



Faculty of Medicine
School of Medical Sciences

PHAR 3251

Clinical & Experimental Pharmacology

COURSE OUTLINE

SESSION 1, 2017

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

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

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

PHAR3251 Course Information

Clinical & Experimental Pharmacology (PHAR3251) is a 3rd year Science Course worth Six Units of Credit (6 UOC). The course is required as part of a major study plan in Pharmacology for the Bachelor of Science or Bachelor of Medical Sciences. The course will build on the information you have gained in Pharmacology (PHAR2011) 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 PHAR 2011, 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 b) introduce and develop an understanding of the use of selected formulae to predict drug concentration in, and clearance from, the human body c) develop an appreciation of the need for further research to identify new drug targets for more effective therapies.

COURSE CO-ORDINATOR and LECTURERS

Course Coordinator: Dr Trudie Binder ph: 9385 8737
Consultation times: By appointment, email or phone.

Co – Coordinator: Dr Greg Smith ph: 9385 58075
Consultation times: By appointment, email or phone.

Lecturers in this course:

Dr Trudie Binder	w.binder@unsw.edu.au
Prof Ric Day	r.day@unsw.edu.au
Dr Ross Grant	r.grant@unsw.edu.au
Dr Lu Liu	lu.liu@unsw.edu.au
Prof Margaret Morris	m.morris@unsw.edu.au
A/Prof Larry Wakelin	l.wakelin@unsw.edu.au
Dr Greg Smith	g.smith@unsw.edu.au
Dr Johnson Liu	johnson.liu@unsw.edu.au

COURSE STRUCTURE and TEACHING STRATEGIES

This is a 6 unit course and consists of:

- 2 lectures per week
- practical/tutorial sessions of up to 4 hours 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. 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 in Pharmacology.

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

PHAR3251 will develop those attributes that the Faculty of Science and the Department of Pharmacology has identified as important for a Pharmacology 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.

Pharmacology Learning Outcomes

- Demonstrate an understanding of how drugs/therapeutics are developed, work and are used safely
- Critically analyse, interpret and effectively communicate pharmacology data and literature
- Design and/or execute experiments or other activities to address a pharmacological scenarios

On completion of this subject students should:

1. demonstrate an understanding of the clinical application of a range of drug classes.
2. be able to describe the mechanism of action of specified drug classes used to treat the major types of disease.
3. be able to accurately perform experiments, record data, draw conclusions from experimental data and write up a scientific report.
4. be able to demonstrate their ability to work in teams and communicate scientific information effectively to a variety of audiences and in a variety of formats.

ASSESSMENT PROCEDURES

	Date due	% final mark
Progress exam (40 min duration)	4 April	15%
Practical assessment (1 st report, data analysis)	2 weeks after practical	10%
Practical assessment (2 nd report, Pharmacokinetics)	2 weeks after practical	5%
Student poster presentation	23th May	15%
End of session examination (2 hours duration)	TBA	55%

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 a written report for two of the practical sessions.

Written assessment tasks must be submitted electronically *via* Moodle, through Turnitin (data analysis report) or a hard copy submitted to G7, Bioscience Building (pharmacokinetics report). A penalty will apply for late submissions (10% per day).

Student poster presentation

Students will work in teams to research their topic for presentation as a scientific poster. The poster will be displayed during a poster presentation and viewing session. The student will be expected to answer questions relating to the topic both individually and as a group. The poster will be marked on set criteria by 2 academic/research reviewers or staff. 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).

Progress examination

The progress exam will be held during the session in week 6. 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 disease but also your ability to apply the knowledge you have acquired from multiple lectures to identifying areas of research on appropriate drug targets. This examination will be in the form of 20 multiple choice 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.

Final Exam

The end of session examination will be held during the official examination period.

