Screening of pollutants in human matrices - human milk

Session title:

How can they help to identify emerging pollutants?

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Some key questions related to screening pollutants

What is emerging chemicals?

– established, novel and potential?

Which are the hazardous chemicals to identify?

Approaches to identification/assessments

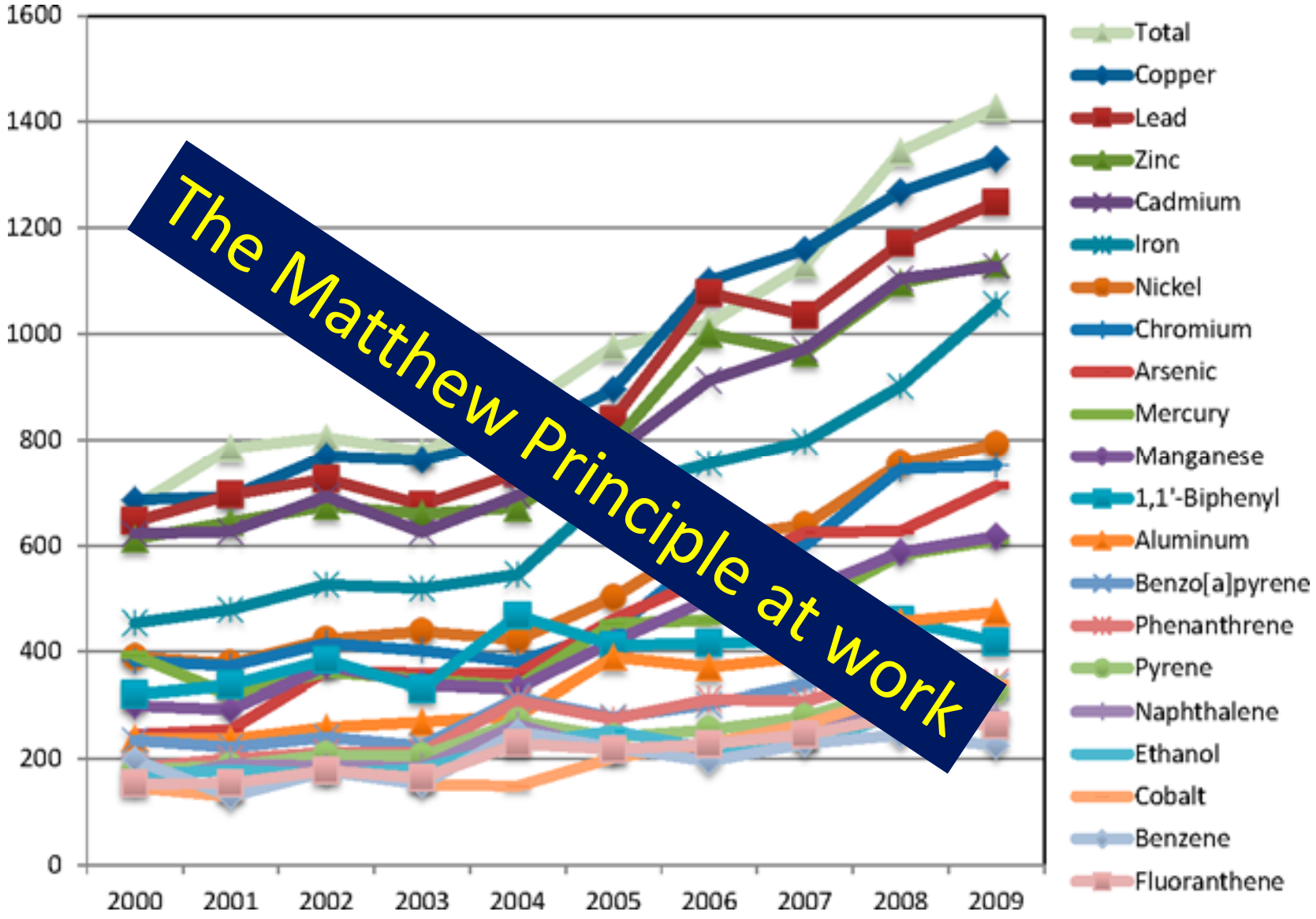
Idetify them **All**! Limitations to make

Matrix selection

Mothers' milk as a matrix for screening pollutants

Method selection

Most commonly researched elements/chemicals 2000-2009



From Grandjean et al. Envi. Health 2011

Other established pollutants – OR?

