



UNSW
THE UNIVERSITY OF NEW SOUTH WALES

FACULTY OF MEDICINE

SCHOOL OF MEDICAL SCIENCES

DEPARTMENT OF PHARMACOLOGY

PHAR 3202

Neuropharmacology

COURSE OUTLINE

SESSION 2, 2010

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PHPH3202 Course Information

Neuropharmacology (PHAR3202) is a 3rd year Science Course worth Six Units of Credit (6 UOC). The course will build on the information you have gained in Pharmacology (PHPH2011) and Physiology (2101 & 2201) as well as Biochemistry (BIOC2101/2181) and Molecular Biology (2201/2291) or Chemistry (2021/2041).

OBJECTIVES OF THE COURSE

Building on basic pharmacology skills learned in PHPH2011, the objectives of this course are to a) provide both knowledge and conceptual understanding of the use and action of various classes of drugs in the treatment of different human diseases affecting the brain and b) develop an appreciation of the need for further research to identify new drug targets for more effective therapies.

COURSE CO-ORDINATOR and LECTURERS:

Course Co-ordinators:

Dr Nicole Jones

Room M205

Wallace Wurth Building

Ph: 9385 2568

n.jones@unsw.edu.au

Consultation time: Monday 2-3pm

Professor Margaret Morris

Room M211A

Wallace Wurth Building

Ph 9385 1560

m.morris@unsw.edu.au

Students wishing to see the course coordinator outside consultation times should make an appointment via email.

Lecturers in this course:

Dr. Trudie Binder

w.binder@unsw.edu.au

Dr. Jane Carland

j.carland@unsw.edu.au

A Prof Kay Double

k.double@neura.edu.au

Dr. Gilles Guillemin

g.guillemin@cfi.unsw.edu.au

Dr. Ross Grant

r.grant@unsw.edu.au

Dr. Nicole Jones

n.jones@unsw.edu.au

Prof. Margaret Morris

m.morris@unsw.edu.au

A Prof Laurence Wakelin

l.wakelin@unsw.edu.au

COURSE STRUCTURE and TEACHING STRATEGIES

Learning activities occur on the following days and times:

- Lectures: Monday (1-2pm), Tuesday (1-2pm)
- Tutorials: Tuesday (3-4pm) or* Thursday (4-5pm)
- Practicals: Friday (11am-2pm).

*Once enrolled in one of the two tutorials sessions, students cannot change.

Students are expected to attend all scheduled activities for their full duration (2 hours of lectures per week and up to 4 hours of practical and tutorial sessions per week). Students are expected to attend all scheduled activities for their full duration. Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150-180 hrs of study and learning activities. The formal learning activities are approximately 76 hours throughout the semester and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

Lectures will provide you with the concepts and theory essential for understanding the mechanism of action and clinical effects of drug classes which are used to treat CNS disorders. For each disease the pathological process will be outlined in the lecture and the relevant drug targets in the disease process identified and current pharmacological treatments will be described. While lectures will focus on the mechanism of action and adverse effects of drugs currently in use, potential new therapies, drug targets and areas requiring further research for more effective therapies, will be identified and discussed.

To assist in the development of research and analytical skills practical classes and tutorials will be held. These classes and tutorials allow students to engage in a more interactive form of learning than is possible in the lectures. The skills you will learn in practical classes are relevant to your development as professional scientists.

APPROACH TO LEARNING AND TEACHING

The learning and teaching philosophy underpinning this course is centred on student learning and aims to create an environment, which interests, challenges and enthuses students. The teaching is designed to be relevant and engaging in order to prepare students for future careers.

Although the primary source of information for this course is the lecture material, effective learning can be enhanced through self-directed use of other resources such as textbooks and Web based sources. Your practical classes will be directly related to the lectures and it is essential to prepare for practical classes before attendance. It is up to you to ensure you perform well in each part of the course; preparing for classes; completing assignments; studying for exams and seeking assistance to clarify your understanding.

STUDENT LEARNING OUTCOMES

PHPH3202 will develop those attributes that the Faculty of Science has identified as important for a Science Graduate to attain. These include; skills, qualities, understanding and attitudes that promote lifelong learning that students should acquire during their university experience.

