



"Cross-Mediterranean Environment and Health Network (CROME)"

LIFE12 ENV/GR/001040



Cross-Mediterranean Environment and Health Network

CROME-LIFE

ANNEX 19

Deliverable D.1.6

Report on the second Interregional Workshop in Rome

**LIFE ENVIRONMENT PROGRAMME
LIFE12 ENV/GR/001040**

<http://www.crome-life.eu>



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Task Technical Report



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CROME-LIFE

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CROME-LIFE+ "Cross-mediterranean network for environment and health"

Workshop interregionale, 21/04/2016, 9.00-17.00

Aula Bovet, Istituto Superiore di Sanità, Viale Regina Elena 299, 00161 Roma (Italy)

Workshop Agenda

- 9.00 Saluti introduttivi da parte del Presidente ISS, Prof. Walter Ricciardi
- 9.15 The CROME Project: Introductory overview (environmental problem tackled, main objectives, methodologies applied, expected results)
Dimosthenis Sarigiannis, *Project Coordinator*
Aristotle University of Thessaloniki, GREECE
- 9.45 The PROBE adolescent cohort in the Latium Region (Italy): applying the CROME integrated approach to fill data gaps in a human biomonitoring study on metals
Anna Pino, Beatrice Bocca, Jenny D'Aversa, Alessandro Alimonti
Department of Environment and Primary Prevention, Istituto Superiore di Sanità (ISS), ITALY
- 10.05 The NAC-II birth cohort in Friuli-Venezia Giulia Region: prenatal and childhood exposure to mercury and neuropsychological maturation at 7 years
Gemma Calamandrei¹, Flavia Chiarotti¹, Fiorino Mirabella¹, Aldina Venerosi¹, Anna Pino¹, Beatrice Bocca¹, Alessandro Alimonti¹, Luca Ronfani², Liza Vecchi Brumatti², Marika Mariuz³, Valentina Rosolen⁴, Fabio Barbone⁵
¹*Istituto Superiore di Sanità, Roma ITALY*; ²*Institute for Maternal and Child Health - IRCCS "Burlo Garofolo" - Trieste, ITALY*; ³*DSMB, University of Udine, and Central Health Directorate, Friuli Venezia Giulia Region, ITALY*; ⁴*DSMB, University of Udine, Udine, ITALY*; ⁵*DSMB, University of Udine and DSM University of Trieste, Trieste, ITALY*.
- 10.25 ApoE polymorphism and neurodevelopment in mercury exposed population in PHIME cohort in Slovenia and Croatia
Janja Snoj Tratnik^{1,7}, Ingrid Falnoga¹, Ajda Trdin^{1,7}, Darja Mazej¹, Alenka Sešek Briški³, Joško Osredkar³, Mladen Krsnik³, Alfred B. Kobal², David Neubauer³, Jana Kodrič³, Staša Stropnik³, David Gosar³, Janja Marc⁴, Igor Prpić⁶, Zdravko Špirič⁵, Milena Horvat^{1,7}
¹*Jožef Stefan Institute, Department of Environmental Sciences, Ljubljana, SLOVENIA*; ²*Ex-Department of Occupational Health, Idrija Mercury Mine, Arkova 43, 5280 Idrija, SLOVENIA*; ³*University of Ljubljana, University Medical Centre Ljubljana, SLOVENIA*; ⁴*University in Ljubljana, Faculty of Pharmacy, SLOVENIA*; ⁵*OIKON, Institute of Applied Ecology, Zagreb, CROATIA*; ⁶*University of Rijeka, Medical Faculty of Rijeka, Department of Paediatric, CROATIA*; ⁷*Jožef Stefan's International Postgraduate School, Ljubljana, SLOVENIA*; *Jozef Stefan Institute (JSI), Ljubljana, SLOVENIA*.

