Intercalated BSc Degree in Experimental Pathology

Programme Code UBZF QMICMS1
Route Code USEXP

Programme description

The following section is a formal description of the course. If you require more detailed information please contact the programme organiser or the organisers of the individual modules.

Awarding body/institution:	Queen Mary, University of London
Teaching Institution:	Barts & The London School of Medicine & Dentistry
Name of the final award:	Intercalated Bachelor of Science Degree in Experimental Pathology (Honors)
Criteria for admission:	Normally, completion of 2, 3 or 4 years of the MBBS or 3 years of the BDS course, and permission to intercalate a bachelor's degree by the Dean for Education or his nominated deputy.

Aims and learning outcomes of the programme

- To understand the role of pathology in describing the natural history of disease, and the way in which disturbances in the homeostatic control mechanisms that maintain normal healthy function lead to disease.
- To understand the many general causes of disease, and how the pathologist obtains information about the causes of death.
- To study in depth a number of basic problems in general pathology and a variety of specialist topics not covered in the MBBS or BDS courses.
- To experience first-hand the process of experimental investigation into the study of a problem in experimental pathology, and to acquire specialist laboratory or clinical expertise (as well as data, word processing and presentation skills) sufficient to interpret and report the results of these investigations.

Teaching & learning

Each taught module will take place over a period of up to 1 term, and will consist primarily of lectures, backed up by reading as directed by the course organisers. Where appropriate, guest speakers will present their recent research results or discuss specialist or clinical topics. Typically the number of students doing each module will be small enough to allow considerable informality so that, according to the style and inclination of individual lecturers, some of the presentations may take the form of question-and-answer sessions, round-table discussions, PBL scenarios, or seminars with contributions from individual students or groups. The importance of clear and confident oral presentation of ideas and results from the literature will be strongly emphasised throughout the course.

Early in the first term, special lectures on experimental method and design, statistics and maintaining a notebook, will be presented to aid students beginning their project work. These

topics will then be revisited in the second term to reinforce their importance. Additionally, presentation skills will be integrated into all aspects of the course.

These skills will be drawn upon as part of the project work, when all students will be required to give a short oral account of progress at the end of the first term, and again when the project is completed. Workshops by the QM English Language and Study Skills unit are offered to help you in writing your project and additional sessions will help you with exam essay writing

Programme structure

The programme consists of 4 taught modules out of 5 choices (each of 1 unit) and an experimental project (4 units). Two of the taught modules take place in the first semester, and the remaining three in the second. The project begins at the start of the course and continues to mid April (exact dates will be given to you at the beginning of the course). Experimental work on the project should normally be over by mid March, leaving approximately 1 month for final data analysis, writing up and editorial work. The written examinations will normally take place in the middle to end of May, followed by an oral presentation and examination for all candidates in the second or third week of June.

The following 5 taught modules are offered.

Modules of study

1) The Science of Biocompatibility (MAT 6312)
CU Value: 1
Duration: 1 term, full time

Rationale
To develop an understanding of the concept that chemistry, structure and mechanics combine to contribute to a materials success or failure in clinical applications. Developing the ability to strategically evaluate what comprises biocompatibility and the most appropriate techniques for its assessment is essential in this field.

Objectives
Impart a knowledge and understanding of:
1. the concept that biocompatibility is application dependent
2. the range and complexity of biological responses to a material/device/restoration
3. the range of effects that the physiological environment can have on material/device/restoration functionality
4. the methods used to assess biocompatibility and associated ethics

Promotion of intellectual skills to:
1. appreciate the wide range of material characteristics and host interactions/responses that control biocompatibility
2. identify which materials properties are critical to biocompatibility in a given application
3. recognise the limitations of measurement and experimental techniques used in the study of biocompatibility

Facilitate transferable skills able to:
1. communicate knowledge and ideas verbally and in written reports using a vocabulary of biomedical terms.