What about the 22 POPs in mothers' milk

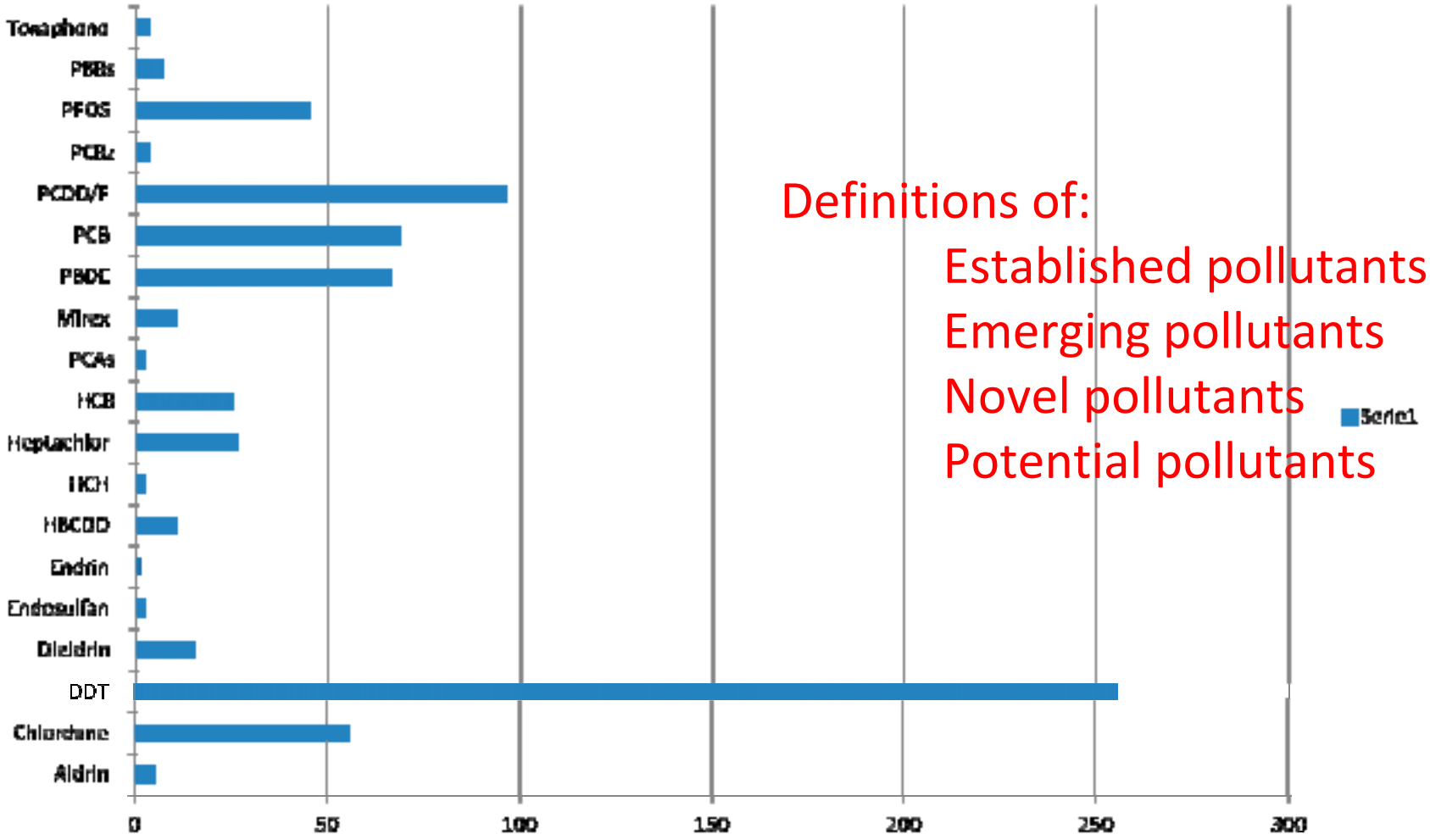
Pesticides:
Aldrin
Chlordane
Chlordecon
DDT
Dieldrin
Endosulfan
Endrin
Heptachlor
HCB
α-HCH
β-HCH
γ-HCH
(Lindane)
Mirex
Toxaphene

