



1. Will this new course affect a current program?

Yes ☐ No ☒

If "yes", has a Program Revision Form been submitted concurrently?

Yes ☐ No ☐

2. Teaching Department:

Pharmacology and Therapeutics

3. Administering  
Faculty/Unit:

Science

6. Responsible  
Instructor

Anne McKinney

4. Campus  
(Downtown, Macdonald,  
Off Campus, Distance  
Ed, Other – specify)

Downtown

5. Effective Term of Implementation  
(Ex. Sept. 2004 = 200409)

Term:

200801

7. Course Title (Limit 30 Characters) - required for all courses:

Pharmacology Research Topics

9. Course Title to Appear in the Calendar (optional)

(Limit 59 characters):

Note: This can ONLY be an expansion of word(s) abbreviated in the 30 character course title above.

8. Course Number(s)

Indicate course number & the number of terms spanned:  
(tick all that apply)

Subject/course number:

PHAR558

Course(s) Span:

☒ 1 term

☐ 2 consecutive terms (D1, D2)

☐ 2 non-consecutive terms (N1, N2)

☐ 3 consecutive terms (J1, J2, J3)

10. Credit Weight

(or CEU's for non-credit CE courses):

3 credits

11. Rationale for new course

With the development of a Pharmacology Majors program, we acknowledge the mandate to expose undergraduate students to research and its role in pharmacology. We will focus on individual protein targets and how our notions of a single target have changed in light of methodological and conceptual advances in recent years. It is clear that methodological advances have been critical for addressing a number of important problems in pharmacology. The target proteins will be from among those taught in 562/563 and will **complement**, rather than overlap directly with 562 or 563 and 503/504. These represent a broad cross section of key macromolecular structures localized in multiple subcellular compartments and interacting with distinct sets of partners in different cells and/or organelles. We will also highlight the strengths and weaknesses of many of the techniques we discuss. An initial lecture will survey the target to be studied: basic function and tissue distribution and perhaps more importantly how our view of their structure and organization has changed over the years since discovery. This will set the stage for a series of lectures on *how* these views changed and their attendant effects on pharmacology as a discipline. There will be 3 stages of study in the research topics course for each of these targets initially described in 562/563 which may run separately or in parallel: 1) Trafficking and assembly of multiprotein complexes associated with the target, 2) spatiotemporal aspects of cellular signalling mediated by the target and 3) studying the target in a native cellular context. Students will attend both lectures and tutorials, will be assigned a number of research papers and will give a presentation. There will be a final exam.

12. Course Description

(as it will appear in the Calendar [maximum 50 words]):

**(N.B. Faculty of Medicine must append complete course outline)**

Selected drug targets in their native cellular milieu, in the context of intact tissues, organs and whole animals, highlighting conceptual advances in pharmacological theory.

13. Supplementary information to appear in the Calendar in addition to the course description.

Such as: equivalent course(s), contact hours, enrolment limitations, language of instruction etc.

Please enter the information as it should appear in the calendar notes.

14. Schedule Types(s):

(Enter all that apply – see course guidelines for a complete list.)  
(i.e. Lecture, Labs, Tutorial)

	Hours per Week		Hours per Week		Hours per Week
Lectures	<input type="text" value="2"/>	Tutorials/small groups	<input type="text" value="1"/>		<input type="text"/>
	<input type="text"/>		<input type="text"/>		<input type="text"/>
Total Hours per Week:					<input type="text" value="3"/>
Total Number of Weeks:					<input type="text" value="13"/>

15. Projected Enrolment:

16. Required text and/or preliminary reading list sent to library?

☐ Yes ☒ No

17. Prerequisite(s) (Courses or Tests)

Specify course number(s) or name(s) of test(s):

If the student does not have a prerequisite  
should web registration be blocked?

☐ Yes ☐ No

If "Yes" complete A and B:

A. Indicate minimum grade or test score(s) the student  
must attain in prerequisite course(s) or test(s):

B. Can the prerequisite course(s) or test(s) be taken in the  
same term as this course?

☐ Yes ☐ No

18. Corequisite(s) Course Number(s):

Specify course number(s) and title(s):

If the student does not register for the corequisite  
in the same term should web registration be blocked?