Graduate Attributes

- A. Research, inquiry and analytical thinking abilities
- B. The capability and motivation for intellectual development
- C. Ethical, social and professional understanding
- D. Effective communication
- E. Teamwork, collaborative and management skills
- F. Information Literacy – the skills to locate, evaluate and use relevant information.

On completion of this subject students should:

1. Be able to describe the synthetic and metabolic pathways of the major CNS neurotransmitters
2. Be able to list examples of drugs used to treat major classes of brain and mind disorders.
3. Be able to outline the mechanism of action of specified drug classes used to treat the major types of brain and mind disorders.
4. Be able to communicate scientific information in a report.
5. Be able to demonstrate their ability to work in teams and communicate scientific information effectively.

ASSESSMENT PROCEDURES

• Progress exam (40 min duration)	10%
• Practical report	10%
• Practical quizzes	5%
• Assignment – “Current Research Topic in Neuropharmacology”	15%
• End of session examination (2 hours duration)	60%

The *practicals and tutorials* are provided to support lecture material and practise analytical skills. The practical classes and tutorials help you to develop graduate attributes A, C, D & E. During the practical course you will be required to submit written reports for one of the practical sessions. The report itself should be in the form of a scientific communication comprising aims, results and discussion. Reports must be legible and as concise as possible, and are limited to a maximum of 4 pages of writing (excluding tables, figures and computer traces). The report will be due two weeks after the relevant practical class. Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the student enquiry counter, located on the ground floor of the Wallace Wurth building (room MG14). A penalty will apply for late submissions. Material covered in the Practical Classes will be examined.

Student assignment

Students will work in teams of 3-4 to research a “Controversial Research Topic in Neuropharmacology”. Each group member must participate in the development of an argument for or against the topic and groups will debate the topic in weeks 8 and 9. Topics will be assigned to groups in the first tutorial session. Individual group members will be required to submit a 500 word synopsis of their own debate. This assessment task will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate your ability to work in a team and collaborate successfully (Graduate attributes A, D, E & F). Marking criteria will be distributed along with assignment details at the first tutorial session. Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the student enquiry counter, located on the ground floor of the Wallace Wurth building (room MG14). A penalty will apply for late submissions (10% per day).

Written Assessment tasks must also be submitted electronically *via* Blackboard, through Turnitin.

The *progress examination* will be held during the lecture session (August 30th) in week 7. This exam will give you feedback on how you are succeeding in the course. The *progress examination* and *end of session examination* will test not only your knowledge of drugs used to treat major classes of brain and mind disorders but also your ability to apply the knowledge you have acquired from multiple lectures. The progress examination will be in the form of multiple choice and short answer questions. The questions will be based on the material covered in the lectures, practical classes and tutorials. Material covered prior to the progress exam may be again examined in the final exam. The exam will address graduate attributes A and B. The end of session examination will be held during the official examination period.

TEXTBOOK AND READING LIST

Recommended Primary Text:

- Nestler, Hyman and Malenka; *Molecular Neuropharmacology: A Foundation for Clinical Neuroscience*. 2nd Edition McGraw Hill, 2008. This book is available for purchase through the UNSW bookshop and there will be a copy available in the UNSW library.

Additional reading suitable as Secondary Resources:

- Rang, Dale, Ritter and Moore; *Pharmacology* 6th Edition. Churchill Livingstone, 2007
This textbook is available from the UNSW bookshop and there are several copies available in the UNSW library
- Brunton, Lazo and Parker; Goodman and Gilman’s *The Pharmacological basis of therapeutics*. 11th Edition. McGraw Hill. There are several copies of this textbook and there is also an electronic resource – both are available through the UNSW library.

Other Resources:

- Additional articles of interest will be placed on the course pages on Blackboard

COURSE EVALUATION AND DEVELOPMENT

Each year feedback is sought from students about the courses offered in the Department of Pharmacology and continual improvements are made based on this feedback. The Course and Teaching Evaluation and Improvement [CATEI] Process of UNSW is the way in which student feedback is evaluated and significant changes to the course will be communicated to subsequent cohorts of students. Also a staff-student liaison group will be set up and students will be invited to become class representatives to seek feedback from their colleagues and meet with academic staff to discuss any issues that arise.