Industrial chemicals:
PCBs
BB-153 (one PBB)
PentaBDE
OctaBDE
PFOS, its salts and PFOS-F

Byproducts:
PCDDs
PCDFs
HCB
Pentachlorobenzene

POPs reported in mothers' milk 1995-2012

(a total of 696 studies)



Definitions of:

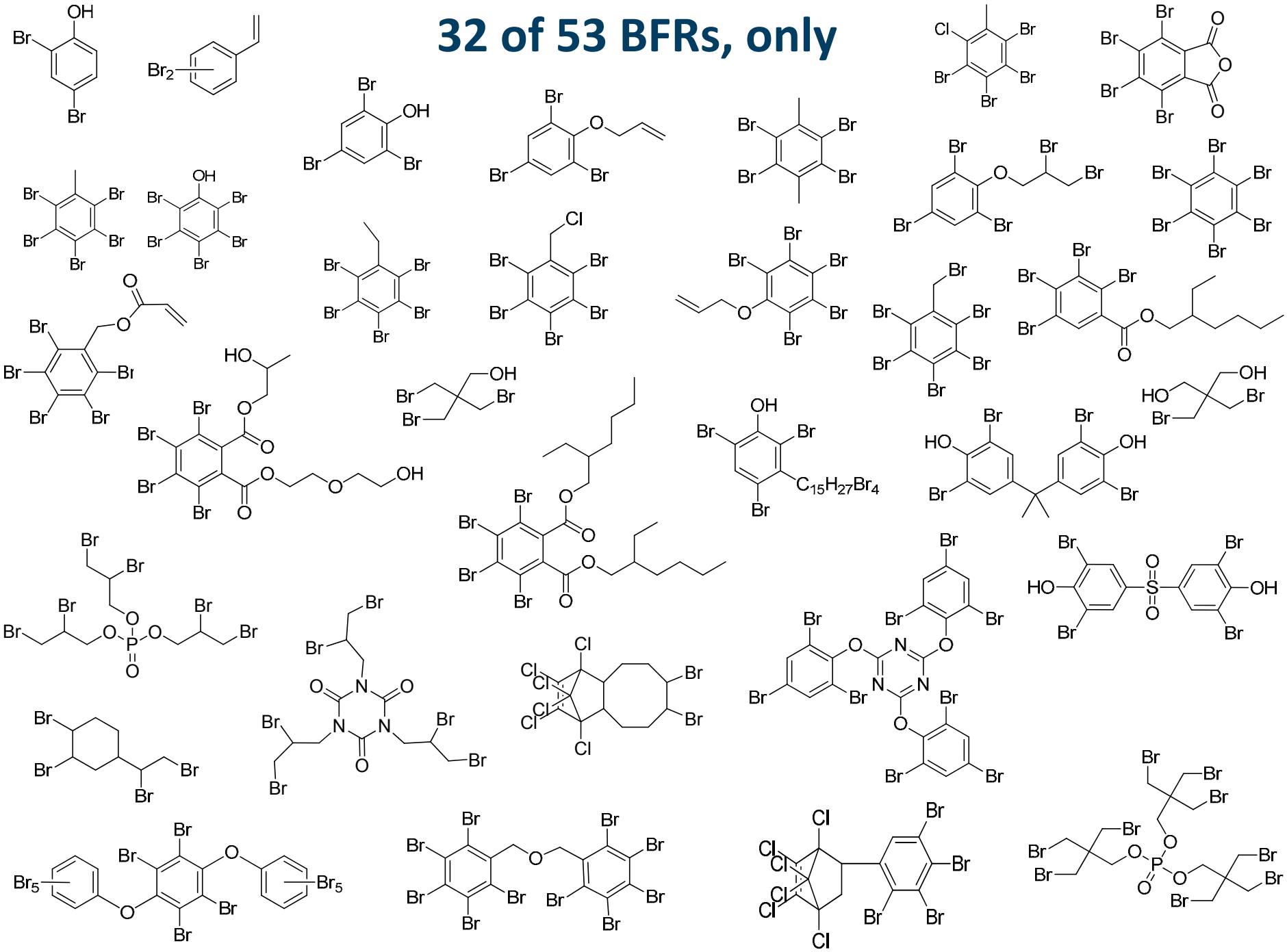
Established pollutants

Emerging pollutants

Novel pollutants

Potential pollutants

32 of 53 BFRs, only



Uses of flame retardants: in asphalt, underweare and nursing pillows

BUT flame retardants is just one ”school” of hazardous chemicals

Which hazardous chemicals to identify?

Mothers' milk the best choise?

Toxic chemicals	CMRs; EDCs; Allergens, Immuno-toxicants, …
P and B chemicals	Few chemicals in retrospect
Semi-persistent chemicals	Huge numbers, not yet studied or even known
Pseudopersistent chemicals	Which are they?
Metabolites/abiotic transformer products & byproducts	Which are they?
Metals/metalloids	Well known

Which are the hazardous chemicals to identify?

Semi-persistent chemicals: Both a school and class problem!

Chemicals based on functions

