

# LF223-12 Microbial Pathogens

**20/21**

**Department**

Life Sciences

**Level**

Undergraduate Level 2

**Module leader**

David Scanlan

**Credit value**

12

**Module duration**

5 weeks

**Assessment**

100% exam

**Study location**

University of Warwick main campus, Coventry

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## 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 web page](#)

### 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:

- 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.

## 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

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## Study

### Study time

Type	Required
Lectures	15 sessions of 1 hour (12%)
Private study	105 hours (88%)
Total	120 hours

### Private study description

Self directed learning and revision for the end of year exam

### Costs

No further costs have been identified for this module.

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## Assessment

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

### Assessment group B1

	Weighting	Study time	Eligible for self-certification
Assessment component			
Online Examination	100%		No

- Online examination: No Answerbook required

Reassessment component is the same

## **Feedback on assessment**

Post-board cohort level feedback

[Past exam papers for LF223](#)

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## **Availability**

### **Courses**

This module is Optional for:

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