THE UNIVERSITY OF AUCKLAND
FACULTY OF MEDICAL AND HEALTH SCIENCES

2012

Pharmacology and Clinical Pharmacology

Handbook

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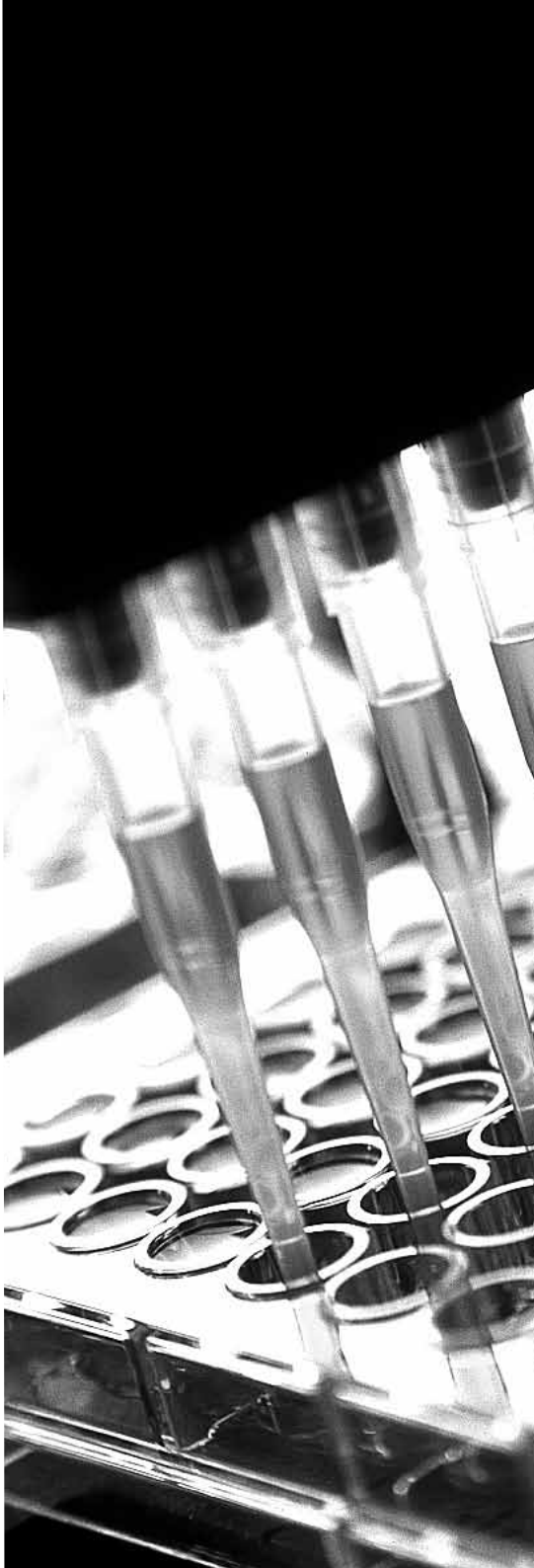

Disclaimer

Although every reasonable effort is made to ensure accuracy, the information in this document is provided as a general guide only for students and is subject to alteration.

All students enrolling at The University of Auckland must consult its official document, *The University of Auckland Calendar, 2012*, to ensure that they are aware of and comply with all regulations, requirements and policies.

Pharmacology and Clinical Pharmacology

2012 Handbook

Introduction

What is Pharmacology and Toxicology?

Pharmacology involves the study of the actions of drugs and chemicals on cells, tissues and the whole body. It includes finding out how drugs produce beneficial and adverse effects, with the aim of improving the way drugs are tested and to give greater benefit in the treatment of disease. The cellular and chemical abnormalities of disease states are studied in the expectation that molecules may be designed specifically to correct the abnormality. The study of pharmacology requires understanding normal body functions (biochemistry and physiology) and the disturbances that occur (pathology).

Pharmacology is the basis of much of the research and development of new drugs. The future of pharmacology is assured, as there remain many diseases for which neither cure nor palliation have been devised - for example, Alzheimer's disease, AIDS, many forms of cancer. Even when a cure or treatment is available, few medicines are perfect and the search for better drugs continues. In addition, other scientists such as physiologists, biochemists and psychologists often find a knowledge of pharmacology useful as they use drugs to probe and define the biological systems they are studying.