10.45 -11.10 Coffee Break



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11.10 The results from the first Slovenian human biomonitoring survey; toxic and essential elements

Darja Mazej¹, Janja Snoj Tratnik¹, Zdenka Šlejkovec¹, Marta Jagodic¹, Vesna Fajon¹, Majda Pavlin¹, Anja Stajnko¹, Mladen Krsnik², Alenka Sešek Briški², Marija Prezelj², Milan Skitek², Alfred B. Kobal¹, Lijana Kononenko³, Milena Horvat¹

¹Jožef Stefan Institute, ² University Medical Centre, ³ Ministry of Health, Chemical Office of the Republic of Slovenia, Ljubljana, SLOVENIA.

11.30 Main intake routes of incorporation of organic pollutants and toxic metals into human Mediterranean populations

Joan O. Grimalt¹, Mercè Garí¹, Eva Junqué¹, Anna Arce¹ and Maties Torrent²

¹Institute of Environmental Assessment and Water Research (IDAEA-CSIC). Barcelona, Catalonia, SPAIN; ²Health Area of Minorca, IB-SALUT, SPAIN.

11.50 Impact of atmospheric pollution generated by remediation of riverine industrial residues into human populations

Esther Marco, Barend van Drooge and Joan O. Grimalt

Institute of Environmental Assessment and Water Research (IDAEA-CSIC). Barcelona, Catalonia, SPAIN.

12.10 The CROME approach to estimation of cancer risk due to biomass burning in Greece

Dimosthenis Sarigiannis^{1,2} and Spyros Karakitsios¹

¹Environmental Engineering Laboratory, Aristotle University of Thessaloniki (AUTH) GREECE, ²Institute for Advanced Study, Pavia, ITALY.

12.30 Networking: breve presentazione dei progetti LIFE PERSUADED (Cinzia La Rocca, ISS) e MAPEC (Gabriele Donzelli, Università di Pisa)

13.00 - 14.00 Lunch

14.00 - 15.30 Tavola rotonda con i portatori di interesse "Ambiente e salute del bambino: metodologie e azioni per la valutazione integrata del rischio"

14.00 - 15.30 Round table with stakeholders "Environment and children health: methodologies and actions for integrated risk assessment"

Partecipano: Ministero della Salute, Associazione Culturale Pediatri (ACP), Legambiente, ISDE Medici per l'Ambiente, Società Italiana Neuropsichiatria Infantile (SINPIA), ARPA Lazio, Dipartimento di Epidemiologia Servizio Sanitario Regione Lazio, Associazione Nazionale per la Microcitemia (ANMI), Associazione Italiana per lo Studio degli Elementi in Traccia negli Organismi Viventi (AISETOV).

Final part of the meeting restricted to project partners

15.30 - 17.30 This session is dedicated to plan the activities and the interaction among partners during the last phase of the CROME project



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Minutes of the CROME-LIFE interregional workshop, Rome (Italy), April 21st 2016

The first CROME-LIFE interregional workshop was held in Rome at the ISS premises on April 21st 2016. About fifty people among researchers of academia and government research bodies, representatives of the National and Regional Health Services and various stakeholders participated to the workshop.

The ISS President welcomed the audience, acknowledging the multilevel approach of the CROME-LIFE consortium, and stressing the importance of informed and timely communication to the citizens on environmental health issues.

The Project Coordinator Prof. Dimosthenis Sarigiannis (AUTH) opened the workshop, introducing the CROME-LIFE methodology and approach to the audience. He explained how the CROME-LIFE project is demonstrating that chemical contamination, internal doses/biomonitoring data and health outcomes can be linked in an integrated framework to improve exposure and health risk assessment. The CROME-LIFE integrated methodology has been applied in four countries the Mediterranean area. After the introductory lecture, the four countries participating to the CROME-LIFE network communicated the results of national case Studies (Action B2) and CROME common study (Action B3).

