

Exposure to Endocrine disruptors: Which substances from which sources?

Åke Bergman

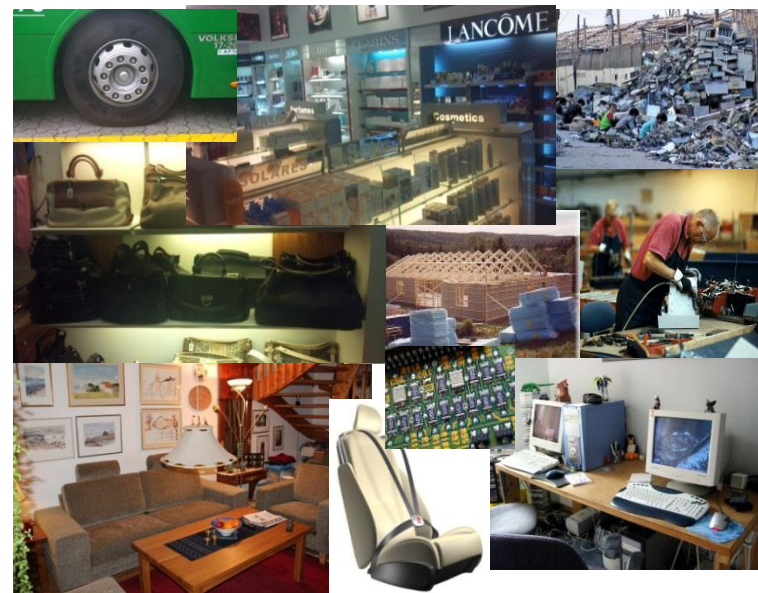
Professor in Environmental Chemistry, Ph.D.,
Dept. of Materials and Environmental Chemistry
Stockholm University, Stockholm, Sweden

How many are the anthropogenic chemicals?

143.000 are pre-registered
by ECHA (REACH)

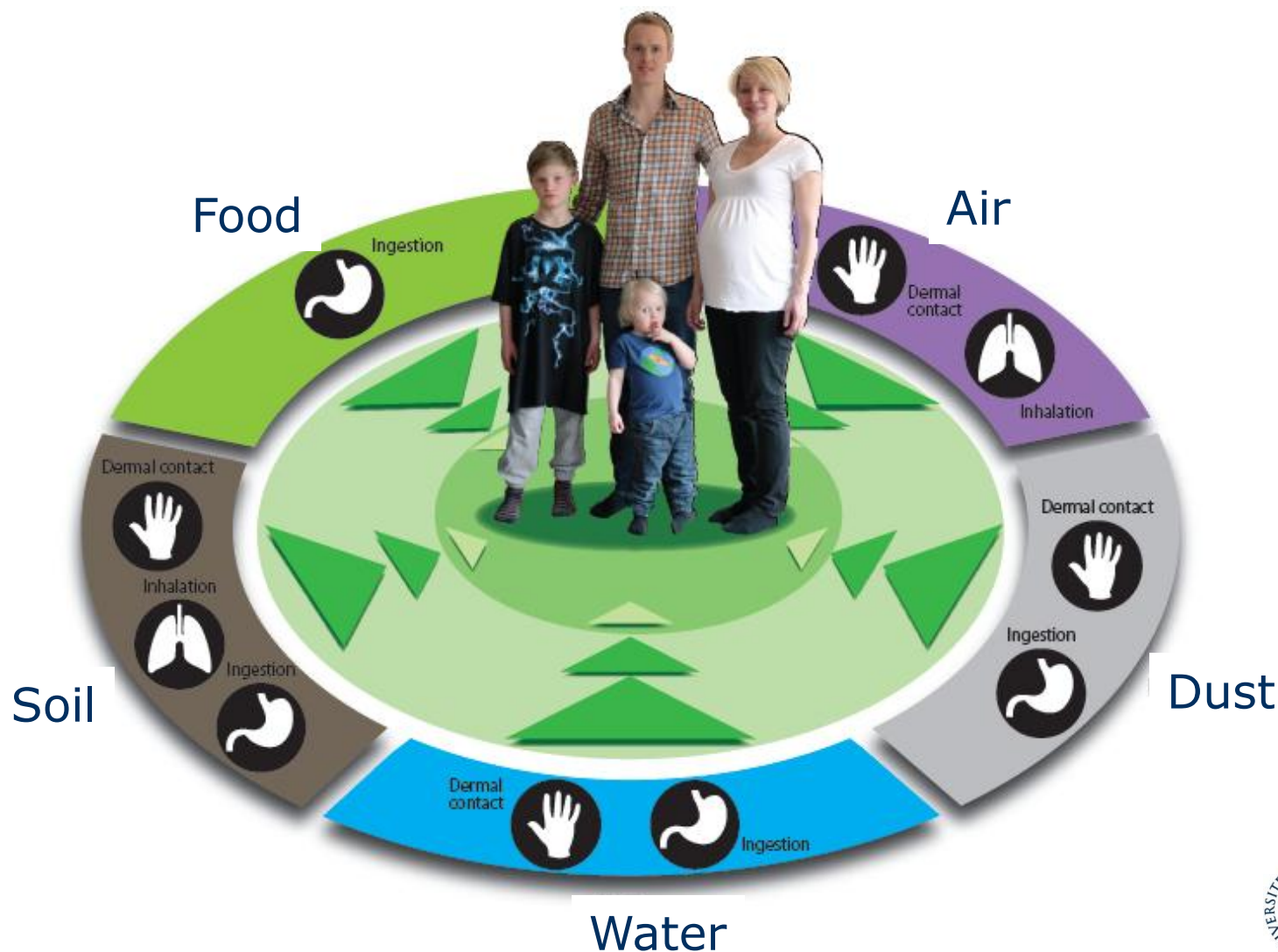
... but many exemptions apply
(pesticides, pharmaceuticals, FCMs, PCPs)

Byproducts and Transformations
products: Generally not registered



**Might well be 500.000 to 1 million chemicals to
consider for their health and wildlife endocrine effects!**

How do the EDCs reach us?



