Proposed MICR221 Lecture Titles and Learning Objectives

Module 1: Microbial Growth and Control, Judith Bateup

Titles

1. Physical and chemical requirements of microbial growth.
2. Bacterial nutrition.
3. The two sides of bacterial endospores.
4. Physical control methods.
5. Chemical control methods.

Objectives

- Describe bacterial replication including the chemical and physical requirements for bacterial growth, the use of microbiological media, and the methods available for measuring microbial growth.
- Understand the process of bacterial endospore formation.
- Compare the physical methods used to control microbial growth, including how the efficacy of heat treatments is measured.
- Compare the chemical methods used to control microbial growth.

Module 2: Microbial Ecology and Evolution, Bridget Watson

Titles

6. Microbial Diversity
7. Development of Microbial Communities
8. Microbial Community Genetics
9. Bacterial Physiology: the engine of microbial life
10. Bacterial Physiology: the engine of microbial life (continued)

Objectives

- Appreciate the vast genetic and physiological diversity of microbes, and the challenges in classification.
- Describe the types of interactions that can occur between microbes in a community.
- Explain the terms: “the great plate count anomaly”, “the rare biosphere”, “biological dark matter” and how molecular methods have influenced them.
- Understand the concepts of the different ‘omic’ approaches, including why they are used.
- Understand bacterial growth and metabolism.
- Investigate bacterial energy production and enzyme activity.

Module 3: Immunology, Alex McLellan

Titles

11. Introduction to the immune system
12. Antigen uptake and presentation
13. T cells
14. B cells
15. Effector cells and immune tolerance.

Objectives

- Understand why and how the immune system protects us against microbes.
- Demonstrate how selection pressure from microbes has shaped our immune system.
- Know the key cells and molecules required for an immune system.
- Understand how peptides derived from both self and microbes are displayed by MHC to activate T cells.
- Define costimulation. How does withholding costimulation help us to avoid autoimmunity?

- Understand the developmental pathways of T cells. Contrast the roles of the CD4 helper T cell with the CD8 T cell.
- Understand the role B cells play in the immune response.
- Explain how lymphocytes are controlled by mechanisms of immune tolerance.

Module 4: Water Microbiology, Judith Bateup

Titles

16. Providing a safe drinking water supply
17. Measuring water quality

Objectives

- Appreciate water as a microbial habitat and the adaptations that aquatic microbes might have
- Describe the typical treatment protocol for drinking water.
- Explain how Campylobacter and Cryptosporidium have been the causative agents of waterborne disease outbreaks.
- Discuss how drinking water supplies are usually monitored for microorganisms, and other quality control tests.

Module 5: Virology, Matloob Husain

Titles

18. Viruses and their hosts: the organisms viruses infect and virus life cycle in a host cell.
19. Virus multiplication I: the replication of viruses with DNA genome.
20. Virus multiplication II: the replication of viruses with RNA genome.
21. Viruses and diseases: types of viral infections and human diseases viruses cause.
22. Virus prevention and control: antiviral drugs and vaccines.

Objectives

- Be able to describe the mechanisms of virus multiplication: entry, replication, assembly, and release and dissemination.
- Be able to distinguish between types of infections and human diseases viruses cause.
- Be able to identify key measures of virus control and describe representative examples.

Module 6: Medical Microbiology, Keith Ireton

Titles

23. Impact of symbiosis on human health and disease.
24. Impact of microbe, host, and medicine on disease.
25. Food-borne diseases.
26. Respiratory infections.
27. Sexually transmitted diseases.

Objectives

- Define ‘symbiosis’, ‘commensalism’, ‘mutualism’, and ‘pathogenesis’.
- Provide examples in which bacteria engage in commensalism or mutualism.
- Discuss classic and modern methods used to identify bacteria that colonise a particular site in the body.
- Provide examples in which mutualistic bacteria transform host physiology and anatomy.
- Explain how gnotobiotic (germ-free) mice have been useful in understanding the effects of mutualistic or commensal bacteria on human health and disease.
- List each of four of Koch’s postulates. Describe how these postulates allow scientists to identify a microbe as a cause of a particular disease.
- Explain how properties of both the pathogen and the human host can determine whether disease develops.

- Explain how breakdown in public health measures can contribute to food-borne disease in developed nations.
- Describe host defenses that protect against colonisation of the lower respiratory tract, and explain how these defenses are impaired during infection with *Streptococcus pneumoniae*.
- Explain how 'antigenic variation' contributes to chronic infections and/or multiple infections with *Neisseria gonorrhoeae*.
- Define 'virulence factor.'

Module 7: Putting Microbes to Work, Daniel Pletzer

Titles

28. Microbial biodegradation and bioremediation: Harnessing microbes for environmental cleanup
29. Microbial biodegradation and bioremediation: Harnessing microbes for environmental cleanup (continued)
30. Microbial warfare: Using microorganisms for biocontrol and antibiotic production
31. Microbial warfare: Using microorganisms for biocontrol and antibiotic production (continued)

Objectives

- Understand how microorganisms consume or break down environmental waste.
- Learn how to control pests using microorganisms.
- Understand microbial cell factories for the production of antimicrobials.

Laboratory Timetable

Labs are run in the second floor (MI201) on a fortnightly rotation, 2.00 pm - 6 pm.

Week of:		Day	Date	Stream	Laboratory Class Details	
Year	Semester					
9	1				No Laboratory	
10	2	Tuesday	3rd March	A1	Laboratory One	Microbiological Techniques
		Thursday	5th March	A2		
11	3	Tuesday	10th March	A3		
		Wednesday	11th March	A4		
12	4	Tuesday	17th March	A1	Laboratory Two	Identification of Bacteria
		Thursday	19th March	A2		
13	5	Tuesday	24th March	A3		
		Wednesday	25th March	A4		
14	6	Tuesday	31st March	A1	Laboratory Three	Enumerating Bacteria
		Thursday	2nd April	A2		
EASTER / MID-SEMESTER BREAK						
16	7	Tuesday	14th April	A3	Laboratory Three	Enumerating Bacteria (cont)
		Wednesday	15th April	A4		
17	8	Tuesday	21st April	A1	Laboratory Four	Eukaryotic Microorganisms and Viruses
		Thursday	23rd April	A2		
18	9	Tuesday	28th April	A3		
		Wednesday	29th April	A4		
19	10	Tuesday	5th May	A1	Laboratory Five	Skin Infections
		Thursday	7th May	A2		
20	11	Tuesday	12th May	A3		
		Wednesday	13th May	A4		
21	12	Tuesday	19th May	A1	Laboratory Six	Gastrointestinal Microorganisms
		Thursday	21st May	A2		
22	13	Tuesday	26th May	A3		
		Wednesday	27th May	A4		

Internal assessment tests in Castle 1 and Castle 2:

Lecture Test: Monday 30th March, 7 pm - 8 pm

Laboratory Test: Monday 11th May, 7 pm - 8 pm