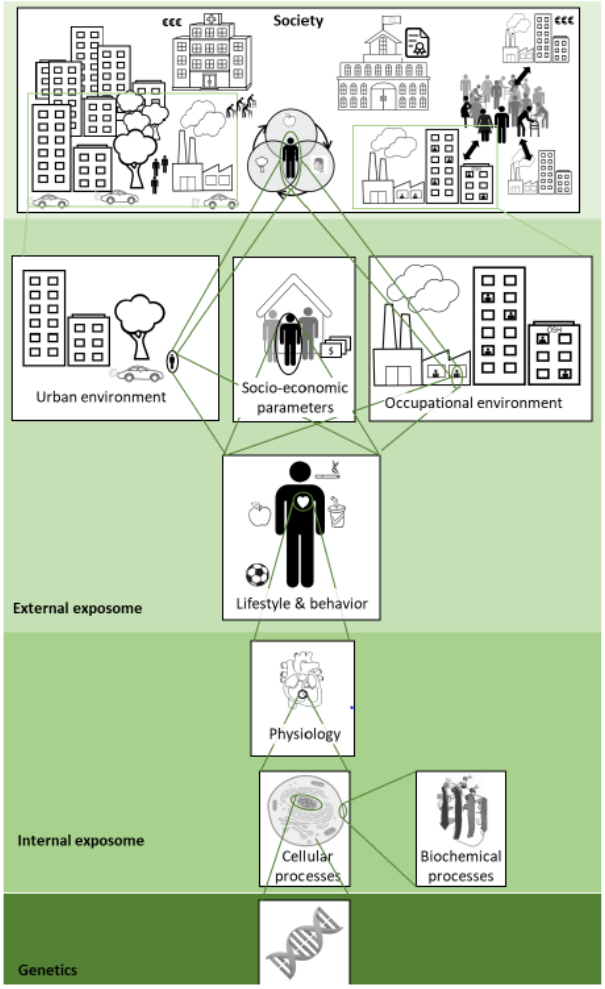
PhD course: Omics in environmental and occupational medicine
18-20 November 2024
Sandbjerg Gods, Sandbjergvej 102, DK-6400 Sønderborg

Aim: There are many challenges to capturing the complexity of exposures in an individual across the lifetime and their potential health effects. Traditionally, environmental health studies have focused on assessing risks related to a single exposure at a time, yet in reality we are constantly exposed to multiple exposures at the same time. To advance environmental health research and positively impact human health through recommendations and policy, we need to incorporate omics data that capture all



chemical species detectable in human plasma and related molecular changes over the life course. The exposome offers this framework and can be viewed as the environmental complement of the genome.

This course integrates the principle concepts of exposomics and the untargeted approaches of measuring exogenous and endogenous chemical exposures and molecular changes on an omic scale. We will step through the tools and techniques currently available to analyze the exposome. We will integrate seminar lectures with group work and presentations to put concepts into practice. Emphasis will be given to leveraging existing resources from ongoing studies and initiating new investigations.

Learning outcomes: By the end of the course, participants will be familiar with the following topics:

1. Principles of omics and exposomics
2. Study design advantages and pitfalls when doing omics
3. Laboratory methods and instrumentation platforms (metabolomics, proteomics, epigenomics) for analysis. Emerging (expo)somic topics, laboratory platforms and sensors
4. Big data, data reduction, AI
5. Pathway data analysis and bioinformatic databases
6. Data visualization and network interpretation, AOP

Workload: The full workload of the course is expected to be 36 hours.

Content: Lectures introducing omics, external exposomics (job exposure matrices and sensors), internal exposomics (epigenomics), big data linking internal and external exposomics and health outcomes, pathway analysis, data visualization, adverse pathway outcomes, emerging (expo)somic topics and laboratory platforms, biological interpretation and

conclusions supplemented with discussion of participants' own research and journal club.

