LF223-15 Microbial Pathogens

26/27

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

Description

Introductory description

This module explores key microparasites, the diseases they cause, and the intricate pathogen–host–environment relationships that shape their biology and control. Using examples from Mycobacterium (tuberculosis) to Plasmodium (malaria), we will investigate biochemical, ecological, and epidemiological factors driving pathogen invasion, persistence, and spread, alongside the host defences they must evade. We cover diagnostic techniques, current control challenges, and emerging solutions, while also reflecting on the historical and societal impact of infectious diseases through the centuries.

Module aims

To explore the biology of important human pathogens and reveal the diverse strategies they use to cause disease. By studying a range of microbes, students will develop a deep understanding of pathogen diversity, mechanisms of infection, approaches to control and their role in human health.

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.

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1. Introduction to bacterial pathogens

- Environmental and physiological factors affecting growth and disease potential: temperature tolerance, pH tolerance, acid resistance, oxygen effects.
- Case examples: Clostridium botulinum, Clostridium tetani.

1. Medically important fungi

- Mechanisms of pathogenicity, diagnosis, and treatment.
- Case studies: Aspergillus, Candida, Cryptococcus, Histoplasma.
  3–4. Mycobacteria
- Diseases caused by slow-growing species (M. ulcerans, leprosy), historical perspectives, treatment challenges, unique genomic and virulence traits.
- Mycobacterium tuberculosis: re-emergence as a global pathogen, HIV association, diagnostic and treatment challenges, multidrug resistance.
  5–6. Trypanosoma cruzi (Chagas' disease)
- Biology of American trypanosomes and their vectors
- Epidemiology of domestic and sylvatic transmission cycles.
- Control strategies: Southern Cone Project and progress toward elimination.
  7–9. African trypanosomes
- Evolutionary biology of human and livestock trypanosomes and their tsetse vectors.
- Diseases: sleeping sickness, nagana, and related livestock infections.
- Important issues such as zoonotic control and maintaining endemic stability alongside tick-borne diseases.
  10–11. Apicomplexan parasites – Malaria
- Life cycle, vector relationships, clinical significance, and pathogenesis.
- Epidemiology and novel control strategies.
  12–13. Spore-forming bacteria
- Biology and structure of bacterial spores; sporulation cycle and triggers.
- Survival strategies in extreme environments.
- Public health concerns; control and decontamination strategies.
- Pathogenic spore-formers: Bacillus anthracis, Clostridium difficile, C. perfringens, C. botulinum.

1. Mechanisms of infection and virulence

- Overview of virulence: adhesins, toxins, secretion systems, immune evasion mechanisms.
- Regulation of virulence gene expression.
- Host–pathogen interactions.

1. Antimicrobial resistance (AMR)

- Review mechanisms of resistance.
- Global epidemiology of AMR: key pathogens and spread.
- Current and emerging strategies for surveillance, stewardship, and novel therapeutics.

Learning outcomes

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

- Explain the biology, life cycles, and pathogenic mechanisms of major human pathogens, including bacteria, fungi, protozoa, and their vectors.
- Explain mechanisms of infection, virulence, and antimicrobial resistance, and assess their implications for diagnosis, treatment, and control.
- Analyse the environmental, host, and microbial factors influencing pathogen survival, transmission, and disease progression, with reference to specific case studies.
- Evaluate strategies for disease prevention, surveillance, and intervention based on pathogen biology and epidemiology.
- Assess current and emerging approaches for the diagnosis, treatment, and control of infectious diseases, including novel therapeutics, vaccines, and environmental or vector-based strategies.

Indicative reading list

Reading lists can be found in Talis

Subject specific skills

By the end of this module, students will have developed skills in:

- Analysing the mechanisms underlying microbial growth, survival, pathogenicity, and host–pathogen–environment interactions.
- Understanding epidemiological and laboratory approaches used to investigate infections, interpreting results, and understanding transmission dynamics.
- Evaluating strategies for the prevention, treatment, and control of infectious diseases, integrating mechanistic knowledge with host and environmental factors.

Transferable skills

- Information literacy – sourcing, evaluating scientific literature to underpin understanding and integrating up-to-date research into in-module assessments.
- Scientific communication – presenting findings clearly in written, and visual formats.
- Critical thinking – exploring complex biological systems to make evidence-based conclusions.

Study

Study time

Type	Required
Lectures	15 sessions of 1 hour (18%)
Private study	70 hours (82%)
Total	85 hours

Private study description

Self-directed learning.

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 D1

	Weighting	Study time	Eligible for self-certification
In-module assessment	30%	30 hours	Yes (extension)
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			
Examination	70%	45 hours	No
Section A: short answer questions. Section B: longer questions (may be essays, data-led or scenario-based).			

Assessment group R1

	Weighting	Study time	Eligible for self-certification
In-person Examination - Resit	100%		No
Section A: short answer questions. Section B: longer questions (may be essays, data-led or scenario-based).			

Feedback on assessment

Individual feedback on in-module assessment.
Post-board cohort level feedback on end-of-year exam.

Past exam papers for LF223

Availability

Courses

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:

- Year 2 of UBSA-C700 Undergraduate 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)
- Year 2 of UBSA-3 Undergraduate 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 UBSA-C1B9 Undergraduate 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)
- Year 2 of ULFA-CB18 Undergraduate Biomedical Science with Placement Year
- Year 2 of UMDA-CF10 Undergraduate Integrated Natural Sciences (MSci)
- Year 2 of ULFA-B140 Undergraduate Neuroscience (BSc)
- Year 2 of ULFA-B142 Undergraduate Neuroscience (MBio)
- Year 2 of ULFA-B143 Undergraduate Neuroscience (with Industrial Placement) (MBio)
- Year 2 of ULFA-B141 Undergraduate Neuroscience (with Placement Year) (BSc)