

Pharmacology and Clinical Pharmacology

Handbook 2018



THE UNIVERSITY OF
AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau
NEW ZEALAND

**MEDICAL AND
HEALTH SCIENCES**
SCHOOL OF MEDICAL SCIENCES

What are 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 for 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, neurodegenerative diseases and 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 as well as 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

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.

Pharmacology is one of the five Departments in the School of Medical Sciences. It is involved in the teaching of pharmacology and toxicology to pharmacy, nursing and science students and has many active research programmes in recently renovated modern laboratories in diverse areas of biomedical research.

Sources of support from outside the University include:

- 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
- Maurice and Phyllis Paykel Trust

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Areas of research interest

Anticancer drugs

Prof McKeage, Assoc Prof Tingle and Dr Jamieson.

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.

Clinical pharmacology

Dr Hannam

Understanding the pharmacokinetics (PK) and pharmacodynamics (PD) of drugs guides their usage in the clinical setting. For many drugs in anaesthesia, our knowledge on how the PK and PD change in certain subpopulations is limited. Examples of such groups include neonates and cardiac patients. Improving PK and PD models that describe the time course of drug action in these groups can assist with optimising dosing schedules. Dr Hannam has an interest in the application of PKPD models to improve dosing of anaesthetics and analgesics for combinations of drugs given concomitantly, and in dosing of common antibiotics. She is also involved in clinical trials investigating differences in drug

pharmacology, as well as projects focused on patient safety and the use of large amounts of routinely collected health data to answer research questions on postoperative health outcomes.

Cancer clinical pharmacology

Prof McKeage

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.

Cancer preclinical pharmacology

Dr Jamieson

Our research focusses on the preclinical development of novel anticancer drugs, including hypoxia-activated prodrugs, molecularly targeted agents and immunotherapies. We utilise in vitro and in vivo models of human cancer to investigate drug pharmacokinetics and pharmacodynamics as well as testing for anticancer efficacy. To assist this, we are developing new clinically relevant tumour models using patient-derived tumour specimens and early passage human tumour cell lines. Finally, through collaborations with researchers at the Auckland Cancer Society Research Centre, we

are using whole genome CRISPR/Cas9 screening technology to identify predictive biomarkers for novel and established anticancer drugs and to better understand mechanisms of action and resistance.

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. We are turning our attention 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.

Drug metabolism and toxicology

Assoc Prof Tingle

Nearly every drug undergoes some sort of metabolism in the body. This is important for duration of drug action. The toxicity of drugs often involves metabolism, either through a lack of metabolism resulting in higher than expected

concentrations or conversion to a chemically-reactive metabolite. Such reactive intermediates may interact with critical macromolecules to initiate direct toxicity (cell death), genotoxicity or hypersensitivity reactions. There may be considerable variability in metabolism between humans and across species, in particular the expression and activity of metabolizing enzymes that may in turn influence the toxicity of drugs and environmental toxicants. Research is focussed on investigating drug metabolism in humans (patients or volunteers) and modelling such metabolism using in vitro and in vivo approaches to probe the role this may play in drug toxicity.

Receptor signalling lab

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.

Neural reprogramming and repair

Assoc Prof Connor

The laboratory of Neural Reprogramming and Repair focuses predominantly on developing new medicines and therapeutic strategies to treat disorders of the brain that involve brain cell death such as Parkinson's disease, Huntington's disease, head injury and stroke. Research is being undertaken to develop novel treatment strategies to prevent cell death, replace lost brain cells and reduce clinical symptoms of neurological disease and brain injury using techniques such as gene delivery and stem cell therapy. In particular, we use cell reprogramming technology to generate brain stem cells from patient-derived skin cells to model neurological diseases. This technology is used to study disease pathology in living human brain cells as well as identify and screen new drug targets.

Human neurodegeneration research

Prof Dragunow

Professor Mike Dragunow is a Molecular Pharmacologist and Neuroscientist. Research in his group focuses on molecular mechanisms of human brain neurodegeneration and repair and on developing novel treatments for brain diseases using adult human brain material, tissue microarray, cell culture models (cell lines and primary adult human brain cell cultures), molecular pharmacology and high-content analysis. These combined research tools are being used to understand the causes of human neurodegeneration and to test and develop new treatment strategies.

