



Humanbiomonitoring in Europe

COPHES - DemoCOPHES



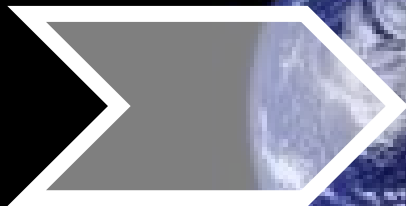
Société Nationale de Biologie Clinique
3^{ième} Journée Nationale de Biologie Clinique

23.09.2011 Centre Culture Prince Henri - Walferdange - Luxembourg

Environment and Health

Introduction

- Classic studies:
 - Influence: Humans on Environment → healthy environment
- Modern studies (*i.e. Cophes and Democophes*)
 - Influence: Environment on humans → environmental health

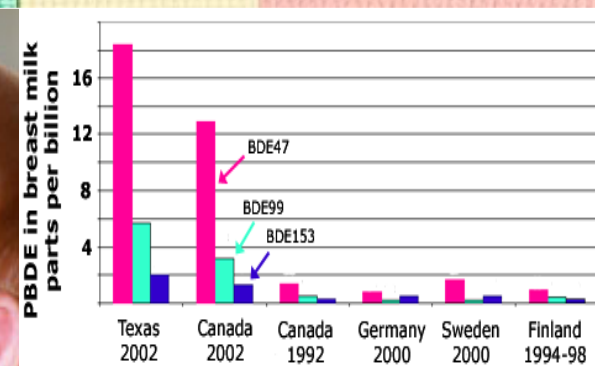
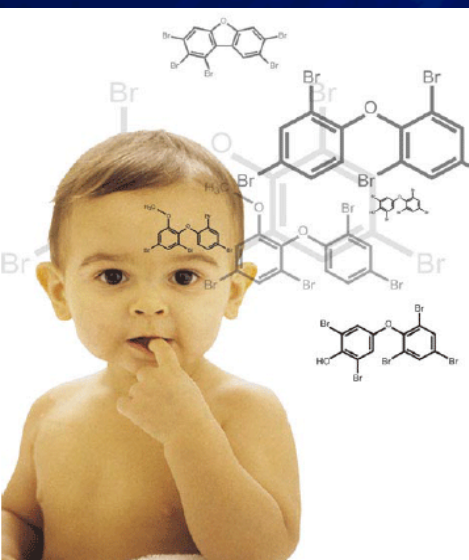


