POPs: Diossine e PCB - solo la punta dell'iceberg?

Werner Tirler, Massimo Donegà, Giulio Voto, Vivienne Malanchin, Valentina Fellin, Albino Basso

Eco-Research, Bolzano, Italy

BOLOGNA POP'S DAY:

Lasceremo un mondo migliore di come l'abbiamo trovato?
Gli effetti dell'uomo sull'uomo

Bologna 01/06/2017

POPs

Gli inquinanti organici persistenti, POPs (Persistent Organic Pollutant) sono delle sostanze che provocano effetti negativi sia a livello ambientale che a livello sanitario.

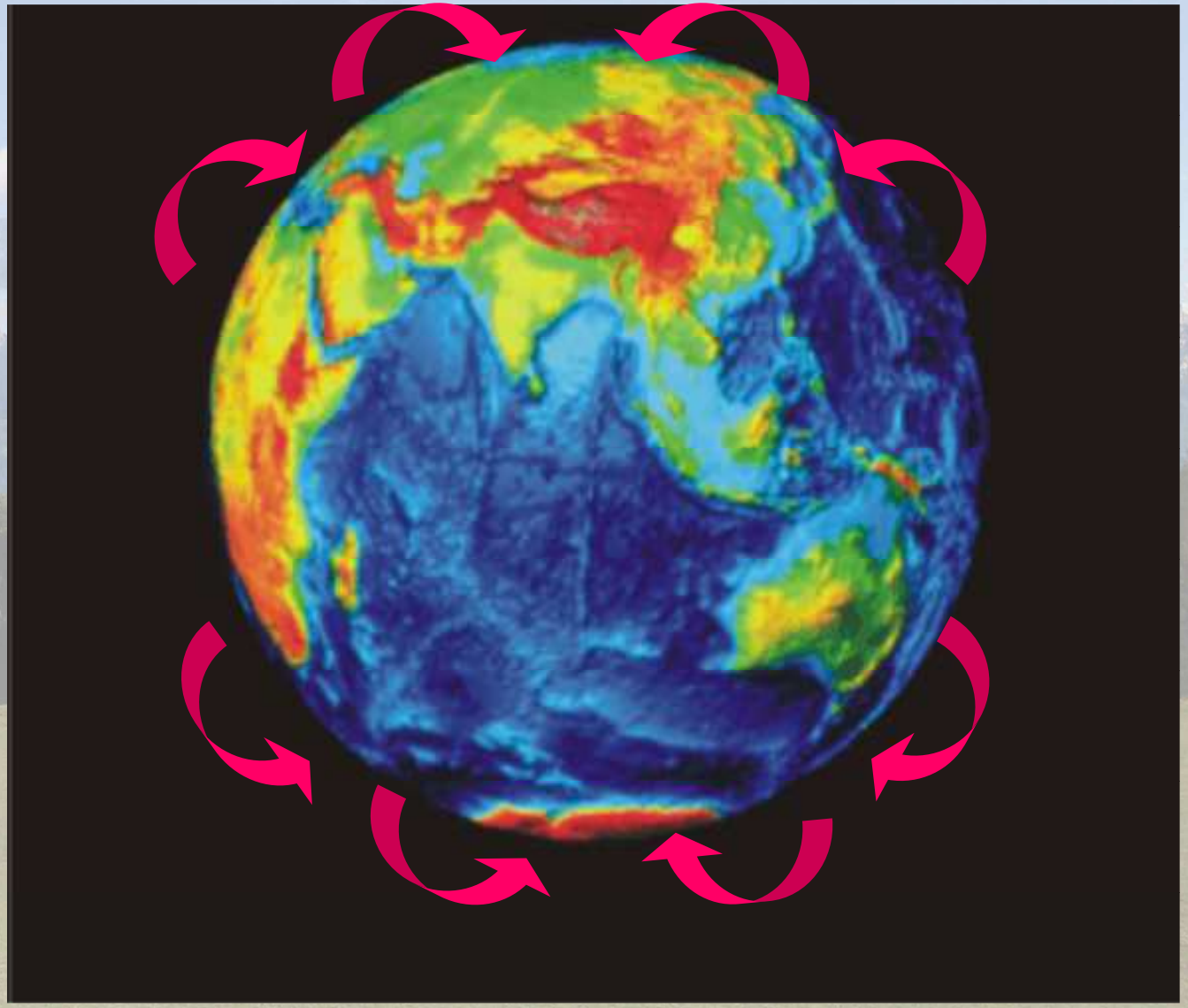
POPs

Rilasciate in ambiente da diverse attività antropiche, quali l'incenerimento di rifiuti e l'industria chimica, registriamo al giorno d'oggi una presenza ubiquitaria

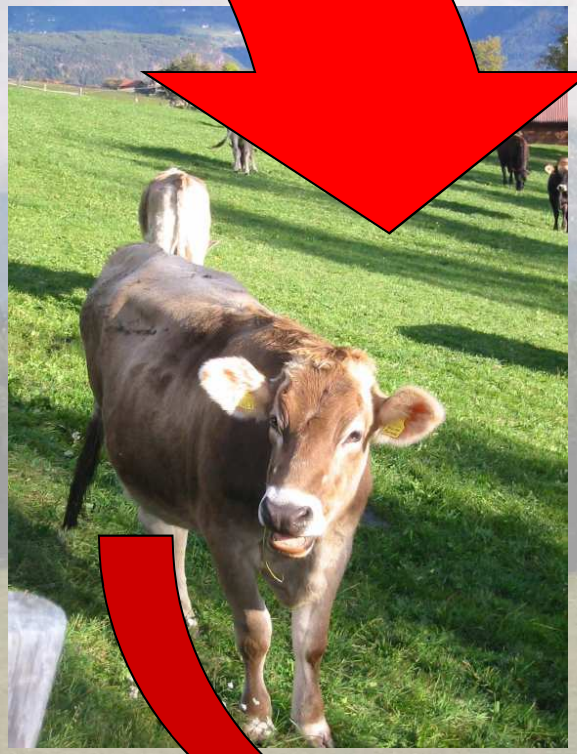
POPs

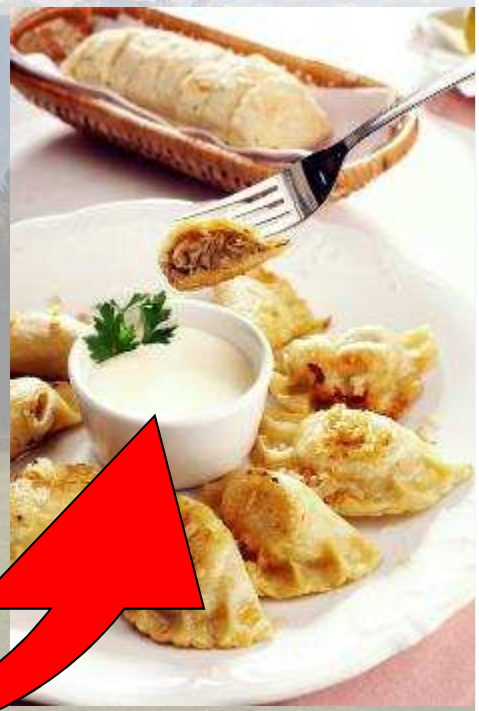
Non si fermano ai confini di stato, ma ormai registriamo la presenza di queste sostanze anche in zone lontane da qualsiasi insediamento industriale

