

Programme CS&D Master class

“Cellular organisation in health and disease”

Week 16-20 March 2019

Venue:

Str. 2.106

Organizer:

Prof. dr. Madelon Maurice, Dept. of Cell Biology, UMC Utrecht

Background:

The architecture and homeostasis of all mammalian cells is established and maintained by the organisation of the cellular interior into distinct functional compartments. Membrane-encapsulated organelles provide an interdependent network of discrete microenvironments that are tailored to facilitate a series of specific biochemical reactions and mediate communication with the extracellular environment. To maintain the organisation and activities of such organelles, membrane-bound proteins need to be directed to the organelles and subcompartments at which they function. Furthermore, specialized transport mechanisms exist to allow soluble proteins to cross membranes, such as the plasma membrane, ER and nuclear envelope.

Over recent years, additional aspects of cell organisation have emerged, including membrane-less compartments that selectively partition biomolecules in the nucleus or cytosol and exhibit rapid biogenesis and disassembly in response to environmental cues. It has become clear that such membrane-less organelles perform critical roles in cellular responses to stress, signal transduction as well as RNA metabolism.

Proper localization of protein complexes allows cells to undergo polarization, perform their specialized tasks and communicate with their environment. In solid tissues, mechanical cues such as stiffness of the extracellular matrix and tissue tension mediate critical intercellular instructive signals that control cellular proliferation, differentiation and migration.

The importance of proper protein localization and function within specific subcellular compartments is key for organismal homeostasis. Consequently, mutations affecting these cellular systems can cause devastating, if not fatal, effects for the whole organism.

The purpose of this Master Class has two aspects:

- Acquire basic and advanced knowledge on cell organisation and its relationship to disease and development.
- Use this knowledge to read a series of articles on a given subject and produce your integrated view of how the studied cell organisation defect (due to a given mutation) explains the etiology of the disease or the developmental defect.

Course organization: A minimum of 12 to max 20 students will receive training in reading and interpreting scientific literature dealing with cell organisation in health and disease.

Lectures and seminars:

- First, students will get 5 introductory lectures on the relationship between different aspects of cellular organization in disease and development by Judith Klumperman, Martijn Gloerich, Jurian Schuijers, Willem Stoorvogel and Madelon Maurice.
- Integrated in the course is seminar of a leading (inter)national scientist on the topic

Student work:

- The students will be divided in 5 groups and each group will prepare one of the subjects. At the end of this week, the students are expected to:

1) provide a concise and coherent oral presentation of two or more research papers in a format of a journal club for 20 min, followed by a 10 min discussion combining several papers (see guidelines) given by the teachers. You need to present primary data to support the facts that you present. It cannot be done as a review with no data.

The presentation will have to integrate the data of these papers to make a single and cohesive story while presenting primary data (See guidelines).

This is an important research exercise, so you learn to read, integrate information and write a introduction/ review/ scriptie etc.

2) After the final presentation on Friday, there will be **an exam**: you will be asked to answer questions about all subjects (5 in total) for 1 hour. This is important for you to gather sufficient information during the presentation of your fellow students but also it is to drive you into presenting the best you can so that others can understand.

Further remarks

The week is meant to be dedicated to this course. The students have to be together all the time, either as a small or large group. The preparation of the presentation has to be made together as a small group. Thursday, however, is dedicated to rehearse your presentation and improve it with all your colleagues of the course who do not deal with the same subject but who are intelligent enough to understand and help.

Grades: The grade will be based on **performance during the week** (interest, participation 20%), **the presentation** itself (with a separate mark for the introduction, result section and answers to questions 40%), and **the exam at the end** (40%)

Location:
STR2.106

Monday 16-03-2020 Group division and lectures

09.00-09.30: Introductory remarks and overview by course coordinator Madelon Maurice.

Students will be divided in 5 groups on the following subjects:

Teachers' subjects:

- 1) **Judith Klumperman: Defects in trafficking of autophagy protein ATG9 as cause for hereditary spastic paraplegias**
- 2) **Martijn Gloerich: Mechanical signals driving tumor progression**
- 3) **Jurian Schuijers: Biomolecular condensates in transcriptional regulation**
- 4) **Madelon Maurice: Wnt pathway degradasomes as a target for cancer treatment**
- 5) **Willem Stoorvogel: Tumor exosomes in liquid biopsies and their role in tumor metastasis**

09.30-11.00: Lecture **Judith Klumperman: "The endo-lysosomal pathway in health and disease"**

11.15-12.45: Lecture **Martijn Gloerich: "Cell-cell communication through force-sensitive adhesion complexes"**

12.45-13.40: *Lunch*

13.45-15.15: Lecture **Jurian Schuijers: "Chromatin organization in transcriptional regulation"**

15.30-17.00: *Reading papers*

Tuesday 17-03-2020 Lectures

09.00-10.30: Lecture **Willem Stoorvogel: "Exosomes in health and disease"**

10.45-12.15: Lecture **Madelon Maurice: "Cellular organization of the Wnt pathway"**

12.15-17.00 *Lunch & Start preparing presentations for Friday*

Wednesday 18-03-2020 Preparation presentations and outside speaker

09.00-14.00: Prepare papers for Friday presentation

14.00-16.00: Contact hours with the teachers for questions etc regarding the papers.

The preparation of the talks has to be made together. 2-3 students will actually present. But the others are meant to answer the questions at the end, so that the workload is shared.

Thursday 19-03-2020 Rehearsal presentations

- 09.00-10.00: Preparation of talks
- 10.00-14.00: General rehearsal as a big group without teachers (30-40 min per groups)
Each group presents the oral presentation to the rest of the students and get feedback. This will be important to improve the presentation. This, in turn, is important because on Friday afternoon, the students will have to answer one question of each presentation.
NOTE: General discussion on the subject should be avoided. Point out what you do not understand. Challenge the content, the clarity, the logics, the amount of info etc
- 14.00-15.30: Processing feedback, finalizing presentations
- 16.00-17.00: CSnD Seminar of external keynote speaker: **Danijela Vignovic, Institut Curie.**
Title: **“Role of microenvironment in epithelial cell migration in gut homeostasis and cancer invasion”**
Location: Ted Peek auditorium, Hubrecht Institute
- 17.00-17.20: Question time with speaker

Friday 20-03-2020 Final presentations, exam and drinks

- 09.00-13.00: 5x30 minutes paper presentation including 10 minutes discussion. 2-3 students will present and the other two answer the questions. Students will be asked to present themselves beforehand. All lecturers are present to grade the talks.
- 09.00: Presentation of paper 1
09.35: Presentation of paper 2
10.10: Presentation of paper 3
10.45: *Break*
11.15: Presentation of paper 4
11.50: Presentation of paper 5
- 12.30-12.45: Feedback on presentations by the teachers
- 13.00-14.00 *Lunch*
- 15.15 -16.15: Exam (questions on presentations + external speaker seminar)
- 16.15: Filling up of evaluation questionnaire
- 16.30 -17.30: Drinks