INTERNATIONAL WORKSHOP

IMPACTS OF EARLY LIFE EXPOSURE TO

ENVIRONMENTAL CONTAMINANTS:

CHILDREN'S HEALTH IN THE ANTHROPOCENE

ABSTRACTS BOOK

ORGANIZING COMMITTEE

Ana Sousa (co-chair)

Department of Biology, University of Évora & Comprehensive Health Research Center (CHRC), Portugal

Ramiro Pastorinho (co-chair)

Department of Medical and Health Sciences, University of Évora & Comprehensive Health Research Center (CHRC), Portugal

Sónia Namorado

Department of Epidemiology, National Institute of Health Dr. Ricardo Jorge & Comprehensive Health Research Center (CHRC), Portugal

Tomohiko Isobe

Health and Environmental Risk Division, National Institute for Environmental Studies, Japan

Yu Ait Bamai

Center for Environmental and Health Sciences, Hokkaido University, Japan / Toxicological Center, University of Antwerp, Belgium

SCIENTIFIC COMMITTEE

Ana Sousa (co-chair)

Assistant Professor, Department of Biology, University of Évora & Comprehensive Health Research Center (CHRC), Portugal

Lino Patrício, MD, PhD

Invited Associate Professor, Head, Lifespan Chair in Demographic Sustainability and Health Department of Medical and Health Sciences, University of Évora & Comprehensive Health Research Center (CHRC), Portugal

Luís Taborda Barata, MD, PhD

Full Professor, Coordinator, Health Sciences Research Center, University of Beira Interior (CICS-UBI), Department of Medical Sciences, Faculty of Health Sciences, University of Beira Interior, Portugal

Ramiro Pastorinho (co-chair)

Assistant Professor, Department of Medical and Health Sciences, University of Évora & Comprehensive Health Research Center (CHRC), Portugal

Sónia Namorado

Researcher, Department of Epidemiology, National Institute of Health Dr. Ricardo Jorge & Comprehensive Health Research Center (CHRC), Portugal

Tomohiko Isobe

Chief Senior Researcher, Health and Environmental Risk Division, National Institute for Environmental Studies, Japan

Yu Ait Bamai

Senior Visiting Researcher, Center for Environmental and Health Sciences, Hokkaido University, Japan / Toxicological Center, University of Antwerp, Belgium

IMPACTS OF EARLY LIFE EXPOSURE TO ENVIRONMENTAL CONTAMINANTS:

CHILDREN'S HEALTH IN THE ANTHROPOCENE

SPONSORS

PÃO DA SÃO

Casa Advinha
desde 1984
mel
Portel
Alentejo

QUINTA DO LAGARTO

BE AROMATIC
organic herbs

HERDADE GRANDE
PROPRIEDADE DE FAMÍLIA DESDE 1920
HG
FAMILY OWNED SINCE 1920

International Journal of
Environmental Research and Public Health
an Open Access Journal by MDPI

SPEDM
SOCIEDADE PORTUGUESA
DE ENDOCRINOLOGIA
DIABETES E METABOLISMO

30 SEPTEMBER 2022

UNIVERSITY OF EVORA · PORTUGAL

IMPACTS OF EARLY LIFE EXPOSURE TO ENVIRONMENTAL CONTAMINANTS:

CHILDREN'S HEALTH IN THE ANTHROPOCENE

PROGRAM

OPENING SESSION
(**Chair: Ramiro Pastorinho**, University of Évora, Portugal)

09:00 - 9:30   Évora Mayor, **Carlos Pinto de Sá**
University of Évora Vice-Rector, **João Nabais**
IIFA (University of Évora Research Institute) Director, **Rui Salgado**
CHRC (Comprehensive Health Research Center - Évora) Director, **Armando Raimundo**

SESSION I
Children in a Chemicals' World
(**Chair: Tomohiko Isobe**, National Institute for Environmental Studies- NIES, Japan)

09:30 - 10:15   **Keynote**
Shoji F. Nakayama, NIES, Japan
"Exposome and children's health: Towards primordial prevention"

10:15 - 10:30   **Yu Ait Bamai**, Center for Environmental and Health Sciences, Hokkaido University, Japan/ Toxicological Center, University of Antwerp, Belgium
"Impact of PFAS and plastic-related environmental chemicals on childhood asthma and allergies and infectious diseases"

10:30 - 10:45   **Joana Madureira**, Environmental Health Department, National Institute of Health, Porto; EPIUnit, Institute of Public Health, University of Porto & Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal
"Quantitative health risk assessment of the chronic inhalation of volatile organic compounds in indoor home environments"

10:45 - 11:00   **Discussion Session I**
11:00 - 11:30   **Coffee-Break and Poster Session**

SESSION II
A Clinical Take on Children and The Environment
(**Chair: Ana Catarina Sousa**, University of Évora, Portugal)

11:30 - 12:10   **Keynote**
Leonardo Trasande, NYU Grossman School of Medicine, USA
"Endocrine Disrupting Chemicals: Health Effects in Children and Policy Implications"

12:10 - 13:00   **Debate**
Leonardo Trasande, NYU Grossman School of Medicine, USA
Shoji F. Nakayama, NIES, Japan
Ricardo Mexia, National Institute of Health Dr. Ricardo Jorge, Portugal
Raquel Carvalho, Member of the Board, Portuguese Society of Endocrinology

13:00 - 14:30   **Lunch**

SESSION III

Chemically Innocent: A Series of Unfortunate Contaminants...

(Chair: Yu Ait Bamai, University of Antwerp, Belgium)

14:30 - 15:15	**Keynote** **Adrian Covaci, University of Antwerp, Belgium** "Exposure to plasticizers of premature newborns in Neonatal Intensive Care Unit"
15:15 - 15:30	**Electra Manea-Karga**, Laboratory of Pesticides' Toxicology, Benaki Phytopathological Institute, Athens, Greece "Determination of pesticide residues and their metabolites in maternal milk, serum and urine using high throughput mass spectrometry techniques"
15:30 - 15:45	**João Xavier Santos**, National Institute of Health Dr. Ricardo Jorge, Portugal & BioISI – Biosystems & Integrative Sciences Institute, Portugal "Evidence for an association of prenatal exposure to particulate matter with clinical severity of Autism Spectrum Disorder"
15:45 - 16:00	**Discussion Session III**
16:00 - 16:30	**Coffee-Break and Poster Session**

SESSION IV

Not Created Equal: Children's Chemical Exposure in The Anthropocene

(Chair: Sónia Namorado, Instituto Nacional de Saúde Dr. Ricardo Jorge, Portugal)

16:30 - 17:15	**Keynote** **Greet Schoeters, University of Antwerp, Belgium** "Inequity of chemical exposure and risks in European children: results from HBM4EU"
17:15 - 17:30	**Usha Dahal**, Institute of Family Medicine and Public Health, University of Tartu, Estonia & Institute of Social Science, University of Tartu, Estonia "Perinatal health inequalities in the industrial region of Estonia: a birth registry-based study"
17:30 - 17:45	**Carla Costa**, Environmental Health Department, National Institute of Health, Porto; EPIUnit, Institute of Public Health, University of Porto & Laboratory for Integrative and Translational Research in Population Health, Porto, Portugal "Assessing tobacco exposure during pregnancy: face-to-face questionnaires vs. urinary cotinine"
17:45 - 18:00	**Discussion Session IV**
18:00	**Wine Tasting**

POSTERS

P1: "Link the Results of the Birth Cohort Study to Chemical Regulation"

Isobe T, Ueyama J, Iwai-Shimada M, Takagi M, Oguri T, Shinohara N, Kunisue T, Nomiyama K, Tanoue R, Nakayama SF

P2- "Environmental measurements in the Sub-Cohort Study of the Japan Environment and Children's Study (JECS)"

Nishihama Y, Nakayama SF, Isobe T

P3- "Ten-year temporal trends (2006–2015) and cross-sectional characterization of urinary concentrations of glyphosate in Japanese children"

Ueyama J, Wada K, Nomura H, Nakane K, Nishihara N, Kitahara Y, Watanabe S, Nagata C, Kamijima M, Saito I

P4- "Adapting the ELEAT (Early Life Exposure Assessment Tool) to Portugal – a pilot study to tackle gene-environment interactions in Autism Spectrum Disorder"

Rasga C, Santos JX, Marques AR, Vilela J, Martiniano H, Sampaio P, Faria C, Oliveira G, Bennett D, Walker C, Schmidt R J, Vicente AM

P5- "Suitable seafood dietary advice for reducing mercury exposure during pregnancy in Portugal: results from the HBM4EU-mom Project"

Peres M, Assunção R, Santiago S, Nunes CL, Esteban López M, Dominguez Morueco N, Pedraza Diaz S, Juliá M, Castaño A, Ingi Halldórsson Þ, Jacobsen E, Gabriel C, Karakoçtzidis A, Karakitsios S, Giannadaki D, Hadjipanayis A, Anastasi E, Thoma C, Snoj Tratnik J, Horvat M, Martin LR, Gilles L, Govarts E, Schoeters G, Sarigiannis D, Katsonouri A, Namorado S

P6- "Dietary exposure to phthalate plasticizers through infant formula consumption in Brazil"

Petrarca MH, Tfouni SAV

P7- "Assessing early-life exposure to mycotoxins in Portugal: results from the earlyMYCO pilot study"

Martins C, Namorado S, Assunção R, Costa A, Serrano D, Visintin L, De Boevre M, Lachat C, Vidal A, De Saeger S, Vidigal C, Almeida A, Alvito P

P8- "Quantitative health risk assessment of the chronic inhalation of volatile organic compounds in indoor home environments"

Costa C, Slezakova K, Valongo C, Teixeira JP, Madureira J

P9- "Urban vs rural – impacts of air pollution on the allergenic content of *Platanus* tree pollen"

Costa AR, Lara B, Galveias A, Otílio M, Rojo J, Antunes CM, Perez-Badia R

P10- "Developing a Japanese Exposure Factors Database"

Takagi M, Isobe T, Iwai-Shimada M, Kobayashi Y, Nakayama SF

P11- "High-sensitive determination method of insect repellents and its metabolites in human urine by solid-phase extraction and high-performance liquid chromatography-tandem mass spectrometry"

Nishihara N, Isobe T, Takagi M, Nakayama S, Iwai M, Kunisue T, Oguri T, Saito I, Ueyama J

P12- "Effect of endocrine disruptors in spermatogonial stem cells metabolism: a protective role for regucalcin?"

