



PFAS Total analyser

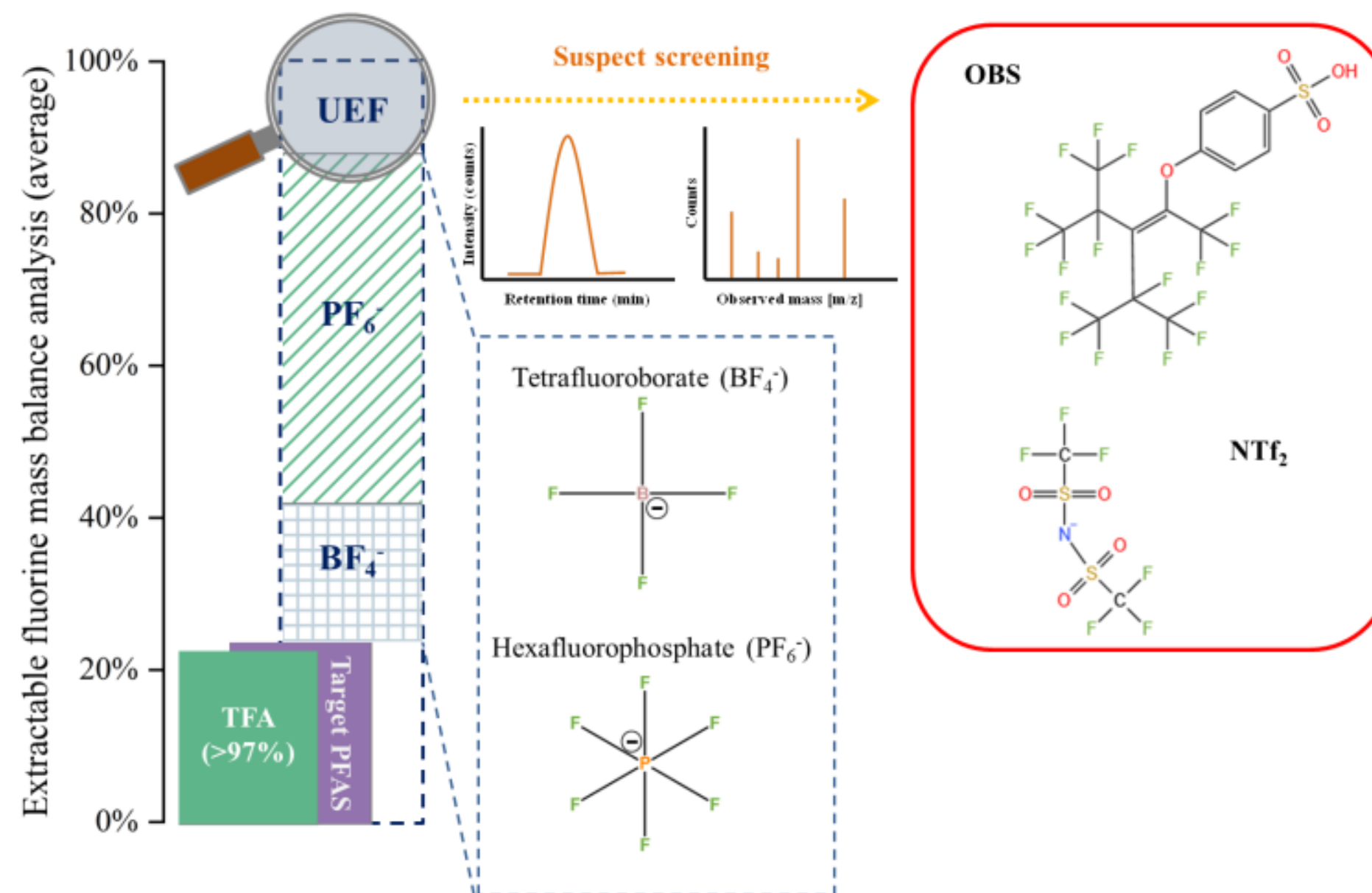
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Varför PFAS Total?