Obligatory presentation of own research with omics – focus on ongoing omics analysis or ideas of omics integrated in the research projects of the participants (prepare 5 min presentation + 10 min feedback). Present the hypothesis, analysis, and possible problems and pitfalls. PPt and abstract to be sent in in advance to the course start.

Instructors: Karin Broberg, Professor, Genetic Occupational and Environmental Medicine, Lund University; Vivi Schlünssen, Professor, Institute of Public Health, Aarhus University; Johan Palmfeldt, Associate Professor, Department of Clinical Medicine, Research Unit for Molecular Medicine, Aarhus University; Martin Hansen, DTU SUSTAIN, Department of Environmental and Resource Engineering, Danmarks Tekniske Universitet, Bertram Dalskov Kjerulff, MSc, Department of Clinical Medicine, Clinical Immunology, Aarhus University; Anda Gliga, Assistant Professor, Institute of Environmental Medicine, Karolinska Institutet; Jens Boldsen, Department of Clinical Medicine, Clinical Immunology, Aarhus University; Ulla Vogel, Professor, National Research Centre for the Working Environment (NFA).

Criteria for participation: University degree in medicine, dentistry, biology, molecular biology, public health or Master's degree in other fields and/or postgraduate research fellows (PhD students and research-year medical students).

Requirements for participation: Investigators at all career stages are welcome to attend, and we particularly encourage trainees and early-stage investigators to participate. Experience with epidemiological analyses of environmental or occupational exposures is an advantage.

Course fee:

- PhD students, research-year students from Health, Aarhus University. A payment for accommodation of DKK 1.017,50 will be charged
- PhD students enrolled at partner universities of the Nordoc collaboration. A payment for accommodation of DKK 1.017,50 will be charged.
- PhD students from other institutions in the open market agreement for PhD courses. A payment for accommodation of DKK 1.017,50 will be charged.
- Others: A payment for accommodation of DKK 1.017,50 + the course fee DKK 3.000 will be charged.

Course dates

- 18 November 2024 12:00-18:00
- 19 November 2024 8:00-18:00
- 20 November 2024 9:00-13:00

ECTS: 2.5

Registration: Please sign up **here** before September 24, 2024

Program, updated 17/11/2024

Day 1	**Introduction and basic tools**	Lecturer
12.00	Lunch	
13.00-13.30	Introduction to omics and course admin	Karin Broberg
13.30-14.15	External exposomics: JEM, sensors	Vivi Schlünssen
14.15-15.00	Internal exposomics: proteomics	Johan Palmfeldt
15.00-15.30	Coffee break	
15.30-16.15	Internal exposomics: metabolomics	Martin Hansen
16.15-17.30	Journal club I incl plenary summary	Karin Broberg and Vivi Schlünssen
18.00-	Dinner	
Day 2	**Data analysis**	
8:45	Photo session	All
9.00-9.45	Internal exposomics: epigenomics	Karin Broberg
9.45-10.30	Big data - linking internal and external exposomics and health outcomes including registry data	Bertram Dalskov Kjerulff
10.30-11.15	Pathway analysis	Anda Gliga
11.15-12.00	Emerging omic topics and laboratory platforms	Anda Gliga
12.00-13.00	Lunch	
13.00-13.45	Adverse outcome pathways, AOP	Ulla Vogel
13.45-14.30	Data visualization	Jens Boldsen
14.30-15.00	Coffee	
15.00-16.30	Journal club II incl plenary summary	Karin Broberg and Vivi Schlünssen
16.30-17.00	Recap and conclusions	Karin Broberg
18.00-	Dinner	
Day 3	**Own research**	
9.00-11.30	Case study/ Presentation of own research*	Karin Broberg and Vivi Schlünssen
12.00-13.00	Lunch	
13,00	End of course	

Venue: Sandbjerg Gods, Sandbjergvej 102, DK-6400 Sønderborg, Southern Jutland (see map)