Correia S, Feijó M, Cavaco JEB, Ramalho-Santos J, van Pelt A, Socorro S

P13- "Tributyltin at nanomolar levels disrupts Sertoli Cell glycolytic metabolism"

Rato L, Alves MG, Silva BM, Jarak I, Carvalho RA, Oliveira PF

P14- "Effect of pesticide exposure on gut microbiota and metabolites in middle-aged and elderly Japanese: A preliminary study"

Hayashi M, Hirayama M, Nishihara N, Kitahara Y, Kondo T, Ito M, Ohno K, Ueyama J

P15- "The impacts of land use on the allergic sensitization to olive pollen: a case study in Alentejo"

Antunes CM, Belchior M, Galveias A, Costa AR

Keynote Lecture

Exposome and children's health: Towards primordial prevention

Shoji F. Nakayama

National Institute for Environmental Studies, Japan

Email address: fabre@nies.go.jp

The former director of the International Agency for Research on Cancer (IARC), Christopher Wild proposed the concept of exposome in 2005. Since then, research has flourished with increasing opportunities of funding, especially in the US and Europe. The exposome is to capture a totality of one's exposure to a whole set of the environment throughout their lifetime. The ultimate goal of the exposome research is to understand the exposure to what environmental factors during what period of life modifies what health outcomes. It is yet impossible to characterise individual's exposome despite the decade long research efforts. Nevertheless, we are trying to evaluate as many environmental factors as possible in our nationwide prospective birth cohort study or the Japan Environment and Children's Study (JECS). JECS started in January 2011 with 103 099 registered pregnant women. Over 100 000 children born to those mothers have been and will be followed for several decades. Many biological samples such as blood and urine have been collected during pregnancy and after birth. Information on other environmental exposure are estimated using self-administered questionnaire, environmental measurements and numerical modelling. Accumulated results from JECS enables us to estimate attributions of known and newly identified risk factors to a children's health and development outcome. This could drive us towards designing the environment where children can live healthier lives. In this presentation, the current status of JECS and its future along with a potential contribution to the primordial prevention will be introduced.

O1: Impact of PFAS and plastic related environmental chemicals on childhood asthma and allergies and infectious diseases: the Hokkaido Study on Environment and Children's Health

Yu Ait Bamai[1,2]

[1] Center for Environmental and Health Sciences, Hokkaido University, Japan, [2] Toxicological Center, University of Antwerp, Belgium

Email address: yu.aitbamai@uantwerpen.be

Background: Per- and polyfluoroalkyl substances (PFAS) are widely used bio-accumulative chemicals in many industrial and household products. Plastic related environmental chemicals, such as phthalates and organophosphate flame retardants (PFRs) are short half-life chemicals used as plasticizers and flame retardants. The global concerns about those environmental chemicals are not only related to environmental pollution, but also to known adverse health effects in humans. Experimental studies reported that exposure to PFAS results in immunotoxicity. Epidemiological studies reported that exposure to phthalates and PFRs is associated with asthma and allergies in children.

Methods: As a part of the Hokkaido Study on Environment and Children's Health (the Hokkaido Study), we have conducted ongoing biomonitoring and epidemiological studies focusing on PFAS, phthalates, PFRs, and other chemicals and their potential adverse health effects among children. In this presentation, our findings regarding PFAS and plastic-related chemicals (phthalates and PFRs), particularly in relation to children's allergies and infectious diseases will be illustrated, as well as future challenges will be discussed.

Results and Conclusions: Decreasing year trends of maternal PFOS and PFOA levels and increasing trends of PFNA and PFDA levels of blood collected between 2003 and 2011 were observed, respectively. Prenatal exposure to PFOS, PFOA, PFDA, and PFUnDA reduced risks of childhood rhino-conjunctivitis and eczema up to age 7 years, whereas, PFOA and PFDA increased risks of infectious diseases. Prenatal exposure to DEHP was negatively associated with cord blood IgE levels and increased risks of allergies and infectious diseases. Increasing year trends in urinary metabolites over time from 2012 to 2017 were found in TCIPP, TDCIPP, and EHDPTP, but not in phthalates metabolites. In cross-sectional setting, higher levels of urinary metabolites of DEHP, DiNP, TDCIPP, and TBOEP were associated with increased risks of allergies among 7-year-old children. PFAS may have immunosuppression effects. Our findings regarding PFRs and phthalates associated with childhood allergies were in line with other studies. Not only single chemicals, but also mixture effect of chemicals are warranted in the further studies.

O2: Endocrine disruptors and cognitive development in child population: research approach of EDC(Mind)2 project

Madureira J[1,2,3], Pereira MC[4], Teixeira JP[1,2,3], Dzúrová D[5], Afonso I[6], Bonassi S[7], Verhagen H[8,9], Morawska L[10,11], Slezakova K[4]

[1]Environmental Health Department, National Institute of Health, Portugal, [2]EPIUnit-Institute of Public Health, University of Porto, Portugal, [3]Laboratory for Integrative and Translational Research in Population Health, Portugal, [4]LEPABE-ALiCE, Faculty of Engineering, University of Porto, Portugal, [5]Department of Social Geography and Regional Development, Faculty of Science, Charles University, Czech Republic, [6]Department of Pediatric Endocrinology, Metabolism and Nutrition, Hospital Pedro Hispano, Portugal, [7]IRCCS San Rafaele, Italy, [8]Food Safety & Nutrition Consultancy, The Netherlands, [9]National Food Institute, Technical University of Denmark, Denmark, [10]School of Earth and Atmospheric Sciences, Faculty of Science, Queensland University of Technology, Australia, [11]Global Centre for Clean Air Research (GCARE), University of Surrey, United Kingdom

Email address: jvmadureira@gmail.com

The environmental and epidemiological data to interpret adverse impacts of endocrine disruptors (EDCs) is highly insufficient, yet these pollutants are largely unregulated in the current frameworks. Current evidence has shown that many of the endocrine-related diseases and disorders (neurobehavioral disorders, prevalence of obesity, diabetes type 2) are on rise. This is especially relevant for children whose exposure to EDCs (known or suspected) is higher in comparison with adults. EDC(Mind)2 is a 3-year multidisciplinary project that will characterize EDCs exposure (air, dermal, diet), and cognitive conditions and behavior among a population of 1800 schoolchildren. The project is divided into two phases. Phase I will address child air exposure (sample of 20 primary schools) and will investigate early signs of adverse cognitive development and behavior in 8-9 years old children (field campaigns at the beginning of the school year 2022/2023). Indoor exposure assessment (simultaneously with outdoor air) will encompass concurrent chemical (selected EDCs– in gas phase + particulate fractions; VOCs, CO, NOx), physical (PM$_{2.5}$, ultrafine, CO$_2$, temperature, relative humidity), and biological pollutants (bacteria and fungi). Detailed information on child's lifestyle, diet, physical activity, and respiratory health will be provided by parents via a standardized questionnaire. Cognitive development will be evaluated via validated short attention form tests; child social behavior will be measured using the teacher form of the Social Skills Improvement Rating Scale. Phase II encompass sub-population of 200 schoolchildren exposed at their homes. Both air and dermal EDCs exposure will be investigated while monitoring diet and eating patterns of the subjects. Successful accomplishment of EDC(Mind)2 will allow for a set of recommendations for surveillance of child exposure to endocrine disruptors while define a list of practices for implementation of guidelines contributing to healthy and safe public and private indoor environments.

Acknowledgments

Keynote Lecture

Endocrine Disrupting Chemicals: Health Effects in Children and Policy Implications

Leonardo Trasande

NYU Grossman School of Medicine, Department of Pediatrics

Email address: Leonardo.trasande@nyulangone.org

Since reports published in 2015 and 2016 identified 15 probable exposure–outcome associations, there has been an increase in studies in humans of exposure to endocrine-disrupting chemicals (EDCs) and a deepened understanding of their effects on human health. We have reviewed subsequent additions to the literature and identified new exposure–outcome associations with substantial human evidence. Evidence is particularly strong for effects on children's health for relations between perfluoroalkyl substances and obesity, impaired glucose tolerance, gestational diabetes, reduced birthweight, and polycystic ovarian syndrome. Evidence also exists for relations between bisphenols and polycystic ovarian syndrome; and phthalates and prematurity, reduced anogenital distance in boys, obesity, and impaired glucose tolerance. Greater evidence has accumulated than was previously identified for cognitive deficits and attention-deficit disorder in children following prenatal exposure to bisphenol A, organophosphate pesticides, and polybrominated flame retardants. Although systematic evaluation is needed of the probability and strength of these exposure–outcome relations, the growing evidence supports urgent action to reduce exposure to EDCs. Endocrine-disrupting chemicals (EDCs) substantially cost society as a result of increases in disease and disability but—unlike other toxicant classes such as carcinogens—have yet to be codified into regulations as a hazard category. In the EU, general principles for EDCs call for minimisation of human exposure, identification as substances of very high concern, and ban on use in pesticides. In the USA, screening and testing programmes are focused on oestrogenic EDCs exclusively, and regulation is strictly risk-based. Minimisation of human exposure is unlikely without a clear overarching definition for EDCs and relevant pre-marketing test requirements. We call for a multifaceted international programme (eg, modelled on the International Agency for Research in Cancer) to address the effects of EDCs on human health—an approach that would proactively identify hazards for subsequent regulation.