Riskbedömning

Mäter vi alla PFAS som är betydelsefulla för människors och miljöns hälsa?



Jiao et al. 2023 Environmental Science and Technology, Vol. 57, no 38, p. 14330-14339

Varför PFAS Total?

PFAS som en grupp

Lagstiftning för att skydda hälsa samt undvika ej önskvärd substitution

EU Chemicals Strategy for Sustainability Towards a Toxic-Free Environment

PFAS⁶²

The Commission will:

- ban **all PFAS as a group in fire-fighting foams** as well as in **other uses**, allowing their use only where they are essential for society;
- address PFAS with a **group approach**, under relevant legislation on water, sustainable products, food, industrial emissions, and waste;
- address PFAS **concerns on a global scale** through the relevant international fora⁶³ and in bilateral policy dialogues with third countries;
- establish an EU-wide approach and provide financial support under research and innovation programmes to identify and develop **innovative methodologies for remediating PFAS contamination** in the environment and in products;
- provide research and innovation funding for safe **innovations to substitute PFAS** under Horizon Europe.

Varför PFAS Total?

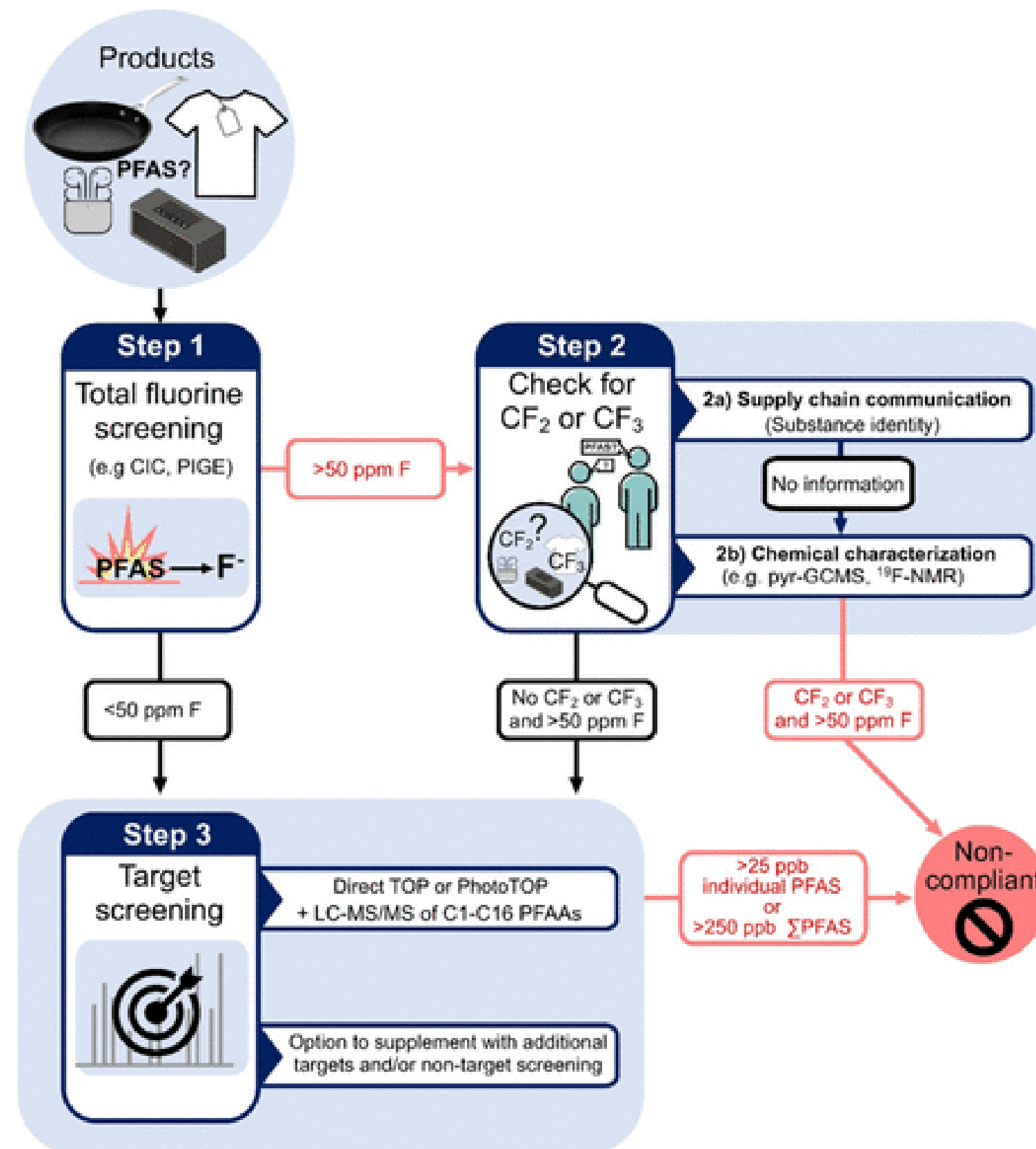
EU dricksvattendirektiv

- Annex I – part B: 2 PFAS parameters (new compared to DWD 98/83/EC)

PFAS Total	0,50	µg/l	<p>'PFAS Total' means the totality of per- and polyfluoroalkyl substances.</p> <p>This parametric value shall only apply once technical guidelines for monitoring this parameter are developed in accordance with Article 13(7). Member States may then decide to use either one or both of the parameters 'PFAS Total' or 'Sum of PFAS'.</p>
Sum of PFAS	0,10	µg/l	<p>'Sum of PFAS' means the sum of per- and polyfluoroalkyl substances considered a concern as regards water intended for human consumption listed in point 3 of Part B of Annex III. This is a subset of 'PFAS Total' substances that contain a perfluoroalkyl moiety with three or more carbons (i.e. $-C_nF_{2n}-$, $n \geq 3$) or a perfluoroalkylether moiety with two or more carbons (i.e. $-C_nF_{2n}OC_mF_{2m}-$, n and $m \geq 1$).</p>

Varför PFAS Total?