MARKING CRITERIA FOR DATA ANALYSIS PRAC REPORT

	Exemplary (>8.5)	Very Good (8.4-7.5)	Good (7.4-6.5)	Satisfactory (6.4-5.0)	Unacceptable (<5.0)
Title and Formatting <hr/> /10 x 0.5	Title clearly indicates the subject matter of the paper. Name and student number and department address given. Times roman, 12 font, 1.5 line-spacing, Margins 3 cm. Word count ~ 1000	Title indicates the subject matter of the paper. Name and student number and departmental address given. Minor errors in formatting. Word count ~ 1000	Title indicates the subject matter of the paper. Name and student number and departmental address given. Errors in formatting. Word count ~ 1000	Title does not indicate the subject matter of the paper. Name and student number and departmental address given. Errors in formatting. Word count > 1000	Title, author's name and/or address not given. Formatting requirements not followed. Word count >or<1000
Introduction <hr/> /10 x 2	Concise and clear account of the scientific background and the rationale of the experiment. Final sentence summarises the broad conclusions of the paper	Clear account of the scientific background and the rationale of the experiment. Minor omissions or errors. Final sentence summarises the broad conclusions of the paper	A good introduction of the scientific background and the rationale of the experiment. A few factual error or omissions. Final sentence summarises the broad conclusions of the paper	Some introduction to the scientific background and the rationale of the experiment. More detail needed. Improved summary of the major finding needed.	Lacking detail of the rationale of the experiment and scientific background. Summary of the major finding not given
Methods <hr/> /10 x 1	Appropriate detail and referencing of methods used.	Sufficient detail and referencing of methods used. Minor details missing.	Insufficient detail and referencing of methods used. Minor errors.	Methods given but not referenced. Lacks details and has errors.	Methods not written in paragraph style.
Results <hr/> /10 x 1	Excellent description of the experimental results. No conclusions or interpretation of results presented. Data analysis was performed correctly	Good description of the experimental results. No conclusions or interpretation of results presented. Minor errors in data analysis.	Good description of the experimental results. Lacks some required detail. No conclusions or interpretation of results presented. A few errors or omissions in data analysis.	Description of the experimental results lacks required detail. Some conclusions or interpretation of results presented. Some errors or omissions in data analysis	No description of results. Results not written in paragraph style. Errors in data analysis. Some data analysis not presented.
Figures & Legends <hr/> /10 x 1	Graph axes labelled and units of measurement given in parentheses. Legends explain the figures in sufficient detail that they can be understood without reference to the text	Graph axes labelled and units of measurement given in parentheses. Legends explain the figures however more detail needed to be understood without reference to the text	Minor errors in graph axes labels and units of measurement. Legends explain the figures however more detail needed to be understood without reference to the text	Errors in graph axes labels and units of measurement. Legends lack the detail needed to be understood without reference to the text	Graphs missing axes labels and units. No figure legends included.
Discussion & Conclusion <hr/> /10 x 2.5	Discussion is clear and succinct. Extensive interpretation of the results with reference to previous scientific studies. No re-statement of the results. Main conclusions conveyed in a final paragraph.	Good interpretation of the results, greater reference to previous scientific studies needed. Some re-statement of the results. Main conclusions conveyed in a final paragraph.	Some interpretation of the results, greater reference to previous scientific studies needed. Minor errors in interpretation of the results. Some re-statement of the results. Conclusions conveyed in a final paragraph.	Some interpretation of the results, greater reference to previous scientific studies needed. Errors in interpretation of the results. Some re-statement of the results. Some conclusions conveyed in a final paragraph.	No interpretation of the results with reference to previous scientific studies given. Results presented. Main conclusions not conveyed in a final paragraph.
Referencing <hr/> /10 x 1	In-text citations and reference list follow BJP conventions. Relevant information selected. A wide range of references used.	In-text citations and reference list follow BJP conventions. Relevant information selected. A wider range of references needed.	In-text citations and reference list follow BJP conventions, with minor errors. Relevant information selected. A wider range of references needed.	In-text citations and/or reference do not follow BJP conventions. Relevant information selected. A wider range of references needed.	BJP conventions not followed. Non-peer review sources used. Information in intro/discussion not referenced. A wider range of references needed
Writing Conventions <hr/> /10 x 1	Excellent sentence structure, correct grammar and word usage. Sentences and paragraphs well connected. Appropriate written expression- using discipline specific vocabulary and formal not oral language. Has been proof read.	Good sentence structure, correct grammar and word usage. Sentences and paragraphs well connected. Appropriate written expression- using discipline specific vocabulary and formal not oral language. Proof reading needed to eliminate minor errors.	Good sentence structure, correct grammar and word usage. Sentences and paragraphs not always well connected. Appropriate written expression- better use of discipline specific vocabulary and formal not oral language needed. Proof reading needed to eliminate minor errors.	Poor sentence structure, grammar and word usage. Sentences and paragraphs not well connected. Appropriate written expression- better use of discipline specific vocabulary and formal not oral language needed. Proof reading needed to eliminate errors.	Use of paragraphs and improved sentence structure needed. The report is difficult to read due to poor grammar and word usage. No evidence of proof reading.
Total= <hr/> /100					