POPs around the world



Bio-accumuolo di POPs

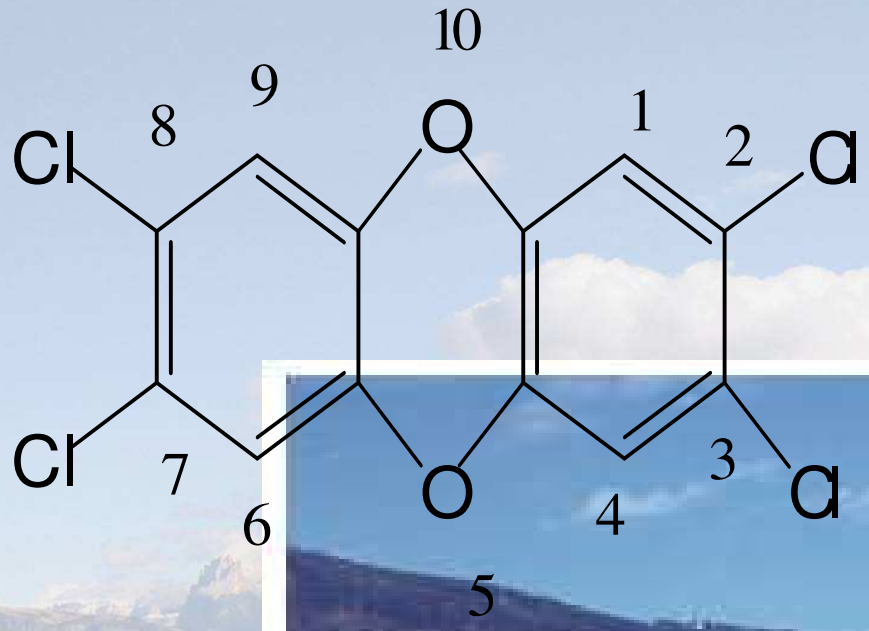


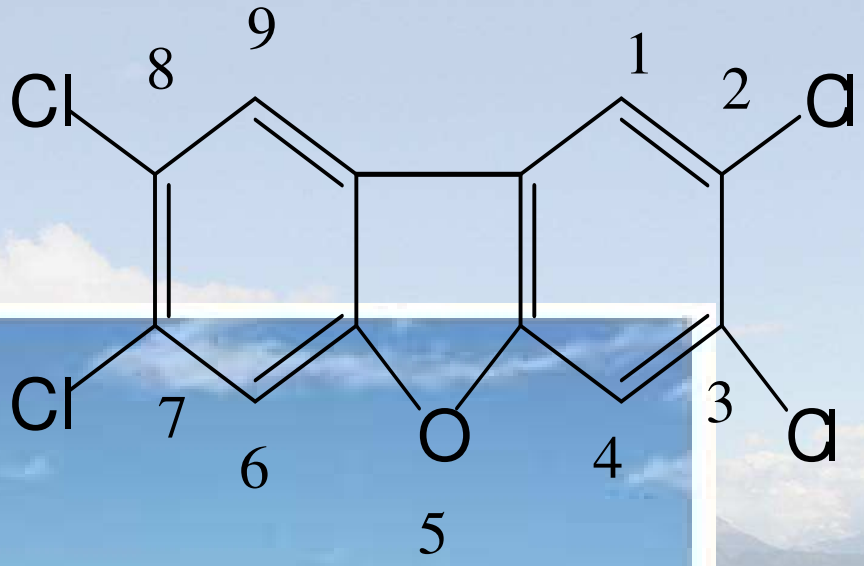


A partire dal 1930, inizio dell'era della clorochimica, si registra un aumento di diossine nell'ambiente.

Mediante dei carotaggi di sedimenti si è visto che le concentrazioni sono aumentate fino agli anni settanta.

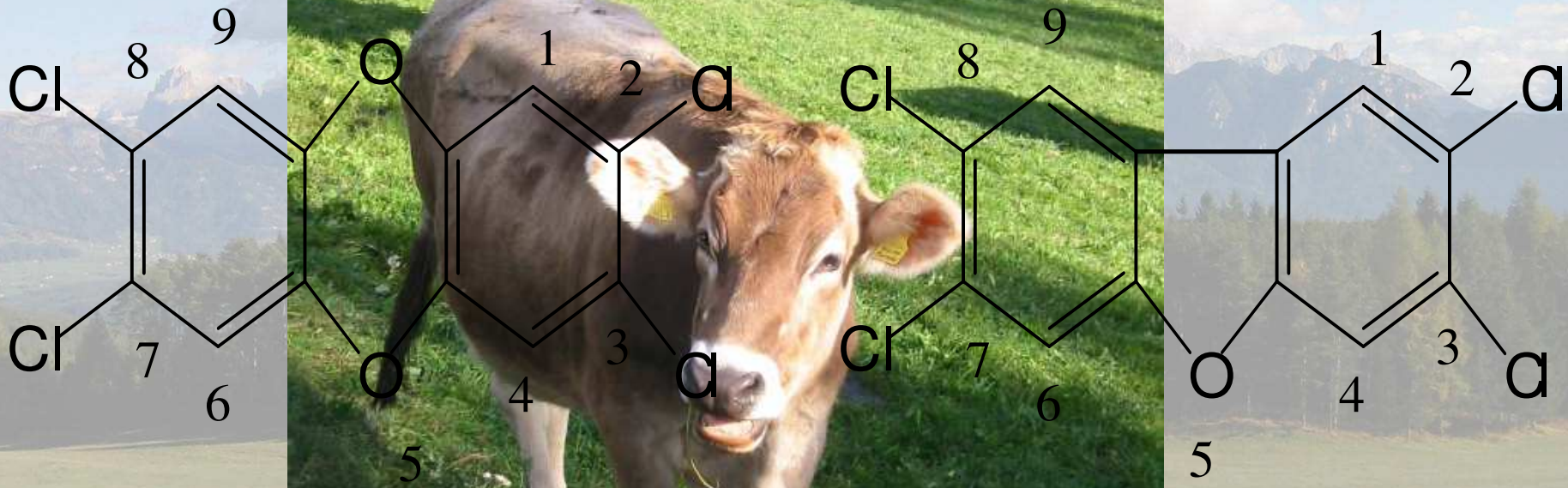
L'industrializzazione, oltre diversi benefici, ci ha lasciato anche questa`"eredità"