Toxicology is closely related to pharmacology but specialises in the study of the harmful effects of drugs and other chemicals on biological systems. A toxicologist is trained to examine the nature of these effects, including their cellular, biochemical and molecular mechanisms of action; and to assess the potential effects on human health and environmental significance of various types of chemical exposures. The variety of potential adverse effects and the diversity of chemicals in the environment make toxicology a very broad science.

In brief, pharmacologists and toxicologists aim to develop a better understanding of the actions of drugs and chemicals on biological systems for the improvement of human and animal health.

About the department

Physical location

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The University of Auckland, Grafton Campus
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www.fmhs.auckland.ac.nz/sms/pharmacology

The Department of Pharmacology and Clinical Pharmacology was established in 1978 and is situated in the Faculty of Medical and Health Sciences, at The University of Auckland's Grafton Campus.

It is one of the 5 Departments in the School of Medical Sciences. It is involved in the teaching of pharmacology and toxicology to medical, pharmacy and science students, and has many active research programmes in diverse areas of biomedical research. Major instrumental facilities include core laboratories for molecular biology, microscopy and imaging, tissue culture, electrophysiology, contractility, radioactivity measurement, HPLC and immunoassay. HPLC equipment includes multiple dual pump systems, automatic injectors, multiwavelength detectors, direct radioactivity monitor and gradient controllers.

Direct access is available to a Storm phosphoimager and a Confocal microscope. An ICP-mass spectrometer and an Ion Trap capillary LC-mass spectrometer are also available as core facilities.

The Department also houses the Discovery-1 High-content screening platform which is a high throughput automated fluoresecence microscope and image analysis system for drug discovery and functional genomics.

Sources of support from outside The University include the:

- Health Research Council,
- Cancer Society of New Zealand
- NZ Neurological Foundation
- National Heart Foundation
- National Child Health Research Foundation
- Lotteries Health Board
- Auckland Medical Research Foundation
- The Wellcome Trust
- The Marsden Fund
- FRST
- The National Research Centre for Growth and Development (NRCGD)

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Areas of research interest

Anticancer Drugs

(Assoc Profs McKeage, Paxton, Tingle, and Prof Wilson)

Cancer is the most common cause of death between the ages of 30 to 60. Chemotherapy has emerged as a form of cancer treatment which, although it may have very disagreeable side effects, has dramatically improved survival for some cancers, particularly in children. More effective and less toxic drugs are required. New drugs have been developed locally in the Auckland Cancer Society Research Centre and collaborative research is under way into their fate (i.e. absorption, distribution, metabolism and elimination) in various animal models and in human subjects; the construction of concentration-effect models; tumour-targeted drug delivery and action; mechanisms of toxicity, and the extrapolation of these results to patients for more effective therapy and fewer adverse drug reactions.

Cancer Clinical Pharmacology

(Assoc Prof McKeage & Dr Liu)

We are a research group of eight staff and students working on translational and clinical projects concerned with the clinical pharmacology and development of anticancer drugs. Our group mission is to reduce suffering and mortality from cancer by generating pharmacological knowledge about new and existing anticancer drugs for ultimate use in their clinical applications.

Current research projects are exploring novel DMXAA-based drug combinations, chemotherapy-induced peripheral neuropathy and novel anticancer drugs in phase I trials.

Neural Repair & Neurogenesis

(Assoc Prof Connor)

The laboratory of Neural Repair & Neurogenesis focuses predominantly on developing new medicines and therapeutic strategies to treat disorders of the brain that involve nerve cell death such as Alzheimer's disease, Parkinson's disease, Huntington's disease, head injury, epilepsy and stroke. Research is being undertaken to develop novel treatment strategies to prevent cell death, replace lost nerve cells and reduce clinical symptoms of neurodegenerative disease and brain injury using techniques such as gene delivery and stem cell therapy.