Drug discovery

Dr Flanagan

Linking biology to chemistry is our primary area of interest and this involves discovering new compounds that can probe disease biology. For this, disease biology is rendered down to specific molecular and then atomic components. This information is then used to look for ways to stop the function of individual molecules. To do this we exploit the three-dimensional structure of a protein to look for molecules that fit into functionally relevant sites on its surface. Computer based methods broadly classed as molecular modelling are the main tools used. Our predictions are then tested in biochemical experiments, some through collaboration with other researchers, and in this way we can connect theory to experiment. Most of the proteins studied are involved in oncogenic cell signalling pathways including cell surface receptors and the lipid kinase enzymes that link to them.

Neuro-Immune Interactions

Dr Graham

My group is focused on investigating the interactions between the immune system and brain cells (neuroinflammation). I have a long-standing interest in the cannabinoid system, where it is thought that the CB2 receptor has therapeutic value for neuroinflammation (mostly rodent based observations). Neuroinflammation underlies most neurological conditions, being a severe driving force in diseases such as MS (RRMS, relapsing and remitting) and stroke. The blood-brain-barrier (BBB) represents the interface between these systems. It is a selective barrier and protects the CNS from pathogens and undesirable entry of immune cells. Protection of the BBB is a growing area of clinical investigation as it represents a tissue that can be targeting with conventional drugs.

Nutritional neurosciences

Assoc Prof Guan

Dr Guan is a neuroscientist and her research interests include nutritional and environmental effects on brain development and functions, as well as the role for small vessel degeneration in neurological conditions by evaluating neuroplasticity, vascular remodelling and the interactions of neurons, glial phenotypes and capillaries. Her research specialty includes neurobiology and neuro-pharmacology of IGF-1 and its related peptides, animal modelling of neurological conditions, behavioural evaluations, biological and pathological assessments of brains. The discovery of the mechanism of IGF-1 metabolites leads to the investigation of novel biomarker for deficiency of IGF-1 function. The group is working toward the potential connections between neurodegeneration and metabolic disorders.



Courses and programmes

BSc (Majoring in Pharmacology)

A BSc requires 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 30 points from courses MEDSCI 303 and MEDSCI 305 and a further 30 points from MEDSCI 304, 306, and 307. A second major must include MEDSCI 303 and 305 and at least 15 points from MEDSCI 304, 306 and 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, 8 x 15-point courses, is the normal load for full time study).

Stage I

MEDSCI 142² Biology for Biomedical Science: Organ Systems

BIOSCI 101¹ Essential Biology: From Genomes to Organisms

BIOSCI 106¹ Foundations of Biochemistry

BIOSCI 107² Biology for Biomedical Science: Cellular Processes & Development

CHEM 110¹ Chemistry of the Living World

CHEM 120 Chemistry of the Material World *OR*

STATS 101 Introduction to Statistics *OR*

COMPSCI 111 An Introduction to Practical Computing *OR*

PHYSICS 160 Physics for the Life Sciences *OR*

General Education Courses

¹ Prerequisites for BIOSCI 203

² Prerequisites for MEDSCI 203, MEDSCI 205 and 206

Please note that the prerequisites have changed from previous years and apply to all students beginning their degree from 2016. For students who commenced their studies prior to 2016 the prerequisites for Stage III pharmacology courses are MEDSCI 204 and one of the following: MEDSCI 205, MEDSCI 206 or BIOSCI 203.

Stage II

Course	Title	Pts	Course director	Prerequisites
MEDSCI 204 S2	Pharmacology and Toxicology	15	D. Young	BIOSCI 106, CHEM 110, MEDSCI 142

Additional Stage II courses to MEDSCI 204 might include:

(Be aware some of these may be prerequisite courses for Stage III Pharmacology courses, see table below.)

- **MEDSCI 203** Mechanisms of Disease
- **MEDSCI 205** The Physiology of Human Organ Systems
- **MEDSCI 206** Principles of Neuroscience *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 Courses

Stage III

Course	Title	Pts	Course director	Prerequisites
MEDSCI 303 S1	Drug Disposition and Kinetics	15	J. Hannam	MEDSCI 204
MEDSCI 304 S1	Molecular Pharmacology	15	M. Glass	MEDSCI 204, BIOSCI 203
MEDSCI 305 S2	Systems Pharmacology	15	B. Connor	MEDSCI 204 and 30 points from BIOSCI 203, MEDSCI 203 & MEDSCI 205
MEDSCI 306 S2	Principles of Toxicology	15	M. Tingle	MEDSCI 204 and 30 points from BIOSCI 203, MEDSCI 203 & MEDSCI 205
MEDSCI 307 S1	Neuropharmacology	15	M. Draganow	MEDSCI 204, MEDSCI 206

GPA requirements may be in place. Contact the Course Director for further information.