2,3,7,8 Tetraclorodibenzo-p-diossina

2,3,7,8 Tetraclorodibenzofurano



2,3,7,8 Tetraclorodibenzo-p-diossina **2,3,7,8 Tetraclorodibenzofurano**

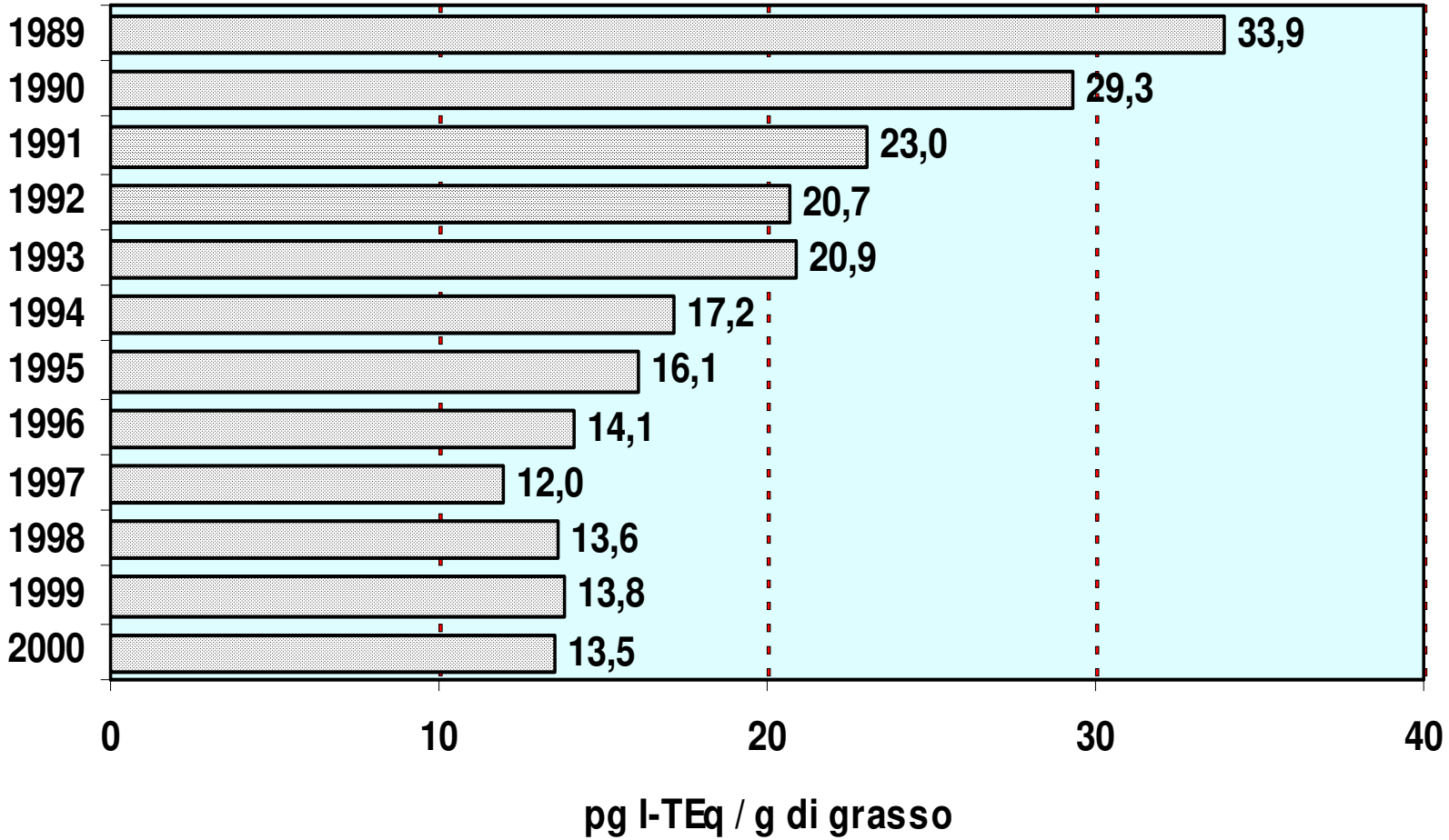
Contaminazione Alimentare:

1998:	Additivo per mangimi (pastazzo d'agrumi - Brasile)
1999:	**Belgio ("polli alla diossina")**
1999:	Additivo per mangimi contaminato (Caolino)
2000:	Additivo per mangimi contaminato (cloruro di colina)
2001:	Additivo per mangimi contaminato
2003	Emergenza Campana (mozzarelle di bufala)
2005	Legno impregnato di origine africano

Segue: Contaminazione alimentare

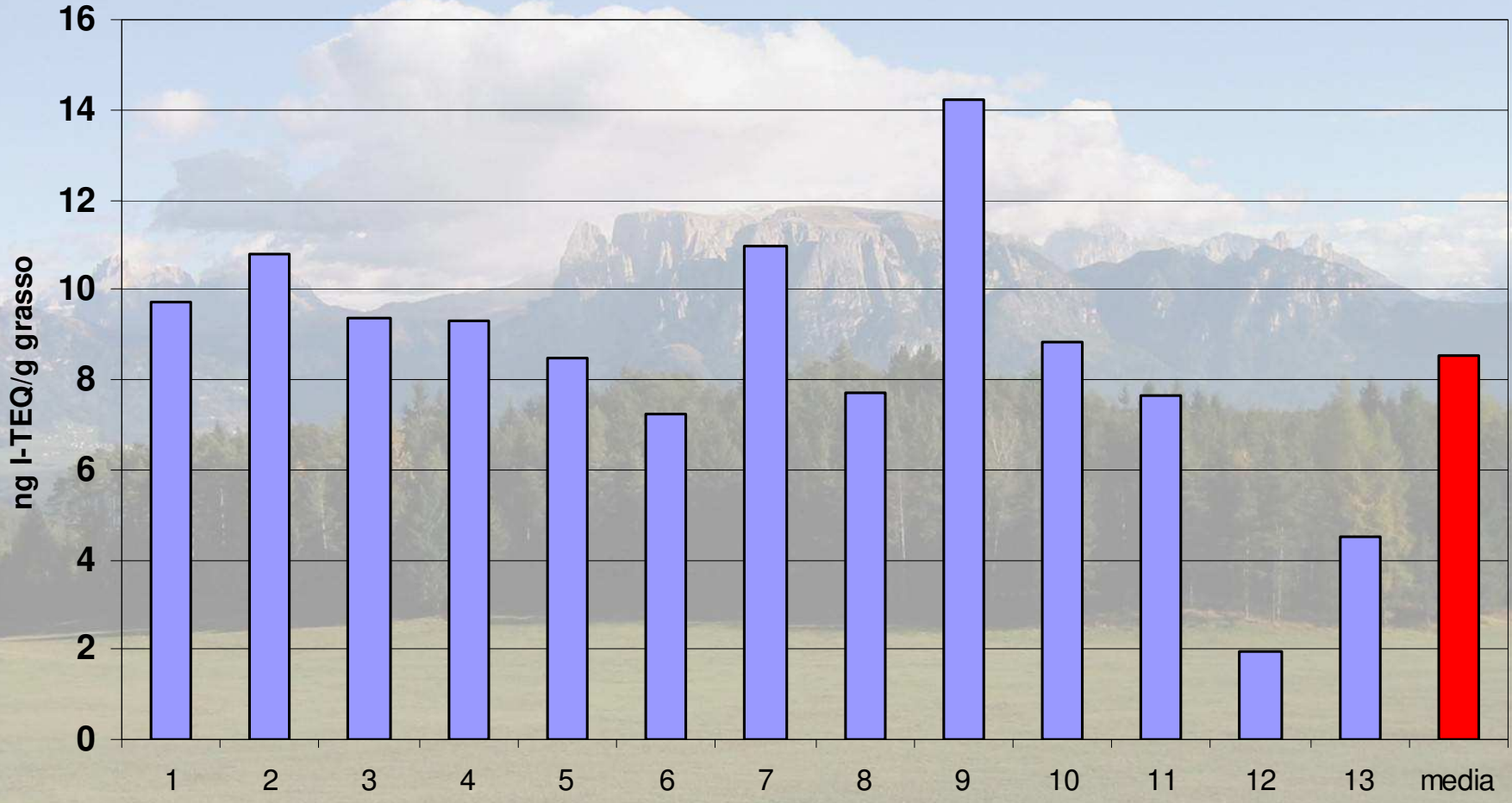
2007	Mangimi – Farina di Guar
2008	Carne in Irlanda
2011	Allevamenti in Germania
2015	Polli in Italia
2017	???

