Extended Abstract (4 X A4 pages)

EVALUATION OF HUMAN EXPOSURE TO STOCKHOLM CONVENTION POPS IN WESTERN EUROPE, NORTH AMERICA, AUSTRALIA AND NEW ZEALAND

Larsson K[1], Hedlund B[2*], Berglund M[1]

[1]Institute of Environmental Medicine, Karolinska Institute, Stockholm, Sweden; [2]Swedish Environmental Protection Agency, Stockholm, Sweden

Introduction

The aim of this investigation was to summarize and evaluate human monitoring data in the WEOG region (Western Europe, North America, Australia and New Zealand) for persistent organic pollutants listed in the Stockholm Convention and to explore possible trends and changes since the convention entered into force. The matrices chosen by the convention for monitoring of human exposure are mother´s milk and/or maternal blood. This is the second time such an evaluation has been performed. The first effectiveness evaluation can be downloaded for the convention website (UNEP, 2014).

Materials and methods

Data were summarized at different levels:

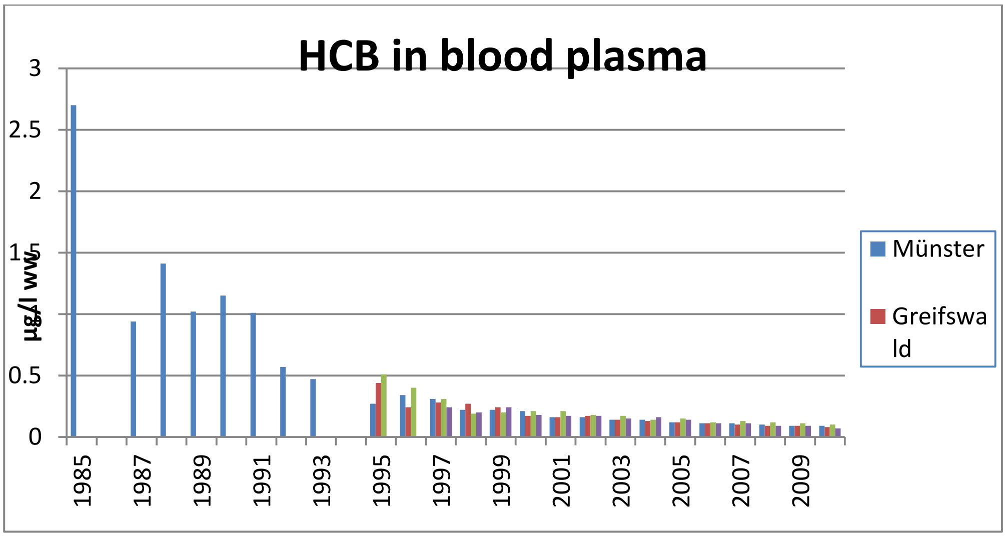
- International programmes available for the WEOG region.
- National trend studies available.
- A literature search of biomonitoring studies that are not part of any programme.

Two international programmes are available for the WEOG region; the WHO milk survey and the Arctic Monitoring and Assessment Programmes (AMAP). National trend studies were available from the US, Canada, Germany, Sweden, Australia and New Zealand. In addition, a literature search of biomonitoring studies that are not part of any programme was made and are presented in complementary tables.

Results and discussion

The levels of persistent pollutants observed in human matrices are mainly dependent on diet and age. The chief exposure route is via food, generally making up more than 90% of the total intake. Detailed statistical evaluations showed that the levels of POPs in human milk tend to increase with the age of the mother, and to decrease with the length of breast-feeding and the number of breast-fed children. For the general population, food items are usually of widespread origin resulting in there being no distinct difference between exposure in urban and rural areas. Exposure pathways are possible resulting from for example, diet choice, and food production and processing practices that could lead to high concentrations in some population groups. The combination of local sources, different groups investigated, long range transport and other factors makes it however difficult to compare contaminant levels observed in different areas. The issue of age is well illustrated in the NHANES study showing that for the TEQ, as for most of the UNEP POPs, one cannot give a “universal” geometric mean, because the concentration is very much age dependent. This study also demonstrated the influence of ethnic patterns of dietary exposure. Therefore when seeking to detect changes in levels over time, the only really valid comparison is in one area and in the same group of people.

The amount of available information on levels of POPs in the WEOG region varies for different compounds and regions. International programmes such as the WHO milk survey and (to some extent) the AMAP programme generate comparable data that are essential to evaluate temporal and spatial trends in the diverse WEOG region. In addition, national programmes evaluating time trends of chemicals in blood and/or milk, such as NHANES in the US and ESB in Germany, are important to assess local time trends. However, the levels are often not directly comparable to other regions due to different study designs and populations. Individual research studies that are not a part of any programme can indicate whether the levels of pollutants are of concern in a certain area, but cannot directly be used to evaluate differences between regions or over time.