Personal care products
Cosmetics
Insecticides
Herbicides
Flame retardants
Plasticizers
Antioxidants
Coloring agents
Detergents
Solvents
Dyes
Heat transfer fluids

Byproducts
Biological transformation products
and abiotic transformation products

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EXCLUSIVE

515 chemicals a day on a woman's face

By JANE HAMILTON

Published: 19 Nov 2009

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WOMEN slap 515 chemicals on their face and body every day - and many could be harmful.

Beauty-conscious girls use up to 13 products, most containing more than 20 ingredients, a new study found.

Some of the additives have been linked to cancer, hormone problems, skin conditions and allergies.

Slip, slap, stop ... women should be wary of the creams and lotions they apply every day

Approaches to identification/assessments

Non-target analysis

also known as un-prejudiced analysis

Directed chemical analysis (DCA)

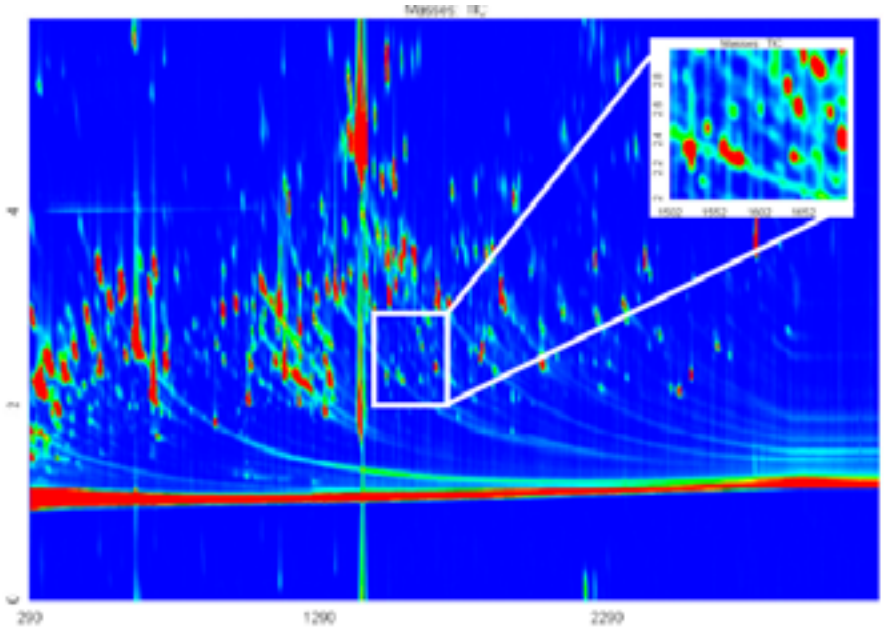
Effect Directed Analysis (EDA)