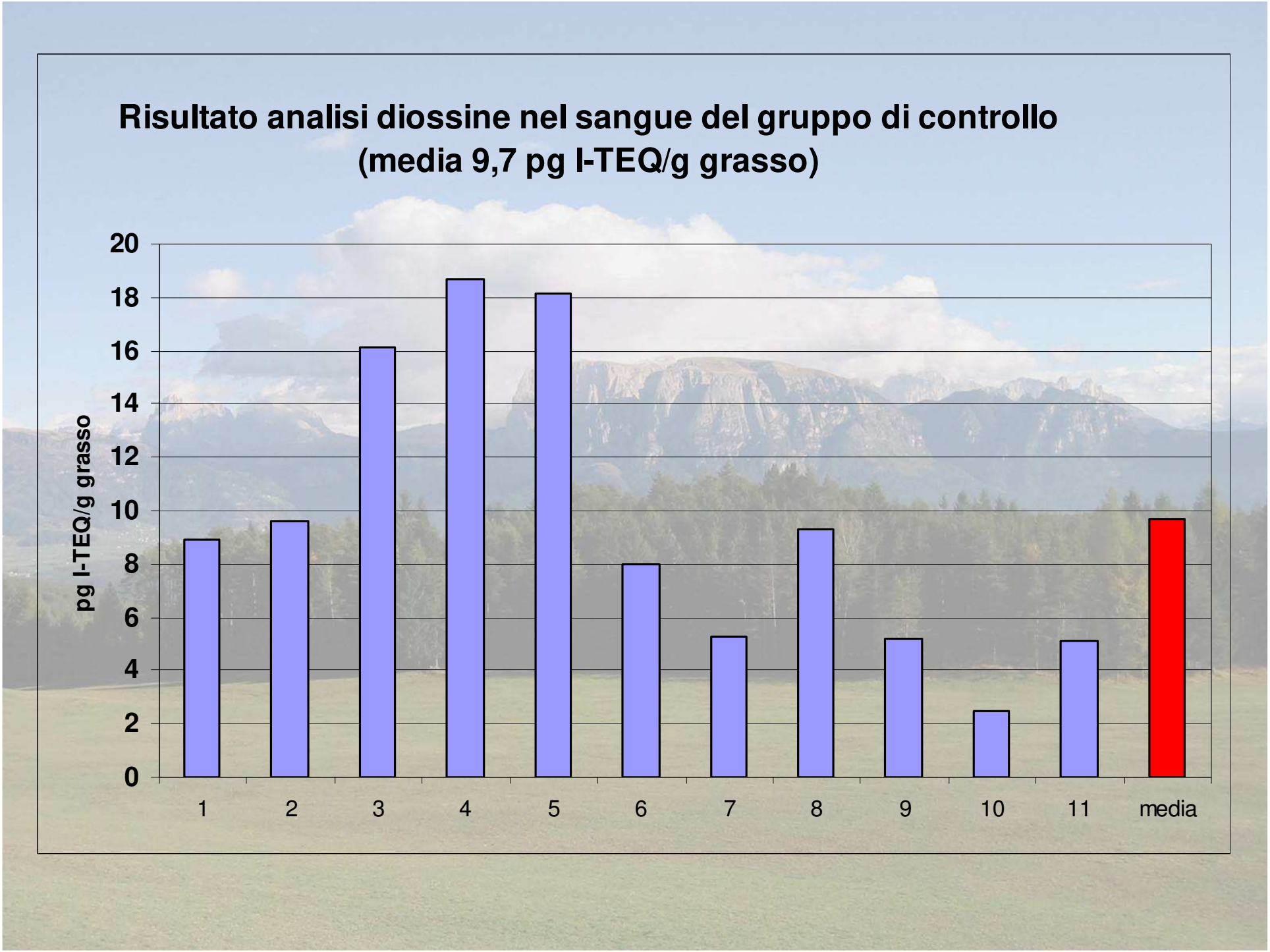
PCDD/F in Latte materno 1989 - 2000



Da Kees Olie, 2001

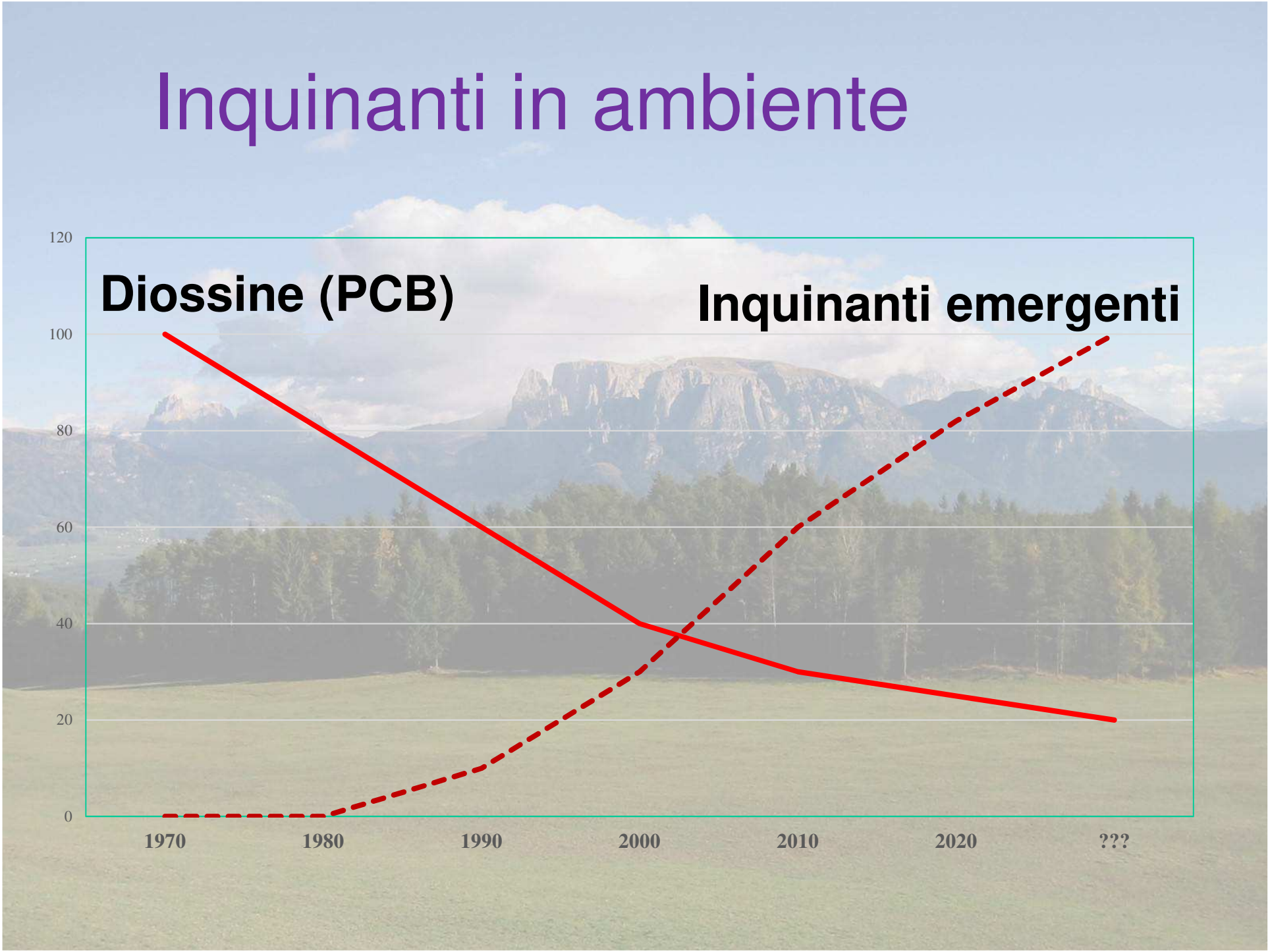
Risultato analisi diossine nel sangue di chi lavora all'inceneritore o in discarica (media 8,5 pg I-TEQ/g grasso)




Risultato analisi diossine nel sangue del gruppo di controllo
(media 9,7 pg I-TEQ/g grasso)
pg I-TEQ/g grasso
20
18
16
14
12
10
8
6
4
2
0
1
2
3
4
5
6
7
8
9
10
11
media


…**un mondo** migliore?

Inquinanti in ambiente



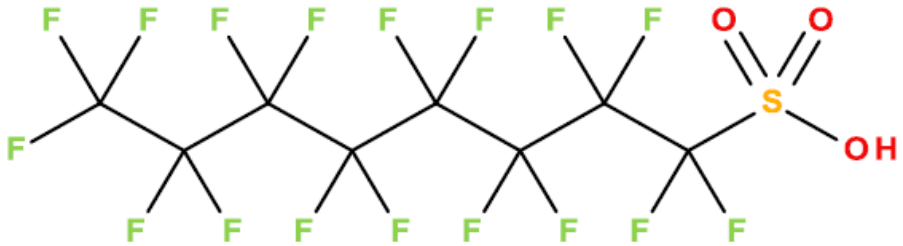
Sostanze perfluoro alchiliche (PFAS)

Nel corso dell'estate del 2013, a seguito di alcune ricerche sperimentali su potenziali inquinanti "emergenti" effettuate