PHARMACOKINETICS PRACTICAL REPORT

NOTE: The write up for the **Pharmacokinetics practical** will require you to answer the questions given at the end of the practical only, see pharmacokinetics practical. A formal report write-up as listed above will not be required.

POSTER PRESENTATION

Academic assessment

Each Student (group) poster will be graded by 2 different academic/staff according to the marking criteria at the scheduled 'Poster Session'. These marks will be collated by the course coordinator to provide the final grade for the poster.

The group mark will be initially assigned to each member of the group. However an individual's mark may be scaled down depending on their peer assessment (see, 'Group-members evaluation' below).

Poster presentation

Aim: Students will work in teams to research a topic for presentation as a scientific poster. The task requires students to research and evaluate a scientific question and come to a conclusion based on their literature search; this may involve various search strategies. Students can then choose a particular focus, to present in poster format, citing approximately 6-8 of the most relevant papers. Students then present the poster to an audience of their peers, and academic/research staff.

Students present the aims, methods, results and conclusion from their literature search on their chosen topic. The methodology defines their search strategy.

Specifically:

The poster should:

- Clearly state the research question
- Describe the literature retrieval process
- Summarise what is known about the topic on the basis of the review that was conducted
- Answer the research question using the literature found
- Summarise the questions/issues/need for future research (if applicable) that arise from the review conducted
- Makes optimal use of visual aids or other creative elements (pictures, drawings, flow charts, figures, etc.) to illustrate key points and provide additional means for the reader to gain understanding about the technique beyond what is stated in the text.

During the Poster-Presentation-Session all students in the group must demonstrate a knowledge of the topic.

A teamwork report worth 5% will be submitted with the poster.

Poster Titles - 2017

Posters will be prepared by a group of up to 4 students and will be presented for marking (by 2 reviewers) at the poster session on the 23rd of May. The poster presentation will be graded on scientific content, visual communication and verbal presentation.

Poster titles will be made available during week 2 of session 1.

All members of the group will be required to participate in the presentation.

GROUP-MEMBERS EVALUATION (of Poster) FORM

Title of poster: _____

Name of student doing the assessment: _____

Instructions

Use this form to evaluate the members of your group. Write the name of each group member, including yourself, in one of the columns, then assign a score of 0 to 10 (0 being the lowest grade, 10 the highest) to each group member for each criterion. Because each group member has different strengths and weaknesses, the scores you assign will differ. At the bottom of this sheet, write down any comments you wish to make.

- Note:
- 1) Each student in the group will complete this evaluation for each member of the group.
 - 2) Students must hand these evaluation forms to the course coordinator during the poster presentation session.
 - 3) While the overall group mark will be set by the 3 academic reviewers this group member evaluation will be used to scale marks within the group as required.
 - 4) An individual's final poster mark will be adjusted if their average peer assessment score is > 15% below the overall average peer assessment score for their group.