2. recognise, analyse and solve problems individually and in groups

Syllabus
This module will provide a comprehensive understanding of the concepts related to biocompatibility. It will cover topics including proteins and protein adsorption, cells and tissue interactions (attachment, fluid shear and mechanotransduction), biomaterial blood and cell interactions, Inflammation, wound healing and foreign body response and Toxicity, hypersensitivity and infection.
The In vitro testing of biomaterials will be considered with respect to
– chemical exchange and degradation
– cell response (proliferation vs differentiation)
– evaluation of material compatibility
– evaluation of device functionality (biomechanics, remodelling/adaptation)
Matters related to clinical trials and regulatory approval will be considered including clean manufacturing, microbiology, packaging and sterility assurance**.**

Dept. responsible.	School of Engineering and Material Sciences (SEMS), QMUL
Course organiser.	Dr Himadri Gupta
Prerequisites.	None
Overlapping courses.	None
Teaching profile:	Lectures and tutorials
Assessment	Examination 100% (one 2.5hr examination)
Resources:	
Staff:	Academic staff from SEMS plus guest lecturer(s)
Library resources:	Standard library resources

2) Experimental Neuropathology (EXP005) (ICM6021)

CU Value:	**1**
Duration:	**1 term, full-time**

Rationale
The module covers the areas of brain injury due to mechanical trauma as well as neuro-degeneration, with emphasis on the research techniques that may be used to study the pathogenesis of disorders. These include the use of animal models of neurological disease, genetic mapping and gene expression techniques, as well as the field of proteomics.

Objectives
To understand the pathogenesis of head injury at a cellular and molecular level, and the sequence of events following on from the initial insult. To understand the use of animal models in the study of neurological disease. To understand neurodegeneration and some of the approaches used in the study of such disorders. To understand the principles of genetic and physical mapping, and the basis of the study of gene expression. The module will complement

the syllabus in basic neurosciences, and is strongly linked at a technical and applied level to the clinical neurosciences.

Syllabus

Genetic factors in disease including: non-Mendelian inheritance, genes and disease, genetic modelling of disease, and phenotype analysis, axonal transport, mechanisms of neuronal death. The general pathology of head injury, neuro-degeneration and demyelination, specific neuro-degenerative diseases, including: motor neuron, Alzheimer's, and Parkinson's diseases, as well as technical aspects including: genomics and proteomics will be covered.

Dept. responsible.	Pathology Unit, BI
Course organiser:	Dr. P.D.Allen, Prof. J.E. Martin
Prerequisites:	None
Overlapping courses.	None
Teaching profile:	Lectures, seminars and tutorials
Assessment:	Examination 100%
Resources:	
Staff:	Academic staff, plus guest lecturer(s), post-graduate students and NHS staff for specialist lectures
Library resources:	Standard library resources

3) Cardiovascular Pathophysiology (EXP006) (ICM6023)

CU Value:	**1**
Duration:	**1 term, full-time**

Rationale

Cardiovascular disease is the main cause of morbidity and mortality in the developed world and is fast becoming a comparable problem in the developing countries. The module describes some of the mechanical factors that underlie the pathogenesis and progression of vascular disease. This requires a brief outline of fluid dynamical and elasticity theory sufficient to understand the properties of extensible and non-linearly elastic materials such as arteries, and the behaviour of blood flowing in them. This approach is not commonly followed in the preclinical medical course, but it provides an essential adjunct to the biochemical and metabolic description of cardiovascular disease that students will encounter in their clinical studies.

Learning aims and objectives

To understand the normal development of the cardiovascular system in terms of the changing demands on the system during growth and ageing. This approach is extended to elucidate the pathogenesis of cardiovascular disease in terms of the response of cells in the vascular wall to changes in mechanical load such as increased blood pressure or reduced flow. To integrate this model of vascular pathology with epidemiological factors such as foetal malnutrition, which affect vessel development in early life and which are linked to an increased incidence of vascular disease in middle age. Finally, as a means of diagnosing and treating these problems, to gain an understanding of non-invasive measurement techniques to monitor the development of abnormal blood vessel properties.

Syllabus
Basic theory of elasticity, non-linear and viscoelastic description of arteries. Introduction to haemodynamics, pulsatile flow in distensible tubes, wave reflection. Arterial structure and composition. Models of vascular elasticity and the relationship between arterial structure and function. The effect of age and vascular disease on this relationship. Response of the arterial system to chronic changes in pressure and flow. Endogenous control of vascular tone and the control of blood pressure. The role of the vascular endothelial cell and its response to changes in blood flow. Mechanical factors in hypertension. Non-invasive measurement of vascular elasticity. Novel treatments for vascular disease.

