1. Course Information
Pharmacology 4320A: Cardiovascular Pharmacology
Fall Term 2019

The course is designed to teach students the principles of cardiovascular pharmacology and therapeutics. We will focus on the underlying mechanistic bases of cardiovascular diseases including ischemic heart disease and heart failure, especially at the cellular and molecular levels, and examine how these relate to therapeutic interventions. Throughout the course, mechanisms, either of disease processes or drug actions are stressed. In addition, recent and late-breaking developments in the understanding and treatment of cardiovascular disease represent important components of the course.

Lectures:
Tuesday 9:30-11:30, DSB 2016

Requisites:
Prerequisite(s): Pharmacology 3620 and either Physiology and Pharmacology 3000E or the former Pharmacology 3580Z; or Physiology 3120; or Pharmacology 3620 and registration in Year 4 of a module in Pathology.

Senate regulation regarding the student’s responsibility regarding requisites:
Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Accessibility Statement
Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

2. Instructors:
- Dr. Qingping Feng (Course coordinator) Email: qfeng@uwo.ca
- Dr. Robert Gros Email: rgros@robarts.ca

OWL:
Students with OWL issues should see: https://owlhelp.uwo.ca
3. Course Syllabus

Basic principles of cardiovascular pharmacology with particular emphasis on cellular mechanisms of drug action and mechanisms of therapeutic efficacy in disease states. The course consists of formal lectures and interactive discussions of student presentations based on papers selected by the instructors. All students will be expected to read, critique and be able to answer the questions raised by the rest of the class. A student panel will be selected at each presentation to facilitate discussions. Student participation on the course particularly in terms of discussions during the sessions will be expected.

Course Learning Outcomes:
- To define the principles of drugs for the treatment of cardiovascular disease
- To explain cellular and molecular mechanisms of cardiovascular disease in relation to pharmacological treatments
- To assess and critique studies on the effects and mechanisms of cardiovascular drugs

2019 SCHEDULE

<table>
<thead>
<tr>
<th>SEPT 10</th>
<th>Introduction, regulation of cardiovascular function, sites of drug action in the cardiovascular system</th>
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<tbody>
<tr>
<td></td>
<td>The purpose of this session is to provide an overview on the cardiovascular system. Topics to be covered will include the regulation of cardiovascular function by adrenergic, cholinergic, and renin-angiotensin systems. Major drug targets in the cardiovascular system will be reviewed.</td>
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<td>Q. FENG</td>
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<tr>
<th>SEPT 17</th>
<th>Regulation of cardiovascular function by nitric oxide</th>
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<td>This session will focus on the role of nitric oxide as an important signalling molecule in the regulation of cardiovascular function. Topics to be discussed include the basic concept of nitric oxide pathway, the regulation of nitric oxide production, and effects of nitric oxide on cardiovascular function during normal physiological conditions and heart failure. This session will help to understand the pharmacological actions of NO donors in cardiovascular disease.</td>
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<td>Q. FENG</td>
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<tr>
<th>SEPT 24</th>
<th>Cardiomyocyte death and heart disease</th>
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<td>Q. FENG</td>
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Loss of cardiomyocyte occurs in the heart during all stages of myocardial infarction. Necrosis, apoptosis and autophagy may contribute to cardiomyocyte death during the acute ischemic stage, as well as for a progressive loss of surviving cells during the subacute and chronic stages. This session will discuss current understanding of the role of myocardial apoptosis and autophagy in myocardial infarction and development of heart failure, and the possibility of therapeutic anti-apoptotic interventions.

