DEPARTMENT OF MEDICAL BIOCHEMISTRY AND BIOPHYSICS

C2F5557 Genome Instability in Cancer Development and Therapy, 1.5 credits (hec)

Genominstabilitet i cancerutveckling och terapi, 1,5 högskolepoäng

Third-cycle level / Forskarnivå

Approval

This syllabus is approved by the The Committee for Doctoral Education on 2023-12-12, and is valid from Spring semester 2024.

Responsible department
Department of Medical Biochemistry and Biophysics, Faculty of Medicine

Prerequisite courses, or equivalent

No prerequisite courses, or equivalent, demanded for this course.

Purpose & Intended learning outcomes

Purpose

The course aims at providing the students with a comprehensive overview of genome instability and its role in cancer development and progression. Genome instability can on one hand be beneficial, creating possibility for natural selection during evolution. On the other hand, it can lead to severe consequences when the level of genomic alterations causes development of cancer. Mutations and other deviations of DNA can be the consequence of inefficient or error-prone DNA repair processes and can originate from a wide range of sources including genotoxic stress due to transcription, DNA replication, DNA structures or chromatin topology.

The students will at the end of the course have become acquainted with the DNA damage response and the different mechanisms involved in sensing, tolerating and repairing DNA damage and how this is exploited in cancer treatment. The student will gain a deeper understanding of how the DNA damage response connects to different cellular responses such as chromatin remodelling and epigenetics, as well as transcription, replication, cell cycle progression and apoptosis. Possibilities for design of anti-cancer treatment strategies, both with

regards to DNA damaging chemo- and radiotherapy as well as emerging treatments targeting key players in the DNA damage response (targeted therapies), will be discussed and applied to the students own research projects.

Intended learning outcomes

After successfully completing this course the students will be able to:
- identify different types of genome instability and describe their role in cancer development and progression
- discuss and explain different mechanisms involved in sensing, tolerating and repairing DNA damage and how this is exploited in cancer treatment
- understand the mechanism of action of DNA damaging inducing anti-cancer treatments and drugs targeting the DNA damage response
- describe and understand state-of-the-art strategies for targeting the DNA damage response in cancer
- critically assess different molecular biology assays to study DNA repair and replication in cells and how this can be applied in their own research
- understand and theorize about how the DNA damage response connects to different cellular responses such as chromatin remodelling and epigenetics, as well as transcription, replication, cell cycle progression and apoptosis and apply this knowledge in their own research projects

Course content

The course will cover the topics stated in the learning outcomes, including key sources and biological responses to DNA damage, state-of-the-art techniques to detect DNA damage and genomic alterations in vitro and in vivo and the consequences of genome instability for cancer development and therapy success.

Forms of teaching and learning

The course consists of lectures and seminary by experts in their fields and group exercises such as journal clubs. To promote active learning, lectures and seminars are followed by discussions between the students and the speakers and the students will apply knowledge from the course in their own research projects in the examination.

Language of instruction
The course is given in English.

Grading scale

Pass (G) /Fail (U)

Compulsory components & forms of assessment

Compulsory components

Attending the lectures, seminars, group exercises and the examination seminar are compulsory. Absence can be compensated by other activities after discussion with the course leader.

Forms of assessment

To pass the course the students must show that they have reached the learning outcomes of the course. The course assignment will consist of:
1) an individual oral presentation about integrating topics from the course into the students' own research projects in line with the intended learning outcomes of the course.
2) the students are expected to ask questions on each other's presentations and be able to discuss and answer questions from fellow students and course leaders in line with the intended learning outcomes of the course.

Course literature

The students will be provided in advance with relevant literature (review articles, original publications). Teaching material will also be handed out during the course.