"Human Biomonitoring (HBM) – Linking Environment to Health and Supporting Policy"

October 22nd – 25th, 2012
Golden Bay Hotel, Larnaca, Cyprus

REPUBLIC OF CYPRUS
MINISTRY OF HEALTH

STATE GENERAL LABORATORY

Welcoming Address

Dearest collaborators and friends,

It is with pleasure and pride that the State General Laboratory of the Ministry of Health is hosting this Cyprus Presidency Conference "Human Biomonitoring (HBM) Linking Environment to Health and Supporting Policy" in Larnaca from the 22nd to the 25th October 2012. Larnaca is built on the ancient city of Kition, the city of the philosopher Zenon (335 B.C.), who founded the Stoic school of philosophy.

HBM is an effective tool to assess human exposure to environmental substances, but its full potential as a policy support tool in Environmental Health has been hindered by many challenges, a prominent one being the lack of harmonization in European biomonitoring programs. Cyprus has been actively involved in all European efforts to harmonize HBM in Europe, starting with the development of the European Environment and Health Action Plan in 2003, all related actions of the World Health Organization Region for Europe, and culminating in the implementation of the first European HBM pilot study achieved by the twin programs COPHES and DEMOCOPHES. We are delighted to host here in Cyprus the first public announcement of the conclusions of the COPHES Project on Harmonised European Biomonitoring, funded under the 7th Framework programme and the DEMOCOPHES Project on the first ever European pilot study, co-funded under the Life+ programme. We hope this Presidency Conference will further provide a forum for discussions for the way forward.

On behalf of the Cyprus Presidency and the local organizing committee, I would like to thank all those who contributed to this booklet and the event, as well as the European Commission that funded the projects. I would also like to wish you all a fruitful conference with productive debates and a most enjoyable stay in Cyprus, an island that acts as bridge between the Eastern and the Western civilization.

Dr Popi Nicolaidou Kanari
Director State General Laboratory

Welcome to Cyprus and the Grand Finale for COPHES and DEMOCOPHES.

The European Commission launched their Environment and Health Action Plan in 2003, which highlighted the urgent need for a harmonised human biomonitoring programme across Europe. Human Biomonitoring is known, by many researchers and policy makers, as a powerful tool in the assessment of population exposure to chemicals from a variety of sources. The goal was to achieve better comparison of data, increase efficiencies across Europe and contribute to evidence based policy development.

COPHES[1] and DEMOCOPHES[2] have delivered the means to achieve this goal. The contributions presented at this conference show what has been accomplished. The sister projects have developed a common protocol, mechanisms for quality assurance, a communication strategy and tested these in 17 countries. Through the successes it is possible to present for the first time, here in Cyprus results of exposure of Europeans to cadmium, mercury, phthalates, cotinine and bisphenol-A . The conference will also highlight lessons learned in the pilot study, recommendations for a longer lasting approach and potential to support and evaluate policies in the field.

We thank the European Commission that funded the twin projects under the FP7 and LIFE+ programs and are indebted to the Cyprus State General Laboratory of the Ministry of Health that hosts this final meeting in the framework of the Cyprus Presidency of the Council of the European Union.

We hope you will find the programme informative and the discussions inspiring in these splendid surroundings.

The COPHES and DEMOCOPHES consortia

[1]COPHES is a consortium of 35 partners coming from 27 European countries starting in 2009

[2]DEMOCOPHES is a consortium of 21 partners from which 17 Europeans countries implemented the pilot study starting in 2010

Conference Abstract

This conference addresses Human Biomonitoring (HBM), which provides direct assessment of human exposure to chemicals, as a link between environment and health and a tool for supporting policy. The conference encapsulates the outcome, recommendations and policy implications of the twin European research programs "COPHES" (FP7), which aims to develop a harmonized approach to HBM in Europe and "DEMOCOPHES" (Life+), which tests out the "COPHES" guidelines in a Europe-wide feasibility study. The lessons learned through the feasibility study set the base for presenting general aspects of setting up HBM survey programs, drawing conclusions regarding the applicability, obstacles and advantages of a harmonized approach to HBM in EU and for presenting suggestions of a framework for sustainable HBM in Europe. Possible ways to integrate HBM in a surveillance infrastructure for environment and health policy decisions will be discussed and the potential of HBM to support and evaluate policy will be highlighted. Finally, the need to further advance HBM through the development of appropriate scientific tools and the potential of HBM in supporting research on the causal links between environmental exposure and disease will be discussed.

Acknowledgements

The Cyprus Presidency Conference "Human Biomonitoring: Linking Environment to Health and Supporting Policy" is co-organized together with the Cyprus State General Laboratory and the EU-funded projects "COPHES" (FP7 / DG Research, Grant Agreement No. 244237) and "DEMOCOPHES"(co-funded by the participating countries and Life+ Program / DG Environment , Grant No. LIFE09 ENV/BE/000410). Many people contributed to the preparation of the conference and this booklet, namely Andromachi Katsonouri, Adamos Hadjipanayis, Lia Demetriou, Christiana Fragopoulou, Elena Anastasi and the others members of the Cyprus "DEMOCOPHES" consortium, Lisbeth Knudsen, Ludwine Casteleyn, Dominique Aerts, Anke Joas, Reinhard Joas, Pierre Biot and the Coordination Team of "COPHES" and "DEMOCOPHES", the Director of the Cyprus State General Laboratory and the officials of the Cyprus Presidency of the Council of the European Union.
We express our sincere thanks to all the speakers, poster presenters, panelists and session chairs, as well as to the large number of people throughout Europe who worked on the implementation of the sister projects "COPHES" and "DEMOCOPHES".

Conference Program

MONDAY OCTOBER 22, 2012

CLOSED FINAL MEETINGS OF "COPHES" AND "DEMOCOPHES"
OPEN ONLY TO PROJECT PARTNERS

09:00 – 13:00 **FINAL MEETING "DEMOCOPHES"**

13:00 – 14:15 **LUNCH**

14:15 – 18:15 **FINAL MEETING "COPHES"**

OPEN CYPRUS PRESIDENCY CONFERENCE - ALL WELCOME
OPTIONAL SOCIAL EVENT

19:30 – 21:30 **WELCOME RECEPTION AT THE GOLDEN BAY HOTEL**

TUESDAY OCTOBER 23, 2012

09:00 –10:00 **WELCOME / OPENING SESSION**
Chairs: *Reinhard Joas, Ludwine Casteleyn, Pierre Biot, Popi Kanari*

09:00-09:10 **Welcome Address**
Popi Kanari, Director, State General Laboratory, Ministry of Health, Cyprus

09:10-09:30 **Introduction:** Working towards a European harmonized HBM survey
Andrea Tilche, Head of Unit, European Commission, DG Research and Innovation, Environment Directorate, Unit "Climate change and natural hazards"

09:30-09:50 **Keynote Address:** History and rationale of Human Biomonitoring
Jürgen Angerer, Institut für Prävention und Arbeitsmedizin der Deutschen Gesetzlichen Unfallversicherung Institut der Ruhr-Universität Bochum (IPA), Germany

09:50-10:00 Opening of Conference Proceedings
Minister of Health of the Republic of Cyprus

10:00 – 10:30 **PRESS CONFERENCE**

10:30 – 13:00 **SESSION 1: ADVENTURES OF A EUROPEAN HBM PILOT STUDY IN 17 COUNTRIES: STUDY DESIGN, CONDUCT AND RESULTS**
Chairs: *Pierre Biot, Ludwine Casteleyn*

10:30-10:45 Exposure levels for selected pollutants in children and their mothers in 17 European countries: an effort in harmonization by COPHES and DEMOCOPHES
Ludwine Casteleyn, Center for Human Genetics, Department of Medicine, Katholieke Universiteit Leuven, Belgium

10:45-11:00 Overview of study design, participation and field work in the European pilot study: critical and non critical country adaptations
Marike Kolossa-Gehring, Federal Environment Agency (UBA), Berlin, Germany

11:00-11:10 How to successfully recruit participants for biomonitoring studies
Marika Berglund, Institute of Environmental Medicine, Stockholm, Sweden

11:10-11:20 Recruitment: bottlenecks and solutions; experiences in UK
Karen Exley, Health Protection Agency, London, UK

11:20-11:35 Achieving comparable exposure data across Europe through a targeted quality control system
Argelia Castaño, Environmental Toxicology Unit, ISCII, Madrid, Spain

11:35 – 12:00 **COFFEE**

12:00-12:10 Capacity building for chemical analyses with focus in cadmium: experiences in Poland
Danuta Ligocka, Institute of Occupational Medicine, Lodz, Poland

12:10-12:20 Capacity building for chemical analyses with focus on Phthalates: experiences in Switzerland
Andrea Lehmann, Federal Office of Public Health, Switzerland

12:20-12:50 Determinants of exposure and interpretation of the biomarker data
Greet Schoeters (presenter) and Elly Den Hond, VITO, Belgium

12:50-13:00 **DISCUSSION**

13:00 - 14:15 **LUNCH**

14:15-15:45 **SESSION 2: LESSONS LEARNED FROM THE IMPLEMENTION OF A HARMONIZED EUROPEAN HBM PILOT STUDY**
Chairs: *Jürgen Angerer, Argelia Castaño, Adamos Hadjipanayis*

14:15 – 14:30 Communication: From Strategy to Reality
Ovnair Sepai Health Protection Agency, London, UK

14:30-14:40 DEMOCOPHES Belgium: to communicate and how to communicate, that's the question
Gudrun Koppen, VITO, Belgium

14:40-14:50 DEMOCOPHES Luxembourg: Talk to Each Citizen? Making Best Use of the Advantages of a Small Country
Arno Gutleb, Centre de Reserche Public, Gabriel Lippmann, Luxembourg

14:50-15:05 Training and capacity building to allow harmonized HBM across Europe
Louis Bloemen, EHSI, The Netherland

15:05-15:15 Training of fieldworkers and implementation: Experiences in Romania
Ioana Lupsa, Environmental Health Centre, Cluj-Napoca, Romania

15:15-15:25 Training of fieldworkers and implementation: Experiences in Cyprus
Giagkos Lavranos, State General Laboratory, Cyprus

15:25-15:45 **DISCUSSION**

15:45 –16:00 **COFFEE**

16:00-17:00 **SESSION 3: HORIZON SCANNING**
Chairs: *Louis Bloemen, Stella Canna – Michaelidou*

16:00 – 16:10 Bisphenol-A and Triclosan in urine of Belgian DEMOCOPHES mother-child pairs. Do we need to worry?
Adrian Covaci, Toxicological Center, University of Antwerp, Belgium

16:10 – 16:20 Phthalates in Healthy Danish Children and Adolescents: Estimation of daily intake and Associations to Age and Puberty
Hanne Frederiksen Department of Growth and Reproduction, University Hospital, Copenhagen, Denmark

16:20 – 16:35 Novel markers of effect and their potential for surveys
Lisbeth E. Knudsen, Section of Environmental Health, University of Copenhagen, Denmark

16:35 – 16:50 Using omics in human biomonitoring and the need for better integration biomarker research: a view from the ECNIS Network
Soterios Kyrtopoulos, National Hellenic Research Foundation, Institute of Biology, Medicinal Chemistry and Biotechnology, Athens, Greece

16:50 – 17:00 **DISCUSSION**

OPTIONAL SOCIAL EVENT

17:30 –21:30 **VISIT AT THE KALLINIKEIO MUSEUM IN ATHIENOU, FOLLOWED BY DINNER AT THE TRADITIONAL CYPRIOT TAVERN "KYRA GIORGENA" IN LARNACA CITY**

WEDNESDAY OCTOBER 24, 2012

09:00-09:15 **SUMMARY OF SESSIONS 1-3**

09:15-11:15 **SESSION 4 : HBM IN SUPPORT OF POLICY**
Chairs: *Marike Kolossa-Gehring, Ovnair Sepai*

09:15-09:30 Future work on Environment and Health – the perspective of the European Environment Agency
Dorota Jarosinska, European Environment Agency

09:30-9:40 Phthalates measurements: linking with questionnaire and other data
Elly den Hond, VITO, Belgium

09:40-09:50 Mercury levels, fish consumption and policy implications
Argelia Castaño, Environmental Toxicology Unit, ISCII, Madrid, Spain

09:50-10:05 Exposure to tobacco smoke in Cyprus: HBM in support of anti smoking bans
Andromachi Katsonouri, Human Biomonitoring and Industrial Products Laboratory, Cyprus State General Laboratory Ministry of Health, Nicosia, Cyprus

10:05-10:15 Mercury and tobacco smoke exposure in Portugal - Policy implications
Fatima Reis (Presenter) and Sonia Namorado, Institute of Preventive Medicine, Lisbon, Portugal

10:15-10:25 A legal framework for HBM: experiences in Slovenia
Milena Horvat, Johan Stefan Institute, Ljubljana, Slovenia

10:25-10:35 Environment Health Monitoring System in the Czech Republic
Milena Černá, National Institute of Public health, Prague, Czech Republic

10:35-10:45 HBM Surveillance Programme in France : How to define the substances of interest
Nadine Fréry, Institute for Public health Surveillance, Paris, France

10:45-11:00 Human biomonitoring and policy relevant investigation of the health effects of drinking water arsenic pollution in the community of Mammari, Cyprus
Pavlos Pavlou, Health Monitoring Unit, Ministry of Health, Republic of Cyprus

11:00-11:15 **DISCUSSION**

11:15 – 11:45 **COFFEE**

11:45-13:00 **SESSION 5 : PROPOSAL FOR A MORE SUSTAINABLE FRAMEWORK FOR HUMAN BIOMONITORING IN HBM SURVEYS**
Chairs: *Anke Joas, Greet Schoeters*

11:45-12:00 Feasibility of a European HBM framework and program
Dominique Aerts, Federal Public Service Health, Food Chain Safety and Environment, DG Environment, Belgium

12:00-12:15 Developing an HBM survey for assessing progress towards goals set in the Parma Declaration
Andrey Egorov, World Health Organization, European Centre for Environment and Health, Bonn, Germany

12:15-12:25 Linking with a Health examination Survey: experiences in Slovak Republic
Katarina Halzlova, Public Health Authority of the Slovak Republic, Bratislava, Slovakia

12:25-12:35 The use of paracetamol among Danish school children– associated with the mothers' use? Health and medication interview after the DEMOCOPHES sampling
Lisbeth E. Knudsen, Section of Environmental Health, University of Copenhagen, Denmark

12:35-12:45 A concept for a sustainable HBM framework in Europe
Anke Joas, BiPro, Germany

12:45-13:00 **DISCUSSION**

13:00 - 14:15 **LUNCH**

14:15-16:15 **SESSION 6: DOCUMENTARY AND GUIDED POSTER SESSION**
Chairs: *Dominique Aerts, Lisbeth E. Knudsen*

14:15 - 15:15 Documentary on Human Biomonitoring: Introduction and Previewing

15:15 – 16:15 Guided poster session

16:15-16:45 **COFFEE**

16:45 - 18:30 **SESSION 7: ROUND TABLE – BUILDING A SCIENTIFICALLY ROBUST AND SUSTAINABLE HBM FRAMEWORK IN EUROPE**
Chairs: *Reinhard Joas, Pierre Biot, Popi Kanari*

Panel discussion with:
Olga Kalakouta, Ministry of Health of the Republic of Cyprus
Andrey Egorov, World Health Organization
Dorota Jarosinska, European Environmental Agency
Konrad Rydzynski, Nofer Institute of Occupational Medicine, Poland
Sean Hays, Summit Toxicology, USA
Lisette van Vliet, Health and Environment Alliance
Stella Canna-Michaelidou, EU and CY Expert on Environment and Health
Chris Money, Cefic European Chemical Industry Council / ExxonMobil

19:30 - 19:40 **CONCLUSIONS OF THE CONFERENCE**
Andromachi Katsonouri and Adamos Hadjipanayis

19:40 - 22:00 **FAREWELL DINNER WITH LIVE CYPRIOT MUSIC AT THE GOLDEN BAY HOTEL**

THURSDAY OCTOBER 25, 2012

OPTIONAL SOCIAL EVENT
COURTESY OF THE CYPRUS PRESIDENCY
ALL WELCOME

09:00 – 13:00 **GUIDED EXCERSION AT THE NEOLITHIC SETTLEMENT OF CHOIROKITIA (UNESCO World Heritage Site) AND LEFKARA VILLAGE**

Social Events

22nd October 2012 at 19:30: WELCOME RECEPTION

You are cordially invited to a Welcome Reception at the Golden Bay Hotel. The Mayor, Mr. Andreas N. Louroutziatis, will welcome the delegates on behalf of the city of Larnaka. A Finger Food Buffet and Cocktails A la Carte will be offered.

23rd October 2012 (18:30-22:00): MUSEUM VISIT, FOLLOWED BY DINNER

We welcome you to experience a small part of the rich heritage of Cyprus at the Kallinikeio Museum in Athienou, which will includes an archeological, an ecclesiastical and an ethnographic collection. Afterwards, you will have the opportunity to taste traditional Cypriot food at the popular Cyprus Taverna "Kyra Giorgena".

24th October 2012 (19:30-21:30): CLOSING DINNER

We invite you to the Closing Dinner at the Golden Bay Hotel, during which the conclusions of the conference will be presented. A "Cypriot night" will follow, with live music and dancing.

25th October 2012 (09:00-13:30): OPTIONAL EXCURSION

We welcome you to an optional guided excursion to Lefkara and Choirokoitia Neolithical Settlement, which is provided by The Cyprus Presidency. Experience the well preserved Neolithic Settlement of Choirokoitia (UNESCO World Heritage Site). In Lefkara village visit The Museum of Folk Art, Embroidery & Silversmithing and see how the renowned 'Lefkaritiko' lace and silver artifacts are made.

GENERAL INFORMATION

MEETING VENUE

The meeting will take place at Golden Bay Beach Hotel, which is located in Larnaca.

The Golden Bay Beach Hotel
Address: P.O. Box 40741 Larnaca 6306 Cyprus
Tel: +357 24645444
FAX: +357-24645451
Email: gbadmin@goldenbay.com.cy

INTERPRETATION

The working language of the meeting will be English. No interpretation will be provided.

CONTACT PERSON

Organisational matters/ Agenda:
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GENERAL INFORMATION ABOUT CYPRUS

Languages
Greek and Turkish are the official languages of the Republic of Cyprus. English is widely spoken.

Local Time
Cyprus Time is GMT +2.

Climate & Weather
Cyprus enjoys an intense Mediterranean climate of hot dry summers, starting in mid-May and lasting until mid-September, and rainy, quite mild winters from November to mid-March. Spring and autumn are effectively short intervals in between, characterized by smooth weather. With almost year-round clear skies and sunshine, daylight length ranges from 9.8 hours in December to 14.5 hours in June.
In broad lines, Cyprus's climate is characterized by hot summers and mild winters. There is a significant seasonal difference between mid-summer and mid-winter temperatures that ranges from 18° C inland to about 14° C on the coast. The difference in daily maximum and night minimum temperatures is also quite significant. In winter they range from 8° to 10° C on the lowlands and 5°to 6° C on the mountains and in summer from 16° C on the central plain and 9° to 12° C elsewhere. In July and August the mean daily temperature ranges between 29° C on the central plain and 22° C on the Troodos mountains, while the average maximum temperature for these months ranges between 36° C and 27° C respectively. In January the mean daily temperature is 10° C on the central plain and 3° C on the higher parts of Troodos mountains with an average minimum temperature of 5° C and 0° C respectively.

Cyprus Weather in October
Cyprus in October is very pleasant. Days are warm, with average high temperatures around 27 °C (at daytime) and average minimum temperatures around 16 °C (at nighttime). You may expect occasional rain (on average 3-4 rainy days in the month). As the sea temperature is around 24° C, it is still warm enough to swim.

Activities in October
Swimming, sunbathing and other beach activities are still possible in October. The evenings though, especially towards the end of the month, get cooler, making it a nice time to have a long walk, to explore countryside or visit archeological and historical places.

In general, October is a good period for outdoor activities.

What to wear in October
Recommended clothes are light weight apparel for the day and a light jacket or woolen jumper and cardigan for the evenings.

Currency
The currency of Cyprus is the Euro.

Currency Exchange
All banks operating in Cyprus offer foreign currency exchange services and quote the exchange rates of the Euro against all major foreign currencies daily. Foreign currency can also be exchanged at hotels.

ATMs and Credit Cards
All major banks in Cyprus have automatic teller machines (ATMs) in most towns and in the majority of the large villages. All major credit cards are accepted almost everywhere.

Electricity supply
The electricity supply in Cyprus is 230 volts, a.c. 50 Hz. Sockets are usually 13 amp, with 3-point plugs, square pin. Many hotels provide adaptors upon request from the reception.

Smoking
Smoking is prohibited in all indoor public places and night clubs.

Opening hours
Shops normally open around 09:00 and close around 19:00 except Wednesday afternoon (up to 15:00 hrs). During the summer period June 15th – August 31st there is an optional three hour afternoon break from 14:00 - 17:00. Shops in tourist areas, large shopping centres and department stores may stay open on weekends and public holidays as well.
Banks are open on workdays (Monday to Friday) usually between 08.30 and 13.30. From October to April they are also open on Monday afternoon between 15.15 and 16.45. Banks are closed on weekends and public holidays. Some banks in central tourist areas are open in the afternoon specifically to provide services to tourists.
Restaurants and cafes have varying opening hours, but lunch is most often served between 12:00 and 15:00. Dinner is served from 19:00 until late in the evening.

Driving Side
Driving is on the left-hand side of the road. All the international road traffic signs are in use and placed on the left-hand side of roads and highways. On roundabouts, priority is given to the right side.

Public Holidays during the Cyprus EU Presidency
15th August
1st October
28th October
24th December
25th December
26th December

Emergency Number
Call 112, the EU-wide emergency number for police, fire department and ambulance.

Dial Code for Cyprus: +357

Telephone Directory Assistance: 11892, 11822, 11800, 11833, 11811.

Site of national carrier for direct flights from main cities: http://cyprusair.com

Site of Cyprus Tourism Organization: www.visitcyprus.com

Abstracts of Oral Presentations

OPENING SESSION

History and rationale of Human Biomonitoring

***Juergen Angerer, Birgit Schindler, Holger Koch, Institute Prevention and Occupational Medicine, Ruhr University Bochum, Germany**

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Institute Prevention and Occupational Medicine, Ruhr University Bochum,
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Human Biomonitoring (HBM) is a child of the 20 th century. It is based on the tremendous progresses of analytical chemistry in the last 50 years, which allow for the determination of concentrations down to the pg/l range.
Human biomonitoring (HBM) has been defined as a systematic continuous or repetitive activity for the collection of biological samples for analysis of chemical substances, metabolites or specific non adverse biological effects to assess exposure and health risk to exposed subjects, comparing the data observed with reference levels and-if necessary-leading to corrective actions. It is the advantage of HBM that it accounts for all sources and routes of uptake so that it measures what really has been taken up. So it is a powerful and irreplaceable tool for the assessment of exposure and health risk as well as for risk management.
According to the state of the art of HBM we nowadays are able to determine about 250 biomarkers in human body fluids accounting for the dose taken up. To a certain extend reference values and limit values like HBM values or Biological Equivalents (BE) are available to estimate possible health risk. However there is an urgent need for the evaluation of further reference and limit values.
To bridge the gap in the exposure- disease-continuum effect markers are necessary which can be linked to exposure on one side and health effect on the other side. The time seems to be ripe to evaluate effect markers based on metabolomics and epigenetics.