Transplacental transfer

**Anthropogenic chemicals are transferred: via the placenta
via mothers' milk
via hand-to-mouth activity**

Exposure via
mothers' milk

Young children exposure

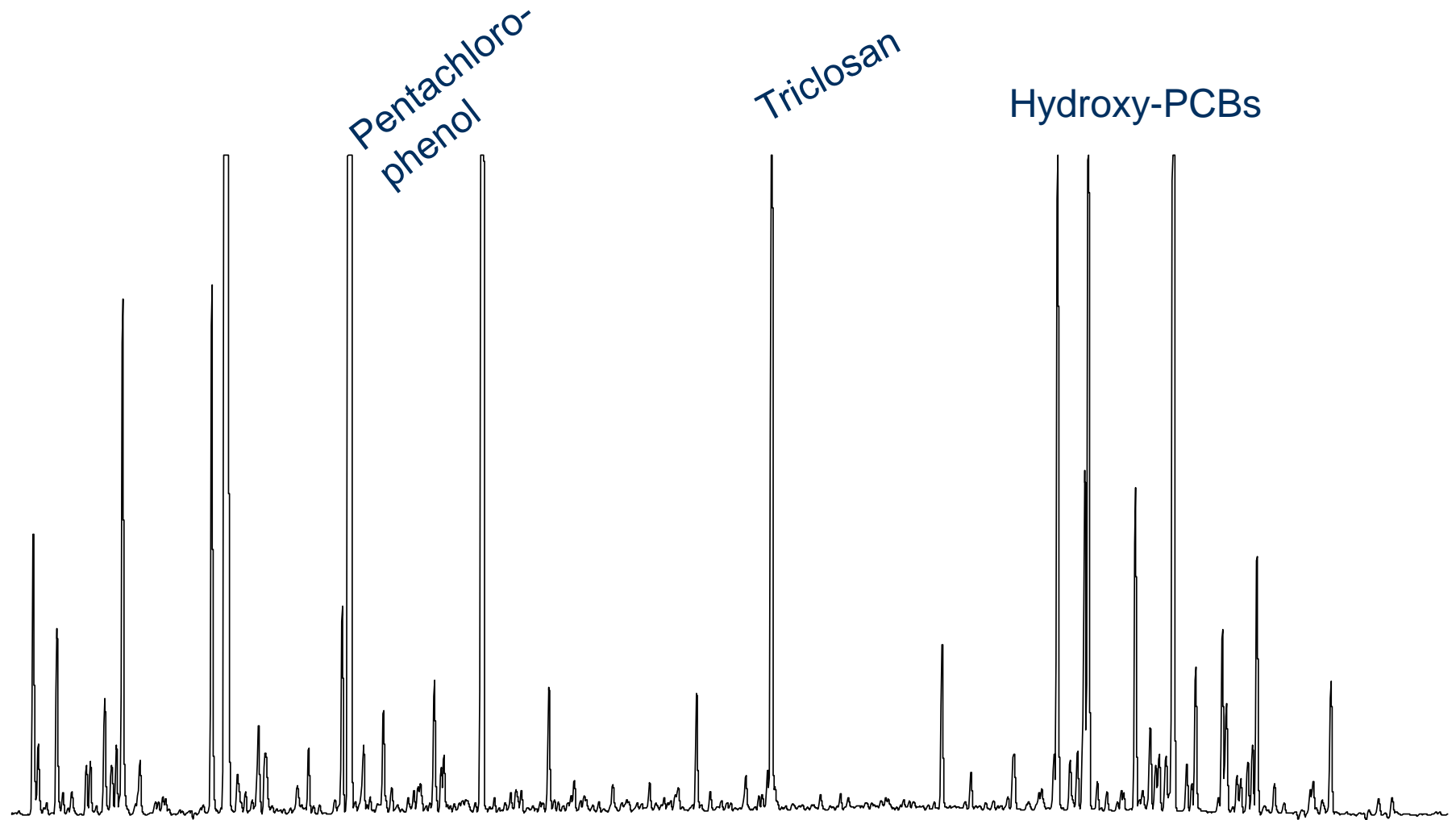
PBDE levels

6.6x

5.1x

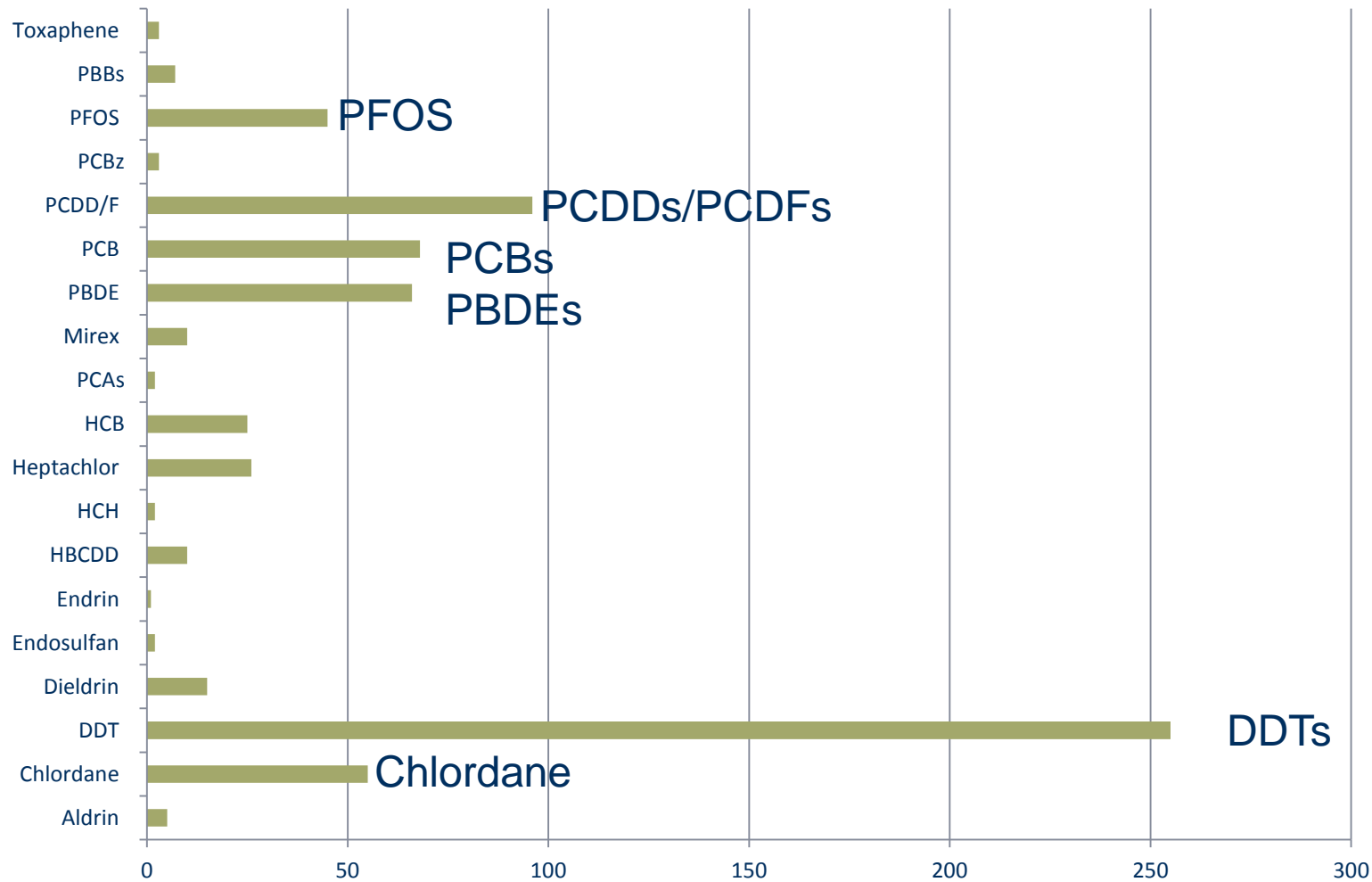
Lunder et al., 2010,
ES&T, 44, 5256

Halogenated Phenolic Compounds in human blood



Hovander *et al.*, Arch. Environ. Contam. Toxicol, 42 (2002) 105

Number of scientific reports on POPs in mothers' milk 1995-2012 (a total of 696 studies)



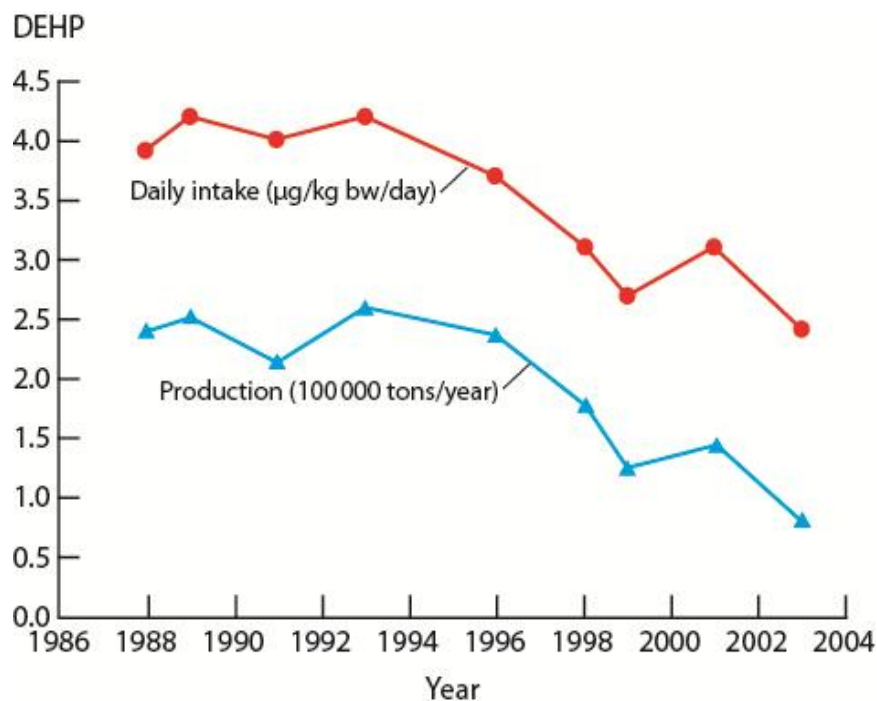
Which are the Endocrine Disrupting Chemicals?