Certified Chemical Analyses

Non-target analysis

Non-descriminating extractions, and clean up

Advanced chromatographic and mass spectrometric methods



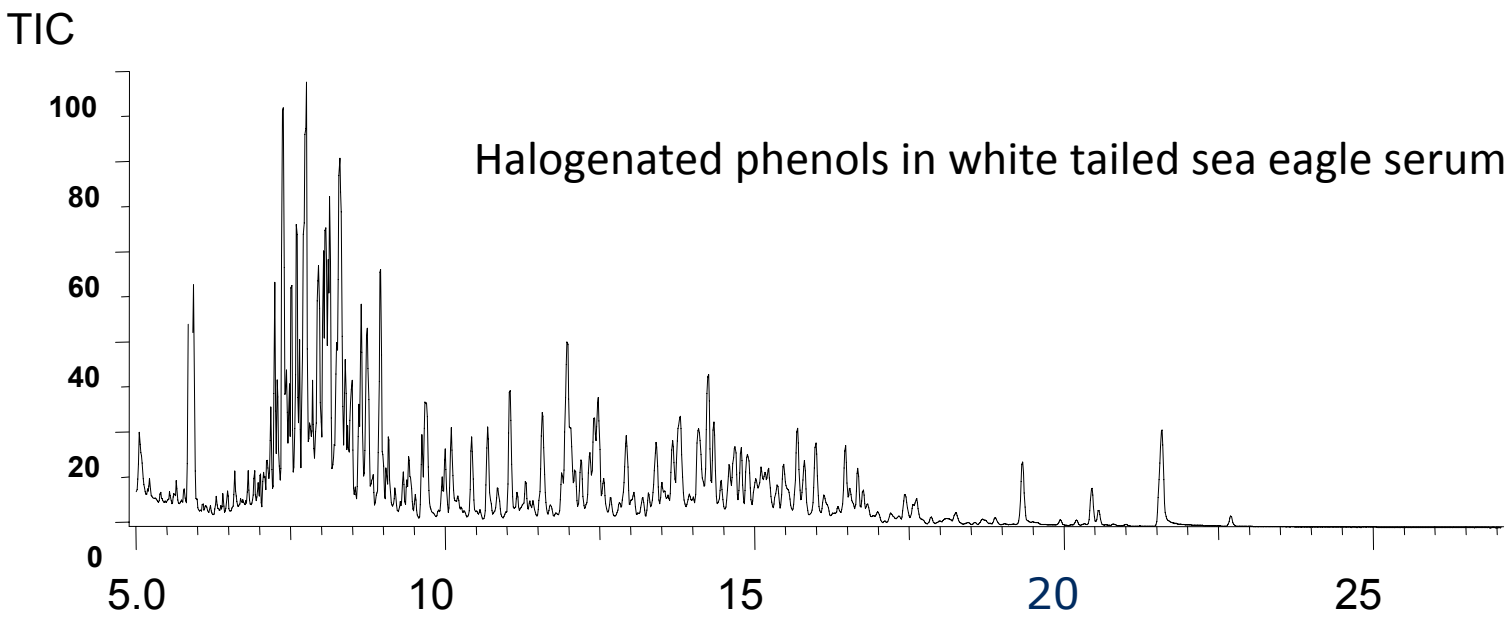
GC-GC separations

GC/MS/MS
LC/MS/MS
TOF or Q-TOF MS

Possibilities & Concern

- Applicable for milk analysis
- Nothing is ”non-target”
- The extensive data sets
- No link to hazardous chemicals
- Cost/benefit problem

