

2005/06 Taught Postgraduate Module Catalogue

BIOL5215M

Molecular Cell Biology

15 credits

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Taught Semester 1 [View Timetable](#)

Year running 2005/06

Pre-requisite qualifications

BSc or equivalent

This module is not approved as an Elective

Objectives

On completion of this module, students should be able to:

Provide a brief overview of the exocytic and endocytic pathways in eukaryote organisms. This includes a brief overview of regulatory molecules that programme the translocation and movement of proteins through the secretory pathway; protein motifs recognised by such regulators; receptor internalisation of nutrients and growth factors.

Provide a brief overview of components of protein translocation and secretion machinery in prokaryotes. Such mechanisms are of potential importance in antibiotic therapeutics and resemble eukaryote pathways. Different model systems are considered for both gram positive and gram negative bacteria.

Understand the control of the eukaryote cell cycle and cell death. The eukaryote (yeast to man) cell cycle is considered with emphasis on regulators via protein phosphorylation-dephosphorylation as well as proteolysis. Cyclins, cyclin-dependent kinases, phosphatases, inhibitors of such components, growth factor and cytokine activation, relation of the cell cycle to cancer are considered. Programmed cell death (apoptosis) is also considered in relation to oncogenesis and regulatory factors such as Bcl-2, Bax and caspases are highlighted.

Describe the cellular cytoskeleton and cell adhesion. Cellular movement in complex organisms is regulated by components which interact with the substratum. The molecular basis for cellular movement and adhesion by the actin, microtubule, and intermediate filament networks, regulatory molecules and transmission of extracellular signals to these networks are highlighted. How these are modulated by adhesion receptors that bind to specific

extracellular substances are considered as well.

Describe the cellular basis for immunity. The humoral immune system will consider antibody and complement systems plus the genetic evolution of such defence systems. The cellular immune system will focus on the T-cell mediated immune recognition system with relevance to MHC Class I and MHC Class II recognition and responses.

Advanced topics in molecular cell biology. A choice of 2 advanced topics (from 6 offered) in different areas of molecular cell biology covering areas such as intracellular signalling, angiogenesis, exo- and endocytosis and other areas will be taken.

Evaluate experimental findings and data. The students will carry out tutorials where papers are summarised and evaluated to help their progress in evaluating experimental findings. Concise abstracts must be written beforehand for each paper and evaluated by the tutor. Assessed coursework on linked problems in molecular cell biology where the students are required to apply quantitative and qualitative analyses.

Literature survey and analysis. The students will be provided with a choice of 1 of 5 topics in membrane traffic, angiogenesis, intracellular signalling, cytoskeleton and diabetes/heart disease. A 3000 word essay will teach the students how to read a wide range of papers and evaluate their findings rapidly and provide a training in report presentation, writing and referencing skills. This will also teach them how to use the internet and library resources for paper retrieval and analysis.

Syllabus

This module is aimed at providing MRes/MSc students from a variety of backgrounds with lectures on molecular cell biology and a choice of 2 specialised topics in linked areas. Lectures are linked to tutorial analysis of experimental papers where the students are asked to evaluate the experiments, conclusions and provide critical analysis. Assessed coursework on problems in molecular cell biology using qualitative and quantitative approaches will highlight the nature of hypothesis-driven research to answer key questions in molecular cell biology. A literature review essay will allow the student to write a detailed essay in one of 5 topics in molecular cell biology, again linked to lecture and tutorial themes. Performance in the module will be based on tutorial work, assessed coursework and literature essay evaluations.

Paper Analysis

3 key papers in molecular cell biology from EMBO J., PNAS, J. Cell Biol., J. Cell Sci., or Mol. Biol. Cell.

Areas covered include cell cycle, membrane traffic, cytoskeleton, signalling, human disease and areas linked to lectures and modules

Students are asked to read the papers and prepare a brief definitive summary/abstract before each tutorial

Each tutorial will involve a discussion of the data and conclusions of each paper: strengths and weaknesses of the work will be explored

Assessed Coursework (3 compulsory pieces of work)
Quantitative Analysis
Qualitative and Morphological Analysis
Biochemical Analysis

Choice of 2 advanced topics modules (from 5); 6 lectures per module
Intracellular Targeting (Dr. A. Baker)
Diabetes and Heart Disease (Profs. S. Baldwin and N. Hooper)
Angiogenesis (Dr. Ponnambalam/Dr. Walker)
Exocytosis and Endocytosis (Dr. S. Ponnambalam)
Eukaryote Signal Transduction (Prof. Baldwin)
Essay is linked to these topics; choice of 5 essay titles

Teaching methods

Lectures: 28 x 1 hour;
Tutorials: 3 x 1 hour.

Private study

2 hours reading per lecture: 56 hours;
5 hours paper analysis per tutorial: 15 hours;
5 hours study per assessed work: 15 hours;
33 hours work on literature survey essay: 33 hours.

Progress monitoring

Students will be closely monitored and performance marked in small group tutorials and paper analyses. Assessed coursework on molecular cell biology problems will be evaluated in parallel. The student will also be evaluated on a 3000 word literature survey essay; a choice of one of 4 topics in membrane traffic, cell cycle, cytoskeletal dynamics and immunology will be provided.

Methods of assessment

Paper analysis and performance: 20%;
Problems x 2: 40%;
Literature survey essay: 40%.

Reading list

The [reading list](#) is available from the Library website