

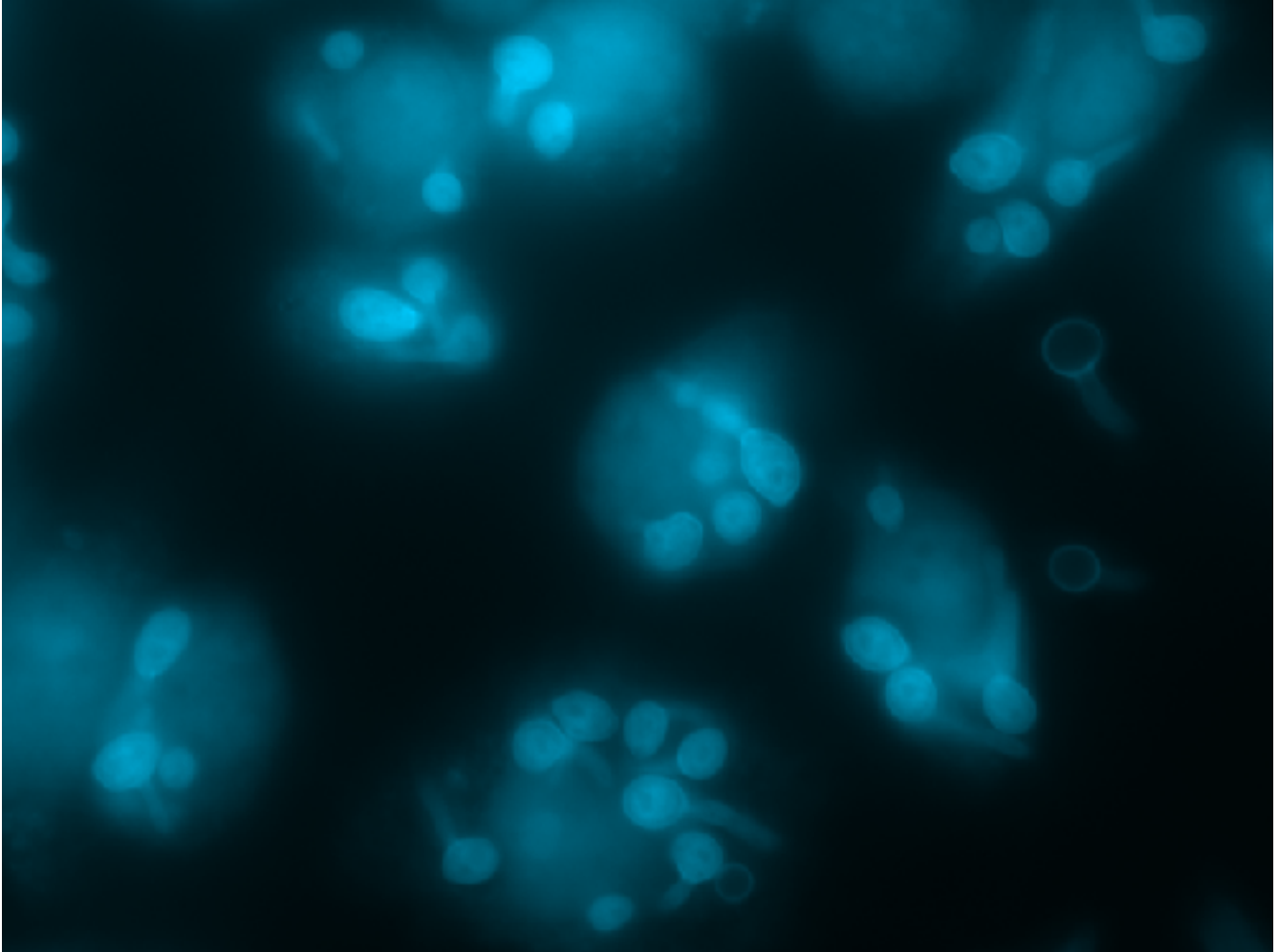
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# MGY277H1

Introduction to Medical Microbiology

## 2018 COURSEBOOK

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*Immune cells known as macrophages engulf cells of the human fungal pathogen Candida albicans*  
photo courtesy of Teresa O'Meara

## Welcome to MGY277!

We are thrilled you are joining us!

In this course we are going to explore one of the most important subjects in all of medical science - communicable diseases. This course was designed to meet the needs of second-year students interested in infectious disease and upper-year students who are interested in a basic microbiology class with a medical perspective, perhaps to meet the prerequisites for a professional program in health sciences.