Property/Behaviour based grouping

- Persistent & Bioaccumulative chemicals
 - POP (Stockholm Convention)
 - Other P and B chemicals (Lipophilic and Proteinophilic)
- Semi-persistent chemicals
 - Chemicals with high persistency but without bioaccumulation potential
- Pseudo-persistent chemicals
 - Chemicals for which continuous exposure may occur, leading to steady-state levels in exposed organisms
- Metals and metalloids

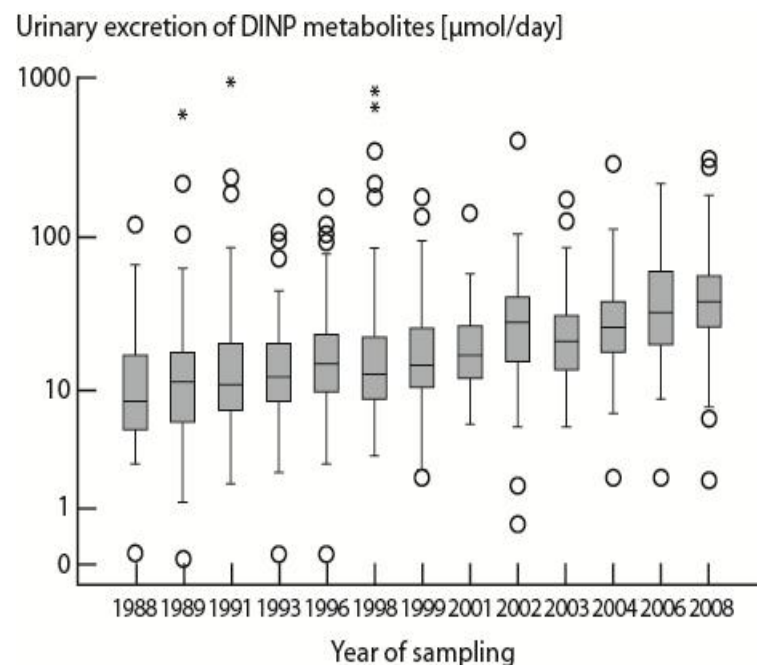
Exposure to EDCs is responsive to changes in production & use

DEHP production in Germany & median daily intake of DEHP



(Helm, STOTEN, 388, 2007)