Paediatric Pharmacology

(Prof Holford)

Prof Holford works with Prof Anderson at Starship Hospital on the clinical pharmacology of medicines in babies and children. The focus of the work is to understand how the changing size and maturation of organ function can be used to predict pharmacokinetic and pharmacodynamic properties of medicines. This is then used to create practical dosing guidelines for babies ranging from very premature to full term and then for infants and children. Some data is collected at Starship Hospital but most of the analysis relies on collaboration with paediatricians overseas.

Disease Progress And Drug Action

(Prof Holford)

Clinical pharmacology expresses the combined knowledge of disease and how drugs affect it. Attention is turning towards understanding how drugs affect the long-term progression of disease. Dr Holford is engaged in studies of Parkinson's Disease and Alzheimer's Disease, osteoporosis, depression and HIV/AIDS which describe both the effects of drugs and the natural progression of the disease over time.

Bioavailability, metabolism and transport of Phytochemicals

(Assoc Prof Paxton & Dr Li)

It is now accepted that a high intake of phytochemicals from a diet rich in fruit and vegetables results in a reduced risk of cancer, cardiovascular disease, osteoporosis and other age-related degenerative illnesses. Most research on these dietary "phyto-pharmaceuticals" has focussed on their mechanisms of action, but to be effective, these bioactive food ingredients must cross the gut epithelium, gain access to the bloodstream, and reach their target site of action in the hepatocytes, or tumour cells, or other organs in the body. A better understanding of these interactions with the uptake and efflux systems and drug metabolizing enzymes in the body will allow strategies to improve the beneficial effects of these bioactive food ingredients to prevent cancer and ageing diseases by diet supplementation tailored to the individual. In addition, these studies will allow the identification of possible detrimental drug-phytochemical interactions. It is also highly likely that these studies will lead to the identification of diet-derived compounds for development as a clinical agent to reverse multidrug resistance, one of the major factors responsible for the failure of cancer chemotherapy.

Toxicology

(Assoc Prof Tingle)

The toxicity of many foreign compounds involves metabolism to a reactive intermediate that can interact with a critical macromolecule and induce direct toxicity (cell death), genotoxicity or hypersensitivity reactions. Research is focussed on the role of metabolism in drug toxicity. In particular, interspecies and inter-individual differences in the expression and activity of xenobiotic metabolizing enzymes and their effect on the toxicity of drugs and environmental toxicants is studied. In addition the effect of drugs on the metabolism and disposition of endogenous factors that results in adverse drug reactions is also investigated.

Human Neurodegeneration Research

(Prof Dragunow)

This group studies the causes and tests treatments for human neurodegenerative disorders such as Alzheimer's disease, Stroke, Parkinson's disease, Motoneuron disease, Epilepsy, and Huntington's disease. Methods to undertake this work include in vitro brain cell culture models (cell lines and cells grown directly from adult diseased and control human brain tissue), human brain tissue microarray, and high-content analysis and high-through-put screening technologies, based around the Discovery-1 microscope and the Metamorph image analysis system. Our goal is to apply these adult human brain cell culture and human brain tissue microarray platforms and the associated high throughput technologies to drug discovery and testing for the development of treatments for people suffering from neurodegenerative disorders.

Receptor Signalling Lab

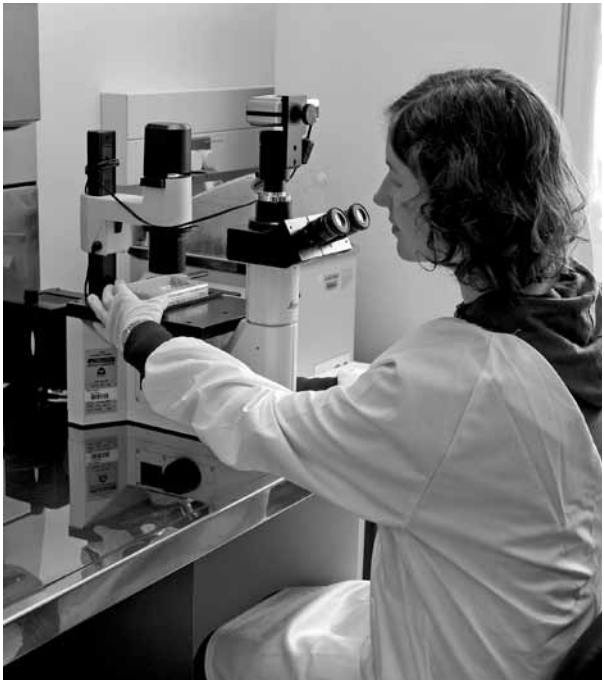
(Assoc Prof Glass)

