

Syllabus Module 234

N°	Titre
Coordinator	Aurore Gely-Pernot
Dates	October 23 th to October 27 th 2023
Credits/ECTS	3 ECTS
Duration	5 days of 6 hours face to face, and group work (estimation 30h)
Location	EHESP Paris
Description	The toxicity of chemicals or of other environmental stressors is highly dependent on exposure conditions and on the particular vulnerability of the exposed individual or group of persons. The module will address these issues with some emphasis on vulnerability during development and growth. As common thread, we will approach the question of endocrine disruptors (EDs). We will see how some population are vulnerable to these compounds and why it is important to consider it. The regulation, the management and the risk assessment of endocrine disruptors will be also discuss.
Prerequisites	Basic knowledge on biological mechanisms of disease. Such background is provided in the M1 EOHS modules (for example module 118).
Course learning objectives	<ul style="list-style-type: none"> • Describe the hypothesis of the developmental origin of adult health and disease (DOHaD) • Identify the vulnerable population to environmental exposure • Knows and where needed applies the International Health Regulations to coordinate and develop strategic partnerships and resources in key sectors and disciplines for health security purposes • Identifies and describes the environmental determinants of health and the connections between environmental protection and public health policy • Critically analyses the take into account EDs at the local and international level
Structure (details of sessions title/speaker/date /duration)	<ul style="list-style-type: none"> - Toxicological basis of vulnerability. Etienne Blanc - Prenatal exposure to mixture of xenobiotics: challenges and perspectives to identify the chemical exposome and its effect on the development. Arthur David - Reprotoxicity and transgenerational effect. Aurore Gely-Pernot - Developmental vulnerability to neurotoxicity. Thierry Charlier - Social vulnerability. Sadia Khan - Management of the issue of endocrine disruptors by public institutions. Annabelle Demy - Risk assessment of EDs. Cécile Michel
Resources	Books All readings and materials will be posted on REAL. Readings are available below for each session. Website, online library
Course requirement	Students are expected to attend all lectures and seminars. Class attendance will be checked accordingly. Students are expected to read and analyse selected papers for the group work before the courses.
Grading and assessment	<ol style="list-style-type: none"> 1) Group work : paper will be read, Presentation made by groups (30% of final grade) 2) On table test of 2 hours: scientific paper reading and answers to a set of questions (critical analysis of the study design, writing of the hidden summary...). Grade on 20 at least equal to 10 <p>Note also that students will complete a questionnaire that assesses their own and their teammates' contributions to group work. All team members will receive the same grade except if it is clear that a</p>

	<p>student has not participated effectively (attended and contributed to meetings; made timely, helpful contributions; been constructive, etc.). In that case, the student's grade will be lowered accordingly.</p>
<p>Course policy</p>	<p>Attendance & punctuality Regular and punctual class attendance is a prerequisite for receiving credit in a course. Students are expected to attend each class. Attendance will be taken at each class. The obligations of attendance and punctuality cover every aspect of the course: - lectures, conferences, group projects, assessments, examinations, as described in EHESP Academic Regulations http://mph.ehesp.fr EHESP Academic Regulation Article. 3). If students are not able to make it to class, they are required to send an email to the instructor and to the MPH program coordinating team explaining their absence prior to the scheduled class date. All supporting documents are provided to the end-of-year panel.</p> <p>Students who miss class are responsible for content. Any student who misses a class has the responsibility for obtaining copies of notes, handouts and assignments. If additional assistance is still necessary, an appointment should be scheduled with the instructor. Class time is not to be used to go over material with students who have missed class.</p> <p>Lateness: Students who are more than 10 minutes late may be denied access to a class. Repeated late arrivals may be counted as absences (See http://mph.ehesp.fr EHESP Academic Regulation Article. 3 Attendance & Punctuality)</p> <p>Maximum absences authorized & penalty otherwise Above 20% of absences will be designated a fail for a given class. The students will be entitled to be reassessed in any failed component(s). If they undertake a reassessment or they retake a module this means that they cannot normally obtain more than the minimum pass mark (i.e. 10 out of 20)</p> <p>Exceptional circumstances Absence from any examination or test, or late submission of assignments due to illness, psychological problems, or exceptional personal reasons must be justified; otherwise, students will be penalized, as above mentioned. Students must directly notify their professor or the MPH academic secretariat before the exam or before the assignment deadline. Before accepting the student's justification, the professor or the MPH academic secretariat has the right to request either a certificate from the attending physician or from a psychologist, or from any other relevant person (See http://mph.ehesp.fr EHESP Academic Regulation Article 4 Examinations).</p> <p>Courtesy: <u>All cell phones/pages MUST be turned off during class time.</u> Students are required to conduct themselves according to professional standards, eating during class time is not permitted during class time, such as course or group work.</p>
<p>Valuing diversity</p>	<p>Diversity enriches learning. It requires an atmosphere of inclusion and tolerance, which oftentimes challenges our own closely-held ideas, as well as our personal comfort zones. The results, however, create a sense of community and promote excellence in the learning environment. This class will follow principles of inclusion, respect, tolerance, and acceptance that support the values of diversity. Diversity includes consideration of: (1) life experiences, including type, variety, uniqueness, duration, personal values, political viewpoints, and intensity; and (2) factors related to "diversity of presence," including, among others, age, economic circumstances, ethnic identification, family educational attainment, disability, gender, geographic origin, maturity, race, religion, sexual orientation and social position.</p>
<p>Course evaluation</p>	<p>EHESP requests that you complete a course evaluation at the end of the school year. Your responses will be anonymous, with feedback provided in the aggregate. Open-ended comments will be shared with instructors, but not identified with individual students. Your participation in course evaluation is an expectation, since providing constructive feedback is a professional obligation. Feedback is critical, moreover, to improving the quality of our courses, as well as for instructor assessment.</p>