Environmental Health

Introduction

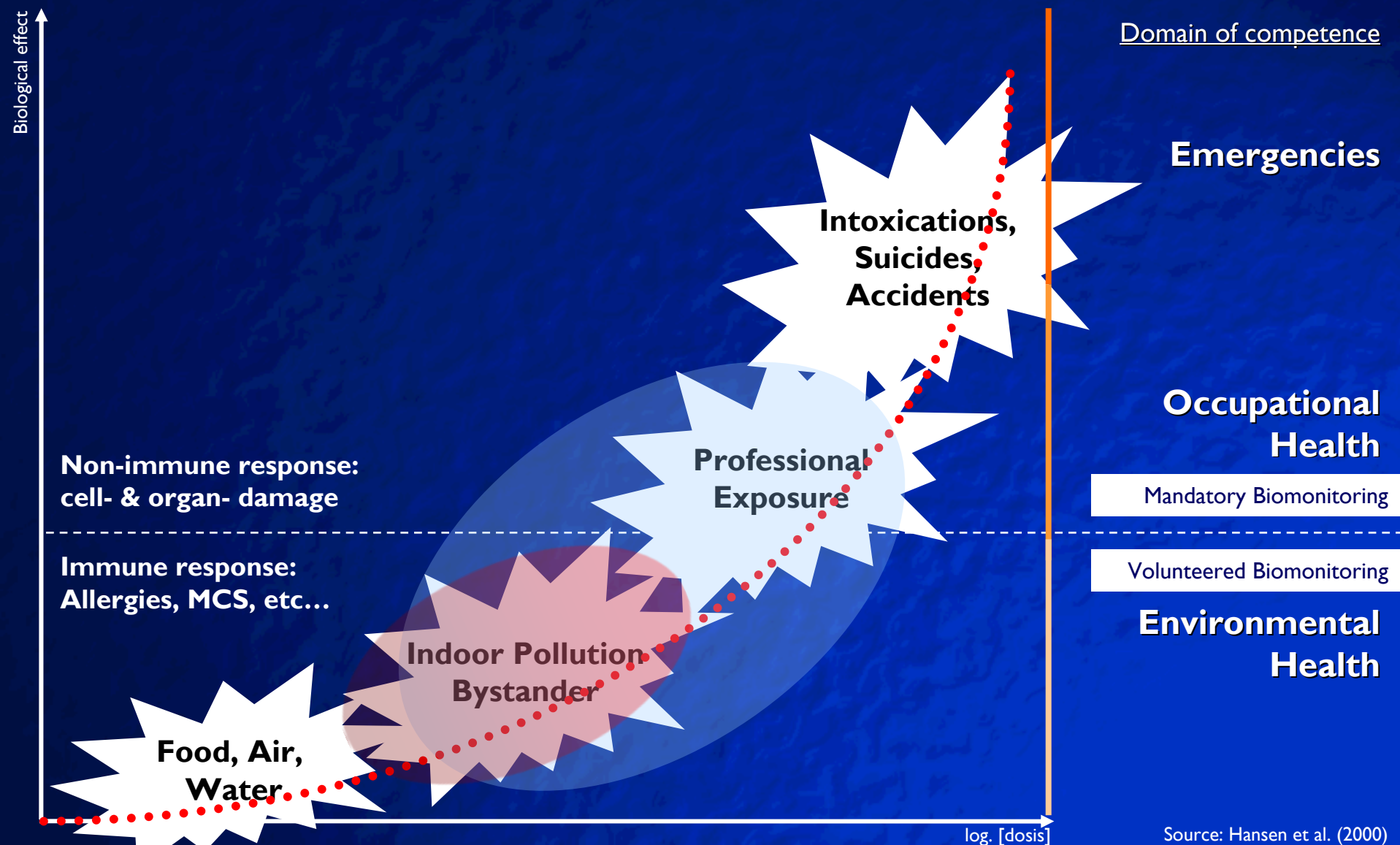
■ Daily life exposure to environmental pollutants

- is not a matter of “whether you are exposed”!
- It is a matter of “how much you are exposed”



Environmental Health

Introduction: Exposure vs dose/time



Source: Hansen et al. (2000)

Environmental Health

Introduction: Exposure vs dosis/time

■ Classic toxicology

- Time of exposure
 - short term
- Dosis
 - high level
- Presence
 - single
 - known effects
ADI, NOEL, LD50
- Knowledge
 - documented

■ Environmental health

- Time of exposure
 - long term
- Dosis
 - low level
- Presence
 - multiple
 - combinatory effects
investigations needed
- Knowledge
 - poor

Environmental health is defined by the **World Health Organization** as:

- Those aspects of the human health and disease that are determined by factors in the environment. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health.
- Environmental health as used by the WHO Regional Office for Europe, includes both the direct pathological effects of chemicals, radiation and some biological agents, and the effects (often indirect) on health and wellbeing of the broad physical, psychological, social and aesthetic environment which includes housing, urban development, land use and transport.

