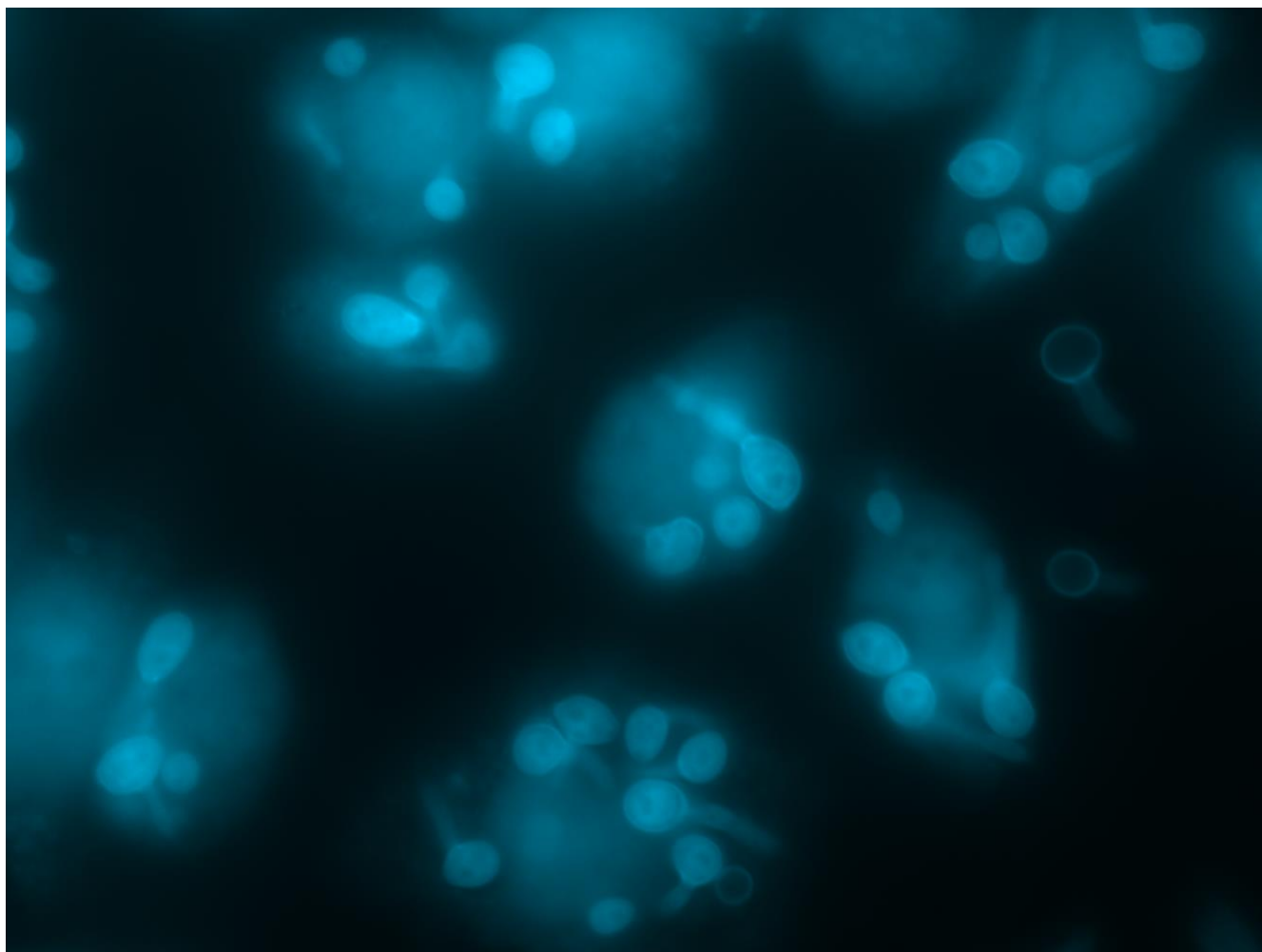# MGY277H1

Introduction to Medical Microbiology

2025 SYLLABUS

Immune cells known as macrophages engulf cells of the human fungal pathogen *Candida albicans*