su incarico del Ministero dell'Ambiente, è stata segnalata la presenza in alcuni ambiti del territorio regionale di sostanze perfluoro alchiliche (PFAS) in acque sotterranee, acque superficiali e acque potabili.

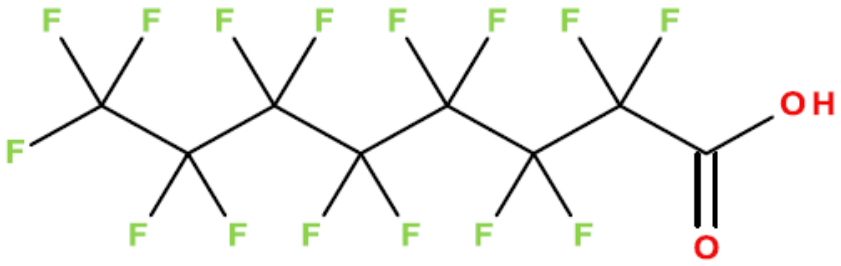
Le sostanze sono caratterizzate da una notevole resistenza nell'ambiente, associata ad una rilevante capacità di diffusione e da una persistenza molto significativa che determinano una diffusa presenza nell'ambiente idrico, nell'ambiente e negli organismi, incluso l'uomo, dove tendono ad accumularsi nel tempo

https://www.regione.veneto.it/web/sanita/pfas

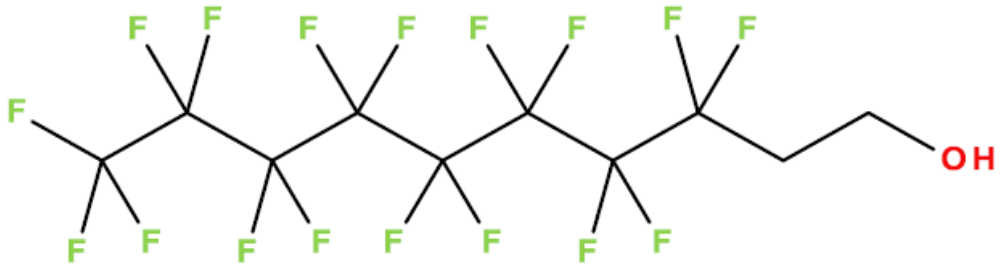
PFAS ?