Dept. responsible:	Pathology Unit, BI
Course organiser:	Prof. S.E. Greenwald
Prerequisites:	None
Overlapping courses.	None
Teaching profile:	Lectures, seminars and tutorials
Assessment	Examination 80% Coursework 20%
Resources:	
Staff:	Academic staff, plus guest lecturer(s) and post-graduate students for specialist lectures
Library resources:	Standard library resources

4) Inflammation and Special Topics in Pathology (EXP007)(ICM6022)

CU Value:	**1**
Duration:	**1 term, full-time**

Rationale
Inflammation is central to many disorders, and chronic inflammatory diseases are a major source of disability. The module will examine the scope of inflammatory disorders, the causes of inflammation, how to treat it and how it should be assessed, both experimentally and clinically. The principal aim is to understand the mechanisms and treatments of common chronic inflammatory disorders. The module will also cover a variety of additional topics in pathology. Material covered in many of the lectures will reflect the research interests of the speakers, and will include such diverse subjects as gastro-intestinal and genito-urinary tumours, and ageing and oncogenes.

Learning aims and objectives
The main aim of this module is to understand the pathogenesis of inflammatory disease. The module offers students the opportunity to see how the theoretical ideas concerning the causes of acute and chronic inflammation are applied to the understanding of common forms of inflammatory disease. It allows them to explore aspects of the subject to a greater depth than is normally possible in the clinical course. It also explores topics in pathology and the role of pathologists to help students understand this branch of medicine.

Syllabus
Topics include: overview of inflammation, mechanisms of inflammatory pain, animal models of inflammation, gene and protein therapies based on animal studies, mediators of inflammation,

regulation of acute inflammation, mechanisms of auto-immune disease, and neuro-endocrine immune regulation of inflammation. Special topics include: testicular and prostatic tumours, and pathology of the bladder and GI system.

Dept. responsible.	Pathology Unit, BI and WHRI
Course organiser:	Dr. P.D.Allen and Dr Diane Cooper
Prerequisites:	None
Overlapping courses.	None
Teaching profile:	Lectures, seminars and tutorials
Assessment	Examination 100%

Resources:

Staff:	Academic staff, plus guest lecturer(s), post-graduate students and NHS staff for specialist lectures
Library resources:	Standard library resources

5) Cancer Biology (EXP008)(ICM6020)

CU Value:	**1**
Duration:	**1 term, full-time**

Rationale

As a major world disease with high mortality and morbidity along with its large impact on health services, cancer has become a topic that medical students want to learn about. The module will examine the scope of cancer, its causes, how to diagnose it, how to treat it and how it should be assessed, both experimentally and clinically.

Learning aims and objectives

On completion of this course, you should have a clear idea of the distinction between benign and malignant neoplasia and the factors, which cause a tissue to loose its ability to control its growth and proliferation. You will be able to recognise the histological features of various tumours and have an overview of current techniques for their diagnosis, treatment and prognosis. However, as a basic science course, the focus will be on the underlying molecular biological mechanisms of tissue transformation and tumour growth, rather than clinical aspects of cancer.

Syllabus

The module will start with the definition of neoplasia and will go on to describe the macro- and microscopic appearance of a range of specific tumours and current ideas on the molecular and genetic basis of their pathogenesis. The transformation from normal to malignant tissue will be described together with the manner in which tumours grow and spread. The course will end with an overview of tumour diagnosis and general methods of treatment (pharmacological, radiotherapeutic and surgical).

Dept. responsible.	Cancer UK
Course organiser:	Dr David Prowse
Prerequisites:	None
Overlapping courses.	None

Teaching profile:	Lectures, seminars and tutorials
Assessment	Examination 100%
Resources:	
Staff:	Academic staff, guest lecturer(s), NHS staff for specialist lectures
Library resources:	Standard library resources

6) Experimental Project (ICM6024).

CU Value:	**4**
Duration:	**2 terms, full-time**

The project will normally be a piece of original research, which is expected to occupy at least half of the time throughout the course. It will normally involve experimental work or measurements on patients undergoing clinical investigation, and is presented as a written report. Students will also deliver a short oral presentation at the end of the first term, and then again at the completion of their project

The project is chosen from one or more of several broad subject areas such as:

- cardiovascular pathophysiology
- molecular genetics
- neuropathology
- tumour pathology
- vascular biomechanics