photo courtesy of Teresa O'Meara

Molecular Genetics
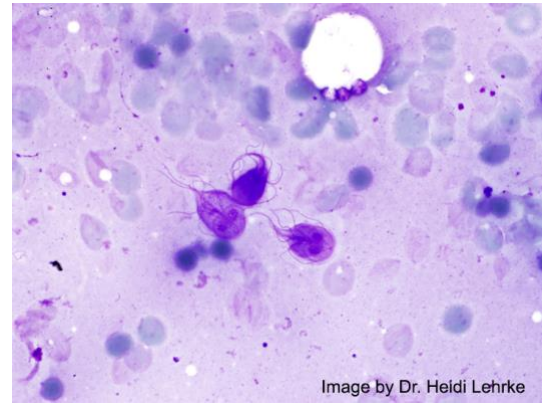**UNIVERSITY OF TORONTO**

Welcome to MGY277!

We are thrilled you are joining us! As the COVID-19 pandemic highlights, this is a critical time to be learning about medical microbiology.

The understanding that microbes are the cause of disease was a revolution every bit as important to our lives as the industrial revolution. Since the year 1900, we have added 30 years to our average life span primarily due to the development of vaccines, antibiotics, and the implementation of public health practices like access to clean drinking water and hygienic food preparation.

Despite our success, challenges remain. New infectious diseases emerge every few years, such the Sars-CoV-2 virus that causes COVID, and in the 1980's the HIV virus, which that now infects millions on every continent. Antibiotics that were once effective against bacterial or fungal infections become useless as these microbes evolve resistance to almost every available treatment, and few new antibiotics have been developed. There is a disparity in health outcomes between low- and high-resourced place: while deaths due to infectious diseases have plummeted in high- and middle-income countries, in low-income countries it is a major cause of death. Health disparities that exist even within our well-resourced nation: in Canada, Indigenous populations are subject to much greater infectious disease burdens than non-Indigenous Canadians.

Image by Dr. Heidi Lehrke

Giardia duodenalis is one of the most common human parasitic infections. They attach to the human intestinal wall with a large sucking disk and move using 4 pairs of flagella. Infections from *Giardia* can be acquired by drinking contaminated water, such as untreated lake and river water.

This course is designed to introduce the basics of medical microbiology. By the end of this course, you will be able to:

- Explain the historical development of germ theory and analyze how this scientific revolution transformed medicine and public health practice

- Classify acellular and cellular pathogens and explain how their structural features determine their pathogenic strategies and treatment approaches

- Analyze the key factors that make microorganisms successful pathogens, including virulence mechanisms, host interactions, and environmental adaptations

- Describe the principles underlying microbial identification methods and evaluate their appropriate applications in clinical and research settings

- Compare different strategies for controlling microbial growth and predict their effectiveness based on pathogen characteristics and environmental conditions

- Explain common mechanisms of antimicrobial resistance and analyze how resistance impacts treatment decisions and public health

- Explain the fundamentals of immune responses to infectious agents and evaluate how this knowledge informs vaccine development and disease prevention strategies

- Apply a One Health approach to analyze infectious disease problems, demonstrating understanding of the interconnections between human, animal, and environmental health

- Describe the key host, pathogen, environmental, and social factors that increase the likelihood of infectious disease emergence and explain how these factors interact to create conditions favourable for outbreaks
- Evaluate the impact of environmental changes (including climate change) on pathogen distribution, emergence, and disease transmission patterns
- Analyze the role of social determinants and health disparities in infectious disease burden and access to prevention and treatment
- Describe basic epidemiological principles and apply measures of disease frequency to understand disease patterns and transmission dynamics
- Interpret and critically evaluate scientific figures, data, and health information from primary literature and popular media sources

This course is always a work in progress, but we do everything in our power to clearly state our expectations and maintain open lines of communication.

Looking forward to an exciting semester!

Jessica Hill, PhD

MGY277 course coordinator

jessica.hill@utoronto.ca

PREREQUISITES

To succeed in MGY277, you will need a basic understanding of the cell (What is DNA? What is a cell? What do proteins do?) and some basic biochemistry and genetics (What is PCR and how does it work?).

CONSIDERATIONS FOR TAKING AN ONLINE COURSE

MGY277 is an online, asynchronous course. All course activities will be conducted online, **except for** the final exam, which will be held in person at the St. George campus.

