UCLouvain

lbbmc2110

2021

Animal and human molecular genetics and genomics

5.00 credits	36.0 h + 18.0 h	Q2

Teacher(s)	Gofflot Françoise ;Knoops Bernard ;Limaye Nisha (compensates Knoops Bernard) ;Rezsohazy René ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Based on review articles and original scientific papers, the main themes of the course are organized following three axes : **1/ Molecular mechanisms of gene regulation :** - transcription factors and cofactors, and their mode of action - modulation of regulators activity, in response to signalling pathways or to the intracellular context - cofactors involved in the establishment of chromatin domains - building up of macromolecular enhancer or silencer complexes - regulation of mRNA maturation and trafficking - translational regulation, the factors involved in, including the small regulatory RNAs (siRNA, stRNA). In addition, different techniques and methodologies will be detailed to address protein-DNA, protein-protein and protein-transcriptional machinery interactions, in the framework of biochemical, cellular and in vivo models. **2/ Animal and human genomics** - the concepts of structural, descriptive and comparative genomics, the analysis of some genomes will illustrate to what extent genomics can bring new viewpoints on evolution, physiology or lifestyles of organisms. - the concepts and tools of functional genomics, including gene inactivation and gene silencing strategies - the concepts, tools and approaches of transcriptomics, proteomics and interactomics allowing to build up wide maps of interacting functional modules in biological systems (system biology, network biology) **3/ The first two modules will be integrated to approach the molecular mechanisms governing animal and human development, including :** - spatial organization of embryos : from ovogenesis to axis determination - early determination of embryonic - molecular and cellular bases of organogenesis - sex determination and the germ line - diversification of animal forms through evolution These themes will cover transversal concepts of potentiality, plasticity, destiny, specification, determination, induction.
Learning outcomes	**At the end of this learning unit, the student is able to :** 1 This course aims at an in-depth approach of the molecular genetics and genomics of animals and human. This will be based on practical cases reported in the most recent scientific literature. The first goal will be to acquire the theoretical knowledge about the networks of interacting players controlling gene expression in the framework of multicellularity, differentiation and embryonic development. This will cover the current understanding of the regulatory mechanisms governing gene expression. The course will also make the student aware of the new concepts and emerging tools in the genomic and postgenomic era. This will consist in looking at the living world through its physiological function, its responses to environmental perturbations and its development in a genome-wide or in a system-wide framework.In connection with other lectures dealing with cell-to-cell communication, intracellular trafficking, cell cycle, apoptosis or cell-motility, this course will then aim to integrate those knowledge for the understanding of the molecular processes underlying cell differentiation and embryonic development. The second goal of this course will be to delineate the tools, methodologies and experimental models commonly used to investigate the molecular genetics and genomics of animals and human. Down the road, the student should be able to establish relevant hypotheses and to design appropriate experimental approaches to concretely tackle questions relevant to this field of research.
Evaluation methods	Analysis of scientific articles and presentation to the class.

Teaching methods	Course *ex cathaedra*.
Content	The course is divided in six parts: - the nematode C. elegans as a model organism for developmental genetics and animal genomics - the fly D. melanogaster: molecular genetics and genomics - the mouse as model mammal in molecular genetics and genomics, with a special focus on developmental biology - the mouse as model animal for human pathologies - cancer molecular genetics -Human genomics and molecular genetics Each part will approach chosen topics as well as the techniques and methods in use for each studied model.
Inline resources	slideshows presented during the course are made available on Moodle. https://moodleucl.uclouvain.be/course/view.php?id=9226
Other infos	Precursory courses: Molecular Genetics, Molecular and Cellular Biology
Faculty or entity in charge	BIOL

Programmes containing this learning unit (UE)

Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Chemistry and Bioindustries	BIRC2M	5		🔍
Master [120] in Biochemistry and Molecular and Cell Biology	BBMC2M	5		🔍
Master [60] in Biology	BIOL2M1	5		🔍