Dr. Anna Pino (ISS Unit, Italy) presented the results of the re-analysis of the biomonitoring data collected in a cohort of 453 adolescents living in the Latium Region (Italy) within the EWAS perspective. Blood samples of these subjects have been originally analyzed for 18 metals (As, Cd, Co, Cr, Hg, Ir, Mn, Mo, Ni, Pb, Pd, Pt, Rh, Sb, Sn, Tl, V, and W) by SF-ICP-MS within the PROBE project, to assess reference values for Italian adolescents. The data base included, for each subject, information such as sex, use of junk jewellery, presence of dental fillings, braces, piercing and/or tattoos, diet habits, lifestyle factors (e.g. exposure to environmental tobacco smoke, alcohol consumption, use of cosmetics, etc.) and parents' occupational status. The CROME-LIFE project adopted an integrated approach combining HBM data with environmental exposure, showing interesting associations between HBM data and exposure determinants. The generic PBTk model was used to link the exposures to some metals with the measured blood concentrations to provide critical information for their distribution in the human body.

Dr. Gemma Calamandrei (ISS Unit, Italy) presented the preliminary results of the new biomonitoring campaign carried out in Italy that consisted in the follow-up of 200 children born within the Northern Adriatic Cohort (NAC II) now at the age of 7 years. Child's hair, child's urine and saliva sample of both mother and child (Oragene DNA self-collection kit) have been collected from each child-mother pair at the time of appointment together with information related to environmental exposures and lifestyle factors. Chemical analyses of biological samples collected following neuropsychological assessment consisted in measurements of the concentration of five neurotoxic metals (mercury, lead, manganese, cadmium, arsenic) in either hair or urine. Results show that total Hg exposure during pregnancy and breastfeeding did not significantly affect neuropsychological performances at 18 months, 40 months or 7 years. However, though in absence of significant impairments of behavioral functions at different ages, the results highlight the complex interaction between environmental exposures, lifestyle, and time of outcome assessment supporting the value of the integrated CROME-LIFE approach in risk modeling.



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Within the context of the CROME-LIFE common study, Dr. Janja Tratnik (JSI, Slovenia) presented the results obtained in the Slovenia mother-child cohort. In its study JSI focused its study on the role played by gene polymorphisms and other relevant confounders in increasing vulnerability to MeHg assumed through the diet. *ApoE* $\epsilon 4$ allele is one of the risk factors associated with Alzheimer disease, but the role of apolipoprotein E genetic variants has become increasingly apparent also in neurodevelopment. The results indicated that even low-to-median Hg exposure levels in children with normal neurodevelopmental outcomes can result in lower cognitive and fine motor score at 18 months of age. The decrease in cognitive function was significant only in the children carrying at least one *ApoE* $\epsilon 4$, while the Hg-related decrease in fine motor score was independent of the *ApoE* genotype. Adjusting for selenium (Se) and lead (Pb) revealed positive influence of Se on language and negative influence of Pb on motor function, but only in the subgroup of children not carrying the $\epsilon 4$ allele.

Dr. Darja Mazej (JSI, Slovenia) illustrated the Slovenian human biomonitoring programme focusing on environmental chemicals and looking at spatial differences in exposure. The study population includes lactating women who have given birth for the first time and men from the same area in the age from 20-40 years. Twelve areas in Slovenia covering urban, rural and potentially contaminated areas due to past human activities were chosen. A total of 1096 persons were sampled (535 women and 561 men). The results of analysis are comparable with the results of similar studies in other countries. Exposure of general population to toxic elements such as lead, mercury, cadmium and arsenic is low and generally does not pose a risk to the population under investigation. Results of the analysis for essential elements (selenium, copper and zinc) are within the ranges given by international organizations and are comparable with other studies elsewhere in the world, which means that there was no noticeable lack or excess of these elements in participating subjects except in some individuals. Evaluation of results of POPs analysis is in progress. The data obtained will allow a health risk assessment of Slovenian population as well as further development and implementation of risk reduction measures.

Two presentations provided by the Spanish group in CROME-LIFE (Prof. Joan Grimalt, CSIC, Spain) reported the results of two biomonitoring campaigns carried out in the island of Minorca and the Municipality of Valencia on one hand, and in a specific area of Catalonia (corresponding to the village of Flix) on the other. Previous results relative to incorporation of mercury and organohalogen compounds into newborns in the island of Minorca and the Municipality of Valencia showed that fish is a key intake route. The results were communicated to the public health authorities of both areas who requested to further investigate which specific food items were contributing more to the overall internal dose. Accordingly, within the CROME-LIFE common study, field campaigns for analysis of representative food items in the diet of these populations were executed. All these studies provided a detailed description of the main food items responsible for the uptake of mercury and organohalogen compounds into the population of these Mediterranean cohorts.