The Laboratory of Receptor Signalling focuses predominantly on the signalling interactions of G-protein coupled receptors, and their potential role in neurodegenerative disease. We have a particular interest in cannabinoid receptors, their signalling interactions with other GPCRs and their contribution to neuroprotection or neurodegeneration in diseases such as Huntington's disease. Our work focuses on using cell models to understand receptor signalling and cross talk, as well as utilizing cells to model disease processes such as those that occur in Huntington's disease. We correlate information gained in this way with the pathology seen in the human brain, through collaborations with the Neurological Foundation Human Brain bank, and other researchers.

New Therapies for Brain Diseases

(Assoc Prof Young)

This group is interested in understanding disease mechanisms and developing novel therapeutic strategies for neurodegenerative disorders such as Alzheimer's, Parkinson's and Huntington's disease, stroke and epilepsy. Key research areas in the lab include gene therapy and vaccine/antibody-based therapeutic approaches, understanding how environment affects brain structure and function, developing neurodegenerative disease models and optimising viral vector-mediated gene transfer technology. The research covers the full spectrum from molecular biology through to animal behaviour, with the aim being to advance promising approaches to human clinical trials



Course and programmes

Science

The prerequisites for pharmacology stage III level courses are:

MEDSCI 204, and MEDSCI 205 or MEDSCI 206 or BIOSCI 203

BSc (Majoring in Pharmacology)

A BSc requires at least 360 points with 300 chosen from a minimum of 3 subjects listed in the BSc schedule. At least 180 points must be above stage I. At least 75 points must be obtained from stage III courses. For a single or first major in pharmacology, you must obtain at least 60 points from courses MEDSCI 303 – MEDSCI 307. A second major must include 45 points from MEDSCI 303-307.

In addition, a student must pass 30 points from courses offered in the General Education Schedule approved for this degree.

Up to 30 points may be taken from courses available for other programmes offered at this University.

A typical course of study to obtain a BSc majoring in Pharmacology might be as follows:
(Note that 120 points per year is the normal load for full time study).

Stage I

[2]MEDSCI 142	Biology for Biomedical Science: Organ Systems
[1]BIOSCI 101	Essential Biology: From Genomes to Organisms
[1]BIOSCI 106	Foundations of Biochemistry
[2]BIOSCI 107	Biology for Biomedical Science: Cellular Processes & Development
[1]CHEM 110	Chemistry of the Living World
CHEM 120	Chemistry of the Material World or
STATS 107	Statistics for Science and Technology or
COMPSCI 111	Mastering Cyberspace or
PHYSICS 160	Physics for the Life Sciences or
General Education Courses	

[1]Prerequisites for BIOSCI 203

[2]Prerequisites for MEDSCI 205 and 206

Stage II

Course	Title	Pts	Coordinator	Prerequisites
MEDSCI 204 SH	Introduction to Pharmacology and Toxicology	15	D. Young / L Anderson	GPA ≥ 3

Additional Stage II courses might include:

*	MEDSCI 205	The Physiology of Human Organ Systems
*	MEDSCI 206	Introduction to Neuroscience
	MEDSCI 203	Mechanisms of Disease or
	CHEM 240	Measurement Analysis in Chemistry and Health Sciences or
	BIOSCI 201	Cellular and Molecular Biology or
	BIOSCI 202	Genetics or
*	BIOSCI 203	Biochemistry or
	MEDSCI 202	Microbiology and Immunology
	General Education Course	

* Core courses – you must pass at least one of these core courses to enter the Stage 3 pharmacology courses.