Perfluorooctane sulfonic acid (PFOS as acid)

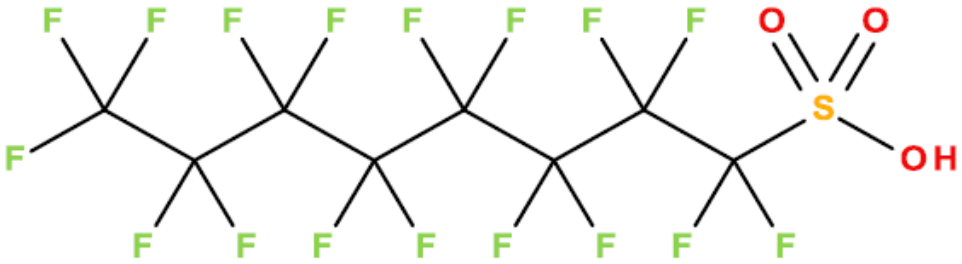


Perfluorooctanoic acid (PFOA)

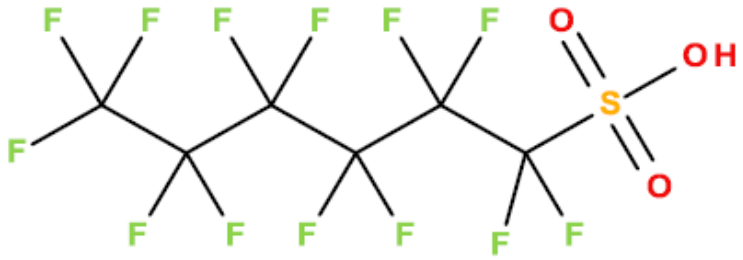


8:2 Fluorotelomer alcohol (8:2 FTOH)

PFAS ?



Perfluorooctane sulfonic acid (PFOS as acid)

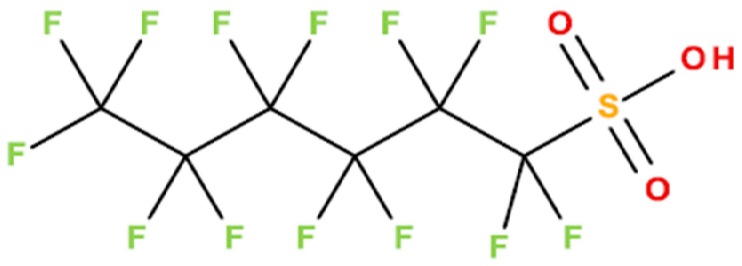


Perfluorohexane sulfonic acid (PFHxS)

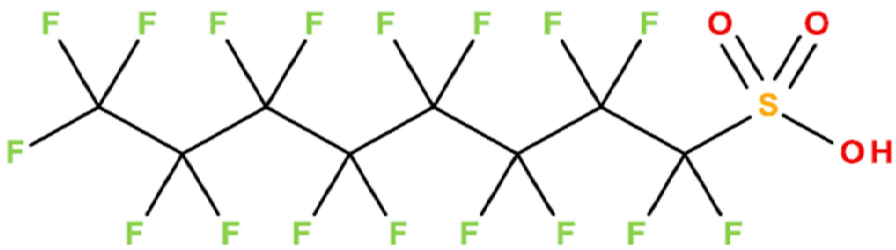
„Short chain PFAS“

PFAS ?

„Short chain PFAS“



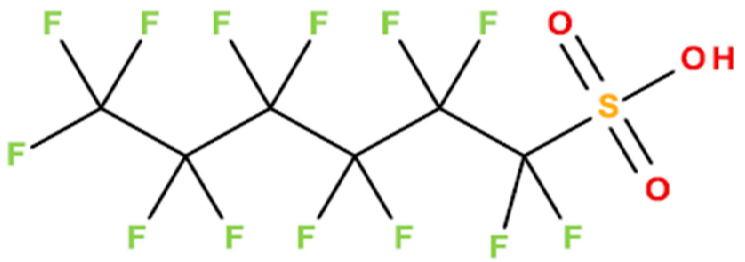
Perfluorohexane sulfonic acid (PFHxS)



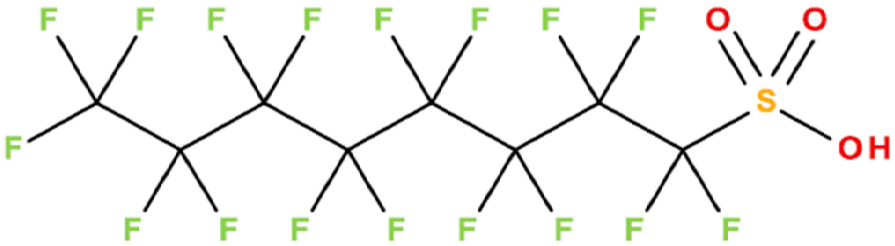
Perfluorooctane sulfonic acid (PFOS as acid)

PFAS ?

„Short chain PFAS“

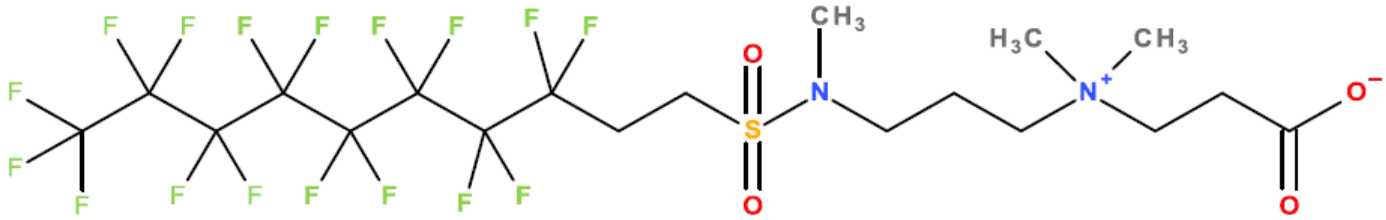


Perfluorohexane sulfonic acid (PFHxS)

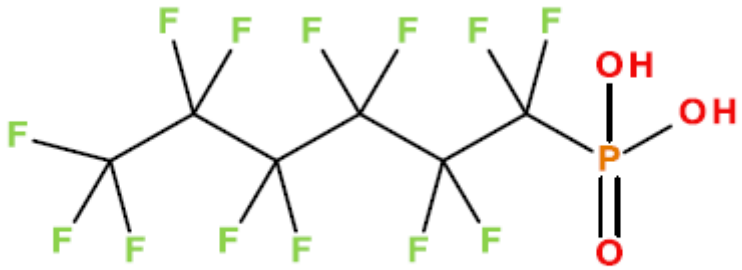


Perfluorooctane sulfonic acid (PFOS as acid)

PFAS ?



