



Monitoring of dl-POPs and PFOS and its precursors in air – Africa region

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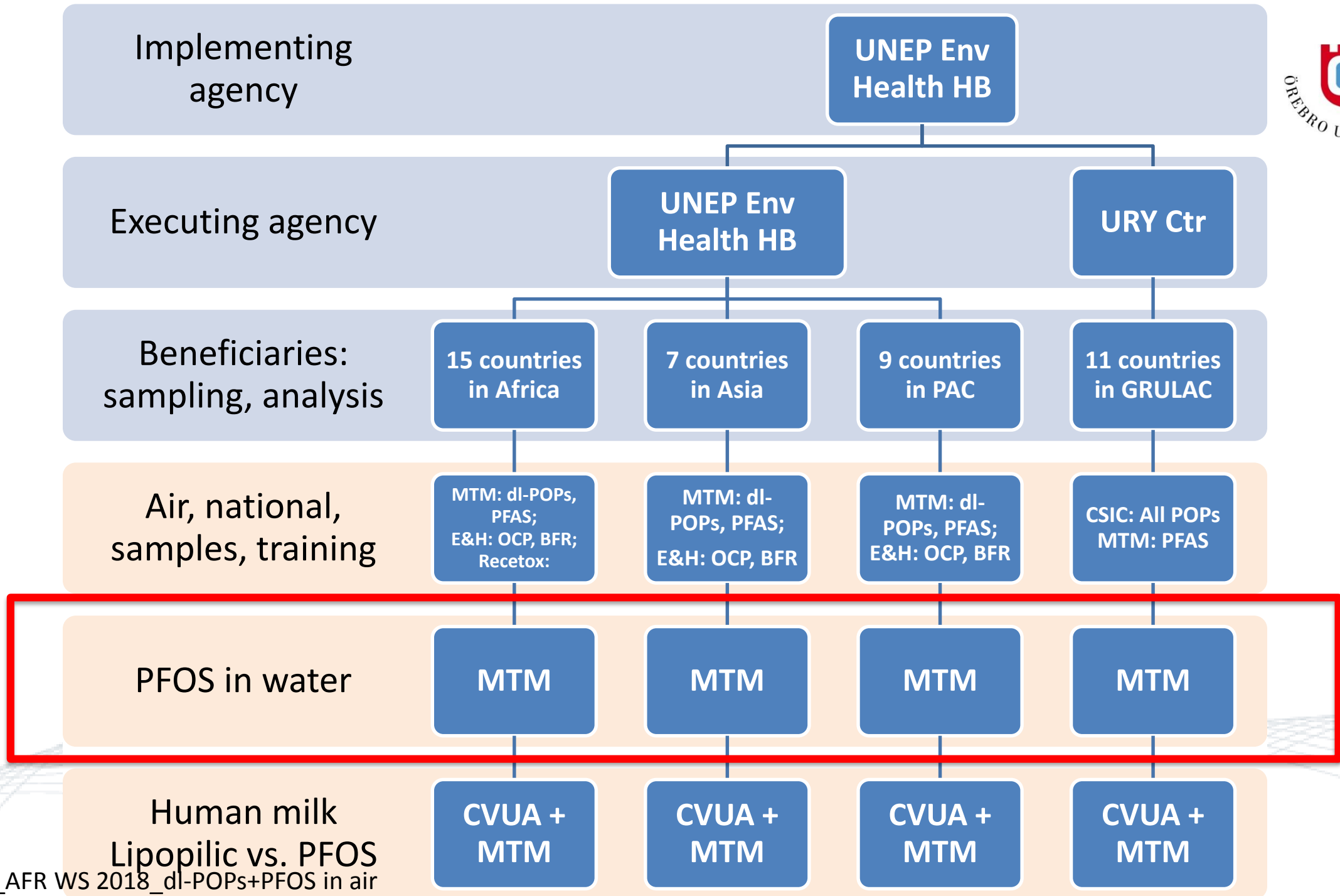
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MTM's role related to the core matrix air in the African region

