



Australia's
Global
University

Faculty of Medicine
School of Medical Sciences

PHSL3211

Cardiovascular Physiology and Pathophysiology

COURSE OUTLINE

TERM 2, 2020

Please read this outline in conjunction with the following pages on the [School of Medical Sciences website](#):

- [Advice for Students](#)
- [Learning Resources](#)

(or see "STUDENTS" tab at medsciences.med.unsw.edu.au)

COURSE COORDINATORS

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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	40%
Mid-session Test	30%
Poster Presentation	15%
PBLs	15%

Total 100%

Final Examination

The final examination will be composed of multiple-choice and short answer questions covering the entire course including practical material. Post or supplementary exams will be made available only in exceptional circumstances. The final exam period is 14-27 August. The supplementary exam period is 7-11 September.

Mid-Session Test

The mid-session test on July 2nd will be a brief test on the material covered to that point of the course only 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 by 10 AM or 2 PM (group depending) on Monday 3rd August 2020.

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

Possible Topics:

1. Endothelium-mediated vasodilatation.
2. Conducted responses in the vasculature.
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 / cardiac cells.
7. Regulation of lymphatic (vaso) motion.
8. Exercise and cardiovascular remodelling.
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. Mechanisms underlying cardiac arrhythmia / heart failure.
15. Vascular remodelling.

Students may select 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

The practical classes are Cardiac Muscle; Recording and Interpretation of the ECG; Exercise Physiology and the Autonomic Nervous System. Completion of pre- and post-lab modules is compulsory. Students will be examined on the findings of these practicals and the concepts explored as part of the mid-session and final examinations.

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 2020

	Wk	Date / Hrs	Time	Activity (Lecture, Practical, Problem Based Learning)	Teacher
Unit One	1	Mon 1 st Jun	10-1 2-5	P - Cardiac Muscle (A) P - Cardiac Muscle (B)	TM TM
		Tue 2 nd Jun	4-6	L - Course Introduction / Cardiac Muscle	TM/MaP
		Thu 4 th Jun	4-5	L - Vascular Smooth Muscle: Electrophysiology	TM
Unit One	2	Mon 8 th Jun	10-12 2-4	PBL-1.1 'Joan Murray' M10B, M10C PBL-1.1 'Joan Murray' M14B, M14C	TM, BC TM, BC
		Tue 9 th Jun	4-6	L - Vascular Endothelium/Gap Juncs	SS
		Thu 11 th Jun	4-5 5-6	L - Vascular Smooth Muscle: Mechanics I L - Vascular Smooth Muscle: Mechanics II	TM TM
Unit Two	3	Mon 15 th Jun	10-1 2-5	P - Recording and Interpretation of the ECG (A) P - Recording and Interpretation of the ECG (B)	KG KG
		Tue 16 th Jun	4-6	L - Control of Cardiac Output	TM
		Thu 18 th Jun	4-5 5-6	L - Introduction to the ECG T - Review Unit One	KG TM
	4	Mon 22 nd Jun	10-12 2-4	PBL-1.2 'Joan Murray' M10B, M10C PBL-1.2 'Joan Murray' M14B, M14C	TM, BC TM, BC
		Tue 23 rd Jun	4-6	L - Haemodynamics	MiP
		Thu 25 th Jun	4-5	L - Microcirculation	TM
	5	Mon 29 th Jun	10-1 2-5	P - Exercise Physiology (A) P - Exercise Physiology (B)	TBD TBD
		Tue 30 th Jun	4-5	L - Cardiovascular Regulation During Exercise	YB
		Thu 2 nd Jul	4-5 5-6	L - Lymphatics L - Autonomic Control of the Cardiovascular System Mid-Session Exam	TM LL
	6	Mon 6 th Jul - Fri 10 th July	MID SESSION BREAK - MID SESSION BREAK - MID SESSION BREAK		
Unit Two	7	Mon 13 th Jul	10-12 2-4	PBL-2.1 'Michael Koval' M10B, M10C PBL-2.1 'Michael Koval' M14B, M14C	TM, BC TM, BC
		Tue 14 th Jul	4-6	L - Control of Blood Pressure	TM
		Thu 16 th Jul	4-5	T - Computer Lab: Isolated Heart Muscle and Cardiovascular Exercises	TM
Unit Two	8	Mon 20 th Jul	10-1 2-5	P - Autonomic Control of the CVS P - Autonomic Control of the CVS	TM, BC TM, BC
		Tue 21 st Jul	4-6	L - Control of the Regional Circulations	TM
		Thu 23 rd Jul	4-5	L - Circulatory Shock T - Review Unit Two	TM TM
Unit Three	9	Mon 27 th Jul	10-12 2-4	PBL-2.2 'Michael Koval' M10B, M10C PBL-2.2 'Michael Koval' M14B, M14C	TM, BC TM, BC
		Tue 28 th Jul	4-6	L - Atherosclerosis	BC
	Thu 30 th Jul	4-5 5-6	L - Heart Failure L - Cardiac Arrhythmia	SYO JV	
Unit Three	10	Mon 3 rd Aug	10-1 2-4	Poster Presentations 'A' Poster Presentations 'B'	Staff Staff
		Tue 4 th Aug	4-6	L Hypertension	MM
		Thu 6 th Aug	4-5	L - Oxygen Radicals and Reperfusion Injury T - Review Unit Two	NJ

LECTURERS AND TEACHING STAFF

BC	Dr Blake Cochran	YB	A/Prof Yati Boutcher
JV	Prof Jamie Vandenberg		
KG	Dr Karen Gibson		
LL	A/Prof Lu Liu		
MM	Prof. Margaret Morris		
MaP	Dr Matt Perry		
MiP	A/Prof Michael Perry		
NJ	Dr Nicole Jones		
SS	Dr Shaun Sandow		
S-YO	Dr Sze-Yuan Ooi		
TM	Dr Tim Murphy		