Online courses have both technical requirements and learner expectations, including the ability to work independently, manage time effectively, and stay motivated. Before continuing further, check out this link: Is Online Learning Right for Me?

COURSE MARKING SCHEME

Assessment	Components	Total Weight
Concept Maps	12 x 1%	12%
Theme Assignments	5 x 6%	30%
Infographic Assignment	Topic selection & work allocation & article comments 2% Infographic reflection 2% Rough draft 2% Peer review 2% Final draft 12% Quiz 2%	22%
Final exam		36%

COURSE ORGANIZATION

MGY277 is organized into 11 Units—12 if you include the Last Week Workshop, which is dedicated to collecting your feedback. Each Unit covers approximately one week's worth of material, though the number and length of videos may vary.
A new Unit is released nearly every week of the course. **You can find out when a new unit is being released by consulting the Course Calendar.** You can access Units from the course homepage.

The Units can be grouped into five themes:

THEME I - FUNDAMENTALS OF MICROBIAL PATHOGENS
Unit 1 - Microbes and Humanity: Historical Impact and Modern Understanding
Unit 2 - Microbial Diversity and Pathogenesis
THEME II: MICROBIAL PATHOGENS IN DEPTH
Unit 3 - Acellular Pathogens: Viruses & Prions
Unit 4 - Bacterial Pathogens
Unit 5 - Eukaryotic Pathogens
THEME III - RECOGNIZING THE THREAT: IMMUNITY AND DIAGNOSTICS
Unit 6 - Layers of Protection: From Barriers to Adaptive Immunity
Unit 7 - Diagnostic Decisions: Identifying Microbial Threats
THEME IV - ANTIMICROBIAL STRATEGIES AND CHALLENGES
Unit 8 - Stopping Microbial Growth: Environmental and Clinical Approaches
Unit 9 - When Control Fails: Antimicrobial Resistance
THEME V - MICROBIAL COMMUNITIES: FROM GLOBAL PATTERNS TO PERSONAL ECOSYSTEMS
Unit 10 - Tracking and Predicting Disease: Epidemiology in Action
Unit 11 - The Microbial Self: Human Microbiome in Health and Disease

Each Unit is composed of video lectures, a forum for questions to be posted and a Concept Map discussion board. Here's a little more detail about each.

Videos: The videos are the core of each Unit and mostly feature lectures from one of our course instructors.

Question Forum: This year, we'll be using Hypothesis as a tool for asking questions about that Unit's material. One advantage of Hypothesis is that it allows you to tag the exact part of a lecture slide where your question arises. For example, in the Unit 1 module, you'll find a link titled *Unit 1 Questions*. Clicking it will open a PDF of the Unit 1 slides in Hypothesis. Scroll to the slide you have a question about and add a page note, annotation, or pin directly on that content. Tag me using @Jessica Hill, and I'll respond within 24 hours (excluding weekends). A video demonstration on how to use Hypothesis is available on Quercus. You can also learn more about how to annotate using Hypothesis and about the use of mentions.

Concept Maps: For each Unit of the course, you will be asked to submit a concept map, which is a visual tool for depicting relationships between different pieces of information. The concept map you submit will be marked for its contribution only (ie. we are not evaluating them), but I encourage you to put effort into creating them, as evidence suggests that they are an excellent study tool. Be sure to upload your concept maps as images. More details about concept mapping can be found on Quercus.

ASSIGNMENTS

There are two types of assignments in this course: the five Theme Assignments and the Infographic Assignment.

The course Units are grouped into five broad themes, as described in the Course Organization section. Each theme includes an assignment. **Theme assignments** may require you to recall material from the relevant Units and apply it to new scenarios. You may also be required to complete additional readings and use your understanding of the theme to answer related questions.

The **Infographic Assignment** is a group project with multiple stages. You will create a "visual summary" of a selected paper on an infectious disease, chosen from a list of options. The stages of the assignment include: topic selection and work allocation, article comments, infographic reflection, rough draft, peer review, final draft, and a quiz. More details about this assignment are available on Quercus.