- MTM Research Centre has been contracted by UNEP (now UN Environment) as expert laboratory for the analysis of dioxin-like POPs and perfluorooctane sulfonate (PFOS) and relevant precursors in air;
- This includes:
 - Technical advice for sampling and analysis of these POPs in air;
 - Analysis of PUFs from passive air samplers (PUF-5, PUF-7; PUF-11) for dl-POPs and PFOS;
 - Analysis of PUF/XAD from two active air samplers (Ghana and Kenya) for dl-POPs and PFOS;
 - On-site training of POPs laboratories in Africa (Egypt, Tunisia, Uganda);
- The duration of the sampling activities are during two years (2017-01 until 2018-12);
- The majority of the chemical analysis to be performed in 2018 and 2019.

Sampling scheme for PAS/PUF in UNEP/GMP2 projects



Assignment of samplers, PUFs, and analytes according to laboratory per country)			No. analyses per year
Sampler 1:	PUFs 1-4:	For basic POPs pesticides in expert back-up laboratory drins, chlordanes, DDTs, HCHs, heptachlors, mirex, HCB, pentachlorobenzene, endosulfans, toxaphenes, chlordecone	4 toxaphene, annual sample only
Sampler 2:	PUFs 1-4:	For basic POPs in national POPs laboratory drins, chlordanes, DDTs, HCHs, heptachlors, mirex, HCB, pentachlorobenzene, endosulfans, toxaphenes, chlordecone	4 toxaphene, annual sample only
Sampler 3:	PUFs 1-4:	For indicator PCB in expert back-up laboratory 6 indicator PCB	4
Sampler 4:	PUFs 1-4:	For indicator PCB in national POPs laboratory 6 indicator PCB	4
Sampler 5:	PUFs 1-4:	For dioxin-like POPs in expert back-up laboratory (combined into one extract as annual average) 17 PCDD/PCDF, 12 dl-PCB	1
Sampler 6:	PUFs 1-4:	For dioxin-like POPs in national dioxin laboratory (combined into one extract as annual average) 17 PCDD/PCDF, 12 dl-PCB	1
Sampler 7:	PUFs 1-4:	For dioxin-like POPs in expert back-up laboratory (each exposure to generate one seasonal data point; total of 4 per year and country) 17 PCDD/PCDF, 12 dl-PCB	4
Sampler 8:	PUFs 1-4:	For dioxin-like POPs in national laboratory (each exposure to generate one seasonal data point; total of 4 per year and country) 17 PCDD/PCDF, 12 dl-PCB	4
Sampler 9:	PUFs 1-4:	For PBDE in expert laboratory 8 PBDE, HBCD, PBB	4
Sampler 10:	PUFs 1-4:	For PBDE in national laboratory 8 PBDE, HBCD, PBB	4
Sampler 11:	PUFs 1-4:	For PFOS in expert laboratory 6 PFAS	4
Sampler 12:	PUFs 1-4:	For PFOS in national laboratory 6 PFAS	4

Color codes:

Green Analysis in expert back-up laboratory

No Fill Analysis in national laboratory

Yellow Groups of chemicals recommended for analysis

PUFs cleaned with water and acetone and conditioned to capture groups of POPs were provided by Recetox as follows:

- Conditioning with dichloromethane (DCM) for: OCPs, indicator PCB, PBDE+HxBB+HBCD ⇒ E&H VU
- Conditioning with toluene for: dl-POPs ⇒ MTM
- Conditioning with methanol for: PFOS+ ⇒ MTM