**Paper to Discuss:**

<table>
<thead>
<tr>
<th>Oct 1</th>
<th>Angiogenesis, a potential treatment for heart disease</th>
<th>OCT 1</th>
<th>OCT 15</th>
<th>OCT 8</th>
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<tr>
<td></td>
<td>Coronary angiogenesis and collateral growth are chronic adaptations to myocardial ischemia, which are aimed at restoring coronary blood flow and salvaging myocardium in an ischemic region. Although there is as of yet no consensus about the mechanisms and causal factors for these coronary adaptations to ischemia, recent evidence strongly suggests that a balance between growth factors and growth inhibitors is critical. This session will discuss the mechanisms of angiogenesis and its recent development in the treatment of ischemic heart disease.</td>
<td>Q. FENG</td>
<td>R. GROS</td>
<td>MIDTERM TEST</td>
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<td><strong>Paper to Discuss:</strong></td>
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<tr>
<td>Date</td>
<td>Topic</td>
<td>Authors</td>
<td>Paper to Discuss</td>
<td>Instructor</td>
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<tr>
<td>Nov 5</td>
<td><strong>Reading Week (NO Class)</strong></td>
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<td><strong>Reading Week (NO Class)</strong></td>
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<td>Nov 12</td>
<td><strong>Coronary heart disease and antianginal agents</strong></td>
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<td><strong>Paper to Discuss:</strong> Shibutani S, et al. Coronary vasospasm induced in transgenic mouse with increased phospholipase C-δ1 activity. <em>Circulation</em> 2012;125:1027-1036. DOI: 10.1161/CIRCULATIONAHA.111.064303</td>
<td>Q. FENG</td>
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<tr>
<td>Nov 19</td>
<td><strong>Diuretics for treatment of cardiovascular disease</strong></td>
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<td><strong>Diuretics for treatment of cardiovascular disease</strong></td>
<td>Q. FENG</td>
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Diuretics are drugs that are used to regulate volume and/or composition of body fluids in clinical conditions including hypertension and heart failure. This lecture will briefly introduce renal anatomy and physiology, which are relevant to diuretic pharmacology. The session will focus on categories of diuretics, mechanism of action, site of action, effects on urinary composition and their applications in the treatment of hypertension and heart failure.

**Paper to Discuss:**

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<tr>
<th>Nov 26</th>
<th>Drugs for treatment of arrhythmias</th>
<th>Q. Feng</th>
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<td>For the majority of patients with cardiovascular risk, mortality and morbidity is due to cardiac arrhythmia. Arrhythmia is due to impulse initiation, impulse propagation or a combination. For many arrhythmias, pharmacological therapy is a first-line approach to treatment. This session will explore the bases of arrhythmia, the classification of antiarrhythmic agents and their potential therapeutic as well as the risk of potential pro-arrhythmic actions. <strong>Paper to Discuss:</strong> Dybkova N, et al. Differential regulation of sodium channels as a novel proarrhythmic mechanism in the human failing heart. <em>Cardiovascular Research</em> 2018 Jun 20. DOI: 10.1093/cvr/cvy152 [Epub ahead of print]</td>
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<tr>
<th>DEC 3</th>
<th>Cardiac hypertrophy and heart failure</th>
<th>Q. Feng</th>
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<td></td>
<td>Cardiac hypertrophy is an adaptive response to myocardial injury and constitutes an important component of myocardial remodelling which eventually results in heart failure. The underlying mechanism of remodelling, and particularly hypertrophy of the cardiac cell represents an important component which will be discussed during this session. Particular emphasis will be placed on understanding some of the key cell signalling events which participate in the hypertrophy program and how understanding these events could lead to the development of better therapeutic strategies for treating heart failure. Pharmacological agents for the treatment for heart failure and their mechanisms of action will be presented. <strong>Paper to Discuss:</strong> Berry JM, et al. Reversibility of adverse, calcineurin-dependent cardiac remodeling. <em>Circulation Research</em> 2011;109: 407-417. DOI: 10.1161/CIRCRESAHA.110.228452</td>
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4. Course Materials

Copyright Statement:
Course material produced by faculty is copyrighted and to reproduce this material for any purposes other than your own educational use contravenes Canadian Copyright Laws.

General References:

5. Evaluation:
A detailed and comprehensive set of regulations concerning the scheduling of tests, assignments, etc. is available at:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&command=showCategory&SelectedCalendar=Live&ArchiveID=15%

15% Assessment Rule:
At least three days prior to the deadline for withdrawal from a course without academic penalty, students will receive assessment of work accounting for at least 15% of their final grade. For more details, refer to the link below:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&Command=showCategory&Keywords=15%&SubHeadingID=73&SelectedCalendar=Live&ArchiveID=#SubHeading_73

Policy on Rounding and Bumping of Grades
Across the Basic Medical Sciences Undergraduate Education programs and within the department of Physiology and Pharmacology we strive to maintain high standards that reflect the effort that both students and faculty put into the teaching and learning experience during this course. All students will be treated equally and evaluated based only on their actual achievement. Final grades in this course, irrespective of the number of decimal places used in marking individual assignments and tests, will be calculated to one decimal place and rounded to the nearest integer, e.g., 74.4 becomes 74, and 74.5 becomes 75. Marks WILL NOT be bumped to the next grade or GPA, e.g. a 79 will NOT be bumped up to an 80, an 84 WILL NOT be bumped up to an 85, etc. The mark attained is the mark you achieved and the mark assigned; requests for mark “bumping” will be denied.

| Paper presentation and participation in discussions | Students are expected read research papers selected by the instructor and present them to the class. This will be followed by a general discussion on the topic of the research paper. ALL students | 10% |
are expected to have read the papers BEFORE class and to participate in discussions.

