London South Bank University

Module Guide

Biology of Disease

FBS_6_302

Faculty of Engineering, Science and the Built Environment

2015-2016

Level 6, Year 3

Template version: 8

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1. MODULE DETAILS

Module Title:	Biology of Disease
Module Level:	Level 6, year 3
Module Reference Number:	FBS_6_302
Credit Value:	2 credits = 30 CATs points
Student Study Hours:	300
Contact Hours:	84
Private Study Hours:	216
Pre-requisite Learning (If applicable):	
Co-requisite Modules (If applicable):	
Course(s):	Bioscience programme combinations
Year and Semester	2015-2016, Semesters 1 & 2
Module Coordinator:	Dr Michael Byford
MC Contact Details (Tel, Email, Room)	Ex 7994, byfordmf@lsbu.ac.uk, B150
Teaching Team & Contact Details (If applicable):	
Subject Area:	Bioscience and Food
Summary of Assessment Method:	Laboratory sessions 20%, Case study 20% Examination 60%

2. SHORT DESCRIPTION

People are all prone to a huge range of disease states. Many are very rare but others are extremely common and so are leading causes of death and suffering to humans. This unit will describe and evaluate a range of common diseases and their treatment options and outcomes.

The first half of the unit will focus on non-infectious (neoplastic, autoimmune and hereditary) disease since these are the major causes of morbidity and mortality in Western populations. In the second half the focus will shift to infectious disease as caused by representative pathogens (bacterial, viral, protozoal and metazoan parasites) critically analysing old and new infectious diseases in the light of modern developments in molecular microbiology. The organisation and running of a clinical laboratory will be described. A series of practicals will isolate and identify a potential pathogen and investigate its resistance to common antibiotics.

3. AIMS OF THE MODULE

- To provide a body of knowledge relevant to the principles of pathogenesis, diagnosis and treatment and management of disease.
- To provide concepts unifying apparently disparate disease states.
- To provide an awareness and to demonstrate how modern techniques in molecular biology can lead to improved diagnostics and treatment especially of diseases thought previously to be highly intractable.
- To acquire an understanding of the principles and practice of modern medicine with regard to the scientific basis of medical treatments.
- To provide information to enable students to draw together information from a wide variety of disciplines (biochemistry, genetics, physiology, molecular biology, pharmacology) and appreciate the contribution of these subjects to our understanding of disease and its treatment.
- To evaluate the impact of molecular and cell biology and related techniques on the diagnosis and treatment of human disease.

4. LEARNING OUTCOMES

4.1 Knowledge and Understanding

- Characterise selected metabolic pathways in humans and explain the consequences of their disruption by selected inherited defects and particularly in the diabetic state.
- Evaluate the effects of selected inter- and intra-cellular signalling in the regulation of cell growth and differentiation in the human body and the disruptions in them that lead to cancer.
- Appreciate the importance of both genetic and environmental factors in the development of disease and the nature of the complex interplay between genetics and the environment.
- Evaluate the scientific validity and ethical acceptability of current methods available for the diagnosis of genetically-based disease.
- Assess the potential for new treatments/diagnoses based on molecular and cell biology techniques.
- Assess the impact of the human genome project and genome-wide association studies on our understanding of the basis of complex diseases of adult life.
- Understand how bacterial and viral pathogens cause disease in humans.
- Understand how to analyse a clinical sample for a potential pathogen, safely.
- Understand the current threats from new or old infectious diseases.
- To understand at the molecular level the mechanisms of pathogenesis and control of these diseases.
- To evaluate the Health and Safety issues associated specifically with a clinical microbiology laboratory.

4.2 Intellectual Skills

- Characterise selected metabolic pathways in humans and explain the consequences of their disruption by selected inherited defects and the diabetic state.
- Evaluate the effects of selected inter- and intra-cellular signalling in the regulation of cell growth and differentiation in the human body.
- Appreciate the importance of both genetic and environmental factors in the development of disease and the nature of the complex interplay between genetics and the environment.
- Assess the potential for new treatments/diagnoses based on molecular and cell biology techniques.
- Assess the impact of the human genome project and genome-wide association studies on our understanding of the basis of complex diseases of adult life.
- Understand the background to our development of understanding of the biological basis of disease
- To understand at the molecular level the mechanisms of drug action and modern strategies used in drug development, testing and evaluation.