Keynote Lecture

Exposure to plasticizers of premature newborns in Neonatal Intensive Care Unit

Cleys P[1,$,*], Panneel L[2,3,$], Malarvannan G[3], Jorens PG[3,4], Mulder A[2,3], Covaci A[1]

[1]Toxicological Centre, University of Antwerp, Wilrijk, Belgium, [2]Neonatal Intensive Care Unit, Antwerp University Hospital, Edegem, Belgium, [3]Laboratory for Experimental Medicine and Pediatrics, University of Antwerp, Wilrijk, Belgium, [4]Department of Intensive Care Medicine and Clinical Pharmacology, Antwerp University Hospital, Edegem, Belgium; [$] Shared first authors

E-mail address: adrian.covaci@uantwerpen.be

Background: Phthalates, plasticizers used to increase elasticity of plastics, can leach from medical devices into the human body. Di-(2-ethylhexyl)-phthalate (DEHP) was the most popular plasticizer. Due to adverse health effects, its use was restricted in medical devices (EU MDR 2017/45), and is now replaced by alternative plasticizers (APs). Neonatal intensive care unit (NICU) patients may be exposed to high amounts of plasticizers via parenteral nutrition, administered intravenously through plastic infusion circuits. This study aimed to 1) characterize current plasticizer exposure leaching from parenteral nutrition and 2) to quantify current plasticizer exposure in premature neonates and 3) to identify patients at higher risk.

Methods: Various plasticizers were identified in medical devices by LC-MS/MS and GC-MS. To assess leaching during clinical use, we developed *ex vivo* leaching experiments, based on a clinical theoretical assumption – to mimic the *in vivo* nutrition situation. Multiple urine samples were collected per patient during the NICU hospitalization, resulting in 249 urine specimens from 26 preterm and 10 control neonates. These were analyzed for phthalate and AP metabolites by LC-MS/MS. Exposure through medical devices was analyzed as predictor for urinary plasticizer metabolites using univariate non-parametric tests.

Results: Leaching of plasticizers present in the medical devices occurred in lipid emulsions, with different leaching profiles between different types of lipid emulsions, while no exposure occurred during administration of non-lipid solutions. In a clinical setting, a neonate was estimated to be exposed to doses (ng/kg bw per day) of DEHP (320), ATBC (86800), TOTM (900), BBzP (700), DnBP (620), and DEHT (250) through parenteral nutrition. The estimated DEHP exposure was below the tolerable daily intake. Median urinary phthalate metabolite concentrations were lower compared to past NICU studies. Detection frequencies of phthalate metabolites were > 90%. Detection of AP metabolites ranged 11-95%, with secondary DINCH-metabolites the most prevalent (DINCH > DEHTP > DPHP > DEHA > DINP > TOTM). Secondary DEHP metabolites (secDEHPm) were used to assess predictors of exposure. Respiratory support and blood products were significantly associated with increased urinary secDEHPm.

Conclusions: NICU patients are exposed to a wide range of plasticizers and the influence of the type of lipid nutrition and administration time on the plasticizer exposure is plasticizer-specific. We show a favorable evolution of DEHP exposure in the NICU and we map neonatal exposure to APs. Nevertheless, despite changing legislation, respiratory support and blood products remain as important sources of phthalate (including DEHP) exposure. Sources of AP exposure in the NICU need further investigation.

O3: Determination of pesticide residues and their metabolites in maternal milk, serum and urine using high throughput mass spectrometry techniques

Manea-Karga E[1], Machera K[1], Baira E[1], Papageorgiou G[1], Barmpouni T[1], Iliodromiti Z[2], Boutsikou T[2], Lacovidou N[2] and Kasiotis KM[1]

[1]Laboratory of Pesticides' Toxicology, Benaki Phytopathological Institute, 8 Stefanou Delta Str., Athens 14561, Greece; [2] Neonatal Department, Aretaieio Hospital, Medical School, National and Kapodistrian University of Athens, Athens, Greece

Email address: e.manea-karga@bpi.gr

Modern humans are exposed daily to multiple chemicals from various sources, mainly food and the environment. Metals and minerals, dioxins, polychlorinated biphenyls, pesticides, perfluoroalkyl substances (PFAS), phthalates, and polycyclic aromatic hydrocarbons (PAHs), are only some of the xenobiotic chemicals that define and shape this complex mixture of substances that can enter the human body. Human Biomonitoring (HBM) assesses the internal dose of xenobiotics, identifying either the parent molecule or its metabolites in human biological matrices, such as blood, urine, maternal milk, and human tissue. HBM contributes significantly to the consolidation, and continuous strengthening of the toxicology and public health professions by providing them with realistic qualitative and quantitative data of the various toxic factors in the human body, their distribution in various tissues, their metabolism, bioaccumulation, and excretion. Maternal milk is considered one of the most preferable of the human biological matrices, mainly because its collection is non-invasive, offering several advantages over the collection of other biological samples to assess overall human exposure. In addition, human milk untargeted analysis, allows the potential risk characterization for infants due to the exposure to mixture of chemicals. In this work, a multi-residue analytical method using liquid and gas chromatography coupled with tandem mass spectrometry (LC-MS/MS and GC-MS/MS) has been developed, optimized, and validated, covering >140 pesticides and metabolites of different categories and chemical families. The method has been applied to three (3) human biological matrices, maternal milk, blood serum and urine. For the sample preparation, variations of the solid phase extraction technique were applied, to recover the target analytes (t.a.). The method was validated following the requirements of international guidelines and standards. The linear range of the method ranged from 0.5ppb to 500ppb, with variations at the lower level among the t.a.. Lower limits of quantification (LLOQ) varied from 0.5-5 ppb, while the limit of detection (LOD) did not exceed 0.5ppb for all t.a. Recoveries of the t.a. were determined at four concentration levels (LLOQ, 5ppb, 50ppb, and 500ppb), exhibiting values in the range of 61.9% to 109.2%, considering all matrices. As far as concerns the precision (expressed as relative standard deviation), the repeatability ranged from 2.1% to 17.5% and the reproducibility varied from 2.0% to 19.2% respectively. The pilot implementation of the analytical methods on human maternal milk samples unveiled low levels of pesticides and metabolites (overall 8 active substances and 2 metabolites) with concentrations fluctuating from <LLOQ-2.7 ppb. To provide a holistic view of the totality of chemical substances in maternal milk, untargeted screening was applied using liquid chromatography high-resolution mass spectrometry (LC-HRMS). Limited additional contaminants were tentatively annotated including one pesticide, not in the scope of t.a., accompanied by a plethora of chemicals, exemplified by lipids and pharmaceutical compounds, verifying the pivotal role of untargeted chemical analysis.

O4: Evidence for an association of prenatal exposure to particulate matter with clinical severity of Autism Spectrum Disorder

Santos JX[1,2], Sampaio P[1,2], Rasga C[1,2], Martiniano H[1,2], Faria C[2], Café C[3], Oliveira A[3,4], Duque F[3,4], Oliveira G[3,4], Sousa L[5], Nunes A[2,6], Vicente AM[1,2]

[1]Instituto Nacional de Saúde Doutor Ricardo Jorge, Portugal, [2]BioISI – Biosystems & Integrative Sciences Institute, Portugal, [3]Unidade de Neurodesenvolvimento e Autismo, Serviço do Centro de Desenvolvimento da Criança, Centro de Investigação e Formação Clínica, Hospital Pediátrico, Centro Hospitalar e Universitário de Coimbra, Portugal, [4]Faculty of Medicine, University Clinic of Pediatrics and Coimbra Institute for Biomedical Imaging and Translational Research, University of Coimbra, Portugal, [5]Departamento de Estatística e Investigação Operacional e Centro de Estatística e Aplicações, Faculdade de Ciências, Universidade de Lisboa, Portugal, [6]Departamento de Física, Faculdade de Ciências, Universidade de Lisboa, Portugal

Email address: joao.xavier@insa-min-saude.pt

Autism Spectrum Disorder (ASD) is an early-onset neurodevelopmental disorder characterized by deficits in social communication and interaction and repetitive patterns of behavior. The clinical heterogeneity of this disorder is likely explained by a multifactorial etiology, involving both genetic and environmental risk factors. Early-life exposure to air pollutants, including ozone (O_3), particulate matter ($PM_{2.5}$ or PM_{10}), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) has been suggested to contribute to the etiology of ASD. In this study, we used air quality monitoring data to examine whether mothers of children with ASD were exposed to high levels of air pollutants during critical periods of pregnancy, impacting the risk of ASD or the clinical severity of the disease in their offspring. For 217 subjects with ASD, born between 2003 and 2016 in Centro Region of Portugal, we accessed public data from the Portuguese Environment Agency to estimate exposure to these pollutants during the first, second and third trimesters of pregnancy, full pregnancy and first year of life of the child. These subjects were stratified in two subgroups according to clinical severity (milder and higher clinical severity groups), as defined by the gold-standard Autism Diagnostic Observational Schedule (ADOS) instrument. While between 2003 and 2016 the average concentrations of $PM_{2.5}$, PM_{10} and NO_2 in Centro Region were within the admissible limits imposed by the European Union, for a fraction of the subjects $PM_{2.5}$ and PM_{10} concentrations during critical periods of pregnancy were above the defined limits. Higher concentrations of $PM_{2.5}$ (p=0.001), NO_2 (p=0.011) and PM_{10} (p=0.041) during the first trimester of pregnancy were associated with higher clinical severity, when compared with milder clinical severity. Using logistic regression, we identified an association between $PM_{2.5}$ concentrations during the first trimester (p=0.001; OR=1.14, 95% CI: 1.05-1.24) and the full pregnancy (p=0.02; OR=1.08, 95% CI: 1.01-1.15) and PM_{10} concentrations during the third trimester (p=0.02; OR=1.07, 95% CI: 1.04-1.14) with higher clinical severity. These results support previous data on prenatal exposure to PM as a risk factor for ASD, and offer new insights on the impact of pollutant exposure in the clinical severity of this disorder. Exposure to PM is known to elicit neuropathological mechanisms associated with ASD, including neuro-inflammation, mitochondrial disruptions, oxidative stress and epigenetic changes. These results highlight the importance of air quality for neurodevelopment, raising questions that need to be addressed by public health policies.