Stage III

Course	Title	Pts	Coordinator	Prerequisites
MEDSCI 303 FH	Principles of Pharmacology	15	L. Anderson	MEDSCI 204 and one of the following: MEDSCI 205 or MEDSCI 206 or BIOSCI 203 and a GPA ≥ 5. Students with GPA < 5 will be waitlisted.
MEDSCI 304 FH	Molecular Pharmacology	15	M. Glass	
MEDSCI 305 SH	Systematic Pharmacology	15	B. Connor	
MEDSCI 306 SH	Principles of Toxicology	15	M. Tingle	
MEDSCI 307 FH	Neuroscience: Neuropharmacology	15	M. Dragunow	

Lecture/Laboratory timetabling information can be sourced from the following website: www.studentservices.auckland.ac.nz/uoa

Additional Stage III courses might include:

BIOSCI 356	Developmental Biology and Cancer or
BIOSCI 350	Protein Structure and Function or
BIOSCI 351	Molecular Genetics or
BIOSCI 353	Molecular and Cellular Regulations or
MEDSCI 308 – MEDSCI 311	any of the Physiology papers or
MEDSCI 301	Molecular Basis of Disease

BSc (Hons), PGDipSci, PGDipHSci, MSc or PhD

Students who have completed a BSc in Pharmacology, are able, subject to appropriate grades, to advance to either the one year BSc (Hons) or one year PGDipSci or PGDipHSci programme. The prerequisites are at least 60 points in stage III pharmacology with a minimum average grade of B+ for BSc (Hons) and B for PGDip. BSc (Hons) students undertake courses (75 points) and a dissertation (45 points). The courses are usually chosen from the 700 level courses listed below. BSc (Hons) is a fast track to PhD. Students with an average grade B in the PGDipSci or PGDipHSci may proceed to a one year MSc or MHSci by research thesis only (120 points). Students with good marks in either the BSc (Hons) or MSc programme are able to proceed to a further three years research for a PhD.

BSc (Hons)

Prerequisites:	A BSc degree with at least 60 points in pharmacology from MEDSCI 303 – MEDSCI 307 and at least 90 points at Stage III.
Requirements:	BSc (Hons) Dissertation PHARMCOL 788 (45 points) plus 75 points from MEDSCI 701/702, MEDSCI 715 - 723.

MSc

Prerequisites:	PGDipSci (in Pharmacology) with an average grade B, or BSc (Hons).
Requirements:	MSc Thesis PHARMCOL 796 (120 points).

PGDipSci

Prerequisites:	A BSc including at least 45 points from MEDSCI 303 – 307.
Requirements:	120 points at 700 level with at least 60 points from MEDSCI 701 or 702, MEDSCI 715 – 723.

Stage IV

(Enrolment to all 700 level courses requires permission of the HOD).

Not all 700 level courses will be taught every year and you must check their availability with the Department

Course	Title	Pts	Coordinator
MEDSCI 701/702 FH/SH	Special Studies in Medical Science (1&2)	15	R. Booth
MEDSCI 715 FH	Molecular Toxicology	15	M. Tingle
MEDSCI 716 FH	Drug Disposition and Kinetics	15	J. Paxton
MEDSCI 717 FH	Advanced Neuroscience: Neuropharmacology	15	B. Connor/M. Glass
MEDSCI 718 FH	Pharmacology of Anaesthetics/Analgesics	15	G. Warman/ J. Cheesman
MEDSCI 719 SH	Pharmacometrics	15	N. Holford
MEDSCI 720 FH	Biomedical Research Techniques	15	D. Young
MEDSCI 721 SH	Advanced Toxicology	15	M. Tingle
MEDSCI 722 SH	Clinical Pharmacology	15	N. Holford
MEDSCI 723 SH	Cancer Pharmacology	15	M. McKeage
PHARMCOL 788 DH	BSc (Hons) Dissertation	45	
PHARMCOL 796 DH	MSc Thesis	120	

Medicine

Clinical pharmacology is taught in the following courses:

Bachelor of Medicine & Bachelor of Surgery

Course	Title	Pts	Coordinator
MBChB 209B DH	Principles of Medicine	15	C. Print/N. Holford
MBChB 256 SH	The Genitourinary System	15	S. Ali/N. Holford
MBChB302 FH	Medical Neuroscience	15	R. Faull/J. Lipski/M. Dragunow
MBChB 355 SH	Regulation of Body Function	15	B. Smaill
MBChB 401 DH	MBChB Part 1	120	S. O'Sullivan
MBChB 501 DH	MBChB Part 2	120	S. O'Sullivan