Status of samples received - 2017



		Sample ID	Sample ID	Sample ID	Date arrived	Sample ID	Sample ID	Sample ID	Date arrived	Sample ID	Sample ID	Sample ID	Date arrived	Sample ID	Sample ID	Sample ID	Date arrived	Subtotal	Subtotal
Africa		PUF 5	PUF 7	PUF 11		PUF 5	PUF 7	PUF 11		PUF 5	PUF 7	PUF 11		PUF 5	PUF 7	PUF 11			
DR Congo	COD	Void		Void		COD-5 (2017-II)	COD-7 (2017-II)	COD-11 (2017-II)	2018-01-24	COD-5 (2017-III)	COD-7 (2017-III)	COD-11 (2017-III)	2018-01-24	COD-5 (2017-IV)	COD-7 (2017-IV)	COD-11 (2017-IV)	2018-07-16	9	8
Egypt	EGY	EGY-5 (2017-I)	EGY-7 (2017-I)	EGY-11 (2017-I)	2017-12-20	EGY-5 (2017-II)	EGY-7 (2017-II)	EGY-11 (2017-II)	2017-12-20	EGY-5 (2017-III)	EGY-7 (2017-III)	EGY-11 (2017-III)	2017-12-20	EGY-5 (2017-IV)	EGY-7 (2017-IV)	EGY-11 (2017-IV)	2018-01-05	12	12
Ethiopia	ETH	Void		Void		ETH-5 (2017-II)		ETH-11 (2017-II)	2018-01-03	ETH-5 (2017-III)		ETH-11 (2017-III)	2018-01-03	ETH-5 (2017-IV)		ETH-11 (2017-IV)	2018-05-01	6	8
Ghana	GHA	GHA-5 (2017-I)	GHA-7 (2017-I)	GHA-11 (2017-I)	2018-01-15	GHA-5 (2017-II)	GHA-7 (2017-II)	GHA-11 (2017-II)	2018-01-15	GHA-5 (2017-III)	GHA-7 (2017-III)	GHA-11 (2017-III)	2018-01-15	GHA-5 (2017-IV)	GHA-7 (2017-IV)	GHA-11 (2017-IV)	2018-01-15	8	8
Kenya	KEN	KEN-5 (2017-I)		KEN-11 (2017-I)	2017-10-25	KEN-5 (2017-II)		KEN-11 (2017-II)	2017-10-25	KEN-5 (2017-III)		KEN-11 (2017-III)	2017-10-25					6	8
Mali	MLI	MLI-5 (2017-I)	MLI-7 (2017-I)	MLI-11 (2017-I)	2017-08-17	MLI-5 (2017-II)	MLI-7 (2017-II)	MLI-11 (2017-II)	2017-08-17	MLI-5 (2017-III)	MLI-7 (2017-III)	MLI-11 (2017-III)	2018-01-26	MLI-5 (2017-IV)	MLI-7 (2017-IV)	MLI-11 (2017-IV)	2018-01-26	8	8
Morocco	MAR	Void		Void		MAR-5 (2017-II)		MAR-11 (2017-II)	2018-03-05	MAR-5 (2017-III)		MAR-11 (2017-III)	2018-03-05	MAR-5 (2017-IV)		MAR-11 (2017-IV)	2018-03-05	6	8
Mauritius	MUS	MUS-5 (2017-I)	MUS-7 (2017-I)	MUS-11 (2017-I)	2017-12-28	MUS-5 (2017-II)	MUS-7 (2017-II)	MUS-11 (2017-II)	2017-12-28	MUS-5 (2017-III)	MUS-7 (2017-III)	MUS-11 (2017-III)	2017-12-28					6	8
Nigeria	NGA	Void		Void		Void		Void		Void		Void				Void		0	8
Senegal	SEN	SEN-5 (2017-I)		SEN-11 (2017-I)	2017-07-31	SEN-5 (2017-II)		SEN-11 (2017-II)		SEN-5 (2017-III)		SEN-11 (2017-III)	2017-12-28					6	8
Tanzania	TZA	Void		Void		Void		Void		Void		Void						0	8
Togo	TGO	TGO-5 (2017-I)	TGO-7 (2017-I)	TGO-11 (2017-I)	2017-08-21	TGO-5 (2017-II)	TGO-7 (2017-II)	TGO-11 (2017-II)	2017-08-21	TGO-5 (2017-III)	TGO-7 (2017-III)	TGO-11 (2017-III)	2018-03-22	TGO-5 (2017-IV)	TGO-7 (2017-IV)	TGO-11 (2017-IV)	2018-03-22	8	8
Tunisia	TUN	TUN-5 (2017-I)	TUN-7 (2017-I)	TUN-11 (2017-I)	2018-01-11	TUN-5 (2017-II)	Void	TUN-11 (2017-II)	2018-01-11	TUN-5 (2017-III)	Void	TUN-11 (2017-III)	2018-01-11	TUN-5 (2017-IV)	TUN-7 (2017-IV)	TUN-11 (2017-IV)	2018-01-11	10	12
Uganda	UGA	UGA-5 (2017-I)		UGA-11 (2017-I)	2018-01-19	Void		Void		Void		Void		UGA-5 (2017-IV)		UGA-11 (2017-IV)	2018-01-19	4	8
Zambia	ZMB	ZMB-5 (2017-I)		ZMB-11 (2017-I)	2017-04-10	ZMB-5 (2017-II)		ZMB-11 (2017-II)	2017-07-11	ZMB-5 (2017-III)		ZMB-11 (2017-III)	2017-10-13	ZMB-5 (2017-IV)		ZMB-11 (2017-IV)	2018-01-08	8	8
Africa		15	10	6	10	10	6	12	11	12	6	12	12	11	6	10	10	97	128