The second study illustrated a global monitoring plan for the sampling and analysis of organochlorine compounds in the Municipality of Flix, a village in the Catalonia region located besides a water reservoir of the Ebro River in which 500,000 tones of residues from a chlor-alkali plant were dumped. Remediation works for the removal of these residues, thermal treatment and disposal in a land fill were carried out. During these remediation works significant amounts of organochlorine compounds were released into the atmosphere. Strong concern was posed as



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consequence of these emissions since the area has a record of high exposure to hexachlorobenzene which involved higher incidence of thyroid cancer and thyroid disfunctions in adults. Accumulation of 4,4'-DDT and 4,4'-DDE has also been documented in relation to exposure to factory dumping. The median concentrations of all compounds were found to be lower than non carcinogen effect levels. Perchloroethylene, hexachlorobenzene and hexachlorobutadiene were found at concentrations lower than one cancer per million. However, trichloroethylene and carbon tetrachloride were present at concentrations corresponding to one cancer every 100,000 inhabitants, with children showing the higher exposure levels.

A final communication given by Prof. Sarigiannis (AUTH, Greece) described the work carried out by the University of Thessaloniki (AUTH) team. Over the last couple of years, the use of biomass as heating source was allowed in Greece as a CO₂-neutral means of space heating in the large metropolitan areas of Athens and Thessaloniki affecting more than half of the country's population. At the same time the use of light heating diesel was heavily taxed. In the same period Greece faces a financial crisis with significant repercussions on the average household income. This combination resulted in reduced traffic loads but excessive biomass use for domestic heating. In this context, the AUTH study dealt with the assessment of the seasonal variability of PM exposure and the related carcinogenic risk from poly-aromatic hydrocarbons (PAHs) in particulate matter in the area of Thessaloniki. A field campaign of PM measurements in air was conducted during warm and cold period for the last 4 years (from 2012 to 2016). Three fractions of particulates (PM₁, PM_{2.5} and PM₁₀) were measured in two sampling sites (urban/residential and traffic influenced) followed by chemical analysis of 19 PAHs and levoglucosan the latter used as a biomass marker tracer.

PAH-induced lung cancer risk was estimated through the CROME-LIFE methodology that incorporated human respiratory tract deposition modelling in order to estimate the toxic equivalent concentration (TEQ) at each target tissue. This allowed to further differentiating internal exposure and risk by age groups. Results showed that all PM fractions are higher in Greece during the cold months of the year, mainly due to biomass use for space heating. The estimated lung cancer risk was non-negligible for residents close to the urban background monitoring site: higher risk was estimated for infants and children, due to the higher bodyweight normalized dose and the human respiratory tract (HRT) physiology. With the methodology developed in CROME-LIFE, the estimated risk presents a 5–7 times difference between the two sampling sites (depending on the age group). These differences could not have been identified based only on conventional risk assessment method. Consequently, the actual cancer risk attributable to PAHs on PM emitted from biomass burning would have been significantly underestimated.

Networking

A specific part of the workshop was dedicated to networking activities, with presentation of two LIFE+ Projects (PERSUADED and MAPEC) focusing on biomonitoring and children health in Italy. In particular, Dr. Cinzia La Rocca (ISS, Italy) illustrated the PERSUADED project (Phthalates and bisphenol A biomonitoring in Italian mother-child pairs: link between exposure and juvenile diseases). This project is focused on evaluation of internal levels of phthalates metabolites and bisphenol A in children and adolescents of Italian population, and it is aimed at setting reference ranges for DEHP and BPA exposure in Italian children and women, according to the area of



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residence, at evaluating environmental factors, food habits and lifestyles as sources of EDs exposure, and at integrating internal EDs levels with biomarkers of effect related to such diseases, as a proxy of potential adverse outcomes. Dr. Gabriele Donzelli (CNR, Pisa, Italy) explained the main objectives of the MAPEC project (Monitoring Air Pollution Effects on Children for supporting public health policy). In MAPEC a total of 1,000 children (200 children in each town) aged 6–8 years were recruited from five Italian towns (Brescia, Turin, Pisa, Perugia and Lecce), with different levels of airborne particulates. Two biomarkers of early biological effects, DNA damage by the comet assay and the micronuclei (MN) test, were investigated and related to different levels of air pollution measured near the schools involved in the research.