We will cover the basics of what microbes are and explain the differences between parasites, fungi, bacteria, and viruses. We will discuss how to cultivate microbes, and how they are identified in the lab. Importantly, we will spend a lot of time discussing microbes of medical relevance including how they cause disease and how they are diagnosed and treated.

The understanding of that microbes are the cause of disease was a revolution every bit as important to our life as the industrial revolution. Since 1900 we have added 30 years to our average life-span, most of this is because of vaccines, wide-spread access to clean drinking water, better hygiene and food preparation practices, antibiotics, and the emergence of public health agencies at all levels of government.

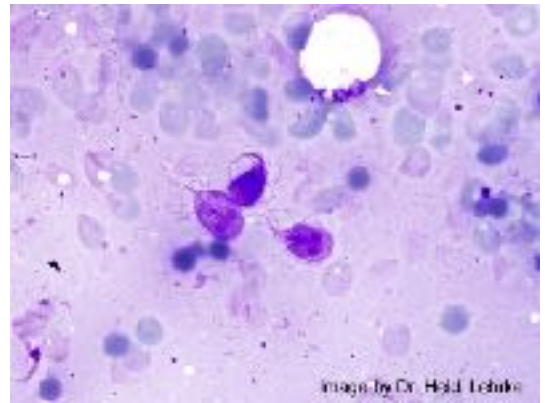
Many challenges remain, however. One challenge is that new infectious diseases emerge every few years. Around 1980 we saw the emergence of a new and terrifying virus, HIV, that now infects millions of people on every continent. We have also seen antibiotics that were effective against many bacterial or fungal infections become useless as these microbes evolve resistance to almost every available treatment.

Another challenge is that the “health gap” between the wealthy and poor countries remains huge. Despite considerable gains against hunger and disease in the poorest regions of the world, a combination of ineffective or conflicting governments, weak public health systems, cultural barriers, and war, all contribute to inexcusably high mortality rates due to infectious disease. Nowhere is this more evident than in the 2014 Ebola outbreak in West Africa and in the current Ebola outbreak in Congo. Not only does poverty lead to more disease, but disease leads to more poverty.

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

Looking forward to an exciting semester!

Jessica Hill, Assistant Professor (Teaching Stream)



*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.

## 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?).

If you find you need a refresher on basic biochemistry please look over Chapter 2 of the recommended textbook – we will not be covering it because we assume you already have a basic understanding of the most important concepts.

## CONSIDERATIONS FOR TAKING AN ONLINE COURSE

In an online course, there is no scheduled lecture time. Over the course of each week, you are expected to watch the videos and do the readings assigned. However, there are deadlines for the **Unit Quizzes**, **Assignments** and the Final Exam. We suggest that, like with a live course, you make sure to schedule the time in your calendar to watch the videos, do the readings assigned and complete the **Unit Quizzes** and **Assignments**! Before we go further, check out this link: [Is Online Learning Right for Me?](#)

## COURSE ORGANIZATION

MGY277 is organized into 11 “**Units**”. Each **Unit** consists of roughly one week’s worth of material. Some units may be longer than others and require more time.

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, or from the Modules page in Quercus.

Each **Unit** is composed of **4** main parts:

1. Videos,
2. Readings,
3. **Unit Quiz**, and most weeks there is also an
4. **Assignment**

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

The readings are typically assigned from the textbook or supplementary material. Unless otherwise stated, textbook readings are meant to support your understanding of lecture material and will not be tested explicitly.

Each week of the course has an associated **Unit Quiz**, an open book quiz that you are expected to complete within a certain time frame. **Unit Quizzes** typically consist of multiple choice type questions.

Most weeks, there will be an **Assignment** due. The **Assignments** are meant to reinforce your knowledge of course material and often present opportunities to apply the course material to real life

scenarios. **Assignments** are also administered through Portal and consist of multiple choice type questions.



## COURSE TEXTBOOK

The textbook for this course is “Microbiology: A Human Perspective” (publisher: McGraw Hill). There are a limited number of copies of the 7th and 8th editions and new 9th 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.