PFAS restriktionsförslag

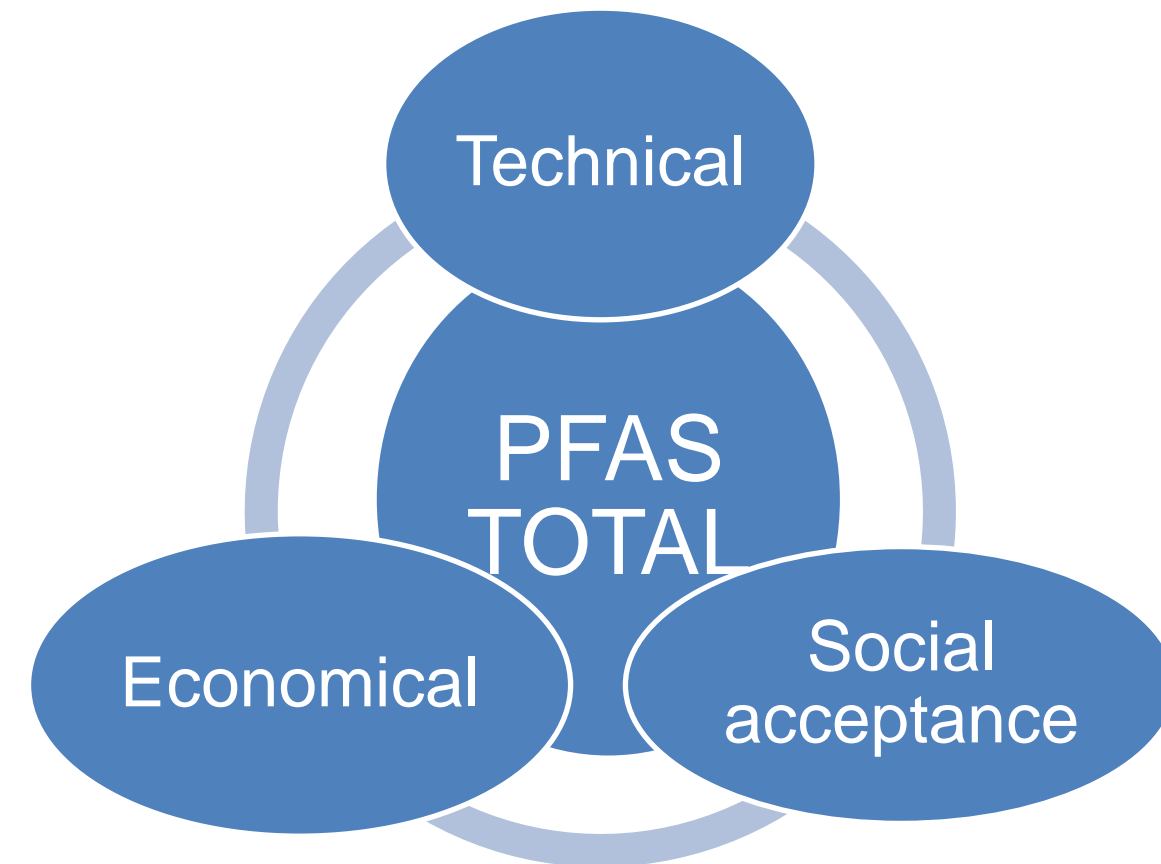


Vad är PFAS?

- PFAS definieras som fluorerade ämnen som innehåller minst en helt fluorerad kolatom (utan någon H/Cl/Br/I-atom fäst vid den) (OECD 2021)

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- *Vad är möjligt att mäta?*
- *Vad är ekonomiskt relevant?*
- *Vad accepteras av samhället?*

PFAS fingeravtryck



Analys av PFAS

Nontarget och suspect screening

- ✓ data bases ~15 000 PFAS
- limited possibilities for quantitative ana
- challenging data mining and reduction, quantification
- standards needed for highest confidence

Kemisk omvandling

- ✓ conversion by oxidation (TOP Assay) or hydrolysis followed by target analysis of oxidation/hydrolysis products
- not always quantitative yields
- all PFAS are not easily oxidized



