
1. PHSL 3211 CARDIOVASCULAR PHYSIOLOGY AND PATHOPHYSIOLOGY

COURSE OUTLINE

Course Co-ordinators:

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COURSE OUTLINE AND STRUCTURE

The cardiovascular system is vital to normal functioning of the human body. Diseases afflicting the cardiovascular system result in high rates of illness and mortality throughout the world. This course aims to educate the student in important aspects of cardiovascular physiology and pathophysiology, and to present the latest research strategies used to investigate this complex system. The course is divided into three units, over which the student will be taken from the physiology of cardiac and vascular cells, examine the function and regulation of these cells within vascular tissues and organs, and finally learn about the latest theories and techniques leading research into cardiovascular pathophysiology and disease. As the course progresses, material builds on information presented in earlier classes. Course material is delivered by staff actively engaged in cardiovascular research, able to illustrate theory with examples from their own laboratories.

Unit 1: Cellular Aspects

The aim of this unit is to become familiar with the cellular characteristics of the blood vessels wall. Further emphasis will be placed on interactions that occur between vascular cells and the extracellular environment.

Endothelial cells:

Cardiac Muscle

Smooth Muscle: Signal transduction, contractile activity, mechanics.

Electrophysiology: Ion channels relevant to the cardiovascular system.

Cellular Junctions: Gap junctions, adherens junctions, integrins

Unit 2: Integration and Control of the Cardiovascular System

This unit aims to expand the knowledge obtained in Unit 1 into circulatory systems and control situations.

Haemodynamics

Microcirculation

Lymphatics: fluid exchange, oedema, cellular basis of lymphatic function

Control of blood pressure

Control of cardiac output

Interaction with Neurohumoral Control: autonomic, hormonal, paracrine

Control of the Regional Circulations

Cardiovascular Regulation During Exercise

Unit 3: Molecular Approaches in the Study of the Cardiovascular System

Using modern state-of-the-art experimental approaches this unit aims to use pathophysiological situations to highlight function of the cardiovascular system.

Circulatory Shock

Heart Failure

Atherosclerosis – alterations in lipid handling leading to disturbed endothelial function and vasoreactivity.

Reactive Oxygen Species / Ischemia Reperfusion / Adhesion

Hypertension – use of animal models, including transgenic animals, for the study of disturbances in blood pressure control.

ASSESSMENT AND TEACHING ACTIVITIES

Final Examination	55%
Mid-session Test	20%
Practical Exam	10%
Poster Presentation	10%
PBL	5%
Total	100%

In order to achieve a satisfactory performance in this course it is anticipated that students will achieve a pass mark, or higher, in each assessment task.

- **Final Examination**

The final examination will be composed of multiple-choice and short answer questions covering the entire course. In the case of failure, a post or supplementary exam will be made available only in exceptional circumstances .

- **Mid-Session Test**

The mid-session test on April 10th will be a brief test on the material covered to that point of the course only (not including practical material), consisting of multiple-choice and short-answer questions.

- **Poster Presentation**

Work will be undertaken in groups of 3-4, to which students will be assigned. Each group will have a topic area assigned to them, and a published paper to report upon. The final product will be a Poster and should include: an Introduction; Methods; Data drawn from the article; Summary.

This poster must be completed for display in room WW116 by 2PM on Monday 2nd June 2014.

Each group is expected to provide a brief (5 mins) oral presentation of poster.

Possible Topics:

1. Endothelium-mediated vasodilatation.
2. Conducted vasomotion.
3. Ca²⁺-dependency of smooth muscle contraction.
4. Ion channels in regulation of vascular tone.
5. Ion channels in regulation of cardiac function.
6. Mechanotransduction in vascular cells.
7. Regulation of lymphatic (vaso) motion.
8. Physiology of “train high – perform low” training regimens.
9. Impact of altitude on cardiovascular physiology.
10. Transgenic models in the study of the cardiovascular system.
11. Cellular mechanisms underlying hypertension.
12. Cellular mechanisms underlying atherosclerosis.
13. Circulatory shock
14. Cellular adhesion in the cardiovascular system
15. Vascular remodelling.

Students will be assigned a topic from the above list, plus a journal article upon which to base their final presentation. Students may use the literature to find extra journal articles to complement their poster presentation. Students may consult with Dr. Murphy or other staff members regarding their assigned topic prior to completing the poster project. Assessment will be based on both the poster presentation and its oral defence.

- **Practical Classes and Exam**

There are four practical classes; Cardiac Muscle; Recording and Interpretation of the ECG; Exercise Physiology and the Autonomic Nervous System. Students will be examined on the findings of these practicals and the concepts explored in a 1-hour exam on Wednesday May 14th, which will consist of multiple-choice and short-answer questions.

- **Problem-Based Learning (PBL) Session**

Students will undertake self-directed learning using a case study or scenario relevant to cardiovascular physiology. In an introductory session students will be given an outline of the problem and “clues” towards what information is required. Students will then research the material and present their findings at a subsequent session. Facilitators will be available to provide direction.