4.3 Practical Skills

- Integration and critical assessment of material drawn from widely differing disciplines (biochemistry, immunology, cell biology, molecular genetics, medicine, ethics).
- Analysis of disease states as complex systems with numerous and diverse interacting components. Students who engage fully with the unit will further develop skills acquired earlier in the programme of study.
- Learning how to learn - there are numerous aspects to this skill which will be developed e.g. time management, finding information, analysing information critically.
- Use of information and communication technology. Use of the unit's Blackboard site. The use of Web based resources such as the Human Genome Sequence, the HapMap database and Online Mendelian inheritance in Man.
- Ability in critical analysis - this key intellectual skill is a major learning outcome of this unit and a main indicator of attainment of graduate status. In the unit the practicals and computer workshops will help develop this skill.
- Understanding methodologies - this will be developed as a result of practical classes.
- Numeracy skills - will be practised during the practical sessions.

4.4 Transferable Skills

The practical programme will involve the students in experimental work, performing it, analysing and reporting. Each group take a sample of Staphylococcus *spp*. The standard isolation procedure will be used and standard tests to identify and characterise the pathogenic properties of the bacteria recovered.

An anti-biogram will be constructed to illuminate the prevalence of antibiotic resistance to major classes of antibacterial compounds. Good Microbiological Practices will be strictly followed.

5. ASSESSMENT OF THE MODULE

Laboratory sessions 20%, Case study 200% Examination 60%. Three hour unseen examination (60% of the assessment) on the diseases covered in the unit, their aetiology, management, treatment options and implications for improvements in human health. Specific developments in how new technologies are affecting our approaches to disease in the 21st century covered in the module will also feature in the examination. You can be examined on any of the content of the module although the examination will cover a representative range of the *types* of disease to be discussed. The examination will cover chiefly learning outcomes 1 – 3.

You will also complete a detailed case study of the developments in the understanding and management of one (*non-infectious*) disease (3000 words, 20% of the assessment) of your choice *not* previously covered in detail in the Unit. The case study will cover chiefly learning outcomes 3 – 5. A 300 word synopsis should be submitted initially to determine suitability of the disease selected by students for in-depth treatment. The focus should be on how modern molecular and cell biology has increased our understanding of the disease mechanism and/or how molecular and cell biology has facilitated improved diagnosis, prevention or treatment. You should also address social and ethical implications of these new developments. Discuss with the module coordinator the emphasis to be given to each of these elements when you submit your initial outline.

To complete this coursework element you will need to consult recent reviews, original research papers, and probably articles in print publications as well as Internet sources intended for a more lay audience (those directed mainly at individuals with the disease and their families and friends). *You are warned therefore of the University's policy on plagiarism*. You must pay careful attention to citing fully and correctly all the reviews and articles you have used (including those accessed over the Internet). You must also acknowledge all sources of quotes or of near quotes. If this is not done correctly you might be guilty of plagiarism and could fail the module. Consult with the module coordinator if you have any concerns about accidental plagiarism.

Your choice of disease, and an outline (about 300 words) of how you intend to cover it, will require initial approval of the module cooordinator by **Friday 18th Dec** (end of Autumn term). You are invited to discuss further your treatment of the assessment, if you wish, as you develop it.

The case study must be submitted by **Monday 4th Jan 2016** (just after the Christmas vacation).

Your case study will have these learning outcomes:

An in depth understanding of the molecular basis of your choice of a non-infectious disease.
An appreciation of its aetiology and an evaluation of the balance between the genetic and/or environmental factors involved.
Critical assessment of the contribution of new strategies for prevention, diagnosis, treatment and management of the disease of choice with particular reference to the impact of modern molecular and cell biology on these elements of medical care.

6. FEEDBACK

Feedback on case study Monday 18th Jan. Feedback on practical classes 14 days after submission. The practical classes were not timetabled at the time this Guide went to press because they are in Semester 2.

7. INTRODUCTION TO STUDYING THE MODULE

7.1 Overview of the Main Content

Diabetes	A major disruption of metabolism, its aetiology and treatment
Glycogenoses	Further example of the effects of metabolic disruption
Ageing	Its associated diseases and their effect on policy choices in healthcare
Atherosclerosis	The major cause of death in the West: causes, effects and treatment
Autoimmune disease	Cause of a wide spectrum of diseases with a common basic theme
Gene therapy	Its basic technology prospects and problems
Cancer (1).	The basic biological defects in cancer and their effects
Cystic Fibrosis	Integrative case study illustrating a number of unifying concepts
Cancer (2).	Paediatric cancer. Modern approaches to cancer treatment
Monoclonal Antibodies	As therapeutics, their development, applications and future prospects
Drug development	Two sessions covering traditional approaches and "rational" drug design and the regulatory environment encountered when bringing a novel drug to market.