Keywords: Human biomonitoring, history, state of the art, reference and limit values, epigenetics, metabolomics

SESSION 1:
ADVENTURES OF A EUROPEAN HBM PILOT STUDY IN 17 COUNTRIES: STUDY DESIGN, CONDUCT AND RESULTS

Exposure levels for selected pollutants in children and their mothers in 17 European countries: an effort in harmonisation by COPHES and DEMOCOPHES

***Ludwine Casteleyn**/* **University of Leuven, Belgium, Greet Schoeters, Elly Den Hond/VITO, Juergen Angerer, Holger Koch/IPA, Marike Kolossa-Gehring, Kerstin Becker/UBA, Argelia Castano, Marta Esteban/ISCIII, Lisbeth E. Knudsen/UC, Pierre Biot/FPS, Louis Bloemen/EHSI, Milena Horvat, Janja Tratnic/JSI, Ovnair Sepai, Karen Exley/HPA, Anke Joas, Reinhard Joas/ BiPRO, Dominique Aerts/FPS.**

Contact Details of Speaker : *Ludwine Casteleyn, Center for Human Genetics, Department of Medicine, University of Leuven, Belgium, Tel. +32 475 87 15 51, Email: Ludwine.casteleyn@med.kuleuven.be*

The European Environment and Health Strategy, launched in June 2003 by the European Commission, aimed at gaining a better understanding of the complex interactions between environment and health in order to take action to reduce the impact of environmental factors on human health. In 2004 the Commission adopted a Communication on the Environment and Health Action Plan 2004 - 2010 in which the value of HBM and the relevance and importance of coordination of HBM programmes in Europe were recognised. In Action 3 of the Action Plan, the Commission announced the development of a coherent approach to HBM in Europe in close cooperation with the Member States. The EU funded projects COPHES and DEMOCOPHES tested out the feasibility of such harmonization. After extensive exchanges of expertise, experiences and expectations, a EU common protocol was proposed and subsequently translated in national operational procedures, with the required adaptations to fit with the national situation. A cross-sectional study of the European population's exposure to cadmium, mercury, phthalates, cotinine, using human biomarker and questionnaire data collected in 17 European countries from a non representative sampling of children of the age group of 6 to 11 and their mothers up to the age of 45 years defined preliminary reference values. A few countries also measured BPA, triclosan and parabenes. The mothers were interviewed on residential environment and residence, nutrition, smoking behaviour, other exposure-relevant behaviour, occupation, and socio-demography. The period of sampling was September 2011 until February 2012. No follow up exams are foreseen. Where possible, additional environmental exposure data and health data will be linked to the biomarker and questionnaire data to improve interpretation of the results.

Keywords: Environment and Health Action Plan 2004 – 2010, feasibility study, harmonization

Acknowledgements: to all partners in DEMOCOPHES and COPHES. COPHES is funded under the 7th framework program of the EU (DG Research – No. 244237. DEMOCOPHES is funded by Life+ 2009 (DG Environment – Life09 ENV/ BE000410)

Overview of study design, participation and field work in the European pilot study: critical and non critical country adaptations

M. Kolossa-Gehring*, K. Becker, U. Fiddicke, G. Schwedler, S. Ißleb, M. Seiwert/ Federal Environment Agency, Berlin, Germany, L. Casteleyn/KULeuven, R. Joas, A. Joas/BiPRO, P. Biot, D. Aerts/FPS, A. Castano, M. Esteban/ISCIII, J. Angerer, H. Koch/IPA, G. Schoeters, E. Den Hond/VITO, O. Sepai, K. Exley/HPA, L. E. Knudsen/UC, M. Horvat/JSI, L. Bloemen/EHSI

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An approach towards a common European human-biomonitoring (HBM) needs a harmonized European consensus protocol with specific standard procedures for all parts of the survey, which was developed by the COPHES network. The COPHES network tested the feasibility of a coherent HBM approach by conducting a pilot study (DEMOCOPHES). DEMOCOPHES was designed as a cross-sectional survey in an urban and a rural part of each country, involving 120 mother-child pairs comprising of an equal number of boys and girls 6- to 11-years-old, their mothers being 45 years or younger. Recruitment of participants could be done either via inhabitant registries or via schools. Sampling of the interviews and collecting of hair and urine samples, or additionally blood could be done either during a home visit or in an examination centre. The collected specimens were analysed for mercury, cadmium, cotinine and some phthalate metabolites. Determining triclosane, parabenes and BPA was voluntary.

The implementation of the protocols in the countries revealed that in most countries a selection of children via schools was preferred to a selection via inhabitant registries. Due to the low response rate, some countries included non-preselected volunteers which might cause a selection bias in the study population. Urban and rural areas differed greatly between the countries, so the degree of urbanization of the sampling locations had to be country specific.

Participation rate in most countries was lower than expected, so the use of incentives should be encouraged. The questionnaires were translated into 15 different languages. The countries only demanded minor changes in few of the questions provided. Although the questionnaires were designed as face-to-face-interviews, some countries used self-administered or web-based questionnaires. With the appropriate design of questionnaires each of these options are conceivable in future studies.

Lessons learned from DEMOCOPHES show that harmonization is not possible and not necessary in each part of the project in the same depth. However sufficient harmonization can be achieved to successfully conduct HBM-studies on a European scale.

Keywords: Human Biomonitoring Europe harmonisation fieldwork

Acknowledgemens:

COPHES is funded under the 7th framework program of the EU (DG Research – No. 244237 DEMOCOPHES is funded by Life+ 2009 (DG Environment – Life09 ENV/BE000410)

How to successfully recruit participants for biomonitoring studies?

Marika Berglund*, Kristin Larsson, Institute of Environmental Medicine, Karolinska Institutet, Stockholm

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The primary aim of DEMOCOPHES is to test the feasibility of an EU-HBM study design to generating comparable data across Europe. In the Democophes study design, there were two options for selection of participants, the first was making use of registers, and the second was recruitment via schools. In Sweden, we used the register approach, since the principals at the schools that were approached showed low or no interest in participating. The main reason was lack of time and interest.

We used the personal addresses (SPAR) register which includes all persons who are registered as resident in Sweden. The data may be processed for research purposes and investigations. The register allows selection of addresses based on area, age and gender. Telephone numbers are not available.

We assumed a low participation rate since the willingness of taking part in surveys and investigations has decreased the last 20 years, aiming at 30% participation. To obtain 120 mothers (60 in urban area and 60 in rural area), we applied for 480 names and addresses in the stipulated age range of 20-45 years. Unfortunately, the participation rate was even lower, i.e. 21%, leaving us with 100 mothers who were willing to participate with their children 6-11 years.

In the rural area, there were only 219 eligible mother-child pairs available why no additional selection could be made, and there was not enough time to apply for additional mother-child pairs. For ethical reasons, we were only allowed to approach a person once, i.e. not to put any pressure on the mothers, and to make one contact to ask for denial of participation.

About 60% never replied to the mailed invitation. Among those who answered, about 30% of the mothers in the urban area and 5% of the mothers in the rural area were willing to answer to questions but did not want to participate in the sampling of urine and hair. Also, some of the positive mothers wanted to participate with another child of the family than what was chosen from register. The main reasons for non-participation were lack of interested or time.

Keywords: Registers, participation rate, Sweden

Acknowledgements:

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Recruitment: bottlenecks and solutions; experiences in the UK

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A harmonised approach to enable the collection of comparable human biomonitoring data from across Europe developed by COPHES was tested in the DEMOCOPHES pilot study by 17 countries in Europe. Creating a framework that takes into account and works with differences in culture, policy, ethics as well as the skills and experiences of each country is an exciting challenge. The need to positively engage the public in this area of research is essential for recruitment and a successful study.

The pilot study has been a valuable exercise in developing the UK's experience in human biomonitoring research. In this presentation the experiences in recruitment from the UK perspective will be reported. The recruitment methods and communication tools that were tested in the study will be evaluated; exploring the bottlenecks encountered, noting the achievements and considering how the methods used compare to other UK studies. Feedback obtained from the public, during recruitment, and from study participants, the timeframe for recruitment, and the timing of communication to potential participants all must be considered in order to maximise response rates. The lessons learnt from the UK pilot study will be discussed and some suggested recommendations to optimise recruitment methods for future studies will be proposed.

Keywords: Human Biomonitoring, recruitment, communication, participation, UK

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The Health Protection Agency

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Achieving comparable exposure data across Europe through a targeted quality control system

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COPHES (Consortium to Perform Human Biomonitoring on a European Scale) began its work to establish the bases for a coherent human biomonitoring (HBM) approach in Europe three years ago. One of the COPHES aims was to guarantee comparable HBM analytical results within Europe and to contribute to capacity building of HBM labs. To achieve that goal a Quality Assurance Unit (QAU) constituted by ISCIII (Spain) and IPA (Bochum) scientists was established. The COPHES Quality Assurance Unit worked towards harmonization of the analytical methods and the pre-analytical phase. Standard operating procedures (SOP) for the pre-analytical and the analytical phase were elaborated. The analytical SOPs were to be regarded as state of the art methods that could be adapted by the labs to fit the local conditions. A system of three interlaboratory comparison investigations (ICI) and two external quality assessment schemes (EQUAS), including preparation of control material and measurements by reference labs, was carried out. Web conferences were established as tool for training and capacity building. Quality assurance, training and capacity building for HBM labs in Europe were successful. The number of participating labs increased from 20 to 38 in the 17 European member states during the project. 15 reference labs from USA, Canada, Japan and Europe kindly collaborated in EQUAS exercises. The supply of SOPs and the training activities during the web conferences proved valuable, especially for the less experienced labs. During this exercises we established a quality assured pan-European HBM network on the examples of 4 rather well established HBM parameters like cadmium, cotinine and creatinine in urine and mercury in hair, while we gave the first steps to work together in an harmonized way in 2 emerging parameters, phthalate metabolites and bisphenol A in urine. Based on the results of the quality assessment schemes, well performing labs were selected by the MS to perform this first European-wide HBM survey. The analysis of the real DEMOCOPHES samples have confirmed that only strict Quality assurance and Quality control will guarantee comparable and reliable results, therefore it is better to lose in capacity building by applying strict criteria for lab selection, than to compromise quality and comparability of results.

Keywords: HBM, Biomarkers, quality assurance, harmonization, capacity building.

Acknowledgements: Spanish project SEG 1112/10 (MAGRAMA-ISCIII agreement), DEMOCOPHES (LIFE09 ENV/BE/000410). Authors also would like to thank the reference labs for EQUAS in COPHES/DEMOCOPHES proojects. www.eu-hbm.info

Capacity building for chemical analyses with focus on cadmium: experiences in Poland

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Within COPHES (Consortium to Perform Human Biomonitoring on a European Scale) a harmonized EU protocol was developed which gave the framework to perform DEMOCOPHES in each of the 17 participating countries. The primary aim of DEMOCOPHES was to test the feasibility of an EU-HBM approach, generating comparable data. Throughout the different steps of data analysis, frequent consistency checks were included to ascertain that no confusing or contradictory interpretation of biomarker data occurs. Standardisation of pre-analytical phase, SOPs for analytical methods and quality assurance in the analytical phase were the tools to achieve comparable HBM results of urinary cadmium, cotinine, and phthalate metabolites as well as total mercury in hair. In Poland the NIOM laboratory was successful in the ICI/EQUAS exercise for analysis of cadmium in urine samples. The cadmium concentration in urine samples was measured with ICP-MS with and without Rh as an internal standard. The validation parameters of the method are limit of quantification(LOQ): 0.012 µg/l, limit of detection (LOD) 0.004 µg/l, accuracy: 7.9 %, recovery:98,2 %, inter-series repeatability: 5%, standard deviation for the internal quality control samples: 0. 22.

Keywords: DEMOCOPHES, HBM, capacity building, cadmium in urine, ICP-MS method

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Capacity building for chemical analyses with focus on Phthalates: experiences in Switzerland

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HBM calls for a high level of analytical expertise. In 2009 a report from the Swiss federal council showed that only a small number of Swiss laboratories have the capacity to determine certain substances in human media such as urine, blood or breast milk, e.g. public sector laboratories. Medical and chemical laboratories often offer determinations of lead and other heavy metals. Private laboratories routinely offering human biomonitoring (HBM) services for typical organic substances rarely exist in Switzerland (no supply due to few demand). By tender procedure for DEMOCOPHES we could only gain one lab for the analysis of the pilot study which was willing to learn and implement the phthalate analyses (MnBP, MBzP, MEHP, 5-OH-MEHP, 5oxo-MEHP, MEP, MiBP). The university lab passed the international inter-laboratory comparison investigations (ICI) and external quality assessment schemes (EQUAS) for the analysis of mercury in hair as well as cadmium and cotinine in urine. Due to limited time the phthalates analytics could not be implemented. This measurements had to be given abroad to a lab which successfully took part in ICIs and EQUAS of DEMOCOPHES. Although the Swiss lab was not able to implement the phthalate analytics in time for DEMOCOPHES, the lab learned the method in principal, could gain capacity and build up a network. Thus the participation was an investment for the future. After DEMOCOPHES the Swiss federal council will decide on a possible implementation of a national survey using HBM. In case of an implementation the network gained within DEMOCOPHES could be used in general, as well as concerning the analytics.

Keywords: Swiss laboratories, phthalates, analyses, Human Biomonitoring

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Determinants of exposure and interpretation of the biomarker data

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For the first time in the EU, 17 countries collected in a harmonised effort human biomonitoring data and questionnaire information about environment, health and life style. More than 4000 subjects (mothers and their children 5-11 yrs) participated in the study. A central database was developed to collect and analyse all the EU data. Information was obtained on the distribution of biomarker levels (urinary cadmium, cotinine, phthalatesmetabolites and mercury in hair) in the EU population. The geometric mean (with 95% confidence interval) and 90th percentile (with 95% confidence interval) were calculated for each biomarker separately in children and in mothers as "European exposure values". The European exposure values were compared with available health based guidance values. After adjustment for confounders, average exposure values in each country were compared with the mean of the "European exposure values" by means of a weighed analysis of variance. Multiple regression analysis was used to identify significant environmental, geographical, personal or life style related parameters which influence the biomarker level.

Exposure of the general population in EU is well below the current health based guidance values, very few participants had values which were higher that the health based guidance values. Biomarker values showed a large variabity in the population and between the countries, the information reported by the participants on their environment and life style allowed to identify factors that influence the biomarker levels and hence indicate the leverage for intervention

The biomarker levels in children were highly correlated with the levels in their mother, especially for mercury and cotinine, which may indicate a common environmental factor that influences the biomarker level.

Younger children (5-8 yrs) have higher levels of mercury, cotinine and phtalates (except MEP) compared to older children (9 - 11 yrs). This emphasises the importance to give specific attention to the younger age group.

After adjustment for known modifying factors, social class (represented by the highest educational level of the mother) has a significant influence on each of the biomarker levels: mercury level in hair increases in children and mothers if social class is higher, while cotinine, cadmium, phthalate metabolites are lower with increasing educational level of the family. This influential factor may hide underlying determinants of exposure yet not discovered.

Keywords: Pilot reference values, data analysis, health based guidance values

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SESSION 2:
LESSONS LEARNED FROM THE IMPLEMENTION OF A HARMONIZED EUROPEAN HBM PILOT STUDY

Communication: From Strategy to Reality

Ovnair Sepai* and Karen Exley, Health Protection Agency UK, Greet Schoeters, Elly Den Hond/VITO, Juergen Angerer, Holger Koch/IPA, Marike Kolossa-Gehring, Kerstin Becker/ UBA, Argelia Castano, Marta Esteban/ISCIII, Lisbeth E. Knudsen/UC, Pierre Biot/FPS, Louis Bloemen/EHSI, Milena Horvat, Janja Tratnic/JSI, Ludwine Casteleyn/KUL, Anke Joas, Reinhard Joas/BiPRO, Dominique Aerts/FPS.

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Often left to the end of a project; communication is a lesser understood key deliverable in any research project but especially in one that involves a wide array of stakeholders.

Why do the public feel that politicians and scientists are not to be trusted? Why do scientists feel frustrated with the questions asked by the general public? Two questions one answer: because there is a lack of appropriate communication.

COPHES produced a communication strategy and material including a website, Newsletters, briefing notes for policy makers and medical practitioners, factsheets, educational material and consent/assent forms were developed. This material was used and tested by DEMO-COPHES and required translation – linguistically and culturally. The reaction of focus groups to the aims and objectives of the project were very enlightening. Material which had been written and 'tailored' for participants was regarded by the participants as too detailed and in some cases 'scary' this shows that there is a lot to be learnt. Interestingly, National Research Ethic Committees often asked for more detail to be given to potential participants as part of the recruitment. This was at odds to the feed-back received from the participants.

The communication strategy covered all phases of the project. The initial recruitment phase called for material for the general public, the potential participants, politicians as well as the scientific community. This also required messages for different age groups – mothers and their children. This material was presented to two focus groups in the UK.

Sample collection and reporting results back to the participants –this phase is very sensitive and personal contact provides an opportunity for participants to ask further questions. This can only be successful if there is trust between the study participants and the project field workers.

Scientists often present their results in scientific papers and at high level international conferences where the participants are anonymous figures, distributions and unexplainable outliers. Rarely do the participants have a chance to discuss their results and what they mean at an individual or collective level.

Communication is a crucial part of a human biomonitoring project when done well leads to trust and mutual understanding.

Keywords: Communication, human biomonitoring, ethics, consent, participation, focus groups

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Democophes Belgium: to communicate and how to communicate, that's the question

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At the start of the Belgian Democophes field work, a press release was launched. At that time all translated documents were available on the Belgian website. The first few months, we tried to stick as close as possible to the communication templates of Democophes, but after three months they were minimized in size. Field work ran from October 2012 until February 2012. The measured levels were discussed on in the steering committee before the Summer time. Since there were very few levels above HBM-I level and none above HBM-II, there was no immediate contact with those individuals at that stage. In July 2012, the participants and directors of the schools received a letter of thanks announcing the approximate timing of communication of the personal and collective results.

An English background report was made containing all information and study data. In an English, French and Dutch lay-man report the principal information and study results were summarized. In September 2012 the individual results were sent to the participants. One day after distributing the results letters via regular post, a press release document was posted on the National website. By that time the website was updated and refreshed, including the final fact sheets in both Dutch and French. The associations of medical practitioners from the sampling regions were sent information on the study in this period. A special information session, on which all Dutch speaking participants were invited, was organized in one school, enabling documentary makers to film the event and in this way advertising human biomonitoring in Belgium. End of November 2012, after the closing meeting of COPHES/DEMOCOPHES a national workshop will be held in Brussels for participants, schools, local politicians, scientists and policy makers. On the agenda will be the presentation of the National results in comparison with the European levels. On that symposium there will be also a closed discussion on policy making and policy priorities. Aim is to strive for a practical action plan similar as is running in the frame of the Flemish Environment and Health Surveys.

Keywords: Belgium, communication, policy
Acknowledgements: DEMOCOPHES Belgium is funded by Life+ 2009 (DG Environment – Life09 ENV/BE000410) and by all Ministries represented in the Belgian Interministerial Conference Environment and Health

Democophes Luxembourg: Talk to Each Citizen? Making Best Use of the Advantages of a Small Country

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In Luxembourg DEMOCOPHES attempted from the beginning to make best use of the advantage of being the smallest participating country. Distances between cities but also information lines are short and an efficient contact network was already established from previous projects. In Luxembourg the project started in March 2011 with a press conference in the office of the Minister of Health, who highlighted the importance of the DEMOCOPHES project. This press conference was well covered by all national newspapers and one radio station. Around that time the website for Luxembourg was also launched. All materials for the field work (questionnaires, information leaflets) were translated in two (German, French) of the three national languages (Luxembourgish was not necessary). The 60 mother-child pairs necessary for the survey were selected via contacts with primary schools (letters) and a newsletter. Fieldwork took place between November 2011 and January 2012 and all families were visited at home where the interviewers also had the possibility to ask additional questions. Laboratory analyses and statistical analyses were performed following all guidelines from COPHES. In October 2012, timely before the meeting on Cyprus, the participants received a letter with their results including information leaflets on the compounds measured. A meeting to inform the Minister of Health about the DEMOCOPHES results is scheduled in November. An information evening aiming at presenting the national results in comparison with the European levels and to which all participants will be invited is envisaged to also take place in November.

Keywords: Luxembourg, human biomonitoring, communication, policy

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Training and capacity building to allow harmonized HBM across Europe

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The COPHES and DEMOCOPHES project has as the key objective to conduct human biomonitoring in a harmonized way according to agreed upon procedures. 17 different countries have been conducting HBM according to these procedures. Aspects of HBM are recruitment, questionnaire administration, sample collection, storage and tramsport, lab analysis, data handling, data quality control, statistics, interpretation and through all this runs communication.

To be sure procedures were well understood, extensive attention was given to training.

Workshops have been organised addressing the different aspects. Training material was developed by WP's responsible and those involved in the different subject matter (field work, communication) were invited. Training sessions were given in English. In particular for field work, to make sure the training was effective, those training in the countries were invited. Sessions were hosted by Germany, Belgium and Denmark.

Keywords: Training Capacity Building Harmonised

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Training of fieldworkers and implementation: experiences in Romania

Anca Elena Gurzau, *Ioana-Rodica Lupsa, Cristina Neagu

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From the Romanian DEMOCOPHES team two persons responsible for the fieldwork and in charge with internal quality control attended the training in Berlin provided by COPHES in June 2011. The training materials (ppt files) were translated into Romanian language and the national adapted Fieldwork Manual. We used the "train the trainer" principle in two sessions.

The fieldworkers were selected from the Environmental Health Center personnel who participated in numerous national and international projects where they had the tasks to fill in the questionnaires, to sample biological matrixes (urine, blood, nails).

No constraints, problems or special points of attention were encountered.

The 4 trainees build two independent teams which had to be able to perform parallel running of home visits, as well as in the survey offices established in the schools or parallel running at the urban and rural location. They were educated and trained for all occurring procedures in order to be able to be responsible for the whole process of recruitment and sampling.

The first module of the training consisted of the theoretical part in which the survey objectives, the pollutants analyzed and other theoretical background information was provided. Although the trainees were all skilled fieldworkers but with different background it was very important for them to be able to answer correct all the supplementary questions during the interviews without influencing the mother's answer.

The second module of the training was a practical module in which the sampling of the urine and scalp hair samples was practiced, as well as how to fill in accurately the questionnaires and especially how to proceed all the activities in a harmonized way, in order to fulfill one objective of the study, namely to obtain comparable data; the rehearsal of sampling and interviews had to help them to perform in a polite way and to deal with difficulties during the home visit. Two assisted scored tests were applied for their evaluation. Although they were advised to keep a permanent link to National Focal Point/Survey Office (where a permanent adviser can find answers to all occurring questions and solve all their problems).

