

# Pharmacology and Clinical Pharmacology

Handbook 2017



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 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, neurodegenerative diseases, 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

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 recently renovated modern laboratories in diverse areas of biomedical research.

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
- Maurice and Phyllis Paykel Trust

## Physical location

Faculty of Medical and Health Sciences  
The University of Auckland, Grafton Campus  
85 Park Road  
Grafton Auckland

## Postal address

Department of Pharmacology and Clinical Pharmacology  
The University of Auckland  
Private Bag 92019  
Auckland 1142 New Zealand

**Phone:** +64 9 923 6733

**Website:**

[www.fmhs.auckland.ac.nz/sms/pharmacology](http://www.fmhs.auckland.ac.nz/sms/pharmacology)

# Staff



## Head of Department and Associate Professor in Toxicology

**Malcolm Tingle**  
PhD Liverpool

Phone: +64 9 923 4949  
Room: 503-302H  
Email: m.tingle@auckland.ac.nz



## Professor in Pharmacology

**Michael Dragunow**  
PhD Otago

Phone: +64 9 923 6403  
Room: 503-501G  
Email: m.dragunow@auckland.ac.nz



## Professor in Clinical Pharmacology

**Nicholas Holford**  
MSc MBChB Manc, MRCP(UK),  
FRACP

Phone: +64 9 923 6730  
Room: 503-302A  
Email: n.holford@auckland.ac.nz



## Professor in Clinical Pharmacology

**Mark McKeage**  
MBChB Otago MMedSci, PhD  
London FRACP

Phone: +64 9 923 7322  
Room: 504-236A  
Email: m.mckeage@auckland.ac.nz



## Professor in Pharmacology

**Michelle Glass**  
PhD Auckland

Phone: +64 9 923 6247  
Room: 503-501F  
Email: m.glass@auckland.ac.nz



## Associate Professor in Pharmacology

**Bronwen Connor**  
PhD Auckland

Phone: +64 9 923 3037  
Room: 501-501D  
Email: b.connor@auckland.ac.nz



## Associate Professor in Pharmacology

**Debbie Young**  
PhD Auckland

Phone: +64 9 923 4491  
Room: 502-501C  
Email: ds.young@auckland.ac.nz

## Lecturer in Pharmacology



## Senior Lecturer in Pharmacology

**Dr Jack Flanagan**  
PhD ANU

Phone: +64 9 923 9728  
Room: 504-119  
Email: j.flanagan@auckland.ac.nz



## Senior Lecturer in Pharmacology

**Dr Stephen Jamieson**  
PhD Auckland

Phone: +64 9 923 9141  
Room: 504-001  
Email: s.jamieson@auckland.ac.nz



## Lecturer in Pharmacology

**Dr Jacqueline Hannam**  
PhD Auckland

Phone: +64 9 923 2869  
Room: 503-302  
Email: j.hannam@auckland.ac.nz



### Senior Research Fellow

**Scott Graham**  
PhD Aberdeen

**Phone:** +64 9 923 6947  
**Room:** 503-501B  
**Email:** s.graham@auckland.ac.nz



### Senior Research Fellow

**Jian Guan**  
PhD Auckland, MD China

**Phone:** +64-09-9236134  
**Room:** 503-263A  
**Email:** j.guan@auckland.ac.nz

## Senior pharmacology tutors and professional teaching fellows



### Liam Anderson

BTech, PGDip Forensic

**Phone:** +64 9 923 6037  
**Room:** 501-002  
**Email:** l.anderson@auckland.ac.nz



### Deanna Bell

PhD Auckland

**Phone:** +64 9 923 6950  
**Room:** 501-002  
**Email:** d.bell@auckland.ac.nz



### Rachel Cameron

PhD Auckland

**Phone:** +64 9 923 3186  
**Room:** 501-002  
**Email:** r.cameron@auckland.ac.nz



### Leslie Schwarcz

PhD Eugene

**Phone:** +64 9 923 3715  
**Room:** 501-002  
**Email:** l.schwarcz@auckland.ac.nz

## Teaching Technician



### Gabriella Blidarean

MSc Romania

**Phone:** +64 9 923 5058  
**Room:** 502-361  
**Email:** g.blidarean@auckland.ac.nz

## Administrative Staff



### Kavita Hussein

Group Services Coordinator

**Phone:** +64 9 923 6733  
**Room:** 505-1D24  
**Email:** k.hussein@auckland.ac.nz

## Honorary appointments

**Mr Trevor Speight** (Medicines Information Company)

**Dr Titaina Palacz** (Waitamata DHB)

**Dr Lian Wu** (Unitec)

## Research fellows

**Erin Cawston** PhD Otago

**Natasha Grimsey** PhD Auckland

**Kathryn Jones** PhD Auckland

**Alexandre Mouravlev** PhD Novosibirsk

**Thomas Park** PhD Auckland

**Emma Scotter** PhD Auckland

## Research technicians

**Miranda Aalderink** MSc Massey

**Sheryl Feng** MSc Auckland

**Erin Firmin** MSc Auckland

**Dahna Fong** PhD Auckland

**Prashannata Khwaounjoo** MSc Auckland

**Christa MacDonald** BSc (Hons) Auckland

**Rebecca Marnane** MSc Auckland

# Areas of research interest

## Anticancer drugs

### Prof McKeage, Assoc Prof Tingle, Dr Jamieson 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.

## 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. Jacqueline 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. 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.