Round table

The technical part of the workshop was followed in the afternoon by a round table discussion with stakeholders, focusing on "*Environment and child health: methodologies and actions for integrated risk assessment*". Invited stakeholders were the following: Ministero della Salute (Ministry of Health), Associazione Culturale Pediatri (Pediatrician Cultural Association; ACP), Legambiente (the major Italian Environmentalist Association), Società Italiana Neuropsichiatria Infantile (Child Neuropsychiatry Association; SINPIA), Regional Authority for Environmental Protection (ARPA Lazio), Dipartimento di Epidemiologia Servizio Sanitario Regione Lazio (Department of Epidemiology of the Latium Health Service), Associazione Nazionale per la Microcitemia (Italian National Association of Microcitemia; ANMI), Associazione Italiana per lo Studio degli Elementi in Traccia negli Organismi Viventi (Italian Association of Trace Elements; AISETOV), Società di Medicina Preventiva (Italian Association of Preventive Medicine).

One of main topics discussed was the increased prevalence rate of neurodevelopmental disorders, which appears to become a global emergency. This evidence requires greater efforts by National Governments, Health Authorities and Research Bodies to investigate the potential developmental neurotoxicity of several environmental chemicals, including metals, particulate matters, and pesticides. In such framework, several participants pointed out the need to establish an integrated national system to monitor environmental exposures. In this light biomonitoring programmes of general population and vulnerable groups such as pregnant women and infants/children should be implemented at national level. Innovative methods, both in terms of detection of individual exposure (i.e. sensors) and data analysis are now available, and represent a great opportunity to support preventive policies. It was acknowledged that the approach developed by CROME-LIFE goes in such direction.

A second main topic addressed entailed the issues related to the risk communication to population, especially in highly polluted areas. Although political, economic and administrative bodies are designed to tackle environmental concerns through large-scale policies and strategic decisions, these often leave citizens as unengaged and silent observers. Too often the scientific community and the local health authorities have difficulties in communicating the real risks to citizens. It is no longer sufficient to develop and provide passive lists of environmental indices or reports and inform citizens about changes in their living environment. There is the need to empower citizens to raise their awareness on how improve their own health and wellbeing through actively informed choices. For example, it is correct to explain people that being exposed to a given chemical does not necessarily mean developing a disease, but the role of risk cofactors (life style, diets, etc.) modulating health and disease should be better explained to the citizens, especially in the more polluted areas. Involving citizens by developing knowledge pools can help to



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promote more active participation and generate a sustainable movement that can build over time. Citizens have expectations to interact and to participate in the decision making processes, and to be engaged in a dialogue about their communities. Altogether, as also emphasized by Prof. Sarigiannis, there is the need to develop new languages and new tools for disseminating knowledge about complex problems.

A third topic discussed concerned education on environmental health issues. The Italian National Health System has a diffused network of primary care pediatricians, who follows the same child from birth to 14 years of age. Associations of pediatricians require updated and high-quality education on environmental health issues. More courses should be promoted by the Ministry of Health, and organised by the ISS: pediatricians and general practitioners are very often the natural points of reference for population. They need to be properly informed to prevent useless alarms on one side, and to suggest the lifestyles more appropriate to reduce health risks on the other. The involvement of gynaecologists is highly advisable in such educational programme.

Along the meeting, the CROME-LIFE panel board was exhibited in the ISS premises; CROME-LIFE leaflets in Italian were distributed to the participants together with a brochure containing a summary of the CROME objectives and methodology and the abstracts of the oral communications both in English and Italian language.



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Pictures



