PHAR3102

Molecular Pharmacology

Course Outline

Term 1, 2023

School of Biomedical Sciences

Faculty of Medicine & Health

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1. Staff

Direct all course-related emails to phar3102@unsw.edu.au

Position	Name	Email	Consultation times and locations	Contact Details
Course Convenor	A/Prof Nicola J Smith	nicola.smith@unsw.edu.au	By appointment	9065 0370
Course Convenor	A/Prof Lu Liu	lu.liu@unsw.edu.au	By appointment	
Course Convenor	Dr Matthew Perry	m.d.perry@unsw.edu.au	By appointment	
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Lecturer	Dr Nicole Jones	n.jones@unsw.edu.au	By appointment	
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2. Course information

Units of credit: 6

Pre-requisite(s): PHAR2011

Teaching times and locations: https://timetable.unsw.edu.au/2023/PHAR3102.html

2.1 Course summary

You will learn the molecular basis of drug action and explore how cutting-edge biotechnology and biomedical research advances pharmacological knowledge. Detailed coverage includes: genetic variability in drug action, protein structure-activity relationships, receptor-ligand interactions, signal transduction, biochemical and molecular aspects of drug targets and their signalling mechanisms The course has a strong focus on developing research and analytical skills.

2.2 Course aims

Building on basic pharmacology skills learned in PHAR2011, the objectives of this course are to

a. explore the basis for drug actions at the molecular level from binding to a target to eliciting a cellular outcome
b. to develop an understanding of why certain molecules might be agonists, antagonists or inverse agonists and the circumstances under which these definitions might change
c. develop an appreciation of how cellular context and genetic variability can impact the effect of a drug at the molecular level

d. to develop skills in the interpretation and analysis of molecular pharmacology experiments and ability to decide whether the data supports the conclusions made by the scientist

2.3 Course learning outcomes (CLO)

At the successful completion of this course you (the student) should be able to:

1. Apply knowledge of molecular pharmacology of drug targets to pharmacological problems
2. Describe the effect of genetic variability on drug action
3. Apply knowledge of molecular biology techniques to the design of experiments to test molecular pharmacology hypotheses
4. Record, analyse and/or draw conclusions from experimental data

2.4 Relationship between course and program learning outcomes and assessments

Course Learning Outcome (CLO)	LO Statement	Related Tasks & Assessment
CLO 1	Apply knowledge of molecular pharmacology of drug targets to pharmacological problems	1, 2, 3, 4
CLO 2	Describe the effect of genetic variability on drug action	1, 2, 3, 4
CLO 3	Apply knowledge of molecular biology techniques to the design of experiments to test molecular pharmacology hypotheses	1, 2, 3, 4
CLO 4	Record, analyse and/or draw conclusions from experimental data	1, 2, 3, 4

3. Strategies and approaches to learning

3.1 Learning and teaching activities

The learning and teaching philosophy underpinning this course is centred on you gaining core skills and developing an understanding of the molecular basis of drug action. We aim to create an environment which interests and challenges you. The teaching is designed to be engaging and relevant to prepare you for future careers. The primary source of information for this course is the lecture material, with the collaborative learning sessions, practical classes and online material directly complementing and supporting the lecture material. Additionally, effective learning can also be enhanced through self-directed use of other resources such as textbooks, literature references and web-based sources.

Learning activities occur on the following days and times:

Lectures: Topics being covered each week can be found on the course timetable. The topics will be covered via pre-recorded lectures and will be available online prior to the week scheduled.

Collaborative learning session: You should attend one session per week, delivered face to face on Tuesday at either 12 – 1 pm or 1 – 2 pm in Mathews 230 (K-F23-230).

Laboratory practicals: You should attend the laboratory practicals to be held face to face on Fridays 9 am – 12 pm in Wallace Wurth 120 (K-C27-120). The practicals are a core part of your learning experience in the sciences.

Q & A sessions: Online on Wednesday 12 – 1 pm via Teams.

Mid-term progress test: Week 5 (covers content from weeks 1-4) and will be held during the Q & A time slot of week 5.

Information regarding weekly activities will be available via the interactive timetable on Moodle and in weekly announcements via Moodle.

