LF223-15 Microbial Pathogens

22/23

Department
Life Sciences
Level
Undergraduate Level 2
Module leader
Erin Dilger
Credit value
15
Module duration
5 weeks
Assessment
Multiple
Study location
University of Warwick main campus, Coventry

Description

Introductory description

The overall objective of this section is to introduce you primarily to a range of important microparasites, the diseases they cause and the parasite-host and environmental interactions that govern their biology and approaches to control. Examples include vector-borne and/or zoonotic organisms from Mycobacterium, Trypanosomes, Plasmodium to fungi. This module includes a focus on bacterial nutrition and nutrient acquisition by addressing the growth characteristics of selected pathogens in the environment (or natural reservoir) and how these are modified and adapted with infection of the host. We also look at epidemiological factors involved in their invasion, spread, and colonisation, and the host defence systems that they have to overcome. Techniques used in the diagnosis of infection, and both current and novel approaches to their control will be discussed. We will also look at the impact of infectious disease over the centuries and how they have been perceived and dealt with by society.

Module aims

The aim of the module is to explain the biology of important pathogens. Through study of a variety of microbes, students will gain an appreciation of the diversity of pathogens and pathogenic mechanisms in human infectious disease.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Lecture Outlines

1. Introduction to bacterial pathogens; temperature tolerance, especially cold shock response and Listeria virulence; Legionella and heat shock proteins.

2. pH tolerance, particularly of acidic conditions e.g. by Salmonella typhimurium and Helicobacter pylori.

3. Anaerobiosis and the effect of oxygen on growth and pathogenicity e.g. of Clostridium botulinum, C. tetani.
   4-6. African trypanosomes. The evolutionary biology of African human and cattle trypanosomes and their vectors causing sleeping sickness in humans, and nagana and related diseases in livestock. Important issues relating to zoonotic control include maintaining endemic stability in the context of circulating tick-borne diseases.

4. Apicomplexan parasites: Plasmodium.
   This lecture will provide an introduction to apicomplexan biology, including structure, life cycles, and vectors but focus on Plasmodium, the causative agent of malaria. The clinical significance, pathogenesis, epidemiology and control strategies will be discussed.

5. Apicomplexan parasites: Toxoplasma and Cryptosporidium.
   Toxoplasma is a coccidian parasite which infects humans as well as a wide variety of mammals and birds. It exhibits a predator-prey type life cycle and felines are the only definitive host. Cryptosporidium, a parasite commonly found in lakes and rivers, especially when the water is contaminated with sewage and animal wastes, is a parasite of the intestinal tracts of fishes, reptiles, birds, and mammals.

6. Infections featuring slow growing bacteria: examples, collective problems of diagnosis and treatment.

7. Focus on diseases associated with slow growing mycobacteria: leprosy, historical aspects, treatment and irradiation. Unique features of M. leprae genome and virulence determinants; Buruli ulcers and M. ulcerans.

8. Tuberculosis and its re-emergence as a major global pathogen of the developing and developed world. Association with HIV, diagnosis and treatment: problems for both especially multidrug resistant strains.

12-13. Trypanosoma cruzi (Chagas’ disease). The epidemiology of domestic and sylvatic transmission cycles and its implications for the Southern Cone Project working towards its elimination.

14-15. Fungi as pathogens of medical importance; survey and general properties of medically important fungi; prevalence and incidence of fungal diseases, mechanisms of pathogenicity. Biology and pathogenesis of major groups of fungi causing both superficial and deep mycoses. Selected examples will include Aspergillus, Candida, Cryptococcus and Histoplasma including case histories, diagnosis and treatment.