Based on student feedback received from 2009 the following changes have been made: the student assignment and has now been allocated a larger proportion of the total assessment marks – 15%. The tissue culture practical class is modified and an accompanying tutorial has been added, to allow students a chance to research and design their own neuroprotection experiment (within class time and resource constraints).

GENERAL INFORMATION

The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is located on the lower ground, 2nd and 3rd floors of the Wallace Wurth building. General inquiries can be made at the School of Medical Sciences Student enquires counter, located on the Ground Floor of the Wallace Wurth (MG14). Office hours are 9.00 am - 5:00pm.

Professor Margaret Morris is Head of Department and appointments may be made through her Administrative Assistant in Room MG14.

There is an honours program conducted by the School. The Honours program is coordinated by Dr Patsie Polly Room 508, Wallace Wurth Building (ph: 9385 2924). Any students considering an Honours year should discuss the requirements with the coordinator. Outstanding students may be considered for scholarships offered by the University and School and these are offered annually.

Postgraduate research degrees

The Department of Pharmacology offers students the opportunity to enter into the following graduate programs:

Doctorate (Ph.D): In Pharmacology. For further information contact the co-ordinator Dr Pascal Carrive (p.carrive@unsw.edu.au)

Departmental Vacation Scholarships: The Department of Pharmacology supports several summer vacation scholarships each year to enable good students to undertake short research projects within the department. For further details contact the Administrative Officer.

The School Teaching Administrator

Ms Carmen Robinson is able to provide additional information on any courses offered by the School. Student Enquires Counter: G27 of the Biosciences Building, ph: 9385 2464, Email: Carmen.robinson@unsw.edu.au

OFFICIAL COMMUNICATION BY EMAIL

All students in the course PHAR3202 are advised that e-mail is now the official means by which the School of Medical Sciences at UNSW will communicate with you. All e-mail messages will be sent to your official UNSW e-mail address (e.g. z1234567@student.unsw.edu.au) and, if you do not wish to use the University e-mail system, you MUST arrange for your official mail to be forwarded to your chosen address. The University recommends that you check your mail at least every other day. Facilities for checking e-mail are available in the School of Medical Sciences and in the University library. Further information and assistance is available from IT Services at UNSW (<http://www.it.unsw.edu.au/students/index.html>.)

Note on Email etiquette: When contacting a lecturer with a query, all email communications should be in formal business English; students should include their name, student number and course name and number.

ATTENDANCE REQUIREMENTS

Attendance at practical classes is compulsory, and must be recorded in the class roll ON THE DAY OF THE CLASS. It is your responsibility to ensure that the demonstrator records your attendance and no discussions will be entered into after the completion of the class. Satisfactory completion of the work set for each class is essential. It should be noted that non-attendance for other than documented medical or other serious reasons, or unsatisfactory performance, **for more than 1 practical class during the session** may result in an additional practical assessment exam or ineligibility to pass the course.

The University acknowledges that students are involved in many extra-curricular activities throughout their studies. The School of Medical Sciences is generally supportive of students' activities but must be confident that these do not significantly impact on attendance at scheduled teaching activities or completion of assessment requirements.

Guidelines on extra-curricular activities affecting attendance can be found on the School of Medical Sciences Website.

[http://medicalsciences.med.unsw.edu.au/SOMSWeb.nsf/resources/Course+Outline+NEUR+2/\\$file/Extra-curricularActivitiesSOMS.pdf](http://medicalsciences.med.unsw.edu.au/SOMSWeb.nsf/resources/Course+Outline+NEUR+2/$file/Extra-curricularActivitiesSOMS.pdf)

BEHAVIOUR IN PRACTICAL CLASSES

The practical class is an opportunity for students to develop graduate attribute C by behaving in an ethical, socially responsible and professional manner within the practical class.

- Punctual arrival is expected.
- Turn off mobile phones before entering the class.
- A lab coat must be worn to all practical classes
- Enclosed shoes are compulsory.

Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. Those who don't adhere to these basic laboratory rules will be marked absent.

PRACTICAL CLASSES

The experimental procedure for each practical is given in this course outline. Students are required to familiarise themselves with the experimental procedure before attending each class.

In the interests of safety, special attention should be paid to any precautionary measures recommended in the notes. If any accidents or incidents occur they should be reported immediately to the demonstrator in charge of the class who will record the incident and recommend what further action is required.