COURSE TEXTBOOK
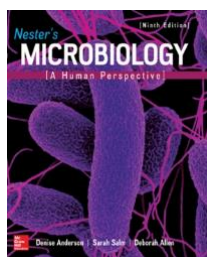
The textbook for this course is "Microbiology: A Human Perspective" (publisher: McGraw Hill). There are a limited number of copies of the 10th edition (pictured) on reserve at the Gerstein library. It is also available through the University of Toronto Bookstore.

The textbook is **recommended** for the course: it can help reinforce course material. Your exam questions, however, will be based on material from course videos and assigned readings.

IMPORTANT DATES IN THE COURSE

The release dates and due dates for all Concept Maps and Assignments have been added to the MGY277 Calendar. Please check the Calendar for the most recent updates of course due dates.

All Assignments and Concept Maps will be due at 11:59pm

COURSE COMMUNICATION — HOW TO GET HELP

Have a question? Chances are you're not the only one. We like to hear from you and would like to help set you up for success early on if issues arise.

FOR QUESTIONS REGARDING COURSE MATERIAL:

All course material related questions should be directed to the question forums that can be found in each Unit module. Please feel free to respond to your fellow students' questions!

Each question forum is monitored by the course coordinator. You can expect a response to questions posted on the discussion forum **within 24 hours excluding weekends**.

Before posting a question, please read the other posts in that forum because your question may have already been asked. In fact, you may want to follow along with questions posted!

FOR QUESTIONS OR HELP ON OTHER ISSUES:

(eg**.** illness, accommodations, family issues, etc.)

Please contact your designated contact below:

Last name beginning with:	Contact the following:
A — Doh	Stefanie Castelblanco stefanie.castelblanco@mail.utoronto.ca
Don — Ku	YuYing Fan yuying.fan@mail.utoronto.ca
Kw — Ry	Jonathan Tersigni jonathan.tersigni@mail.utoronto.ca
Sa — Z	Amin Yarmand amin.yarmand@mail.utoronto.ca

Your TA or the course coordinator will respond to you within **24 hours (excluding weekends)** to let you know your message has been received. However, unless the need is truly urgent, your matter will not be discussed until our weekly TA meeting.

WHEN WE WANT TO CONTACT YOU:

When we want to disseminate information to the entire class, we make a course Announcement. Course Announcements will be retained at the Announcements link.

> **It is critical that you read/watch the videos for Course Announcements in a timely manner.**

COURSE POLICIES

LATE SUBMISSIONS:

In this course, Concept Maps and Assignments are due on the dates and times specified in the course Calendar. Please ensure that you submit your work correctly. If you are unable to meet a submission deadline, please notify your TA before the deadline, if possible, so that accommodations can be considered on a case-by-case basis.
Except in exceptional circumstances, late Concept Map submissions without prior notification will receive a mark of 0. Assignments submitted late will lose 50% of the total possible marks on the first day and receive a mark of 0 thereafter.

MARKING POLICY:

If we have given incorrect information, we will make an Announcement to the entire class at once about what the issue was and how we will resolve it.

TECHNOLOGY REQUIREMENTS:

You must have access to a computer or a tablet with a Wi-Fi internet connection (or faster) to be able to watch the videos.

This course requires the use of computers, and of course sometimes things can go wrong when using them. You are responsible for ensuring that you maintain regular backup copies of your files, use antivirus software (if using your own computer), and schedule enough time when completing an assignment to allow for delays due to technical difficulties. Computer viruses, crashed hard drives, spotty Wi-Fi signals, broken printers, lost or corrupted files, incompatible file formats, and similar mishaps are common issues when using technology, and are not acceptable grounds for a deadline extension or late submissions.

GENERATIVE AI:

Navigating the world of generative AI—especially in an online asynchronous course—can be daunting. My goal is to strike a balance: I want you to benefit from AI tools while also ensuring you're developing your own critical thinking skills.
There are several reasons why you may choose to avoid using generative AI tools altogether:
- These tools are known to **hallucinate**—producing incorrect but plausible-sounding information
- They often reflect **biases** present in their training data, which can perpetuate stereotypes and misrepresent marginalized groups
- Many generative AI models are trained on **copyrighted material without consent**, raising legal and ethical concerns
- They are **environmentally costly**, requiring significant electricity and water resources for training and deployment

That said, I have used generative AI to support the development of this course. Specifically, I've used it to:
- Edit video lecture scripts.
- Suggest academic papers based on specific queries (e.g., "Where can I find figures showing the gap between antibiotic availability and resistance emergence?").
- Provide feedback on lecture flow and alignment.