Keynote Lecture

Inequity of chemical exposure and risks in European children: results from HBM4EU

Greet Schoeters

University of Antwerp, Belgium

Email address: Greet.schoeters@uantwerpen.be

Children in Europe are exposed to many hazardous chemicals from very early on when they are still in the womb of their mother. Children are vulnerable as they are often higher dosed compared to adults, they grow and develop rapidly and they have their entire life time to develop the adverse health consequences of exposures. Human biomonitoring measures the presence of chemicals, their metabolites or related early molecular changes in easily accessible human tissues or fluids and aggregates exposure through ingestion, inhalation and dermal uptake. HBM4EU is the second pan-European project that has used human biomonitoring to measure chemical exposure of European children in a harmonised way. HBM4EU (2017-2022) is funded under Horizon 2020 and co-funded by 30 participating countries and the European Environment Agency. The main aim of the initiative is to coordinate and advance human biomonitoring in Europe and to provide better evidence of the actual exposure of citizens to chemicals and the possible health effects to support policy making. One of the goals of HBM4EU was to generate EU wide comparable data on human internal exposure to chemicals and mixtures of chemicals to support chemicals' regulation in the European Union. The HBM4EU aligned studies generated new internal exposure data from 3576 children (6-12 years), from 3117 teenagers (12-18 years) and from 4102 adults (20-39 years). The participants were recruited from the participating countries with a good geographical spread over Europe (children from 14 countries: NO, DK, HU, SK, PL, Sl, EL, IT, FR, DE, BE, NL, CY and IL) with an almost equal representation per country. 38 biomarkers were measured in children providing exposure data on pesticides, phthalates, flame retardants and acrylamide. Legacy chemicals and substitutes were included in the selection. A quality assurance / control (QA/QC) program was established to guarantee the comparability of the biomarker data. HBM4EU collected accessory data of the study participants on personal characteristics, urbanicity of the residence area, educational level of the household. Data were pooled in a European database and aggregated data are now widely accessible (EU HBM Dashboard – HBM4EU – science and policy for a healthy future). The data were statistically analysed at the EU level. Exposure distribution is heterogenous in Europe and biomarker levels are influenced by the country of residence. Exposure was also influenced by the educational attainment of the household. Some biomarkers showed decreasing levels with time, others went up. The results clearly demonstrate that European children are co-exposed to many hazardous chemicals. For only a few biomarkers health based guidance values are available. Comparing the measured biomarker values with health based guidance values let us conclude that health risks cannot be excluded for specific pesticides, phthalates and for acrylamide. Comparisons with older age groups showed higher mean values in children compared to adults (acrylamide and pesticide biomarkers) or compared to teenagers (phthalates/DINCH). The information provides handles for policy makers on priorities and measures to further reduce exposure.

O5: Perinatal health inequalities in the industrial region of Estonia: a birth registry-based study

Dahal U[1,2]*, Veber T[1], Åström DO[3], Tamm T[1], Albreht L[4], Teinemaa E[5], Orru K[2], Orru H[1,3]

[1]Institute of Family Medicine and Public Health, University of Tartu, Estonia, [2]Institute of Social Science, University of Tartu, Estonia, [3]Section of Sustainable Health, Umeå University, Sweden, [4]Environmental Health Department, Estonian Health Board, Estonia, [5]Estonian Environmental Research Centre, Estonia

Email address: Usha.Dahal@ut.ee

Background and Aim: Despite the increasing number of studies on industrially contaminated sites (ICS) and their health effects, there are very few studies on perinatal health outcomes in ICSs. In the present study, we aimed to examine the perinatal health inequalities by comparing adverse birth outcomes (ABOs) (indicated by preterm birth (PTB) and low birth weight (LBW)) in the oil–shale industry region of Ida-Viru County in Estonia with national–level figures and subsequently investigate the effects of maternal environmental and sociodemographic factors.

Methods: From the Estonian Medical Birth Registry, all 208,313 birth records from 2004–2018 were extracted. The maternal and neonatal socio-demographic and health characteristics were also extracted from the birth registry. The air pollution exposure assessment for particulate matter (PM_{10}), fine particles ($PM_{2.5}$), and nitrogen dioxide (NO_2) concentrations included a combined method using measured and modeled data to catch temporal and spatial differences. Each child's home address at the moment of birth was geocoded to identify the residential proximity to ICS. Multiple logistic regression analysis was conducted to find the association of ABOs with maternal environmental and sociodemographic factors.

Results: Ida-Viru ICS has 124.5 g lower birth weight than on average in Estonia and a higher prevalence of PTB and LBW. The result shows the statistically significant association of ABOs with $PM_{2.5}$, mother's ethnicity, education, and age throughout Estonia. However, in Ida-Viru ICS, the ABOs odds are remarkably higher in these characteristics except for the mother's ethnicity. Russian mothers throughout the nation and in ICS have equally higher risks of ABOs. In contrast, mothers with basic and secondary education and mothers of advanced age are more affected by ABOs in Ida-Viru ICS. Furthermore, the ABOs are significantly associated with the residential proximity of ≤ 3 km and ≤ 5 km to ICS.

Conclusions: Thus, the Ida-Viru ICS has unequally higher odds of adverse perinatal health across the environmental and sociodemographic factors. Therefore, in addition to reducing the air pollutants, policy actions on social disparities are vital to address the country's unjustly higher perinatal health inequalities, especially in the Ida-Viru ICS.

O6: Assessing tobacco exposure during pregnancy: face-to-face questionnaires *vs.* urinary cotinine

Madureira J[1,2,3], Silva AI[1,2,3,4], Reis AT[1,2,3], Teixeira JP[1,2,3], Costa C[1,2,3]

[1]Environmental Health Department, National Institute of Health, Porto, Portugal; [2]EPIUnit, Institute of Public Health, University of Porto, Porto, Portugal; [3]Laboratory for Integrative and Translational Research in Population Health (ITR), Porto, Portugal; [4]ICBAS - Institute of Biomedical Sciences Abel Salazar, University of Porto, Porto, Portugal

Email address: cstcosta@gmail.com

Despite public health awareness campaigns and tobacco control policies implemented in many countries, including Portugal, a significant number of women continue to smoke during pregnancy. Several studies demonstrated that tobacco smoking or exposure to environmental tobacco smoke (ETS) during pregnancy has numerous adverse health effects on both mother and fetus. Accurate assessment of tobacco smoke exposure is critical to evaluate its effects, as well as for the implementation of health policies and educational programs. This study aimed: i) to assess the smoking prevalence, environmental tobacco smoke (ETS) exposure and smoking/exposure cessation rate among pregnant women living in Porto metropolitan area, and compare it with data previously reported in Portugal; additionally, ii) to validate data on smoking and ETS exposure obtained by face-to-face questionnaires *versus* maternal urinary cotinine (UC), an objective and accurate biomarker of recent tobacco exposure. A cross-sectional study was conducted using data of 595 pregnant women receiving prenatal care at Centro Hospitalar de S. João, between April 2017 and July 2018. Smoking prevalence was 27.9% before pregnancy and reduced to 12.9% at birth, corresponding to a cessation rate of 46.4%; these values are similar to those reported earlier in Portugal [1-2], suggesting that there is no decreasing trend on smoking rates over the years. Daily exposure to ETS among non-smoking pregnant women, characterized in Portugal for the first time in this study, also decreased throughout the pregnancy, from 31.7% before pregnancy to 26.3% in the third trimester. The agreement was very good between data obtained with questionnaires and UC-based smoking status (κ= 0.919, p<0.001) but only fair between questionnaires and UC-based ETS exposure (κ=0.386, p<0.001). Overall, our findings show that face-to-face questionnaires constitute an adequate strategy to assess smoking among pregnant women. Reducing tobacco exposure among pregnant women remains a challenge in Portugal and, therefore, public policies must continue to encourage smoking cessation in order to improve maternal and neonatal health outcomes.

References

1. Alves, E., Azevedo, A., Correia, S. et al. Long-term maintenance of smoking cessation in pregnancy: an analysis of the birth cohort generation XXI. Nicotine Tob Res. 15(9), 1598-1607 (2013). 2. Teixeira, C., Al Hamwi, S., Carrapatoso, M. et al. Tobacco use during pregnancy among native and migrant women in Portugal. Results from the Bambino study. Revue d'Épidémiologie et de Santé Publique. 66(S5), S358-S359 (2018).