Students with GPAs lower than stated will be waitlisted. Additional Stage III courses might include:

- BIOSCI 350** Protein Structure and Function *OR*
- BIOSCI 351** Molecular Genetics *OR*
- BIOSCI 353** Molecular and Cellular Regulation *OR*
- BIOSCI 356** Developmental Biology and Cancer *OR*
- MEDSCI 301** Molecular Basis of Disease *OR*
- MEDSCI 309, 311, 312, 316 or 317** (Physiology papers)

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 recommended minimum average grade of B+ for BSc(Hons) and B for PGDipSci. BSc(Hons) students undertake courses (60 points) and a dissertation (60 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 MHS by research thesis only (120 points) conditional upon finding a supervisor. 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 303-307 and at least 90 points at Stage III and a minimum recommended grade of B+.

Requirements: BSc(Hons) Dissertation PHARMCOL 787 (60 points) approved by Head of Department plus 60 points from MEDSCI 700-701, MEDSCI 715-723.

MSc (120 points)

Prerequisites: PGDipSci (in Pharmacology) with an average grade B-, or BSc(Hons).

Requirements: MSc Thesis PHARMCOL 796 (120 points).

MSc (240 points)

Prerequisites: BSc (or approved equivalent) with B average grade (GPA 5.0) in 75 points above Stage II, including at least 45 points in a relevant major.

Requirements: 120 points at 700-level with at least 60 points from MEDSCI 700 or 701, MEDSCI 715-723, 735. MSc Thesis PHARMCOL 796 (120 points).

PGDipSci

Prerequisites: A BSc including at least 45 points from MEDSCI 303-307 and a minimum recommended grade of B.

Requirements: 120 points at 700-level with at least 60 points from MEDSCI 700 or 701, MEDSCI 715-723, 735.

Stage IV

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

Course	Title	Pts	Course director
MEDSCI 700 S2	Special Topic: Drug Discovery Biology	15	J. Flanagan
MEDSCI 701 S1/S2	Special Studies in Medical Science	15	N. Helsby
MEDSCI 715 S1	Molecular Toxicology	15	M. Tingle
MEDSCI 716 S1	Advanced Drug Disposition and Kinetics	15	S. Jamieson
MEDSCI 717 S1	Advanced Neuroscience: Neuropharmacology	15	B. Connor/M. Glass
MEDSCI 718 S1	Pharmacology of Anaesthetics & Analgesics	15	G. Warman/J. Cheesman
MEDSCI 719 S2	Pharmacometrics	15	N. Holford/J. Hannam
MEDSCI 720 S1	Biomedical Research Techniques	15	D. Young
MEDSCI 721 S2	Advanced Toxicology	15	M. Tingle
MEDSCI 722 S2	Clinical Pharmacology	15	N. Holford/J. Hannam
MEDSCI 723 S2	Cancer Pharmacology	15	M. McKeage
MEDSCI 735 S1	Special Topic: Concepts in Pharmacology	15	D. Bell/M. Tingle
MEDSCI 744 S1/S2	Project Design in Biomedical Sciences	15	S. Graham/J. Lim
PHARMCOL 787 FY	BSc(Hons) Dissertation	60	
PHARMCOL 796 FY	MSc Thesis in Pharmacology	120	

Description of course content

MEDSCI 204

Pharmacology and Toxicology

Semester Two, three lectures per week and three workshops per semester.

A principles-based introduction to pharmacology and toxicity. Its goals are to impart a working understanding of the nature, applications, and implications of basic pharmacological and toxicological principles as they relate to clinical and biomedical sciences. Topics covered including drug targets and action, ADME and pharmacokinetics, toxicity and adverse drug reactions, preclinical models, drug discovery and development.

Assessment:

Coursework	25%
Mid-semester test	15%
End-of-semester test	10%
Final Exam	50%

MEDSCI 303

Drug Disposition and Kinetics

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; drug-drug interactions, novel drug delivery systems; mechanisms of drug action; pharmacogenetics and pharmacogenomics; drug analysis and drug dispositions in selected populations, including the elderly, children & neonates, in pregnancy, and in various pathological conditions.

Assessment:

Laboratories	40%
Mid-semester test	10%
Final exam	50%

MEDSCI 304

Molecular Pharmacology

Semester One, two lectures and one tutorial per week. Two-day laboratory intensive held during mid-semester break.

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 tutorials are designed to support the course material by providing the opportunity to critically evaluate experimental data and learn about experimental methodology and design.

Assessment:

Laboratory write-up/tutorials	30%
Laboratory test	10%
Mid-semester test	10%
Final exam	50%

MEDSCI 305

Systems 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:

Practicals	25%
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 toxicity of compounds such as drugs, food additives and contaminants, plant and animal toxins as well as environmental toxicants are included.

