

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

Cardiac Arrhythmia and 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	50%
Mid-session Test	20%
Practical Exam	10%
Poster Presentation	10%
PBLs	10%
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. Post or supplementary exams will be made available only in exceptional circumstances .

- **Mid-Session Test**

The mid-session test on April 15th 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 1st June 2015.

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 ‘wet’ 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 6th, which will consist of multiple-choice and short-answer questions.

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

Students will undertake self-directed learning using case studies or scenarios 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, either directly via e-mail or through the discussion boards on Moodle.

Timetable 2015

	Wk	Date	Time	Activity (Lecture, Practical, Problem Based Learning)		Teacher	
Unit One	1	Wed 4 th Mar	11-1	L - Course Introduction / Cardiac Muscle	Mat D	TM / MP	
	2	Mon 9 th Mar	10-1	P - Cardiac Muscle (A)	WW116	TM, GF	
			2-5	P - Cardiac Muscle (B)	WW116	TM, GF	
		Weds 11 th Mar Thurs 12 th Mar	11-1 5-6	L - Endothelium L - Gap Junctions	Mat D Mat D	SS SS	
	3	Mon 16 th Mar	10-12	PBL-1.1 'Joan Murray' A: Mat230, B: Mat231, C: Mat232		TM, FB, WH	
			3-5	PBL-1.1 'Joan Murray' D: Mat230, E: Mat231, F: Mat232		TM, FB, WH	
Weds 18 th Mar Thurs 19 th Mar		11-1 5-6	L - Vascular Smooth Muscle: L - Vascular Smooth Muscle: Electrophysiology	Mat D Mat D	TM TM		
Unit Two	4	Weds 25 th Mar	11-1	L - Haemodynamics	Mat D	TM	
		Thu 26 th Mar	5-6	Tutorial Unit One	Mat D	TM online	
	5	Mon 30 th Mar	10-12	PBL-1.2 'Joan Murray' A: Mat230, B: Mat231, C: Mat232		TM, FB, WH	
				PBL-1.2 'Joan Murray' D: Mat230, E: Mat231, F: Mat232		TM, FB, WH	
		Weds 1 st Apr Thurs 2 nd Apr	11-1 5-6	L - Control of Cardiac Output L - Introduction to the ECG	MatD MatD	FB KG	
	3rd - 12th April – MID-SESSION RECESS – MID-SESSION RECESS – MID-SESSION RECESS						
	6	Mon 13 th Apr	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 15 th Apr Thu 16 th Apr	11-12 5-6	Mid-Session Exam L - Control of Blood Pressure	MatD MatD	TM TM	
	7	Mon 20 th Apr	10-1	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM, others	
			2-5	P - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	WW116	TM, others	
		Weds 22 nd Apr	11-12	L - Cardiovascular Regulation During Exercise	Mat D	SB	
Thurs 23 rd Apr		12-1 5-6	L - Microcirculation L - Lymphatics	Mat D Mat D	TM TM		
8	Mon 27 th Apr	10-1	P - Exercise Physiology (A)	WW116	SB		
		2-5	P - Exercise Physiology (B)	WW116	SB		
	Weds 29 th Apr Thurs 30 th Apr	11-1 5-6	L - Control of the Regional Circulations L - Autonomic Control of the Cardiovascular System	Mat D Mat D	TM LL		
9	Mon 4 th May	10-1	P - Autonomic Control of the CVS	WW116	TM, others		
		2-5	P - Autonomic Control of the CVS	WW116	TM, others		
	Weds 6 th May Thu 7 th May	11-12 5-6	Practical Exam L - Integrated Cardiovascular Physiology	Mat D Mat D	TM TM		
Unit Three	10	Mon 11 th May	10-12	PBL-2.1 'Michael Koval' A: Mat230, B: Mat231, C: Mat232		TM, FB, WH	
			3-5	PBL-2.1 'Michael Koval' D: Mat230, E: Mat231, F: Mat232		TM, FB, WH	
		Wed 13 th May Thu 14 th May	11-1 5-6	L - Hypertension L - Circulatory Shock	Mat D Mat D	MM TM	
	11	Mon 18 th May	10-11	Tutorial Unit Two (A)	TBC	TM/on- line	
		Wed 20 th May	3-4	Tutorial Unit Two (B)	TBC	TM/on- line	
			11-12	L - Cardiac Arrhythmia	Mat D	JV	
	12	Mon 25 th May	10-12	PBL-2.2 'Michael Koval' A: Mat230, B: Mat231, C: Mat232		TM, FB, WH	
			3-5	PBL-2.2 'Michael Koval' D: Mat230, E: Mat231, F: Mat232		TM, FB, WH	
Wed 27 th May		11-12	L - Heart Failure	Mat D	TC		
Thu 28 th May		12-1 5-6	L - Oxygen Radicals and Reperfusion Injury Tutorial Unit Three	Mat D Mat D	NJ TM		
13	Mon 1 st June	2-4	Poster Presentations	WW116	Staff		
	Wed 3 rd June	11-1	L - Atherosclerosis	Mat D	FT		

Lecturers and Teaching Staff

FB Dr Fiona Britton
FT Dr Fatiha Tabet
GF Dr. George Fatseas
JV Prof Jamie Vandenberg
KG Dr. Karen Gibson
LL Dr Lu Liu
MM Prof. Margaret Morris

MP Dr Matt Perry
NJ Dr. Nicole Jones
SB A/Prof. Steve Boutcher
SS Dr. Shaun Sandow
TC Prof. Terry Campbell
TM Dr. Tim Murphy
WH Dr. Will Hat