Acknowledgments

P1: Link the Results of the Birth Cohort Study to Chemical Regulation

Isobe T[1], Ueyama J[2], Iwai-Shimada M[1], Takagi M[1], Oguri T[3], Shinohara N[3], Kunisue T[4], Nomiyama K[4], Tanoue R[4], Nakayama SF[1]

[1]National Institute for Environmental Studies, Japan, [2]Graduate School of Medicine, Nagoya University, Japan, [3]National Institute of Advanced Industrial Science and Technology, Japan, [4]Center for Marine Environmental Studies, Ehime University, Japan

Email address: isobe.tomohiko@nies.go.jp

In the large-scale birth cohort studies, the health effects of chemical exposure have been assessed by analyzing the association between the levels of chemicals in body and health outcomes. These epidemiological studies have clarified the relationship between the concentrations in biospecimens, such as blood and urine, and the children's health effects. It is, however, difficult to estimate the exposure from the levels in the biospecimen because the information on pharmacokinetics is available only for limited chemicals. Therefore, the achievement of birth cohort studies is not directly utilized to risk assessment and chemical management. Reduction of exposure would be required if the biomonitoring levels exceed the guidance values, but it is difficult to take measures when the pathway and contribution constituting the levels in biospecimen are unknown. In this regard, exposure reconstruction, which is to back calculate the exposure from the levels in biospecimen, is necessary for evidence-based policy making using data from the birth cohort studies. To investigate the pharmacokinetics of the chemicals in the daily use products, we conducted an intervention trial with controlled diet and use of personal care products. This approach allows us to obtain pharmacokinetic parameters without administering chemicals to the participants. Decreasing trends were observed for some chemicals such as parabens, triclosan, neonicotinoids, during the study period. Estimated elimination half-lives were consistent with the previous reports.

P2: Environmental measurements in the Sub-Cohort Study of the Japan Environment and Children's Study (JECS)

Nishihama Y[1], Nakayama SF[1], Isobe T[1]

[1]National Institute for Environmental Studies, Japan

Email address: nishihama.yukiko@nies.go.jp

Background: Exposure to particulate matter (PM) is one of the major environmental risks to children's health. World Health Organization (WHO) reported that acute lower respiratory infection from outdoor/indoor PM exposure accounted for almost 10% of the total mortality of children under 5 years of age in 2016. Although some studies reported the significant associations between prenatal PM exposure and childhood asthma or child behavioral problems, only few birth cohort studies have been carried out in Japan to investigate the association between PM exposure and children's health.

Methods: The Japan Environment and Children's Study (JECS), which is a nation-wide birth cohort study, was launched in 2011 to evaluate the relationships between environmental factors and children's health and development, involving 100,000 mother-child dyads. The Sub-Cohort Study was formed in JECS consisting of approximately 5,000 subjects randomly selected from the main cohort. In the Sub-Cohort Study, home visits were conducted when child participants became 1.5 and 3 years old along with the face-to-face medical and developmental examinations.

Results and conclusions: This presentation introduces the progress status of the JECS Sub-Cohort Study, especially of environmental measurement. Indoor/outdoor air and house dust samples were collected and analyzed for PM, volatile organic compounds (VOCs), aldehydes and acidic gases. PM ($PM_{10-2.5}$ and $PM_{2.5}$) sampling was conducted with an active pump operated intermittently for 7 days (repeating 5 min move and 30 min rest). The field staff conducted dwelling observations and interviewed the participants about daily use of commodity and chemical substances. We also collected the information on the frequency of cleaning and the predictors of PM concentration, such as candles and incense burning, smoking and cooking. Out of 5,018 Sub-Cohort participants, indoor/outdoor air samples were collected from 5,014 (99.9%) at age 1.5 and 4,712 (93.9%) at age 3.

P3: Ten-year temporal trends (2006–2015) and cross-sectional characterization of urinary concentrations of glyphosate in Japanese children

Ueyama J[1], Wada K[2], Nomura H[1], Nakane K[3], Nishihara N[1], Kitahara Y[1], Watanabe S[1], Nagata C[2], Kamijima M[4], Saito I[1]

[1]Department of Biomolecular Sciences, Field of Omics Health Sciences, Nagoya University Graduate School of Medicine, Nagoya, Japan, [2]Department of Epidemiology and Preventive Medicine, Gifu University Graduate School of Medicine, Gifu, Japan, [3]Okazaki City Public Health Center, Okazaki, Aichi, Japan, [4]Department of Occupational and Environmental Health, Nagoya City University Graduate School of Medical Sciences, Japan…

Email address: ueyama@met.nagoya-u.ac.jp

Over the past two decades, domestic shipments of glyphosate (Gly), in the form of an ionic salt, have been increasing steadily in Japan. This increase has raising concerns about the effects of chemical exposure on children. The purpose of the current study was to analyze Gly in urine samples of Japanese children to determine temporal changes, seasonal changes, and gender differences. First-morning urine samples were obtained from 50 Japanese children (4–6-year-old) in October of 2006, 2011, and 2015 (total = 150) to investigate the temporal trends in urinary Gly concentrations. Additionally, first-morning urine samples were collected from 3-year-old children in August–September of 2012 (summer; n = 42) and in February of 2013 (winter; n = 42) to investigate the seasonal and gender differences, and the correlations between urinary Gly concentrations and insecticide exposure biomarkers. Urine samples were analyzed to measure for Gly using a liquid chromatography with tandem mass spectrometry (LC-MS/MS). Detectable Gly concentrations were found in 41% of the 234 children. The 75th percentile and maximum concentrations of urinary Gly were 0.20 and 1.33 µg/L, respectively. The urinary Gly concentration in 2015 was significantly higher than in 2006, suggesting that the Gly exposure levels have been increasing. No seasonal or gender-specific differences in urinary Gly concentrations were observed, and no correlation with insecticide exposure biomarkers was found. This study revealed that Gly exposure trends show an increase between 2006 and 2015, and that season and gender were not the exposure-determining factors.

P4: Adapting the ELEAT (Early Life Exposure Assessment Tool) to Portugal – a pilot study to tackle gene-environment interactions in Autism Spectrum Disorder

Rasga C[1;2], Santos JX[1;2], Marques AR[1;2], Vilela J[1;2], Martiniano H[1;2], Sampaio P[1;2], Faria C[1;2], Oliveira G[3], Bennett D[4], Walker C[4], Schmidt R J[5], Vicente AM[1;2]

[1] Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisbon, Portugal; [2] BioISI: Biosystems & Integrative Sciences Institute, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal; [3] Hospital Pediátrico de Coimbra, Coimbra, Portugal; [4] University of California, Sacramento, CA; [5] Public Health Sciences, University of California Davis, Davis, CA

Email address: celia.rasga@insa.min-saude.pt

Genetic factors account for 50 to 80% of Autism Spectrum Disorder (ASD) risk, suggesting that modifiable non-genetic factors may play an important role in ASD. Pre-, peri and post-natal exposure to a variety of environmental factors have previously been implicated in its etiology. However, the comprehensive assessment of environmental exposure in ASD in large datasets from various environmental settings is still insufficient. To examine the role of environmental exposures in a population of Portuguese children with ASD, we translated, adapted and piloted the Early Life Exposure Assessment Tool (ELEAT). The ELEAT was originally developed at the University of California Davis to assess environmental factors in studies of neurodevelopmental disorders. It is a questionnaire completed by mothers of children with ASD, enquiring about Demographic Information, Maternal Conditions/Medical Interventions, Breastfeeding and Child Diet, Maternal Diet, Supplements, Lifestyle, Home and Environment, Environment, Occupation and Exposures. The ELEAT gathers information about environmental exposure along key phases of early neurodevelopment, including 3 months prior to conception, pregnancy, labor and delivery and the first year of life of the child. An ELEAT version adapted to the UK was translated into Portuguese, and a few further adaptations were made to minimize cross-cultural issues that might compromise its validity, namely regarding lifestyle, habits, dietary, household and daily items, access to healthcare and education, as well as employment and infrastructure. After translation, the ELEAT was piloted in a group of mothers of typically developing and a group of mothers of ASD children, ranging in age from 1 to 8 years. All mothers had a secondary degree or higher and were between 35 and 50 years old. Feedback was obtained from the mothers regarding length, clarity, certainty, and relevance of the questions, using the inbuilt Evaluation Instrument. Concerning length, globally, 30% of the mothers considered the ELEAT very long, and 60% considered it slightly long. In a Lickert-type scale, 71% and 12% of both mothers agreed/slightly agreed that the instructions were clear. 75% agreed/slightly agreed that they were globally sure about their answers, but 23% were neutral. In four modules (Maternal Condition/Medical Interventions, Breastfeeding, Maternal Diet and Home Environment) between 74% and 89% of all mothers reported high certainty concerning their given answers. Only in Occupation did both groups express lower confidence, with around 50% reporting high certainty. Finally, 66% and 15% agreed/slightly agreed that the questions were important. There were no significant differences between the ASD and control groups for the topics discussed above (all $z < 1$). In group discussions similar concerns were reported regarding the length and complexity of the questionnaire, but the main positive conclusions from the mothers of ASD and typically developing children were that the questions were direct and well written.

Integration of the pilot feedback will allow us to enhance the tool for use in Portuguese-speaking communities, improving its capacity to assemble accurate environmental data from diverse cultural settings, and to extend to larger population datasets. Combined with genetic and clinical data, the ELEAT will contribute to the identification of modifiable lifestyle and environmental risk factors for ASD.

P5: Suitable seafood dietary advice for reducing mercury exposure during pregnancy in Portugal: results from the HBM4EU-mom project

Peres M[1], Assunção R[2,3,4], Santiago S[1], Nunes CL[1], Esteban López M[5], Dominguez Morueco N[5], Pedraza Diaz S[5], Juliá M[5], Castaño A[5], Ingi Halldórsson Þ[6], Jacobsen E[6], Gabriel C[7], Karakoçtzidis A[7], Karakitsios S[7], Giannadaki D[8], Hadjipanayis A[9], Anastasi E[8], Thoma C[8], Snoj Tratnik J[10], Horvat M[10], Martin LR[11], Gilles L[11], Govarts E[11], Schoeters G[11], Sarigiannis D[7], Katsonouri A[8], Namorado S[1,2]

[1]National Institute of Health Dr. Ricardo Jorge; [2]Public Health Research Centre & Comprehensive Health Research Center; [3]Centre for Environmental and Marine Studies, University of Aveiro; [4]Instituto Universitário Egas Moniz; [5]National Centre for Environmental Health, Instituto de Salud Carlos III; [6]Faculty of Food Science and Nutrition, University of Iceland; [7]Aristotle University of Thessaloniki & HERACLES Research Center on the Exposome and Health, Center for Interdisciplinary Research and Innovation; [8]Cyprus State General Laboratory; [9]Larnaca General Hospital; [10]Jožef Stefan Institute, Department of Environmental Sciences; [11]Flemish Institute for Technological Research.