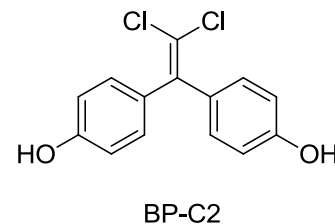
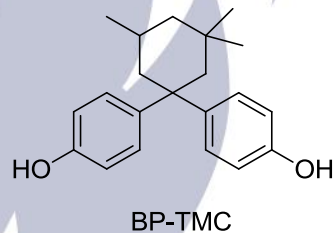
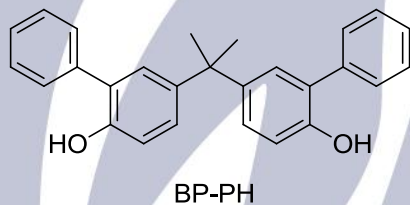
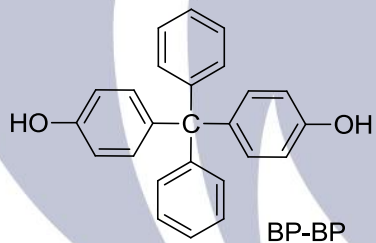
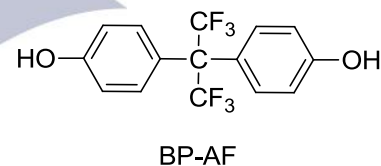
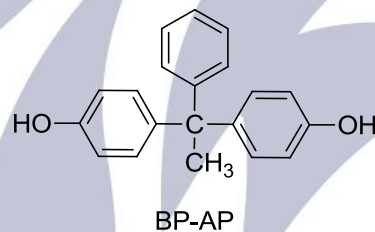
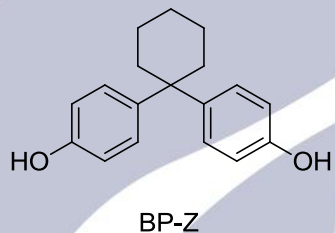
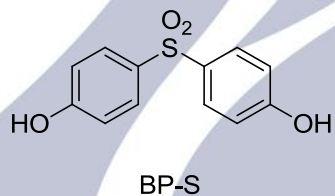
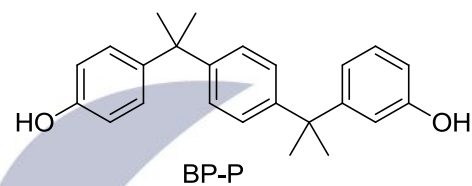
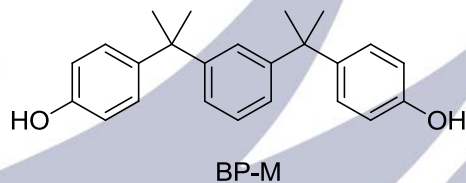
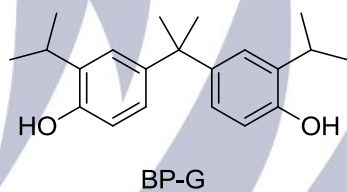
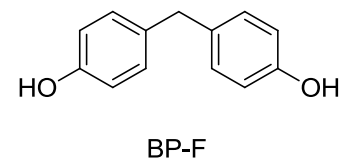
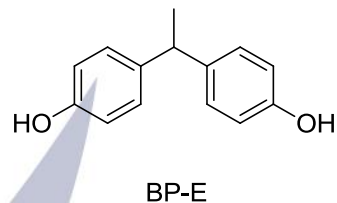
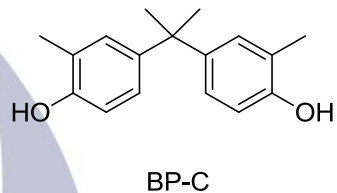
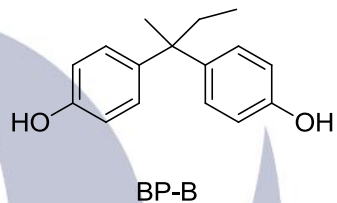
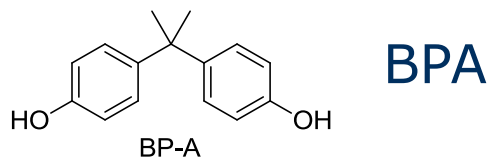
Trend of urinary excretion (mmol/day) of DiNP metabolites



(Göen et al. J. Hyg. Env. Health, 215 (2011))

Exposure to BPA

...and to



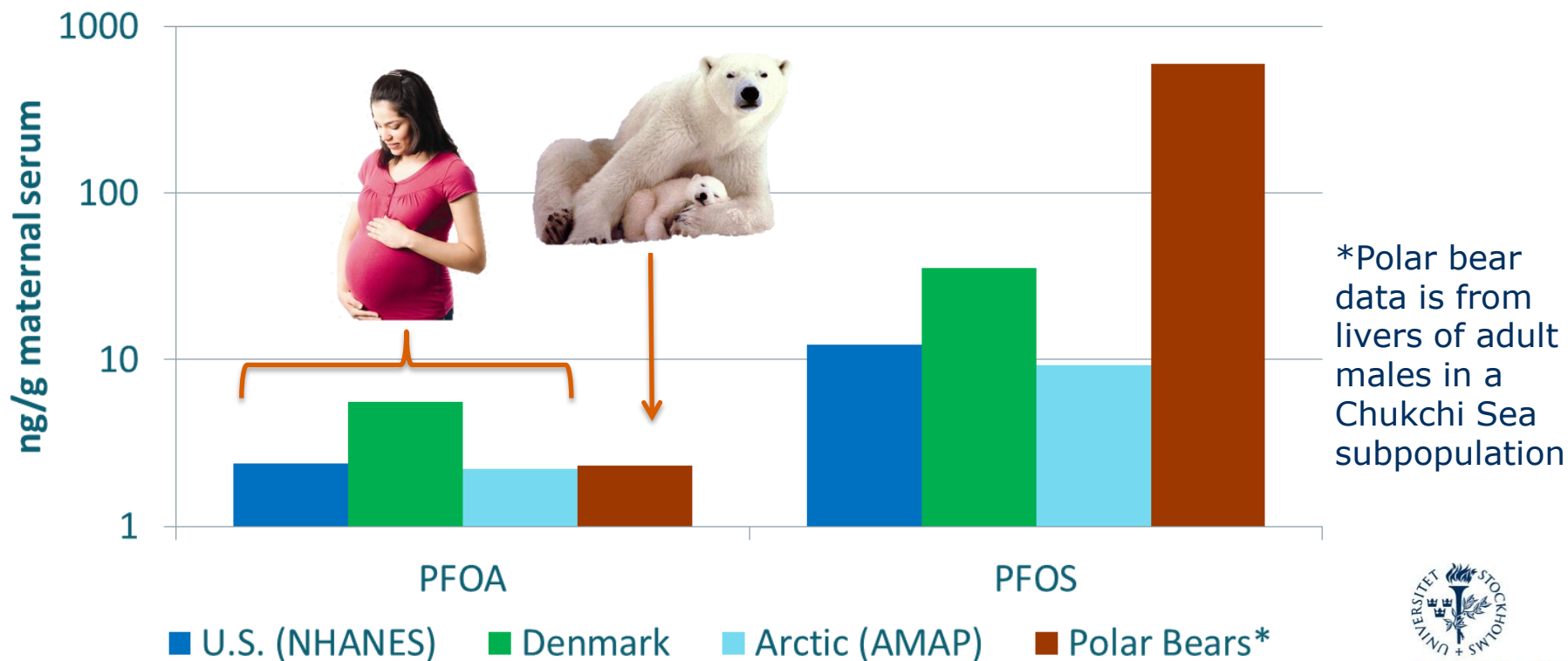
Which are the EDCs of Concern?