Animal Experimentation

The procedures used in the laboratory classes involving *the use of animals* have been approved by Animal Care and Ethics Committee (registration number 10/71A). All experiments undertaken in the Department of Pharmacology adhere to the NHMRC code of conduct for animal experimentation.

NOTICEBOARDS

Noticeboards for this course can be found on the 2nd floor of the Wallace Wurth building. Current timetables and information relevant to you will be displayed here and on the course page on Blackboard. It is your responsibility to check these regularly.

TECHNOLOGY ENABLED LEARNING AND TEACHING RESOURCES

The Department of Pharmacology has chosen to use the University's central Blackboard service to provide teaching material for all of its courses.

- To access these materials, either point your browser to:

<http://lmsblackboard.telt.unsw.edu.au/webapps/portal/frameset.jsp>

or go to the School's home page at:

<http://medicalsciences.med.unsw.edu.au/> then select "Current Students" from the menu bar and click on Blackboard, under "Quicklinks" in the left column.

- You will need to click through the "UNSW" at the left, then click the "Log on" button and enter your zPass (zStudentNo. and password).
- After logging on to Blackboard, look for the course PHAR3202. You should have access to it if you are properly enrolled.
- You can make use of Lectopia (formerly iletures) recordings taken of the lectures that are available on Blackboard. Lecture slides will also be made available on Blackboard.

HANDWRITING

Students whose writing is difficult to understand will disadvantage themselves in their written assessment. Make every effort to write clearly and legibly. Do not use your own abbreviations.

SPECIAL CONSIDERATION

Please note the following Statement regarding Special Consideration.

*If you believe that your performance in a course, either during session or in an examination, has been adversely affected by sickness or for any other reason, you should notify the Registrar and ask for special consideration in the determination of your results. Such requests should be made as soon as practicable after the problem occurs. **Applications made more than three days after an examination in a course will only be considered in exceptional circumstances.***

*When submitting a request for special consideration you should provide all possible supporting evidence (eg medical certificates) together with your registration number and enrolment details. Consideration request forms are available from the Student Centre in the Chancellery and from Course Offices. In exceptional circumstances further assessment may be given. **If you believe you might be eligible for further assessment on these grounds, you should contact the Course Authority or the relevant Course Office as soon as possible.***

Please refer to <https://my.unsw.edu.au/student/resources/Policies> for further details regarding special consideration.

MISSED EXAMS

If in any circumstances you unavoidably miss an examination, you must inform the Registrar and also contact the relevant Course Office immediately. Normally, if you miss an exam (without medical reasons) you will be given an absent fail. If you arrive late for an exam no time extension will be granted. It is your responsibility to check timetables and ensure that you arrive with sufficient time. **PLEASE NOTE** that if you miss any examinations for medical reasons you must lodge a medical certificate with UNSW Student

Central within **3 DAYS** (refer to <https://my.unsw.edu.au/student/atoz/SpecialConsideration.html> for further details). Your request for consideration will be assessed and a deferred exam may be granted. You cannot assume you will be granted supplementary assessment. **The deferred exam may include a significant oral element.**

The supplementary exam will be held in the week beginning the 7th December

MISSED TESTS

If you unavoidably miss one of the tests in PHAR3202, you must inform the course coordinator immediately. You must supply adequate documentation (medical certificate) to be considered for any supplementary tests. Such tests may consist of an oral examination that will be held during the first week of the stuvac period.

MEDICAL CERTIFICATES

Students who miss practical classes due to illness or for other reasons must submit a copy of medical certificates or other acceptable documentation to the course co-ordinator in Room M205. **Certificates should be lodged no more than 7 days after an absence. Certificates lodged after 7 days will not be accepted.** The following details must be attached: Name, Subject number, Group number, Date of the class, Name of class/es missed.

REPEATING STUDENTS

Practical class exemptions may be granted to repeat students but students **must** check with the course coordinator whether they have exemption **prior** to their first practical class. All students must be familiar with the material covered in the practical classes.