Email address: maria.peres@insa.min-saude.pt

Background: The prenatal stage is particularly vulnerable to the effects of mercury on the central nervous system. Methylmercury contaminated seafood is the main source of mercury exposure in Europe. Exposure is higher in countries where seafood consumption is high, such as Portugal.

Methods: HBM4EU-mom was a pilot randomized intervention study aiming to reduce methylmercury exposure of pregnant women in high seafood-consuming European countries. Women received recommendations on safe seafood intake during pregnancy (intervention) vs. standard care (control). Each of the two study phases included a measurement of total mercury in hair and a questionnaire on health, nutrition and lifestyle. Phase 1 was at ≤ 20 weeks of pregnancy (n = 135) and phase 2 occurred ≥ 12 weeks later (n = 113).

Results: Total mercury in hair was highest in Portugal for the intervention group (GM: 1.61 µg/g in phase 1 vs. 1.39 µg/g in phase 2) compared to the control group (GM: 1.58 µg/g in phase 1 vs. 1.35 µg/g in phase 2). 36% of samples exceeded EFSA's health-based guidance value (1.8 µg/g) in phase 1 vs. 27% in phase 2, with no significant differences between groups. Frequency of overall seafood consumption decreased slightly between phase 1 and phase 2, similarly in both groups, and was positively associated with mercury levels in both phases.

Conclusions: Mercury exposure and seafood intake were high in Portugal, however they decreased in phase 2 in both groups. Our results show it is crucial to continue to raise awareness to the mercury-related risks of seafood consumption during pregnancy, while also ensuring its nutritional benefits.

P6: Dietary exposure to phthalate plasticizers through infant formula consumption in Brazil

Petrarca MH[1], Tfouni SAV[1]

[1] Centro de Ciência e Qualidade de Alimentos, Instituto de Tecnologia de Alimentos (ITAL), Avenida Brasil nº 2880, 13070-178 Campinas, SP, Brasil

Email address: petrarcamh@gmail.com

Phthalates, diesters of 1,2-benzene dicarboxylic acid, constitute a group of anthropogenic compounds widely used as plasticizers for polymers to increase the flexibility and toughness of certain plastic products. Nonetheless, several adverse effects on human health have been associated with exposure to these chemicals, particularly asthma and allergies in children. In this context, the goals of the study included the evaluation of the occurrence of seven phthalates (benzyl butyl phthalate, bis(2-ethyl hexyl) phthalate, dibutyl phthalate, diethyl phthalate, diisobutyl phthalate, dimethyl phthalate, and di-n-octyl phthalate) in infant formulas marketed in Brazil, and the dietary exposure to phthalates through the intake of infant formulas by babies up to 6 months old. A total of 60 samples of powdered infant formulas were randomly collected in retail markets and drugstores in the city of Campinas, SP, Brazil. A sample preparation approach based on dispersive solid-phase extraction (d-SPE) and dispersive liquid-liquid microextraction (DLLME) techniques was used. The phthalate contents were determined by gas chromatography-mass spectrometry in selected ion monitoring (SIM) mode. Suitable method performance characteristics were obtained, including adequate limits of detection (0.5–5 µg/kg) and quantification (1–10 µg/kg); acceptable recoveries (70–120%) and precision (RSD values < 20%); as well as, linearity in matrix-matched calibration curves. Diisobutyl phthalate (10–404.2 µg/kg), dibutyl phthalate (10.2–58.3 µg/kg), and diethyl phthalate (1.1–10.3 µg/kg) were the analytes most frequently found in the samples, with a frequency of 72%, 60%, and 35%, respectively. Di-n-octyl phthalate (15–48.6 µg/kg), benzyl butyl phthalate (2.6–10 µg/kg), and dimethyl phthalate (2.5–30.6 µg/kg) were also observed in two, four, and six samples, respectively. High and average dietary exposure to phthalates was estimated based on the 95th percentile and mean contents detected in the samples, respectively. For this, the 50th percentile weight for age of WHO Child Growth Standards [1] and the recommendations for daily intake of infant formula for non-breastfed infants [2] were considered. In general, the estimated daily intake (EDI) values were lower than the tolerable dietary intake (TDI) of 0.01 mg/kg b.w. for dibutyl phthalate, 0.05 mg/kg b.w. for bis(2-ethyl hexyl) phthalate, and 0.5 mg/kg b.w. for benzil butyl phthalate fixed by the European Food Safety Authority (EFSA), suggesting that there are no health concerns at the estimated exposure levels.

References: [1]World Health Organization (2018) Child growth standards: weight-for-age. https://www.who.int/childgrowth/standards/weight_for_age/en/. [2]First Steps Nutrition Trust (2021) Infant milks: a single guide to infant formula, follow-on formula and other infant milks. https://www.firststepsnutrition.org/parents-carers.

P7: Assessing early-life exposure to mycotoxins in Portugal: results from the earlyMYCO pilot study

Martins C[1,2,3,4], <u>Namorado S</u>[1,3,4], Assunção R[1,2,4,5], Costa A[2], Serrano D[2], Visintin L[6], De Boevre M[6], Lachat C[6], Vidal A[6], De Saeger S[6], Vidigal C[7], Almeida A[7], Alvito P[1,2]

[1]National Institute of Health Dr Ricardo Jorge; [2] Centre for Environmental and Marine Studies, University of Aveiro; [3] Public Health Research Centre, NOVA National School of Public Health, Universidade NOVA de Lisboa; [4] Comprehensive Health Research Center, Universidade NOVA de Lisboa; [5] Instituto Universitário Egas Moniz (IUEM), Egas Moniz-Cooperativa de Ensino Superior; [6] Centre of Excellence in Mycotoxicology and Public Health, Faculty of Pharmaceutical Sciences, Ghent University; [7] ACES Lisboa Central, Regional Health Administration of Lisbon and Tagus Valley (ARSLVT), Portugal

Email address: sonia.namorado@insa.min-saude.pt

Early-life exposure occurs during gestation through transfer of hazardous chemical substances from the mother to the fetus and later to the newborn during lactation. Mycotoxins are natural toxins produced by fungi that have been shown to have carcinogenic, nephrotoxic, hepatotoxic, and immunosuppressive effects thus constituting a public health concern. Recent studies have revealed that the Portuguese population is exposed to mycotoxins. These results emphasized the need for assessing the prenatal and lactation exposure to mycotoxins in a vulnerable period of life. As such, the earlyMYCO project (PTDC/MED-TOX/28762/2017) aimed, for the first time, to develop and implement a pilot study to assess the early-life exposure to mycotoxins through a mother-child cohort, and to identify the associated challenges thus contributing to the development of future studies and to the knowledge of the exposome of Portuguese population. Participating mothers were recruited in primary healthcare units located in Lisbon during pregnancy (1st trimester) and followed-up in three moments of observation: 2nd trimester of pregnancy (mother), and 1st and 6th months of the child's life (mother and child). Biological samples (blood, urine, breast milk) and sociodemographic and food consumption data were collected. The earlyMYCO pilot study enrolled 19 mother–child pairs. Participants in the earlyMYCO pilot study (n = 19) reported more than nine years of education, with 37% reporting 10-12 years and 63% reporting more than 12 years. Regarding the household monthly income, 42% reported a monthly income above 1941€, with most of participants (95%) being workers for remuneration or profit. The food items with a higher consumption frequency were dairy products, bread, tea and coffee, meat, fish and pasta. Regarding infants, 22% were fed with infant formula and 78% were exclusively breastfed at the 2nd moment of observation. The chemical analyses have revealed the presence of 4 out of 15 and 5 out of 18 mycotoxins' biomarkers of exposure in urine and breast milk samples from participants, respectively. The multidisciplinary and dedicate team members in the healthcare units, the reduced burden of participation, and the availability of healthcare units for the implementation of the fieldwork were the main aspects identified as contributors for the successful development of the earlyMYCO pilot study.

Acknowledgments

P8: Quantitative health risk assessment of the chronic inhalation of volatile organic compounds in indoor home environments

Costa C[1,2,3], Slezakova K[4], Valongo C[1], Teixeira JP[1,2,3], Madureira J[1,2,3]

[1]Environmental Health Department, National Institute of Health, Porto; [2]EPIUnit, Institute of Public Health, University of Porto; [3]Laboratory for Integrative and Translational Research in Population Health (ITR), Porto; [4]LEPABE-ALiCE, Faculty of Engineering, University of Porto, Portugal