Environmental Health

Long term health effects

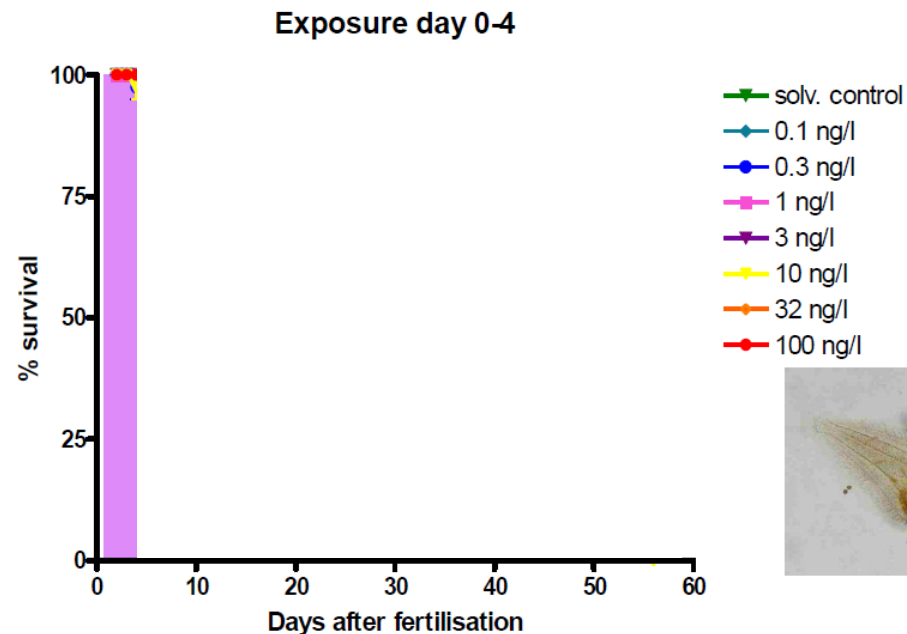
■ Animal test

- FETAX (frog embryo teratogenesis assay *Xenopus*) – 4 days
- OECD fish early life stage test – 4 days
 - 60 days

■ Look at the right time at the right place... not to miss the crux!



Delayed effects of PCB126 on Sole-survival



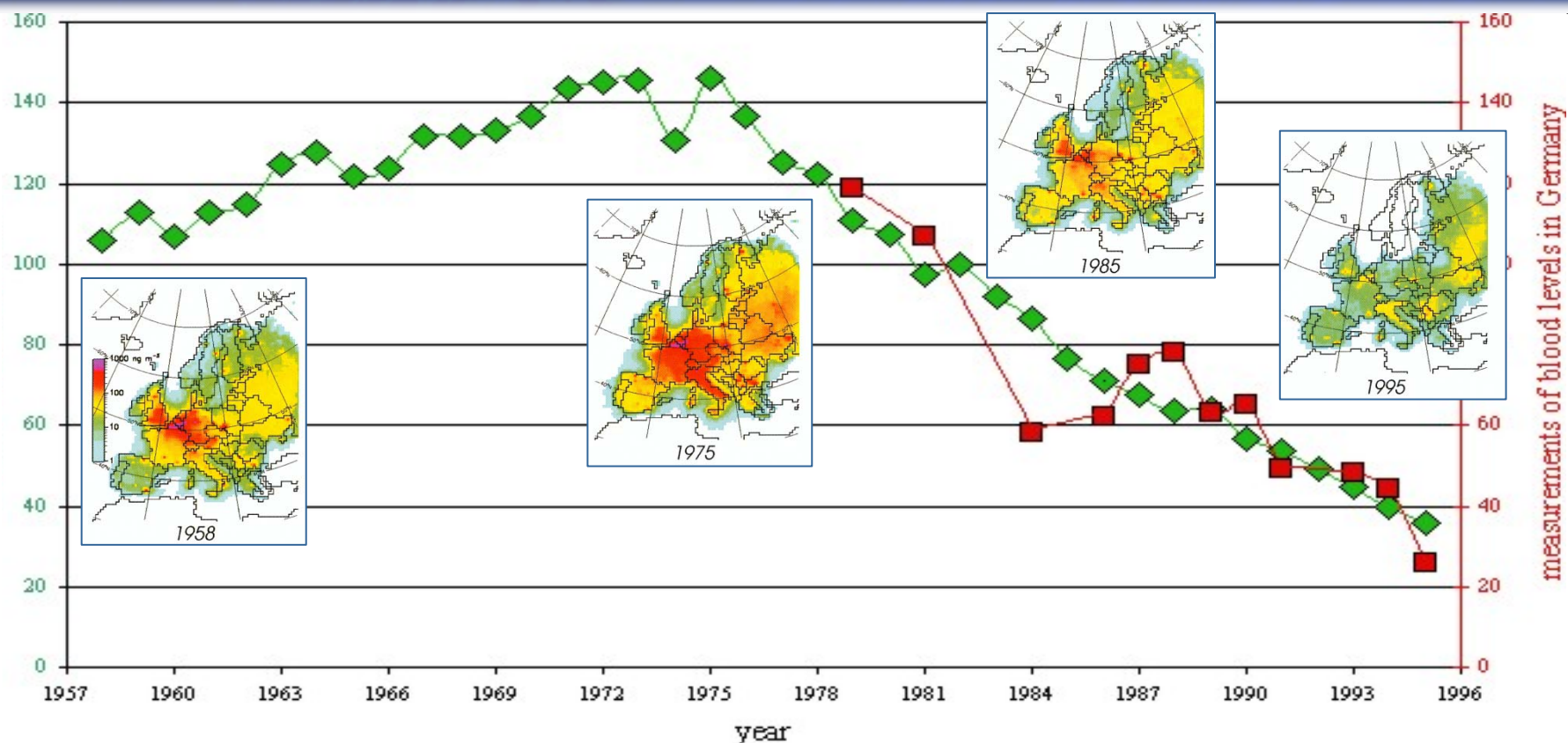
Early exposure to PCB-126 reduces sole (*Solea solea*) larvae survival at a development stage not included in the OECD Fish early life stage test (Foekema et al., accepted). Pink box indicates the duration of exposure.