3.2 Expectations of students

Students are reminded that UNSW recommends that a 6 units-of-credit course should involve about 150 hours of study and learning activities. The formal learning activities total approximately 60 hours throughout the term and students are expected (and strongly recommended) to do at least the same number of hours of additional study.

The *Q&A sessions* are provided to allow you the opportunity to clarify points covered in each week's topics. You should review the week's topics and make notes well in advance of the Q&A session. You should then review your notes and write down any questions you have about these topics – posting them in advance on the discussion forum is a great idea. Join the online Q&A session to discuss the answers.

The *practicals* are provided to support lecture material and practise analytical and critical evaluation skills.

In the *collaborative learning sessions*, you will learn about techniques used in molecular pharmacology. You will then apply this knowledge in the critical analysis and interpretation of data presented in a journal article. These sessions will allow you to develop your research, information literacy, critical analysis, communication and time management skills.

The practical classes and collaborative learning sessions help you to achieve course learning outcomes 1-4. You need to complete any preparation work set prior to attending these classes. This might include pre-lab modules, reading of information sheets or answering Journal Club questions. Attendance at practical classes and collaborative learning sessions will be recorded at the start of each class.

If you wish to contact the course convenors or staff, you can do so by via the course e-mail, using the details provided in section 1 of this document and on the course Moodle page. We are committed to providing the best experience and outcome for all students and will therefore endeavour to respond to e-mails as soon as possible, but please consider the following:

- Standard work hours are Monday to Friday from 8 am to 6 pm. E-mail correspondence received outside of this time may be dealt with from the next working day.

- All staff have busy schedules and multiple commitments, so while staff will endeavour to answer e-mail correspondence as quickly as possible, please apply appropriate expectations in this regard (i.e., within 48 hours and on a workday).
- Please only use Teams messaging to communicate with the course staff during class, although we cannot guarantee we will see it while we are teaching. Outside of class, please use the course e-mail.
- All digital correspondence, including e-mail, Teams messages, and messages on discussion forums, should be respectful, courteous, and polite.

To help us improve the course, please consider providing us with feedback by acting as a **student liaison** and/or by completing the MyExperience survey later in the term.

4. Course schedule and structure

This course consists of 58 hours of class contact hours. You are expected to take an additional 100 hours of non-class contact hours to review online topics (lectures), complete assessments and class preparation activities, and study and revision in preparation for exams.

Week	Topic	Activity [Learning opportunity]	Related CLO
Week 1 (13 Feb)	• Introduction to Molecular Pharmacology • G protein-coupled receptors	Collaborative learning session: Introduction to CLS Practical: Introduction to practical class & accurate record keeping Q&A: week 1 topics	1, 3, 4
Week 2 (20 Feb)	• Advanced Pharmacodynamics: measuring drug response • Advanced Pharmacodynamics: binding kinetics	Collaborative learning session: Molecular technique - BRET Practical: Determining antagonist potency Q&A: week 2 topics	1, 3, 4
Week 3 (27 Feb)	• Signalling pathways • G proteins	Collaborative learning session: Journal Club Practical: Receptor binding Q&A: week 3 topics	1, 3, 4
Week 4 (6 Mar)	• Constitutive activity & inverse agonism • Turning off the signal	Collaborative learning session: Molecular technique - confocal Practical: Receptor Signalling A: drug treatment Q&A: week 4 topics	1, 3, 4
Week 5 (13 Mar)	• Subcellular control of signalling • Biased signalling	Collaborative learning session: Journal Club Practical: Receptor Signalling B: protein separation Q&A: mid-term progress test	1, 3, 4
Week 7 (27 Mar)	• Receptor theory • Allosteric modulators	Collaborative learning session: Molecular technique - AlphaScreen	1, 3, 4

		Practical: Receptor Signalling C: Western blotting Q&A: week 7 topics	
Week 8 (3 Apr)	• Orphan receptors • Ligand-gated ion channels	Collaborative learning session: Journal Club NO PRACTICAL for Good Friday Q&A: week 8 topics	1, 3, 4
Week 9 (10 Apr)	• Catalytic receptors • Nuclear receptors/transcription factors	Collaborative learning session: Molecular technique - EMSA Practical: Receptor Signalling D: data analysis Q&A: week 9 topics	1, 3, 4
Week 10 (17 Apr)	• Transporters • Pharmacogenetics/genomics	Collaborative learning session: Journal Club Practical: Pharmacogenetics Q&A: week 10 topics	1, 2, 3, 4