Calculation of Marks:
Knowledge of topic 35%
Presentation of material 35%
Leading Discussion 15%
Responses to Questions 15%

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<tr>
<th>Examination</th>
<th>Format</th>
<th>Percentage</th>
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<tr>
<td>Midterm test – Oct 8</td>
<td>Short answer and essay format</td>
<td>30%</td>
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<tr>
<td>Final examination – TBA Dec. 9-20, 2019</td>
<td>Short answer and essay format</td>
<td>60%</td>
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NOTE THAT YOU MUST WRITE THE MIDTERM TEST TO SIT FOR THE FINAL EXAM.
THERE ARE NO SUPPLEMENTARY EXAMINATIONS IN THIS COURSE.

6. Additional Information/Statements

Statement on Academic Offences
“Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following website:
http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Policy on Plagiarism
The Department of Physiology and Pharmacology strongly condemns plagiarism. Plagiarism is the “act or instance of copying or stealing another’s words or ideas and attributing them as ones own.” (Excerpted from Black’s Law Dictionary, West Group, 1999, 7th ed. Pg 1170 and the definition used by Western’s Scholastic Discipline document). Plagiarism can be intentional or unintentional and regardless of intent, is a scholastic offence. It should be noted that self-plagiarism, plagiarizing ones own words for multiple assignments is subjected to the same penalty as plagiarizing another. Courses in Physiology and Pharmacology use turnitin, a similarity checking software embedded within OWL. We encourage all students to run their assignments through turnitin prior to submitting their reports for grading. Any report flagged as yellow (25-49% matching text), orange (50-74% matching text) or red 75-100% matching text) will be considered plagiarism (pending investigation by the instructor). It should be noted that a document could be plagiarized yet still pass the similarity check on turnitin.

The *minimum* penalty for a first time plagiarism offence of any kind is a grade of zero on the assignment. In addition, details of the offence will be forwarded to Dean’s office and stored. A second offence will carry a much stricter penalty in line with Western’s Scholastic Discipline policies (https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).
Statement on Use of Cell Phones and Electronic Devices
The Schulich School of Medicine and Dentistry is committed to ensuring that testing and evaluation are undertaken fairly across all our departments and programs. For all tests and exams, it is the policy of the School and the Department of Physiology and Pharmacology that any electronic devices (e.g. cell phone, tablet, camera, watch, smart watch, ipod, ear buds, headphones) are strictly prohibited. These devices MUST be left either at home or with the students bag/jacket at the front of the room and MUST NOT be at the test/exam desk or in the individuals pocket. Any student found with one of these prohibited devices will receive a grade of zero on the test or exam. Non-programmable calculators are only allowed when indicated by the instructor. The Department of Physiology and Pharmacology is not responsible for stolen/lost or broken devices.

Statement on Discussion of Grades

The Department of Physiology and Pharmacology is committed to fair assessment of student work and encourages students to discuss course content and graded work with their peers in an effort to improve learning.

For Students: While all students have the right to question their grade should they feel it’s inaccurate, this exercise should be undertaken in a respectful manner. Professionalism and respect should be demonstrated in all interactions with instructors and peers. When discussing a grade or exam question with a professor or teaching assistant, the discussion should focus on your individual concern. Students should remember that some forms of assessment or specific questions are designed to be more challenging than others. In this situation, there may be several students that don’t receive the correct answer and this does not necessarily mean that there is a problem with the question or assessment. Concerns from one student that indicate that they are communicating on behalf of a larger group of peers (mob/crowd mentality) will not be considered. Concerns with an assessment should be communicated to the instructor and should reflect your individual concern. Threats of any sort will not be tolerated and will be considered a violation of the student code of conduct. It is a requirement that you treat your instructors with respect and you should expect the same respect returned to you by your instructor.

