INSTRUCTOR:
Prof Stash Nastos
stash.nastos@mcmaster.ca

INTRODUCTION:
Alexander Fleming changed modern medicine upon discovering penicillin in 1929. Yet in a New York Times interview in 1945, he predicted the situation in which we find ourselves today: "the microbes are educated to resist penicillin and a host of penicillin-fast organisms is bred out which can be passed to other individuals and from them to others until they reach someone who gets a septicemia or a pneumonia which penicillin cannot save". Using an inquiry/problem-based learning approach, we will examine the BIOCHEMICAL and MOLECULAR basis for antibiotic resistance in bacteria. We will investigate prominent "superbugs" plaguing patients in hospitals and communities such as: methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant enterococci (VRE), multi-drug-resistant Mycobacterium tuberculosis (MDR-TB) and Pseudomonas aeruginosa (biofilms), and devise potential novel interventions to move antimicrobial chemotherapy forward. Over the term you will become familiar with the disease. Along the way, you will learn about microbial genetics, gene and protein expression, protein structure and function, signal transduction, and drug design and discovery. Throughout this course, you will refine your verbal and written communication skills, your ability to find and critically evaluate information, and your ability to work effectively as a member of a group.

LEARNING OBJECTIVES:

- To consolidate a comprehensive understanding of the principles of biochemistry, including the understanding of nucleic acid and protein structure and function, and understand the relevance of this information to health.
- To apply biochemical knowledge to the underlying mechanisms of pathogenesis and disease.
- To understand the issues of importance and the principles of human disease and its implication to pathology.
- To understand the purpose and methodology of experimental analyses behind the discovery and screening of diseases in molecular detail.
- To identify potential targets and applications for treatment.
- To understand the identification of potential targets and applications for treatment.
- To know the issues of importance to health and treatment of infectious diseases.

PRESENTATIONS AND CLASS PARTICIPATION:
There will be 4 groups in the class, with 5 students in each (groups A, B, C and D). Attendance is mandatory during class for all groups. On 5 occasions throughout the term, groups will meet in class with the Instructor and other 3 groups for 1 hour to report on their recent work, review progress and set direction. Be prepared to show evidence of your research and learning. Presentations will be formal yet casual, and groups are required to use PowerPoint, and supplement their slides with the blackboard, whiteboard or SmartBoard as needed, to present their work. During the presentations, your group will decide and self
**select 2 members of the group to present on behalf of the group.** The presentation should last about 45 minutes, leaving 15 minutes for questions/discussion. Each member of the group will receive a mark based on the performance of the chosen individuals, so it is in your best interest to work cohesively and to a common understanding. Participation by the other 3 groups in asking questions is expected (asking questions, constructive critiquing, etc). There will also be a presentation evaluation form each person has to fill out and submit for each presentation and a group evaluation component at the end of the course to ensure contributions to the group project were equitable. Because the success of the group depends on the full participation of all members, attendance is mandatory (see MSAF below). Be sure to appropriately reference your resources. Use only the Vancouver referencing style. Guidelines can be found at: https://goo.gl/YHrDj

**CONTENT (40 marks):**
- Was the background material appropriate and did it help the audience's comprehension of the topic?
- Did the group demonstrate an understanding of basic biochemical and molecular principles and their problem?
- Did an appropriate amount of the talk focus on future directions (what comes next)?
- Did the group demonstrate creativity in their approach to the theme/problem?
- Did the group use adequate results from original research?
- Did the group critically evaluate the literature, integrate and reconstruct the new knowledge?

**ORGANIZATION AND FORMAT (15 marks):**
- Was the format of the presentation well organized and presented in a logical, easy-to-follow sequence?
- Was the presentation indicative of a clearly defined set of objectives?
- Was the use of visuals appropriate and legible?

**CLARITY AND DELIVERY (15 marks):**
- Clear, appropriate use of scientific language, terminology?
- Were the speakers clear and audible?
- Did the speakers remain attentive and enthusiastic throughout the presentation to make it rewarding for the audience and sustain interest?
- Was the delivery practiced and smooth?
- Were the speakers able to deal with interruptions from the Instructor and classmates, think on their feet, answer questions, regroup, and continue with the presentation?

**QUESTIONS AND ANSWERS (30 marks):**
- Group members ability to answer questions and discuss the information presented?
- Demonstrated knowledge of biochemistry and molecular biology?

**MARKS/GRADERS:**
Your final grade will be calculated as noted below.

Presentations (group) 85% (5x17%)
Class Participation (individual) 15%
100%

Conversion from percentages to letter grades will follow the standard McMaster procedure (please see the Table below).