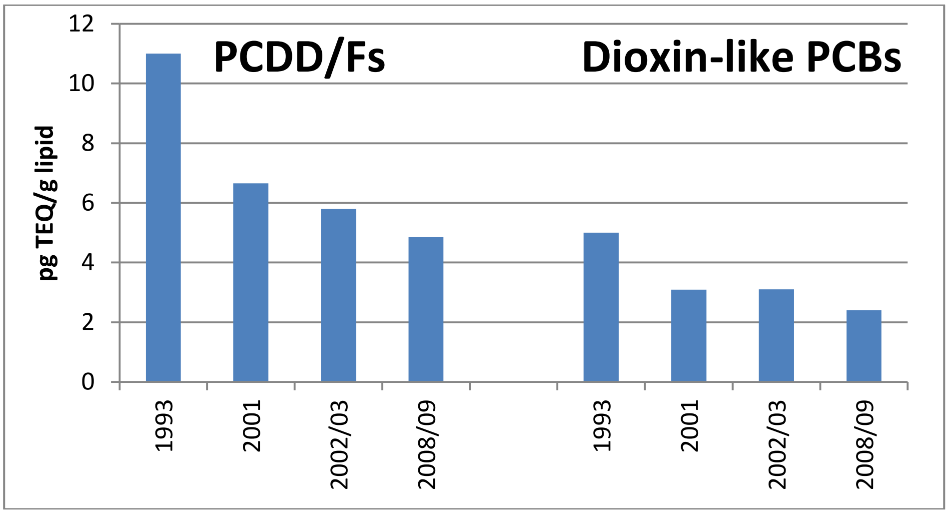


HCB in blood plasma (µg/L) from students in the German Environmental Specimen Bank (Umweltbundesamt 2013)

The available human biomonitoring data mainly covers PCBs, dioxins, DDT/DDE, HCB, PBDEs and PFOS, whereas there is less information about the levels of the compounds which are generally not detectable in blood and milk, such as aldrin, endrin and mirex. Chlordecone was included in the Stockholm Convention in 2009, but no human biomonitoring data for this compound was found in neither national programmes or in the literature search. Also for PeCB, a compound included in the Convention in 2009, there is very scarce biomonitoring information available.

Compared to other regions within the WEOG region, the Inuit populations in the Arctic Canada and Greenland have the highest levels of most persistent organic pollutants in blood and milk. This is due to long-distance atmospheric transport with deposition of pollutants in the arctic region where they biomagnify in the food chain and consequently are present in high levels in marine mammals which constitute the traditional Inuit diet.

The levels of PBDEs are known to be higher in North America compared to Europe, which has been shown in both human samples and house dust. This pattern probably reflects the historic high usage of pentaBDE preparations in North America. As a consequence of the recent ban of these compounds, a decrease is expected also in North America. However, the exposure to PBDEs will continue as long as PBDE containing products are still in use.

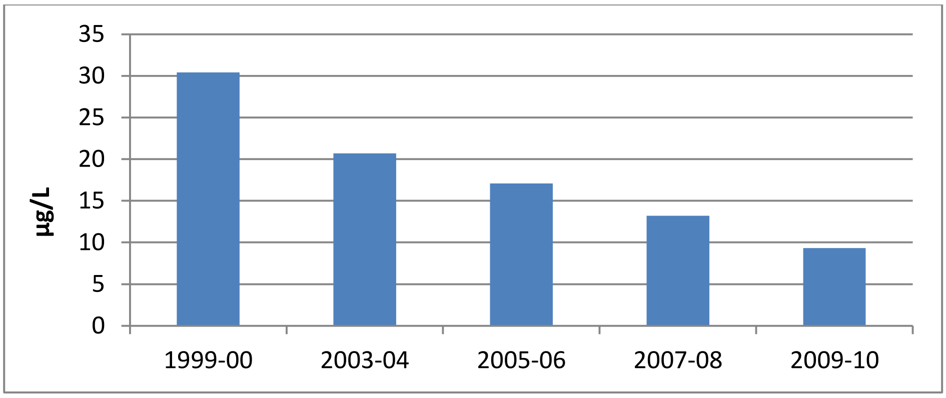


TEQ PCDD/F and TEQ Dioxin-like PCB in human milk from Australia analysed in the WHO milk survey (2001 and 2008/09) and the Australian National Dioxin Programme (1993 and 2002/03). The results from 1993 and 2002/03 are presented as mean, from 2001 as median and from 2008/09 as the result of the only one pooled sample measured (Van Leeuwen and Malisch, 2002, Harden et al., 2007, personal communication).

Trends

The trend studies covered in this report show that the levels of most persistent organic pollutants, such as PCBs, dioxins and DDE/DDT in human blood and milk, have been declining since the start of the trend studies and are still decreasing. Some OCPs that have been banned for a long time, such as aldrin, endrin and mirex, are no longer present in human tissues in detectable levels.

However, the levels of PFOS and PBDEs show a slightly different temporal pattern. In the few available long-running trend studies of PFOS, the levels increased in the 1980s and 1990s, reflecting the industrial production, and have then declined in most WEOG areas. While the phase-out of PFOS is reflected by declining levels in humans, some of the other PFASs still use are now increasing in human tissues (Glynn et al., 2011). Long time series of PBDEs have shown that the levels peaked around the late 1990s and early 2000s. For most PBDEs, the levels now seem to gradually decline, however it is unclear whether the levels of BDE-153 currently are increasing or decreasing. Also, it is uncertain whether the levels of HBCD currently are decreasing.



The levels of PFOS (µg/L) in the NHANES population between 1999 and 2010 (CDC, 2013).

Recommendations for the future
Temporal and spatial trend evaluations in the current report are based on a small number of on-going international and national programmes, whereas results from individual research studies were considered unsuitable for the trend evaluation. Available information indicates that the levels of substances included in the Stockholm Convention, where comparable data is available, are decreasing.

Given the lack of data valid for comparison, it is highly important that existing programmes are continued in a consistent way in the future. Hopefully we will see a continuation of newly started measuring series, such as the Canadian CHMS and FNBI. Also, new harmonized and sustainable biomonitoring initiatives should be encouraged. To better evaluate trends over time and in different regions, human monitoring programmes should be initiated in regions, such as Southern Europe, Australia and New Zealand, which are currently lacking such programmes.

Acknowledgements
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