Summary 2017: 97 of 128 expected PUFs were received, corresponding to 76%.

PUF-5, PUF-7: Analysis for dl-POPs – MTM lab lacks sensitivity and selectivity to analyse air samples

⇒ MTM entered into agreement with CSIC to analyse PUFs for dl-POPs

PUFs were analyzed for each season

PUF-11: Analysis for PFOS and precursors

⇒ analytical method almost finalized to analyse PUFs for PFOS and precursors

(unexpected difficulties with precursor compounds and some background issues

Note: in 3rd interlab – no consensus values could be assigned for FOSAs and FOSEs among experienced laboratories).

Status PUFs from 2017

- PUF-5: Analysis for dl-POPs – combine 4 into an annual value
 - For 2017, we analyze PUFs for each quarter/season. When 2 PUFs were available, then these were combined
- PUF-11: Analysis for PFOS and precursors – 1 PUF
 - Togo and Tunisia sent also PUF-12.
 - Question: Tunisia supposed to analyze for PFOS in national laboratory?

Questions:

- Nigeria and Tanzania have not sent any PUF so far – status? Future procedure?
- Uganda: not clear how long was exposure time for UGA-5 (2017-I) and UGA-11 (2017-I)?
Accompanying sheets states for 269 days

Status of samples received - 2018

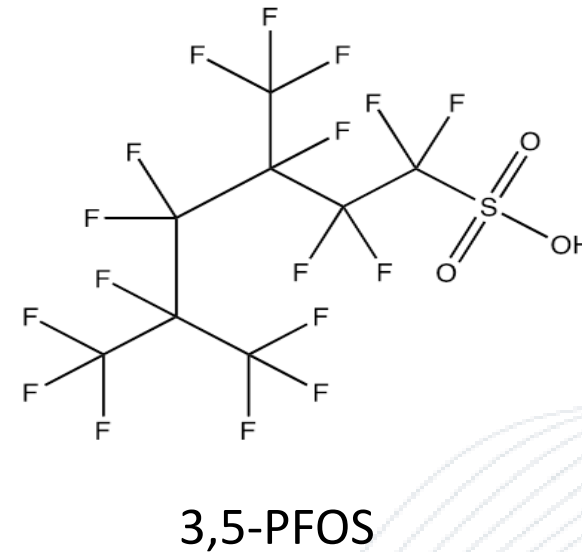
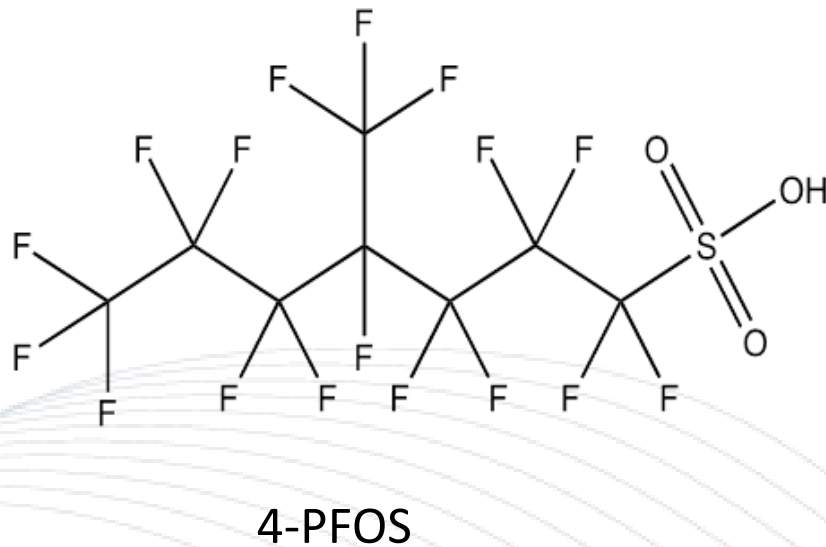
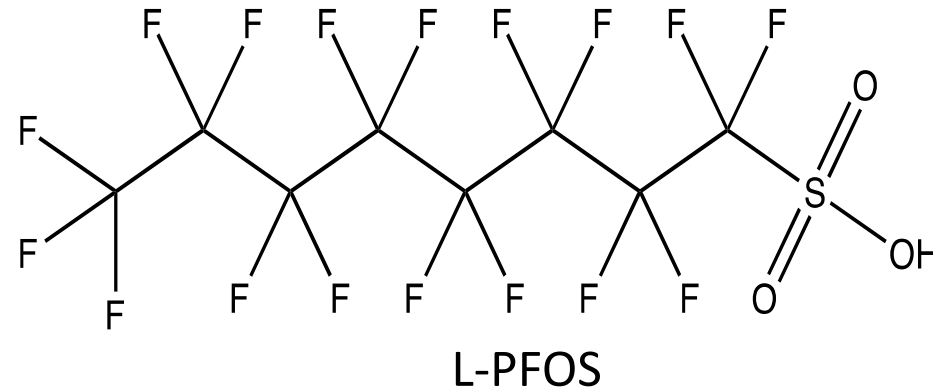
Country name	ISO_3	Campaign 1				Campaign 2				Year 2018	Target
		Sample ID	Sample ID	Sample ID	Date arrived	Sample ID	Sample ID	Sample ID	Date arrived	Subtotal	Subtotal
Africa		PUF 5	PUF 7	PUF 11		PUF 5	PUF 7	PUF 11			
DR Congo	COD	COD-5 (2018-I)	COD-7 (2018-I)	COD-11 (2018-I)	2018-07-16					3	8
Egypt	EGY									0	12
Ethiopia	ETH	ETH-5 (2018-I)		ETH-11 (2018-I)	2018-05-01					2	8
Ghana	GHA									0	8
Kenya	KEN									0	8
Mali	MLI									0	8
Morocco	MAR									0	8
Mauritius	MAR									0	8
Nigeria	NGA									0	8
Senegal	SEN									0	8
Tanzania	TZA									0	8
Togo	TGO									0	8
Tunisia	TUN	TUN-5 (2018-I)	TUN-7 (2018-I)	TUN-11 (2018-I)	2018-05-09	TUN-5 (2018-II)	TUN-7 (2018-II)	TUN-11 (2018-II)	2018-07-19	6	12
Uganda	UGA									0	8
Zambia	ZMB	ZMB-5 (2018-I)		ZMB-11 (2018-I)	2018-04-09	ZMB-5 (2018-II)		ZMB-11 (2018-II)	2018-07-10	4	8
Africa	15	4	2	4	4	2	1	2	2	15	128

Sampling still ongoing. Until to-date, 15 PUFs from an expected 128 PUFs have been received
None from NGA and TZA.