The adjustment will generally be made according to the following formula:

$$\text{Adjusted score} = \frac{\text{Academic poster mark} \times \text{individuals average peer assessment score}}{\text{overall average peer assessment score}}$$

Criteria	Group Members (name)		
Regularly attends meetings			
Is prepared at the meetings			
Meets deadlines			
Contributes good ideas			
Effort given to researching subject			
Submits high-quality work			
Listens to other members			
Give constructive feedback			
Responds to constructive feedback			
<u>Your</u> PEER assessment Score of this person's contribution (/10)			

Comments:

TEXTBOOK AND READING LIST

Recommended Primary Texts

Rang, Dale, Ritter and Flower; Pharmacology 8th ed. Churchill Livingstone, 2015

Brunton, Parker, Blumenthal, Buxton. Goodman & Gilman's Manual of Pharmacology and Therapeutics. McGraw-Hill, 2012

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 UNSW [myExperience](#) survey 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 student feedback forum 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 feedback from students the following changes have been made: The weighting of the end of session final examination has been reduced from 65% to 55%. While, the poster presentation assessment has been increased from 10 to 15%. In addition, extra tutorials have been provided and the pain pharmacology practical has been replaced with a new practical class 'Topical analgesia/ anaesthesia' to provide an extra 'wet practical' inductive to reasoning in clinical assessment.

GENERAL INFORMATION

The Department of Pharmacology is part of the School of Medical Sciences and is within the Faculty of Medicine. It is in the Wallace Wurth building, C27. General inquiries can be made at the BABS.SOMS.BEES (B.S.B.) [Student Office](#), located on the Ground Floor Room G27, of the Biosciences Building. Office hours are 9.00 am - 5:00pm.

Prof Margaret Morris is Head of Department and appointments to meet with her may be made via email (m.morris@unsw.edu.au).

Honours Program. Dr Greg Smith (g.smith@unsw.edu.au ph:9385 8075) coordinates the Honours program. Any students considering an Honours year should discuss the requirements with the coordinator.

Honours Administrator: Vicky Sawatt (v.sawatt@unsw.edu.au ph:9385 8195).

Postgraduate degrees

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

Course Work Masters: Masters of Pharmacological Medicine. Contact Dr Orin Chisholm (o.chisholm@unsw.edu.au).

Research Masters: In Pharmacology. Contact the post-graduate co-ordinators Assoc. Prof Pascal Carrive (p.carrive@unsw.edu.au) & Dr Nicole Jones (n.jones@unsw.edu.au).

Doctorate (Ph.D): In Pharmacology. Contact the post-graduate co-ordinators Assoc. Prof Pascal Carrive (p.carrive@unsw.edu.au) & Dr Nicole Jones (n.jones@unsw.edu.au).

Enrolment and administrative help

If you have any problems with enrolment or scheduling please contact the SoMS Student Admin team via email (below) and write PHAR3251 as the subject heading.

Email: SOMSenquiries@unsw.edu.au.

OFFICIAL COMMUNICATION

All communicate will be via your official UNSW email please see [Advice for Student-Official Communication](#) for more details.

ATTENDANCE REQUIREMENTS

For details on the Policy on Class Attendance and Absence see [Advice for Students](#) and the [Policy on Class Attendance and Absence](#).

Attendance at practical classes is compulsory, and must be recorded in the class roll at the start of each class. Arrival more than 15 minutes after the start of the class will be recorded as non-attendance. 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. Students who miss practical classes due to illness or for other reasons must submit a copy of medical certificates or other documentation to the course coordinator.

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.

Students must take due care with biological and hazardous material and make sure all equipment is left clean and functional. 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.

For more details see [Advice for Students-Practical Classes](#)

ACADEMIC INTEGRITY AND PLAGIARISM

The School of Medical Sciences will not tolerate plagiarism in submitted written work. The University regards this as academic misconduct and imposes severe penalties. Evidence of plagiarism in submitted assignments, etc. will be thoroughly investigated and may be penalized by the award of a score of zero for the assessable work. Flagrant plagiarism will be directly referred to the Division of the Registrar for disciplinary action under UNSW rules.

The [UNSW Student Code](#) outlines the standard of conduct expected of students with respect to their academic integrity and plagiarism.