Source: T MURK (2008)

Human Biomonitoring in Europe

History and examples

■ Lead (Pb)



Pb from tap water
lead piping - 1973

Pb from fuel
<70s : 0.60 g/L
1972 : 0.40 g/L
1976 : 0.15 g/L
1985 : Pb free

Human Biomonitoring in Europe

Human Biomonitoring (HBM) : Concept

■ Concepts of Human Biomonitoring:

- HBM is an important **tool to support environment and health policy making.**
- HBM allows superior **quantification of exposure** of the general European population **to existing and emerging environmental substances.**
- HBM **enables evaluation of policy actions aimed at reducing exposure**, more comprehensive health impact assessments of policy options, control of chemical regulations (e.g. REACH), etc.

Human Biomonitoring in Europe

COPHES and DEMOCOPHES : Objectives

■ Project Objectives

- The main objective of **COPHES** is the **development of a functional framework** allowing the collection of comparable HBM data throughout Europe. Starting from an inventory and analysis of similarities and discrepancies in existing and planned HBM studies in different EU Member States, harmonised study protocols will be prepared and tested out in collaboration with **DEMOCOPHES**, the **demonstration study**, from 2011 onwards. Although the focus at this stage is given to mercury, cadmium, phthalates as well as environmental tobacco smoke, further substances (e.g. Bisphenol A) are included in an coordinated approach.

■ History

- Paris (2008)
- → Cophes
- Parma (2010)
- → Democophes
- Berlin (2010)

Human Biomonitoring in Europe

...on a truly European scale

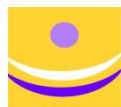
- Luxembourg
- Europe



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Laboratoire national de santé



Centre de Recherche Public
Gabriel Lippmann



Initiativ
Liewensufank

Initiativ Liewensufank a.s.b.l.



Human Biomonitoring in Europe

Who – What – When – Where

■ Who

- Laboratoire National de Santé
 - Initiator - Center of competence - Analytics
- CRP Gabriel Lippmann
 - Coordination - Administration - Development
- Initiativ Liewensufank
 - Sampling - Communication



■ What

- *Mercury – Cadmium – Phthalates – Cotinine – Creatinine – Bisphenol A*

■ When

- 2011 onwards

■ Where

- 60 Children/MS betw. 6-11 years
- 60 Mothers/MS betw. 20-45 years



Analytics

Scope (LNS and collaborating Partners*)

Chemistry

- **Formaldehyde**

- **VOC**

active and passive sampling / indoor air and microchamber
aliphatic & aromatic comp. (BTeX), terpenoids, styrene, PER, ...