Learning outcomes

By the end of the module, students should be able to:

- Level 5 understanding of micro parasitic infections
- Level 5 understanding of parasitic disease and vectors
- Level 5 understanding of the environmental impact on parasites and their vectors
- Level 5 understanding of infection diagnostics
- Level 5 understanding of the social and population impacts of infections

Indicative reading list

Madigan, Bender, et al. Eds. Brock Biology of Microorganisms, 15th edn. (Pearson, Benjamin Cummings, 2018). [ISBN 1-292-23510-1]

Mims, et al. Medical Microbiology, updated 3rd edn. (Mosby, 2005). [ISBN 0-323-03575-2]

Murray, Rosenthal and Pfaller. Medical Microbiology, 5th edn. (Mosby, 2005). [ISBN 0-323-03303-2]

Salyers, A. A. and Whitt, D. D. Bacterial Pathogenesis: a Molecular Approach (ASM Press, 2002). [ISBN 1-55581-171-X]

Subject specific skills

Understand a range of important microparasites, the diseases they cause and the parasite-host and environmental interactions that govern their biology and approaches to control. Examples include vector-borne and/or zoonotic organisms from Mycobacterium, Trypanosomes to fungi.

Understand bacterial nutrition and nutrient acquisition by addressing the growth characteristics of selected pathogens in the environment (or natural reservoir) and how these are modified and adapted with infection of the host.

Explain epidemiological factors involved in the invasion, spread, and colonisation of pathogens, and the host defense systems that they have to overcome.
Understand techniques used in the diagnosis of infection, and both current and novel approaches to their control will be discussed. We will also look at the impact of infectious disease over the centuries and how they have been perceived and dealt with by society.

Transferable skills

Self directed learning
Adult Learning

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (10%)
Other activity	10 hours (7%)
Private study	125 hours (83%)
Total	150 hours

Private study description

Self directed learning and revision for the end of year exam

Other activity description

In module assessment -

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D

	Weighting	Study time
In-module assessment	30%	30 hours
Authentic assessment, based on a common problem or dataset researchers would deal with on a regular basis in the academic environment. This is in-line with both AQSC and RSB requirements on assessments		
Online Examination	70%	45 hours
1.5 hr exam- 45 min short answer question paper / 45 min essay based paper		

- Online examination: No Answerbook required

Assessment group R

	Weighting	Study time
In-person Examination - Resit 45 min SAQ paper / 45 min essay paper	100%	

- Answerbook Green (8 page)
- Students may use a calculator

Feedback on assessment

Post-board cohort level feedback

Past exam papers for LF223

Availability

Courses

This module is Core for:

- UBSA-C1B9 Undergraduate Biomedical Science
  - Year 2 of C1B9 Biomedical Science
  - Year 2 of C1B9 Biomedical Science
  - Year 2 of C1B9 Biomedical Science
- ULFA-C1A3 Undergraduate Biomedical Science (MBio)
  - Year 2 of C1A3 Biomedical Science
  - Year 2 of C1B9 Biomedical Science
- Year 2 of ULFA-C1A7 Undergraduate Biomedical Science with Industrial Placement (MBio)
- ULFA-CB18 Undergraduate Biomedical Science with Placement Year
  - Year 2 of CB18 Biomedical Science with Placement Year
  - Year 2 of CB18 Biomedical Science with Placement Year
  - Year 2 of CB18 Biomedical Science with Placement Year

This module is Core optional for:

- UIPA-C1L8 Undergraduate Life Sciences and Global Sustainable Development
  - Year 2 of C1L8 Life Sciences and Global Sustainable Development
  - Year 2 of C1LA Life Sciences and Global Sustainable Development: Biological Sciences

This module is Optional for:

- UBSA-C700 Undergraduate Biochemistry
  - Year 2 of C700 Biochemistry
  - Year 2 of C700 Biochemistry

- ULFA-C1A2 Undergraduate Biochemistry (MBio)
    - Year 2 of C1A2 Biochemistry
    - Year 2 of C700 Biochemistry
- Year 2 of ULFA-C702 Undergraduate Biochemistry (with Placement Year)
- Year 2 of ULFA-C1A6 Undergraduate Biochemistry with Industrial Placement (MBio)
- UBSA-3 Undergraduate Biological Sciences
    - Year 2 of C100 Biological Sciences
    - Year 2 of C100 Biological Sciences
- Year 2 of ULFA-C1A1 Undergraduate Biological Sciences (MBio)
- Year 2 of ULFA-C113 Undergraduate Biological Sciences (with Placement Year)
- Year 2 of ULFA-C1A5 Undergraduate Biological Sciences with Industrial Placement (MBio)
- Year 2 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)