Exam Period: 28 April – 11 May

Supplementary Exam Period: 22 May – 26 May 2023

5. Assessment

5.1 Assessment tasks

Assessment task	Length	Weight	Mark	Due date and time
Assessment 1: Mid-term Progress Test	50 min	15%	100	Wednesday 15th March 12 pm
Assessment 2: Laboratory Notebook	See task description for details	15%	100	Weeks 3, 4 & 10 Monday 12 pm
Assessment 3: Collaborative Learning Activities	See task description for details	15%	100	Weeks 2-5, 7-10
Assessment 4: Final Exam	2 h	55%	100	Exam Period: 28 April – 11 May

Assessment 1: Mid-term Progress Test. This test will give you feedback on how you are succeeding in the course. It will test not only your knowledge of the molecular pharmacology of receptors and molecular techniques used in pharmacology, but also your ability to apply the knowledge you have acquired from multiple lectures, collaborative learning sessions and practicals to molecular pharmacology scenarios. The questions will be in the format of MCQ and short answer questions and will be based on the material covered in the lectures, practical classes and collaborative learning sessions. Material covered prior to the progress test may again be examined in the final exam.

Assessment 2: Laboratory Notebook. Students will record the details of each experiment performed during the practical classes, collect and analyse data, and draw conclusions from the data generated.

Assessment 3: Collaborative Learning Activities

Part 1: Molecular Technique Quizzes: Students will take online quizzes covering the application of molecular techniques to pharmacological studies, and the interpretation and analysis of molecular pharmacology experiments (4 quizzes, 5%).

Part 2: Journal Club: 'Journal Club' will be scheduled every second week. You will answer questions that guide you through the process of analysing and drawing conclusions from data presented in a research article that has used the molecular techniques taught in the collaborative learning session the week before. You will submit answers to these questions prior to each journal club. At the end of term you will reflect on your critical analysis learning trajectory and nominate your 'best' attempt at answering the questions for marking (10%).

Assessment 4: Final examination. The end of term examination will test not only your knowledge of the molecular pharmacology of receptors, channels and transporters, and molecular techniques used in pharmacology, but also your ability to apply the knowledge you have acquired from multiple lectures, collaborative learning sessions and practicals to molecular pharmacology scenarios. The examinations will be in the format of MCQ and short answer questions. The questions will be based on the material covered in the lectures, practical classes and collaborative learning sessions.

Further information

UNSW grading system: https://student.unsw.edu.au/grades

UNSW assessment policy: https://student.unsw.edu.au/assessment

5.2 Assessment criteria and standards

Practice exam questions will be made available to you via Moodle, as well as during the collaborative learning sessions.

Details regarding the assessment tasks will be provided to you during the first laboratory practical session and first collaborative learning session in week 1, as well as being available on the course Moodle page. A detailed marking rubric for each task will be provided to you via the course Moodle page.

5.3 Submission of assessment tasks

Late Submission

UNSW has standard late submission penalties as outlined in the UNSW Assessment Implementation Procedure, with no permitted variation. All late assignments (unless extension or exemption previously agreed) will be penalised by 5% of the maximum mark per day (including Saturday, Sunday and public holidays). For example, if an assessment task is worth 30 marks, then 1.5 marks will be lost per day (5% of 30) for each day it is late. So, if the grade earnt is 24/30 and the task is two days late the student receives a grade of 24 – 3 marks = 21 marks.

Late submission is capped at 5 days (120 hours). This means that a student cannot submit an assessment more than 5 days (120 hours) after the due date for that assessment.

Special Consideration

If you experience a short-term event beyond your control (exceptional circumstances) that impacts your performance in a particular assessment task, you can apply for Special Considerations.

You must apply for Special Consideration **before** the start of your exam or due date for your assessment, except where your circumstances of illness or misadventure stop you from doing so.