More details of what constitutes plagiarism can be found [here](#)

MISSED EXAMS AND SPECIAL CONSIDERATION

Please see [UNSW-Special Consideration](#) and [Student Advice-Special Consideration](#)

If you unavoidably miss an exam in PHAR3251, you must lodge an application with UNSW Student Central for special consideration.

PLEASE NOTE that if you miss any examinations for medical reasons you must lodge a medical certificate with UNSW Student Central within **3 DAYS**. Your request for consideration will be assessed and a supplementary exam may be granted. You cannot assume you will be granted supplementary assessment.

MISSED PROGRESS EXAM

If you unavoidably miss the progress exam in PHAR3251, you must inform the course coordinator within **3 DAYS**. You must supply adequate documentation (medical certificate) to be considered for any supplementary progress exam. If your request for consideration is granted an alternative assessment will be organised which may take the form of a supplementary exam or increased weighting of the final exam.

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 coordinator.

STUDENT SUPPORT SERVICES

Details of the available student support services can be found at [Student Advice-Student support services](#).

APPEAL PROCEDURES

Details can be found at [Student-Advice-Reviews and Appeals](#)

LECTURE OVERVIEW AND SUMMARIES

The course timetable can be found on Moodle.

The course is divided into 4 main themes covering the major diseases and therapeutics;

- Drugs affecting diseases and disorders of major systemic organ systems
- Predicting drug concentrations in the body (pharmacokinetics)
- Cancer chemotherapy
- Infection and antimicrobial drugs

Anti-Hypertensive Drugs

Definition of hypertension, primary (essential) and secondary hypertension, consequences of untreated hypertension, guidelines for treating hypertension, non-pharmacological treatment including lifestyle issues, pharmacological treatment including ACE inhibitors, angiotensin 2 receptor blocking agents, diuretics, calcium channel blocking agents and beta receptor blocking agents

Cardiac Failure

Types of heart failure, causes of heart failure, signs and symptoms of heart failure, pathophysiological changes, non-pharmacological treatment, pharmacological treatment including ACE inhibitors, angiotensin 2 receptor blocking agents, diuretics, beta receptor blocking agents, spironolactone and digoxin

Lipid lowering drugs

Dyslipidaemia is considered a primary contributor to the development of atherosclerosis leading to heart disease. This lecture will outline briefly the pathogenesis of atheroma and the process of lipid transport before discussing the mechanism of action of the major classes of lipid lowering drugs. Limitations of current lipid therapies will be discussed with an emphasis on possible areas of new drug targets.

Haemostasis and Thrombosis drugs

This lecture will review the fundamentals of blood coagulation emphasizing primary elements that underlie haemorrhagic and thrombotic disease. Using this as a foundation the lecture will then discuss the role and mechanism-of-action of the anticoagulant, anti-platelet and thrombolytic drugs currently used in clinical medicine. Limitations of current anticoagulant and thrombotic therapy and possible new drug targets will then be discussed.

Endocrine 1& 2

After a brief overview of endocrine function, major issues regarding treatment of endocrine disorders will be addressed. The lecture will focus on two common endocrine disorders, thyroid disease and diabetes. Their epidemiology and rationale for treatment will be discussed, including the adverse effects of therapy. The need for ongoing monitoring of therapy will be highlighted.

Renal Pharmacology

This lecture will outline the role played by the kidney in the development of oedema and hypertension. The mechanism of action of important drug classes that act on the kidney will be outlined and their relative merits in controlling disease will be discussed within the clinical context.

Pharmacokinetics 1&2: These lectures will provide an introduction to the calculation of major pharmacokinetic parameters based on either single or 2 compartment modelling. Parameters covered include; half-life, volume of distribution, clearance, dosing rate, maintenance dose and bioavailability. Numerical examples will be given. The accumulation of drugs and fluctuations in plasma levels during long term drug treatment will be discussed.