Keywords: DEMOCOPHES, train-the-trainer, fieldworker

Acknowledgements: Life+ Programme, European Comission (Life 09 ENV/BE/000410) and Environmental Health Center, Cluj-Napoca, Romania

Training of fieldworkers and implementation: the Cyprus experience

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The implementation of the common DEMOCOPHES framework for a unified approach in HBM across Europe required significant effort. In the case of Cyprus, a particular challenge was to apply a strategy based on initial school – based recruitment, followed by home visits, while maintaining all essential components of the EU protocol developed by COPHES.

The selection of the fieldworkers was made using an open call in Spring 2011. Priority was given to allied health professionals with significant prior experience in field research in Cyprus. Selection was made based on submission of cv, references and personal interviews conducted by the national coordinators. Due to the lower sample population required for the Cyprus national study (60 mother-child pairs), a minimum of 2 field workers was sufficient, each operating on a different setting (i.e. rural and urban site, respectively).

With regard to fieldwork training, the Cyprus team first developed and distributed a detailed manual in print and electronic form. This included all translated questionnaires and fact sheets, along with SOPs, national protocol, bioethics, ministry of education and personal data protection authority licences and checklists for self-control, internal and external audit. An original version of the manual was distributed in July 2011, followed by the final in September 2011, which was partially reorganized in accordance with samples prepared by other DEMOCOPHES partners during the summer. Field work training was conducted via a combination of a full day theoretical workshop (providing background information on study design, rationale for sampling, recruitment process and home interview structure) and 2 practical sessions for practice in mock interviews and sampling techniques. Moreover, a briefing session was also arranged after the first home visit for each fieldworker for feedback and improvement opportunities.

The study implementation ranged from October to December 2011. The 2 fieldworkers received contact details of interested mothers who have been previously screened for eligibility via a telephone recruitment interview by the medical doctors of the study. Following settlement of a home visit date, they proceeded with a 1-hour interview and sampling session, with minimal difficulties pertaining to rescheduling due to inability to receive samples or time restrictions on behalf of the participants.

Keywords: Biomonitoring, DEMOCOPHES, fieldworkers, manual, training

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SESSION 3:
HORIZON SCANNING

Bisphenol-A and Triclosan in urine of Belgian DEMOCOPHES mother-child pairs. Do we need to worry?

Adrian Covaci*, Tinne Geen/University Antwerp, Belgium, Gudrun Koppen, Tine Caeyers, Eva Govarts/ VITO, Marie-Christine Dewolf/Provincial Institute Hainaut Vigilance Sanitaire, Belgium, Els Van de Mieroop, Vera Nelen/Provincial Institute of Hygiene Antwerp, Belgium, Dominique Aerts, Pierre Biot Federal Public Service Health, Food Chain Safety and Environment, Belgium and the Belgian steering committee members

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In Belgium, 129 pairs of mothers (average 40y old) and children (average 8y old) were sampled in 13 schools in the urban region of Brussels and in a rural area in the West of the country. Urine and hair samples were tested for several chemical contaminants, including phthalates, cotinine, cadmium, mercury, bisphenol-A (BPA) and triclosan (TCS). The latter two compounds are discussed in this abstract.

BPA, a very high production chemical, is widely used in the production of polycarbonate and epoxy resins. BPA mimics estrogen and in vitro studies have shown that BPA binds to the estrogen receptor and introduce estrogen receptor-mediated gene expression. TCS is an antimicrobial compound widely used in personal care products (soaps, tooth paste, etc) in concentrations up to 0.3%. There are few data on human exposure to BPA and TCS and there is a need for human studies to investigate the relationships between exposure levels and disorders such as early puberty or poor semen quality.

The determination of BPA and TCS was performed following a method published by Geens et al. (2009) employing GC-ECNI/MS. Geometric mean concentrations of BPA were similar among mothers and children (2.55 and 2.35 µg/L, respectively), with 97 to 100% detection frequency. In mothers, higher BPA concentrations were correlated to the increased regular consumption of canned food. None of the mothers or children had BPA urinary levels higher than the Human Biomonitoring Limit of 2500 or 1500 µg/L, respectively. Using a model based on the measured concentrations (µg/L) and literature reference values for the daily age-dependent excreted urine volume (L/kgbw/day), we roughly estimated that the daily intakes of BPA were at least 100 to 500 times lower than the current EFSA Tolerable Daily Intake of 50 µg/kgbw/day.

TCS concentrations were higher in mothers compared to children (2.72 vs. 1.23 µg/L), possibly due to the higher use of personal care products by the mothers. TCS levels in children increased if they have used personal care products and sun screens.

Urine appeared to be a suitable matrix to assess contamination with BPA and TCS present in daily life of the Belgian mothers and children.

Keywords: Belgium, bisphenol-A, triclosan, results, mothers, children, determinants of exposure

Acknowledgements: DEMOCOPHES Belgium is funded by Life+ 2009 (DG Environment – Life09 ENV/BE000410) and by all Ministries represented in the Belgian Interministerial Conference Environment and Health.

Phthalates in Healthy Danish Children and Adolescents: Estimation of daily intake and Associations to Age and Puberty

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Phthalates are widespread used in the industrial production of numerous consumer products. They have shown anti-androgenic effects and are suspected to be involved in human male reproductive health problems. Phthalates have also been associated with health problems in children such as obesity, astma, reduced intelligence, and changes in pubertal timing among girls and pubertal gynaecomastia in boys, although controversies exist.

Determination of urinary phthalate metabolites in more than 1300 healthy Danish children and adolescents from the Copenhagen area showed that monoethyl phthalate (MEP), mono-iso-butyl phthalate (MiBP), mono-n-butyl phthalate (MnBP), monobenzyl phthalate (MBzP) and metabolites from di-(2-ethylhexyl) phthalate (DEHPm) and di-iso-nonyl phthalate (DINPm) were measured in almost all samples, and that the median concentrations were 39, 81, 51, 48, 136, and 25 ng/mL, respectively. Furthermore, the children and adolescents were exposed simultaneously to multiple phthalates. Twenty-four hour urine samples were collected from a subgroup of the children (n=129) and the median estimated daily intake of phthalate diesters was: 4.29 (DBP), 4.04 (DEHP), 1.70 (DiNP), 1.09 (DEP) and 0.62 (BBzP) g/kg bw/24h. Of these children, 8.5% were estimated as being exposed to DBP at levels above the European food Safety Authority's (EFSA) limit for tolerable daily intake (TDI).

In general the youngest children with less advanced pubertal development had the highest urinary concentration of ∑MBP(i+n), MBzP, DEHPm and DINPm. MEP followed the opposite pattern and significant increasing urinary concentration with increasing age was observed for both genders.

After stratification of the urinary phthalate excretion into quartiles, an increasing age at pubarche (onset pubic hair) and a lower prevalence of detectable testosterone in the girls with increasing phthalate metabolite quartiles (except for MEP) was observed. No association between phthalates and age at onset of breast development was observed. In boys the urinary levels of phthalate metabolites were not associated with age at pubertal onset, serum testosterone levels or presence of gynaecomastia. These findings suggest that the observed phthalate exposure in children may have sufficient anti-androgenic activity to significantly affect the activity of the low testosterone level in girls whereas boys with a much higher endogenous testosterone level do not seem to be affected.

Keywords: human biomonitoring, risk assessment, phthalates, children, puberty, anti-androgen effects

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Novel markers of effect and their potential for surveys

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In environmental health, a number of studies have been performed with newborns, children, and adults with classical biomarkers of exposure as well as promising markers of effect and new techniques of 'omics'. Several EU financed projects have developed and validated human biomarkers such as the PHIME (Public Health Impact of long-term, low-level Mixed element Exposure in susceptible population strata), Integrated Project, Newgeneris (Newborns and Genotoxic exposure risks: Development and application of biomarkers of dietary exposure to genotoxic and immunotoxic chemicals and of biomarkers of early effects, using mother-child birth cohorts and biobanks) program, EC-NIS (Environmental Cancer Risk, Nutrition and Individual Susceptibility) network of excellence and our European pilot program COPHES/DEMOCOPHES. Today much attention is put towards biomarkers predictive of diseases and consequently the development of biomarkers in disease diagnostics and medicine evaluation has increased and expectation towards predictive effect biomarkers in environmental health. When considering effect biomarkers the Wilson and Jungner classic screening criteria published by WHO 1968 should be revisited and modernized.

1. The condition sought should be an important health problem
2. There should be an accepted treatment for patients with recognized disease.
3. Facilities for diagnosis and treatment should be available.
4. There should be a recognisable latent or early symptomatic stage.
5. There should be a suitable test or examination.
6. The test should be acceptable to the population.
7. The natural history of the condition, including development from latent to declared disease, should be adequately understood.
8. There should be an agreed policy on whom to treat as patients.
9. The cost of case-finding (including diagnosis and treatment of patients diagnosed) should be economically balanced in relation to possible expenditure on medical care as a whole.
10. Case-finding should be a continuing process and not a 'once and for all' project.

Wilson . JMG, Jungner G. Principles and practice of screening for disease. Geneva: WHO; 1968.

Keywords: New biomarkers of effect omics survey validation development

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Using omics in human biomonitoring and the need for better integration biomarker research: a view from the ECNIS Network

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Omics technologies allow the quantitative measurement of global sets of molecules in bio-samples using high-throughput techniques, thus providing a molecular description of the state of cells as they respond to environmental influences and as they evolve towards pathological states. In combination with reliable measures of individual exposure, they can offer strong support for the establishment of etiologic links between environmental exposures and disease. Furthermore, emerging evidence indicates that some types of omic profiles may serve as long-lived biomarkers of past exposures, thus providing a route to the characterization of the exposome.

Applications of omics technologies in environmental health-related population studies are still limited. However the available evidence supports the anticipation that these technologies can lead to the discovery of new biomarkers. Examples of exposures for which characteristic omic profiles in blood cells have been reported include benzene, arsenic and other chemicals of wide interest. Furthermore, omic profiles which serve as biomarkers of risk of future disease have been reported for a number of diseases. Analogous results have been obtained in the context of the European project EnviroGenomarkers (www.envirogenomarkers.net) which consists of a number of prospective studies nested within existing adult and child cohorts. This project, being by far the largest environmental health population study in which omics technologies have been applied, has provided valuable experience on the utility of this approach in relation to population monitoring.

A particularly important message emerging from current experience in the use of omics in population studies relates to the need for combining the characterisation of omic profiles with measurement of chemical-specific biomarkers of exposure such as have been collected in the context of COPHES. Given the enormous amount of effort and resources required for collecting such diverse kinds of data, the coordination of biomarker-based environmental health research becomes of critical importance. This is a challenge that needs to be addressed at a European level, towards which the ECNIS Network of Excellence has been working for the past seven years.

Keywords: omic profiles; biomarkers of exposure; biomarkers of risk; molecular epidemiology; biomonitoring

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SESSION 4:
HUMAN BIOMONITORING IN SUPPORT OF POLICY

Future work on Environment and Health – the perspective of the European Environment Agency

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In 2010, the comprehensive European environment state and outlook report showed that environmental policies have delivered substantial progress in reducing specific pressures and improving the state of the environment. While many challenges, such as air pollution, water stress, nature protection and waste management, have been on the political agenda for several decades, the appreciation of their drivers and the impacts has changed, both in Europe and globally. Increasing recognition of multiple, direct and indirect links between environmental challenges, coupled with global developments, points towards the existence of systemic risks - that is the potential loss or damage to an entire system, rather than a single element. Identifying environmental risks to human health has thus become more complex, and should go beyond immediate and individual health impacts of specific, well-known stressors. Multiple exposure, long-term impacts, inequalities and footprint aspects should also be addressed, taking account of links between health, environment and social agendas. The limitations of a segmented, hazard-focused approach to environment and health become increasingly apparent, when confronted with interconnected and interdependent challenges to human health, like climate change, depletion of resources, ecosystems degradation, impacts of chemicals on human health, etc. To protect and sustain human health and well-being, future efforts to improve the quality of the environment will need to be complemented by other measures, including significant changes in lifestyle, human behaviour, and consumption. Thus, in the future, a broader framing of environment, health and well-being issues is needed, adding a social dimension and linking them with other policy domains, such as resource efficiency and ecosystem services.

Keywords: Environment multiple exposures long term impact inequalities

Phthalate measurements linking with questionnaire and other data

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Phthalates are man-made chemicals that are used in a large variety of consumer products. Long-chain phthalates (DEHP, DiNP, DiDP) are primary used as plasticizers to increase the flexibility and transparency of plastics. As a component of polyvinyl chloride (PVC), these phthalates find their application in construction materials, flooring, roofing, toys, food packing materials, medical devices, etc. Short-chain phthalates (DMP, DEP, BBzP, DnBP, DiBP) are also often used in non-PVC applications such as personal care products, paints, adhesives, textiles, coating of medications, pesticides, etc. Phthalates are suspected endocrine disrupters. In animal studies and in epidemiological surveys, exposure to phthalates has been linked to disturbances of the male reproductive system (testicular dysgenesis syndrome), female breast cancer, obesity and metabolic syndrome.

Seven urinary phthalate metabolites (MEHP, 5OH-MEHP, 5oxo-MEHP, MnBP, MBzP, MEP and MiBP) were measured in a standardised and harmonised way in more than 4000 mothers and their 5-8-year old children from 17 European countries in the DEMOCOPHES project (Demonstration of a Study to Coordinate and Perform Human Biomonitoring on a European Scale). Comparison of European exposure values with available health-based guidance values shows that exposure is well below the limit values. Multiple regression analyses allow to quantify the impact of personal factors (age, gender), life style related parameters (food intake, use of cosmetics), environmental factors (indoor environment, rural/urban) and social factors (educational level) in relation with phthalate levels in the body. These findings may also be linked to ecological data, e.g. production volumes or information on consumer habits in a country. The results show that phthalates are highly present in our environment and in the human body. This information can serve as input for policy makers to regulate the use of phthalates in industrial processes. Further, the data allow to specify typical exposure patterns for the different phthalates and hence identify triggers for sensibilisation actions to lower the exposure in the population.

Keywords: Human biomonitoring, phthalates, endocrine disruption, nutrition, personal care products, health based guidance values

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Mercury levels, fish consumption and policy implications

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The adverse effects of high mercury exposure in humans are well known. For general population, fish and particularly large marine fishes like tuna, sharks and swordfish are the major source of methyl-mercury. On the other hand fish and marine products are rich in unsaturated fatty acids, which reduce the risk of cardio-vascular disease and therefore are beneficial for health. Cardio-vascular disease is related to high consumption of red meat and dairy products and low intake of vegetables and fruits. Public health authorities are therefore recommending a Mediterranean diet with a high proportion of fish, marine products, vegetables and fruit has as a way to reduce cardiovascular disease burden. However, the authorities are facing the dilemma to balance the benefits of fish consumption, with the assumed adverse effects of low level methyl-mercury exposures. Shall the policy makers advise against fish consumption because of contaminants or are the negative effects of the contaminant burden still minor to the positive effects of a healthier diet? The decision makers need robust information before they can decide on mitigation strategies. The first question to answer is, how much mercury are we exposed to in our daily lives and from where is it coming? Democophes (Demonstration of a Study to Coordinate and Perform Human Biomonitoring on a European Scale) is giving an insight of mercury levels in the hair of children and their mothers in 17 European countries measured under strictly standardized and harmonized conditions. For the first time it is possible to map human mercury exposure at a European level with real and comparable numbers, despite the sample cannot be considered representative at national level and not all European countries are represented. The results obtained evidenced differences of one order of magnitude between the participating countries and these differences are associated with diet. For individual Member States this mapping provides an important benchmark which could assist in national mitigation strategies. Information of this kind is essential for international negotiations at the global level in forming the European position in the negotiations and implementation of a Global Mercury Treaty currently developed by UNEP.

Keywords: HBM, children, fish consumption, mercury, mitigation strategies fish consumtion, age

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Exposure to tobacco smoke in Cyprus: HBM in support of anti smoking bans

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Environmental Tobacco Smoke (ETS) is known to cause a multitude of adverse health effects to non smoking individuals and is classified as a "Group A carcinogen", with no safe level of exposure.

As children are particularly vulnerable, an anti-smoking campaign was initiated in Cyprus 2004, with the aim to reduce children's exposure to passive smoking and to promote antismoking attitude in both children and their parents. The study design involved: a) assessment of parents' and children's knowledge –attitudes-practices related to ETS from self-answered questionnaires b) experimental determination of the total exposure of children to ETS by measurement of cotinine (i.e. metabolite of nicotine) in biological samples and c) an indication of the extent of exposure at the family home by indoor air measurements of nicotine. A multi-faced intervention program followed, targeting parents, children and the general public with the aim to reduce children's exposure to ETS. Finally, the situation was reassessed in the same study population, using the same methodology, in order to evaluate the success of the intervention. Two such studies have been completed, the first in 2004-2008 and the second 2009-2011. Both studies concluded that the intervention improved the knowledge and practices of parents and had more significant influence on children of smokers. Generally, children remain exposed to ETS, primarily outside the family home, even after the introduction of a new national law in 2010, which prohibits smoking in public enclosed places.

DEMOCOPHES, the first ever European harmonized HBM survey, provided Cyprus with the opportunity for direct comparisons of ETS exposure with other European countries. Cotinine in urine was measured in 60 pairs of mothers and their children. Supplementary information was collected in questionnaires by interviewing mothers at their home. 18.6% of mothers were smokers and had >360 X higher cotinine levels than non-smokers ($GM_{\text{smoker mothers}}$ = 290.2 μg/g creatinine). All non-smokers (mothers and children) had levels well below the benchmark of 50 μg/g cr, which distinguishes smokers and heavily exposed passive smokers ($GM_{\text{non-smoker mothers}}$ = 0.8 μg/g cr, GM_{children} = 0.8 μg/g cr). Self-reported exposure to ETS correlated strongly with higher levels of cotinine in non-smokers (for both mothers and children) with average levels close the European averages.

These results demonstrate the usefulness of HBM in providing authorities with actual levels of exposure of (sub) populations to ETS and in support of anti-smoking campaigns.

Keywords: Human biomonitoring, cotinine, ETS exposure, Cyprus

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Mercury and tobacco smoke exposure in Portugal, Policy implications

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Mercury exposure has been associated with an increased risk for several health effects in particular in children. The intake of fish has been shown to be the main route of exposure to Hg and Portugal represents the highest fish consumption country in Europe. Among non-smokers, especially children, exposure to environmental tobacco smoke (ETS) represents a major cause of serious health problems and there is no safe level for this exposure. Since people still smoke at home and other enclosed places, non-smokers may be exposed to ETS. Consequently there is an evident interest in providing competent authorities with exposure data so that they can determine whether specific groups have been exposed to higher levels than the reference/guidance values.

Besides contributing to the objectives of the European DEMOCOPHES Project, the DEMOCOPHES in Portugal has been carried out to determine human exposure in the country to the selected biomarkers, in order to specifically verify if the higher national fish consumption and the still current high prevalence of people smoking in enclosed places are reflected in the mercury and ETS exposure levels, respectively.

The results show, for 120 mothers (M) and 120 children (C), a very high prevalence of frequent fish consumption (M=80%; C=93.3%), a higher than expected prevalence of smoking women (30% vs 20.9% reported in the national population) and a high current ETS exposure in non-smokers (M=24.7%; C=28.3%). Hair Hg levels (M= 1.203; C=1.035 mg/g) are lower than the reference value (5mg/g), suggesting that the high fish intakes are not reflected in the Hg exposure, eventually due to the usually low Hg levels of the most common fish included in the Portuguese diets. Given the recognised health benefits of a diet rich in fish, appropriate policy intervention would be the continuous advice on high intake of usual species. Urinary cotinine levels (M= 9.1; C=1.2 mg/g creatinine) are much lower than the cut-off 50mg/g creatinine used to identify smokers or ETS heavily exposed. However, the likelihood of adverse health effects due to low levels exposure mainly in children makes it imperative to systematically advise smokers to quit especially near children.

Keywords: Human biomonitoring, Portugal, Mercury, Cotinine, Smoking, ETS exposure, Fish consumption

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A legal framework for HBM: experiences in Slovenia

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The Legislative basis for the implementation of the Human Biomonitoring programme in Slovenia is defined in the Article 49 Act of Chemicals of the Chapter IX. Protection of Human Health and the Environment (O.J. RS No. 16/2008) under the topic related to protection of people or the environment, prohibitions and restrictions. Short-term objectives of the HBM programme is to provide data on exposure of the inhabitants to chemicals and related health impact throughout Slovenia, reference (background) values, and spatial differences in exposure including rural, urban environments and contaminated sites. Long-term objectives include the exposure and risk assessment for health, implementation and monitoring of implemented measures, science based risk evaluation, time trends of exposure, and providing input for policy making, based on surveillance activities.

The study population includes lactating women and men from the same area in the age from 20-40 years. Twelve areas covering urban, rural and contaminated sites are covered, of which three have already been included in the pilot phase. 50 women and 50 men from each area (1200 subject all together, of which 300 have already been included in the pilot phase). Inclusion criteria strictly followed are: (i) residency in the area at least 5 years, (ii) first child, (iii) breastfeeding only one child not twins; (iv) normal healthy pregnancy; (v) availability for sampling 6-8 weeks after delivery. Exclusion criteria include the following: chronic diseases, occupational exposure, smoking, alcohol or drug abuse, reside near known emissions of pollution except on contaminated areas.

The sampling matrix and the measurements include breast milk (Cd, Hg, Pb, Se, organochlorinated pesticides, marker PCBs (28, 52, 101, 138, 153, 180, PCDD, PCDF, dioxin like PCB, PBDE, triglycerides, cholesterol); Blood – women (Hemogram, Pb, Cd, Hg, As, Cu, Zn, Se); Blood – men (Hemogram, Pb, Cd, Hg, As, Cu, Zn, Se, organochlorinated pesticides, marker PCBs (28, 52, 101, 138, 153, 180, triglycerides, cholesterol, PCDD, PCDF, dioxin like PCB, PBDE); urine (Cd, Hg, Markers of kidney function: albumin, alpha-1-mikroglobulin, IgG, NAG) TSH, Creatinine); and hair (Hg).

Recruitment remains one of the major obstacle and most difficult part of the programme. Therefore, communication during the study conduct phase needs to be considerably improved. The institutional arrangements and the implementation of results in the policy context also remain to be further elaborated.

Keywords: Human biomonitoring, exposure, contaminants, Slovenia

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A legal framework for Environmental Health Monitoring System in the Czech Republic

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The Environmental Health Monitoring System in the Czech Republic includes altogether 8 subprojects; human biomonitoring is one of them. The System was set out by the Government Resolution from 1991; later on it was incorporated in the Act 258/2000 on Public Health Protection. The System represents one of the priorities of the National Environmental Health Action Plan approved in the Governmental Resolution from 1998. The Human biomonitoring subproject fully respects the Act on the Personal Data Protection. The results have been used as comparative data on common background environmental pollutant levels, as long-term time trends and reference levels for the Czech general population. It will also provide information on performing the Strategic Framework for Sustainable Development which was adopted by the Government Resolution in 2010.