Target analys

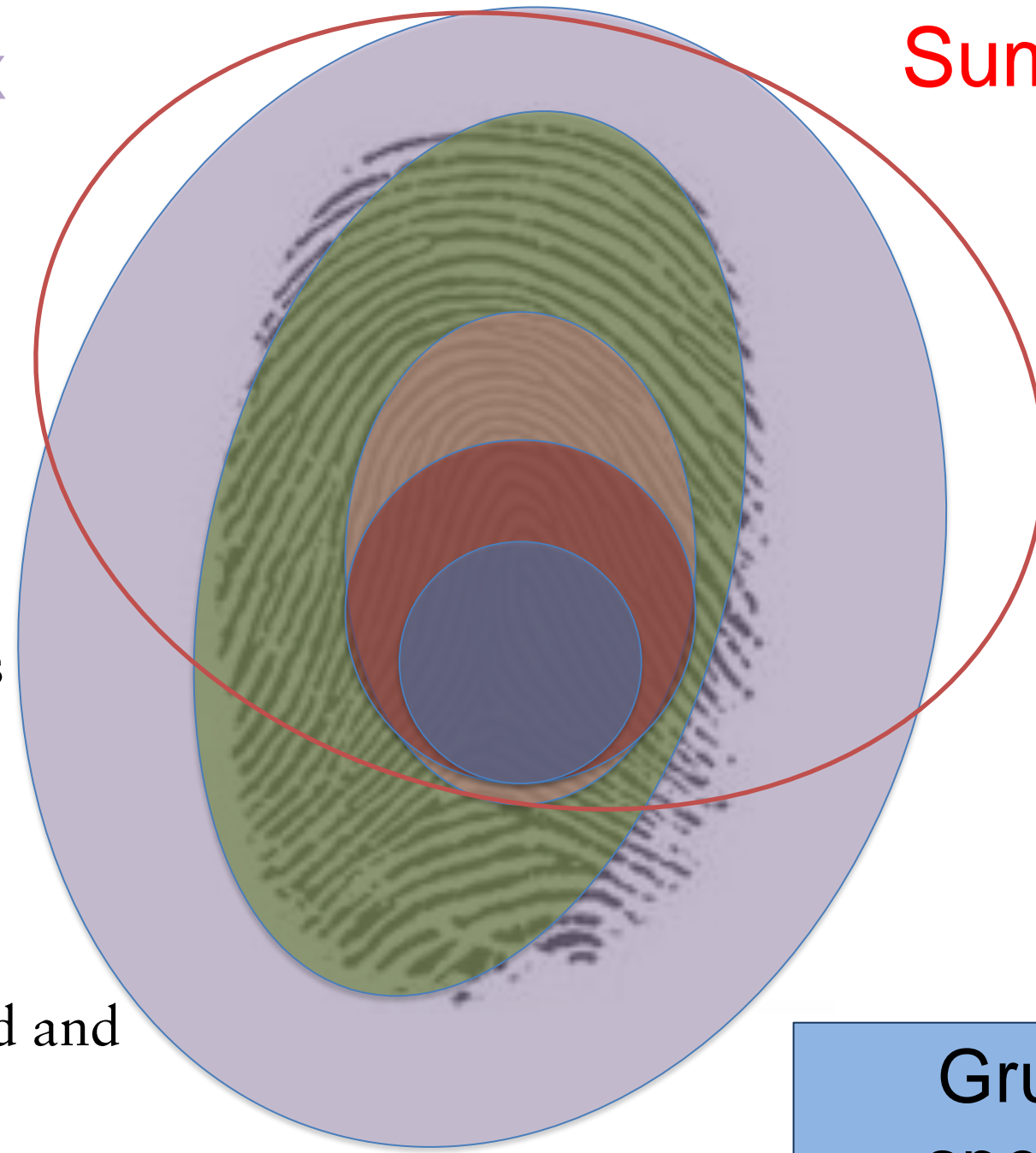
- ✓ sensitive and specific using MS/MS
- large physicochemical range requires
 - multiple techniques
 - several/series of sample preparation steps
- lack of commercial standards
- poorly ionizable compounds not included

Specifik PFAS analys med direkt eller indirekt strukturinformation

Analys av PFAS

Summa fluor eller F-complex

- measurement of F as proxy of PFAS
- no sample pretreatment returns total fluorine (TF)
- after extraction → Extractable Fluorine (EF), or Extractable Organic Fluorine (EOF)
 - Sample pretreatment defines the output



Summa effekter

- capture the sum of mixture effects of groups of chemicals that elicit the same mode of action
- high-through put bioassays
- Thyroid hormone transport disruption potential has been suggested (Behnish et al., 2021)

