Pharmacology 4320A  
Cardiovascular Pharmacology  
Fall Term 2017

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

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.

Requisites:  
Prerequisite(s): Pharmacology 3550A/B and 3580y (the former Pharmacology and Toxicology 357), or Physiology 3120 (or the former Physiology 310) or the former Biology 362, or Pharmacology 3550A/B and registration in Year 4 of a module in Pathology and Toxicology, or permission of the Department.

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.

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

Components of the Course:  
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.

- Paper presentation and participation in discussions  10 %
  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 are expected to have read the papers BEFORE class and to participate in discussions.
Calculation of Marks:

- Knowledge of the topic 35 %
- Presentation of material 35 %
- Leading Discussion 15 %
- Responses to Questions 15 %

- Mid-term examination - short answer and essay format 30 %
- Final examination - short answer and essay format 60 %

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

WebCT:
Students with WebCT issues should contact the Computer Support Centre at 519 661-3800 or fill out the WebCT webform: https://servlet.uwo.ca:8081/vistahelpdesk/controller.jsp
Faculty with WebCT issues should contact the ITRC at 85513

Course Syllabus

Pharmacology 4320A
Cardiovascular Pharmacology

2017 SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>LECTURER</th>
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<tr>
<td>September 12</td>
<td>Introduction, regulation of cardiovascular function Q Feng</td>
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<td>sites of drug action in the cardiovascular system</td>
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<td>The purpose of this session is to provide an overview on</td>
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<td>the cardiovascular system. Topics to be covered will</td>
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<td>include the regulation of cardiovascular function by</td>
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<td>adrenergic, cholinergic, and renin-angiotensin systems.</td>
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<td>Major drug targets in the cardiovascular system will</td>
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<td>be reviewed.</td>
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<td>September 19</td>
<td>Regulation of cardiovascular function by nitric oxide</td>
<td>Q Feng</td>
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<td>This session will focus on the role of nitric oxide as</td>
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<td>an important signalling molecule in the regulation of</td>
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<td>cardiovascular function. Topics to be discussed include</td>
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<td>the basic concept of nitric oxide pathway, the regulation</td>
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<td>of nitric oxide production, and effects of nitric oxide</td>
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<td>on cardiovascular function during normal physiological</td>
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<td>conditions and heart failure. This session will help to</td>
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<td>understand the pharmacological actions of NO donors in</td>
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Paper to Discuss:
September 26  Cardiomyocyte death and heart disease  Q Feng

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:

October 3  Angiogenesis, a potential treatment for heart disease  Q Feng

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.

Paper to Discuss:

October 10  Reading Week (NO Class)

October 17  MIDTERM EXAMINATION

October 24  Regulation of the cardiovascular system by G protein-mediated signal transduction  R Gros

This session will review the mechanics of G protein-mediated signal transduction and provide an overview of how the heart and vasculature are regulated by GPCRs that are activated in response to a wide variety of hormones, neurotransmitters, paracrine factors and autocrine factors. In addition there will be an overview of cardiovascular drugs that produce their effects via GPCRs.

Paper to discuss:
October 31  Drugs for treatment of hypertension  R Gros
In this session the mechanisms of actions of drugs used in the treatment of hypertension will be discussed. With particular focus on the different classes of anti-hypertensive agents currently utilized in the treatment of hypertension.

Paper to Discuss:

November 7  Drugs for treatment of hyperlipidemia  R Gros
In this session the mechanisms of action of drugs used in the treatment of hyperlipidemia will be discussed. With particular focus on the pharmacology of the different classes of lipid-lowering drugs currently used in the treatment of hyperlipidemia.

Paper to Discuss:

November 14  Coronary heart disease and antianginal agents  Q Feng
Pathophysiology of coronary heart disease with particular reference to Angina Pectoris and treatment strategies will be discussed. The session will focus on the mechanisms of action of drugs used for treatment of angina. Three families of drugs will be discussed, which include organic nitrates, beta blockers and calcium channel blockers.

Paper to be discussed:

November 21  Diuretics for treatment of cardiovascular disease  Q Feng
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 be discussed:
November 28  
**Drugs for treatment of arrhythmias**  
Q Feng

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.

Paper to Discuss:

December 5  
**Cardiac hypertrophy and heart failure**  
Q Feng

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. Current drug treatment guidelines and potential new treatment options for heart failure will be presented.

**Paper to be discussed:**

**Course Materials**

**General References**
Evaluation:
A. Paper presentation and participation in discussions 10 %
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 are expected to have read the papers BEFORE class and to participate in discussions.

Calculation of Marks:

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<tr>
<td>Knowledge of topic</td>
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<td>Responses to Questions</td>
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B. Mid-term examination (short answer and essay format, 30%). Date: Tuesday, October 17, 2017, 9:30 to 11:30 AM.
C. Final examination (short answer and essay format, 60%). Date: TBA

NOTE THAT YOU MUST WRITE THE MIDTERM EXAMINATION TO SIT FOR THE FINAL EXAM.

THERE ARE NO SUPPLEMENTARY EXAMINATIONS IN THIS COURSE.

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.

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).

**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/handbook/appeals/scholastic_discipline_undergrad.pdf

**Absence from course commitments**

A. Absence for medical illness:

Students must familiarize themselves with the Policy on Accommodation for Medical Illness: https://studentservices.uwo.ca/secure/index.cfm

**Statement from the Dean’s Office, Faculty of Science**

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean’s office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see: http://www.uwo.ca/univsec/handbook/appeals/medical.pdf

A student requiring academic accommodation due to illness, should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found at: https://studentservices.uwo.ca/secure/medical_document.pdf

B. Absence for non-medical reasons:

A clear indication of how non-medical absences from midterms, tutorials, laboratory experiments, or late essays or assignments, will be dealt with must be provided. If documentation is required, such documentation must be submitted by the student directly to the appropriate Faculty Dean’s Office and not to the instructor. It will subsequently be the Dean’s Office that will determine if accommodation is warranted.

C. Special Examinations

A Special Examination is any examination other than the regular examination, and it may be offered only with the permission of the Dean 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 of the Faculty. The Dean will consult with the instructor and Department Chair and, if a later date is arranged, will communicate this to Registrarial Services. 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 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.

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.sds.uwo.ca

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

Students that are in emotion/mental distress should refer to Mental Health@Western http://www.uwo.ca/uwocom/mentalhealth/ for a complete list of option about how to obtain help.