STUDENT SUPPORT SERVICES

Those students who have a disability that requires some adjustment in their teaching or learning environment are encouraged to discuss their study needs with the course coordinator prior to, or at the commencement of, their course, or with the Equity Officer (Disability) in the EADU 9385 4734. Issues to be discussed may include access to materials, signers or note-takers, the provision of services and additional exam and assessment arrangements. Early notification is essential to enable any necessary adjustments to be made.

Student Equity and Disabilities Unit, Ground Floor of the Goodsell Building

Tel: +61 2 9385 4734/5434

Email: seadu@unsw.edu.au

Website: www.studentequity.unsw.edu.au

STUDENT RIGHTS AND RESPONSIBILITIES

<https://my.unsw.edu.au/student/resources/Policies.html#StudentResponsibilities&Conduct>

APPEALS PROCEDURES

Details can be found at MyUNSW via the Student Central Link

<https://my.unsw.edu.au/student/academiclife/StudentCentralKensington.html>

GRIEVANCE RESOLUTION OFFICER

In case you have any problems or grievance about the course, you should try to resolve it with the Course Coordinator (Dr Nicole Jones ph: 9385 2568) or the Head of Department (Prof Margaret Morris ph: 9385 1560). If the grievance cannot be resolved in this way, you should contact the School of Medical Sciences Grievance Officer, Dr P.Pandey (9385 2483, P.Pandey@unsw.edu.au).

PLAGIARISM

The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalised by the award of a score of zero for the assessable work. Evidence of plagiarism may result in a record being made in the Central Plagiarism Register and the Faculty Students Ethics Officer being notified.

What is Plagiarism?

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†
- For the purposes of this policy, submitting an assessment item that has already been submitted for academic credit elsewhere may be considered plagiarism.
- Knowingly permitting your work to be copied by another student may also be considered to be plagiarism.
- Note that an assessment item produced in oral, not written, form, or involving live presentation, may similarly contain plagiarised material.
- The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.
- The Learning Centre website is the main repository for resources for staff and students on plagiarism and academic honesty. These resources can be located via:www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle

† Adapted with kind permission from the University of Melbourne.

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Neuropharmacology

LECTURE and PRACTICAL OUTLINES

The course timetable is appended at the end of these notes and can also be found on Blackboard.

The course is divided into 5 main themes covering Neuropharmacology

1. Introduction to Neuropharmacology
2. Neurotransmitter and Receptor systems in the brain
3. Brain Disorders – and drugs used to treat them
4. Analgesics and Anaesthetics
5. Neurodevelopment and Neuroimmunology

1. Introduction to Neuropharmacology

This lecture will provide an introduction to neuropharmacology - the study of drugs that affect the brain. It will briefly review the way that nerve cells communicate to each other via chemicals and receptors and provide an overview of the variety of different chemicals and receptors utilized and the nerve pathways and neuronal functions associated with different neurotransmitter systems.

2. Neurotransmitter and Receptor systems in the brain

Serotonin / Noradrenaline

This lecture will cover the mechanisms involved in synthesis and metabolism of serotonin and noradrenaline. Principle serotonergic and noradrenergic pathways in the CNS. Agonists and antagonists at receptors. Provide a general overview of therapeutic uses of drugs affecting 5HT, NA systems in the CNS.

Acetylcholine / Dopamine

This lecture will cover basic aspects of acetylcholine synthesis, storage and release. Nicotinic and muscarinic receptors in the brain and drugs which mediate cholinergic transmission in the CNS. An overview of cholinergic drugs used to treat CNS conditions. This lecture will cover pathways involved in dopamine synthesis and metabolism. Provide an overview of functional aspects of dopaminergic pathways in the brain (including motor control and behaviour). Pharmacology of drugs affecting dopamine; important adverse reactions to dopamine antagonists including the underlying mechanisms; selectivity of dopamine antagonists; types of dopamine receptors in the brain. Provide a brief summary of dopaminergic drugs used to treat brain disorders.

Neuropeptides

This lecture will cover the general characteristics of neuropeptides; how they act as neurotransmitters and neuromodulators; possible roles in modulating CNS functions; specific receptors; agonists and antagonists. Examples: substance P, neuropeptide Y and neurotensin

ATP as a neurotransmitter

ATP as a neurotransmitter; adenosine as a modulator; P1 and P2 classes of purinergic receptors; functional aspects of the receptors; drugs acting on the receptors. Nitric oxide, the only neurotransmitter not stored in vesicles; effects of nitric oxide; clinical conditions in which nitric oxide may play a role.

