Programme: Endocrine disruptors-molecular mechanisms and adverse effects
September 17-21, 2018
IMM Institute of Environmental Medicine, Karolinska Institutet. Room: Gunnar Höglund, KI Solna, Berzelius väg 3, level 4.
Course leaders: Anna Beronius, Johanna Zilliacus and Annika Hanberg

Monday Sept 17	**Tuesday Sept 18**	**Wednesday Sept 19**	**Thursday Sept 20**	**Friday Sept 21**
9.00-9.30 Welcome and introduction to the course (AB, JZ, AH)	9.00-9.45 Endocrine disruptors and female reproduction (PD)	9.00-9.45 Endocrine disruptors and male reproduction (JBS)	9.00-9.45 Retinoic acid in developmental toxicity (EH)	9.00-9.45 Presentation and discussion of group work
9.30-10.30 Introduction of participants	9.45-10.15 Coffee break	9.45-10.15 Coffee break	9.45-10.15 Coffee break	9.45-10.15 Coffee break
10.30-11.00 Coffee break	10.15-11.00 Endocrine disruptors and female reproduction (PD)	10.15-11.00 Endocrine disruptors and male reproduction (JBS)	10.15-11.00 Endocrine disruptors and thyroid disorders (EH)	10.15-12.30 Presentation and discussion of group work
11.00-12.00 Introduction to endocrinology (JZ)	11.15-12.00 Early-life exposure to ED and metabolic outcomes (JR)	11.15-12.00 Group work	11.15-12.00 Group work	
12.00-13.00 Lunch	12.00-13.00 Lunch	12.00-13.00 Lunch	12.00-13.00 Lunch	12.30-13.00 Course ending
13.00-13.45 Introduction to endocrine disruptors and ED criteria (AH)	13.00-13.45 Early-life exposure to ED and neurodevelopmental outcomes (JR)	13.00-13.45 ED criteria – Endocrine activity and MoA analysis (AB)	13.00-13.45 Group work	13.00-17.00 Take home exam handed in at 17.00
13.45-14.15 Coffee break	13.45-14.15 Coffee break	13.45-14.15 Coffee break	13.45-14.15 Coffee break	
14.15-15.00 Adverse outcome pathways (AB)	14.15-15.00 ED and epigenetics (JR)	14.15-15.00 Group work	14.15-17.00 Group work	
15.15-16.00 AhR mediated mechanisms for endocrine disruption (EW)	15.00-17.00 Group work	15.00-17.00 Group work		
16.15-17.00 Group work				

Teachers:

AB, Anna Beronius, IMM, KI
AH, Annika Hanberg, IMM, KI
EH, Ellen Hessel, RIVM, The Netherlands
EW, Emma Wincent, IMM and Swetox, KI
JBS, Jan-Bernt Stukenborg, Dept of women's and children's health, KI
JR, Joëlle Rüegg, IMM and Swetox, KI
JZ, Johanna Zilliacus, IMM, KI
PD, Pauliina Damdimopoulou, CLINTEC and Swetox, KI

Course information

Purpose of the course:
The purpose of the course is to give the student knowledge and understanding of molecular mechanisms and adverse effects of endocrine disruptors as well as of methodologies to study such chemicals substances.

Learning outcomes:
After the completion of the course the student shall be able to:
- Describe molecular mechanisms and potential adverse effects of endocrine disruptors
- Explain methodologies to study the mechanisms of endocrine disruptors
- Identify and discuss challenges in identification and study of endocrine disruptors
- Discuss implications of endocrine disruption for human health

Content of the course:

Endocrine disruptors are defined as an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub)populations. Endocrine disruptors act via hormone receptors and by altering hormone levels and have been implicated in several endocrine-related diseases. The course will include molecular mechanisms of endocrine disruptors, from molecular initiating events to adverse effects. Current and emerging methodologies for identification and analysis of the endocrine disruptors will be addressed. Attention will be given to future challenges in endocrine disruptor research.

Content of individual teaching and learning activities:

Introduction to endocrinology (lecture)
- Endocrinology
- Nuclear receptor signalling

Introduction to endocrine disruptors and ED criteria (lecture)
- Endocrine disruptors, definition, examples of chemicals, mechanisms and adverse effects

Adverse outcome pathways (lecture)
- Introduction to AOPs
- MIE, KE, AP, KER
- Examples

AhR mediated mechanisms for endocrine disruption (lecture)
- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Endocrine disruptors and female reproduction (lecture)
- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Early-life exposure to endocrine disruptors and metabolic outcomes (lecture)

- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Early life exposure to endocrine disruptors and neurodevelopmental outcomes (lecture)

- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Endocrine disruptors and epigenetics (lecture)

- What is epigenetics
- Examples for endocrine disruptors
- Methods to study epigenetic effects

Endocrine disruptors and male reproduction (lecture)

- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

ED criteria – Endocrine activity and MoA analysis (lecture)

- Methods and assessment of endocrine activity and MoA analysis according to EFSA/ECHA guidance

Retinoic acid in developmental toxicity (lecture)

- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Endocrine disruptors and thyroid disorders (lecture)

- Mechanisms
- Adverse outcomes
- Examples of EDCs
- Methods used

Group work

- Building and assessment of an AOP relevant for endocrine disruptors
- Oral presentation of group work

Take home exam

- Short answer questions on factual knowledge
- Essay/reflection on
  - Challenges in identification and study of endocrine disruptors
  - Implications of endocrine disruption for human health