If your circumstances stop you from applying before your exam or assessment due date, you must **apply within 3 working days** of the assessment, or the period covered by your supporting documentation.

More information can be found on the Special Consideration website.

5.4. Feedback on assessment

Assessment 1: Mid-term progress test. Individual marks are provided via Moodle once the tests have been graded. Cohort feedback is provided in the form of a post or podcast via the course Moodle page in week 7.

Assessment 2: Laboratory Notebook. You will be receiving formative feedback during practical classes and 3 times during the term your laboratory notebook will be graded. After each submission you will receive summative written feedback. A marking rubric will be used to evaluate the laboratory notebooks and provide feedback.

Assessment 3: Collaborative Learning Activities
Part 1: Molecular Technique Quizzes: Feedback will be provided in class once the quiz is completed.
Part 2: Journal Club. You will receive feedback during class on how well you are analysing the journal article as part of the class discussion of the paper. A marking rubric will be used to evaluate your submission and written feedback on your reflection will be provided.

Assessment 4: Final examination. Cohort feedback is provided once the exams are completed in the form of a post in Moodle.

6. Academic integrity, referencing and plagiarism

Referencing is a way of acknowledging the sources of information that you use to research your assignments. You need to provide a reference whenever you draw on someone else's words, ideas or research. Not referencing other people's work can constitute plagiarism.

Please use Vancouver referencing style for this course.

Further information about referencing styles can be located at https://student.unsw.edu.au/referencing

Academic integrity is fundamental to success at university. Academic integrity can be defined as a commitment to six fundamental values in academic pursuits**:** honesty, trust, fairness, respect, responsibility and courage.[1] At UNSW, this means that your work must be your own, and others' ideas should be appropriately acknowledged. If you don't follow these rules, plagiarism may be detected in your work.

[1] International Center for Academic Integrity, 'The Fundamental Values of Academic Integrity', T. Fishman (ed), Clemson University, 2013.

Further information about academic integrity and **plagiarism** can be located at:

- The Current Students site https://student.unsw.edu.au/plagiarism, and
- The ELISE training site https://subjectguides.library.unsw.edu.au/elise

The Conduct and Integrity Unit provides further resources to assist you to understand your conduct obligations as a student: https://student.unsw.edu.au/conduct.

7. Readings and resources

Due to the cutting-edge nature of this course and the rapid advances made in the field of Molecular Pharmacology, a single primary text that adequately covers the content of this course has not been identified. Therefore, each lecturer will provide you with additional resources to supplement their lecture material. These resources will take the form of textbooks, journal articles or web-based resources. If available, links to the electronic form of these resources will be placed on the course Moodle page.

Three textbooks have been identified that together cover the majority of the course content. These texts are available as online resources from the UNSW library.

- "Pharmacology in drug discovery: understanding drug response" by T. P. Kenakin.
- "Molecular Pharmacology: From DNA to Drug Discovery" by Dickenson, Freeman, Lloyd Mills, Thode, & Sivasubramaniam.
- "General and Molecular Pharmacology: Principles of Drug Action" Edited by Francesco Clementi and Guido Fumagalli, will be used as an additional reference text throughout the course.

8. Administrative matters

Student enquiries should be submitted via student portal https://portal.insight.unsw.edu.au/web-forms/

9. Additional support for students

- The Current Students Gateway: https://student.unsw.edu.au/
- Academic Skills and Support: https://student.unsw.edu.au/academic-skills
- *Student Wellbeing and Health* https://www.student.unsw.edu.au/wellbeing
- UNSW IT Service Centre: https://www.myit.unsw.edu.au/services/students
- *UNSW Student Life Hub:* https://student.unsw.edu.au/hub#main-content
- *Student Support and Development:* https://student.unsw.edu.au/support
- *IT, eLearning and Apps:* https://student.unsw.edu.au/elearning
- *Student Support and Success Advisors:* https://student.unsw.edu.au/advisors
- *Equitable Learning Services (Formerly Disability Support Unit):* https://student.unsw.edu.au/els
- *Transitioning to Online Learning* https://www.covid19studyonline.unsw.edu.au/
- *Guide to Online Study* https://student.unsw.edu.au/online-study