Keywords: Environmental Health; Czech Republic; Human biomonitoring; legislation

HBM Surveillance Programme in France: How to define the substances of interest

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A French national human biomonitoring (HBM) programme has been implemented in order to estimate the exposure of the French population to different chemicals in food and environment and to better understand the determinants of chemical exposures. Two studies are conducted simultaneously in this programme i) a cross-sectional HBM survey coupled to a nutrition and health survey in the French continental population aged 6-74 years and ii) a children cohort from birth. This communication presents the method used to select the chemicals of interest and to obtain a consensus list of about 100 biomarkers to be analyzed in those both studies.

The method was done step by step according to a formalized approach, the Delphi method. French speaking experts and foreign experts were included in the selection process separately. A preliminary work was done by a working group including Ministries and Agencies; it provided a list of chemicals classified in 51 groups based on feasibility criteria (foreign and French experiences), toxicity (IARC, endocrine disruptors …) and relevance (regulation in air, water or food, law, priorities).Then the first step was to select 8 criteria (Hazard identification, Exposure characteristics, Social perception, Biomarker characteristics, Feasibility of results' interpretation, Logistic and analytic feasibility, Feasibility of the prevention, Contribution in terms of new knowledge) and to ask to experts to note them with a note from 0 to 10. Based on the median note from all experts, the initial note of each expert could be commented and changed. The second step consists for each of the 51 groups of chemicals, to give to each of the 8 criteria a score among 4 possible answers (totally yes (0.8), rather yes (0.6), rather no (0.4), totally no (0.2)); for example, the criteria "hazard identification" for arsenic (which means "Is arsenic toxic?") was scored by 0.8, totally yes. A total rate for a particular chemical was obtained by multiplying the median note of each of the 8 criteria by the corresponding mean score given by all experts for a chemical and a particular criterion. Finally, a list of chemicals/biomarkers was obtained with their corresponding rate. For the French experts, a final meeting to further exchange and fine tune the ranking was done. A final list was obtained and used for the both studies. Rates of French and foreign experts were very similar.

Keywords: HBM Survey France, Priority chemicals

Human biomonitoring and policy relevant investigation of the health effects of drinking water arsenic pollution in the community of Mammari, Cyprus

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In July 2009, the State General Laboratory found an elevated concentration (18-19 μg As/L) of arsenic in the drinking water supply of the community of Mammari, which exceeded the legal limit of 10 μg As/L. The well water supply was stopped immediately and clean drinking water was distributed to the community. A medical investigation was carried out with the objectives of a) assessing the degree of exposure of community residents to arsenic, b) assessing the potential health effects and c) preventing potential adverse health effects.

The investigation involved nail arsenic biomonitoring of the inhabitants, dermatological examination of a representative sample of the community's population and assessment of the possibility of an increased incidence of cancer in the community in comparison to the rest of Cyprus. Biomonitoring consisted of measuring arsenic concentrations in nail specimens from representative samples of the population of Mammari and an unexposed community with similar demographic, socioeconomic and geographic characteristics. The selection of the two population samples was based on the results of a questionnaire specifically designed to maximize their representativity and comparability. Fifty six (56) nail specimens from Mammari non-smokers and forty eight (48) matched controls were analysed in a specialized laboratory. Mean nail arsenic concentration in Mammari was 0.319 μg/g compared to 0.112 μg/g in the control community. The differences were statistically significant with a value for $t = 5.364$ and p-value <0.001.

It was concluded that, although the increase in nail arsenic in Mammari residents was probably linked to their exposure to higher concentrations of arsenic in drinking water, for an unknown period of time, this level of exposure did not pose a significant risk to their health. The results of this study were used to better inform residents about the magnitude of risk to which they had been exposed and to make specific recommendations on further monitoring and handling the situation. The results of follow-up nail arsenic measurements, approximately two years after the discontinuation of exposure, are expected soon.

Keywords: Arsenic, drinking water, arsenic poisoning, pollution, well water, nail arsenic, health effects

Acknowledgements: Ministry of Health, Medical and Public Health Services, Cyprus State General Laboratory

SESSION 5:
PROPOSAL FOR A MORE SUSTEINABLE FRAMEWORK FOR HUMAN BIOMONITORING IN HBM SURVEYS

Feasibility of a European HBM framework and program

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The EU Environment and Health Action Plan considers HBM as an essential tool to link health and environment and promotes more harmonized approaches so to reach higher efficiency and relevance. The EU funded projects. COPHES and DEMOCOPHES have tested out the feasibility of such harmonization within 17 European countries.

Challenges with respect to the feasibility of a harmonized approach providing comparable data were identified throughout the implementation of this pilot study, allowing to develop (1) conclusions on the feasibility of a common approach to HBM in Europe and (2) recommendations for further steps needed to reach a sustainable HBM framework.

The main challenges identified were (1) the recruitment of the participants taking in to account the strict inclusion and exclusion criteria established in the European protocol and with the required distribution of children in different age groups; (2) the capacitation and qualification of the labs for analyzing the collected samples in order to obtain comparable measurements; (3) the cleaning of the data and statistical analyses with programs that could be used in the 17 countries and (4) the communication to the participants from the start of the recruitment phase till the communication of the results.

Conclusions are that a common approach to HBM in Europe is feasible provided that the common European protocol is followed and that only minor country specific adaptations to the European protocol without major impact on comparability are allowed.

Recommendations for a further successful harmonization and improved impact at EU level are to (1) define inclusion and exclusion criteria that can be met in all countries; (3) measure one substance in one lab thus avoiding uncertainties regarding comparability of measurements of small doses; (4) provide user friendly programs for statistical analysis and (5) elaborate communication material well adapted to the target group of participants.

Keywords: Feasibility, harmonized approach, human biomonitoring, sustainable HBM framework

Acknowledgements: Acknowledgements to all partners in DEMOCOPHES and COPHES.

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Developing an HBM survey for assessing progress towards goals set in the Parma Declaration

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At the 5th Ministerial Conference on Environment and Health (2010), Member States of the WHO European Region made commitments to protect children and pregnant women from risk posed by environmental pollutants, and to develop a consistent approach to human biomonitoring as a tool to assist public health and environmental policies. The WHO European Centre for Environment and Health (ECEH) is coordinating the development of a standardized HBM survey to facilitate the collection of comparable data in volunteer countries in the Region. At a series of WHO technical meetings, HBM experts discussed the lessons learned from the existing national HBM programmes and COPHES, defined priority biomarkers for the WHO survey and agreed on the survey design. The proposed cross-sectional survey aims to characterize prenatal exposures. It will be conducted in maternities and will involve non-invasive sampling: maternal hair, maternal urine and cord blood. The proposed design of national surveys includes two arms to characterize the distribution of exposures in the general population and in industrial contamination hot spots or other areas with high exposure levels. Prenatal exposure to mercury is a core indicator for monitoring the effects of international efforts to reduce mercury emissions. Total mercury in maternal hair is recommended for the general population arm. Other high priority biomarkers for the general population arm include cadmium and cotinine in urine, and lead in cord blood. Medium priority biomarkers include urinary arsenic, urinary mercury (to characterize exposure to elemental and inorganic mercury when warranted), and metabolites of phthalates and non-persistent pesticides in urine, and analytically simple POPs in cord blood. Environmental data from areas of Sicily contaminated by the petrochemical industry were analyzed to indentify additional priority biomarkers for exposure hot spots: metabolites of polyaromatic hydrocarbons (PAHs), and benzene, toluene, ethylbenzene and xylenes (BTEX) in maternal urine. Further methodology development and pilot testing in at least one region with industrial pollution problems, such as Sicily, are envisioned in 2013-2014.

Keywords: Parma Declaration, prenatal exposure, cross-sectional survey, non-invasive biomarkers

Acknowledgements: The Government of Germany and the Regional Government of Sicily, Italy generously provided funding for the development of biomonitoring-based indicators at WHO.

Linking with a Health Examination Survey ; experiences in Slovak Republic

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Modifiable risk factors caused the huge number of deaths across Europe therefore the public health authorities in all countries need more and more data for the advocacy of their policy for health and to take inevitable activities to solve the cumulated health problemes. The Health examination survey is doubtlessly a very appropriate tool for getting reliable data for health indicators, which is currently missing at the European as well as national levels and provide evidence based information.

Considerable high premature mortality and incidence rates of cardiovascular, oncological and other non-communicable diseases in adult men and women in Slovakia require harmonised fight against their preventable risk factors. The medical approach has to be „to know and to solve". Good scientific arguments are required to start with the health promotion activities and to reach broad acceptance at professional level and in the general public. To solve the problemes with gaps in the knowledge about health status of the adult population reliable information on medical causes of illness and exposure or risk factors are needed.

Slovakia has a long tradition in implementing the WHO Countrywide Integrated Noncommunicable Disease Intervention programme. This involved four population health examination surveys, but only at the regional level in the years 1993- 2008. Some informative data on health risks have been collected in the framework of the case- control cancer epidemiological studies performed in cooperation with IARC. Another data come from periodic health every 2 years. However, these data and other data are not collected and not managed in representative, comparable form.

The need for objective data on the health of the population of the whole country had led to participation in the European Health Examination Survey project. An EHES pilot survey was carried out in November-December 2010. A full-size national HES (4000 persons) started in 2011 and finalized in April 2012. This survey was funded by the Ministry of Health. The vision of the 2nd phase of the national HES was prepared. The attempt will be to cover the whole country. The financing of the ful-range project is still not available. We hope it will be managed on the EU level.

Keywords: Health examination survey, European Health Examination Survey

Acknowledgements: Funding provided by the Project COPHES

The use of paracetamol among Danish school children– associated with the mothers' use?- Health and medication interview after the DEMOCOPHES sampling

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Object: The aim of this study is to investigate the association between children's recurrent pains and their use of analgesics. Furthermore the correlation between the mother's use of analgesics and the child's use of analgesics is investigated.

Method: A cross-sectional study was conducted as a quantitative questionnaire survey with 131 participating schoolchildren and their mothers. The interviews were performed after the DEMOCOPHES samples had been collected and a specific information and informed consent was adhered to this supplementary part to DEMOCOPHES. The project "Health in School-age", is a general medical survey about health, pains and use of medicine among 6-11 year old Danish schoolchildren. The prevalence of the children's pains and their use of analgesics were determined, as well as the mother's use of painkillers. The association between the children's pains and their use of analgesics and the association between the mother's use of painkillers and the children's use of analgesics were determined using a bivariate analysis and furthermore by using a multivariate logistic regression analysis, which was adjusted for background factors and health factors.

Results: The participation of this extra part of the DEMOCOPHES protocol was high which was also the case for blood samples where all mothers and the majority of children participated.

From the interview of the children it was shown a large part of the participating and healthy children had had analgesics. No significant correlation between the children's pains and their use of analgesics was found. However there was a strong association between the mother's use of analgesics and the children's use. The association was significant after adjusting for background- and health factors.

Conclusion: The findings indicate that parents, who often use analgesics, are more likely to give their children analgesics – even when adjusted for the children's pains. It is important to inform children and adolescents plus their parents, about appropriate use of analgesics.

Keywords: Children health pain paracetamol mothers use

Acknowledgements: The Institute of Public Health at the University of Copenhagen is thanked for housing and supporting this activity. Some of the results were developed by Mathilde Gottschau as part of bachelor thesis in medicine.

A concept for a sustainable HBM framework in Europe

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Human Biomonitoring (HBM) is able to generate information on exposure and uptake, which is lacking from external-exposure based risk assessment alone, and is a powerful tool to raise awareness of environmental health aspects. The EU Environment and Health Action Plan considered HBM as an essential tool and promoted a harmonized approach.

In this context, the European twin projects (COPHES & DEMOCOPHES) currently test feasibility of harmonised HBM, and established a functional expert network as one pillar of a future surveillance infrastructure, taking an important first step towards a fully operational, sustainable and scientifically sound EU HBM programme.

A combination of European wide comparable HBM data and toxicological guidance values for interpretation and analysis of exposure pathways will provide a powerful approach to trigger and evaluate regulatory measures for chemicals, consumer products, or food. Recent discussions with EU institutions showed, that there is a clear demand and interest in such data. In this context the development of selection schemes for substances and legal embedding of HBM in selected policy fields were considered priorities for future use.

In the long-term perspective HBM should be part of a cost-efficient integrated system for assessment and interpretation of exposures and effects, with an EU wide body providing guidance on aspects and parameters for comparability and further development.

We will present recommendations for organisational, legal and financial concepts, composition of the guiding body, and options to decide upon prioritization of biomarkers, technology and tool development, study design, data interpretation and communication rules, quality assurance systems, etc. And it will highlight possibilities for European data storage and data sharing, use of synergies at national, European and international level (e.g., WHO). Convincing stakeholder however, is not easy as resources and costs for large population survey are considered high.

Keywords: Sustainable framework, policy tool, HBM, European structure

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ABSTRACTS OF POSTER PRESENTATIONS

Human Biomonitoring in Austria

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A cross-sectional human biomonitoring study was carried out in Austria from 2009 until 2011 in order to assess the exposure of the Austrian general population to environmental contaminants. 150 volunteers were randomly selected in five test regions in Austria who gave blood, urine and hair samples. Mothers, child and father (or partner) lived in the same household. Exposure indicators were collected by means of a questionnaire in a guided interview. The project based on scientific principles which were elaborated in ESBIO. The design of our study should also enable compatibility with the upcoming COPHES project. Selected biomarkers were phthalate metabolites (urine), polybrominated diphenylethers (PBDE, blood), methyl mercury (hair) and the industrial chemicals nonyl- and octyl phenol (NP, OP; urine) and bisphenol A (BPA, urine).

Most abundant phthalate species were metabolites of DEP, DEHP, DnBP and BBP. Secondary (DEHP) metabolites were found in higher concentrations than mono-esters. Concentrations were comparable or lower than reported in other studies, depending on the specific species. Significant correlations between results and questionnaire data were found regarding the use of "hair foams", "hair colouring agents", use of "make up" and "chewing gum consumption". Concentrations of MEP, MBzP and MEHP were correlated with the symptoms "headaches", "coughs", "itching" and "diarrhea".

Out of 18 PBDE species, 16 were analysed in concentrations above the LOQ in at least one sample. Most abundant congeners were #153 and #197, found in 80% and 50% of the samples, respectively. A significant correlation between PBDE concentrations were found for the symptoms "headache" and "asthma attacks". PBDEs are likely to occur in house dust which may be a co-factor in asthma attacks.

NP, OP and BPA were found only in a minority out of 25 samples above the LOQ. BPA was found in four samples (LOQ: 0,60 µg/L) with a maximum of 11 µg/L.

Methyl mercury (Me-Hg) was determined in hair samples. Results of mothers (median 64 µg/kg, n=50) yielded in higher values than their children (median 6 µg/kg, n=50). Results, however, are lower than typical results in traditionally fish consuming nations like Denmark or Portugal.

Keywords: HBM, phthalates, environmental health, body burden

Acknowledgements: We thank the Austrian Ministry for Agriculture, Forestry, Environment and Water Management for funding this study.

The Austrian Platform for Human Biomonitoring

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When Austria decided to take part in the European process of harmonizing human biomonitoring it was realized that this task, being a cross sectional project, needs to be implemented by a broad interdisciplinary community. On this occasion the Environment Agency Austria founded in September 2007 the "Austrian Platform for Human Biomonitoring". The network brings together experts from science and administration in order to guarantee a coordinated, evidence based approach towards policy consulting in the field of environmental health. The platform aims at establishing human biomonitoring in Austria as a tool for health and environmental protection, supporting national prevention targets and extending national competence in the field of human biomonitoring. The platform should contribute to implementing national and international conventions (Stockholm convention, environment and health action plan, European chemical policy REACH,…). It should enable the implementation of studies and identification of environmental health factors by means of human biomonitoring. Coordinated planning of research activities has already led to a co-operation project with the study concerning the nutritional status of the Austrian population, which will be published in the Austrian Nutrition Report. Within this collaboration it is intended to monitor contaminants (phthalates, bisphenol A, polybrominated diphenyl ethers, perfluorinated compounds) for which food intake is a relevant pathway of exposure.

Further objectives are the advancement of communication between relevant federal authorities, federal provinces, local authorities and scientific institutions which should enable quick and efficient dealing with "hot spots" and its risk management. Current results are disseminated in order to support reliable reporting of environmental health issues. A symposium was held in January 2010.

The Austrian platform for human biomonitoring is a collaborative initiative between universities, the Austrian Social Insurance for Occupational Risks, the Chief medical Offices of the Austrian Federal States as well as ministries, the Austrian Agency for Health and Food Safety, the Austrian Health Institute, the Austrian Medical Association and the Environment Agency Austria.

Keywords: Human Biomonitoring, environment and health, pollutants, body burden, networking

Democophes: Recruitement in Belgium and lessons learned

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In the framework of the harmonized European human biomonitoring pilot study DEMOCOPHES, 129 children (aged 6 to 12 years old) and their mothers (≤ 45 years old) have been recruited in Belgium between September 2011 and February 2012. Their urine and hair samples were collected and interviews regarding lifestyle, nutrition and habitat were conducted. Participants were recruited in the rural areas of Brakel, Ellezelles, Frasnes-lez-Anvaing and for the urban area in Brussels.

All harmonized protocols and documents have been submitted and were approved by the ethical and the privacy committees. The recruitment was mainly organized through schools. Although schools managers showed interest for the project, quite a few schools and local authorities refused or did not see opportunity to participate within the time frame. In the international area of Brussels, schools often were also not able to participate because of a low number of French or Dutch speaking children. Aside of the language, the amount of documents and information sent for the recruitment and the too limited time for informing parents, children, teachers or local authorities were other possible explanations for the relative low participation rate. In total 2190 invitations letters were distributed. About 14.1% of the children/mothers wished to participate, but due to stringent inclusion criteria of area, age and sex needed, and the exclusion of two or more children of the same mother, overall only 5.3% could participate.

The COPHES questionnaires have been used. Some questions were regarded to be more difficult: surface of the living space, difference between sea and freshwater fishes, number of dental amalgam fillings, children's time spent outdoor,… It was not always easy to fix an appointment for the interview with the majority of the working mothers. However, as soon as the participants were selected, the collaboration between the fieldworkers, the participants and the schools was constructive and positive and samples were all handled in time to the laboratories.

Keywords: Belgium, Human biomonitoring, DEMOCOPHES, recruitment, schools, field work
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Democophes Belgium: contaminants present in urine and hair explained by life style information from questionnaires

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In Belgium, 129 mothers (average 40y old) and 129 children (average 8y old) were sampled in 13 schools in the Brussels capital and a rural area in the West of the country. The levels of the plastic component BPA showed to be comparable for mothers and children: 2.55 vs 2.35 µg/L (geometric mean). Most exposure markers were however higher in mothers than in children: mercury in hair (0.383 vs. 0.204 µg/g), urinary cadmium (0.21 vs 0.04 µg/L), triclosan (2.72 vs. 1.23 µg/L) and the urinary phthalate metabolite MEP (36.30 vs 26.18 µg/L), originating from DEP. Urinary cadmium reflects accumulation during years. Triclosan and DEP are present in personal care products, which were more (often) used by mothers. The other measured phthalate metabolites showed to be lower in the mothers compared to the children: MEHP+5oxo-MEHP+5OH-MEHP (21.28 vs 36.72 µg/L), MBzP (6.47 vs 8.78 µg/L), MiBP (38.08 vs. 58.16 µg/L) and MnBP (30.86 vs 38.97 µg/L). MiBP and MnBP were the most apparent metabolites present in urine. In the mothers, additionally MEP was present to the same extent. Fish consumption and amalgam fillings in mothers were determinants of influence on hair mercury levels. The cadmium levels were higher in the urban area, and boys had increased levels compared to girls. BPA increased in mothers if they regularly consumed canned food. In children, this was not observed. Their triclosan levels were higher if they used personal care products and sun screens. The levels of the urinary components MBzP, MiBP and MnBP, were linked to the presence of PVC flouring or wall paper in the participants' homes. In children MiBP and MnBP were also associated with the use of personal care products. MEP, which is a metabolite of the widely used phthalate DEP, was higher in children using plastic toys, in participants having PVC flouring/wall paper or having recently done renovation activities in house. Furthermore its concentration was also linked to consumption of canteen food (mothers) and chewing gum (children).
Urine and hair appeared to be suitable matrices to assess contaminants (chronically) present in daily life of the Belgian mothers and children.

Keywords: Belgium, results, determinants of exposure

Acknowledgements: DEMOCOPHES Belgium is funded by Life+ 2009 (DG Environment – Life09 ENV/BE000410) and by all Ministries represented in the Belgian Interministerial Conference Environment and Health.

Democophes Belgium: Analytical methods for the determination of phthalate ester metabolites, bisphenol-A and triclosan in urine of Belgian and other European mother-child pairs

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Phthalates, bisphenol-A (BPA) and triclosan (TCS) are high-production industrial chemicals that are used in numerous applications. Due to their widespread presence in consumer products, humans are exposed to these chemicals through different routes. Phthalates are rapidly metabolized in humans to their respective monoesters, which can be further metabolized to their oxidation products. The metabolites are glucuronidated and excreted via urine and faeces. BPA and TCS are also quickly conjugated to their glucuronide and sulfate metabolites and quickly excreted via urine. The reference method for the determination of phthalate metabolites in urine consists of an enzymatic hydrolysis of glucuronides followed by solid phase extraction (SPE) and LC-MS/MS detection of the free metabolites. At VITO, a simplified method was validated for the Democophes samples. The SPE extraction step was omitted and urine was directly injected in a sensitive UPLC-MS/MS system. The quantification of the studied metabolites (MEP, 5-OH-MEHP, MnBP, MiBP, 5-oxo-BP, MBzP, and MEHP) was done by isotope dilution. The method accuracy at 25 µg/L was > 97%, with a RSD < 6%. All results in the EQUAS 48 and 49 interlaboratory comparison were within the tolerance range (< 15% from the reference value). Although phthalate metabolites could be detected below 50 ng/L, LOQs were set at 0.1 to 0.5 µg/L depending on the blank values.

The determination of BPA and TCS followed a method published by Geens et al. (2009). After enzymatic hydrolysis, urine samples were extracted by SPE, followed by derivatization using extractive acylation with pentafluorobenzoyl chloride and by clean up on acidified silica (10% sulfuric acid, w/w). The analysis of the fluorinated derivatives of BPA and TCS employed GC-ECNI/MS for increased sensitivity. LOQs were 0.2 and 0.1 µg/L for BPA and TCS, respectively. The method's performance has been thoroughly assessed through successful participation in EQUAS 48 and 49 and to the interlaboratory comparisons organized in the frame of Cophes. In all cases, deviations were less than 15% from assigned values. The described analytical techniques required low sample volumes of urine and were successfully applied in a high throughput mode for Belgian and/or European samples from the Democophes project

Keywords: Belgium, phthalates, bisphenol-A, triclosan, analytical methods, urine

Acknowledgements: DEMOCOPHES Belgium is funded by Life+ 2009 (DG Environment – Life09 ENV/BE000410) and by all Ministries represented in the Belgian Interministerial Conference Environment and Health.

