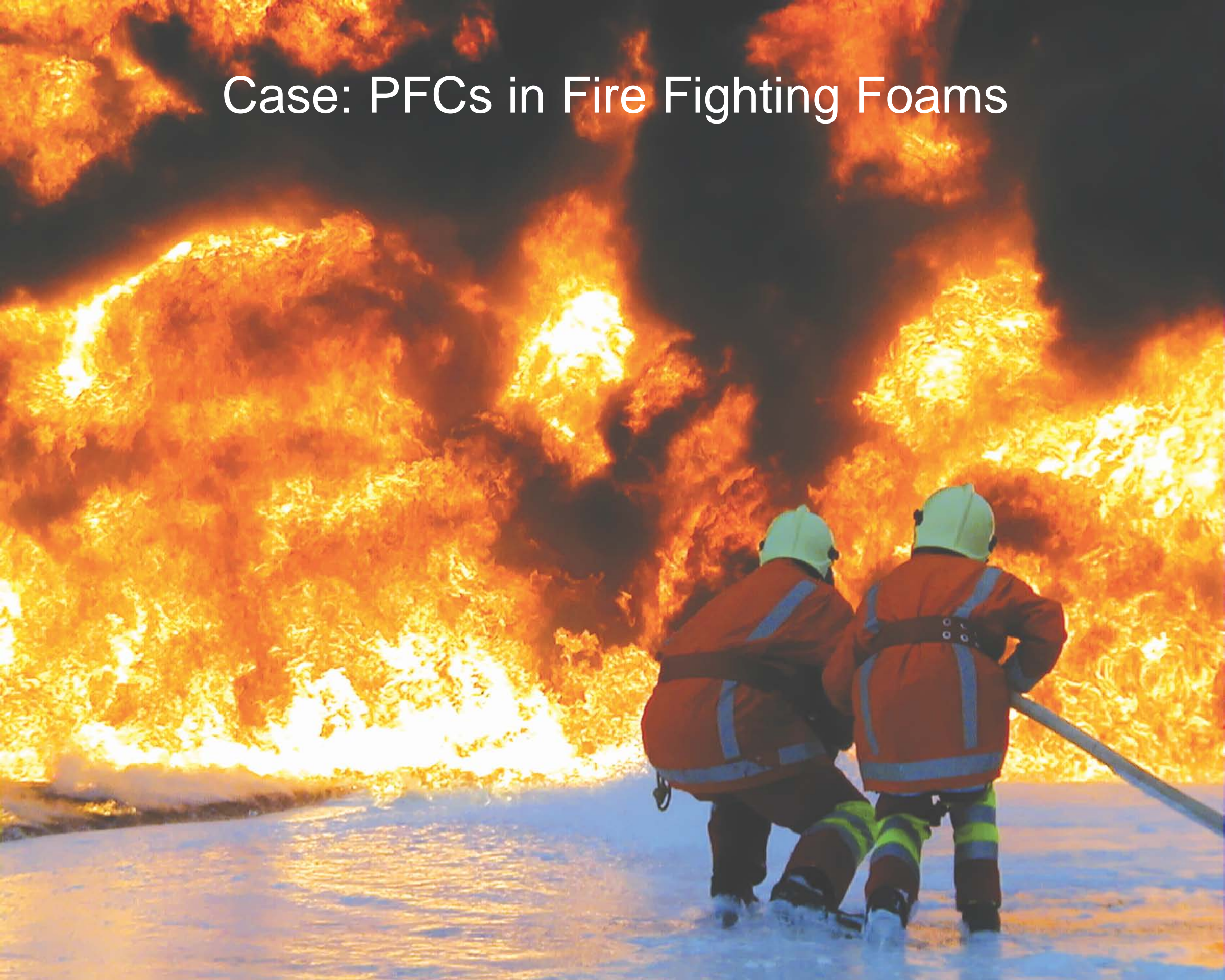
Regulatory activities - PFOA

- 2006: OECD Hazard Assessment prepared by US-EPA and UBA, supported by DuPont; result: candidate for further work
- 2009: Risk Assessment (Chemical Safety Report) according to REACH-TGD prepared by consortia of Miteni and DuPont, submitted by German Ministry of Environment to EU-Commission
- 2010: Dossier for harmonised classification and labelling (Reprotox. Cat 1 B), submitted by Norway
- 2010: EU-COM Workshop on PFOA

Regulatory activities - PFOA

- **US-EPA (2005):** Stewardship program to reduce emissions of PFOA and precursors to 95% of the level of 2000 till 2010, phase out till 2015
- **Canada (2010):** risk management scope for PFOA: goal phase out of PFOA and precursors
- **Germany (2007):** threshold values for drinking water and sewage sludge
- **Germany and Norway (2012):** suggest PFOA as a Substance of Very High Concern according to the EU REACH-Regulation (followed by a restriction)

Case: PFCs in Fire Fighting Foams



PFCs in Fire Fighting Foams

- PFCs are used in fire fighting foams since the 1960s („Light water“ – PFOS-based)
- Point sources with high exposure to the environment
- High potential for contamination of surface and ground water
- PFC-containing fire fighting foams are often not the appropriate choice
- Approach: Dialogue with fire fighting and foam manufacturing associations

Findings in ground water

findings [$\mu\text{g/l}$]	PFOA	PFHxA	PFOS	PFHxS
Neval Air Station, Nevada, USA (Moody et al.1999)	6570	n.a	n.a	n.a
Wurtsmith Air Forth Base; Michigan, USA (Moody et al., 2003)	105	20	110	120
Etobicoke Creek (Toronto Airport, Canada) (Moody et al., 2002)	11	n.a	2210	134
Gerresheim (Germany) (2010)			89	

Stakeholder - Dialogue

- Discussions between UBA, fire fighting associations, and foam manufacturers on high level
- Several joint publications in fire fighting journals
- Flyer for fire fighters
- Public Discussions on conferences for fire protection and prevention
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Conclusions

1. PFCs are increasingly detected in the environment, leading to exposure of the general population, and findings especially in blood samples
2. Sources are different, including precursors (e.g. FTOH) and residues in polymers
3. Due to the concerns for men and the environment the complete group of PFCs needs to be considered
4. Germany and Norway will suggest PFOA as a Substance of Very High Concern (SVHC) under REACH and propose a restriction including also residues in products and precursors



Thank you

**UBA Background paper
“Do without Per- and Polyfluorinated Chemicals
and Prevent their Discharge into the Environment“:**

<http://www.umweltdaten.de/publikationen/fpdf-l/3818.pdf>

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