UCLouvain

lbbmc2106

2023

Molecular genetics and microbial genomics

5.00 credits	36.0 h + 18.0 h	Q2

Teacher(s)	Hallet Bernard ;Hols Pascal ;
Language :	English
Place of the course	Louvain-la-Neuve
Main themes	Relevant topics in the course are developed around three interconnected axes : BBMC2106A: genomics The first section of the activity provides a brief introduction on genomics concepts and approaches, emergence of the genomic era. Methods of genome sequencing and annotation, transcriptomics approaches, proteomics and interactomics approaches. Advances made by genomics studies on the understanding of microbial genome organisation, evolution and functioning are then discussed. These advances serve as a starting point for the development of specific topics in the two other sections. BBMC2106B: regulation of genome expression This part of the activity reviews the various mechanisms used by microbial organisms to regulate gene expression at different levels from signals to cell responses, signals integration and global regulatory networks (concepts of regulon, modulon, and stimulon), stress adaptation, microbial differentiation process (e.g., sporulation), cell to cell signalling (quorum sensing) and microbial collectivism (e.g., biofilms formation, toxins production, virulence onset, altruistic behaviours in microbial populations), phase variation mechanisms. BBMC2106B: regulation of genome plasticity This section reviews evolutionary strategies used by microbial organisms to adapt to their environment, based on genome rearrangements and lateral gene transfers. These strategies are discussed with respect to those developed by higher organisms, concepts of genome flux, genome regression, and genome expansion, concept of mobile genetic elements (plasmids, transposons, integrons and phages), specialised recombination mechanisms (unity and diversity), mechanisms of lateral gene transfer (conjugation, transduction and transformation), mutability and virulence, emergence of new pathogens, nocosomial affections, multi-resistance, adaptation to extreme environments.
Learning outcomes	**At the end of this learning unit, the student is able to :** Based on up-to-date data from comparative and functional genomics, this course aims at providing an in depth view of the global and specific mechanisms allowing microbial cells and microbial populations to regulate their activities in response to environmental conditions and physiological changes. Long-term evolutionary strategies of the microbial word are also considered and compared to those of higher eukaryotes. The goals are 1 (i) to integrate the different levels at which these mechanisms function (from individual cells to populations and species), (ii) to evaluate their impact on ecology and health, and (iii) to become familiar with the experimental approaches that were developed for their study. Students are asked to actively participate in the course by searching recent information in the literature, by discussing with invited scientists active in the field, and by exerting their criticism with respect to specific topics.
Evaluation methods	Students present a seminar based on a recent article connected to the course. Integration of the subject is examined during a discussion following the seminar.
Content	Vol.1: The content of the course is divided into specific modules developed by each teacher based on recent literature and his/her main field of expertise. Concepts are developed so as to reach the current state of the art, both in terms of knowledge and technological developments. Vol 2: External speakers from the academic world or industry are invited to contribute based on their personal scientific and professional activities. Excursions outside the university are organised in order to meet professionals of the field in their specific environment.

Other infos	Precursory courses : Students must be familiar with most fundamental concepts and techniques in microbiology and molecular biology.
Faculty or entity in charge	BIOL

Programmes containing this learning unit (UE)

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