

MOLECULAR BIOLOGY 4P03 / BIOLOGY 6P03 - Medical Microbiology

Term II
2018-2019

Instructor: Dr. Herb E Schellhorn (Microbiologist)
Guest Lecturers: Dr. Marek Smieja (Medical Microbiologist, Infectious Diseases Physician)
Dr. Padman Jayaratne (Clinical Microbiologist)
Dr. Zhou Xing (Immunologist, Physician)
Dr. Radhey Gupta (Biochemist)

Course description:

This course introduces students to both the fundamentals of medical microbiology and the advanced research results on all major groups of infectious agents. The fundamentals include the epidemiology, geographic distribution, ecology, and evolution of microbial pathogens; infectious disease immunology and vaccination; pathogenesis and virulence factors; diagnostics and treatments; and antibiotics and antibiotic resistance. The groups of infectious microbes covered include viruses, bacteria, protozoa, and fungi. The lectures will cover materials derived from both textbooks and recent research articles. In addition, during tutorial, students will be actively involved in analyzing and discussing the primary literature in the broad field of medical microbiology, including the economical, social, and ethical issues related to infectious diseases.

Time and location of regular lectures:

L01 Thursday 12:30 - 14:20 BSB137

Time and location of tutorial sections:

T01 Wednesday 14:30 - 17:20 BSB155

Tutorial sessions will be organized and led by the assigned teaching assistant. Each student will give a total of two presentations during the semester. The first presentation deals with an **original research/opinion paper** on medical microbiology. Each student will give ONE individual presentation and participate in ONE group presentation (3-4 students per group depending on class size). The individual presentation is 25min long with 5min of questions while the group presentation is 40min long with 5min of questions. The first presentation deals with an **original research paper** in medical microbiology. The second presentation is based on the group PBL topics (See below). I have listed a few potential topics that students can choose from for the PBL. These sessions will familiarize students with some of the most topical medical microbiology issues and to communicate them effectively.

Evaluation:

Course evaluation will consist of the following components:

1. Individual presentation (15%). The first presentation deals with an **original research paper in medical microbiology**. It is 25min long plus 5 min for questions. Students may choose the paper from a diversity of journals on medical microbiology (e.g. EID, CID, I&I; PLoS Pathogen; Med Mycol; AAC; JCM; Eukaryotic Cell; and Virology etc.). A one-page summary should be provided to each of the tutorial classmates at the beginning of the presentation. The summary will be worth 2% of the total course mark while the presentation will be worth 13%.
2. Group presentation on the PBL topic (10%). Some candidate PBL topics include:
 - a. Many human infectious disease agents originated from animals. Examples of which include SARS, AIDS, and Ebola. Review the literature and design a novel approach that we can use to

prevent/limit zoonotic diseases in humans.

b. The human microbiome is a complex community and has been suggested to play a critical role in many human chronic diseases. Review the literature and design an experiment to test whether certain microbes (including viruses) contribute significantly to mental diseases.

c. Volatile organic compounds are everywhere and many of these compounds are emitted by microorganisms, including human infectious disease agents. In addition, infectious diseases alter human metabolism and the volatiles emitted by humans. How can we use such signals as non-invasive diagnostic markers of human infectious diseases?

d. Antibiotic resistance is common in human microbial pathogens. One of the approaches to limit antibiotic resistance is to reduce antibiotic use. Review the literature on whether reduced antibiotic use contributed to reduced resistance. In addition, design an experiment to test whether a novel approach to combat antibiotic resistance would work in clinics.

I also welcome other topics from students. Each group of 3-4 students will work on one topic.

3. Group summary paper (15%) based on PBL. The finalized summary paper should be maximum of 5 pages, single-spaced, 12 fonts. Need to include background, rationale, experimental design, limitations, and budget. Detailed guidelines will be posted.

4. Reviews of draft summary papers from two peer groups (5% total)

5. Tutorial participation and discussion will account for 5% of the total mark.

6. Mid-Term Test (25%): Thursday, Feb 28, 2016, 12:30-14:20 am BSB137. Open-Book Test: Covering materials from lectures 1 to 12.

7. Final Exam (25%): To be scheduled by the Registrar.

In accordance with the "Senate Resolution on Course Outlines," the instructors reserve the right to make changes in the course that may occur as the course progresses. In accordance with University policy, academic dishonesty, including plagiarism, will not be tolerated. If you need to clarify what constitutes plagiarism, please consult the statement on Academic Dishonesty in the Senate Policy Statements available either in abbreviated form in the university calendar or in entirety at:

<http://www.mcmaster.ca/univsec/policy/AcademicIntegrity2008.pdf>.

The instructor and university reserve the right to modify elements of the course during the term.

The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, students will be given reasonable notice with an explanation and an opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.

Academic Dishonesty: Attention is drawn to the Statement on Academic Integrity as found in the Senate Policy Statements distributed at registration and available in the Senate Office or the Office of Academic Integrity. Any student who infringes any one of these resolutions will be treated according to published policy—

www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf Students are warned that any plagiarism, including failing to properly cite sources, rephrasing ideas presented in publications and copying verbatim or with slight modification, will be subject McMaster's Policies on Academic Integrity.