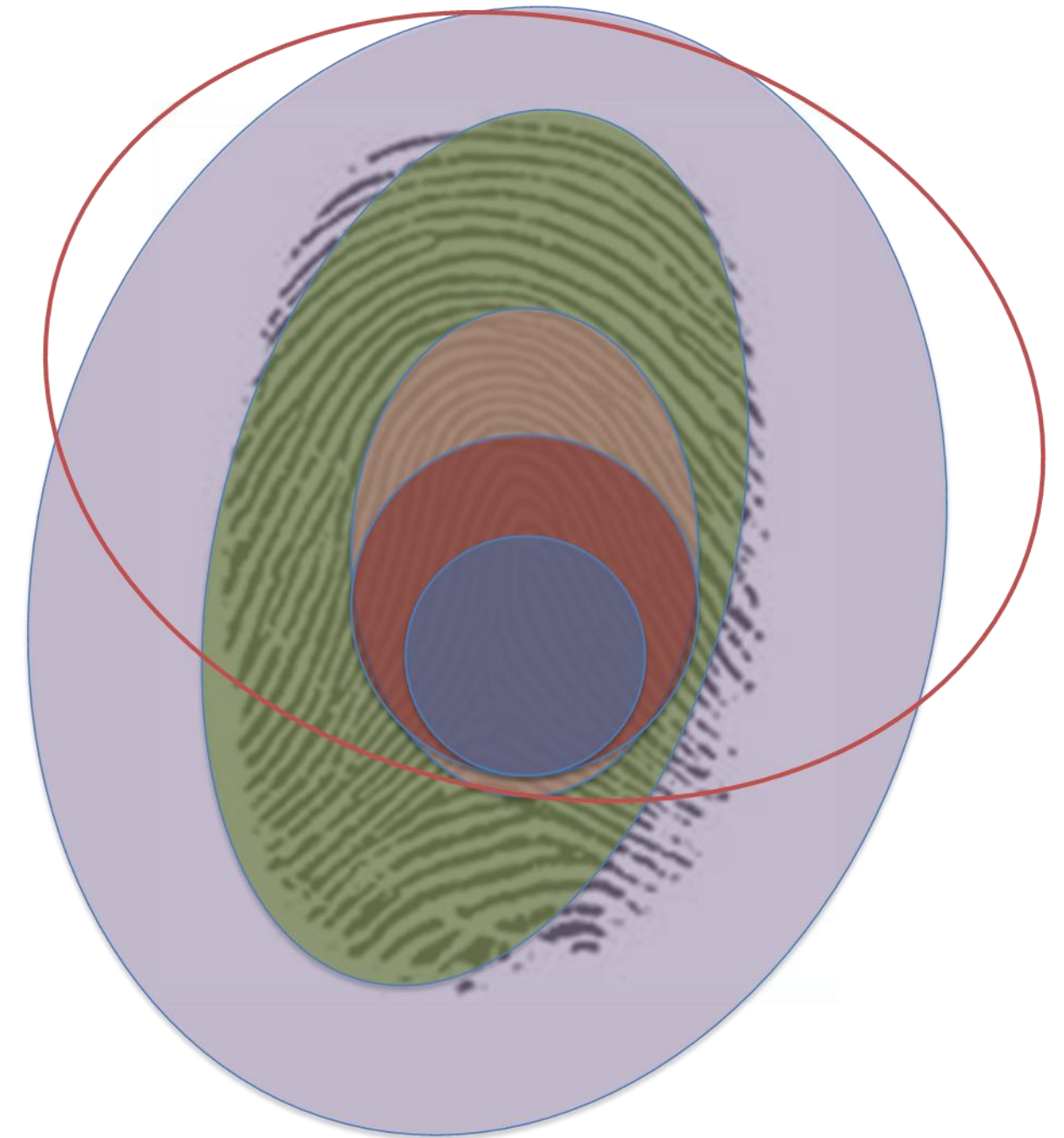
Summa perfluoralkyler

- ✓ CF_2 or CF_3 groups can be targeted and summed by NMR, XPS, FTIR
- ✓ highly selective
- detection limits high

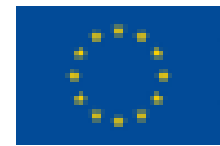
Gruppbaserad PFAS analys utan specifik information om strukturen

Analys av PFAS

- Specifik PFAS analys (baserat på strukturinformation)
 - PFAS-n, Σ_n PFAS (n= antal PFAS)
- PFAS Total – vad tekniken som används kan mäta
 - ”Total Assessed PFAS” med [metod]