I welcome your thoughts and discussion on the role of generative AI in this course. Here is the current MGY277 policy:
- **Concept maps**: Generative AI is **not permitted**. These are contribution marks and should reflect your own understanding.
- **Theme assignments**: AI use will be addressed on a case-by-case basis.
- **Infographic assignment**: You may use generative AI to **edit** work you've created, but **not** to generate the work from scratch.
- **General questions**: You may use generative AI tools as a tutor. However, I strongly encourage you to post questions on the course discussion forum, where our expert Teaching Team can provide reliable answers.

INSTITUTIONAL POLICIES AND SUPPORT

POLICY ON DISTRIBUTION OF THE MATERIALS OUTSIDE OF THE COURSE:

At the University of Toronto and the Department of Molecular Genetics we take pride in the fact that we have unique, high-level and up-to-date expertise in the course topics. All course materials are the Intellectual Property of the lecturers. Further distribution of the lecture materials without permission constitutes an academic offence, and the instructors have the right to pursue disciplinary action.

ACADEMIC INTEGRITY:

Academic integrity is essential to the pursuit of learning and scholarship in a university, and to ensuring that a degree from the University of Toronto is a strong signal of each student's individual academic achievement. As a result, the University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (www.governingcouncil.utoronto.ca/policies/behaveac.htm) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Potential offences include, but are not limited to:

In papers and assignments:

1. Using someone else's ideas or words without appropriate acknowledgement.

2. Submitting your own work in more than one course without the permission of the instructor.

3. Making up sources or facts.

4. Obtaining or providing unauthorized assistance on any assignment.

On tests and exams:

1. Using or possessing unauthorized aids.

2. Looking at someone else's answers during an exam or test.

3. Misrepresenting your identity.

In academic work:

1. Falsifying institutional documents or grades.

2. Falsifying or altering any documentation required by the University.

All suspected cases of academic dishonesty will be investigated following procedures outlined in the Code of Behaviour on Academic Matters. If you have questions or concerns about what constitutes appropriate academic behaviour or appropriate research and citation methods, you are expected to seek out additional information on academic integrity from your instructor or from other institutional resources (see www.utoronto.ca/academicintegrity/resourcesforstudents.html).

ON ACCOMMODATION FOR STUDENTS WITH DISABILITIES:

The University provides academic accommodations for students with disabilities in accordance with the terms of the Ontario Human Rights Code. This occurs through a collaborative process that acknowledges a collective obligation to develop an accessible learning environment that both meets the needs of students and preserves the essential academic requirements of the University's courses and programs.

Students with diverse learning styles and needs are welcome in this course. If you have a disability that may require accommodations, please feel free to approach me and/or the Accessibility Services office.

ON ACCOMMODATION FOR RELIGIOUS OBSERVANCES:

The University provides reasonable accommodation of the needs of students who observe religious holy days other than those already accommodated by ordinary scheduling and statutory holidays. Students have a responsibility to alert members of the teaching staff in a timely fashion to upcoming

religious observances and anticipated absences and the MGY277 teaching team will make every reasonable effort to avoid scheduling compulsory activities at these times.

Please reach out to your TA as early as possible to communicate any anticipated delays in work submission related to religious observances, and to discuss any possible related implications for course work.

ON ACCOMMODATION FOR FAMILY CARE RESPONSIBILITIES:

The University of Toronto strives to provide a family-friendly environment. You may wish to inform me or your TA if you are a student with family responsibilities. If you are a student parent or have family responsibilities, you also may wish to visit the Family Care Office website at familycare.utoronto.ca.

PROMOTING EQUITY, DIVERSITY AND INCLUSION:

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.

SERVICES AND SUPPORT:

The following are some important links to help you with academic and/or technical service and support

- General student services and resources at Student Life
- Full library service through University of Toronto Libraries
- Resources on conducting online research through University Libraries Research
- Resources on academic support from the Academic Success Centre
- Learner support at the Writing Centre
- Information about Accessibility Services
- What to know if you are taking the course from outside the GTA
- Recommended technology requirements for online learning