Directed chemical analysis

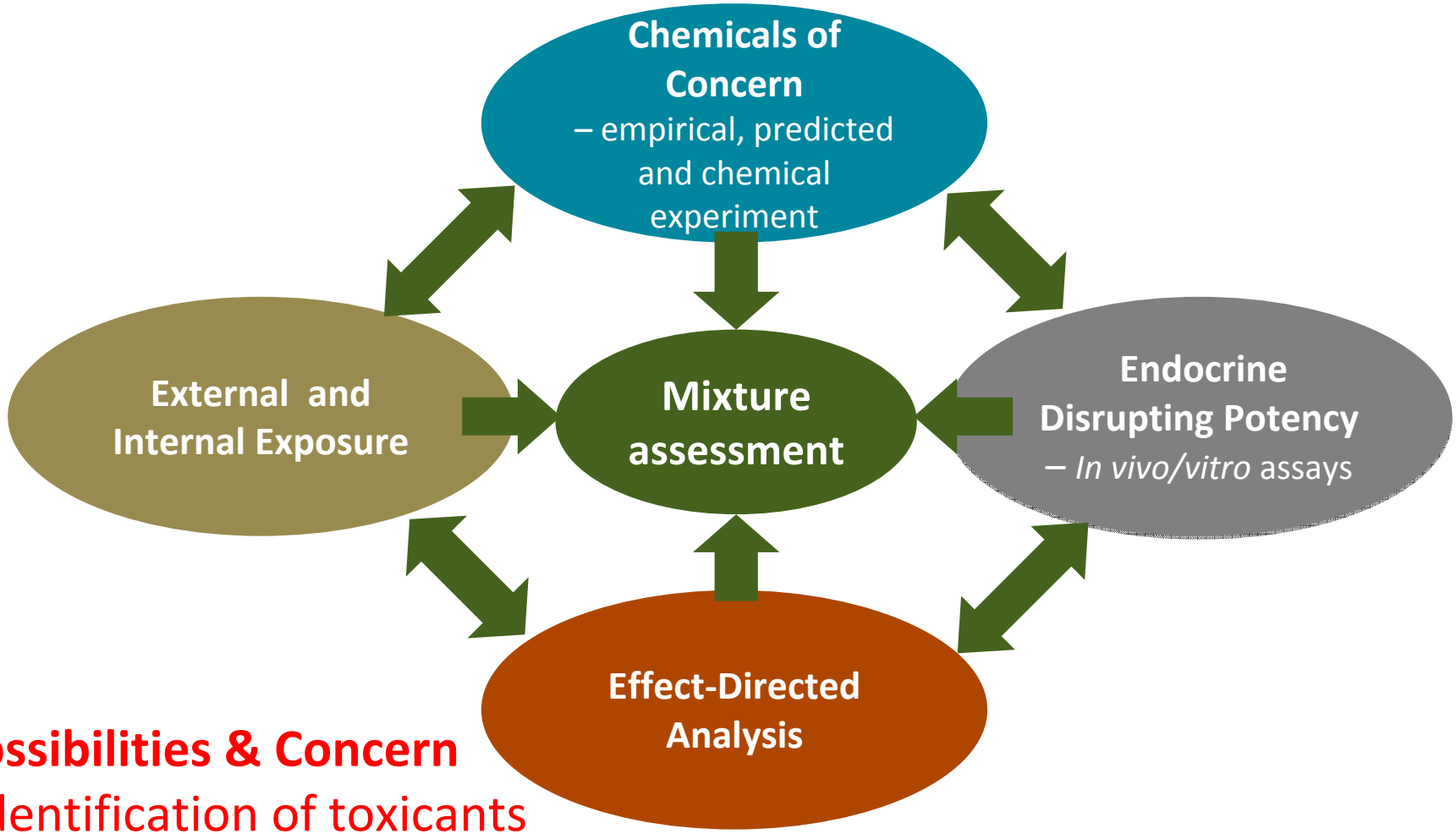


Suitable for analysis of mothers' milk

Possibilities & Concern

- Applicable for milk analysis
- Allow identification of B's
- Time consuming
- Cost/benefit problem

Effect Directed Analysis (EDA)