From science to policy: translation of human biomonitoring results into policy measures in Flanders (Belgium)

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In Flanders, human biomonitoring (HBM) is specifically mentioned as a legal instrument for evidence-based environmental health policy making. For over a decade now, Flanders has built a strong human biomonitoring program, based on a combination of a broad population-based survey program aimed at establishing reference values for the general population but also targeting specific hot spots for risk identification and evaluation. Specific research topics are embedded throughout the different HBM programs.

The phased action plan has been developed for close cooperation between policy makers, a multi-disciplinary team of scientists and various stakeholders to ensure the optimal use of HBM in evidence-based risk evaluation. At the same time, this cooperation has put a lot of effort on stimulating stakeholder involvement, active participation of the general public, interpretation of HBM values for risk management, and open communication towards the various parties involved.

The action-plan was piloted in practice on the basis of the DDE-results of the human biomonitoring campaign. This resulted two actions: 1) A specific research study on routes of exposure to DDE/DDT by means of a case-control study amongst high and low exposed participants of the biomonitoring in order to get an idea of e.g. (historical) use and gardening practices. 2) A special campaign of awareness raising and collection of DDT and other pesticides for waste disposal.

On the basis of the DDE pilot project the action-plan was carried out for two different cases: increased levels of persistent organic pollutants in the rural areas in Flanders and the increased asthma and allergy incidences in Flemish city areas. This resulted in two concrete policy action plans which include a wide variety of policy actions concerning further research, awareness raising, monitoring, adaptation of product policy,…. Illustrating examples are the new campaign on outdoor and indoor stoking and wood burning during spring and autumn 2012 and an awareness raising campaign on a healthy indoor environment for general public and building professionals

Keywords: Phased action plan: environmental health policy making

Acknowledgements: The study was commissioned, financed and steered by the Flemish Government (Department of Economics, Science and Innovation; Flemish Agency for Care and Health; and Department of Environment, Nature and Energy).

Urinary levels of bisphenol A, triclosan and 4-nonylphenol in a general Belgian population

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Bisphenol A (BPA), triclosan (TCS) and 4-Nonylphenol (NP) are among endocrine disruptors which are widely used in daily product. BPA is mainly used to manufacture polycarbonate, while TCS is an antimicrobial and antifongical agent used in personal care, and n-NP is mainly present in detergent and cosmetic products. In this study, we reported total urinary levels of NP, BPA and TCS in order to evaluate the baseline contamination of a general population in Belgium. For this purpose, three milliliters of urine were hydrolyzed with beta-glucuronidase and sulfatase, and loaded on Solid Phase Extraction cartridges. The eluate was extracted by liquid/liquid extraction with hexane and derivatizated with pentafluorobenzoylchloride. Detection was carried out using gas chromatography coupled with tandem mass spectrometry in Negative Chemical Ionization mode. The analytical method was validated according to total error approach. A cohort 133 volunteers aged from 1 to 75 years were classified by gender and age. Results below limit of quantification (LOQ) were expressed as LOQ/2.

BPA and TCS were detected in respectively 97.7% and 74.6% of the samples examined demonstrating that the general Belgian population is extensively exposed to both chemicals. On the other hand, 4-nonylphenol was not detected in any urine samples analyzed, suggesting either low exposure, inadequate biomarker, or that urine is an inappropriate biological matrix for assessing exposure to nonylphenol commercial mixtures. Geometric mean concentration was determined for bisphenol A at 2.55 µg/l and for triclosan at 2.70 µg/l. No significant difference was observed between levels and gender for both bisphenol A and triclosan. When classified by age, the 20-39 year group showed the highest triclosan levels, while all age groups seemed to be similarly exposed to bisphenol A. Both bisphenol A and triclosan urinary levels were not correlated with creatinine excretion in our healthy population, questioning the relevance of the creatinine adjustment in reporting these chemical levels. Bisphenol A levels in urine of people living in the same home and collected on the same time were fairly correlated, confirming the assumption that dietary intake would be the primary route of exposure. Triclosan urinary levels were not correlated with bisphenol A levels.

Keyword: Bisphenol A, Triclosan, Nonylphenol, Belgium, General Population

Poster P3a
Cyprus

Implementation of DEMOCOPHES in Cyprus

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Cyprus has been active in all European efforts to harmonize HBM, since the beginning stages in 2003. The COPHES and DEMOCOPHES projects provided the opportunity to build the national HBM consortium and capacity, in harmonization with other European countries and to assess, for the first time, the total exposure of Cypriot mothers (≥ 45 years) and their children (6-11 years) to phthalates, cadmium and mercury. Exposure to tobacco smoke was also assessed by measuring cotinine in urine.

The national consortium was established as a small team of chemists, medical doctors, fieldworkers and a statistician. The National Study Protocol was adopted from the EU Protocol of COPHES, evaluated for harmonization compliance and approved by the National Bioethics Committee. Protection of participants' personal information was safeguarded by notifying the Commissioner for the Protection of Personal Data.

The participants (N=120, 60 mothers-child pairs) were recruited through schools, following approval by the Ministry of Education, in urban Nicosia (Pernera, 30 pairs) and rural Famagusta (Frenaros, 30 pairs). Of 497 families invited, 103 fulfilled eligibility requirements and were positive to participate. From these, the 60 participating families were randomly selected. Home visits enabled hair/urine sample collection and interviews on living conditions, food intake, workplace and possible contact with chemicals. No incentives were offered and no refusals or failures were noted. All questionnaire data were transferred from paper to electronic database (SOCRATOS-CAPI). Communication materials were in Greek and based on COPHES.

Chemical analyses were under strict internal and external quality control. Cotinine and cadmium in urine were analyzed in-house with validated methods. Phthalate metabolites (MnBP, MBzP, MEHP, 5-OH-MEHP, 5oxo-MEHP, MEP, MiBP), creatinine in urine and total mercury in hair were measured in subcontracted laboratories. All laboratories received authorization to perform the measurements based on their performance in Interlaboratory Comparison Investigations and External Quality Assessment Schemes. Statistical analysis was performed in SPSS. No surpass of health guidance values was observed for cadmium and mercury. Cotinine levels were higher than 50 µg/g creatinine only for smoker mothers. A single mother exceeded the health guidance value of 300 µg/L for the sum of 5-OH-MEHP + 5oxo-MEHP phthalate metabolites.

Keywords: Human biomonitoring Europe, Cyprus, DEMOCOPHES, mercury, cotinine phthalates

Acknowledgements: DEMOCOPHES LEFE(09) ENV/BE/000410, Republic of Cyprus

Challenges and opportunities during DEMOCOPHES implementation in Cyprus: a SWOT analysis

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This work consolidates the most significant strengths, weaknesses, opportunities and threats encountered during DEMOCOPHES implementation in Cyprus, along the timeline of its five Tasks. Emphasis is given on the special difficulties presented, the solutions found and the gains obtained in terms of experience, organizational background and technical expertise

TASK 1 – Preparation of the National Protocol: Major challenges pertained to the lack of a pre-existent HBM research unit and limited experience with relevant research. This difficulty was surpassed by developing an independent HBM laboratory and attracting a multidisciplinary team. All material of the EU protocol had to be translated and validated in Greek with minimal adaptations.

TASK 2 – Recruitment and Fieldwork: Due to the limited availability of up to date population registries, the study population had to be identified via primary schools. Due to the absence of highly-urbanized settlings, the choice of urban / rural sampling areas was adjusted to local figures. The national sampling goal of 60 mother-child pairs was reached via home-visits. The final outcome exceeded the target, with 103 eligible participants out of 497 invited.

TASK 3 – Chemical Analyses: Capacity building was accomplished with the successful introduction of two methods (cotinine and cadmium in urine), validated in house and authorized based on performance in Interlaboratory Comparison Exercises and External Quality Assessment Schemes.

TASK 4 – Statistical Analysis and Data Interpretation: All data was collected in paper and subsequently uploaded in an electronic database (SOCRATES-CAPI). Statistical analysis was performed using SPSS. Results indicated consistency between mother-child responses and measurements and no difference between participants-non-responders. Challenges were primarily the tight deadlines and data interpretation. Successes included capacity building and the first ever database of exposure of Cypriots to selected biomarkers.

TASK 5: Communication: The use of minimally adopted communication materials provided by COPHES was occasionally hindering and identification of components where flexibility is required, would be useful for future studies. Capacity building was the biggest benefit.. Dissemination of results has already required the creation of a national webpage, as well as the issue of informative material and extensive media coverage. Further communication actions are scheduled until the end of the project.

Keywords: Cyprus, DEMOCOPHES, human biomonitoring, national protocol, SWOT analysis

Acknowledgements: Life+ Programme, European Commission (Life 09 ENV/BE/000410)

Endocrine disruptive substances in some consumer products in Cyprus - The case of Bisphenol A and Phthalate esters – Low vs. High concentrations

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In recent years a variety of chemicals have been found to disrupt the endocrine systems, and there is strong evidence that chemical exposure has been associated with adverse developmental and reproductive effects on fish and wildlife in particular locations. Bisphenol A (BPA) is one of a number of chemicals that has the potential to interact with endocrine system in the human body, especially at early stages of life. BPA is an organic compound with two phenol functional groups used to make polycarbonate plastic material e.g. baby feeding bottles and epoxy resins, along with other applications. Another class of chemicals are the phthalate esters and are mainly used as plasticizers (substances added to plastics to increase their flexibility, transparency, durability, and longevity). They are used primarily to soften polyvinyl chloride (PVC) used in soft children toys, but also they have other application e.g. in cosmetics and some medical devices.. To investigate the presence of the above substances in food contact materials (FCM) and children toys, samples are taken, as far as possible, at critical control points (import, industry, big stores) and from retail sale and analyzed by the State General Laboratory (SGL) of Cyprus. In some cases, the sampling regime is a combination of both random and target oriented sampling. In general the results of the surveillance and official control of plastic FCM in 2003 – 2012 showed that: all the examined samples of polycarbonate plastics such as baby feeding bottles, bottles of water, cans with epoxy resin coating had very low migration concentrations of BPA and many of them below the detection limit (15 μg/kg). For soft children toys made from PVC the results showed, that they contain very high concentrations of some phthalate esters (DEHP, DINP, DBP) ranging from 0,14-52,6% w/w and a rate of about 50% of the examined samples to be above legal limits. In all cases of violative samples appropriate measures are taken by the relevant Competent Authorities.

Keywords: Phthalate esters, Bisphenol A, Endocrine disrupters, official control

Acknowledgements: State general Laboratory, Ministry of Health Government of Cyprus

DEMOCOPHES in Denmark

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Denmark has no experiences with human biomonitoring surveys. However a number of research programs have been performed including biomarker analysis related to environmental or occupational exposures. The DEMOCOPHES sampling locations were located in the Federal State of North-Rhine-Westphalia, a county with partly highly industrialized and partly sparsely populated regions. The city of Bochum and a small town in the Higher Sauerland District were chosen as urban and rural sampling locations, respectively. A random sample of the 6- to 11-year-old children was selected via the respective inhabitant registries. Phone numbers were derived from the reply cards. In case families did not react at all, telephone numbers were looked up in phone books or in the internet. This practice increased the participation rate noticeably. If no phone number could be retrieved, the families were visited at home, but this procedure was not efficient. As the response rate in the urban area was very low, the invitation material was optimized and recruitment in the rural area was accompanied by a local press release and a poster presented in local shops resulting in a higher response rate. After excluding 20 interested mothers aged older than 45 years and focusing on the requested age and gender distribution of the children, finally 120 mother-child pairs distributed approximately equal between age and gender and sampling location participated. Interviews and sampling (hair and urine) were done nearly exclusively during home visits with only minor difficulties. As a reward for participation small non-monetary incentives were given to the children. Children living in households with one smoker had a substantially higher urinary cotinine level (geometric mean 0.51 µg/L) than those in non-smoker households (0.19 µg/L). If more smokers lived in the household, the value was even higher (1.99 µg/L). For both, mothers and children, an increasing level of fish consumption resulted in increasing levels of mercury in hair.

In DEMOCOPHES children, the concentrations of most phthalate metabolites analysed in urine were considerably lower than in the nationwide representative GerES IV conducted from 2003 to 2006. Only DiNP metabolites were at the same level in both studies. In GerES IV and DEMOCOPHES 1.4 % and 1.7% of the children, respectively, exceeded the health based guidance value HBM I for DEHP.

Keywords: Human biomonitoring Europe, Denmark, mercury, phthalates, blood samples

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Poster P4b
Denmark

The exposure to potentially harmful environmental chemicals of Danish school children and their mothers

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In recent years a variety of chemicals have been found to disrupt the endocrine systems, and there is strong evidence that chemical exposure has been associated with adverse developmental and reproductive effects on fish and wildlife in particular locations. Bisphenol A (BPA) is one of a number of chemicals that has the potential to interact with endocrine system in the human body, especially at early stages of life. BPA is an organic compound with two phenol functional groups used to make polycarbonate plastic material e.g. baby feeding bottles and epoxy resins, along with other applications. Another class of chemicals are the phthalate esters and are mainly used as plasticizers (substances added to plastics to increase their flexibility, transparency, durability, and longevity). They are used primarily to soften polyvinyl chloride (PVC) used in soft children toys, but also they have other application e.g. in cosmetics and some medical devices.. To investigate the presence of the above substances in food contact materials (FCM) and children toys, samples are taken, as far as possible, at critical control points (import, industry, big stores) and from retail sale and analyzed by the State General Laboratory (SGL) of Cyprus. In some cases, the sampling regime is a combination of both random and target oriented sampling. In general the results of the surveillance and official control of plastic FCM in 2003 – 2012 showed that: all the examined samples of polycarbonate plastics such as baby feeding bottles, bottles of water, cans with epoxy resin coating had very low migration concentrations of BPA and many of them below the detection limit (15 µg/kg). For soft children toys made from PVC the results showed, that they contain very high concentrations of some phthalate esters (DEHP, DINP, DBP) ranging from 0,14-52,6% w/w and a rate of about 50% of the examined samples to be above legal limits. In all cases of violative samples appropriate measures are taken by the relevant Competent Authorities.

Keywords: Phthalate esters, Bisphenol A, Endocrine disrupters, official control
Acknowledgements: State general Laboratory, Ministry of Health Government of Cyprus

Updating of reference values in biological fluids in Finland

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Accurate interpretation of biomonitoring results in occupational exposure requires reliable reference limits. The background exposure level of the general population may be different due to different geographic locations and changes in living environment. Blood and urine samples were collected from ca. 150 volunteers, aged from 24 to 67 years, not exposed to chemicals in their work and living in three different areas in Finland. A questionnaire about smoking habits, diet, consumption of vitamins etc. was used to clarify background exposure. People that had metal implants were excluded from the study. If a statistical difference between smokers and non-smokers was observed, different limits were set for each group. Most of the chemicals included in the study were not accumulated in the body by age. The concentrations in the urine were standardized to a relative density of 1.021, or to the concentration of creatinine. All dilute samples - a relative density <1.010 or creatinine concentration <3 mmol/l - were discarded. The reference limit for non-exposed is the 95th percentile observed for Finns not exposed to the chemical at work.

Totally new reference limit values for non-exposed were set for blood molybdenum (1.4 µg/l), and titanium in blood (24 µg/l) and urine (680 nmol/l). The updated limits for chromium (0.8 µg/l), cobalt (0.8 µg/l), lead (0.09 µmol/l), and manganese (295 µmol/l) in blood and cobalt (25 nmol/l), lead (0.008 µmol/l), manganese (10 nmol/l), selenium (0.07 mg/g creatinine), uranium (0.08 µg/g creatinine) and vanadium (7 nmol/l) in urine were established. The updated limits for the cyanide exposure were: thiocyanate in serum 110 µmol/l (non-smokers), 250 µmol/l (smokers), and thiocyanate in urine 140 µmol/l and 250 µmol/l, respectively. The PCB limit value in a fasting serum was 2 µg/l. The reference limits for the urinary metabolites of PAH were: 2-naphthol 7 µg/l (non-smokers) and 30 µg/ (smokers) and 1-hydroxypyrene 0.8 µg/l.

Biomonitoring action limits are concentrations not recommended to be exceeded in occupational exposure. New biomonitoring action limits were set for cobalt exposure (cobalt in urine 125 nmol/l) and for PAH exposure (urinary 1-hydroxypyrene 2.6 µg/l).

Keywords: Reference limits, blood, urine, Finns

Acknowledgements: The study was financially supported by the Finnish Institute of Occupational Health.

Metal exposure among French adults from the French Nutrition and Health Survey (ENNS 2006-2007)

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Exposure of the French population to chemical contaminants through food and the environment was characterized using 42 biomarkers in the French National Nutrition and Health Survey (ENNS). ENNS is the first biomonitoring study of this magnitude implemented in France and coupled to a nutrition and health survey. Measured biomarkers correspond to chemical contaminants of 11 metals (antimony, arsenic, cadmium, chromium, cobalt, tin, mercury, nickel, lead, uranium and vanadium), 6 non-dioxin-like-PCBs (NDL-PCBs) and 3 chemical families of pesticides (organochlorines, organophosphorus and pyrethroid compounds). This presentation focuses on metals.

In the ENNS metal survey, a representative sample of the population included people living in continental France in 2006-2007 ; they were adults of 18-74 years old (n~2000 and less than 400 for mercury) and children of 3-17 years old (n~1400). Chemicals were measured in samples of blood, urine or hair and data on individual characteristics (age, sex, BMI, etc.), environment and food were collected. Descriptive statistics of biomarkers levels of metal and factors influencing the metal levels are presented. The mean blood lead concentration in French adults was 25.7 µg/L. It has dropped sharply (to the order of 60%) since the previous study carried out in 1995. Only 1.7% of the participants had a blood lead concentration above 100 µg/L. For cadmium, the mean urinary concentration was 0.29 µg/g of creatinine, which is quite similar to those observed in previous French studies (in 1997, 2000 and 2005) and in other studies carried out in Europe and the United States. Urine cadmium level exceeded 1 µg/g of creatinine (EFSA) in 3.6% of adults and 2 µg/g of creatinine (CSTEE) in 0.34%, thresholds for renal toxicity. Concentrations of mercury in hair were relatively low (0.59 µg of mercury/g of hair among adults and 0.37 µg/g of hair among children.

Factors influencing metal levels were different according to metals, such as, age for Sb, Cr, Co, Sn, U and V. Results of the ENNS study indicate that metal levels in urine, blood or hair in the French population are low and globally in the same range that those observed in other developed countries.

Keywords: Exposure biomarkers, metals, human biomonitoring, French population, chemicals, urine, blood, hair

Acknowledgements: InVS, French Institute for Public Health Surveillance

DEMOCOPHES in Germany

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Germany has long lasting experience on HBM surveys.

The DEMOCOPHES sampling locations were located in the Federal State of North-Rhine-Westphalia, a county with partly highly industrialized and partly sparsely populated regions. The city of Bochum and a small town in the Higher Sauerland District were chosen as urban and rural sampling locations, respectively. A random sample of the 6- to 11-year-old children was selected via the respective inhabitant registries. Phone numbers were derived from the reply cards. In case families did not react at all, telephone numbers were looked up in phone books or in the internet. This practice increased the participation rate noticeably. If no phone number could be retrieved, the families were visited at home, but this procedure was not efficient. As the response rate in the urban area was very low, the invitation material was optimized and recruitment in the rural area was accompanied by a local press release and a poster presented in local shops resulting in a higher response rate. After excluding 20 interested mothers aged older than 45 years and focusing on the requested age and gender distribution of the children, finally 120 mother-child pairs distributed approximately equal between age and gender and sampling location participated.

Interviews and sampling (hair and urine) were done nearly exclusively during home visits with only minor difficulties. As a reward for participation small non-monetary incentives were given to the children.

Children living in households with one smoker had a substantially higher urinary cotinine level (geometric mean 0.51 µg/L) than those in non-smoker households (0.19 µg/L). If more smokers lived in the household, the value was even higher (1.99 µg/L). For both, mothers and children, an increasing level of fish consumption resulted in increasing levels of mercury in hair.

In DEMOCOPHES children, the concentrations of most phthalate metabolites analysed in urine were considerably lower than in the nationwide representative GerES IV conducted from 2003 to 2006. Only DiNP metabolites were at the same level in both studies. In GerES IV and DEMOCOPHES 1.4 % and 1.7% of the children, respectively, exceeded the health based guidance value HBM I for DEHP.

Keywords: Human biomonitoring Europe Germany mercury cotinine phthalates

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Poster P8
Hungary

DEMOCOPHES results in Hungary

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Introduction. One of the basic tasks of the National Institute of Environmental Health is offering an up-to-date survey on the environmental health situation of Hungary to the government. HBM surveys are important sources of this type of information. The pilot study of the DEMOCOPHES and COPHES projects fitted well to this task with their preparatory and field work activities and the results of the chemical analyses, even if they can not be regarded representative of the whole country.

Methods. Two study areas were chosen: the urban one was the 8th District of Budapest, with high traffic density and a population density of 11,712 person/km2. The rural area was Rétság in County Nógrád (population density: 150 persons/ km2.) Recruitment of 60-60 pairs of 6-11 year old children and their mothers was done through the schools. Questionnaires on the health status, life style, home environment and sources of possible environmental exposure were filled in during personal interviews combined with hair and urine sampling. Measurements of Hg in hair, creatinine and Cd level in urine were done by the former NIOH in Budapest and cotinine and phthalate metabolites in the urine samples were measured by the NIPH in Prague. Statistical analyses of the data were performed using STATA/SE 10.0 software.

Results. Concentrations of all the chemicals measured in the hair or urine samples were below the recommended reference values.

Mean mercury levels of hair samples of both the children and their mothers were significantly higher in Budapest than in the rural area which can be explained mainly by the different frequency of sea fish consumption. Hg content of hair samples was significantly associated also with using some types of cosmetics (make-up, eye make-up, massage oil) and high level of alcohol consumption (wine and spirits). No association was found with amalgam filling or with broken thermometer or energy saving lamp. There were significant differences in the urinary cotinine level on the one hand between the smoking and the non-smoking women, and on the other hand, between the children exposed and not exposed to environmental tobacco smoke. Cadmium level was also higher in the urine samples of the smoking mothers than of those not smoking. Urinary levels of phthalate metabolites were significantly associated with pvc flooring (MBzP), flat/house redecoration (MEHP), consumption of hazelnut spread (MBzP, MCHP), wild mushrooms (MEP, MCHP), game (MEP) and offal (MCHP) as well as with frequent use of make-up (MCHP, MEP) and hair styling products (MEP).

Conclusion. The results provided important information on the exposure of some segments of the population to some important environmental chemicals. The pilot project should be continued with monitoring extended spectrum of environmental exposures in order to be able to make effective steps in the prevention of environmental related diseases.

Exposure to Environmental Contaminants in the Israeli Population: Results of the Ministry of Health Biomonitoring Study

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Background: The Ministry of Health Biomonitoring Study estimated exposure of individuals in the Israeli population to bisphenol A (BPA), organophosphate pesticides, phthalates, cotinine, polycyclic aromatic hydrocarbons (PAHs), and the phytoestrogenic compounds genistein and daidzein.

Methods: In 2011, 250 individuals ages 20 – 73 were recruited from five different regions in Israel. Urine samples were collected and questionnaire data were obtained, including detailed dietary data (food frequency questionnaire and 24 hour recall). Urinary samples were analyzed at the University of Erlangen-Nuremberg in Germany. For each urinary parameter, the detection frequency, quantification frequency, 95th percentile and geometric mean were calculated.