Email address: jvmadureira@gmail.com

Exposure to volatile organic compounds (VOCs) in indoor home environments constitutes an important risk to human health, as VOCs may cause upper/lower respiratory symptoms. Due to the spatial variety (different indoor emission sources, building characteristics, etc.), people are exposed to large range of VOCs, which are further impacted by seasonal patterns. This study aimed to evaluate seasonal trends of target VOCs (benzene, toluene, trichloroethylene, tetrachloroethylene, limonene, pinene, and xylenes) in indoor home environments; and to estimate the associated health risks among mothers with newborns. A cross-sectional study was conducted (May 2018-February 2019) using 8 hours VOCs data obtained at 64 home environments within the NeoGene project. Carcinogenic (lifetime cancer risk, LCR) and non-carcinogenic risk (hazardous quotient, HQ) assessment of chronic exposure of target VOCs, by inhalation, was performed using US Environmental Protection Agency methodology. Health risk associated with the total VOCs was assessed by the hazard index (HI). The maximum cumulative ratio (MCR) approach was used to group combined exposures based on the non-carcinogenic risk into categories as follows: Group I: single substance concern (maxHQ>1); Group II: low concern for both individual pollutants and for their combined effects (HI<1); Group IIIA: concern for combined effects dominated by one substance (MCR<2; HI>1; maxHQ<1); Group IIIB: concern for combined effects dominated by more substances (MCR>2; HI>1; maxHQ<1). Results showed that limonene was the VOC with highest mean indoor concentration ($\mu g/m^3$) in all seasons (spring: 37.40; summer: 79.90; autumn: 47.30; winter: 34.40; overall mean: 49.75), whereas tetrachloroethylene was the least abundant compound in autumn (1.60) and winter (1.78); overall mean of 2.03. LCR frequently exceeded the protective threshold of 10^{-6}: summer - trichloroethylene and pinene (5.79×10^{-5}; 1.37×10^{-2}, respectively); autumn - benzene (2.11×10^{-5}) and limonene (2.45×10^{-2}); winter - toluene (3.75×10^{-3}) and xylenes (4.28×10^{-3}). HQ values were below the threshold of 1, except for trichloroethylene (3.47); pinene (1.57) and limonene (3.52). When data was analysed by season, high HQ values were obtained for trichloroethylene (spring: 2.31; summer: 7.06; autumn: 1.77; winter: 2.75;) and for limonene (spring: 4.14; summer: 7.06; autumn: 5.23; winter 3.81). The MCR values ranged from 2.72×10^{-4} to 0.80. Almost all cases belonged either to Group II or Group IIIA (57.1% vs. 42.9% of the target VOCs), indicating, respectively, either low concern for non-carcinogenic health effects attributable to the investigated VOCs or considerable non-carcinogenic risk caused by one VOC. In conclusion, the exposure to VOCs demonstrated seasonal patterns among the investigated home environments, in levels that might pose considerable health risks for some occupants.

P9: Urban vs rural – impacts of air pollution on the allergenic content of *Platanus* tree pollen

Costa AR[1], Lara B[2], Galveias A[1], Otílio M[1], Rojo J[2], Antunes CM[1], Perez-Badia R[2]

[1]University of Évora. Institute of Earth Sciences - ICT & Department of Chemistry, School of Sciences and Technology, Évora, Portugal; [2]University of Castilla-La Mancha. Institute of Environmental Sciences (Botany), Toledo, Spain

Email address: acrc@uevora.pt

Childhood respiratory allergies have increased in recent years, possibly due to environmental factors. In addition to the harmful effects of gaseous pollutants on mucous membranes, indirect effects of pollutants on long known allergy-causing agents, like pollen, may also contribute to the increased incidence and severity of respiratory allergy in children, especially in urban environments. The *Platanus hybrida* is a highly disseminated tree in man-inhabited spaces, both rural and urban, creating shade areas on traffic roads and gardens. The prevalence of allergy to *P. hybrida* pollen is raising worldwide. Upon dispersal in the early spring, pollen from these trees comes in with air gaseous pollutants generated by automobile traffic, such as nitrogen oxides and ozone, whose effects on allergenic properties of the pollen are still unclear. The aim of this work was to evaluate the effect of urban and rural environment on the major *P. hybrida* allergen the Pla a 1 level.

Pollen was harvested in 2019, from similar size *P. hybrida* trees in Madrid, Toledo, Argés (rural) (Spain), Lisboa, Évora and Valverde (rural) (Portugal). For each location, the pollen from 3-5 different trees was pooled. Pollen protein extracts were prepared: a) in bicarbonate buffered solution, followed by samples lyophilization for ELISA measurements; b) in phosphate buffered solution for western blot. Total protein was quantified by the BCA method. Pla a 1 allergen was quantified by specific ELISA. Western blot was used to evaluate Pla a 1 immuno-reactivity with pooled sera from allergic individuals (purified Pla a 1 was used as control).

Pollen Pla a 1 content was equivalent in the four cities (1806 ± 149, 1893 ± 119, 1849 ± 336 and 1525 ± 179 ng Pla a 1/mg protein for Madrid, Toledo, Lisbon and Évora, respectively) and was lower in rural areas (1382 ± 149 and 1121 ± 52 ng Pla a 1/mg protein in Argés and Valverde, respectively). Pla a 1 immunoreactivity to allergic sera, assessed by western blot, was also lowered in pollen extracts originated from rural areas.

The results suggest that the characteristics of an urban environment, potentially related with road traffic, affects Pla a 1 content and consequently pollen allergenicity. Further studies will be needed to identify the factors leading to the increased expression of Pla a 1 in urban environments.

P10: Developing a Japanese Exposure Factors Database

Takagi M[1], Isobe T[1], Iwai-Shimada M[1], Kobayashi Y[1], Nakayama SF[1]

[1]National Institute for Environmental Studies, Japan

Email address: takagi.mai@nies.go.jp

Exposure factors are essential components for risk assessment and management of chemical substances. The National Institute for Environmental Studies have been developing a Japanese Exposure Factors Database. In this study, we derived exposure factors related to lifestyles and the use of personal care products (PCPs) for Japanese adults using web-based questionnaire.

The exposure factors such as number of cigarettes smoked, heat-not-burn tobacco, drinking water consumption, duration of bathing and/or showering, time spend outdoors, duration of swimming, mobile phone or PC usage, and frequency and amount of PCPs use were obtained via web-based questionnaire from 600 each of Japanese men and women at the age of 20-69 in February 2021 and February 2022.

For men, the median of cigarette smoking, drinking water consumption, duration of bathing, PC usage, time spend outdoors, and frequency of sanitizer use were 15.0 cigarettes/day, 1.5 L/day, 10 min/day, 3.0 hours/day, 60 min/day, and 5 times/day, respectively. For women, those were 12.5 cigarettes/day, 1.5 L/day, 15 min/day, 2.0 hours/day, 60 min/day, and 4 times/day, respectively. Some factors are comparable to the previous reports from Japan and other countries. The median of the usages of skin toner, hand cream, face wash, shampoo, and toothpastes for women were 0.5, 0.2, 0.5, 3 and 0.8 g/day, respectively.

P11: High-sensitive determination method of insect repellents and its metabolites in human urine by solid-phase extraction and high-performance liquid chromatography-tandem mass spectrometry

Nishihara N[1], Isobe T[2], Takagi M[2], Nakayama S[2], Iwai M[2], Kunisue T[3], Oguri T[4], Saito I[1], Ueyama J[1]

[1]Department of Pathophysiological Laboratory Sciences, Nagoya University Graduate School of Medicine, Aichi, Japan, [2]Japan Environment and Children's Study Program Office, National Institute for Environmental Studies, Tsukuba, Japan, [3]Center for Marine Environmental Studies (CMES), Ehime University , Bunkyo-cho 2-5, Matsuyama, Ehime, Japan, [4]Research Institute of Science for Safety and Sustainability, National Institute of Advanced Industrial Science and Technology, Tsukuba, Japan

Email address: nishihara.nanami.h1@s.mail.nagoya-u.ac.jp

Insect repellents picaridin (IUPAC name: butan-2-yl 2-(2-hydroxyethyl) piperidine-1-carboxylate) and DEET (IUPAC name: *N,N*-diethyl-3-methylbanzamide) are widely used on human skin and clothing to repel mosquitoes, biting flies, ticks, fleas, and chiggers. The analytical method for urinary repellents exposure markers needs further development for application to epidemiological studies, which provide strong evidence related to risk assessment from daily repellent exposure. In this study, we have developed an analytical method of the concentrations of picaridin, DEET, and two DEET metabolites (*N,N*-diethyl-3-(hydroxymethyl)benzamide (DHMB) and 3-(diethylcarbamoyl)benzoic acid (DCBA) in human urine sample. After formic acid-induced acidification of a urine sample, urinary repellent exposure markers were extracted using solid-phase extraction (EVOLUTE® EXPRESS ABN, Polymeric SPE column). A separation analysis was performed using high-performance liquid chromatography-tandem mass spectrometry within 10 minutes. The limits of detection ranged from 0.06 to 0.11 µg/L of urine. The extraction recoveries ranged from 74 to 88%. The within-day and between-day variation was 1.5–17.5 and 0.9–15.8%RSD, respectively. The preservation in room temperature and 4 °C was 89–108 and 85–102%, respectively. The stability of the analytes after three freeze-thaw cycles was 94–101%. This method was successfully applied to urine obtained from 5 Japanese adults (20–43 years old) who used picaridin or DEET containing products within a week. The urinary concentrations of repellent exposure markers were reached the maximum level within 15 hours after repellent usage. These results indicated that our present method might be used to evaluate insect repellents exposure levels.

P12: Effect of endocrine disruptors in spermatogonial stem cells metabolism: a protective role for regucalcin?

Correia S[1], Feijó M[1], Cavaco JEB[1], Ramalho-Santos J[2], van Pelt A[3], Socorro S[1]

[1]CICS-UBI-Health Sciences Research Centre, University of Beira Interior, Covilhã, Portugal, [2]CNBC - Center for Neuroscience and Cell Biology, University of Coimbra, Coimbra, Portugal, [3]AMC - Academic Medical Center, Reproductive Biology Laboratory, Center for Reproductive Medicine, University of Amsterdam, Amsterdam, The Netherlands

Email address: scorreia@fcsaude.ubi.pt

The last decades have shown that exposure to endocrine disruptors (EDs) *in utero* and during early life can disturb hormonal signalling disrupting spermatogenesis and male reproductive function. Furthermore, the effects of EDs during this critical time of growth and development can be passed down to future generations. Methoxychlor (MXC) and Vinclozolin (VNZ) are compounds used in human activities with extensively reported actions as EDs. MXC is an insecticide extensively used in the agricultural sector, which displays endocrine-disrupting activity by mimicking estrogens actions. VNZ is a commonly used fungicide in the wine industry that is metabolized into more active compounds displaying higher affinity to the androgen receptor. It has been proved that MXC and VNZ can affect male reproduction. However, little is known regarding the impact of these EDs on spermatogonial stem cells (SSCs). This specific testicular cell type relies on the foundation of spermatogenesis and is crucial in determining spermatogenic output and male fertility. Moreover, the SSCs are the basis of generating the male gametes that are responsible for the transmission of genetic information. Consequently, all modifications in SSCs can be passed down to subsequent generations with relevant consequences. Regucalcin (RGN) is a calcium-binding protein supporting male reproductive function by its protective role in the control of oxidative stress, apoptosis and metabolism.