- **Tutorials**

Each unit is followed by a tutorial, with practice multi-choice and short-answer questions on-line. These questions do not constitute a ‘bank’ of questions and will not appear on any exam. In addition, students are encouraged to collect and submit any questions relating to lecture material. Details of this process will be provided. Tutorials are expected to last between 60 and 90 minutes.

Timetable 2014

	Wk	Date	Time	Activity (Lecture, Practical, Problem Based Learning)	Teacher	
Unit One	2	Mon 10 th Mar	10-12	PBL-1.1 'Joan Murray' A: Mat230, B: Mat231, C: Mat232	TM, FB, AC	
			2-4	PBL-2.1 'Joan Murray' D: Mat230, E: Mat231, F: Mat232	TM, FB, AC	
		Weds 12 th Mar	10-12	L - Course Introduction / Endothelium	MatD	TM/PC
		Thurs 13 th Mar	9-10	L - Gap Junctions	MatD	SS
	3	Mon 17 th Mar	10-1	P - Cardiac Muscle (A)	WW116	TM, GF
			2-5	P - Cardiac Muscle (B)	WW116	TM, GF
		Weds 19 th Mar Thurs 20 th Mar	10-12 9-10	L - Cardiac Muscle L - Vascular Smooth Muscle: Electrophysiology	MatD MatD	MaP TM
	4	Mon 24 th Mar	10-12	PBL-1.2 'Joan Murray' A: Mat230, B: Mat231, C: Mat232		TM, FB, AC
			2-4	PBL-2.2 'Joan Murray' D: Mat230, E: Mat231, F: Mat232		TM, FB, AC
		Weds 26 th Mar	10-12	L - Vascular Smooth Muscle: Mechanics and Signal Transduction	MatD	TM
Thu 27 th Mar		9-10	L - Introduction to the ECG	MatD	KG	
Unit Two	5	Mon 31 st Mar	10-1	P - Recording and Interpretation of the ECG (A)	WW116	KG/TM
			2-5	P - Recording and Interpretation of the ECG (B)	WW116	KG/TM
		Weds 2 nd Apr Thurs 3 rd Apr	10-12 9-10	L - Haemodynamics Tutorial Unit One	MatD MatD	MiP TM
		Weds 9 th Apr Thurs 10 th Apr	10-12 9-10	L - Control of Cardiac Output Mid-session exam	MatD MatD	FB
	7	Mon 14 th Apr	10-1	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM/AC
			2-4	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM/AC
		Weds 16 th Apr Thu 17 th Apr	10-12 9-10	L - Microcirculation and Lymphatics L - Autonomic Control of the Cardiovascular System	MatD MatD	TM LL
		18 th - 27 th April – MID-SESSION RECESS – MID-SESSION RECESS – MID-SESSION RECESS				
	8	Mon 28 th Apr	10-1	P - Autonomic Nervous System (A)	WW116	TM
			2-4	P - Autonomic Nervous System (B)	WW116	TM
Weds 30 th Apr Thu 1 st May		10-12 9-10	L - Control of Blood Pressure L - Cardiovascular Regulation During Exercise	MatD MatD	TM SB	
9		Mon 5 th May	10-1	P - Exercise Physiology (A)	WW116	SB
		2-5	P - Exercise Physiology (B)	WW116	SB	
	Weds 7 th May	10-12	L - Control of the Regional Circulations	MatD	TM	
10	Wed 14 th May Thu 15 th May	10-11 9-10	Practical Exam L - Integrated Cardiovascular Physiology	MatD MatD	TM TM	
	Unit Three	11	Mon 19 th May	10-11	Tutorial Unit Two (A)	TBC
			2-3	Tutorial Unit Two (B)	TBC	TM / on-line
Wed 21 st May Thu 23 rd May			10-12 12-1	L - Atherosclerosis L - Cardiac Arrhythmia	MatD MatD	FT JV
12		Wed 28 th May Thu 29 th May	11-1 9-10	L - Hypertension L - Circulatory Shock	MatD MatD	MM TM
		13	Mon 2 nd June Wed 4 th June	2-4 10-11	Poster Presentations L - Heart Failure	WW116 MatD
			11-12	L - Oxygen Radicals and Reperfusion Injury	MatD	NJ
Thu 5 th June	9-10		Tutorial Unit Three	MatD	TM / on-line	

Lecturers and Teaching Staff

AC	Mr Adrian Campbell	MaP	Dr Matt Perry
FB	Dr Fiona Britton	MiP	A/Prof. Michael Perry
FT	Dr Fatiha Tabet	NJ	Dr. Nicole Jones
GF	Dr. George Fatseas	PC	Dr Preet Chadha
JV	Prof Jamie Vandenberg	SB	A/Prof. Steve Boutcher
KG	A/Prof. Karen Gibson	SS	Dr. Shaun Sandow
LL	Dr Lu Liu	TC	Prof. Terry Campbell
MM	Prof. Margaret Morris	TM	Dr. Tim Murphy