Results: BPA urinary concentrations were above the level of quantification (LOQ) in 89% of the samples whereas urinary concentrations of phthalate metabolites were above the LOQ in 92 – 100% of the samples. PAH metabolites were above the LOQ in 63 – 99% of the samples. All non-smoking participants had detectable levels of cotinine in their urine and 63% had levels above the LOQ, indicating widespread exposure to environmental tobacco smoke.

Median creatinine adjusted urinary BPA concentrations in the study population (2.3 ug/g creatinine) were comparable to the median creatinine adjusted BPA urinary concentrations reported for the general US population ages 20 and older (1.9 ug/g creatinine) in 2007 – 2008. Median creatinine adjusted phthalate and PAH concentrations were also comparable to those reported for the general US population. Median creatinine adjusted concentrations of several organophosphate metabolites (dimethyl phosphate, dimethyl thiophosphate) were high in our study population compared to the general US and Canadian populations but comparable to those reported in the 2010 Study on Exposure of the French Population to Environmental Pollutants.

Conclusions: The study population is widely exposed to a range of environmental contaminants. Further study will include multi-variate analyses of variation in exposure in population subgroups, and variation in exposure with intake of food items/ use of consumer products. The data from this study can be used to follow up time trends in exposure levels and to develop policy actions.

Keywords: human biomonitoring, exposure, environment, Israel

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Exposure assessment of Japan Environment and Children's Study

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Japan Environment and Children's Study (JECS) is a birth cohort study involving 100,000 pairs of parents and children. The Study aims to evaluate impacts of environmental factors on children's health and development. Biomonitoring during pregnancy and child development is planned as a part of JECS' assessment of prenatal and postnatal exposures to environmental contaminants. For the biomonitoring, hundreds of thousands of samples, including blood, urine, breast milk and hair, will be collected and analysed for target contaminants, which requires development of high-throughput and reliable analytical methods. Due to limited volume of samples available for each analysis, highly sensitive and precise methods are the key to the Study. Since multiple laboratories will participate in the analysis, sound quality assurance and quality control (QA/QC) measures should be implemented. Collection of samples, types of containers, transport and storage conditions will all affect the measurement results.

The timing of sample collection is an important factor when assessing the effect of exposures on children's health and development. Particular critical window(s) for each outcome's onset should be taken into account. Performing invasive sampling during earlier childhood is also challenging and its ethical aspect is under discussion.

In this presentation, the JECS' biomonitoring and QA/QC procedure will be discussed.

Keywords: Large scale birth cohort, exposure assessment, biomonitoring

Acknowledgements: Ministry of the Environment, Japan

Luxembourg Democophes Luxembourg: A small countries perspective

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In Luxembourg DEMOCOPHES attempted from the beginning to make best use of the advantage of being the smallest participating country for all aspects involved. As Luxembourg has three administrative languages (Luxembourgish, German, French) all documents were translated at least into German and French. Fieldwork took place between November 2011 and January 2012 and all families were visited at home. Laboratory analyses and statistical analyses were performed following all guidelines from COPHES. Levels of mercury in hair, and cotinine, cadmium, phthalates and bisphenol A in urine were analyzed within DEMOCOPHES in Luxembourg by laboratories that had passed the quality criteria as defined by COPHES. Overall the levels of chemicals analyzed in the 60 mother-child pairs were lower than available health based assessment values. In October 2012, timely before the meeting on Cyprus, the participants were informed about their results by a letter including the information leaflets on the compounds measured. An information evening aiming at presenting the national results in comparison with the European levels open to all Luxembourgish participants of DEMOCOPHES will take place in November.

Keywords: Luxembourg, human biomonitoring, mercury, cadmium, cotinine, phthalates, bisphenol A

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DEMOCOPHES in Poland

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The primary aim of DEMOCOPHES is to test the feasibility of an EU-HBM approach, generating comparable data. The Nofer Institute of Occupational Medicine (NIOM) was the National Management Unit of DEMOCOPHES in Poland. Two different locations representing the two extremes of degree of urbanization, independent, which means that the "rural" was not a commuter area of the "urban". The sampling locations were identified with the population density, no hot-spots and urban area was Lodz, one of the biggest cities in the central Poland and NIOM location with population density of 22 500 inhabitants/km2, and rural area of Sulejow with less than 100 inhabitants/km2. Poland chose to recruit mother-child pairs via schools. Field work was done by laboratory personnel and trained interviewers together with educational event "Environment and Health Days". Poland designed its own CAPI system which may be used/adopted for further study. Analyses of samples were conducted by the laboratories which successfully participated in the respective ICI and EQUAS rounds designed and supervised by WP 3. Mercury in hair was determined by flow-injection cold vapour atomic absorption spectrometry (CV-AAS) technique, urinary cadmium with ICP-MS, cotinine and phthalate metabolites with LC-MS/MS method. Analyses of all data were run with the assistance of SPSS programs provided by WP 4.

Keywords: DEMOCOPHES, Poland, harmonized HBM, biomarkers, CAPI

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DEMOCOPHES in Portugal: Challenges and opportunities

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The primary aim of the European Pilot Project DEMOCOPHES is to test the feasibility of an EU-Human Biomonitoring (HBM) approach, generating reliable and comparable data among the participating countries. Portugal has participated in this European Project implementing the national project "DEMOCOPHES in Portugal". In order to evaluate how the national implementation contributed to the accomplishment of the main objectives of the European Project, a comparative analysis was performed regarding what was expected to be developed and what in fact was carried out taking into account the specificities of the country.

The analysis was performed considering the COPHES/DEMOCOPHES guidelines and, at the national level, the produced deliverables as well as the results of the team's analytical thought on the project implementation. Issues like the procedures to select and recruit participants, the communication plan at the several defined levels, the interviews and biological sample collection, the sample handling, the analytical capacity building in the country, the methods to assure quality control, and the data treatment and analysis procedures have been addressed.

In the current communication results of the analysis performed are presented, arranged so as to identify the challenges of implementing DEMOCOPHES at the national level, how these challenges were responded, the opportunities that came from this implementation in the country, and finally how these opportunities could or not be used regarding a coherent and harmonized approach in HBM activities, leading to a more effective use of resources.

Keywords: Human Biomonitoring, Portugal, DEMOCOPHES, Challenges, Opportunities, HBM project implementation

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Foetal exposure to lead in Central Portugal determined by human and environmental biomarkers

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Foetal exposure to subtoxic lead levels during pregnancy may be responsible for delays in foetal development and contribute to an increased risk of morbi-mortality among newborns, pointing to the need of preventing Pb exposure of pregnant women, even to the reduced levels recently evidenced as hazardous. Previous studies have identified the Central Region of Portugal as one of those with higher environmental Pb levels in the country. As such, the main objective of this study was the assessment of foetal exposure to lead through biomonitoring in the blood of pregnant women residing in Central Portugal, in order to verify if the higher environmental levels detected in moss were reflected in the blood lead levels (BLL) of the region's population.

Pregnant women were recruited before delivery and blood samples collected in the health institutions of the civil parishes corresponding to the environmental sampling points, in a ratio of 3 women per location. A questionnaire was applied by phone interview for gathering relevant data on participant's socio-demography, smoking and dietary habits and exposure-relevant behaviour.

The analysis of the data obtained by questionnaire shows a homogeneous study group (N=294) in relation to their main characteristics.

The results on Pb foetal exposure show a mean value of 2.3 ± 1.9 µg/dl, ranging from 0.1 to 10.9 µg/dl (GM =1.46 µg/dl, 95% CI: 0.88–2.44 µg/dl), although there are still some women (1%) with BLL higher than the established limit of 10 µg/dl.

Given that the women BLL do not seem independent of their district of residence, investigation of potential determinants is performed for the sample overall and for each district. According to the project objectives, environmental lead levels are included in the analysis. The results show that the foetal exposure to lead in the Central Region does not depend on any of the variables considered, in particular on the environmental Pb levels determined in samples of mosses and soils collected in the same region. This may be due to the reduced environmental bioavailable lead levels and the insufficient variability of both environmental and foetal exposure to prove a correlation if it exists.

Keywords: Lead, Human biomonitoring, Foetal exposure, Environmental exposure, Portugal, Potential determinants

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A decade of consecutive human biomonitoring addressed to exposure to heavy metals and dioxins in adults residing near solid waste incinerators

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Environmental Health Surveillance Programs related to solid waste incineration facilities near Lisbon (VALORSUL Municipal Solid Waste Incinerator) and in Madeira Island (ValorAmbiente Solid Waste Incinerator at Meia Serra) are being developed since 1999 and 2002, respectively. The main aim of these Programs is to guarantee the safeguard of public health concerning the potential negative impact of the incineration processes on human health. The hypothesis in test underlying the whole program is that if the incineration processes are under control, human exposure to pollutants relevant and related adverse health effects are not significantly different between the potentially exposed population and one non-exposed that is taken for control. Consequently each Program includes several human biomonitoring (HBM) projects addressed to the exposure to heavy metals, dioxins and dioxin-like compounds in different population groups, aiming to monitor prevalence and space and time trends of human exposure to those pollutants.

For the last decade, the HBM projects focussed on adults of the general population have been repeatedly carried out involving the determination of at least 3 heavy metals (mercury, lead and cadmium), dioxins (PCDD/Fs) and dioxins-like compounds (8 mono-ortho and 4 non-ortho PCBs) in the blood of selected volunteers. In each observation, clinical tests were also performed and a questionnaire was administered to collect relevant data on participant's health, socio-demography, smoking and dietary habits and exposure-relevant behaviours.

Altogether 1590 adults (1260 from Lisbon and 330 from Madeira) have already participated in the study, being exposed and non-exposed groups relatively homogeneous in relation to principal characteristics. From the results on the biomarkers' levels, the overall conclusion is that metal and dioxin exposure of those residing near the incineration facilities cannot be related to the emissions of these facilities, meaning that sources controls seem to be effective in relation to each incinerator. The temporal evolution of metals' exposure shows statistically significant differences between values, reflecting variations always well below the "normal" limits. For PCDD/Fs, a trend for consistent and statistically significant reduction suggests a human exposure to dioxins relatively stable or tending to lower values along the observations carried out so far.

Keywords: Human Biomonitoring, Portugal, Heavy metals, Dioxins, Incineration facilities, Blood, Spatial and temporal trends

Acknowledgements: This work is funded by national institutions (VALORSUL and ValorAmbiente).

Poster P13d
Portugal

Foetal and infant exposure to lead and dioxins: spatial and temporal trends near incineration facilities

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Children and foetuses are considered as risk groups for adverse health effects caused by environmental pollutants such as lead (Pb) and dioxins mainly because their organisms are still developing. Additional risk for children comes from physiological characteristics and specific behaviour patterns leading to a higher relative exposure. As part of the Environmental Health Surveillance Programs related to solid waste incinerators that are being developed near Lisbon (starting 1999) and in Madeira Island (starting 2002), three human biomonitoring (HBM) projects were carried out focussed on foetal and infant exposures to Pb and to dioxins and aiming to determine whether living near the incinerators increases the maternal exposure to those pollutants and accordingly the foetal exposure to Pb and the exposure of breast-fed infants to dioxin, as well as the exposure to Pb of children aged 12-72 months.

The hypothesis in test underlying the whole program is that if the incineration processes are under control, exposure to relevant pollutants is not significantly different between the potentially exposed population and one non-exposed that is taken for control. Consequently each Program includes several HBM projects addressed to the pollutants exposure in selected population groups, aiming to monitor prevalence and space and time trends of human exposure to those pollutants. For the last decade, the HBM projects focussed on foetuses, breast-feeding women and children up to six years have been repeatedly carried out involving the determination of maternal blood and/or umbilical cord lead levels, blood lead levels in children and human milk dioxin levels. Altogether 885 women (Lisbon=530; Madeira=355) and 864 children (Lisbon=490; Madeira=374) have already participated. Determined levels are among the lowest in comparable studies. From these results, the overall conclusion is that Pb and dioxin exposures of those residing near the incinerators cannot be related to their emissions, meaning that sources controls seem to be effective in relation to the facilities. Time trends of Pb and dioxin exposures show statistically significant differences between values, reflecting consistent and statistically significant reduction and suggesting a human exposure to these pollutants relatively stable or tending to lower values along the observations carried out so far.

Keywords: Human Biomonitoring, Portugal, Lead, Dioxins, Foetal and infant exposures, Incineration facilities, Spatial and time trends

Acknowledgements: This work is funded by national institutions (VALORSUL and ValorAmbiente).

Recruitment strategy for national implementation in Romania of the EU Protocol of DEMOCOPHES Pilot Study in accordance to cultural, social and ethnic differences

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In Romania DEMOCOPHES Pilot Study the only recruitment opportunity in Romania was via schools and some changes had to be done in the recruitment strategy in order to implement the national protocol.

The school directors gave verbal approvals at the first phone call to contact the parents for the study, but not by sending invitation letters and replay cards to the families. Instead they organized meetings at their schools between our fieldworkers and the teachers and parents.

This decision conducted to changes in the recruitment protocol but also turned as an opportunity for our team to have a better approach of explaining the aim of the study by face to face contact with the subjects. Due to the social, economic and cultural differences of the families, as well as the ethnical structure (high percent of Hungarians and few Rroma families), the procedures, scope and benefit of the study has been easier clarified by talking directly and answering their questions on the spot.

This way their interest and confidence in the study was raised and this led to a high acceptance to enter the study from the first contact compared to the alternative of sending them an informing letter to read.

During the meetings a Protocol Sheet was assigned for the participants. To the parents who accepted to take part in the study the recruitment interview was applied and the eligible families gave the written consent; the others answered the non-responder questionnaire on the spot. The sampling material and instructions for urine sampling was distributed to the participating families and for some of them also the date and place of interview and sampling was fixed. For the remaining families the date and place of sampling was fixed by only one telephone call. The same procedure was applied again to another rural school as there were not enough pairs to match the selection criteria.

Due to the changes in the recruitment protocol the fieldwork was more time consuming and less cost effective (more fieldworkers, travel and time), but the response rate (75.32%), the cooperation rate (62.47%) and the contact rate (100%) were satisfactory.

Keywords: Humanbiomonitoring, DEMOCOPHES

Acknowledgements: Life+ Programme, European Comission (Life 09 ENV/BE/000410) and Environmental Health Center, Cluj-Napoca, Romania

Democophes: Investigation of mother´s and children exposure to environmental contaminants in Slovakia

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Public Health Authority of the Slovak Republic, in order to protect public against adverse effects of environmental contaminants, performed in cooperation with Regional Authority of Public Health in the district of Banska Bystrica, pilot study DEMOCOPHES in the framework of the harmonized European human biomonitoring.

After approval of study procedures and methods in national ethical committee, an extensive recruitment was implemented between October 2011 and January 2012 through primary schools, resulted in participation of 63 pairs of mother´s and children from the capital city of Slovakia, Bratislava (urban environment) and 66 pairs of mother´s and children from Brusno and Slovenská Ľupča in the district of Banská Bystrica (rural environment).

Public Health representatives visited involved schools during parental meetings explaining the study purposes to children´s mothers directly while handling out of invitations (924 invitations together in both locations). Despite of this effort they were only hardly able to meet expected amount of pairs.

Beside the excessive amount of documents and information provided to parents, they had to embrace in a very short time, we believe, negative experiences with quite amount of various commercial surveys on the public opinion, people are bothered by last years, could also discouraged families from DEMOCOPHES participation. Furthermore, 11 pairs accepted with regret the fact, they had to be excluded due to study criteria.

Experiences from sampling and interviews procedure in households and project centres are perceived quite positive, except for minor difficulties with answering of several questions (identification of gloves and floor material, sea and freshwater fishes, time spent per day outdoors or in the car). In a few cases, some kind of concerns of privacy breach was felt from mothers queries (recruitment through telephone, storage of samples in biobank, abusing of hair material for cloning purposes).

On the other side, questions we received from mothers through the sampling visits suggest, most people in Slovakia fear for their health and therefore appreciate much this kind of studies.

Keywords: Slovakia, DEMOCOPHES, human biomonitoring, recruitment, sampling, parents, experiences

Acknowledgements: Democophes in Slovakia was funded by the LIFE+ program of the European Commission in combination with health sector represented by Public Health Authority of the Slovak Republic.

DEMOCOPHES in Slovenia – pilot study results

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In the framework of Democophes pilot study, urine and hair samples were collected from 156 mother–child pairs and 69 men (fathers/ partners). Families were recruited through schools, 3 from urban and 2 from rural area. Mercury (Hg) was determined in hair, cadmium (Cd), cotinine, phthalate metabolites (MEP, MEHP, DEHP=5oxoMEHP+5OH-MEHP, MBzP and MnBP), bisphenol A (BPA, free and conjugated), triclosane (TCL) and parabene metabolites (MeP, EtP, PrP and BuP) in urine samples. All concentrations were adjusted for creatinine. In all biomarkers, significant differences between population groups were obtained. Concentration of Cd in urine, TCL and parabene metabolites levels were significantly higher in mothers ($p<0.001$). Fathers had the highest Hg and cotinine levels, while children the highest BPA and phthalate levels ($p<0.001$). Hair Hg, was observed to be significantly higher in urban than in rural area ($p<0.001$), the same was observed for phthalate metabolite MnBP, TCL and parabens ($p<0.05$). MEHP and DEHP were significantly higher in rural than in urban area ($p<0.001$). As expected, hair Hg was influenced by the frequency of fish consumption, while Cd and cotinine by smoking of mothers and fathers. Passive smoking in children influenced cotinine but not Cd levels. Higher Hg was observed also in families, where broken Hg thermometer or soldering activities were reported. In addition to smoking, frequency of game consumption influenced Cd in urine. For phthalate metabolites significant positive associations were observed with hazelnut spread (MEP, MnBP), ice cream (MEP), chewing gum (MEP, DEHP), and convenience food consumption (MEHP). Negative significant association was observed between MnBP and meat consumption. Presence of PVC floor or walls in family's house influenced MBzP significantly, but not other phthalate metabolites. MBzP was observed to be associated with use of personal care products in children. Among parabene and TCL metabolites, only EtP was significantly associated with the use of personal care products in general, and MeP with body lotion and crème usage. Prominent source of BPA exposure was not observed, however mothers taking contraception pills had higher BPA in urine (total and conjugated), and when adjusted for pills, significant positive association between BPA and consumption of canned food was observed.

Keywords: mercury, cadmium, cotinine, phthalates, bisphenol A, parabens, triclosan

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Human biomonitoring studies in Slovenia – toxic metals, arsenic and essential elements

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In Slovenia, several cross-sectional studies following the same protocol were conducted in recent years to assess the extent of exposure of Slovenian population (women in childbearing age, women 50-60 years, men and children 6-11 years) to environmental chemicals including Hg, Pb, Cd and As. In addition, status of essential elements (Se, Zn, Cu) was also assessed. Sampling in rural and urban sites was performed. Democophes pilot study included sampling of urine, hair and blood samples from 156 mother-child pairs and 69 men (fathers/partners). Within EU research project PHIME, venous blood, hair and urine samples were collected from 150 children aged 6-11 years and 60 women aged 50-60 were recruited. In the framework of the National Human Biomonitoring programme, 150 pairs (mothers-partners) were sampled for venous blood, hair and urine in the pilot study phase. Combining all the results it was found that Hg blood level was significantly higher in urban areas (GM=1.13 µg/L) than in rural (GM=0.818 µg/L) ($p<0.001$). Significant difference was observed also between different population groups – fathers/partners having the highest exposure to Hg (GM=1.47 µg/L) and children the lowest (GM=0.708 µg/L) ($p<0.001$).Significant difference between different population groups was observed also for Pb and Cd in blood (both $p<0.001$). Fathers had the highest exposure to Pb (GM=21.1 µg/L) and children the lowest (GM=14.2 µg/L). In case of blood Cd, the highest exposure was observed in mothers (GM=0.306 µg/L) and the lowest in children (GM=0.124 µg/L). No significant difference between rural and urban areas was observed for Cd and Pb in blood ($p=0.427$ and 0.996, respectively). As in blood was found to be higher in urban areas (GM=0.945 µg/L) than in rural (GM=0.640 µg/L) ($p<0.001$), mothers having the highest As exposure (GM=0.807 µg/L) and children the lowest (GM=0.667 µg/L) ($p=0.031$). Essential elements Se and Zn were the highest in fathers (GM=120 and 6317 µg/L, respectively) and the lowest in children (GM=87.4 and 4389 µg/L, respectively) ($p<0.001$). In contrary, fathers were the lowest in Cu status (GM=788 µg/L), while mothers the highest (GM=881 µg/L). Overall Se level was significantly higher in urban areas ($p=0.013$), Zn and Cu levels did not differ significantly between areas.

Keywords: Human biomonitoring, mercury, lead, cadmium, arsenic, essential elements
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DEMOCOPHES in Spain

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The occurrence of different activities and legislations on Environment and Health together with the fragmentation concerning human biomonitoring (HBM) studies in Europe have boosted the path to achieve the harmonization of HBM in Europe. Two projects funded by the European Commission have been focussed in that harmonization: COPHES (Consortium to Perform Human Biomonitoring on a European Scale) and DEMOCOPHES (Demonstration of a Study to Coordinate and Perform Human Biomonitoring on a European Scale). Following the establishment of the theoretical bases (COPHES) required, the test phase (DEMOCOPHES) will allow proving the viability of such harmonized approach by the implementation of a pilot study performed in 21 countries

In accordance to the EU Study Protocol provided by COPHES, two sampling location were selected in Spain, Añover de Tajo (rural) and Madrid City (urban) where pairs mother-child were recruited via schools and following the inclusion/exclusion criteria. The fieldwork started in October 2011 and finished in January 2012.

First-morning urine and hair were sampled and different information was collected by ad hoc questionnaires of 134 pairs mother-child. Analysis of mercury levels in hair and concentration of cadmium, cotinine, phthalates metabolites and bisphenol A in urine were performed in 2 different COPHES/DEMOCOPHES qualified labs.

Important disparities were found between the interest in participating and availability of mothers living in the rural and urban locations which had consequences in the logistics and time progress of the recruitment procedure and sampling (three days in October for complete the rural sampling and from November to January for the urban sampling).The success in the rural recruitment was in part due to the interest and involvement of local authorities. The difficulties in the urban recruitment lead us to modify the original plan and include three urban schools instead of one as was planned. Other difference was found in the age of the mothers (urban AM±SD = 41.1 ± 4.0; rural AM±SD = 38.8 ± 3.4; p=0.002). It was difficult to find mothers ≤45 years of children of 11 years old in the urban but not in the rural location.

Although several aspects of the study required small adaptations, the experience was very successful and no serious deviations occurred in the implementation of DEMOCOPHES Spain.

Keywords: HBM, children, mercury, cadmium, cotinine, phthalates, bisphenol A.