## COURSE MARKING SCHEME

**Final Exam - 50%**

**Unit Quizzes - 25%**

- top 10 of 11 **Unit Quiz** scores

**Assignments - 25%**

- all **Assignment** marks are factored into your overall **Assignment** mark (lowest mark is *not* dropped)

## UNIT SCHEDULE

| UNIT | TOPIC   | HELP FROM |
|------|---|-----------|
| 1    | Perspectives on Microbiology and Infectious Disease in 2018 | JH        |
| 2    | The Bacteria  | CG        |
| 3    | The Viruses   | RK        |
| 4    | The Eukaryotic Microbes                                     | KI        |
| 5    | Control of Microbial Growth                                 | HM        |
| 6    | Microbial Classification and Identification                 | RK        |
| 7    | Antimicrobials and Antimicrobial Resistance                 | KI        |
| 8    | Epidemiology and Disease Transmission                       | RK        |
| 9    | Immunity and Vaccines                                       | CG        |
| 10   | Principles of Pathogenesis                                  | HM        |
| 11   | The Microbiome  | JH        |

## IMPORTANT DATES IN THE COURSE

The release dates and due dates for all **Unit Quizzes** and **Assignments** have been added to the course **Calendar**. Please check the **Calendar** for the most recent updates of course due dates.

***All Unit Quizzes and Assignments will be due at 4:59pm***

Note that the correct answers for Unit Quizzes will be released one week after the due date.

## COURSE COMMUNICATION — HOW TO GET HELP

Have a question? Chances are you're not the only one.

### FOR QUESTIONS REGARDING COURSE MATERIAL:

We would like to have open lines of communication, so we will answer questions related to course content on the "**Discussion Board**" for each module Quercus. ***All course material related questions should be directed to the Discussion Board, not to your TA or professor's email.***

The **Discussion Board** is meant to be a positive space where students should feel comfortable asking questions that they have taken the time to consider independently, and for other students to provide feedback. Each forum will be monitored by a TA and/or the course coordinator, who can helpfully and respectfully clear up any misconceptions that may arise.

Each unit of the course will have its own forum. Before posting a question, please read the other posts in that forum because your question may have already been asked.

### FOR QUESTIONS OR HELP ON OTHER ISSUES:

(eg. sick, family issues, prerequisites, etc.)

Please contact your designated contact below:

| Last name beginning with: | Contact the following:  |
|---------------------------|---|
| A — Chen                  | Ruwandi Kariyawasam<br><a href="mailto:ruwandi.kariyawasam@mail.utoronto.ca">ruwandi.kariyawasam@mail.utoronto.ca</a> |
| Cheng — Lah               | Kali Iyer<br><a href="mailto:kali.iyer@mail.utoronto.ca">kali.iyer@mail.utoronto.ca</a>                               |
| Lam — Ram                 | Cynthia Guo<br><a href="mailto:cynthia.guo@mail.utoronto.ca">cynthia.guo@mail.utoronto.ca</a>                         |
| Ran — Z                   | Harley Mount<br><a href="mailto:harley.mount@mail.utoronto.ca">harley.mount@mail.utoronto.ca</a>                      |

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 and a decision will not be reached until our weekly TA meeting.

### WHEN WE WANT TO CONTACT YOU:

At times, we may decide to send out important course information by email. To that end, all students are required to have a valid University of Toronto email address. You are responsible for ensuring that your University of Toronto email address is set up and properly entered in the ROSI system.

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

## COURSE POLICIES

### LATE SUBMISSIONS:

In this course, **Unit Quizzes** and **Assignments** are due at the dates and times specified on the course **Calendar**.

***Late submissions receive a mark of 0.***

Please ensure that you submit your **Unit Quizzes** and **Assignments** correctly. Complete or partially complete **Unit Quizzes** and **Assignments** that have not been properly submitted prior to the due date will receive a mark of 0.

### MARKING:

There are 11 **Unit Quizzes** in this course. Your **Unit Quiz** mark will be calculated by averaging **your 10 highest Unit Quizzes** marks.

Your **Assignments** mark will be calculated by averaging *all Assignments*. Your lowest mark *will not* be dropped from the calculation.

For the purposes of marking, what we say on the **Discussion Board** or in **Announcements** or via email is the final word. 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.

## **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](http://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](http://www.utoronto.ca/academicintegrity/resourcesforstudents.html)).

### **FINAL EXAM:**

The University of Toronto, St. George, Arts and Science final examination will require your attendance on Campus. This exam is closed book.

If you are eligible and require off-site proctoring, please notify your Faculty registrar and submit your request no later than twelve (12) business days after the start of term.

If requested on time, the Arts and Science Registrar will endeavour to provide arrangements for proctored exam writing for students residing more than 125 km travel distance from the campus at a proposed outside examination centre. You must provide the contact information of an institution in your area offering proctoring services, however, please note that the requested location is not guaranteed and an alternative test centre may be identified. Students are responsible for any fees charged by the test centre. Please contact the Faculty Registrar's Office for further details.

For more information see [FAQs for Off-Site Exams](#).