So far only a very small number of all potential EDCs has been identified, and fewer has been subjected to exposure assessments and/or monitored.

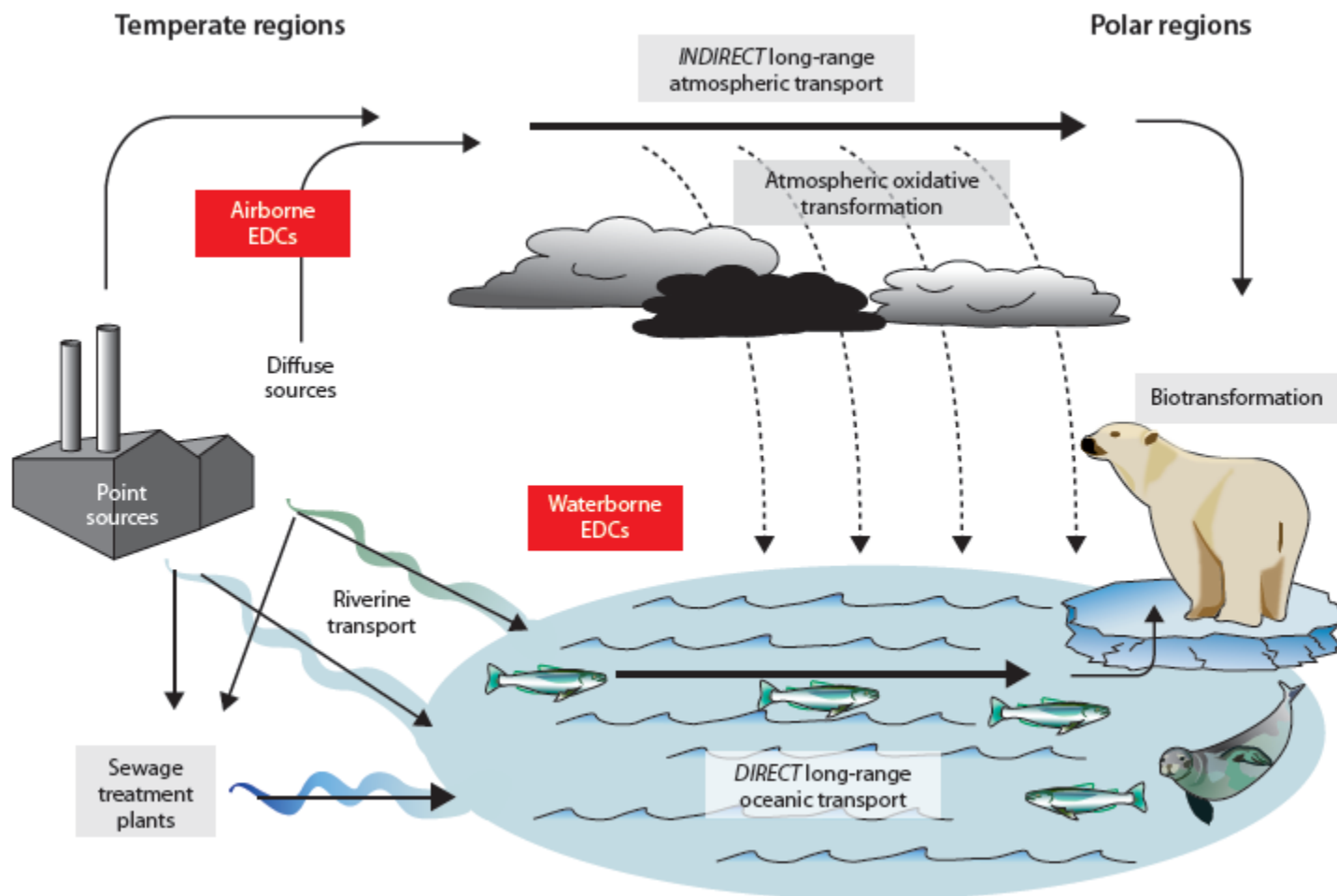
- A large number of environmental scientists have hitherto focused their research on the same few chemicals (*the Matthew Principle**)
- Financial support is primarily given to research on the same few chemicals