Technical Guidelines for PFAS under the DWD - Methods for monitoring 'Sum of PFAS' & 'PFAS Total'



Official Journal
of the European Union

EN
C series

C/2024/4910

7.8.2024

Commission Notice

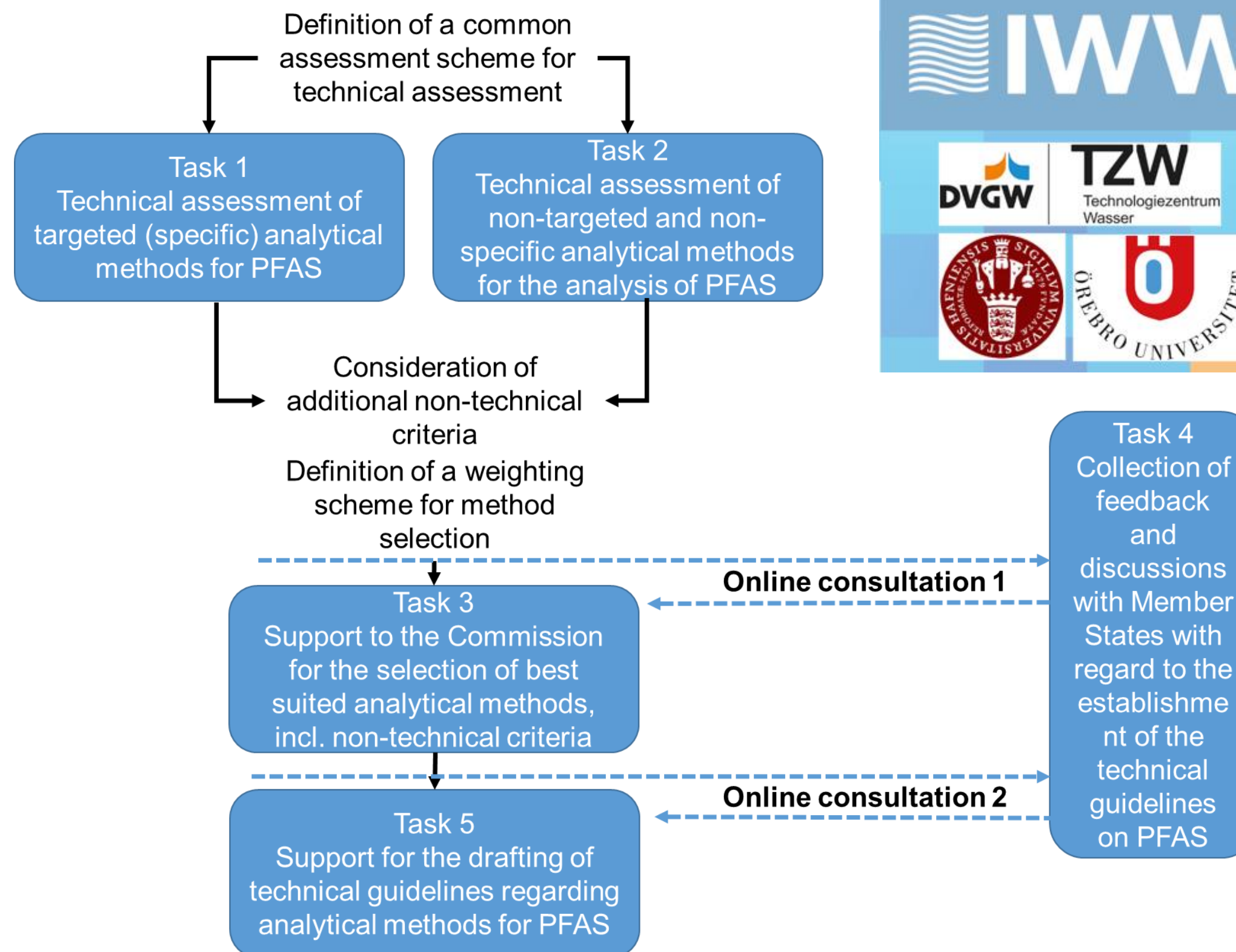
Technical guidelines regarding methods of analysis for monitoring of per- and polyfluoroalkyl substances (PFAS) in water intended for human consumption