Session 1	Prenatal exposure to mixture of xenobiotics: challenges and perspectives to identify the chemical exposome and its effect on the development
Speakers	Arthur David
Session Outline	The concept of exposome will first be presented and then discussed to explain how it can be applied to study exposure to complex xenobiotic mixtures during the prenatal period. The lecture will then focus on the omics approach and in particular on metabolomics to explain how this technique can be used to improve exposure assessment and at the same study biological changes at a comprehensive level. Finally, challenges that we are currently facing to apply metabolomics in a high-throughput manner at the population level will be discussed.
Competency	<ul style="list-style-type: none"> - Understand the concept of “chemical exposome” - Understand how the omics approach can be used to characterize the exposure and study associated health effects
Duration	3 Hours
Training methods	Lecture
Reading	<ul style="list-style-type: none"> - Dennis KK, Marder E, Balshaw DM, Cui Y, Lynes MA, Patti GJ, Rappaport SM, Shaughnessy DT, Vrijheid M, Barr DB, 2017. Biomonitoring in the Era of the Exposome. <i>Environ Health Perspect</i>; 125: 502-510. 10.1289/EHP474 - Rappaport SM, 2011. Implications of the exposome for exposure science. <i>J Expo Sci Environ Epidemiol</i>; 21: 5-9. 10.1038/jes.2010.50 - Rappaport SM, Barupal DK, Wishart D, Vineis P, Scalbert A, 2014. The blood exposome and its role in discovering causes of disease. <i>Environ Health Perspect</i>; 122: 769-74. 10.1289/ehp.1308015 - Wild CP, 2005. Complementing the genome with an "exposome": the outstanding challenge of environmental exposure measurement in molecular epidemiology. <i>Cancer Epidemiol Biomarkers Prev</i>; 14: 1847-50. 10.1158/1055-9965.EPI-05-0456

Session 2	How chemicals including EDs affect health
Speakers	Etienne Blanc, Thierry Charlier and Aurore Gely-Pernot
Session Outline	<p>Etienne Blanc course will focus on some basic concept of toxicology and give some examples of vulnerable states of exposition. We will see the case of dioxin and polycyclic aromatic hydrocarbon (gene/environment interaction and developmental disruption) and the case of alcohol (genetic and epigenetic mechanism).</p> <p>The lecture of Thierry Charlier will show how developmental vulnerability can induce neurotoxicity. This course of Aurore Gely-Pernot will focus on how prenatal or childhood exposure can affect fertility using toxicological et epidemiological evidence. A specific focus will be done on how endocrine disruptors can affect the next generation after exposition (transgenerational impact).</p>
Competency	Analyze sources, pathways, and routes of exposure to these environmental and occupational hazards and safety, and determine the populations with a high risk of exposure
Duration	9 hours (Lecture) and Group works
Training methods	Lecture and Case Study
Reading	<ul style="list-style-type: none"> -Only One Chance: How Environmental Pollution Impairs Brain Development — and How to Protect the Brains of the Next Generation, Philippe Grandjean -The epigenetic impacts of endocrine disruptors on female reproduction across generations, <i>Biology of Reproduction</i>, 2019, 101(3), 635–644Saniya Rattan and Jodi A. Flaws. -Environmentally induced epigenetic transgenerational inheritance of male infertility. <i>Curr Opin Genet Dev</i>. 2014 Jun;26:79-88. doi: 10.1016/j.gde.2014.06.005. Epub 2014 Aug 11 Guerrero-Bosagna C¹, Skinner MK.

Session 3	Social-economical vulnerability
Speakers	Sadia Khan
Session Outline	<ul style="list-style-type: none"> • Overview of the impact of environmental exposures on maternal and child health • Social Vulnerability and Maternal Health • Social Vulnerability and Child Health • Recognizing the critical windows of exposure to EDs during pregnancy and childhood. • Inequality in Exposure to Endocrine Disrupting Chemicals • Linking Social Vulnerability, Inequality, and Endocrine Disrupting Chemicals in Maternal and Child Health
Competency	<ul style="list-style-type: none"> • Health Equity Skills • Community Partnership Skills • Public Health Sciences Skills • Leadership and Systems Thinking Skills.
Duration	3 hours
Training methods	Mixed – Lecture and Interactive
Reading	

Session 4	Management of the issue of endocrine disruptors by public institutions
Speakers	Anabelle Demy
Session Outline	This session aims to give a global understanding of the regulation of endocrine disruptors in the European Union (EU) today. After a brief history of how endocrine disruptors have come to be considered by the regulatory authorities of the United States, the EU and international organizations like the WHO and the OECD from the 1990s onwards, we will focus on the different European sectoral regulations dealing with endocrine disrupting chemicals and the actors involved to implement those.
Competency	<ul style="list-style-type: none"> -Critically analyses the take into account EDs at the local and international level -Knows and where needed applies the International Health Regulations to coordinate and develop strategic partnerships and resources in key sectors and disciplines for health security purposes
Duration	3 hours (Lecture) and Group work
Training methods	Lecture, Group work and Questions & Answers sessions
Reading	

Session 5	Risk assessment of EDs
Speakers	ANSES
Session Outline	Actors involved in the coordinated protection program regarding endocrine disruptor chemicals (EDCs) The French strategy on EDCs The CLP classification Reach and EDCs identification Identification of EDCs as defined in the law
Learning Objectives	Identifies the connections between environmental protection and public health policy
Duration	3 hours
Training methods	Lecture
Readings	