- **Biocides**

chlorothalonil, DDE, DDT, chlorpyrifos, dichlofluanide, dieldrine,
endosulfane, PCP, lindane, methoxychlor, eulan, tolyfluande,
tetrachlorvinphos, ...

- **Pyrethroïdes**

permethrine, cypermethrine, cyfluthrine, deltamethrine,
fenvalerate, ...

- **Flame retardants**

TCEP, TCPP, TEHP, TCP, ...
PBDE (polybrominated diphenyl ether)

- **PCB**

- **PAH**

- **Phthalates**

- **OTHER**

Mycology*

- **Mold / Fungi**

air
contact

- **Humidity / Temperature**

- **MVOC**

- **Mycotoxines**

Biology

- **Bio-monitoring**

Blood
Serum
Urine
Faeces
Hair
Heavy metals (Pb, Cd, Hg, Se, Zn, ...)

- **Dental Amalgams**

- **OTHER**

Physics*

- **Electromagnetic fields**
(low frequency)

- **Electromagnetic fields**
(high frequency)
(GSM, UMTS, DECT, WLAN)

- **Terr. magnetic field**

- **Radon**

- **Radioactivity**

- **Asbestos**

- **Mineral Fibers**

Analytical scope

Analytes : multielement

Periodic Table of the Elements

[illegible]

Analytics of elements

Technique : Quantification of Elements by ICP-MS CC

ICP-MS

for mono- and multi-elemental analysis

Analytics of elements

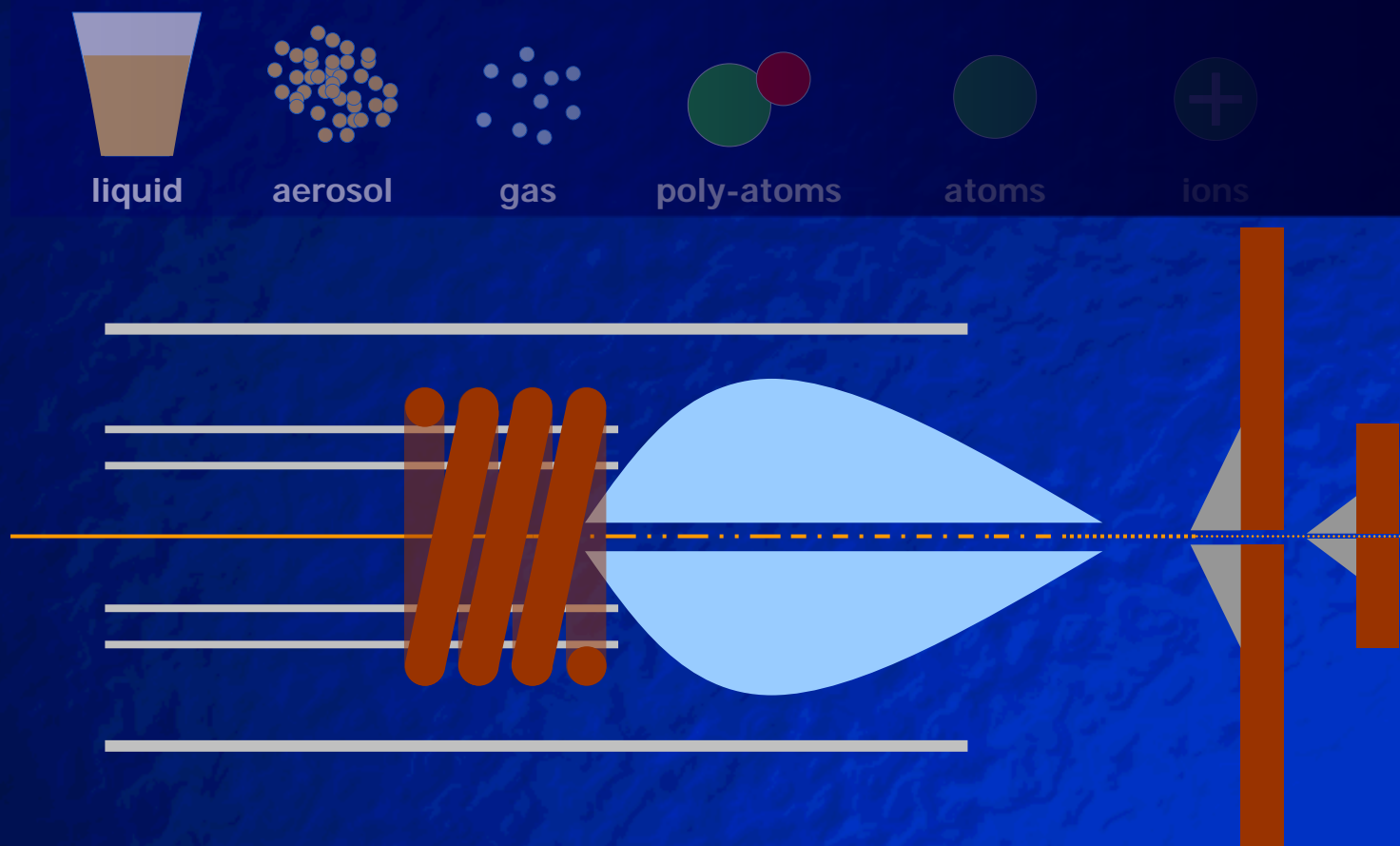
Technique : Quantification of Elements by ICP-MS CC