* Grandjean et al., Environmental Health 2011, 10:96

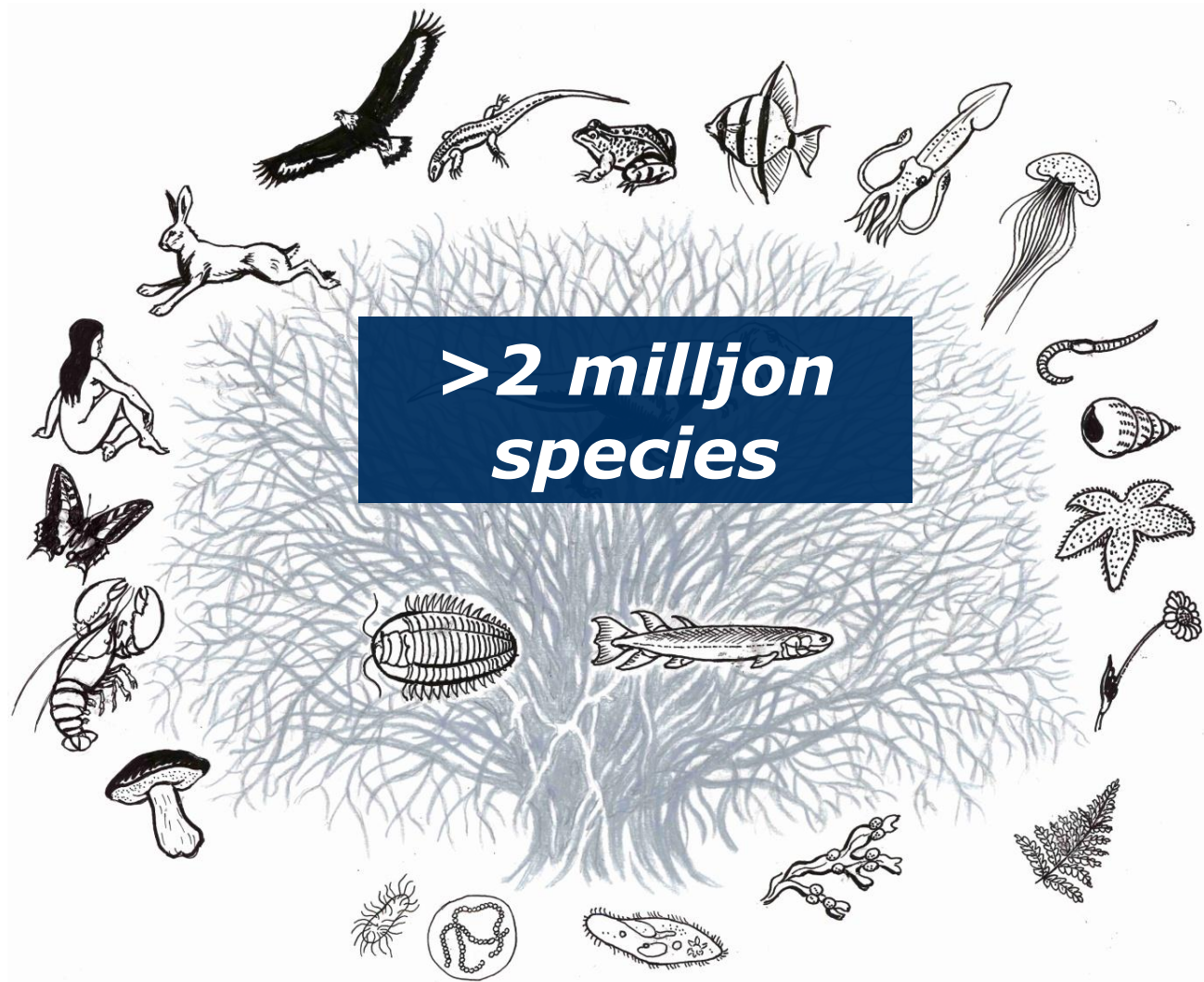
Wildlife and human exposure to EDCs



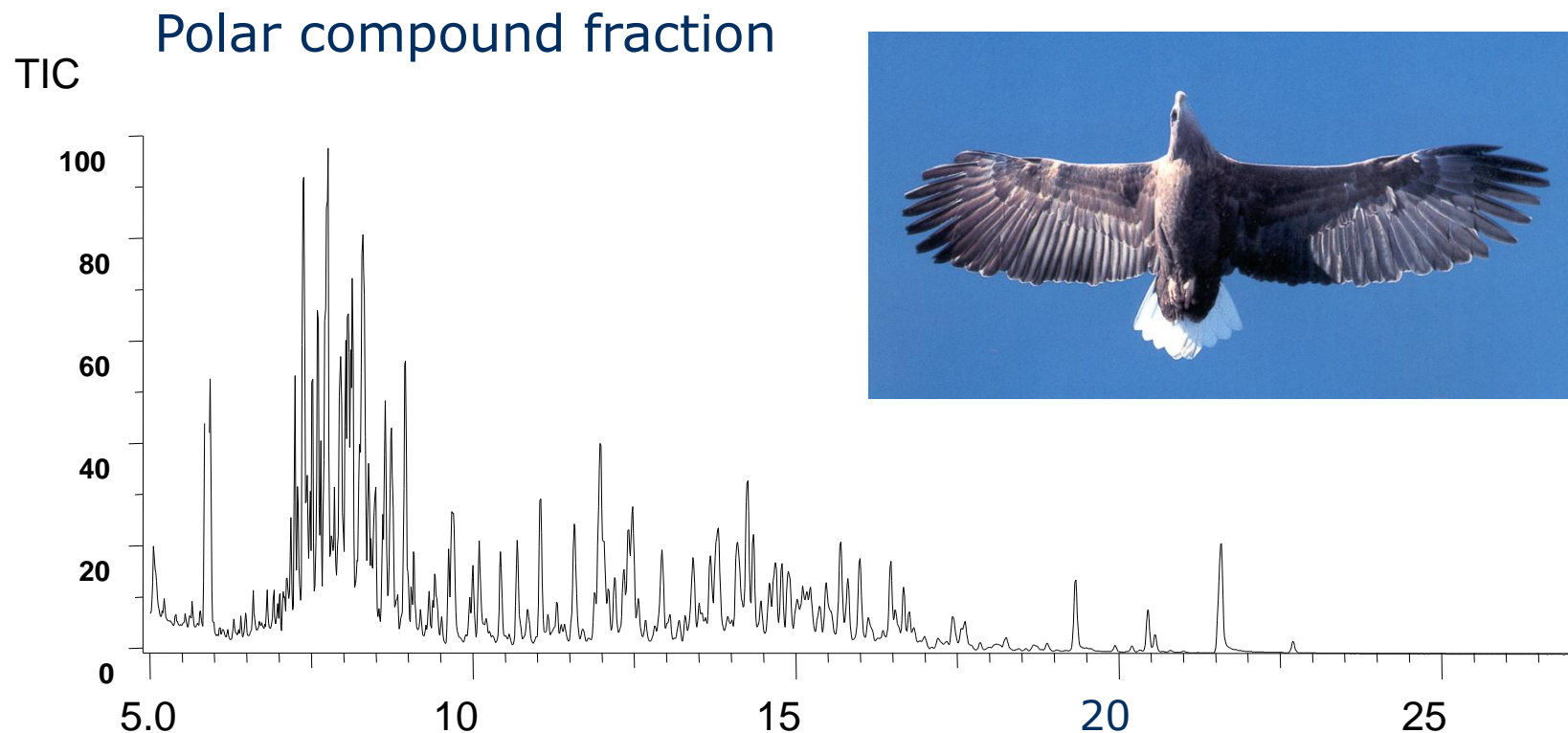
How do the EDCs reach wildlife?