This study hypothesized that RGN's actions might attenuate the putative damaging effects of EDCs in SSCs. For that purpose, we make use of a SSC cell line model overexpressing RGN. Mock- and RGN-transfected SSCs were treated with the xenoestrogen MXC (25 µM) and the anti-androgenic VNZ (50 µM) for 48 hours. Glucose consumption and lactate production, as well as, the expression and activity of glycolytic metabolism regulators were evaluated by spectrophotometric assays and Western blot analysis.

The results obtained showed that MXC and VNZ increased the glycolytic flux in SSCs, as indicated by the augmented glucose consumption and lactate production. Moreover, the effect of MXC in stimulating the glycolytic activity was supported by the increased expression of key metabolic regulators, namely, glucose transporter 3, phosphofructokinase-1 and lactate dehydrogenase, and by increased phosphofructokinase-1 activity. Overall, the stimulatory effect of EDs on the glycolytic metabolism of SSC was attenuated by RGN overexpression. The present study first showed that SSCs are a direct target of EDs, namely MXC and VNZ, with an impact in deregulating the glycolytic flow. Furthermore, it identified RGN as a protective factor against the possible noxious effects of EDs in SSCs with relevance for male fertility.

P13: Tributyltin at nanomolar levels disrupts Sertoli Cell glycolytic metabolism

Rato L[1,2], Alves MG[3,4,5,6], Silva BM[7], Jarak I[8], Carvalho RA[9,10], Oliveira PF[11]

[1]CICS – UBI – Health Sciences Research Centre, University of Beira Interior; [2] Health School of the Polytechnic Institute of Guarda; [3]Laboratory of Cell Biology and Unit for Multidisciplinary Research in Biomedicine (UMIB), Department of Microscopy, Institute of Biomedical Sciences Abel Salazar (ICBAS), University of Porto; [4]Laboratory for Integrative and Translational Research in Population Health (ITR), University of Porto; [5]Biotechnology of Animal and Human Reproduction (TechnoSperm), Institute of Food and Agricultural Technology, University of Girona, Spain; [6]Unit of Cell Biology, Department of Biology, Faculty of Sciences, University of Girona, Spain; [7]University of Beira Interior; [8] Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Coimbra; [9]Department of Life Sciences, Faculty of Sciences and Technology, University of Coimbra; [10]Nanoplatforms for Life, LAQV, REQUIMTE, Department of Pharmaceutical Technology, Faculty of Pharmacy, University of Coimbra; [11]LAQV-REQUIMTE and Department of Chemistry, University of Aveiro, Portugal

Email address: luis.pedro.rato@gmail.com

Obesogens are environmental contaminants predisposing to weight gain. They have been appointed as major contributors for the decline in male fertility. Tributyltin arises as an excellent obesogen model, as is known to affect testicles. Within these organs, Sertoli cells (SCs) are essential for spermatogenesis and the effects of compounds in their function have been shown to predict male fertility potential. In this work, we hypothesized that tributyltin impairs SCs' metabolism, particularly glucose metabolism. SCs were exposed to different concentrations of tributyltin during 6 hours: 0.1 nM, a subtoxic level; 10 nM, a physiological relevant level; and 1000 nM, a supraphysiological level and the respective control group. Sertoli cell proliferation was evaluated by the sulforhodamine B assay. The glycolytic profile of SCs was assessed by proton nuclear magnetic resonance and by studying the expression of key glycolysis-related transporters and enzymes, namely glucose transporters 1 (GLUT1), 2 (GLUT2), lactate dehydrogenase (LDH) and monocarboxylate transporter 4 (MCT4) through Western Blot. The exposure to tributyltin 1000 nM decreased the proliferation of SCs to 28%, when compared with the control group. Concerning glucose metabolism, the remaining doses significantly affected glycolysis and lactate production-related events, namely the expression of LDH and MCT4. SCs exposed to 10 nM of tributyltin decreased glucose and pyruvate consumption, which was followed by a decrease in lactate production and alanine production. The most pronounced effects were observed in SCs exposed to the lowest nanomolar level of tributyltin (0.1 nM), since the expression of GLUT1 and LDH was decreased, whereas the expression of MCT4 was increased. Overall, these results provide new insights on the effects of tributyltin, a well-known obesogen, in the metabolism of SCs. The results show that this obesogen modulates the glycolytic metabolism of SCs in a dose-dependent manner, highlighting novel mechanisms for which obesogens may impact one of the main functions of these cells and subsequently male fertility.

P14: Effect of pesticide exposure on gut microbiota and metabolites in middle-aged and elderly Japanese: A preliminary study

Hayashi M[1], Hirayama M[2], Nishihara N[1], Kitahara Y[1], Kondo T[3], Ito M[4], Ohno K[4], Ueyama J[1]

[1]Department of Biomolecular Sciences, Field of Omics Health Sciences, Nagoya University Graduate School of Medicine, [2]Department of Pathophysiological Laboratory Sciences, Field of Omics Health Sciences, Nagoya University Graduate School of Medicine, [3]Faculty of Medical Sciences, Shubun University, [4]Division of Neurogenetics, Center for Neurological Diseases and Cancer, Nagoya University Graduate School of Medicine

Email address: hayashi.mai.f9@s.mail.nagoya-u.ac.jp

Pesticides play a significant role in increasing crop productivity. A limited number of previous animal experiments have reported that pesticides exposure may affect the gut microbiota, which is responsible for short-chain fatty acids (SCFA) and polyamine (PA) production. This study aimed to present a preliminary observation of the relationship between pesticide exposure and fecal SCFAs and PAs in middle-aged and elderly Japanese.

In total, 36 healthy adults aged 69 ± 10 years (mean ± S.D) were recruited and submitted stool and spot urine samples. Urinary dialkylphosphates (DAP), 3-phenoxybenzoic acid, and glyphosate were assayed as pesticide exposure markers of organophosphorus insecticide (OP), pyrethroid insecticide, and glyphosate, respectively. Fecal acetate, propionate, butyrate, valerate, lactic acid, putrescine, and spermidine were quantified by separation analysis.

Significant negative correlations (p<0.05, Spearman's rank correlation coefficient) between urinary DAP and fecal acetate (r = -0.34) and lactic acid (r = -0.57) were found. Multiple regression analyses (stepwise forward) were performed using acetate and lactic acid as criterion variables and urinary concentrations of pesticide exposure marker and intake frequency of food items as explanatory variables. The analysis revealed that urinary DAP is a significant explanatory variable of fecal acetate concentration ($p < 0.001$, $\beta = -24.0$, SE = 4.9, t = -4.9) and intake of some vegetables (adjusted R-square = 0.751). None of our statistical analyses showed a significant relationship between the urinary DAP and fecal acetate concentrations. These findings suggest that OP exposure may be linked to a low fecal acetate level in humans.

P15- The impacts of land use on the allergic sensitization to olive pollen: a case study in Alentejo

Antunes CM [1], Belchior M [2], Galveias A [1], Costa AR [1]

[1]University of Évora. Institute of Earth Sciences - ICT & Department of Medical and Health Sciences, School of Health and Human Development. Évora, Portugal, [2]Laboratórios de Patologia Clínica, Unidade Local de Saúde do Baixo Alentejo, ULSBA, Beja, Portugal

Email address: cmma@uevora.pt

Allergic diseases are a serious public health problem mainly in industrialized countries. In Portugal, pollen allergy affects about 20% of the population, with grasses and olive trees being among the most allergenic. The growing increase in the cultivation of olive groves in Alentejo as well as its use as an ornamental plant may have an impact on exposure to allergens, which may influence the risk of sensitization to which the population.

Nowadays, the prevalence of allergic sensitization to olive pollen in Alentejo is still unknown. Thus, the aim of this study was to characterize the prevalence of allergic sensitization in the population in relation to the pollen level in Alentejo.

A retrospective analysis (2011-2021) of the available data on sensitization of the population found at Clinidata®XXI, Hospital de Beja, was performed; the levels and type of specific IgE for the different allergen groups, with a special focus on olive tree pollen were collected. The pollen levels were collected from https://lince.di.uevora.pt/polen/index.jsp, University of Évora. Analysis of the association between the two variable was be performed. The land use, particularly, the extension of olive cultivar groves was obtained from Pordata and EDIA (https://www.pordata.pt; EDIA, https://www.edia.pt).

The extension of cultivar groves increased between 2011-2021 in Alentejo, having almost tripled around the Alqueva basin (from ~20,000ha to >70,000ha). The annual pollen index presents a tendency to increase in the last year. Interestingly a tendency to diminish between 2011 (~10,500 pollen/m^3) and 2018 (~4000 pollen/m^3) while it tended to increase between 2018 and 2021 (>15,000 pollen/m^3), not following the steady increase profile of olive cultivar groves. Considering, the prevalence of positive olive sIgE also followed a biphasic pattern, reaching a nadir in 2017 – 2018, the years with the lower levels of olive pollen, followed by an increase between 2019 and 2021. When the mean levels of sIgE is considered, a 5-fold increase and a 2-fold were observed in 2021 compared to 2018 and to 2011, respectively, in keeping with the high pollen levels.

In conclusion, these results suggest that the exposure to highest concentration of olive pollen favours the increase of sensitization of the population, particularly children. Other data should be analised to validate the observations in this case study.