Pharmacology 4320A  
Cardiovascular Pharmacology  
Fall Term 2015

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.

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.

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.

Instructor Information

Course coordinator:  
Dr. Qingping Feng  
Email: Qingping.Feng@schulich.uwo.ca

Lecturers:  
Dr. Robert Gros  
Email: rgros@robarts.ca  
Dr. Morris Karmazyn  
Email: Morris.Karmazyn@schulich.uwo.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

2015 SCHEDULE

<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>LECTURER</th>
</tr>
</thead>
<tbody>
<tr>
<td>September 15</td>
<td>Introduction, regulation of cardiovascular function sites of drug action in the cardiovascular system</td>
<td>Q Feng</td>
</tr>
<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>
<td></td>
</tr>
<tr>
<td>September 22</td>
<td>Regulation of cardiovascular function by nitric oxide</td>
<td>Q Feng</td>
</tr>
<tr>
<td></td>
<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>
<td></td>
</tr>
<tr>
<td></td>
<td>Paper to be discussed:</td>
<td></td>
</tr>
<tr>
<td>September 29</td>
<td>Cardiomyocyte death and heart disease</td>
<td>Q Feng</td>
</tr>
<tr>
<td></td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paper to be discussed:</td>
<td></td>
</tr>
</tbody>
</table>
October 6  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 be discussed:

October 13  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 be discussed:

October 20  MIDTERM EXAMINATION

October 27  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:
November 3  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 be discussed:

November 10  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 be discussed:

November 17  Coronary heart disease and antianginal agents  M Karmazyn
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 24  Myocardial cell death and the role of Na-H exchange  M Karmazyn
The myocardial sodium-hydrogen exchanger (NHE) is the major mechanism by which the cardiac cell regulates intracellular pH. NHE, of which 10 isoforms have been identified, neutralizes intracellular acidosis by removing protons in exchange for sodium. In this session we will discuss the regulation of NHE in the heart under physiological and pathophysiological conditions with particular emphasis placed on the contribution of NHE to cardiac pathology particularly ischemia-induced cell death. The concept of NHE as a target for therapeutic intervention in treating heart disease will be discussed.

Paper to be discussed:
December 1  Myocardial hypertrophy and remodelling  M Karmazyn
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.

Paper to be discussed:

December 8  Heart failure and its treatment  M Karmazyn
The session will discuss compensatory mechanisms and drug treatment strategy in heart failure. Current pharmacological treatment guidelines for heart failure will be presented. Future potential treatment options for heart failure will also be discussed.

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

B. Mid-term examination (short answer and essay format, 40%). Date: Tuesday, October 21, 2014, 9:30 to 11:30 AM.
C. Final examination (short answer and essay format, 50%). Date: TBA
NOTE THAT YOU MUST WRITE THE MIDTERM EXAMINATION TO SIT FOR
THE FINAL EXAM.

THERE ARE NO SUPPLEMENTARY EXAMINATIONS IN THIS COURSE.

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:

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](http://www.registrar.uwo.ca)
- Academic Counselling (Science and Basic Medical Sciences): [http://www.uwo.ca/sci/counselling/](http://www.uwo.ca/sci/counselling/)
- USC Student Support Services: [http://westernusc.ca/services/](http://westernusc.ca/services/)
- Student Development Services: [http://www.sds.uwo.ca](http://www.sds.uwo.ca)
- Student Health Services: [http://www.shs.uwo.ca/](http://www.shs.uwo.ca/)

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