FH = Semester One Medicine & Health Science Campus

SH = Semester Two Medicine & Health Science Campus

DH = Double semester Medicine & Health Science Campus

Description of course content

MBChB 209 Principles of Medicine

Topics covered include: the concepts of receptor function in relation to the action of drugs, how drugs modify the action of neurotransmitters and hormones; the principles of drug disposition and the time course of drug action; introduction to poisoning.

MBChB 302 Medical Neuroscience

A co-ordinated, multidisciplinary approach to the central and peripheral nervous systems and gives a firm scientific understanding of the structure and function of the nervous system and the clinically important aspects of the nervous system.

MBChB 355 Regulation of Body Function

Integrated physiology of human organ systems and associated aspects of pharmacology. Topics covered include the regulation of electrolytes and extracellular fluid volume, control of cardiovascular function, control of respiration and regulation of body temperature.

MEDSCI 204 Introduction to Pharmacology and Toxicology

Semester Two, three lectures and one computer-based laboratory per week)

A principles-based introduction to pharmacology and toxicology. Topics covered include drug targets and action, ADME and pharmacokinetics, drugs of the autonomic system, toxicity and adverse drug reactions, selective toxicity of chemotherapy; integrated clinical pharmacology; drug discovery and development.

Assessment:

Project	20%
Mid-semester test	10%
Laboratory exam	20%
Final exam	50%

MEDSCI 303 Principles of Pharmacology

(Semester One, two lectures and one laboratory per week)

This is a basic course on the principles of pharmacology. The topics include; passage of drugs across membranes; drug absorption, distribution, metabolism and excretion; pharmacokinetics; novel drug delivery systems; mechanisms of drug action; pharmacogenetics; drug analysis; drug development and evaluation; drugs in selected populations.

Assessment:

Practical reports	25%
Laboratory test	15%
Mid-semester test	10%
Final exam	50%

MEDSCI 304 Molecular Pharmacology

(Semester One, two lectures and one laboratory per week)

This course explores the cellular and molecular mechanisms of drugs acting at receptors, with a particular focus on G-protein coupled receptors. The lectures explore how receptors signal and traffic through cells and the implications of these processes on drug development and design. The laboratories are designed to support the course material by providing experiences in the methods used to understand receptor function, and to illustrate some of the key concepts. Finally, the course investigates novel drug targets presented by cell cycle and apoptotic pathways.

Assessment:

Practical reports	12.5%
Laboratory test	12.5%
Project	15%
Mid-semester test	10%
Final exam	50%

MEDSCI 305 Systematic Pharmacology

(Semester Two, two lectures and one laboratory per week)

This course considers the modification by drugs of human systems under physiological and pathological conditions. Consideration will be given to the cardiovascular, gastrointestinal, reproductive, respiratory and the central nervous systems. The cellular and molecular mechanisms of action of the drugs are considered.

Assessment:

Laboratory practical	25%
Laboratory project	15%
Mid-semester test	10%
Final exam	50%

MEDSCI 306 Principles of Toxicology

(Semester Two, two lectures and one laboratory per week)

This course introduces the principles and concepts involved in toxicology. The lectures cover the general mechanisms involved in the toxicity of foreign compounds, including the formation and detoxification of chemically reactive metabolites and their interactions with macromolecular targets. The course describes the secondary and tertiary consequences of these interactions, such as direct toxicity, genotoxicity and hypersensitivity reactions, plus the basis of organ-selective toxicity. The course covers the toxicity of compounds such as drugs, food additives and contaminants, plant and animal toxins as well as environmental toxicants.

Assessment:

Mid-semester test	10%
Project presentation	15%
Practical reports	25%
Final exam	50%

MEDSCI 307 Neuroscience:Neuropharmacology

(Semester One, two lectures and one laboratory per week)

This course introduces the principles and concepts involved in neuropharmacology. It covers the anatomy, neurochemistry and pharmacology of the normal and diseased human brain; the biochemical causes of psychiatric and neurological diseases; and the types and mechanisms of action of drugs used to treat human brain disorders.