Amino Acids

Glutamate and GABA are amino acids that are key neurotransmitters within the mammalian CNS. This lecture will cover their synthesis and storage, the structure and function of glutamate and GABA receptors *in vivo* and look at some selective glutamatergic and GABAergic drugs.

3. Brain disorders – and drugs used to treat them

Depression

Monoamine theory of depression; pharmacology of antidepressant drugs (tricyclic antidepressants; monoamine oxidase inhibitors; "atypical" antidepressants); important adverse reactions to these drugs including the underlying mechanisms; mode of action of lithium

Schizophrenia / Neuroleptic Drugs

Neuroleptic drugs are drugs that are used to treat psychosis such as schizophrenia. This lecture will briefly describe what schizophrenia is and the neuroleptic drugs which are used to treat this disorder. This lecture will also cover the brain and peripheral neurotransmitter receptors which neuroleptic drugs interact with, the proposed mechanism of clinical action and the side effects associated with neuroleptic drug use.

CNS control of Feeding / Obesity

Obesity is a growing health problem and a major contributor to burden of disease in our society. This lecture will review the physiology of appetite control and the major potential therapeutic targets: fat absorption, food intake and thermogenesis. The mechanism of action of current anti-obesity drugs, their adverse effects, and central signals that are potential new therapies for obesity will be considered.

Drug Addiction / Dependence

This lecture provides an overview of the effects of chronic drug use on the CNS and the adaptive responses that underlay withdrawal and dependence. Key concepts include drug withdrawal and dependence, synapses and cell signalling and the modulation of neurotransmitters and biochemical pathways contributing to drug addiction. Signalling pathways modulated by drugs of abuse can provide new targets for treating drug addiction.

Motor coordination: Parkinsons disease

This lecture is an introduction to pharmacological treatments for Parkinson's diseases. Mechanisms of action, efficacy and side-effects of commonly used pharmacological treatments will be considered. Choice of treatment and other treatment issues will also be discussed.

Epilepsy and anticonvulsants

This lecture will provide an overview of the different types of epilepsy. Anticonvulsant drugs and how they work: (clonazepam, valproate, vigabatrin, phenobarbitone, primidone, phenytoin, carbamazepine, ethosuximide, trimethadione); adverse effects on CNS, blood and other tissues.

Sedatives and Hypnotics

This lecture will provide a brief overview of sleep and anxiety. We will discuss a number of different classes of pharmacological agents that are used to help with these conditions, their mechanism of action and potential side effects.

Stroke and Neuroprotection

This lecture will cover the incidence of stroke and the mechanisms involved in brain injury. It will provide an overview of the current therapies used to treat or prevent stroke in humans. There will be a mention of current clinical trials for stroke treatment and models used to identify neuroprotective drug candidates.

Neurodegeneration

These lectures will provide an overview of a number of neurodegenerative diseases (e.g. Alzheimer's disease, Amyotrophic lateral sclerosis, Huntingtons disease, Parkinson's disease); their pathophysiology, possible novel areas for therapeutic intervention and efficacy of current therapies.

4. Analgesics / Anaesthetics**Pain and Analgesia in the CNS**

This lecture provides an overview of central nervous system mechanisms of pain and analgesia. It encompasses modulatory mechanisms in nociceptive pathways, neurotransmitters involved in nociception, chemical signalling and the pharmacology of drugs such as opioids which modulate pain.

Local and General Anaesthetics

This lecture will provide an overview of the different types of local and general anaesthetic agents. Mechanisms of action of a number of different commonly used anaesthetics. The central nervous system effects; sites of action; adverse effects; effects on axonal and synaptic transmission.

5. Neurodevelopment and Neuroimmunology**Neuroimmunology**

This lecture will cover the immune response within the central nervous system including the description of cells involved, inflammatory mediators and examples of pathologies.

Neurodevelopment

This lecture will provide an overview of the role of neurotrophic factors in development. Neurotrophic factors, receptors and signaling pathways. Importance of neurotrophic factors as possible therapeutics in degenerative disorders.