<table>
<thead>
<tr>
<th>%</th>
<th>Letter</th>
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<th>Letter</th>
<th>%</th>
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<tbody>
<tr>
<td>90-100</td>
<td>A+</td>
<td>77-79</td>
<td>B+</td>
<td>67-69</td>
<td>C+</td>
<td>57-59</td>
<td>D+</td>
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<tr>
<td>85-89</td>
<td>A</td>
<td>73-76</td>
<td>B</td>
<td>63-66</td>
<td>C</td>
<td>53-56</td>
<td>D</td>
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<tr>
<td>80-84</td>
<td>A-</td>
<td>70-72</td>
<td>B-</td>
<td>60-62</td>
<td>C-</td>
<td>50-52</td>
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I reserve the right to alter weights in any category by 10% without eliminating any of the above. Conversion from percentages to letter grades will follow the standard McMaster procedure (please see the Table below). All percentage grades within 0.5% of the next letter grade will be reviewed.

GROUP/'SUPERBUG' ASSIGNMENTS:
I will leave it to you to decide your groups. We will need 4 groups, with 5 students per group. You will need to also negotiate upon which 'superbug' you will investigate this term, and confirm with other groups that each group is studying a different 'superbug'.

SCHEDULE:
All groups must be present for all classes and participate in asking questions of the presenting groups.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Time</th>
<th>Who attends?</th>
<th>What are we doing?</th>
<th>Who presents?</th>
<th>Location</th>
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<tr>
<td>1</td>
<td>January 4</td>
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<td>MDCL-2218</td>
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<td>2</td>
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<td>Introduction</td>
<td></td>
<td>MDCL-2218</td>
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<td>3</td>
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<td>Groups A &amp; B</td>
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<td>4</td>
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<td>Groups C &amp; D</td>
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<tr>
<td>5</td>
<td>February 1</td>
<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #2</td>
<td>Groups A &amp; B</td>
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<td>6</td>
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<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #2</td>
<td>Groups C &amp; D</td>
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<td>7</td>
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<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #3</td>
<td>Groups A &amp; B</td>
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<td>8</td>
<td>February 22</td>
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<td>9</td>
<td>March 1</td>
<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #3</td>
<td>Groups C &amp; D</td>
<td>MDCL-2218</td>
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<tr>
<td>10</td>
<td>March 8</td>
<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #4</td>
<td>Groups A &amp; B</td>
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<tr>
<td>11</td>
<td>March 15</td>
<td>6:00-9:00pm</td>
<td>Everyone</td>
<td>Presentations #4</td>
<td>Groups C &amp; D</td>
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<td>12</td>
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<td>6:00-9:00pm</td>
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<td>Presentations #5</td>
<td>Groups A &amp; B</td>
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<td>13</td>
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<td>Presentations #5</td>
<td>Groups C &amp; D</td>
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<td>14</td>
<td>April 5</td>
<td>No Class: Group Evaluations Due</td>
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ACADEMIC INTEGRITY:
You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on course work, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy. To see the Turnitin.com Policy, please go to: www.mcmaster.ca/academicintegrity.
MODIFICATIONS TO COURSE OUTLINE AND EMAIL COMMUNICATION:
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, reasonable notice and communication with the students will be given with explanation and the 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. We will make announcements in class and by email to your official McMaster University email account. Please note that all emails sent must originate from your official McMaster University email account.

ASSIGNMENT DEADLINES AND MISSED OR LATE WORK:
Students are expected to hand in all assignments on the specified due dates. Late submissions will be subject to a penalty of 10% per day (including weekends). Assignments submitted after class on the due date will be counted as one day late.

MCMASTER STUDENT ABSENCE FORM (MSAF):
This is an online, self-reporting tool for students to report absences due to minor medical situations that last up to 5 days and to request accommodation for any missed academic work that is worth less than 25% of the final grade. Please note that this tool cannot be used during any final examination period. It is the prerogative of the Instructor to determine the appropriate relief for missed term work. You may submit a maximum of one request per term. The form should be filled out immediately when you are about to return to class after your absence. It is YOUR responsibility to follow up with your instructor immediately (within 2 working days) about the nature of the accommodation. If you are absent for more than 5 days, have missed academic work worth 25% or more, or exceed one request per term, you must see someone in the BHSc (Honours) Program office in MDCL-3308. You will be required to provide supporting documentation.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES:
Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone x28652 or email sas@mcmaster.ca. For further information, consult McMaster University’s Policy for Academic Accommodation of Students with Disabilities.

SUSTAINABILITY AND WRITTEN WORK:
The written work submission guidelines for this course have been chosen to support the more sustainable use of paper, energy and toner. Four levels of criteria have been developed by the Office of Sustainability and encouraged for adoption by professors and faculties. The submission guidelines for this course meet the Platinum standard. All written work must be submitted in the following format: reduced line spacing (1.5 lines), sans-serif font, and online submission and return. For more information about criteria for sustainable written work submissions, visit the Office of Sustainability website: www.mcmaster.ca/sustainability.