N-(2-Carboxyethyl)-N,N-dimethyl-3-((1H,1H,2H,2H-tetrahydroperfluorodecyl)sulfonylamino)-1-propanaminium



PFHxPA

EFFECTS OF WEATHERING ON PFASS USED IN DURABLE WATER REPELLENCE OF OUTDOOR CLOTHING

Van Der Veen, A. Hanning, J. Weiss, P. Leonards, J. De Boer

Organohalogen Compounds Vol. 78, (2016) 126

„Per- and polyfluoroalkyl substances (PFASs) are increasingly attracting attention of environmental scientists. The wide application possibilities together with the persistence of these substances have caused that these compounds occur basically everywhere in the global environment [1]. On top of that, background values several PFASs in human blood have established worldwide. For example, for perfluorinated octanoic acid (PFOA) a background level of 4 ng/mL, and for perfluorinated octylsulfonate (PFOS) a background level of 21 ng/mL is reported for human blood in the USA “

EFFECTS OF WEATHERING ON PFASS USED IN DURABLE WATER REPELLENCE OF OUTDOOR CLOTHING

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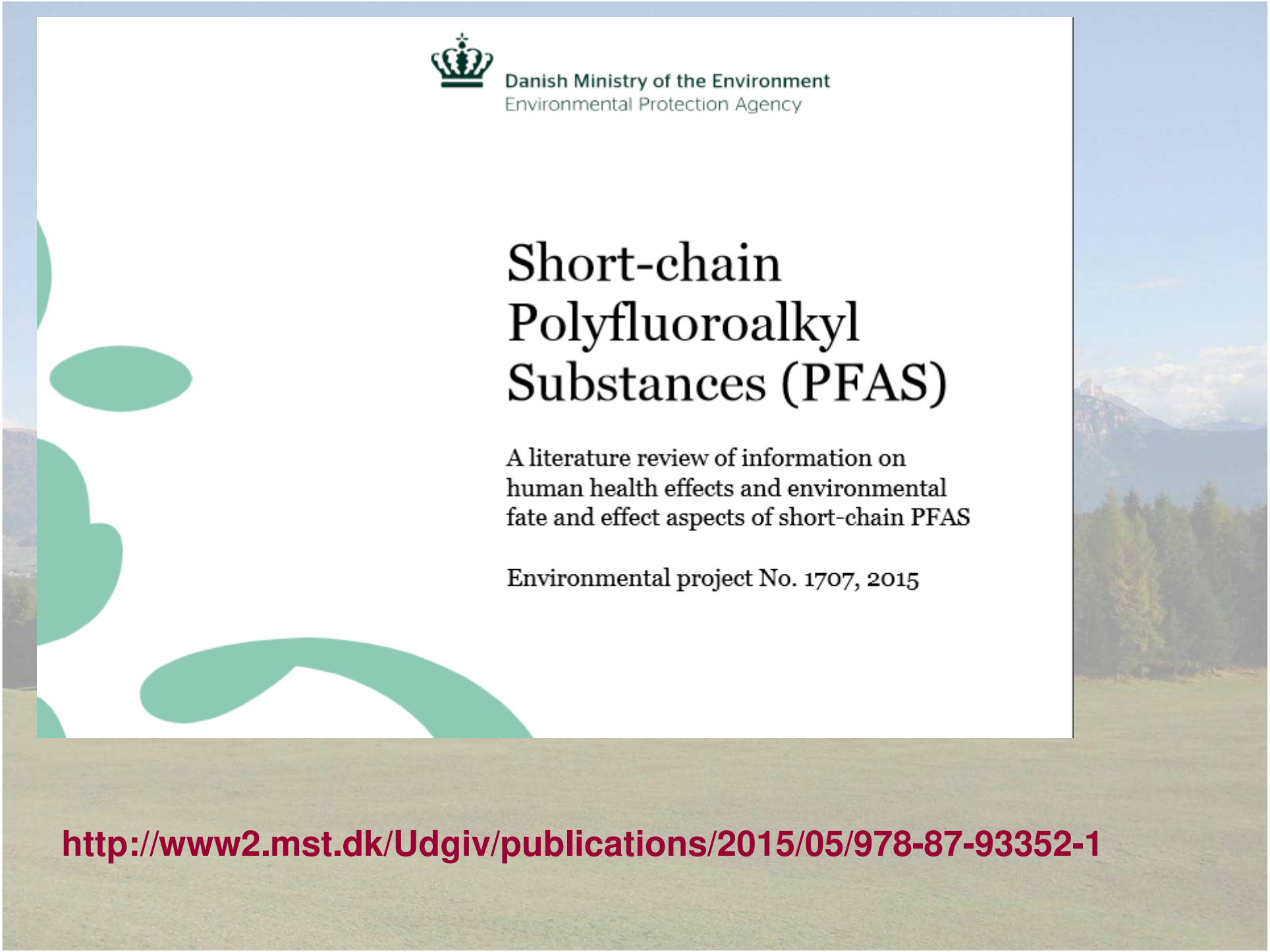
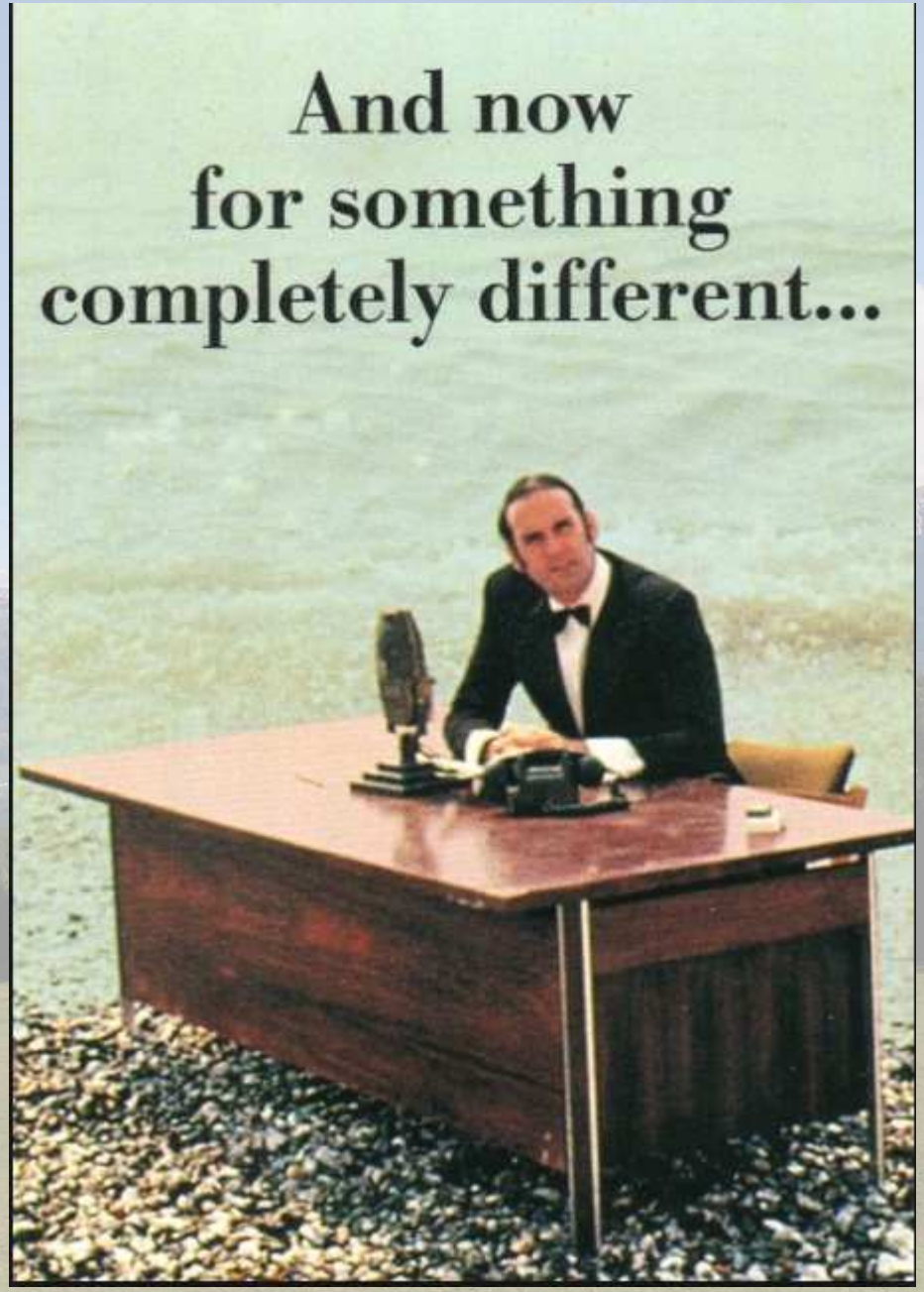
Studied were the ionic PFASs: perfluoroalkane sulfonic acids (PFSAs), perfluoroalkyl carboxylic acids (PFCAs), Fluorotelomer sulfonic acids (n:2) (FTSAs), Fluorotelomer carboxylic acids (n:2) (FTCAs), Perfluorooctane sulfonamide (FOSA), and the neutral PFASs: Fluorotelomer alcohols (n:2) (FTOHs), Fluorotelomer acrylates (n:2) (FTACs), Fluorotelomer methacrylates (n:2) (FTMACs), N-Methyl perfluorooctane sulfonamide (MeFOSA), N-Ethyl perfluorooctane sulfonamide (EtFOSA), N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE).