■ Measurement of m/z

- Means : Measuring the mass-to-charge ratio
- Allows measuring different isotopes from one element
 - E.g.: Pb^+ 206, Pb^+ 207, Pb^+ 208
- Facing interferences due to:
 - Isotopes of different elements
 - E.g.: Pd^+ 110 interferes with Cd^+ 110
 - Double charged ions
 - E.g.: Gd^+ 156 : Gd^{++} 78 interferes with Se 78
 - Polyatomic ions
 - E.g.: ArO^+ 56 interferes with Fe^+ 56
 - Mainly: Oxides, Argides, Chlorides...
- Limits of detection: down to 0.3 ppt (U^+ 238)

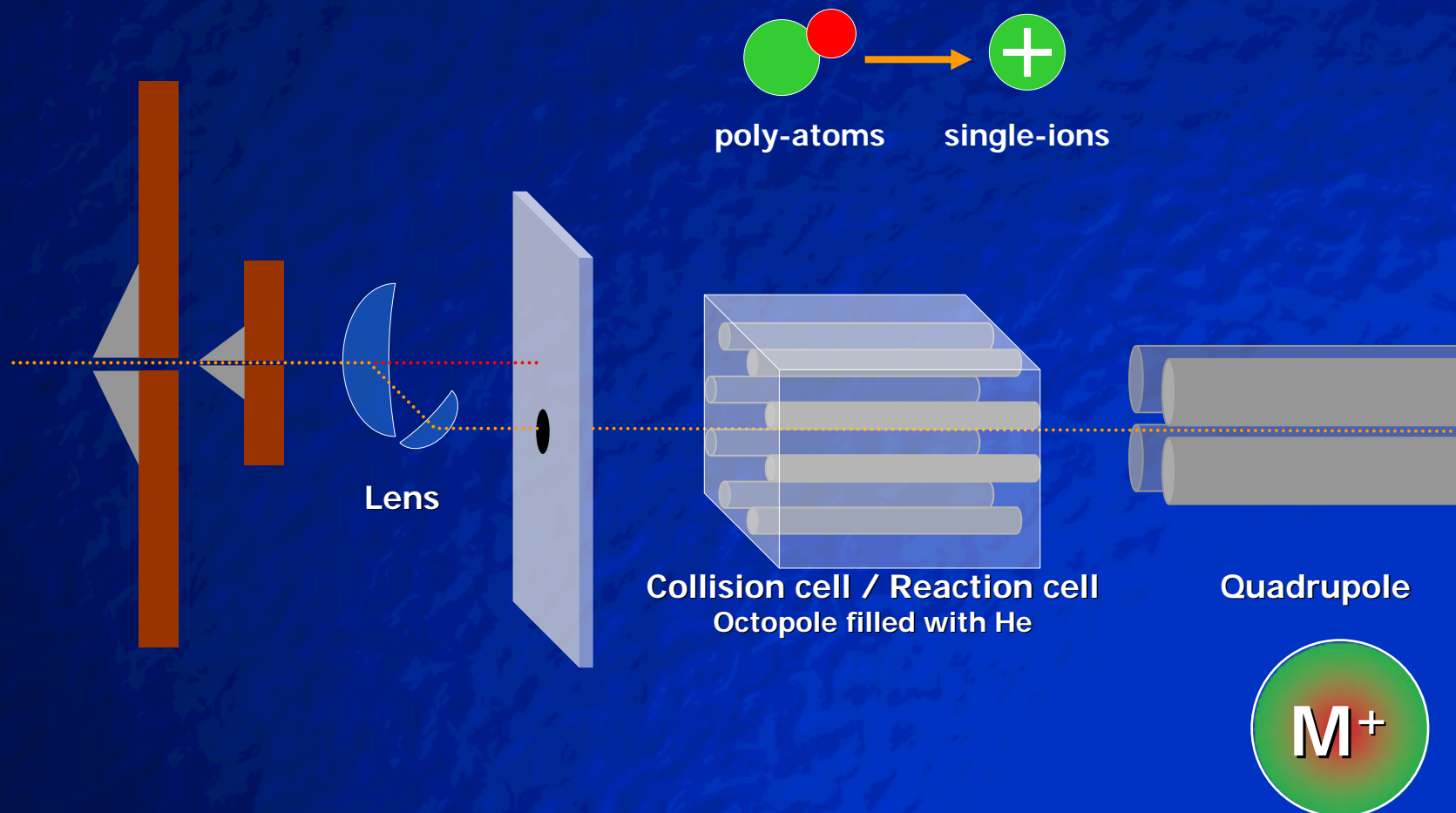
Analytics of elements

Technique : Quantification of Elements by ICP-MS CC



Analytics of elements

Technique : Quantification of Elements by ICP-MS CC

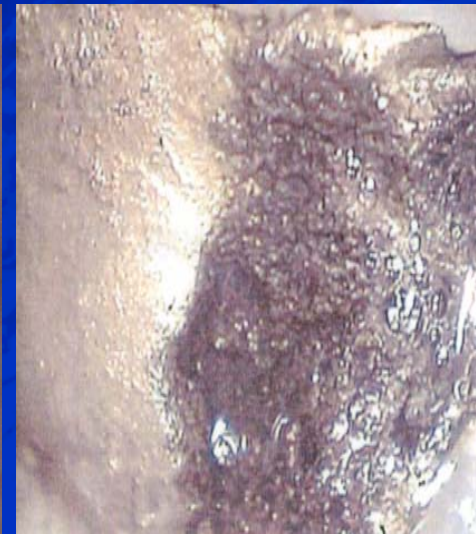
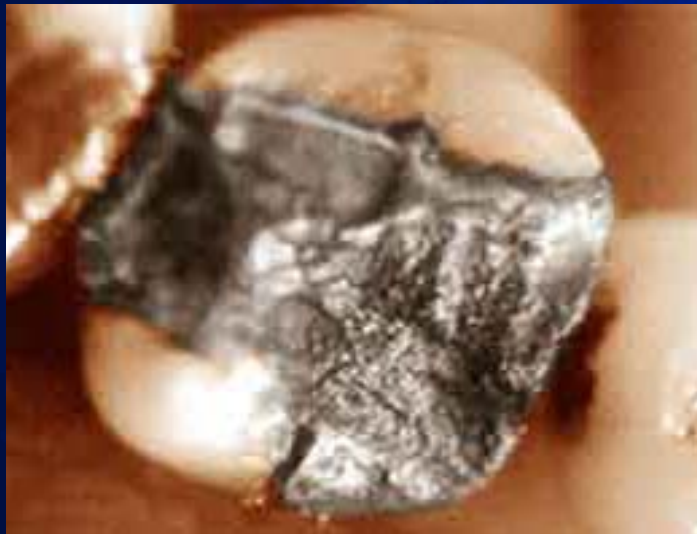
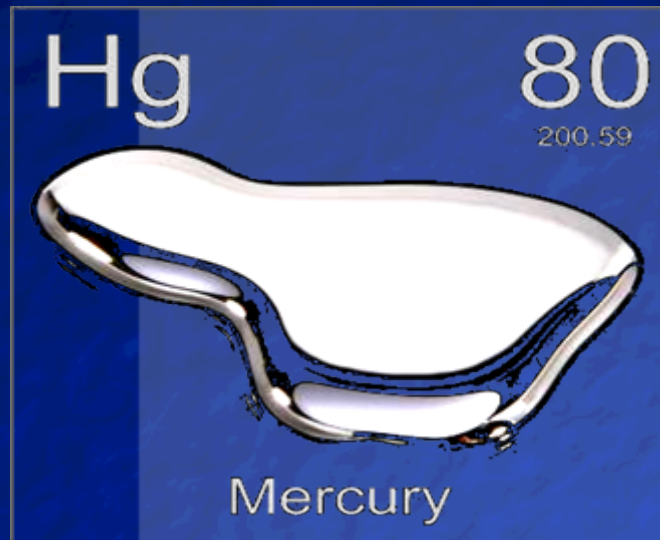


Analytics of elements

Analyte : Hg

■ Dental amalgams

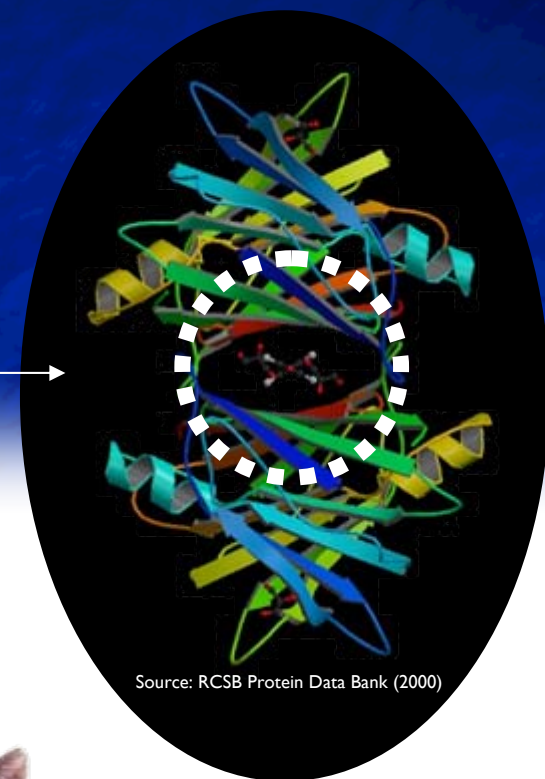
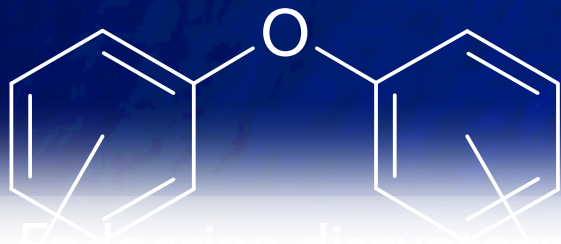
- Influence of Quantity
- Influence of Quality
- State of the Art Removal (?)



Analytics of molecules

Technique : Quantification of molecules by GC/LC MS

- Structurally similar to PCBs and thyroid hormones
- Transthyretin
(transfer protein / prealbumine)
- PBDE



Source: RCSB Protein Data Bank (2000)

Contact & information

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Thank you for your attention