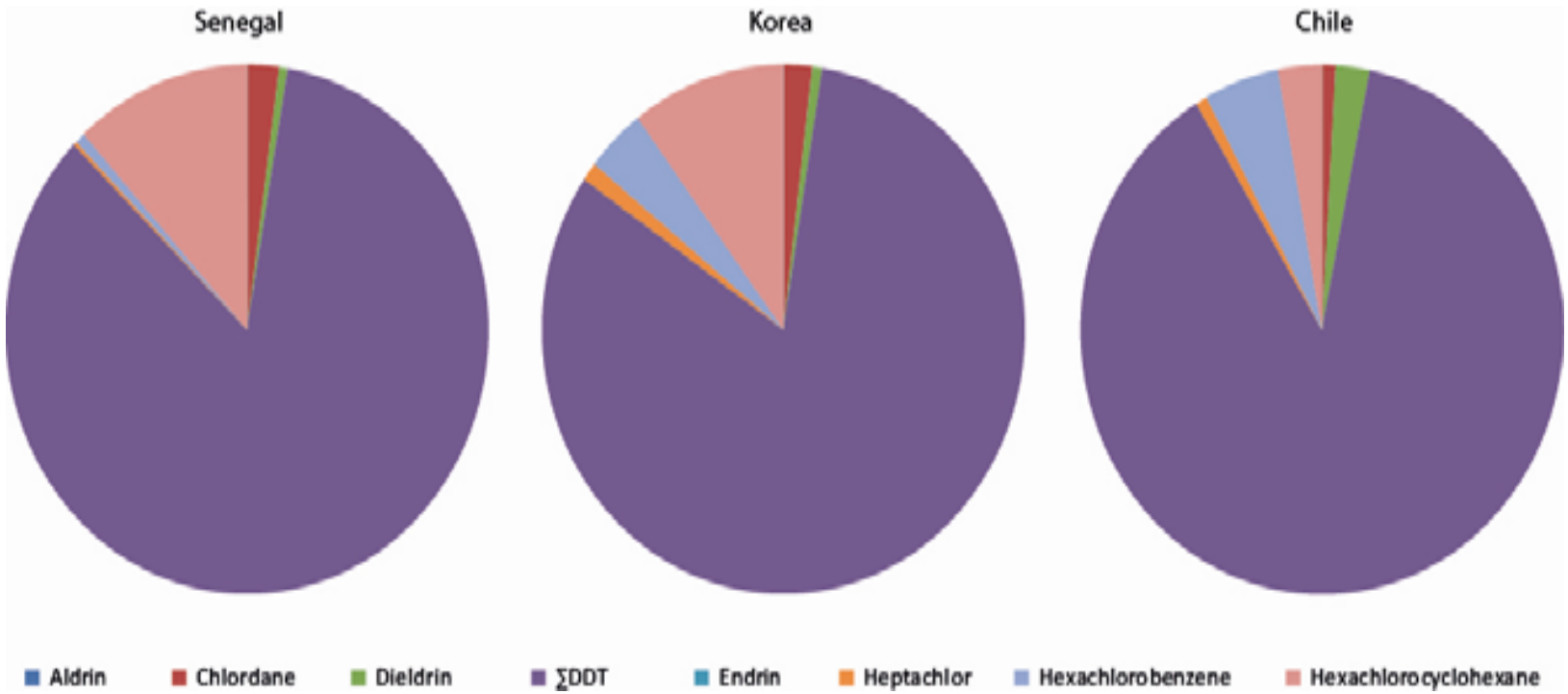


Possibilities & Concern

- Identification of toxicants
- Require development to become applicable for milk analysis
- Time consuming
- Cost/benefit problem