Biodiversity – Different exposures – Diversity of effects



Anthropogenic chemicals in White-tailed sea eagle blood

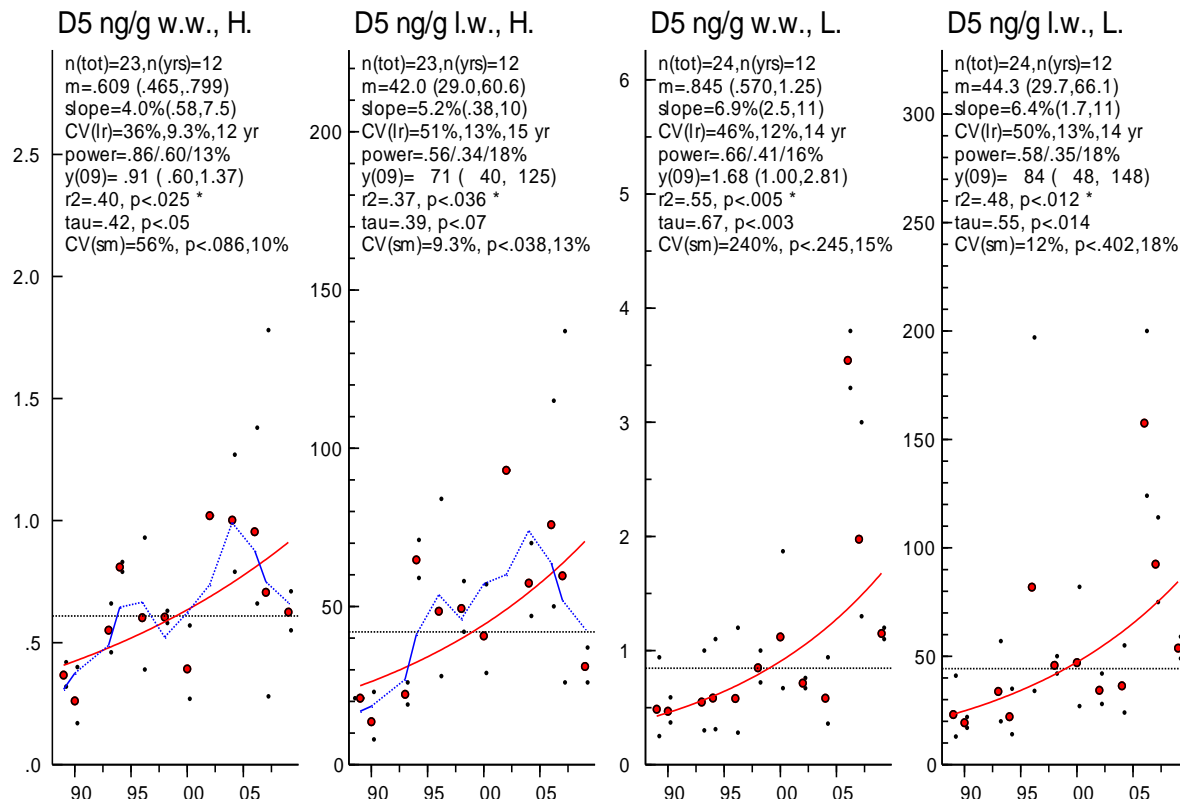


Source: Asplund, 2012

Time trend of the cyclic siloxane D5, in herring from two locations in the Baltic Sea

Harufjärden

Landsort

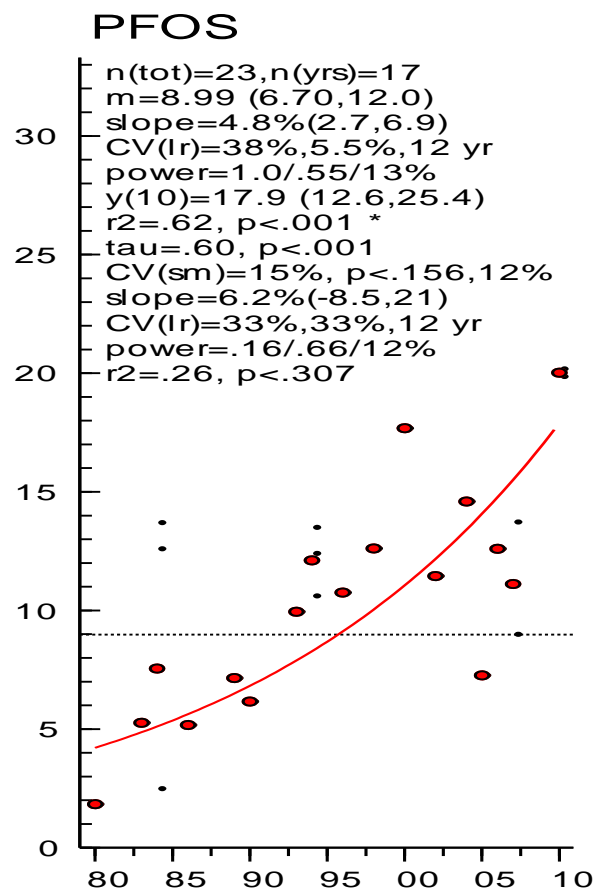


Source: A. Bignert, Swedish Museum of Natural History,
Contaminant report, 2012

EU Conference on Endocrine Disruptors; Brussels, June 11-12, 2012

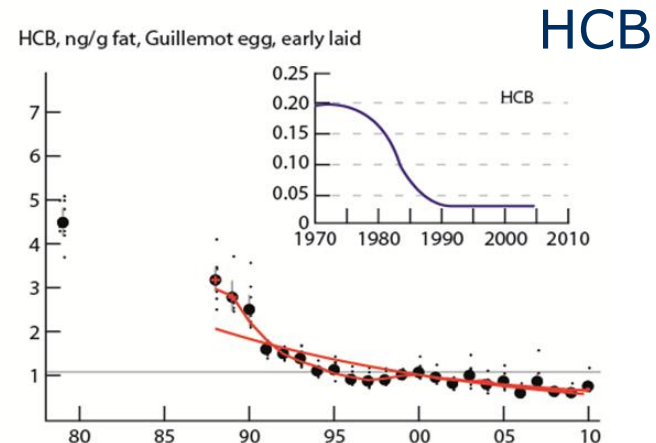
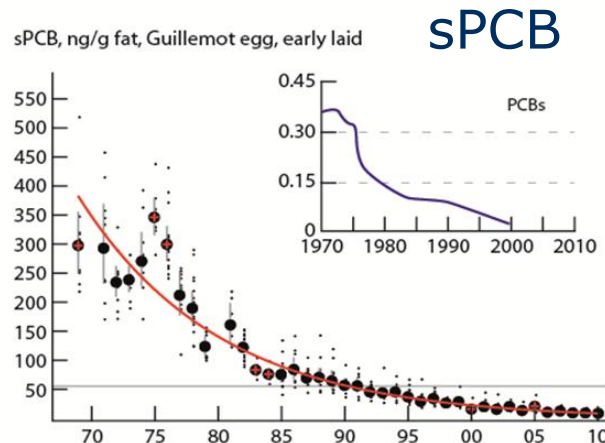
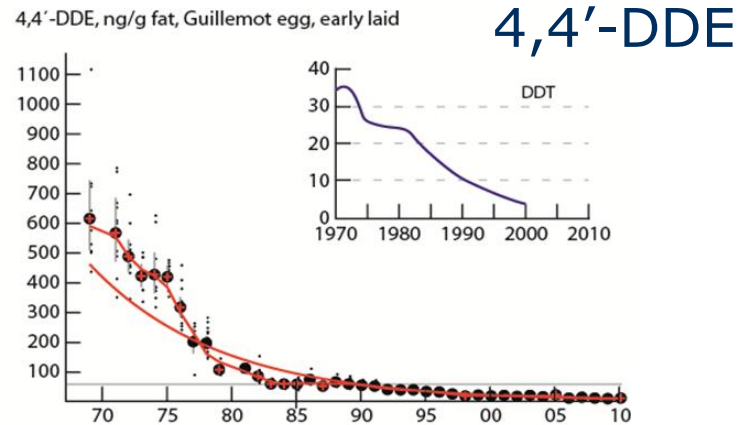
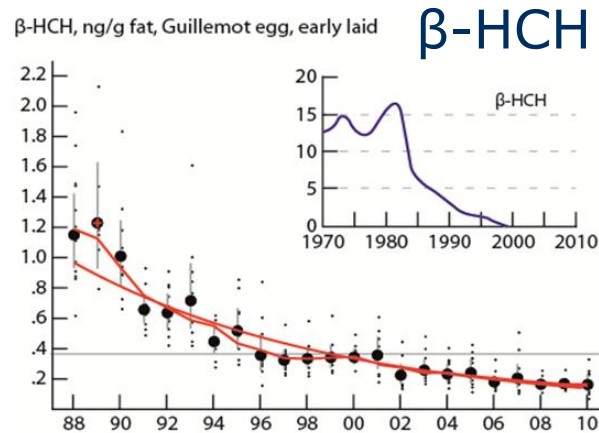
Time trend of PFOS in Baltic Sea herring