(C/2024/4910)

Contents

Utveckling av Technical guideline

“Analytiska metoder och tillvägagångssätt som anses vara lämpligast, baserat på tekniska och socioekonomiska faktorer”



Utvärdering av befintliga analytiska tekniker

Task 1
 Technical assessment of targeted (specific) analytical methods for PFAS

Task 2
 Technical assessment of non-targeted and non-specific analytical methods for the analysis of PFAS

Task 3
 Support to the Commission for the selection of best suited analytical methods, incl. non-technical criteria

Technical criterion	Max. points
T.1: Number of validated PFAS (PFAS listed in Annex III, Part B of the DWD)	20
T.2: Selectivity (Number of identification points)	20
T.3: Sensitivity (LOQ < 30% of parametric value)	20
T.4: Measurement uncertainty (Maximum 50% uncertainty of parametric value)	20
T.5: Recoveries (Relative deviation in %)	5
T.6: Sampling issues (Offline/online, containers, minimisation of blanks)	10
T.7: Sample preparation steps (Number, nature)	5
Total	100

Technical criterion	Max. points
T.8: Number of validated PFAS (PFAS listed in Annex III, Part B of the DWD)	20
T.9: Selectivity (Validated data on accurate detection of each of the 20 PFAS defined in the PFAS listed in Annex III, Part B of the DWD)	20
T.10: Sensitivity (LOQ < 30 % of relevant parametric value. Non-specific methods: Evaluated for a proxy target substance, e.g. PFOA. Non-targeted methods: based on the available known PFAS used in the validation)	20
T.11: Measurement uncertainty (Maximum 50 % uncertainty of the parametric value, based on interlaboratory tests or intralaboratory variation)	20
T.12: Sampling issues (Offline/online, containers, minimisation of blanks)	10
T.13: Sample preparation steps (Number, nature)	10
Total	100

Economic criteria

- E.1 Direct costs of the analyses/equipment
- E.2 Direct Costs for training and upholding accreditation (if required)
- E.3 Scalability of the method in European laboratories (related to costs of instruments, needed expertise of staff to run the method, cost of analysis)
- E.4 Indirect implications on the affordability of the tap water
- E.5 Implications on the employment in the water sector
- E.6 Other indirect impacts (e. g. impacts on SMEs, food industry (incl. exports) and other market related effects)

Social criteria

- S.1 Ease of communication of the methods/results
- S.2 Feeling that the water is safe to drink (to prevent behavioral changes to drink bottled water)
- S.3 Acceptability to close the water supplies, in case that the limit values of the method are exceeded

Multi-criteria ranking

Class of method	Method	Sum of all Criteria (T+E+S)	Ranking	Outcome
Sum of PFAS	EN17892 Part B	90,1	1	highest ranked method
Sum of PFAS	EN17892 Part A	89,4	2	
Sum of PFAS	ISO 21675	69,8	3	
Total PFAS *	TOP assay	67,0	4	
Total PFAS *	EOF-CIC	65,8	5	
Total PFAS *	LC-HRMS (NT)	50,5	6	

* Inga standardiserade metoder finns, refererar till tekniker som kan bestämma proxy PFAS Total, och en separat rapportering för TFA föreslås

Slutsatser

- Acceptans av begreppet PFAS Total behövs
- Gemensam definition av de analytiska kraven för att bedöma PFAS som grupp
 - Acceptans av icke-specifika metoder och semikvantifiering
 - Analytiska lösningar i flera steg nödvändiga för PFAS Total

Tack för att ni lyssnat!

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Urval av referenser



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