Assessment:

Mid-semester test	15%
Practical exam	15%
Practical reports	10%
Final exam	60%

MEDSCI 701/702
Special Studies in Medical Science (1 & 2)

Special topics in pharmacology may be arranged with the permission of the HOD after consultation with supervisor.

Assessment:

Course work	100%

MEDSCI 715 Molecular Toxicology

This course involves advanced study into the role of metabolism (including induction/inhibition and genetic polymorphisms) in the toxicity of xenobiotics and molecular events following exposure to toxic xenobiotics, such as mutagenesis, teratogenesis and apoptosis. The toxicity of several classes of drugs, including anticancer, antibacterial and antimalarial drugs is also studied in detail.

Assessment:

Project presentation and essay	25%
Final exam	75%

MEDSCI 716 Drug Disposition and Kinetics

This course is concerned with the advanced study of: the absorption, distribution, metabolism and excretion of drugs; in vivo and in vitro techniques for ADME studies; and the analysis of these processes.

Assessment:

Course work	25%
Final exam	75%

MEDSCI 717
Advanced Neuroscience:Neuropharmacology

An advanced discussion of current research in neuroscience. The course will involve critical analysis of the literature within the context of a series of major research themes. Each theme will encompass models from molecular through to systems level neuroscience. In this course, themes will be selected from the following areas: neuroscience; neurodegeneration and addiction.

Assessment:

Course work	30%
Final exam	70%

MEDSCI 718
Pharmacology of Anaesthetics/Analgesics

This course deals with the general aspects of anaesthetics and analgesics. Topics covered include the development of modern anaesthesia, the mechanisms of action of drugs used in general and local anaesthesia, and issues surrounding safety and efficacy of anaesthesia, including drug error and circadian variation in drug action.

Assessment:

2000 word essay	25%
Seminar presentation	5%
Final exam	70%

MEDSCI 719 Pharmacometrics

This course deals with the application of mathematical models to interpretation of pharmacological observations. Models provide an explanation for experimental observations as well as a description. Computer based analysis methods are used for individuals and populations. Typical areas of application are pharmacokinetics, pharmacodynamics, ligand binding, enzyme kinetics and time course of drug effect.

Assessment:

Course work	50%
Final exam	50%

MEDSCI 720 Biomedical Research Techniques

Introduction to a broad base of research techniques ranging from tissue culture through microcopy to gene cloning and RNA interference. Emphasis is on theoretical basis, application and interpretation.

Assessment:

Course work	60%
Lab test	40%

MEDSCI 721 Advanced Toxicology

The course addresses current issues and recent advances in toxicology. This course is aimed primarily at students wishing to undertake research in a field related to toxicology.

Assessment:

Course work	100%

MEDSCI 722 Clinical Pharmacology

This course deals with therapeutic drug monitoring and clinical pharmacokinetics; disease progress and variability in drug response; adverse drug reactions and evaluation of clinical trials. Drug disposition and action in the elderly, young and in pregnancy will also be considered. Emphasis is placed on the use of medicines in humans and application of clinical pharmacology to drug development.

Assessment:

Course work	25%
Final exam	75%

MEDSCI 723 Cancer Pharmacology

This course focuses on the clinical pharmacology and development of drugs for treating cancer. The course deals with the main classes of anticancer drugs, including alkylating agents, platinum-based drugs, antimetabolites, topoisomerase-interactive drugs, antimicrotubule agents, targeted therapies and vascular targeting drugs. Other topics include the pharmacological basis of cancer chemotherapy, pharmacological variability and individualisation of cancer therapy, oncology clinical trials, drug interactions and combination chemotherapy, and selected research topics.

Assessment:

Course work	40%
Final exam	60%

BSc (Hons) in Pharmacology

Students must undertake 75 points in courses from the 700 level pharmacology courses and complete a 45 point dissertation of a research project by the end of the second semester.