CNS drugs and blood brain barrier

This lecture will discuss the blood brain barrier and its importance in protecting the brain and regulating the exchange of factors between the blood and brain. One problem facing the design of drugs for CNS disorders is blood brain barrier permeability, in particular large molecules are not able to get into the brain. Novel approaches to deliver agents to the brain will be discussed.

Assessment Tasks and Due Dates

Task	Due Date
Practical Quizzes	Submit prior to leaving prac session
Mid Session Test	Monday 30 th August - 1-2pm
Narcotic Analgesics Prac Report	Monday 20 th September – 9am
Research Debate Presentations	*Friday 17 th or 24 th September – 11am-2pm
Research Debate Synopsis	*Monday 27 th September or 4 th October – 9am
Final Examination	Official Exam period

* Depending upon when your group research debate presentations occur.
The individual 500 word synopsis is due 2 weeks after your group has made their presentation.

Group Assignment Information

Students will work in teams of 3-4 to research a “Controversial Research Topic in Neuropharmacology”. Each group member must participate in the development of an argument for or against the topic and groups will debate the topic in weeks 8 and 9. Topics will be assigned to groups in the first tutorial session. Individual group members will be required to submit a 500 word synopsis of their own debate. This assessment task will allow you to develop your research, information literacy, communication and time management skills, as well as allowing you to demonstrate your ability to work in a team and collaborate successfully (Graduate attributes A, D, E & F). Written assessment tasks must be accompanied by a signed plagiarism form and submitted to the student enquiry counter, located on the ground floor of the Wallace Wurth building (room MG14). The report also has to be submitted electronically *via* Blackboard, through Turnitin. A penalty will apply for late submissions (10% per day).

Groups: Students will chose their own groups in the first tutorial. Each group will be assigned a topic and instructions will be handed out in the in the first tutorial session.

Wk	Wk beginning (Mon)	Lecture 1 Monday 1-2pm LG02	Lecture 2 Tuesday 1-2pm Biomed E	Tutorial Tuesday 3-4pm LG02 Thursday 4-5pm LG03	Practical Class Friday 11am-2pm WW G2/G4 or M210
1	19/7	Introduction: Neurochemical transmission and neuromodulation N.Jones	Serotonin / Noradrenaline N.Jones	Assignment Information Research Topics distributed	
2	26/7	Depression M. Morris	Acetylcholine / Dopamine N.Jones	Summarising Research Articles	Behavioural Pharmacology N.Jones
3	2/8	Neuropeptides as transmitters L.Liu	Neuroleptic Drugs and Schizophrenia N. Jones	Group Work – Research Debates	Animal Handling N.Jones / T.Binder
4	9/8	Motor coordination: Parkinsons disease K. Double	CNS control of Feeding/Obesity M.Morris	Treatments for Mood / Psychiatric Disorders	Barbiturates N.Jones / T.Binder
5	16/8	ATP and NO as neurotransmitters L.Liu	Amino Acids – Glutamate N.Jones	Group Work – Research Debates	Neurodegeneration: Parkinsons patient N. Jones / K.Double
6	23/8	Amino Acids –GABA and Glycine J.Carland? / N.Jones	Hypnotics and sedatives N. Jones	CNS Neurotransmitters	
7	30/8	Mid Session TEST	Pain and Analgesia in CNS T.Binder	Group Work – Research Debates	Narcotic analgesics N.Jones / T.Binder
Mid Semester Break – 4th -12th September					
8	13/9	Epilepsy and anticonvulsants N. Jones	Stroke and Neuroprotection N.Jones	Mid Session TEST Feedback	Research Debate Presentations
9	20/9	General and Local Anaesthetics L.Wakelin	Neurodegeneration R.Grant	Neuronal toxicity	Research Debate Presentations
10	27/9	Neurodegeneration II R.Grant	Neuroimmunology G.Guillemain	Neuronal toxicity	Tissue Culture – neuronal toxicity (Group 1) N.Jones
11	4/10	Public Holiday – No lecture	Drug Addiction / Dependence T.Binder	Treatments for Neurological Disorders	Tissue Culture – neuronal toxicity (Group 2) N.Jones
12	11/10	Neurodevelopment N.Jones	CNS drugs and blood brain barrier N.Jones	Exam Revision Quiz	Tissue Culture – neuronal toxicity (Group 1 & 2) N.Jones