PFOS (ng/g w.w.) Utlängan



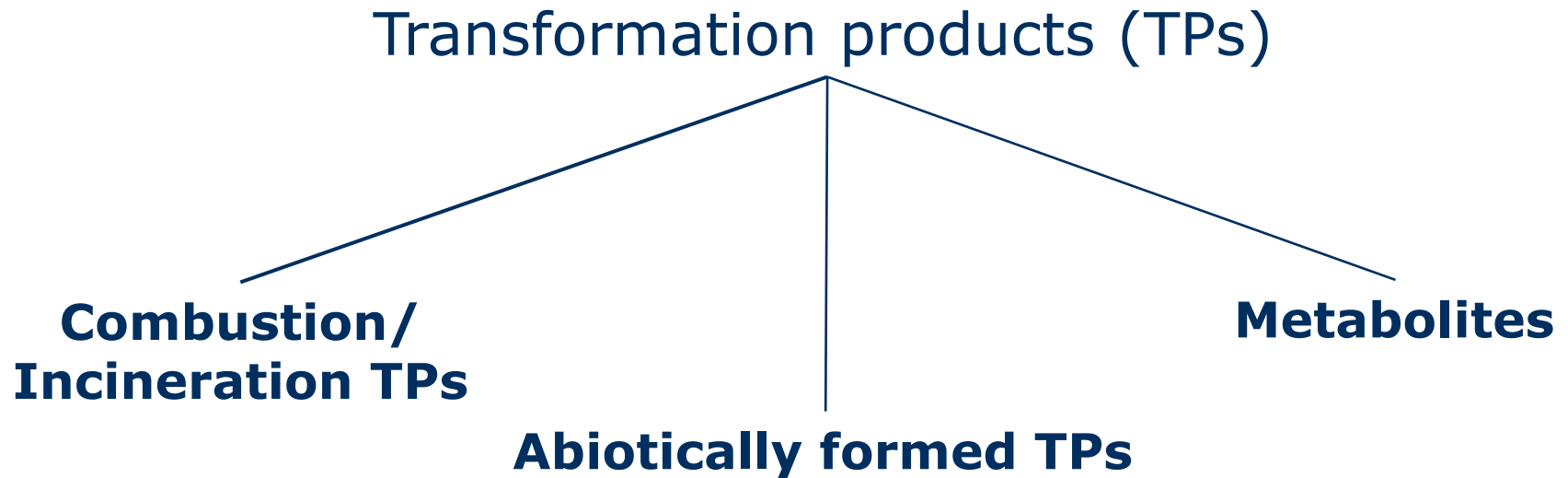
Source: A. Bignert, Swedish Museum of Natural History, Contaminant report, 2012

Exposure to EDCs responsive to regulations

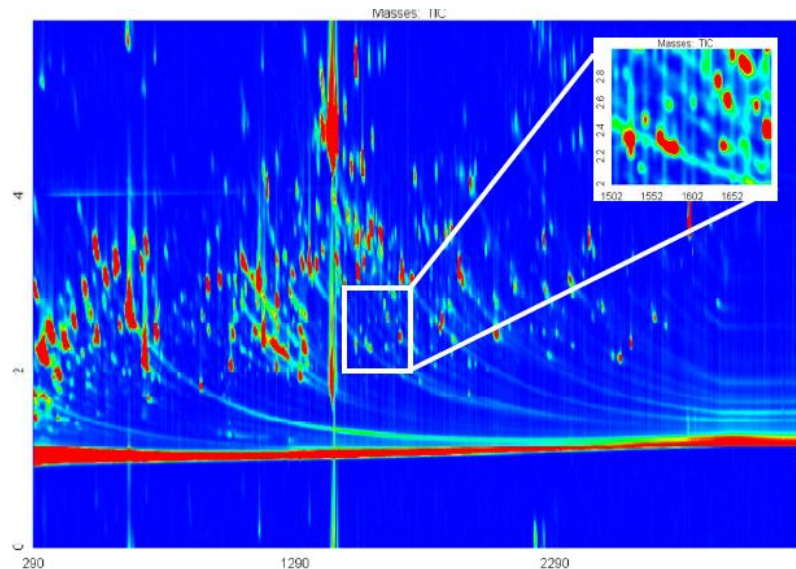


Source: Bignert et al., Report from Swedish Museum of Natural History (2010)
 Breivik et al. STOTEN, 290 (2002) 199; Li and Macdonald STOTEN, 342 (2005) 87
 Pacyna et al. Atmosp. Envir. 37 (2003) 119- 131

Which are the Endocrine Disrupting Chemicals?



Advanced chemical analytical methodology is required



GC-GC separations

but what about the yet not observable hazardous chemicals (e.g. EDCs)



Concern

Too much focus on well-known EDCs

It is taking far too long to identify novel EDCs in environmental samples (humans, wildlife or abiotic matrices) – and when indicated, it is too late to be proactive

It is very costly to be “pollution detectives” for novel hazardous chemicals – particularly for those known by producers to go into materials and goods

Stronger focus on development of methods for exposure assessments is required to better promote EDC related toxicology and epidemiology research

...and

EDCs are everywhere!



Endocrine Disrupting Chemicals
have many sources



Thank you



Åke Bergman ake.bergman@mmk.su.se
Professor in Environmental Chemistry, Ph.D.,
Dept. of Materials and Environmental Chemistry
Stockholm University, Stockholm, Sweden www.su.se

EU Conference on Endocrine Disruptors; Brussels, June 11-12, 2012