### **ACCESSIBILITY NEEDS:**

The University of Toronto is committed to accessibility. If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom or course materials, please contact [Accessibility Services](#) as soon as possible.

### **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](#)
- Information for [Technical Support/Blackboard Support](#) (Portal Info)



## COURSE INSTRUCTORS



### **Jessica Hill, Ph.D. (course coordinator)**

Jessica Hill completed her undergraduate studies at Queen's University and her MSc at the University of British Columbia with Sally Otto. She received her PhD from the University of Toronto in 2014, having studied the evolution of drug resistance in the fungal pathogen *Candida albicans* with Leah Cowen. She then pursued post-doctoral research with Helen Dimaras at SickKids, studying clinical cancer genetics in global health and has rejoined the Department of Molecular Genetics as an Assistant Professor, Teaching Stream. Besides science and undergraduate education, she is passionate about yoga, ultimate, reading and baking.



### **William Wiley Navarre, Ph.D.**

William Navarre was born and raised in Ann Arbor, Michigan and attended the University of Michigan as an undergraduate. He obtained his Ph.D. in the lab of Olaf Schneewind at UCLA studying the anchoring of surface proteins in Gram-positive bacteria. He was a Damon Runyon Postdoctoral Fellow and did post-doctoral work with Arturo Zychlinsky at New York University prior to joining the lab of Ferric Fang at the University of Washington in Seattle. With Ferric he studied mechanisms of bacterial resistance to immune effectors. He joined the Department of Molecular Genetics as an Assistant Professor in September of 2007 and was a CIHR New Investigator. In 2012 he was promoted to Associate Professor and became head of the departmental undergraduate program. He also teaches MGY377H1, the main bacteriology course on campus.



### **Alexander Ensminger, Ph.D.**

Like Dr. Navarre, Dr. Ensminger was also born and raised in Ann Arbor, Michigan (they didn't know each other then). After completing his Ph.D. at MIT in 2006, Alex began postdoctoral work with Dr. Ralph Isberg (Tufts University). During this time, he established the laboratory's expertise in next-generation sequencing technologies and developed a powerful experimental evolution approach to uncover new bacterial genes that influence host range and virulence. He started his independent research program at the University of Toronto in March, 2011 and is currently holds appointments in the Department of Biochemistry and the Department of Molecular Genetics. He is also an avid barefoot water-skier and fearless DIYer.

## TEACHING ASSISTANTS



### Cynthia Guo

I am a PhD student in Dr. Scott Gray-Owen's lab. My project aims to characterize how a bacterial metabolite from *Neisseria gonorrhoeae* shapes the immune response to gonococcal infection using the mouse as a model. I completed my undergrad here at the University of Toronto, where I double majored in Immunology and Global Health. Outside of the lab, I enjoy reading sci-fi (Alastair Reynolds), playing volleyball (indoor only), and consuming certain microbial by-products (mostly beer).



### Kali Iyer

Hi Everyone! I am a PhD student in Dr. Leah Cowen's lab in the Department of Molecular Genetics, where we study fungal pathogens. My work is focused on identifying and characterizing the mechanism of action of compounds with novel antifungal activity, specifically, against emerging drug-resistant *Candida* species. My interest in infectious disease began in with bacterial work during my undergrad at McMaster University in Integrated Science. Aside from research, I also enjoy being involved in a variety of student groups, traveling, eating, and being active.



### Ruwandi Kariyawasam

Hola! My name is Ruwandi Kariyawasam and it is my pleasure to serve as one of your TAs for this semester. I am currently a PhD student through the Institute of Medical Sciences under the supervision of Dr. Andrea K. Boggild. I am currently investigating the role of a double stranded RNA virus, Leishmania Virus-1 (LRV-1) in the overall pathogenesis of the protozoan parasite *Leishmania*. I completed my undergraduate degree at McMaster University. Prior to starting my degree at UofT, I worked as a Research Technician at Public Health Ontario where I was involved in projects focusing on ill-returned Canadian travelers. When I'm not focusing on tropical infectious diseases, I enjoy being active, cooking, playing the piano and travelling.



**Harley Mount**

I am a third year Ph.D. Student in Dr. Alexander Ensminger's Lab. Our lab studies several bacterial pathogens, with a major focus on *Legionella pneumophila*. I am using a newly developed high-throughput yeast two-hybrid technology to systematically map the complete virulence protein physical interactome of *L. pneumophila* and further elucidate how this pathogen regulates its pathogenicity during host infection. I completed my undergraduate degree at the University of Toronto as a specialist of molecular genetics. My interests outside of academia range from cycling, hiking, and climbing.