Diploma in Pharmacology

Pharmacology courses (Stage III) may also be taken as part of the Diploma in Science (DipSci) and (stage IV courses) the postgraduate Diploma in Science (PGDipSci). Students are referred to the current University Calendar for further information regarding these diplomas.

PGDipSci or PGDipHSci

At least 60 points from MEDSCI 701 (or 702), 715-723, and up to 60 points from other 700 level courses as approved by Head of Department.

MSc or MHSc

120 point Masters thesis in pharmacology

Possible careers

The study of the way in which drugs work is the basis for a number of career possibilities. Some of these are briefly listed below and give examples of the opportunities available.

Teaching and Research in Higher Educational Institutions

In New Zealand most teachers of pharmacology are concerned with training students for the medical, veterinary and pharmaceutical professions. Pharmacology is also taught to science students at The University of Auckland and University of Otago. It should be noted that appointment to a university teaching post usually requires the possession of a research degree or equivalent experience.

Biotechnology and Pharmaceutical Research and Development (R and D)

The discovery and development of new and better medicines for the treatment of diseases in man and animals, as well as chemicals for food processing and agricultural application requires pharmacologists as part of the multi-disciplinary research and development teams. The pharmaceutical industry is a major source of employment opportunities but this mostly occurs overseas in Europe, the US and also Japan. In New Zealand pharmaceutical research is mainly confined to clinical trials with little basic pharmacological research being undertaken. However a number of small Biotech companies have started in New Zealand and offer some career opportunities. Pharmacologists can also find key roles in the medical, regulatory and marketing divisions of the pharmaceutical industry in New Zealand.

Clinical Teaching and Research

Medically qualified clinical pharmacologists are employed by pharmaceutical companies for evaluating drug activity in patients. In these studies, their work is supported by non-clinically qualified graduates and non-graduate technicians who contribute to the laboratory aspects of the clinical studies. Increasingly, more offices of multinational pharmaceutical companies and clinical research organisations are offering posts for clinical research assistants.

Government Department and Research Institutions

A number of opportunities are available for work in Government or government-sponsored research institutions. Examples of the type of work available are: research and development studies, assessment of the cost and safety of medicines and advisory and safety aspects of chemicals used in the food processing and agricultural industries. In addition there are a number of private research institutions and companies, such as the Auckland Cancer Society Research Centre (ACSRC) in Auckland, which is sponsored by the New Zealand Cancer Society, and the Malaghan Institute of Medical Research in Wellington which can provide research opportunities for pharmacologists.

Medical Publishing and Drug Information

A background in pharmacology and toxicology is ideal for entry into medical publishing and drug information dissemination. There are many opportunities in this expanding field. For example, Adis International is an international publishing and drug information company which has its headquarters at Mairangi Bay in Auckland.

Toxicology

A pharmacology/toxicology qualification is one of the principal entry routes into employment as a toxicologist. The training and ability to appreciate and measure the many aspects involved in the assessment of drug action and the adverse effects of chemicals forms an ideal basis for a career in toxicology. Toxicologists are employed in all the career categories mentioned above. The increasing use of food additives and agricultural chemical products, and increasing environmental hazards arising from pollution provide additional areas of career employment.

The Academic Year – 2012

Semester One – 2012

Semester One begins	Monday 27 February
Mid-semester break /Easter	Friday 6 April – Friday 20 April
ANZAC Day	Wednesday 25 April
Graduation	Monday 30 April - Friday 4 May
Lectures end	Friday 1 June
Study break/Examinations	Saturday 2 June - Monday 25 June
Queen's Birthday	Monday 4 June
Semester One ends	Monday 25 June
Inter-semester break	Tuesday 26 June - Saturday 14 July

Semester Two – 2012

Semester Two begins	Monday 16July
Mid-semester break	Monday 27 August - Saturday 8 September
Graduation	Tuesday 2 October
Lectures end	Friday 19 October
Study break/Examinations	Saturday 20 October - Monday 12 November
Labour Day	Monday 22 October
Semester Two ends	Monday 12 November

Semester One – 2013

Semester One begins	Monday 4 March 2013

THE UNIVERSITY OF AUCKLAND

FACULTY OF MEDICAL AND HEALTH SCIENCES

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