UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Laboratory of Genetic Technologies

2021-2-E0201Q052-E0201Q065M

Aims

The course aims to provide students with the theoretical and practical knowledge essential to manage basic experimental methodologies for genetic analysis, guiding them to set up and perform simple genetic experiments with model microorganisms and discussing their results with them.
Knowledge and understanding.
At the end of the course, students are expected to consolidate and deepen basic knowledge of theoretical, technical and methodological issues already presented by the course in genetics.
Applying knowledge and understanding.
At the end of the course, students are expected to correctly interpret the experimental protocols already used, recognize their salient aspects, collect and process experimental data.
Making judgments.
At the end of the course, students are expected to have developed a critical vision of the experimental design and of the results achieved. Students should recognize when and how it is appropriate to apply experimental procedures and data processing methods learned during the course.
Communication skills.
At the end of the course, students will be able to process experimental data obtained and describe the results achieved in an appropriate language and with the correct technical terms.
Learning skills.
Students will be able to correctly interpret experimental protocols similar to those already practically performed, in contexts different from those already faced during practical laboratory experiences. It is also expected that this experience will increase student's interest in research activities and awareness in scientific aptitudes.

Contents

This course provides a practical approach to simple genetic analysis. Two different model microorganisms will be

used, the yeast Saccharomyces cerevisiae and the bacterium Escherichia coli. The students will acquire the ability to set up, perform and interpret simple genetic analyses, with particular regard to the correlations between genotypes and phenotypes, to the analysis of dominance and recessivity, segregation of genes in gametes, complementation, transformation of cells with plasmid DNA and the consequent acquisition of new heritable characteristics and phage infection.

Detailed program

-Introduction to the genetics laboratory: operational and personal safety rules, sterilization and culture techniques, main characteristics of the microorganisms used and introduction to the problems treated.
-Determination of the concentration of cultures of yeast cells (S. cerevisiae) in liquid medium by counting under the microscope and of the relative vital title by plating of appropriate dilutions on solid medium.
-Crosses of haploid yeast strains with different genotypes, selection of diploids, induction of meiosis and analysis of the phenotype of the same strains and their meiotic products.
-Growth inhibition test of cells of mating type a (MATa) with alfa factor (halo assay).
-Phenotypic analysis of “cell division cycle” (cdc) mutants and determination of their viability.
-Fluctuation test for the evaluation of the frequency of intrachromosomal recombination and of spontaneous mutation in yeast.
-Transformation of yeast cells (S. cerevisiae) with plasmid DNA, selection of transformants. Verification of the effects of the plasmids used on the phenotypes of the transformants.
-Plasmid loss test in yeast.
-Infection of E. coli cells with bacteriophages.

Prerequisites

Background: The participation in the Genetics course.
Specific prerequisites: none.
General prerequisites: Students can take the exams of the second year after passing the examinations of Introductory Biology, General and Inorganic Chemistry, Mathematics, and Foreign Language.

Teaching form

The genetics practical course (30 h, 3 ECTS) is mostly performed in a teaching lab (26 h) and partially in a classroom (4 hours), where the final day is carried out the final discussion of experimental results.
At the beginning of each lesson, theory, aims and experimental design will be exposed. Once experimental work is concluded, data are prepared and collected results are collectively discussed.
Last theoretical lesson consists in a final discussion of overall collected data.

Teaching language: italian.

Textbook and teaching resource

Learning material (slides of lessons and experimental data, handout) are made available in printed form and at the e-learning web page of LTA-Genetics module.

Semester

Second semester

Assessment method

Written exam.
Practical and theoretical knowledge will be tested with open questions/definitions and exercises. More in detail, exercises concern simple genetic analyses, such as correlations between genotypes and phenotypes, analysis of dominance and recessivity, complementation. Open questions concern the description of experiments performed during the course

Office hours

Contact: on demand, upon request by mail to lecturers.