## 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 plus 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

### 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.

## 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 then atomic components and 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 Research

### 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

### Dr 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.





# Course and programmes

## 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

**MEDSCI 142**<sup>2</sup> Biology for Biomedical Science: Organ Systems

**BIOSCI 101**<sup>1</sup> Essential Biology: From Genomes to Organisms

**BIOSCI 106**<sup>1</sup> Foundations of Biochemistry

**BIOSCI 107**<sup>2</sup> Biology for Biomedical Science: Cellular Processes & Development

**CHEM 110**<sup>1</sup> 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

<sup>1</sup> Prerequisites for BIOSCI 203

<sup>2</sup> 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 SH	Pharmacology and Toxicology	15	D. Young	BIOSCI 106, CHEM 110, MEDSCI 142, (BIOSCI 101 is required for MEDSCI 304 and BIOSCI 107 is required for MEDSCI 305, 306 & 307)

Additional Stage II courses to MEDSCI 204 might include (be aware some of these may be core courses for Stage III Pharmacology courses, see table below):

**MEDSCI 203** Mechanisms of Disease

**MEDSCI 205** The Physiology of Human Organ Systems

**MEDSCI 206** Introduction to 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 FH	Drug Disposition and Kinetics	15	J. Hannam	MEDSCI 204
MEDSCI 304 FH	Molecular Pharmacology	15	M. Glass	MEDSCI 204, BIOSCI 203
MEDSCI 305 SH	Systems Pharmacology	15	B. Connor	MEDSCI 204 and 30 points from BIOSCI 203, MEDSCI 203 & MEDSCI 205
MEDSCI 306 SH	Principles of Toxicology	15	M. Tingle	MEDSCI 204 and 30 points from BIOSCI 203, MEDSCI 203 & MEDSCI 205
MEDSCI 307 FH	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 Regulations 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 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 MSci 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 788 (45 points) approved by Head of Department plus 75 points from MEDSCI 700-701, MEDSCI 715-723.

### 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.

### MSc

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

**Requirements:** MSc Thesis PHARMCOL 796 (120 points).

## 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	Course director
MEDSCI 700 SH	Special Topic: Drug Discovery Biology	15	J. Flanagan
MEDSCI 701 FH/SH	Special Studies in Medical Science	15	N. Helsby
MEDSCI 715 FH	Molecular Toxicology	15	M. Tingle
MEDSCI 716 FH	Advanced Drug Disposition and Kinetics	15	S. Jamieson
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:

Course	Title	Pts	Clinical Pharmacology Coordinator
MBChB 221 A/B	MBChB Part II	120	N. Holford
MBChB 401 A/B	MBChB Part IV	120	S. O'Sullivan
MBChB 501 A/B	MBChB Part V	120	S. O'Sullivan

A/B = Double Semester, Medical & Health Sciences Campus

# Description of course content

## MEDSCI 204

### Pharmacology and Toxicology

**(Semester Two, three lectures per week and three workshops per term)**

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-term 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 midsemester 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 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%
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 HOD 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%

## 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

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.

# 2016 academic year

## Semester One – 2017

Semester One begins	Monday 6 March 2017
Mid-semester break/Easter	Friday 14 April – Saturday 29 April 2017
ANZAC Day	Tuesday 25 April 2017
Graduation	Monday 1, Wednesday 3, Friday 5 May 2017
Queen's Birthday	Monday 5 June 2017
Lectures end	Friday 9 June 2017
Study break	Saturday 10 June – Wednesday 14 June 2017
Exams	Thursday 15 June – Monday 3 July 2017
Semester One ends	Monday 3 July 2017
Inter-semester break	Tuesday 4 July – Saturday 22 July 2017

## Semester Two – 2017

Semester Two begins	Monday 24 July 2017
Course withdrawal deadline	Friday 4 July 2017
Mid-semester break	Monday 4 September - Saturday 16 September 2017
Graduation	Tuesday 26 September 2017
Labour Day	Monday 23 October 2017
Lectures end	Friday 27 October 2017
Study break	Saturday 28 October - Wednesday 1 November 2017
Exams	Thursday 2 November - Monday 20 November 2017
Semester Two ends	Monday 20 November 2017

## Semester One – 2018

Semester Two begins	Monday 26 February 2018
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### Privacy

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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 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.

## Contact

Department of Pharmacology and Clinical Pharmacology  
School of Medical Sciences  
Faculty of Medical and Health Sciences  
The University of Auckland  
Private Bag 92019  
Auckland 1142, New Zealand  
Phone: +64 9 923 6733  
Website: [fmhs.auckland.ac.nz/sms/pharmacology](http://fmhs.auckland.ac.nz/sms/pharmacology)



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