Drugs for young and old

The objectives of this lecture are to understand the factors influencing drug handling in the very young and elderly patient and to be able to describe the effects of ageing on pharmacodynamics and pharmacokinetic parameters. Polypharmacy, multiple diseases and optimal prescribing practice will be discussed.

Tropical Medicine

This lecture will cover a brief overview of fungal and protozoal infections, the life cycle of the malaria parasite, antimalarial drugs, tuberculosis, drugs used to treat tuberculosis and resistance to antimicrobial drugs.

Anti-Viral Pharmacotherapy

A brief overview will be given on viruses and their classification. The infectious process for a virus will be discussed and the biochemical targets for antiviral therapy developed from that discussion, using the Human Immunodeficiency Virus (HIV) as the main example. The major antiviral drug classes will be presented, as well as treatment limitations and failures, highlighting the need for the development of new agents.

Anti-Cancer Drugs 1&2

Cancer biology including epidemiology, incidence and mortality, tumour genetics, apoptosis, metastasis, tumour vasculature, approaches to cancer treatment, reasons for treatment failure, mechanisms of cancer drug resistance, cancer drug classes including antimetabolites, hormones, hormone antagonists, mitotic spindle inhibitors and DNA-binding agents. Targeting P13 kinase in cancer.

Antibacterials 1&2

Lecture 1 covers antibiotic resistance mechanisms and drugs that target DNA biochemistry, including dihydropteroate synthase inhibitors, dihydrofolate reductase inhibitors, and DNA gyrase inhibitors. Lecture 2 addresses cell wall biochemistry and inhibitors of cell wall synthesis (penicillins, cephalosporins, vancomycin), and protein biosynthesis and inhibitors of ribosome function (tetracyclines, aminoglycosides, macrolides).

Therapeutics of the G.I.T.

The gastrointestinal tract (G.I.T.) is a complex organ system that, in addition to its digestive capability, possesses an extensive neuronal network and major endocrine functions. A wide range of pathologies affect the G.I.T. and contribute significantly to morbidity within the society. This lecture will discuss the rationale for therapy and the mechanism of action of current drugs affecting gastric secretion and motility and will highlight limitations of current therapy and possible new areas for drug targets.

Reproductive Pharmacology

This lecture will review the physiological actions of estrogens, progestins and androgens. The molecular basis of their actions at nuclear receptors will be discussed. The clinical uses of these hormones and antagonists of their receptors in contraception, hormone replacement therapy, prostate cancer and benign prostate hypertrophy will be addressed. The treatment of erectile dysfunction will also be covered

Antiinflammatory/Antiarthritic Drugs

This lecture will provide a brief overview of the use of pharmacotherapy in the two types of arthritis broadly classified as inflammatory and non-inflammatory arthritis. The objective of drug therapy in these conditions is for symptom control (pain, stiffness, loss of function) and suppression of disease activity in order to prevent long-term damage. The mechanisms of pain, inflammation and joint damage and the pharmacological approaches to dealing with these will be presented.

Opioids in pain management:

This lecture encompasses: analgesic agents; historical introduction to the use of opioids, *Papaver somniferum* and opium; mode of action; the opioid receptors; the endogenous opioids; assessment of analgesic activity, pain measurement and pain control; adverse effects; commonly used opioids including, morphine, codeine, pethidine, methadone, heroin, fentanyl, oxycodone, naloxone, and buprenorphine; tolerance, dependence and opioid kinetics.

Topical Formulations

This lecture will enable students to describe the different types of topical application, discuss topical and transdermal administration of drugs and the factors which affect bioavailability and pharmacokinetics of topically applied drugs. Students will be able to describe the principal behind the transdermal delivery systems outline in the lecture.

Respiratory Pharmacology

This lecture builds upon the concepts encountered in Introductory Pharmacology 'The Pharmacology of asthma'. The lecture will focus on chronic airway limitation, a disease state characterized by airflow limitation that is not fully reversible (unlike asthma) leading to chronic bronchitis's and emphysema. The lecture encompasses bronchodilators, anti-inflammatory drugs, antitussives and respiratory stimulants (analeptic drugs).