Danish Ministry of the Environment
Environmental Protection Agency
Short-chain Polyfluoroalkyl Substances (PFAS)
A literature review of information on human health effects and environmental fate and effect aspects of short-chain PFAS
Environmental project No. 1707, 2015
http://www2.mst.dk/Udgiv/publications/2015/05/978-87-93352-1


And now
for something
completely different...

Ritardanti di Fiamma Bromurati (BFR)

I ritardanti di fiamma bromurati (inglese: BFR) vengono aggiunte a un'ampia gamma di prodotti quali plastiche, mobili, articoli tessili e apparecchiature elettriche/elettroniche.

https

BFR di comune utilizzo:

- **eteri bifenili polibromurati (PBDE)**
- **esabromociclododecane (HBCDD – in polistirolo espanso/estruso)**
- **tetrabromobisfenolo A (TBBPA)**
- **bifenili polibromurati (PBB)**
- **altri ritardanti di fiamma bromurati.**

Indoor Sources of and Human Exposure to Brominated Flame Retardants (BFRs)

Yang et al– BFR2017 - York

Emerging and legacy flame retardants in UK human milk and food suggest slow response to restrictions on use of PBDEs and HBCDD

Fang Tao et al,– BFR2017 - York

https

*** Ingestion of extruded polystyrene by laying chicken hens results in eggs contaminated with hexabromocyclododecane**

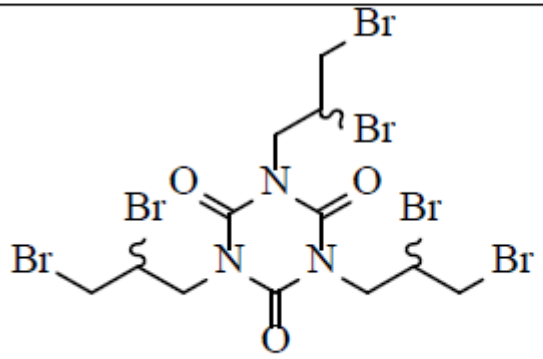
*Cariou et all – BFR2017 - York

Listing of POPs in the Stockholm Convention

Parties must take measures to eliminate the production and use of the chemicals listed under Annex A

Hexabromocyclododecane (HBCD)
Hexabromobiphenyl
……

: Chemical structure and main physico-chemical properties of TDBP-TAZTO

Structure	CAS no.	MW	$LogK_{OW}$	K_{OC}
	52434-90-9	728.69 g mol^{-1}	4.45	6260

1,3,5-Tris-(2,3-dibromopropyl)-1,3,5-triazine-2,4,6-trione

Alternative ?

1. Organophosphorus Flame Retardants

Triphenylphosphate(TPP)*,

Resorcinol bis(diphenylphosphate) (RDP),

Bisphenol-A bis(diphenylphosphate) (BDP),

Dihydrooxaphosphaphenanthrene (DOPO),

Aluminum diethylphosphinate (ALPI)

Alternative ?

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Dihydrooxaphosphaphenanthrene (DOPO),

Aluminum diethylphosphinate (ALPI)

*The aquatic toxicity of TPP is, in many cases, high to many types of fish, algae, and crustaceans, since the LC_{50s} recorded for these species is about or lower than 1 mg L^{-1}

Persistence, Bioaccumulation, and Toxicity of Halogen-Free Flame Retardants, Hendriks et al., Reviews of environmental contamination and toxicology · (2013)

Alternative ?

2. Nitrogen-Based Organic Flame Retardant

*Melamine Polyphosphate

*There are not enough data to classify the in vitro toxicity of MPP.
Persistence, Bioaccumulation, and Toxicity of Halogen-Free Flame Retardants, Hendriks et al.,
Reviews of environmental contamination and toxicology · (2013)

Obama: 'The best is yet to come'

UVCB: Substances of unknown or variable composition, complex reaction products or biological materials
es, N-alkoxy hindered amine *

As a result of compositional variability, the identification of UVCB substances is mostly based on their generic description

Reaction product which could not reliably be assigned to a CAS Number

* K. Aschberger et al. / Environment International 101 (2017) 27–45

Scusate, dimenticavo…

Microplastica…

Xeno-Estrogeni…

Nano-Particelle …

Farmaci…

Altro…

Ringrazio per l’attenzione