

Programme: Adverse Outcome Pathways (AOPs) – principles and applications in toxicology and health risk assessment

October 11-15, 2021, times are in CET

Lectures and group discussions are online using Zoom.

IMM Institute of Environmental Medicine, Karolinska Institutet.

Course leaders: Annika Hanberg, Johanna Zilliacus, Anna Beronius

Monday Oct 11	Tuesday Oct 12	Wednesday Oct 13	Thursday Oct 14	Friday Oct 15
9.00-9.30 Welcome and introduction to the course (JZ, AH, AB)	9.00-9.15 Wrap-up from previous day	9.00-9.15 Wrap-up from previous day	9.00-9.15 Wrap-up from previous day	9.00-9.15 Wrap-up from previous day
9.30-10.30 Introduction of participants	9.15-10.00 Assessment of Adverse Outcome Pathways (JZ)	9.15-10.00 Presentation and discussion of group assignment 1	9.15-10.00 Presentation and discussion of group assignment 2	9.15-10.00 Group assignment 3 – group discussion, cont.
10.30-11.00 Break	10.00-10.15 Break	10.00-10.30 Break	10.00-10.30 Break	10.00-10.30 Break
11.00-11.45 Introduction of participants, group discussions	10.15-11.00 Assessment of Adverse Outcome Pathways, cont. (JZ)	10.30-11.15 AOP networks (AB)	10.30-11.15 Use of AOPs for mixture risk assessment (JZ)	10.30-12.00 Presentation and discussion of group assignment 3 End of course
11.45-12.45 Lunch	11.00-11.15 Break	11.15-11.30 Break	11.15-11.30 Break	12.00-13.00 Lunch
12.45-13.45 Introduction to Adverse Outcome Pathways (AB), OECD EAGMST (EW)	11.15-12.00 Adverse Outcomes (AH)	11.30-12.15 Identification of endocrine disruptors (AB)	11.30-12.15 Regulatory application of AOPs for assessment of skin sensitization (LW)	13.00-17.00 Take home exam handed in at 17.00
13.45-14.00 Break	12.00-13.00 Lunch	12.15-13.15 Lunch	12.15-13.15 Lunch	
14.00-14.45 Key events (AB)	13.00-13.45 Quantitative AOP (DK)	13.30-14.30 Introduction to group assignment 2. Individual learning (incl break)	13.15-14.15 Introduction to group assignment 3 Individual learning (incl break)	
14.45-15.15 Break	13.45-14.00 Break	14.30-16.00 Group assignment 2 - group discussion	14.15-16.00 Group assignment 3 - group discussion	

15.15-16.00 Key event relationships (AB)	14.00-15.00 Introduction to group assignment 1. Individual learning (incl break)	16.00-16.15 Reflection on today's learning	16.00-16.15 Reflection on today's learning	
16.00-16.15 Reflection on today's learning	15.00-16.00 Group assignment 1 - group discussion	16.15-17.00 Individual learning Preparation for next day	16.15-17.00 Individual learning Preparation for next day	
16.15-17.00 Individual learning Preparation for next day	16.00-16.15 Reflection on today's learning			
	16.15-17.00 Individual learning Preparation for next day			

Teachers:

AB – Anna Beronius, IMM, KI

AH – Annika Hanberg, IMM, KI

DK– Dries Knapen, University of Antwerp, Belgium

JZ – Johanna Zilliacus, IMM, KI

LW– Lars Wiklund, RegSafe

EW– Emma Wincent, IMM, KI

Course information

Purpose of the course:

The purpose of the course is to give the student/participant knowledge and understanding of the principles of AOPs and examples on how AOPs can be used in regulatory risk assessment.

Learning outcomes:

After the end of the course the student should be able to:

- describe the principles and components of Adverse Outcome Pathways (AOPs)
- explain how experimental studies can support the development of AOPs
- discuss how AOPs can be used as a central framework for mechanistic toxicity studies, toxicity testing and health risk assessment

Content of the course:

The course will include the concept and principles of Adverse Outcome Pathways (AOPs). Development and assessment of AOPs. Examples of different AOPs. Application of the AOP concept in toxicological research and health risk assessment.

Participants of the course:

The participants will be master students in toxicology, PhD students, as well as professionals from authorities, companies and academia.

Content of teaching and learning activities:

Welcome and introduction to the course

- Introducing course directors
- Presenting Karolinska Institutet and Institute of Environmental Medicine
- Presenting course (learning outcomes, programme and exam)
- Explaining practical aspects of on-line course, including Zoom and Canvas

Introduction of participants

- Participants introduce themselves using 1-2 PowerPoint slide provided in advance
- Participants get to know each other in group discussions

Introduction to Adverse Outcome Pathways (AB), EAGMST (EW)

- What are AOPs
- Principles of AOPs and AOP development
- Applications of AOPs
- What is OECD's AOP development programme and the role of the Extended Advisory Group for Molecular Screening and Toxicogenomics (EAGMST)
- Including quiz or group discussion

Key events (AB)

- Main characteristics of key events
- Components of key events and applicability domain
- How are key events developed and described, essentiality of key events
- Including quiz or group discussion

Key event relationships (AB)

- Main characteristics of key event relationships
- Applicability domain
- How are key event relationships developed, evaluated and described
- Including quiz or group discussion

Assessment of Adverse Outcome Pathways (JZ)

- Why should the applicability of AOPs and confidence in AOPs be assessed

- Defining the biological domain of applicability of an AOP
- Determining the confidence in the AOP based on biological plausibility of key event relationships, essentiality of key events and empirical support of key event relationships
- Including quiz or group discussion

Adverse Outcomes (AH)

- What is Adversity
- Adverse Outcomes in AOPs
- Including quiz or group discussion

Quantitative AOP (DK)

- Quantitative AOPs

AOP networks (AB)

- What are AOP networks
- How can AOP networks be developed
- How can AOP networks be used, including examples
- Including quiz or group discussion

Identification of endocrine disruptors (AB)

- Use of AOPs in Mode-of-Action analysis for identification of endocrine disruptors
- Including quiz or group discussion

Use of AOPs for mixture risk assessment (JZ)

- What is mixture risk assessment
- How can AOPs support mixture risk assessment
- Including quiz or group discussion

Regulatory application of AOPs for assessment of skin sensitization (LW)

- AOP for skin sensitisation, regulatory applications, OECD guideline on defined approaches.
- Including quiz or group discussion

Introduction to group assignment (1-3). Individual learning

- Presentation of group assignment based on previous lectures
- Time for individual preparation for group assignment

Group assignment (1-3) and group discussion

- Work on group assignment in small groups

Reflection on today's learning

- Individual reflection on What was the most important I learnt today? Are there any open/unclear issues from today?

Wrap-up from previous day

- Teachers comment and clarify any open/unclear issues

Presentation and discussion of group assignments (1-3)

- Each group presents their group assignments
- Other groups ask questions and discuss

Take home exam

- Short answer questions on factual knowledge
- Reflection question on how AOPs can be used as a central framework for mechanistic toxicity studies, toxicity testing and health risk assessment