

MICR 221: Microbes To Medicine

Semester One 18 points

Course overview

Microbes are all around us, all over us and all over every surface on earth. Microbes compose greater than 50% of life forms on our planet and yet it is estimated that only 1% have been identified and studied. We can't live without microbes and they benefit our lives immensely. Many of the microbes that surround us can cause disease and our immune system helps protect us from these microbes. The specialised cells of the immune system work as key defenders, protecting us from infection and disease.

MICR 221 will introduce you to the wonderful world of Microbiology and Immunology. You will learn about the immune system and the key cells and pathways of the immune system and also learn about the world of microbes.

The labs will teach you essential skills in handling and manipulating microorganisms and include looking at the treatment of microbial infections with different pharmaceutical preparations.

MICR 221 is essential if you want to carry on in Microbiology but it is also a useful addition to a wide variety of courses.



Learning outcomes

- Be able to demonstrate an in-depth knowledge of microbiology and immunology in preparation for advanced laboratory skills in 300-level and in graduate papers
- Display a practical knowledge of fundamental microbiology and immunology, with the ability to assimilate complex information on a spectrum of interdisciplinary topics and to use this knowledge for applications in the workplace
- Develop an ability to communicate ideas about science

Lecture course overview

MICR 221 is a 31-lecture course that gives you a general introduction to Microbiology and Immunology. Lectures cover the following areas:

Module 1: Microbial Growth and Control

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

Module 2: Bacteria at the Aerobic-Anaerobic Interface

6. Bacterial persistence and surviving an environment in flux
7. The energy consuming processes of growing and nongrowing bacterial cells
8. Gotta grow fast: bacterial aerobic cellular respiration
9. Making enough just to get by: fermentation and alternative cellular respiration pathways
10. Bacterial ATP synthesis and how it became the newest target-space for antibiotics

Module 3: Immunology

11. Introduction to the immune system
12. Antigen recognition
13. The major histocompatibility complex (MHC)
14. Antigen presentation and costimulation
15. T cells
16. B cells
17. Effector cells and immune tolerance

Module 4: Virology

18. Introduction to viruses: what are they and what is their composition?
19. Viruses and their hosts: the organisms viruses infect and virus life cycle in a host cell.
20. Virus multiplication I: the replication of viruses with DNA genome.
21. Virus multiplication II: the replication of viruses with RNA genome.
22. Viruses and diseases: types of viral infections and human diseases viruses cause.
23. Virus emergence, evolution, and classification: where do new viruses come from and how are they classified?
24. Virus prevention and control: antiviral drugs and vaccines

Module 5: Medical Microbiology

25. Symbiosis
26. Impact of symbiosis on human health and disease
27. Impact of microbe, host, and medicine on disease
28. Food-borne diseases
29. Respiratory infections
30. Sexually transmitted diseases
31. Microbial virulence factors and their host targets

Lab course overview

The MICR 221 paper includes a 6-lab course. The labs aim to teach you fundamental laboratory skills and reinforce concepts discussed in lectures. You will learn basic bacterial culture techniques, how to grow bacteria, how to estimate bacterial numbers and how to identify bacteria. You will gain microscope and staining skills and visualise microbes using the microscope. The labs will also see you look at medically important microbes, including a look at the bacteria on your own skin and a look at pharmaceutical products that can be used to control microbial infections. The labs will cover eukaryotic microbes such as fungi, protozoa and algae.

The MICR 221 lab course covers:

- Lab 1: Microbiological techniques
- Lab 2: Identification of bacteria
- Lab 3: Enumerating bacteria
- Lab 4: Eukaryotic microorganisms and viruses
- Lab 5: Skin infections
- Lab 6: Gastrointestinal microorganisms

Assessment

1. Lecture test (15%)
2. Laboratory test (15%)
3. A 3-hr final exam (70%)



Textbooks

Essential text:

Prescott's *Microbiology* by Wiley, Sandman and Wood, 11th edition, 2020, McGraw-Hill Publishers

Recommended text for Immunology module:

Kuby *Immunology*, 8th edition (2019), Palgrave Macmillan.

Note, Kuby *Immunology* is also the recommended text for those wishing to continue immunology in MICR334.

Teaching staff

- [Dr Judith Bateup \(Convenor\)](#)
- [Professor Alexander McLellan](#)
- [Associate Professor Keith Ireton](#)
- [Associate Professor Matloob Husain](#)
- [Professor Gregory Cook](#)

Workload expectations

An 18 point paper has a minimum expectation of 14 hours per week per paper. This is made up of formal contact times (lectures, tutorials, laboratories etc.) and independent study (studying, revision, assignments, reading etc.).

This course comprise 31 lectures (50 minutes each), and 6 laboratory sessions (up to 4 hours each). A guide to workload expectations is;

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| • Lecture preparation, reading and review | 2 hours per lecture |
| • Laboratory preparation | 1 hour per lab |
| • Assessment test preparation | 8 hours per test |
| • Final examination preparation | 40 hours |

Responsibilities of students

- Students are responsible for making themselves aware of all University rules and regulations pertaining to their rights and responsibilities as students and to the degree in which they are enrolled.
- Students shall be deemed to have received any information:
 - provided in scheduled classes, regardless of attendance;
 - sent to their student email address;
 - made available via Blackboard or other University-approved learning management systems.
- Students are expected to be aware of all information related to a paper that is made available to them, and, in a timely manner, to raise with staff any questions or concerns relating to this information.
- Students are expected to be aware of, and to act in accordance with, the University's [Academic Integrity Policy](#).

Academic integrity and academic misconduct

Academic integrity means being honest in your studying and assessments. It is the basis for ethical decision-making and behaviour in an academic context. Academic integrity is informed by the values of honesty, trust, responsibility, fairness, respect and courage. Students are expected to be aware of, and act in accordance with, the University's Academic Integrity Policy.

Academic Misconduct, such as plagiarism or cheating, is a breach of Academic Integrity and is taken very seriously by the University. Types of misconduct include plagiarism, copying, unauthorised collaboration, taking unauthorised material into a test or exam, impersonation, and assisting someone



else's misconduct. A more extensive list of the types of academic misconduct and associated processes and penalties is available in the University's Student Academic Misconduct Procedures.

It is your responsibility to be aware of and use acceptable academic practices when completing your assessments. To access the information in the Academic Integrity Policy and learn more, please visit the University's Academic Integrity website at www.otago.ac.nz/study/academicintegrity or ask at the Student Learning Centre or Library. If you have any questions, ask your lecturer.

- Academic Integrity Policy (www.otago.ac.nz/administration/policies/otago116838.html)
- Student Academic Misconduct Procedures
(<http://www.otago.ac.nz/administration/policies/otago116850.html>)

