MOLECULAR BIOLOGY 4P03 / BIOLOGY 6P03 - Medical Microbiology

Term II
2015-2016

Instructor: Dr. Jianping Xu (Microbiologist)
Guest Lecturers:
- Dr. Marek Smieja (Medical Microbiologist, Infectious Diseases Physician)
- Dr. Jim Mahony (Virologist)
- Dr. Zhou Xing (Immunologist)
- Dr. Tim O'Shea (Public Health Specialist, Infectious Diseases Physician)

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:
- Friday 8:30 - 10:20 MDCL1009

Time and location of tutorial sections:
- T01 Tuesday 8:30 - 11:20 UH-B116
- T02 Wednesday 8:30 - 11:20 MDCL1116

Tutorial sessions will be organized and led by teaching assistant Eta Ashu. 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 5min for questions. Students may choose the paper from a diversity of journals on medical microbiology (e.g. EID,
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%): Friday, Feb 26, 2016, 8:30-11:20am MDCL1009. Open-Book Test: Covering materials from lectures 1 to 12.

7. Final Exam (25%): Friday, April 8, 2016, 8:30-11:20am MDCL1009. Open-Book Exam: Covering materials from lectures 13 to 22.

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.
**Reference textbook:**

**REFERENCE MATERIALS:**
American Society for Microbiology review journals and other relevant periodicals are available in Health Sciences Library.
Course Schedule

**Week 1.**
Lecture 1. Friday, Jan 8. *Course Introduction and Infectious Disease Epidemics* (Dr. Xu)
Lecture 2. Friday, Jan 8. *Introduction to Clinical Microbiology* (Dr. Xu)

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. Friday, Jan 15. *Infectious Disease Epidemiology: Relative Risk, Odds Ratio, Herd Immunity, Clinical Trial Design, and Statistical Analysis* (Dr. Xu)
Lecture 4. Friday, Jan 15. *Genetic and Genomic Variation of Human Pathogens* (Dr. Xu)

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. Friday, Jan 22. *Medical Parasitology - Gastrointestinal Parasites* (Dr. Smieja)
Lecture 6. Friday, Jan 22. *Medical Parasitology - Blood and Tissue Parasites* (Dr. Smieja)

Tutorial: First round of presentations: 4-5 presentations in each group
Set up PBL groups

**Week 4**
Lecture 7. Friday, Jan 29. *Fundamentals of Medical Virology* (Dr. Mahony)
Lecture 8. Friday, Jan 29. *Viral Diseases – Case Studies* (Dr. Mahony)

Tutorial: First round of presentations: 4-5 presentations in each group
PBL progress sharing and discussion

**Week 5.**
Lecture 9. Friday, Feb 5. *Medical Mycology–Fundamentals and Diversity of Agents* (Dr. Xu)
Lecture 10. Friday, Feb 5. *Medical Mycology–Pathogenesis and Virulence Factors* (Dr. Xu)

Tutorial: First round of presentations: 4-5 presentations in each group
PBL progress sharing and discussion

**Week 6.**
Lecture 11. Friday, Feb 12. *Infection by Body Systems-I* (Dr. O’Shea)
Lecture 12. Friday, Feb 12. *Infection by Body Systems-II* (Dr. O’Shea)

Tutorial: First round of presentations: 4-5 presentations in each group
PBL progress sharing and discussion; PBL proposal writing
Week 7.
February 13-20 READING WEEK: No class or tutorial this week

Week 8.
Friday, Feb 26. Open-Book Midterm Test: Covers materials from lectures 1 to 12 in room MDCL1009 from 8:30-11:20.

Tutorial: PBL proposal writing

Week 9
Lecture 13. Friday, March 4. Bacterial Pathogenesis – An Overview (Dr. Xu)
Lecture 14. Friday, March 4. Bacterial Pathogenesis - Virulence Factors (Dr. Xu)

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

Week 10
Lecture 15. Friday, March 11. Bacterial Pathogenesis – Toxins (Dr. Xu)
Lecture 16. Friday, March 11. Hospital and Community-Acquired Infections and Infection Control (Dr. Xu)

Return reviews to your TA.
Reviewer comments and essays return to students; decide order of the second round presentation

Week 11
Lecture 17. Friday, March 18. Biosafety and Bioterrorism (Dr. Zhou Xing)
Lecture 18. Friday, March 18. Anti-microbial Innate Immunity (Dr. Zhou Xing)

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

Week 12
Lecture 19. Friday, March 25. Anti-microbial Adaptive Immunity (Dr. Zhou Xing)
Lecture 20. Friday, March 25. Human Vaccination against Infectious Diseases (Dr. Zhou Xing)

Tutorial: Presentations by 2-3 PBL groups

Week 13
Lecture 21. Friday, April 1. Antibiotics and Susceptibility Testing (Dr. Xu)
Lecture 22. Friday, April 1. Antibiotic Resistance (Dr. Xu)

Tutorial: Presentations by 2-3 PBL groups
Revised research proposal and rebuttal letter due.

Week 14
Final Exam: Friday, April 8, 2016, 8:30-11:20am MDCL1009; open-book final exam.
AVAILABILITY OF INSTRUCTORS: Dr. JP Xu is available by E-mail (jpxu@mcmaster.ca) and A2L for specific questions arising from course material. Dr. Xu will attend some of the tutorials and can address questions about the course after lectures and tutorials.