Acknowledgements: Spanish project SEG 1112/10 (MAGRAMA-ISCIII agreement), DEMOCOPHES (LIFE09 ENV/BE/000410). Authors also would like to thank the volunteers and our COPHES/DEMOCOPHES partners. www.eu-hbm.info

Poster P18a
Sweden

Environmental contaminants in hair and urine from Swedish mothers and children – an EU harmonized approach

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The European human biomonitoring project DEMOCOPHES aims to harmonize biomonitoring and generate comparable data across Europe. As one out of 17 participating countries, Sweden recruited 100 children (6-11 years) and accompanying mothers (20-45 years). Half of the mother-child couples were from a rural area and half were form an urban area. Hair and urine samples were collected and a questionnaire about lifestyle, diet, living environment and socio-demographics was answered. The hair samples were analysed for mercury and the urine samples were analysed for cadmium, cotinine, bisphenol A, 7 phthalate metabolites (MEHP, 5OH-MEHP, 5oxo-MEHP, MBzP, MnBP, cx-MiNP and MEP), triclosan and 5 parabens.

The mean mercury concentration in hair was 0,26 (range 0,02-1,19) µg/g hair in the mothers and 0,18 (0,03-0,60) µg/g hair in the children. As expected, the mothers who frequently ate fish had higher levels of mercury than mothers who rarely or never ate fish. However, no correlation between fish consumption and elevated mercury levels among the children was found. The mean urinary cadmium value was 0,15 (0,02-0,87) µg/L in the mothers and 0,08 (0,03-0,29) µg/L in the children.

The urinary cotinine levels were below the LOQ in 85% of the children and 59% of the mothers. The cotinine content represents the nicotine exposure and persons with urinary cotinine levels above 50 µg/g creatinine can be regarded as smokers or heavy exposed non-smokers. This value was exceeded by 22% of the mothers, but not by any child.

The mean urinary bisphenol A concentration was 1,3 (0,2-6,3) µg/L among the mothers, which was slightly lower than the mean value for children (1,5 µg/L; range 0,3-32,4 µg/L). The children had higher levels than the mothers of all analysed phthalate-metabolites except for MEP. There was an association between elevated levels of some of the phthalates and high consumption of chocolate or ice cream, PVC in flooring and wall material, private well drinking water and living in a rural area.

Overall, the concentrations of environmental contaminants were low. In general, children had higher concentrations of phthalate metabolites and BPA concentrations in urine, while mothers had much higher exposure to parabens.

Keywords: Human biomonitoring, metals, cotinine, phthalates, bisphenol A, parabenes, triclosane

Acknowledgements: EU FP7, EU Life+, Swedish Environmental Agency

Biomonitoring as an early warning of increased exposure to toxic substances in humans

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An important part of the National Food Agency's (NFA) work includes the estimation of levels of hazardous substances which consumers are exposed to through the diet. Traditionally, calculations are based on the food content and consumers' self-reported food intake. However this method is uncertain due to rather low reliability. Also, it does not consider such factors as for example uptake and metabolism of the toxic agent. Therefore NFA has recently launched a major project within biomonitoring, funded by the Swedish Civil Contingencies Agency. The project period is 2012-2014, aiming to monitor exposures in the Swedish population with a focus on an early warning of increased exposure to toxic substances, as well as on cases of a possible threat/crisis. It includes collaboration with several agencies and organizations within and outside Sweden. We aim to create effective and quality assured systems for the collection, storage and analysis of a large number of samples for analysis of different types of biomarkers. The system will be used to monitor the exposure annually as well as in case of threat/crisis and also to detect exposures to "new" unexpected toxic agents in the Swedish population. Further, the biomonitoring strengthens the capacity of NFA to make informed risk management decisions and to follow up risk-reducing/preventive actions.

Keywords: Human biomonitoring, food, toxic substances, early warning, Sweden

Acknowledgements: The authors acknowledge the Swedish Civil Contingencies Agency for funding this project.

DEMOCOPHES in Switzerland

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Between 2010 and 2012 the pilot study DEMOCOPHES was realized in 17 countries within Europe to test the feasibility of a harmonized Human Biomonitoring project to get comparable data. In Switzerland the pilot study was successfully realized. 120 mother-child pairs were recruited and visited to collect morning urine and hair samples as well as questionnaire data about the residential environment, residence, nutrition, smoking status, the exposure relevant behavior, and occupation. Mothers of age up to 45 years and children between 6-11 years of both sexes were included. The study location was limited to one urban (capital city Bern) and one rural area (regions of the Oberaargau). The concentration of cadmium, cotinine, and phthalate metabolites (MnBP, MBzP, MEHP, 5-OH-MEHP, 5oxo-MEHP, MEP, MiBP) were measured in the urine samples and the mercury concentration was determined in the hair samples. Data evaluation and interpretation were performed following the EU guidelines. Comparing the analytical chemical data (mercury, cotinine, cadmium, and phthalates (DEP, DEHP) to the available health based guidance (HBM I & II, BE values) and reference values a health risk can be excluded for the 120 mother-child-pairs. In the 8 smoking mothers cotinine was detected in the urine. The health risks of smoking are well known. The recruitment was performed via inhabitant registries. The final response rate to take part in the study was 10%. By comparing the involved study population with the non-responder population or data of the general Swiss population, a bias is shown in the involved study population. The latter is well educated, interested in health and health issues, has middle to high standard of living (income, SES), shows stable family conditions (regarding the ratio of single mothers compared to the ratio of the national population) and a very low percentage of smoking mothers. This population do not reflect the general population and this fact should be considered by interpreting the data. By participating in the EU harmonized pilot study, Switzerland was able to gain frameworks, experiences and a network which is important for a realization of a future national Human Biomonitoring project in Switzerland.

Keywords: Human Biomonitoring, chemical exposure, mercury, cadmium, cotinine, phthalates, Switzerland

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Derivation of Margins of Safety from Human Biomonitoring Data: A Chemical Industry Perspective

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Human biomonitoring data are currently available for many chemicals. The significance of detectable, but often low levels of these chemicals in humans requires tools to enable interpretation in a risk-based context. Such a tool is the Biomonitoring Equivalent (BE) value, defined as the concentration of chemical in a biological medium such as blood or urine that is consistent with an existing government health-based exposure guidance value such as a reference dose or tolerable daily intake. BEs are derived using chemical-specific pharmacokinetic (PK) data to translate the existing exposure guidance value into an equivalent internal dose in humans. As part of The Dow Chemical Company's (Dow) Product Stewardship Goals, we are developing and using BE values to interpret human biomonitoring data and derive Margin of Safety (MOS) values for our products. To support derivation of BE values, the generation of PK data is being incorporated into many of Dow's safety evaluation programs, particularly repeat dose studies such as subchronic/chronic and reproductive/developmental animal studies. Animal biomonitoring levels at a point of departure (POD), such as the no-observed-adverse-effect-level (NOAEL), are obtained for blood and/or urine to correlate with current and future human biomonitoring data generated in either of these matrices. An overview of the methods employed in animal PK measurements, the modeling tools to correlate animal and human internal dosimetry data, and MOS calculations for Dow products are presented.

Keywords: Biomonitoring Equivalents;

Poster P21a
United Kingdom

UK experiences in the DEMOCOPHES pilot study

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In the UK DEMOCOPHES pilot study biomarkers of exposure to cadmium, phthalates, and environmental tobacco smoke in urine and mercury in hair were measured in children aged 6-11 years old and their mothers. Participants were recruited from rural and urban areas in Gloucestershire and Oxfordshire between January and March 2012 and were invited to attend an appointment at the child's school, a scout hut or other similar venue, which was chosen to be within the local vicinity and reduce travel time for the participants. During the visit, first morning urine samples and small hair samples were collected and then the mothers answered a questionnaire covering living conditions, food intake, workplace and their possible contact with chemical substances. The children enjoyed helping to answer the questions and most questions were straightforward to answer but the question asking mothers to estimate living space in m2 was more difficult. Each visit took just over one hour and all participants reported having a positive experience. As this was a pilot study with a limited number of participants the results must be interpreted with caution, however, of the chemicals tested for, cadmium, cotinine (a metabolite of nicotine), and phthalate metabolites in urine and mercury in hair, the values were low and similar to or below population based reference values published by the US NHANES and Germany's GerES surveys. No results were above available health guidance values and were of no concern with regards to health. In children, mercury in hair was associated with frequent consumption of fish. Very low levels of the phthalate metabolites DEP, DEHP, DiBP, DnBP and BBzP were measured in both mothers and children; all but MEP were higher averages in the children. None of the mothers reported being regular smokers and this was evident with extremely low levels of cotinine measured, in 90% of children cotinine was below the limit of quantification. The low exposure to environmental tobacco smoke is probably due to the legislation to prohibit smoking in public places and the decline in the number of smokers within the UK. The experience and lessons learned in this UK pilot study have been valuable for developing future human biomonitoring research.

Keywords: Human Biomonitoring, cadmium, mercury, phthalates, cotinine, UK

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Reference ranges for key biomarkers of chemical exposure within the UK population

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Human biomonitoring (HBM) is a widely accepted tool to aid assessment of chemical uptake in risk assessment. However, our understanding of biological relevance of the results of HBM can be limited, due in some part to the limited information on background exposures and biomarker concentrations in the general population.

The study described here specifically addresses the question of what constitutes normal background levels in the UK population of a number of biomarkers (the chemical itself or one of its stable metabolites) for a variety of environment chemicals that are frequently encountered because of their widespread use. The environmental chemicals selected for this study were benzene, chlorinated hydrocarbons, dithiocarbamates, cadmium, mercury, naphthalene, diethylhexyl phthalate, synthetic pyrethroids and xylene.

Letters were sent to people randomly selected from the UK Electoral Register and 436 volunteered to take part in the study. Participants were asked to complete a questionnaire and provide a urine sample. The overall response rate was 7.5%, with volunteers being recruited from all areas of the UK including Scotland, Wales and Northern Ireland. Study participants were adults and comprised 45% male and 55% females.

Detection rates for the various chemicals (or their metabolites) ranged from 37% (chlorinated hydrocarbons) to >99% (naphthalene, diethylhexyl phthalate).

We report here the Reference Values (RVs), representative of the 95th percentile value for each chemical studied. Where information is available for comparison, the RVs determined in this study compare well to those from other published larger surveys. This demonstrates that large investigations may not be necessary to get a very reasonable idea of environmental exposures, especially in initial 'screening-type' investigations to identify particular exposures of concern or to demonstrate that exposures are reassuringly low and that no further survey data needs to be gathered.

Keywords: Biological monitoring, background levels, general population, reference range, postal survey

Acknowledgements: Cefic European Chemical Industry Council

Poster P21c
United Kingdom

Background levels in the UK population for 38 elements including rare and unusual metals

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Determining background levels of metals in urine samples from non-exposed people allows for normal levels in a population to be established. This provides a baseline for a direct comparison (and interpretation) of biological monitoring results from workers exposed to metals and to determine exposure trends or 'hotspots' in the general population. The impact of some policy interventions (such as removing lead from petrol) has already been monitored through biological monitoring trends over time. Exposure to rare metals is becoming a concern because of their increasing use in many new areas of technology. The development of technologies such as solar panels and semiconductors (and their subsequent recycling) mean that there is the potential for people in the UK to be exposed to rare metals.

Urine samples (n = 297) were collected from 137 volunteers (85 males and 52 females), not occupationally exposed to metals. All participating individuals provided informed consent. Each sample was analysed for 38 elements and for creatinine. Urine samples were prepared and analysed in different diluents and ICP-MS methods depending on the elements. Analysis was undertaken on an X7 Series 2 ICP-MS Thermo Fisher Scientific. Internal quality controls were made for elements for which no external quality control existed. Mixed effects models were fitted within a Bayesian framework that explicitly modelled the left censored observations and inference was made using Markov Chain Monte Carlo methods, implemented in the WinBUGs software.

The limits of quantification and summary statistics were established for each element. It was possible to establish 95th percentile background levels for 33 elements. Mixed effect analysis showed that creatinine correcting the data in all cases gave a reduction in variability or no significant difference in variability. No smoking effect was observed for any element that was modelled. Gender effects were observed for some elements.

Reference levels based on 95th percentiles for thirty-three elements have been established for a UK population. More elements are yet to be determined in this project. From the data presented here it would suggest that elemental concentrations in urine should be creatinine corrected.

Keywords: Toxic elements, background levels, general population, reference range, rare metals

Acknowledgements: Health & Safety Executive, UK

Biomonitoring Results Conveyance

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Conveying individual biomonitoring study results to study participants who request such information needs to be done with full consideration for cultural frameworks, differences in learning styles, available resources, and assessment of need for follow-up counseling or consultation.

The Commonweal Biomonitoring Resource Center has designed and implemented a number of biomonitoring studies, working in collaboration with such agencies as the Centers for Disease Control, the California Department of Public Health and with national and community organizations such as the International Association of Fire Fighters, Pesticide Action Network North America, and the Silent Spring Institute as well as several grass roots communities of concern.

Within this context, CBRC has developed a set of protocols designed to encourage interest in biomonitoring study participants in their possible exposures to toxic chemicals, to increase participant understanding of the significance of study findings, and to suggest next steps in avoiding further exposures to toxic chemicals should results indicate this necessity.

This poster session will review elements of our results conveyance system, including information included in study recruitment materials, information conveyed during the consenting process and during sample collection, discussions initiated during the usually lengthy time period preliminary to data analysis and results conveyance to participants, and activities offered, such as conference calls or counseling, once results are received by study participants.

Keywords: Biomonitoring results conveyance

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Poster P22b
USA

Evaluation of U.S. National Biomonitoring Data in a Risk Assessment Context: Perspectives Across Chemicals

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Biomonitoring data generated through the continuous US National Exposure Report (NER) provide state of the art information on the presence and concentrations of more than 400 chemicals in human biological matrices; namely blood and urine. Biomonitoring Equivalents (BEs) and other risk assessment-based values now exist to allow interpretation of these biomonitoring data in a public health risk context. We compared the measured biomarker concentrations in the US NER database with BEs and similar risk assessment-based values to provide an across-chemical perspective on the measured levels in the context of current risk assessments for approximately 130 analytes in the NER. Available risk assessment-based biomarker screening values, including Biomonitoring Equivalents, Human Biomonitoring-I (HBM-I) values from the German Human Biomonitoring Commission and other values were identified. Geometric mean and 95th percentile population biomarker concentrations from the NER were collected and compared to generate chemical-specific hazard quotients (HQ) or cancer risk estimates. A number of analytes in the NER datasets approach or exceed HQ values of 1 or cancer risk levels greater than 1x 10-4 at the geometric mean or 95th percentile, suggesting exposure levels in a large fraction of the population exceed what is considered safe. Analytes of concern include acrylamide, dioxin-like chemicals, benzene, xylene, several metals, di-2(ethylhexyl)phthalate, and some legacy organochlorine pesticides. The results of these comparisons for these analytes can be used to set priorities for chemical risk management and research to fill data gaps.

Keywords: Biomonitoring Equivalents, NHANES, population, biomonitoring, interpretation

Acknowledgements: Partial funding provided by American Chemistry Council

PROBE Program: internal dose of metals of the healthy Italian population

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The 1st PROBE programme for the assessment of the internal dose of metals of the healthy Italian population closed in 2011. A population sample of 1423 individuals, aged between 18 and 65 years from five regions, are recruited and information on gender, age, residence and lifestyles of subjects was collected by a questionnaire. Concentrations of 20 metals, namely As, Be, Cd, Co, Cr, Hg, Ir, Mn, Mo, Ni, Pb, Pd, Pt, Rh, Sb, Sn, Tl, U, V and W are determined by the sector field inductively coupled plasma mass spectrometry (HR–ICP–MS) in whole blood and serum. Metals levels are reported as geometric means (GM) and 95th percentiles. Biomarkers variations in sub-groups of the population stratified for affecting variables are also assessed. A comparison with available guideline values for some biomarkers of exposure (Cd, Co, Hg and Pb in human blood) as well as with the levels available from other National campaigns are also outlined.

Keywords: human biomonitoring, metals, reference values, internal dose

Acknowledgements: The programme has been launched funded by the Italian Ministry for Health

SHORT BIOGRAPHY OF SPEAKERS

Aerts, Dominique is coordinator of DEMOCOPHES at the Belgian Federal Public Service for Health, Food Chain Safety and Environment. Since 1998 she is working at several levels on the development and implementation of the Belgian National Environment and Health Action Plan, in strong collaboration with other authorities in the field. From 2002 till mid-2006 she initiated and led the Environment and Health team at the Environment Administration in the Ministry of the Flemish Community, increasing research for policy and supervising the Flemish Human Biomonitoring Programme. From mid-2006 till 2010 she was manager science-policy interface at the Flemish Research Institute for Nature and Forest. She obtained her masters degree in engineering in agricultural and applied biological sciences at the University of Leuven in 1987 and worked for 11 years in and for Latin-America with a Belgian non-governmental organization for development aid (ACT, now TRIAS).

Angerer, Jürgen has led extraordinarily successful research teams for the last 36 years at the Universities of Hamburg, Erlangen/Nuremberg and now Bochum. Together with well over 20 PhD students he has been and still is developing analytical methods for biological monitoring (metals, solvents, pesticides, carcinogenic substances, haemoglobin adducts, DNA-adducts etc.). The methodologies have been applied in many occupational and environmental settings, often in large scale studies to determine internal exposures. He and his working groups have published more than 400 papers in peer-reviewed scientific journals. He early understood and propagated that biological monitoring could be used to estimate the extent to which a person has been exposed to a hazardous substance and the resulting effects on the person's health. In 1977, Prof. Angerer became Chairman of the working group "Analysis of Hazardous Substances in Biological Materials" within the DFG Commission for the Investigation of Health Hazards of Chemical Compounds in the Work Area. Since then he has promoted the development of suitable, valid and tested analytical methods for biological monitoring. In 1979 the DFG commission was the first to evaluate threshold limit values based on parameters of biological monitoring in the form of BAT (Biological Tolerance Values for Occupational Exposures) and EKA (Exposure Equivalents for Carcinogenic Substances) values. Since 1992, Prof. Angerer is member and Vice-Chairman of the "Human Biomonitoring Commission" of the Federal Environment Agency (UBA) of Germany. Prof. Angerer is an active member in the International Life Sciences Institute (ILSI) Health and Environmental Sciences Institute (HESI) Biomonitoring Technical Committee dedicated to the integration of human biomonitoring exposure data into risk assessment. Since 2009, he is also appointed member of the Scientific Committee on Consumer Safety (SCCS) of the Directorate General for 'Health and Consumers' of the European Commission. Prof. Angerer is editor of the International Journal of Hygiene and Environmental Health and also in the editorial board of the Journal of Chromatography B. He early understood and propagated that biological monitoring could be used to estimate the extent to which a person has been exposed to a hazardous substance and the resulting effects on the person's health.

Berglund, Marika is an Associate Professor and head of the risk assessment secretariat at the Institute of Environmental Medicine, Karolinska Institutet, Stockholm. She re-

ceived her Master's degree in Toxicology in 1988, and her doctoral degree in Environmental Medicine in 1994 from Karolinska Institutet. She conducts research, risk assessment and teaching in the field of environmental medicine. Her research field is exposure analysis focused on human exposure to environmental pollutants, including metals and organic substances. The main purpose is to improving and expanding exposure information which feeds into health risk assessment and risk management and to evaluate links between environmental exposures and health effects. For the last five years, she has been a member of the European Human Biomonitoring Implementation group, with the aim to develop harmonized methods for HBM on a European level, and is currently a member of COPHES, the Consortium to Perform Human Biomonitoring on a European Scale, performing a pilot study (Democophes) of human biomonitoring in Europe. She has for many years been engaged in the National Health Related Environmental Monitoring Programme, run by the Swedish EPA, and is responsible for the human exposure database covering data generated by that programme.

Bloemen, Louis is educated as biochemist and epidemiologist. He worked in an academic hospital and later for an American multinational chemical company. There, Louis has been involved in designing the medical computer system for the EU area and the quality control programs of health screening data. He was responsible for scientific and regulatory issues in relation to solvents and has conducted epidemiological studies in the EU the US and China. The concept of training as an essential part of study projects has always had his keen interest

Biot, Pierre is coordinator of DEMOCOPHES at the Belgian Federal Public Service for Health, Food Chain Safety and Environment. Since 2001 he is working on the development and implementation of the Belgian National Environment and Health Action Plan, in strong collaboration with other authorities in the field. He has represented Belgium in the EU Consultative forum and in the WHO network of environment and health focal points till 2010. He obtained his masters degree in engineering in agricultural sciences at the University of Louvain-La-Neuve in 1987 and worked for 9 years in a food manufacturing industry.

Castaño, Argelia holds a PhD in Toxicology by the UCM Madrid. She is Head of Unit Environmental Toxicology in the Spanish National Center of Environmental Health, Institute of health Carlos III and is responsible for the Spanish National Program of Human Biomonitoring by mandate of the Spanish Ministry of Environment. (2007-2014). She is Leader of WP3 (Quality assurance) in the FPVII-European Union Project "COPHES" (DG RTD), Spanish National Focal point for the European project Life+ DEMOCOPHES (DG ENV) , Member of the Technical Working Groups (TWG) heavy Metals and the TWG on Research needs for the elaboration of the Environment and Health Action Plan under the SCALE Strategy, Member of the Spanish Technical Group POPs for the Implementation of Stockholm Convention Spanish National Plan, Member of the Persistent pollutants committee in the Spanish Food Safety Agency, National Expert nominated by EFSA for the evaluation of active substances and Plant Protection Products under Annex I Directive 91/414/CEE,
Member of the Scientific Advisory Committee of ECVAM (European Center of Validation

of Alternative Methods) JRC-EC ESAC from 2002-2009, President for the Spanish platform for animal Alternatives (REMA) from 1990 to 2010. She contributed over 300 presentations and invited talks in international meetings and a considerable number of papers in the field of environmental toxicology.

Casteleyn Ludwine is Doctor in Medicine, Master in Occupational Medicine, Master of Laws in Social Law, and certified in Radioprotection. She is researcher at the Center for Human Genetics of the University of Leuven , working on the interaction between genetic factors and occupational / environmental exposure, and on ethics and data protection. She chaired the EU Technical Working Group on Human Biomonitoring (HBM) for Children and the EU Implementation Group HBM established in the frame of the European Environment and Health Action Strategy (2003) and Plan (2004). She was government advisor for the Flemish HBM Program and chair of the working group on translation of HBM results into policy measures till 2006. She serves on the Scientific Committee of the Environmental component of the French National Survey on Nutrition and Health and is WP leader on ethics and communication in NewGeneris and ECNIS. Since 2007 is advisor to the Belgian FPS Health, Food Chain Safety and Environment, dealing with environmental and occupational health. She is Project leader of COPHES.

Černá, Milena was borne in Prague and was educated at the Faculty of Medicine, Charles University in Prague. She holds a Postgraduate Diploma (Board Certification I) in Hygiene and Epidemiology and a Postgraduate Diploma (Board Certification II) in Hygiene of Nutrition. She is Prof., D.Sc. and Head of the Institute of General Hygiene, NIPH Prague, Czech Republic. She has taught pregraduate courses at the Charles University, 3rd Faculty of Medicine, Prague, and Postgraduate courses at the Medical Institute, Prague and the Institute of Postgraduate Medical Education, Brno. She is Editor-in-Chief of the Central Eur. J. Public Health. Her research activities are in genetic toxicology, environmental toxicology, nutrition toxicology, human biological monitoring. Principal investigator of the project „Health consequences of human exposure to toxic pollutants from the environment, biological monitoring and genotoxicity testing" in the framework of the System of monitoring the environmental impact on population health in the Czech Republic – since 1994.