Matrix selection: Mothers' milk

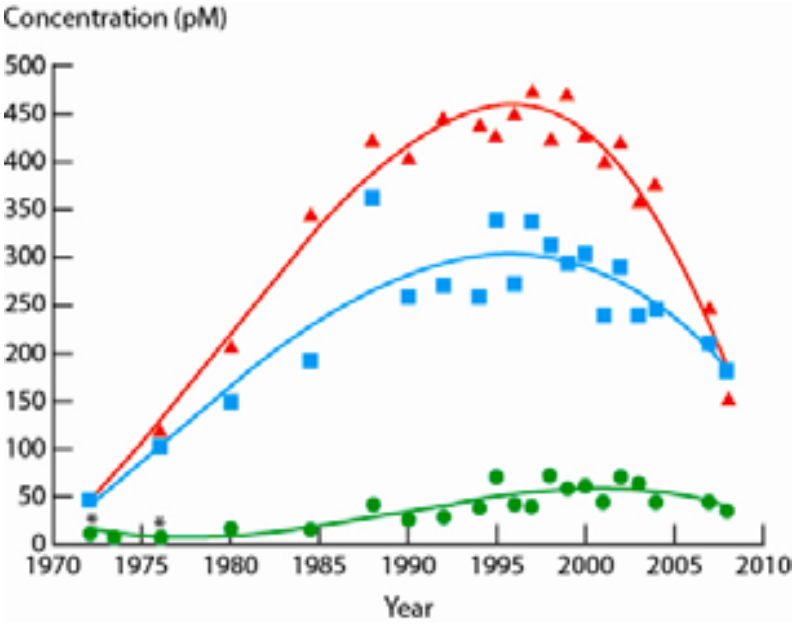
Possibilities and limitations



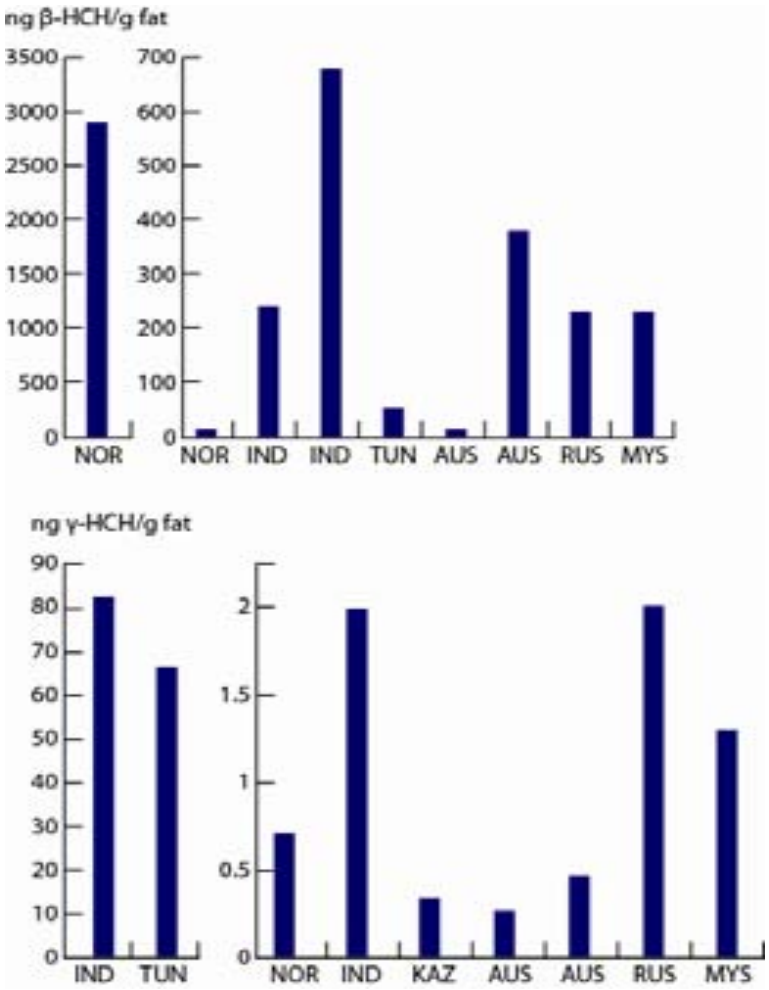
Relative content of different organochlorine pesticides in mothers' milk from three countries in three continents around the globe (UNEP 2009)

Matrix selection: Mothers' milk

Possibilities and limitations



Temporal trends of PFOS (▲), PFOA (■) and PFHxS (●)(pmol) in mothers' milk from Stockholm, Sweden, from 1972 - 2008 (Sundström et al. 2011).



Data are from WHO mothers'milk program (UNEP 2009c; 2011b).

Final Words

Mothers' milk is of particular use for identification of P and B's

B's particularly as lipophilic compounds but may be linked to some proteinophilic chemicals (will require special design of studies).

The "*Sherlock Holmes approach*" is NOT ACCEPTABLE
for identification of emerging, novel or potential commercial chemicals any more. Motivations:

- Time and cost for identification of ONE new environmental pollutant is to long and to high, respectively.
- Chemicals in all products, materials and goods (articles) can and must be declared by the manufacturers.
- Drawing the focus from exposure studies (method development, exposure analysis)
- Counteract Team science development

Thank you for listening!