Advanced immunology	Immunological concepts will be revised and extended to encompass more advanced topics
Antibody diversity	A key problem in understanding our response to disease is the generation of many billions of possible antibodies from a couple of hundred genes
Pathogenicity	Two sessions on the processes by which bacteria cause disease. This impacts on the practical classes significantly
Viral disease	Processes by which viruses cause disease
Prions	As entirely novel pathogens
Rabies and Smallpox	Two case studies in viral disease, one eradicated, one invariably fatal
Antibiotic resistance	A major concern in healthcare settings
HIV/AIDS	An example of a newly emergent disease and the response to it.
Clinical laboratories	Running of a medical microbiology facility

7.2 Overview of Types of Classes

A series of thematic lectures on major diseases will be augmented by others focusing mainly on recent specific developments in treating diseases, such as the impact of the Human Genome Project, transgenic technology and gene therapy. Tutorials will be introduced based around specific cases to give a clinical dimension to the diseases studied.

7.3 Importance of Student Self-Managed Learning Time

As with any course at this level the lecture and tutorial programme exists as a framework to underpin additional study by individual students. A reading list is given and there are numerous Internet based resources that focus on specific conditions that can be readily consulted

7.4 Employability

The unit will equip students with an in-depth knowledge of a variety of disease states. This will be useful in the post degree environment as those studied are frequently this of particular interest to the pharmaceutical sector.

8. THE PROGRAMME OF TEACHING, LEARNING AND ASSESSMENT

Semester 1

Diabetes
Glycogen storage diseases
Ageing and Age related degenerative disease
Atherosclerosis
Autoimmune disease
Gene therapy
Cancer (1)
Cystic Fibrosis
Cancer (2)
Monoclonal Antibodies as therapeutics
Drug design and development (1)
Drug design and development (2)
Recap on semester 1 content.

Semester 2

Advanced immunology
Generation of Antibody diversity
Pathogenicity (I)
Pathogenicity (II)
Viral disease
Prions
Rabies and Smallpox
Antibiotic resistance
HIV/AIDS
Clinical laboratories
Revision class

Tutorial Programme

Clinical case studies on the diseases with associated questions will be distributed and then discussed in a subsequent session

Practical Class

Separate practical guide giving detailed background and experimental procedures made available in due course

9. STUDENT EVALUATION

83% of students passed the module. One student passed on referral, overall pass rate 86%

10. LEARNING RESOURCES

10.1 Core Materials

Ahmed N., Dawson M., Smith C., and Wood E. (2007) *Biology of Disease.* Taylor and Francis (this covers both infectious and non-infectious disease)
A good text for infectious disease is: *Medical Microbiology*, 4th edition Edited by Samuel Baron. University of Texas Medical Branch at Galveston, Galveston, Texas 1996. ISBN-10: 0-9631172-

1-1. It is out of print but available free online from the US National Library of Medicine at: http://www.ncbi.nlm.nih.gov/books/NBK7627/

10.2 Optional Materials

- Cox T. M. and Sinclair J. (1997) *Molecular Biology in Medicine.* Blackwell Scientific.
- Devlin T. M. (1997) *Textbook of Biochemistry with Clinical Correlations.* Wiley.
- Lodish H *et al.* (2001) *Molecular Cell Biology*, 4th ed. WH Freeman.
- Sudbury P. (1998) *Human Molecular Genetics* Longman.
- British Medical Association (1998) *Human Genetics: Choice and Responsibility.* OUP.
- Franks L. M. and Teich N. M. (eds.) (1997) *Introduction to the Cellular and Molecular Biology of Cancer*, 3rd ed. Oxford University Press.
- Salisbury J. (1997) *Molecular Pathology.* Taylor and Francis.
- Jeffery S., Booth J. and Myint S. (1999) *Molecular Diagnosis*. BIOS Scientific.
- Strachan T. and Read A. P. (1999) *Human Molecular Genetics*, 2nd ed. BIOS
- Salyers AA, and Whitt DD. Bacterial Pathogenesis: a molecular approach, 2nd edition ASM Press (2002)
- Prescott LM, Harlet JP, Klein DA Microbiology WCB (1999) 4th edition or later edition

NOTES