Covaci, Adrian is currently appointed as research-professor at the Toxicological Center, Department of Pharmaceutical Sciences, University of Antwerp, Belgium. He received the PhD title in Sciences, specialization Chemistry in 2002 at the University of Antwerp. Since then, he has developed expertise in the analytical and environmental aspects of (persistent) organic pollutants, with emphasis on the brominated flame retardants. In particular, the research group of Dr. Covaci has investigated the fate, distribution and the toxicological relevance of organic pollutants in aquatic and terrestrial ecosystems. In parallel, the contribution of different exposure pathways to humans for these pollutants has been investigated. Recently, increased interest has been shown for the analytical and environmental aspects of emerging pollutants, including pharmaceuticals, illicit drugs, bisphenol-A, personal care products and new flame retardants. The current research includes also in vitro metabolism of various indoor contaminants and the identification of major metabolites

which can be used in biomonitoring studies. Dr. Adrian Covaci has published 235 peer-reviewed articles since 1997, with an h-index of 43 and a total number of citations of 6200. He has also co-authored 15 book chapters and had active and passive participations to almost 100 conferences. In 2011, Dr. Covaci has co-chaired the organization of the Dioxin 2011 symposium in Brussels, Belgium and he is currently involved in 3 Marie Curie ITN projects.

Den Hond, Elly is trained in nutritional sciences with a doctoral thesis in epidemiology. She is senior scientist at the department of Environmental Risk and Health at VITO (Belgium). She is involved in several Flemish, Belgian and European projects on human biomonitoring, on prospective follow-up studies of birth cohorts and on analysis of health registries. She participated for COPHES in work package 4 on Data analysis and interpretation

Egorov, Andrey is at the World Health Organization, European Centre for Environment and Health, Bonn, Germany. He received a doctoral degree in environmental health from the Harvard School of Public Health in Boston, Massachusetts. He had conducted research on health effects of water pollution and developed immunological biomarkers of water-related infections at the Tufts University School of Medicine and US Environmental Protection Agency. Since joining the WHO European Centre for Environment and Health in Bonn, Germany in 2010, he has been working on the development of health related indicators and data collection methods for monitoring the European Environment and Health Process

Exley, Karen has an MSc and PhD in toxicology and is a senior Environmental Public Health Scientist in the Toxicology department of the centre for Radiation, Chemicals and Environmental Hazards at the Health Protection Agency in the UK. Dr Exley's works focuses on human biomonitoring and the effects of environmental chemicals, including air pollutants, on health. She was the project co-ordinator for the DEMOCOPHES study in the UK and for COPHES is co-leader of work package 5 – Communication and dissemination with Ovnair Sepai.

Frederiksen, Hanne is a Senior scientist at Department of Growth and Reproduction, Rigshospitalet, Copenhagen University Hospital since 2006. Before then she was a scientist in "the group of bioactive food components and vitamins" at Department of Food Chemistry, Danish Institute for Food and Veterinary Research (DFVF) and Project scientist in "the group of prevention and life style diseases", Department of Toxicology and Risk Assessment, DFVF. She holds a PhD from Dep. of Life Sciences and Chemistry, Roskilde University (RUC) and worked on the EU-project "Heterocyclic Amines in cooked foods - Role in Human Health" Institute of Food Safety and Nutrition, DFVF. She has a Master of Science in molecular biology and chemistry from RUC and holds a Laboratory technician certification from Laboratory Technician School, Copenhagen .

Fréry, Nadine is a senior scientific epidemiologist, with 20 years experience in biomarkers and human biomonitoring (HBM). She works at the French Institute for Public Health Surveillance (InVS), where she was in charge of developing national HBM programmes in the Environmental Health Department. She assessed the exposure of the French popula-

tion to chemicals with emphasis on metals, dioxins, PCBs and more recently, pesticides (ENNS study) and was involved in the new national strategy on Human biomonitoring. She participated in several expert committees and working groups on environmental health and HBM. She was a member of the European working group dealing with HBM during the SCALE process, a member of the EU Expert team to Support Biomonitoring (ESBIO), of the the Implementation Group established by the EU commission and of the European COnsortium to Perform Human biomonitoring on a European Scale (COPHES). She recently joined the occupational health department of InVS.

Gutleb, Arno is a European Registered Toxicologist with a background in veterinary medicine and environmental sciences. His area of research covers toxicology of nanomaterials, endocrine disrupting compounds and human biomonitoring. He is working at the Centre de Recherche Public - Gabriel Lippmann in Luxembourg.

Hadjipanayis, Adamos graduated from the Athens Medical School, Athens University, in 1988 and obtained a distinction for his doctorate in epilepsy in children with cerebral palsy from the National University of Athens School of Medicine. His post-graduate training in paediatrics was completed at St. Sophia Children's Hospital, Athens. In 1998 he was awarded a Fulbright Scholarship for training in paediatric nephrology at Children's Hospital of Philadelphia, Pennsylvania, USA. He is a member of the executive committee of the European Academy of Pediatrics. In 1998 he was awarded from the Greek Neurology Association prize for best publication in International Medical Journal in Epilepsy. He is the editor of five modules of the book "European Mastercourse in Paediatrics". He is one of the authors of the chapter "Urinary system". He has published three books for parents plus numerous papers in Scientific Journals. He has been actively participated in a number of research projects (main researcher, Coordinator) such as, "Use and abuse of antibiotics in URTI", "Passive smoking", "Registration of rare infectious diseases" funded by the Research Promotion Foundation of Cyprus, "Antibiotic prescription for URTI" funded by European Academy of Paediatrics. He participated as a speaker and moderator in many national and international Conferences. He is currently working at Larnaca General Hospital.

Halzlová, Katarína has a degree in chemistry and obtained a Master of Public Health in 2006. She worked as an expert in the environment and health field at the Ministry of Health of the Slovak Republic for 8 years and currently holds the position of head of the environment and health department at the Public Health Authority in Slovakia. She is the National focal point for environment and health issues

Horvat, Milena is an environmental chemists currently employed as a Head of the Department of Environmental Sciences of the Jožef Stefan Institute (JSI) in Ljubljana, Slovenia (www.environment.si). The Department is involved in several EU funded projects and its principal work is to monitor sources, concentrations, pathways and effects of pollutants (radioactivity, trace and major elements, persistent organic pollutants) and to understand and assess their effects in man and his environment. She is also a Head, Ecotechnology, postgraduate programme at the International Postgrauduate school Jožef Stefan (www.mps.si). Her basic research activities

include Environmental sciences (e.g. biological and geochemical cycling); Environmental analytical chemistry, Environment and health – chemicals in the environment; Environmental technologies; and Quality systems in analytical laboratories, Metrology in chemical laboratories; Standardisation of analytical methods for environmental studies and industrial applications. She has published over 170 scientific papers in per review journals and book chapters (http://izumbib.izum.si/bibliografije/Y20120515060337-05027.html).

Jarosinska, Dorota is at the European Environment Agency, Copenhagen Denmark. Medical doctor by training (Medical University of Silesia, Poland, 1988), PhD, a specialist in public health, D. Jarosinska has over 20 years of experience in the area of environmental medicine and environmental health. In the 1990-ties, she participated in a year-long postgraduate course on Advanced Environmental Sanitation in the Netherlands, and in a two-year long training in environmental health for physicians in Poland. In 2000/2001 she was a Fulbright scholar at the National Institute of Environmental Health Sciences, USA. For almost 10 years D. Jarosinska was leading the first outpatient clinic of environmental medicine in Poland. She has been collaborating with WHO Europe on environmental health, in particular on the projects on environment and health information. Between 2005 and 2009, a seconded national expert to the European Environment Agency (EEA) in Copenhagen, Denmark. Since 2009, she has been working on Environment and Health issues in the Integrated Environmental Assessment Programme at the EEA. Authored several scientific papers and contributed to the reports by EEA, WHO, and UNEP; among others contributed as a lead author to the 4th Assessment of Europe's Environment (2007) and the European Environment State and Outlook (2010).

Joas, Anke is member of the management board of BiPRO and responsible for environment and health in the company. After some years of clinical experience in paediatrics and orthopaedics, she has worked as scientific lecturer and author, and since 1999 is consulting on environmental and health issues. She is project manager and work package leader in COPHES responsible for policy support and was involved in HBM over the last 10 years. She has managed a number of European consortia for policy advice and has long-term experience in POPs management, environmental monitoring, awareness raising, training and elaboration of guidance material.

Joas, Reinhard is educated as a chemical engineer (Dipl.-Ing.) and an economist (PhD). He is the managing director of BiPRO GmbH and works as advisor among others for the European Commission, UNEP, UNIDO, WHO and several European governments. His main areas of expertise are chemicals policy, environment &health policy, risk assessment and risk prevention as well as sound chemicals management. He was involved from the beginning into the approaches for a harmonized European Human Biomonitoring and was the coordinator of ESBIO and COPHES.

Katsonouri, Andromachi holds a B.Sc. degree in Chemistry (Honors / Summa cum Laude) from the University of Akron, OH, USA and a M.Sc. and Ph.D. in Biochemistry (Honors) from the University of Illinois at Urbana Champaign, IL, USA. Her academic achievements earned her several scholarships and recognitions, such as from the Fulbright

Foundation / Cyprus America Scholarship Program, the American Chemical Society, the Lubrizol Foundation, the Akron Rubber Group and many more. She held post doctoral fellowships in biochemistry / biophysics at Gothenburg University and Stockholm University in Sweden. Her early research focused on Natural Products Synthesis and later on the elucidation of catalytic mechanisms and structure – function relationships of membrane metalloenzymes. For her research, she worked briefly at UCLA, Los Alamos National Laboratory, Boston University, Tel Aviv University and EMBL, Heidelberg. She was a lecturer in the Department of Chemistry of the University of Cyprus from 2001 to 2004. She then joined the State General Laboratory of Cyprus, where she held appointments in environmental laboratories, before becoming head of the newly established human biomonitoring laboratory in early 2011. She has been active in Environment and Health since 2007 and served as secretary of the Cyprus National Committee on the Environment and Children's Health from 2007 until early 2012. She represented Cyprus at the Consultative Forum on Environment and Health and the WHO Environment and Health Task Force. She serves as a Focal Point of the Ministry of Health on Environment and Health for the Cyprus Presidency of the Council of EU. She is the National Focal Point for COPHES and DEMOCOPHES and Contact Person for this Cyprus Presidency Conference.

Knudsen, Lisbeth E. is at the University of Copenhagen, Section of Environmental Health. M.Sc. in Biochemistry (1980). PhD in Biomedicine 1993. Professor 2006. Research in toxicology, genotoxicology, biomonitoring of environmental and occupational exposures, alternatives to animal experiments, ethical aspects of genetic testing and human biomonitoring. LEK was National member of the Scientific Advisory Committee (ESAC) for the European Centre for the validation of Alternative Methods (ECVAM) 2000-2009, the EU implementation group on biomonitoring 2003-. At the national level Lisbeth coordinated major biomonitoring studies within occupational health: stainless steel welders 1987, busdrivers and mail carriers 1995. Member of the Research Council of the Faculty of Health Sciences, University of Copenhagen. Member of Danish Consensus Platform for 3R Alternatives to Animal Experimentation (DACOPA). LEK received the Nordic Alternative Price 2006 for promoting development of alternatives to animal testing. LEK is the coordinator of the Danish in vitro toxicology network and president in the European Consensus Platform for 3R Alternatives to Animal Experimentation (ECOPA).

Kolossa-Gehring, Marike received her state exam in Biology in 1986 and Ph.D. based on a toxicological thesis in 1991 from the University of Kiel. During all her working life she was engaged in the field of toxicology and protection of health and the environment. She joined the German Environment Agency in 1992 where she worked as a scientist in the sections environmental impacts on human health, general and international affairs of environmental chemicals and toxicology. In 2002 she became head of the section responsible for environmental risk assessment and regulation of pharmaceuticals, washing- and cleansing agents. Since 2004 she is heading the section "Toxicology, Health related Environmental Monitoring" where she is responsible for the German Environmental Survey and the German Specimen Bank which build the basis for the German system for health-related environmental monitoring. In 2010 she took over the management for a German

initiative to support human biomonitoring which is a co-operation project between the German Chemical Industry Association and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. She was member of the finalized EU-project Expert team to Support BIOmonitoring (ESBIO), a consortium preparing a concept for biomonitoring in Europe and is member of DEMOCOPHES and COPHES, the Consortium to Perform Human Biomonitoring on a European Scale preparing a human biomonitoring study for Europe. From to 2006 to 2010 she was vize-chair and chair, respectively, of the OECD Endocrine Disruptor Testing and Assessment Advisory Board. Since 2011 she is governmental councilor of the International Society of Exposure Science ISES.

Koppen, Gudrun is an Engineer in Chemistry and Agricultural Sciences (University of Ghent, Belgium, 1987-1992). She has completed a post-university degree in School Teaching (University of Ghent, 1991-1992) and in Environmental Sanitation (partly in Bochum-Germany via an Erasmus exchange program, 1992-1993). She worked one year as researcher on aerosols at the Institute of Nuclear Research of the University of Ghent (1994). Between 1994 and 1999, she completed a PhD in Applied Biological Sciences at the Free University of Brussels (Belgium) on genotoxicity testing in plants. Since 1999 she works at the Flemish Institute of Technological Research (VITO, Belgium), in the unit Environmental Risk and Health. She mainly performs project work in the field of 'human biomonitoring'. Tasks include WP coordination, study design, logistics, data interpretation, statistics and reporting. She is also involved in biomarker development and lab organisation/students supervision in the field of oxidative stress and inflammation. Projects involved in during the last years are: Flemish Environment and Health Surveys (FLEHS), Belgian WHO mother milk survey, Flemish mother milk study, Biomonitoring of PAH exposure and effects (Flanders, INTARESE), Indoor air exposure in schools (BIBA), traffic study in urban children, and the asthma allergy cohort study (FLEHS I, ENRIECO). Within Democophes she was responsible for the technical coordination of the Belgian study.

Soterios Kyrtopoulos is Research Professor at the Institute of Biology, Medicinal Chemistry and Biotechnology of the National Hellenic Research Foundation. His main research interests lie in the area of the development and application of biomarkers of environmental health. He has participated in a large number of European projects and is currently coordinating the FP7 project "Envirogenomarkers". He is author of more than 115 papers in international journals with approx. 2,000 citations. He is a member of the editorial boards of a number of international journals and past member of the EC Scientific Advisory Committee for Toxicity, Ecotoxicity and the Environment.

Lavranos, Giagkos M. was born in Pireaus, Greece in 1983 and has been living permanently in Cyprus since 2008. He entered the Medical School of the University of Athens after achieving the highest total grade among Greek students in the Panhellenic Examinations for admittance to tertiary education and graduated in 2007 with distinction. Subsequent postgraduate studies have resulted in the award of an MA in Health Management (Open University, Cyprus) and a PhD on liver regeneration (Athens University, Greece) in 2012. At present he is specializing in Internal Medicine in Nicosia General Hospital,

expected to reach completion of training in early 2013. Throughout his academic career, he has been awarded a number of distinctions and prizes for academic merit, including the scholarship offered by the National Foundation of Scholarships of Greece, the Mavrokordatos and Kontoleontos Scholarships of Athens University, the Athens Medical School Honorary Award, the Panhellenic Medical Olympiad 1st Prize and the doctoral grant of the Propondis Foundation and has participated in several EU-funded research projects. He has published 58 academic papers in Greek and English, as well as chapters in several medical books and is a frequent reviewer for various international medical journals. He speaks Greek, English, French and German and acts as a volunteer for various patient unions, including the Pancyprian Diabetes Association. Since April 2011 he has joined the Cyprus DEMOCOPHES team as a senior medical researcher, with a particular interest in the reproductive and liver toxicity of heavy metals and other environmental pollutants.

Lehmann, Andrea D. is an external Expert for the realization and management of the EU coordinated Human Biomonitoring pilot study DEMOCOPHES at Federal Office of Public Health in Switzerland. Her current work involves Building up a national HBM network, exchange with the international network and the organisation of the first HBM symposium of the Federal Office of Public Health in 2012. She holds a Bachelor's Degree in Human Movement Sciences (BSc ETH HMS), ETH Zurich, a Master's Degree study in Human Movement Sciences (MSc ETH HMS), ETH Zurich and a Ph.D. in Cellular and Biomedical Science. She attended an Additional programme for Didactic Education in Human Movement Sciences, ETH Zurich.

Ligocka, Danuta, PhD, is head of the Laboratory of Environmental Organic Pollutants Monitoring, Nofer Institute of Occupational Medicine, Lodz, Poland. Her early research was focused on air pollution and hygienic evaluation of workplace. Then her main areas of interest were toxicokinetics studies in animals and qualitative and quantitative analysis of metabolites. On presentation of a doctoral thesis on `The dispositon and metabolism of 1,3-[14C]-Dioxolane and 1,3,5-[14C]-Trioxane in rats´ she was granted a Ph.D. degree in medical biology. For 3.5 years she was visiting scientist at the Industrial Toxicology and Occupational Medicine Unit, Catholic University of Louvain in Brussels. She is mainly engaged with the management of Projects related to the development of analytical methods and of biological monitoring of exposure, mainly to ETS, phthalates, pesticides, dioxins and PCB. She is the member of the Scientific Commission of Occupational Exposure Limits in Poland, and the technical expert/auditor of Polish Centre of Accreditation. Danuta Ligocka is COPHES and DEMOCOPHES NMU/NFP.

Lupsa, Iona, MD, PhD is a specialist in diabetes mellitus, nutrition and metabolic diseasesa and an environmental health scientist at the Department of Environmental Health. Her main activities and responsibilities invlove health protection and prevention of diseases associated to environmental risk factors, health status and risk factors assessment, screenings of the population nutritional status and chronic diseases; research support projects for methods and decision support tools for environmental health risk analysis and policy development. Working in National Projects of the Romanian Ministry of Health on: prevalence of arterial hypertension, obesity and metabolic disorders

(diabetes mellitus, dyslipidaemia); nutritional quality and contamination of meat products and food supplements in Romania; strengthening the institutional and administrative capacity of the Ministry of Health to adopt and implement the Acquis Communautaire in the field of water, and health related risks. Projects of Excellency Research – Romanian Ministry of Education and Research: study of synergist bioactivity of antioxidant functional food regarding reversibility of the metabolic syndrome; promotion of innovative and constant technologies for treating water in order to obtain drinking water.

Pavlou, Pavlos, Dr., M.B., Ch.B., MRCP(UK), MSc is Head of the recently formed Health Monitoring Unit of the Ministry of Health of Cyprus. He studied Medicine at the University of Manchester and became a Member of the Royal College of Physicians (UK). He specialized in Internal Medicine in England and General Practice in Cyprus. He obtained an MSc in Environmental Health in 2008. In 2001 he was detached to the Ministry of Health and was given responsibility for setting up and organizing the Health Monitoring Unit. He represented Cyprus in the Network of Competent Authorities and in the Health Information Committee of the European Commission. He is a Member of the Steering Committee of the Middle East Cancer Consortium. He is Head of the Working Group for introducing clinical coding procedures in public hospitals. He has implemented a major upgrading of the Mortality Coding procedures in Cyprus, upgraded the Medical Birth Register in State Hospital Maternity Units and introduced the Injury Database in Nicosia General Hospital. He has recently taken charge of the Cyprus Cancer Registry. He is responsible for reforming the registry and for introducing new procedures in casefinding and registration, including electronic data transfer

Reis, M. Fátima has a PhD in Chemistry and has Post-graduations in "Health Information and Knowledge Management", "Practical Epidemiology", and "Humanitarian Medicine". She has an extensive experience as a chemist in the field of nuclear analytical techniques (mainly Instrumental Neutron Activation Analysis), being the first person responsible for the implementation and development of an automated neutron activation system for short-lived nuclides in the Portuguese Nuclear Research Reactor. She has been a Senior Researcher at the National Institute of Health and Coordinator of the Toxicology and Nutrition Laboratory, being member of the National Committee for the Study and Surveillance of Transmissible Spongiform Encephalopathies (by ministerial nomination). She is, at present, Head of the Environmental Health Unit of the Institute of Preventive Medicine and, for the past decade, Coordinator of three Environmental Health Surveillance Programs developed in Portugal in the vicinity of solid waste incinerators (each program comprises 14 monitoring projects to evaluate exposure and health effects in the populations residing in the areas of incinerator's influence, most of them including HBM activities). She is also Supervisor of academic studies (MSc and PhD dissertations) related with Environmental Health, the Coordinator of research teams and the Principal Investigator of several research projects developed for better understanding the relationship between Environment and Health in the contexts in which health is harmed, improved or maintained. She is the Coordinator and, for the past seven years, the Principal Professor of the first Course on Environmental Health organized and implemented under

her responsibility in the medical curriculum of Lisbon's Faculty of Medicine. By official national nomination she has been member of the Technical Working Groups (TWGs) in support of the EC Strategy on "Environment and Health", namely the TWG Biomonitoring of Children and she is member of the HBM Implementation Group.

Schoeters, Greet is program manager of environmental health at VITO (The Flemish Institute for Technological Research) and professor at the department of biomedical sciences of the University of Antwerp where she coordinates a master's program on environment and health. She coordinates the Flemish human biomonitoring study (FLEHS) of the Flemish ministries of Environment and Health (2002-2015) and participates in the EU ESBIO and EU COPHES project to prepare a European human biomonitoring program. She is president of ESTIV, the European Society for Toxicology in Vitro and committed to initiatives for accelerating the transition to a toxicity pathway-based paradigm for chemical safety assessment. She was member of the CONTAM panel of the European Food Safety Agency (2003-2006). She is author and co-author of more than 120 manuscripts in peer reviewed journals. She participates in several EU framework programs in the areas of FOOD: effects of prenatal exposure to food contaminants (EU-ATHON and EU-OBELIX) , ENVIRONMENT: use of biomonitoring for health impact assessment (EU-INTARESE, CEFIC-LRI). Greet Schoeters is is WP4 leader in Cophes.

Sepai, Ovnair trained as an analytical chemist at the University of London and gained a PhD in Chemistry. Subsequent postdoctoral positions at the Medical Research Council Toxicology Unit London and Institute for Toxicology and Pharmacology in Wurzburg Germany allowed Ovnair to develop her interest in Human Biomonitoring. Her research interests have always been in the application of analytical techniques to toxicology, understanding exposure and mechanisms of toxicity. Human Biomonitoring projects require different skills to purely laboratory based science. Ovnair now leads a toxicology group at the UK Health Protection Agency. This group provides health risk assessment and advice to the public, UK government and many other stakeholders in relation to exposure to chemicals from water, contaminated land and waste, cosmetics and consumer products. Communication has been a huge learning curve – with many valued lessons learnt. Ovnair was Work Package Leader on Communication and Dissemination for COPHES and UK National Focal Point for DemoCOPHES

Notes