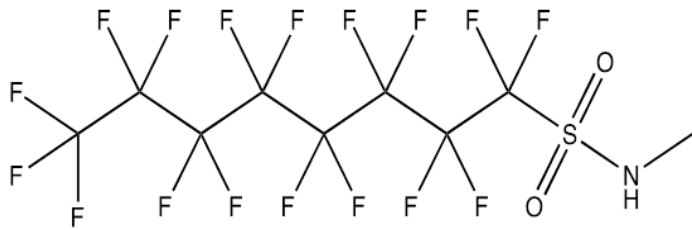
PUF-5, PUF-7: Collaboration between MTM and CSIC to be continued.

Question: Continue with quarterly samples or change to annual?
Capacity in Egypt and Tunisia for the analysis of dl-POPs or PFOS?

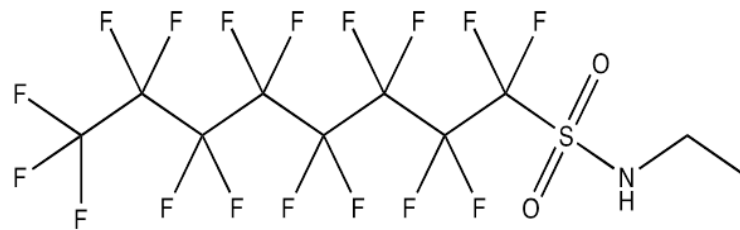
Perfluorooctane sulfonic acid (PFOS isomers)



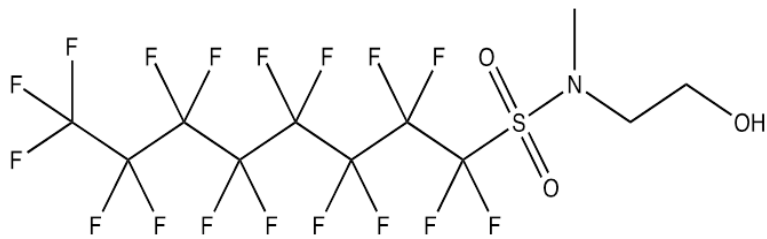
PFOS-related compounds



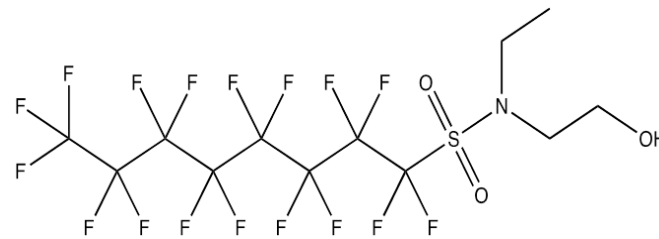
N-methyl perfluorooctane sulfonamide
MeFOSA



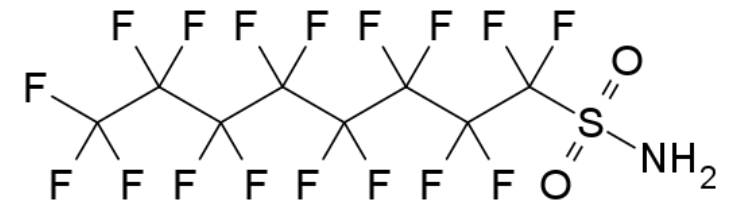
N-ethyl perfluorooctane sulfonamide
EtFOSA