Assessment:

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

MEDSCI 307

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%
Laboratory test	15%
Laboratory reports	10%
Final exam	60%

MEDSCI 700

Special Topic: Drug Discovery Biology

This course reviews recent studies on the use of chemical and genetic methods to characterise the role of proteins in disease and their potential as drug targets. Topics will include proteins involved in regulation of immune response, lipid mediated cell signalling pathways, drug-protein interactions, some discovery methods and pre-clinical studies on mechanism of action.

Assessment:

Course work	100%
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MEDSCI 701

Special Studies in Medical Science

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

Assessment:

Course work	100%
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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, as well as the application of toxicological principles in drug safety evaluation.

Assessment:

Project presentation and essay	25%
Final exam	75%

MEDSCI 716

Advanced 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, pharmacokinetics and pharmacogenomics in drug development.

Assessment:

Course work	30%
Final exam	70%

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%
Written 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%
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MEDSCI 722

Clinical Pharmacology

This course deals with the target concentration strategy 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%

MEDSCI 735

Special Topic: Concepts in Pharmacology

The course explores the cellular and molecular mechanisms of drug action plus drug discovery and development from the perspective of in silico modelling, biochemical assessment, intracellular signalling and human disease. It considers the pharmacokinetic processes of input, distribution and elimination involved in achieving clinically-relevant drug concentrations. It also describes the link between concentration and effect and the time course of effect and explores factors such as disease progression, drug metabolism, drug-drug interactions, pharmacogenetics, use in selected populations and in various pathological conditions that may influence both clinical effectiveness and drug toxicity.

Assessment:

Written assignment	15%
Oral presentation	15%
Workshop participation	20%
Integrated written assignment	50%

MEDSCI 744

Project Design in Biomedical Science

The course is targeted at potential masters students with the intention of developing ideas with a mentor around a research question that is then likely to become the basis of a masters research project. The written research proposal may have more resemblance to a grant application. It will include sections on background, proposed methods, ethical and regulatory considerations, a budget and the potential impact on health significance and/or translational potential to provide an understanding of the holistic requirements for biomedical research.

Assessment:

Preliminary proposal assignment	10%
Research proposal	65%
Oral presentation	25%

BSc(Hons) in Pharmacology

Students must undertake 60 points in courses from the 700-level Pharmacology courses and complete a 60-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 PGDipHSc

At least 60 points from MEDSCI 700 or 701, 715-723 and 735 and up to 60 points from other 700-level courses as approved by Head of Department.

MSc (120 points) or MHSc

120-point masters thesis in Pharmacology.

MSc (240 points)

At least 60 points from MEDSCI 700 or 701, 715-723, 735 and up to 60 points from other 700-level courses as approved by Head of Department.

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

The discovery and development of new and better medicines for the treatment of diseases in people 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.

Privacy

The University of Auckland undertakes to collect, store, use and disclose your information in accordance with the provisions of the Privacy Act 1993. Further details of how the University handles your information are set out in a brochure available by phoning 0800 61 62 63.

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 current Calendar of the University of Auckland, to ensure that they are aware of and comply with all regulations, requirements and policies.

We advise that the University of Auckland is not involved in the employment of completing health professional students and can make no guarantee of post-qualification registration or employment in New Zealand or any other country.

2018 academic year

Semester One – 2018

Semester One begins	Monday 26 February 2018
Mid-semester break/Easter	Friday 30 March – Saturday 14 April 2018
ANZAC Day	Wednesday 25 April 2018
Graduation	Monday 7, Wednesday 9, Friday 11 May 2018
Lectures end	Friday 1 June 2018
Study break	Saturday 2 – Wednesday 6 June 2018
Examinations	Thursday 7 – Monday 25 June 2018
Queen's Birthday	Monday 4 June 2018
Semester One ends	Monday 25 June 2018
Inter-semester break	Tuesday 26 June – Saturday 14 July 2018

Semester Two – 2018

Semester Two begins	Monday 16 July 2018
Mid-semester break	Monday 27 August – Saturday 8 September 2018
Graduation	Tuesday 25 September 2018
Lectures end	Friday 19 October 2018
Study break	Saturday 20 – Wednesday 24 October 2018
Labour Day	Monday 22 October 2018
Examinations	Thursday 25 October – Monday 12 November 2018
Semester Two ends	Monday 12 November 2018

Contact

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NEW ZEALAND

**MEDICAL AND
HEALTH SCIENCES**
SCHOOL OF MEDICAL SCIENCES