Assignments McMaster subscribes to Turnit, a service that checks material for possible duplication and has adopted the following policy

www.mcmaster.ca/academicintegrity/turnitin/guidelines.html

Consistent with this policy, we will check assignments for originality.

Reference textbook:

Murray P. R. et al. (2005) Medical Microbiology, 5th edition. Mosby Publishers.

Wessner D.R., Dupont C., and Charles T. 2013 (1st ed) 2016 (2nd ed). Microbiology. Wiley and Sons.

REFERENCE MATERIALS:

American Society for Microbiology review journals and other relevant periodicals are available in Health Sciences Library.

Course Schedule

Week 1.

Lecture 1. Thursday, Jan 10. **Course Introduction and Infectious Disease Epidemics (Dr. Schellhorn)**

Lecture 2. Thursday, Jan 10. **Introduction to Clinical Microbiology (Dr. Schellhorn)**

No tutorial this week. Students should download the list of suggested papers or choose a primary research paper by themselves for the first presentation.

Week 2.

Lecture 3. Thursday, Jan 17. **System Biology Approaches (Dr. Schellhorn)**

Lecture 4. Thursday, Jan 17. **Genetic and Genomic Variation of Human Pathogens (Dr. Schellhorn)**

Tutorial: Decide order of first round of presentations. Choosing research papers for first presentation. Handing out guidelines for research proposal writing.

Looks through PBL topics.

Week 3

Lecture 5. Thursday, Jan 24. **Biosafety (Dr. Zhou Xing)**

Lecture 6. Thursday, Jan 24. **Anti-microbial innate immunity (Dr. Zhou Xing)**

Tutorial: First round of presentations: 4-5 presentations in each group

Set up PBL groups

Week 4

Lecture 7. Thursday, Jan 31. **Anti-microbial adaptive immunity (Dr. Zhou Xing)**

Lecture 8. Thursday, Jan 31. **Human vaccination program (Dr. Zhou Xing)**

Tutorial: First round of presentations: 4-5 presentations in each group

PBL progress sharing and discussion

Week 5.

Lecture 9. Thursday, Feb 7. **Bacterial pathogenesis (Dr. Jayaratne)**

Lecture 10. Thursday, Feb 7. **Bacterial pathogenesis (Dr. Jayaratne)**

Tutorial: First round of presentations: 4-5 presentations in each group

PBL progress sharing and discussion

Week 6.

Lecture 11. Thursday, Feb 14. **Bacterial pathogenesis (Dr. Jayaratne)**

Lecture 12. Thursday, Feb 14. **Bacterial pathogenesis (Dr. Jayaratne)**

Tutorial: First round of presentations: 4-5 presentations in each group

PBL progress sharing and discussion; PBL proposal writing

Week 7.

February 21 READING WEEK: No class or tutorial this week

Week 8.

Thursday, Feb 28. Open-Book Midterm Test: Covers materials from lectures 1 to 12 in room BSB137 from 12:30-2:20.

Tutorial: PBL proposal writing

Week 9

Lecture 13. Thursday, March 7. **Viral Pathogenesis – An Overview (Dr. Schellhorn)**

Lecture 14. Thursday, March 7. **Viral Pathogenesis – Case Studies (Dr. Schellhorn)**

Draft proposal due this week. Draft proposal handing out for peer-review (each student should receive two proposals for reviewing).

Week 10

Lecture 15. Thursday, March 14. **Hospital and Community-Acquired Infections and Infection Control (Dr. Schellhorn)**

Lecture 16. Thursday, March 14. **Epidemics (Dr. Schellhorn)**

Return reviews to your TA.

Reviewer comments and essays return to students; decide order of the second round presentation

Week 11

Lecture 17. Thursday, March 21. **Parasitology (Dr. Smieja)**

Lecture 18. Thursday, March 21 **Parasitology (Dr. Smieja)**

Tutorial: revise proposal and prepare for presentation, decide order of presentation

Week 12

Lecture 19. Thursday, March 28. **Control of Infectious Disease (Dr. Schellhorn)**

Lecture 20. Thursday, March 28. **Control of Infectious Disease (Dr. Schellhorn)**

Tutorial: Presentations by 2-3 PBL groups

Week. 13

Lecture 21. Thursday, April 4. **Antibiotics and Susceptibility Testing (Dr. Schellhorn)**

Lecture 22. Thursday, April 4. **New Diagnostic Tools (Dr. Gupta)**

Tutorial: Presentations by 2-3 PBL groups

Revised research proposal and rebuttal letter due.

AVAILABILITY OF INSTRUCTORS

: Dr. Schellhorn is available by E-mail (schell@mcmaster.ca) and A2L for specific questions arising from course material. Dr. Schellhorn will attend some of the tutorials and can address questions about the course after lectures and tutorials.