For Professors and Teaching Assistants: All professors and teaching assistants should keep an open mind when discussing graded work with students. Make an effort to listen to students and try and see their point of view. If there was ambiguity in a question or multiple correct answers that a student brings to your attention, you should revise the grade. If the student concern is not adequately justified, explain your reasoning. Students that have concerns regarding an exam question or graded assignment deserve to be treated with respect. Treat with them with the same respect that you expect from them. That being said, concerns from one student that indicate that they are communicating on behalf of a larger group of peers (mob/crowd mentality) should not be considered.
Statement on Appeals

The Department of Physiology and Pharmacology follows the Western University student academic appeals policy (http://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=1&SelectedCalendar=Live&ArchiveID=#SubHeading_181). All appeals to individual graded course components must be submitted to the course instructor within 3 weeks of the grade being released. All final course grade appeals must be received by January 31 (1st term classes) or June 30 (2nd term half classes and full year classes). You must first appeal to the course manager. If this appeal is rejected, then you can appeal to the Undergraduate Chair of the Department of Physiology and Pharmacology. If this appeal is rejected, you may then appeal to the Associate Dean of the Bachelor of Medical Sciences Undergraduate Education Committee.

You must have suitable grounds for appeal which may include: 1) appeal on medical or compassionate grounds; 2) appeal based on extenuating circumstances beyond your control; 3) appeal based on bias, inaccuracy or unfairness. All appeals must be accompanied by a detailed explanation along with supporting documentation. You should submit your appeal as an e-mail with a single attachment. If you have multiple supporting documents, you should merge them into a single document.

Absence from course commitments

Medical/Compassionate Relief Program Policy

A. Absence for medical illness or non-medical absence:

Students must familiarize themselves with the Policy on Accommodation for Medical Illness for Undergraduate Students, located at: http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=1&Command=showCategory&Keywords=medical&SubHeadingID=323&SelectedCalendar=Live&ArchiveID=#SubHeading_323

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Students should familiarize themselves with the procedures for academic consideration and note the process for self-reporting. http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=1&Command=showCategory&Keywords=absence&SubHeadingID=323&SelectedCalendar=Live&ArchiveID=#SubHeading_323

Approval can be granted either through a self-reporting of absence or via the Academic Counselling unit. The Academic Counselling is located in NCB 280, and can be contacted at scibmsac@uwo.ca.
B. Accommodation for Religious Holidays

The policy for accommodation for Religious Holidays can be found at:
http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=1&Command=showCategory&Keywords=absence&SubHeadingID=323&SelectedCalendar=Live&ArchiveID=#SubHeading_323

C. Special Examinations

http://www.westerncalendar.uwo.ca/PolicyPages.cfm?PolicyCategoryID=5&Command=showCategory&Keywords=special%20examination&SubHeadingID=70&SelectedCalendar=Live&ArchiveID=#SubHeading_70

A Special Examination is any examination other than the regular final examination, and it may be offered only with the permission of the Dean/Academic Counselling Office of the Faculty in which the student is registered, in consultation with the instructor and Department Chair. Permission to write a Special Examination may be given on the basis of compassionate or medical grounds with appropriate supporting documents.

A Special Examination must be written at the University or an Affiliated University College no later than 30 days after the end of the examination period involved. To accommodate unusual circumstances, a date later than this may be arranged at the time permission is first given by the Dean/Academic Counselling Office of the Faculty. The Dean/Academic Counselling Office will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to the Office of the Registrar.

If a student fails to write a scheduled Special Examination, permission to write another Special Examination will be granted only with the permission of the Dean/Academic Counselling Office in exceptional circumstances and with appropriate supporting documents. In such a case, the date of this Special Examination normally will be the scheduled date for the final exam the next time the course is offered.

When a grade of Special (SPC) or Incomplete (INC) appears on a student's record, the notations will be removed and replaced by a substantive grade as soon as the grade is available.

Support Services:
Registrarial Services: http://www.registrar.uwo.ca

Academic Counselling (Science and Basic Medical Sciences): http://www.uwo.ca/sci/counselling
USC Student Support Services: http://westernusc.ca/services/

Student Development Services: http://www.sdc.uwo.ca

Student Health Services: http://www.shs.uwo.ca/

Students who are in emotional/mental distress should refer to Mental Health@Western https://www.uwo.ca/health/mental_wellbeing/self/student.html for a complete list of options about how to obtain help.