



**Karolinska
Institutet**

Course syllabus for

Biochemical and molecular toxicology, 18 credits

Biokemisk och molekylär toxikologi, 18 hp

This course has been cancelled, for further information see Transitional provisions in the last version of the syllabus.

Please note that the course syllabus is available in the following versions:

Spring2011 , Spring2013 , Spring2015

Course code	4TX010
Course name	Biochemical and molecular toxicology
Credits	18 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Toxicology
Level	AV - Second cycle
Grading scale	Pass with distinction, Pass, Fail
Department	Institute of Environmental Medicine
Participating institutions	• Department of Physiology and Pharmacology • Department of Neuroscience
Decided by	Programnämnd 7
Decision date	2010-10-26
Course syllabus valid from	Spring 2011

Specific entry requirements

Introduction to toxicology and Target organ toxicology

Objectives

After the course, the student should: Independently, and with minimised risk, be able to carry out common tasks in toxicological laboratory work including work with toxic chemicals. Have comprehensive knowledge of and be able to present basic research and analysis methods (e.g. analysis of DNA, RNA levels, protein levels, cytotoxicity and enzyme activity) used in biochemical and molecular toxicology. Be able to identify different cell death mechanisms and an appropriate methodology for identifying these. Be able to identify sources of error, weaknesses and strengths of different methods that are used in toxicological research. Be able to plan trials and analyses that can be used in the investigation of specific biochemical and molecular toxicological issues. Understand the usability of different analytical methods in the examination of toxicological mechanisms and modes of action. Be able to use mathematical methods for analysis of dose-effect relationships and relative potency and understand their role in risk assessment. Have general knowledge of methods within molecular

epidemiology. Have general knowledge of omics applications within toxicology. Have general knowledge of method for measurement of irritation of the skin and contact allergy in humans. Have general knowledge of health effects of various types of radiation. Demonstrate an understanding of global perspectives in toxicology and the importance of chemical safety for sustainable development.

Content

The course contains basic biochemical and molecular methods. The course is also based on toxicological applications of basic and more specialised methods that are often used in toxicological research. The methods that are included may vary from course to course depending on current research issues and therefore examples are given below. Laboratory technology and laboratory safety is included. Basic molecular biological methods for the analysis of DNA, RNA levels, protein levels and enzyme activity, e g with PCR, Real-time PCR, Northern blot, Western blot. Cell culture. Gene regulation and reporter assays. Microarray technology. Proteomics. Metabolomics. Computational models of xenobiotic metabolism. Bioinformatics. Heterologous expression and enzyme activity (e g purifying glutathione transferase with affinity chromatography, enzyme kinetics and inhibition). Genotyping techniques within molecular genetics. Molecular epidemiology. Methods for determining cell toxicity (e g detection of markers of DNA injury, apoptosis, phagocytosis and necrosis). Methods within endocrine toxicology (e g enzyme activity measurement with fluorescence spectrophotometry, analysis of vitamin A with HPLC). Methods for analysis of dose-effect relationships and relative toxic potency. Radiation biology with examples such as electromagnetic field and radon. Method for measurement of irritation of the skin and contact allergy in humans. Global perspectives in toxicology, the importance of chemicals safety for sustainable development. Part 1. Laboratory sessions, 9.5 HE credits Part 2. Theoretical method assignment, 1.5 HE credits Part 3. Global perspectives in toxicology, 2 HE credits Part 4. Integration of biochemical and molecular toxicology, 5 HE credits

Laboratory sessions, 9.5 hp

Grading scale: GU

Theoretical method assignment, 1.5 hp

Grading scale: GU

Global perspectives in toxicology, 2.0 hp

Grading scale: GU

Integration of biomedical and molecular toxicology, 5.0 hp

Grading scale: VU

Teaching methods

The course builds largely on laboratory sessions in groups. Laboratory sessions are introduced and supplemented by lectures. Laboratory reports are written in groups and oral discussions are held within independent laboratory session blocks. The students furthermore carry out a theoretical project in groups. A theoretical group assignment about global perspectives and sustainable development is included.

Examination

Part 1 is graded Pass/Fail and is examined through written laboratory reports. Part 2 is graded Pass/Fail and is examined through written and oral presentations. Part 3 is graded Pass/Fail and is examined

through written and oral presentation. Part 4 is graded Pass with distinction/Pass/Fail and is examined through written examination. Final grades in the whole course are based on the grade in part 4. During the semester in question, a regular examination and an occasion for re-examination is given. The course director can decide that re-examination will be oral. Compulsory participation All practical parts including presentations and occasional lectures (indicated in the schedule) are compulsory. The course director assesses if and, in that case, how absence can be compensated. Before the student has participated in all compulsory parts or compensated absence in accordance with the course director's instructions, the student's results for respective part will not be registered in LADOK. Limited number of examinations or practical training sessions: Students who have not passed the regular examination are entitled to participate in five more examinations. If the student is not approved after four examinations, he/she is recommended to retake the course at the next regular course date, and may, after that, participate in two more examinations. If the student has failed six examinations/tests, no additional examination or new admission is provided. The number of times that the student has participated in one and the same examination is regarded as an examination session. Submission of a blank examination is regarded as an examination. An examination for which the student registered but not participated in, will not be counted as an examination.

Transitional provisions

After each course, there will be at least 6 occasions for examination within a 2-year period after the end of the course.

Other directives

Course evaluation will be carried out in accordance with the guidelines established by the Board of Education. Course council meeting is held with the course coordinator and student representatives.

Literature and other teaching aids

Casarett, Louis J.; Klaassen, Curtis D.4 edt; Doull, John

Casarett and Doull's toxicology: the basic science of poisons

7. ed. : New York : McGraw-Hill, cop. 2008 - xv, 1310 s.

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