N-methyl perfluorooctane sulfonamidoethanol
MeFOSE



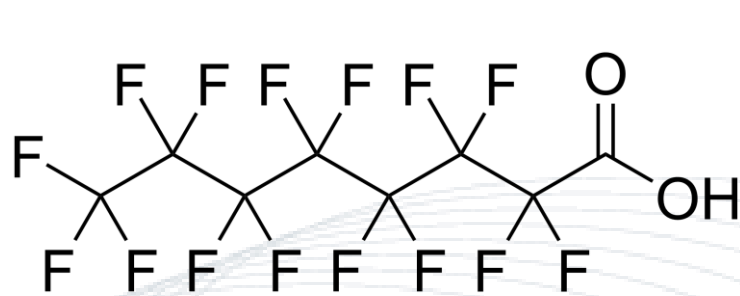
N-ethyl perfluorooctane sulfonamidoethanol
EtFOSE



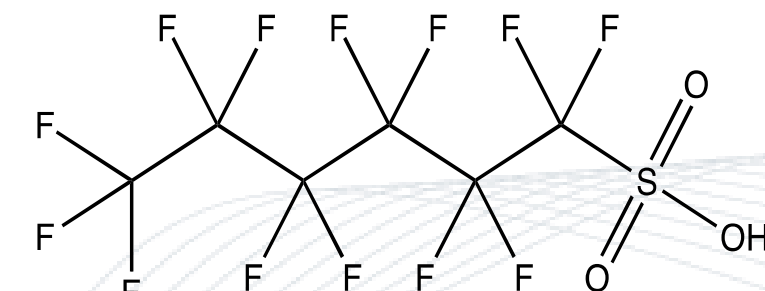
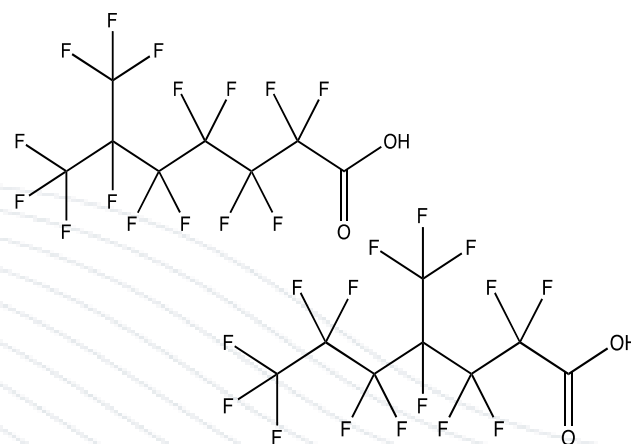
Perfluorooctanesulfonamide
FOSA

Next POPs? Analytes and matrices

	Air	Human Milk	Human Blood	Water
Perfluorooctanesulfonic acid (PFOS)	PFOS (linear and branched PFOS)			
POPs under review for listing				
Perfluorooctanoic acid (PFOA)	PFOA	PFOA	PFOA	PFOA
Perfluorohexanesulfonic acid (PFHxS)	PFHxS	PFHxS	PFHxS	PFHxS



Perfluorooctanoic acid



Perfluorohexane sulfonic acid

Conclusions and next steps

- Cleaned, conditioned PUFs for PAS provided by Recetox (12 per country and campaign);
- PUFs from 2017 sampling received at 76%; arrival of 2018 PUFs ongoing (works well);
 - Some issues with labelling and exposure unclear
 - Need to have exact exposure dates and locations
 - GIS coordinates, temperature either from national information or retrieved from internet sources
- A few countries sent also national PUFs or quarterly for dl-POPs analysis;
 - Not clear what happened to the PUFs that were not shipped
- No samples from active air samplers in Africa received for chemical analysis.
- Method for analysis of PFOS and precursors still under development
 - We propose to include additional perfluorinated compounds – agreement from countries needed
- Analysis of dl-POPs through agreement between Örebro University and CSIC/Barcelona;
 - Analysis follows established methods. So far, concentrations of dl-POPs (very) low (quarterly samples).

Thank you