☐ Yes ☐ No

19. Restriction(s):

20. Consultation Reports Attached

☐ Yes ☐ N/A

21. Additional Course Charges (must be approved by the Fee  
Policy Committee)

Description of Fee  
(e.g. screening fee)

Amount

22. Requires Teaching, Physical, or Financial Resources  
Not Currently Available (attach explanation)

☐ Yes ☒ No

INFORMATION FOR ADMISSIONS, RECRUITMENT & REGISTRAR'S OFFICE		
<i>To be completed by the Faculty</i> Slot Course: <input type="checkbox"/> Yes <input type="checkbox"/> No   Thesis Component: <input type="checkbox"/> Yes <input type="checkbox"/> No	<i>To be completed by ARR</i> CIP Code <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div>	<i>For Continuing Education Use</i> CE Admin. Unit : <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div> CE Non-Grant Courses: <div style="border: 1px solid black; height: 20px; width: 100%; margin-top: 5px;"></div> Flat Rate: CdnFlat Rate: <input type="checkbox"/> Yes <input type="checkbox"/> N/A

23. Approvals:						
Routing Sequence	Departmental Meeting	Departmental Chair	Other Faculty	Curric/Academic Committee	Faculty	SCTP
Name	<div style="border: 1px solid black; padding: 2px;">Dr. Barbara Hales</div>	<div style="border: 1px solid black; padding: 2px;">Dr. Hans Zingg</div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Signature	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Date	<div style="border: 1px solid black; padding: 2px;">August 24, 2006</div>	<div style="border: 1px solid black; padding: 2px;">August 24, 2006</div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>
Departmental Contact Person (name/phone/email)	<div style="border: 1px solid black; padding: 2px;">Tina Tremblay/398-3623/ Christina.tremblay@mcgill.ca</div>					

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## Selected Research Topics in Pharmacology

Course coordinator: Anne McKinney

Lecturers: Derek Bowie, Terry Hébert and possibly Dan Bernard, Stéphane Laporte

*This course will explore the changing nature of selected drug targets in light of advances in techniques for studying proteins in their native cellular milieu and in the context of intact tissues, organs and whole animals. It will also highlight several recent conceptual advances in pharmacological theory which have tremendous bearing on how drug targets are viewed and characterized.*

2 hours of lectures per week and 1 hour of tutorial/discussion of relevant literature. The latter part will include student-led discussions and presentations. Student participation in presentations and discussion will count for 50% of the final mark. There will be a final exam as well which will count for 50% of the final mark.

### Content

As discussed, we will stay away from a disease-based or specific system-based approach and focus on individual drug targets and how our notions of a single target have changed in light of methodological and conceptual advances in recent years. It is clear that methodological advances have been critical for addressing a number of important problems in pharmacology. The targets will be chosen from among the following (and others as necessary) and should **complement**, rather than overlap directly with PHAR 562 or 563 and 503/504- this will be worked out in collaboration with coordinators for these courses. Appropriate review articles from scientific journals will be distributed to the students at the beginning of the class.

These represent a broad cross section of key targets localized in multiple subcellular compartments and interacting with distinct sets of partners in different cells and/or organelles. Interestingly, for example, there are now cell surface steroid receptors and nuclear GPCRs. They also can highlight the strengths and weaknesses of many of the techniques we discuss. The initial subject targets will be *initially broached in 562 or 563* along the lines of characterization of the target as a macromolecule.

Initial lecture- Our initial lecture will be a survey of the targets to be studied: their basic function and tissue distributions and perhaps more importantly how our view of their structure and organization has changed over the years since their discovery. This will set the stage for a series of lectures on *how* these views changed and their attendant effects on pharmacology as a discipline. Subsequent lectures will focus on 6-8 targets which may include (but are not necessarily limited to):

GABA-A receptors  
NMDA receptors  
Insulin receptors  
Kir6/SUR channels  
 $\beta$ -adrenergic receptors  
Prostaglandin receptors  
PKA and the AKAPs  
Estrogen receptors

There will be 3 stages of study in the research topics course for each of the targets initially described in 562/563 which will run separately (562, fall semester) or in parallel (563, winter semester):

- 1) Trafficking and assembly of multiprotein complexes associated with the target
  - a. Protein dynamics- i.e. biosynthesis and targetting to distinct subcellular compartments, half-life determination and degradation.
  - b. Assembly of target proteins with specific sets of partners in a given locale. Trafficking of proteins as a regulatable process. We will consider, for example, anterograde receptor trafficking to alternate subcellular destinations following biosynthesis and ligand-induced internalization and recycling to different compartments.

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- 2) Spatiotemporal aspects of cellular signalling
    - a. Changes in our concepts of ligands and selectivity- going from early work of Black for example on SAR to more recent notions such as stimulus trafficking (see Kenakin, 2002 Annu. Rev. Pharmacol. Toxicol. 2002. 42:349–79). Stimulus trafficking and inverse agonism are two notions we will draw out effectively in this course.
    - b. Cellular context is important in determining signalling outcomes and drug responses.
    - c. Subcellular localization is important in determining signalling outcomes and drug responses.
    - d. Dynamic signalling networks- systems biology approaches to look at gene and protein networks (siRNA, microarrays, protein chips)
  - 3) Going beyond the single cell
    - a. Multicellular preparations, multiphoton imaging- moving techniques from single cells to tissue preparations
    - b. Model organisms (as they apply to our specific targets only) such as *C. elegans* or *Drosophila*
    - c. Transgenic models- inducible KO and KI
    - d. Whole animal physiology
    - e. Strain differences and genetic backgrounds
    - f. Pharmacogenomics/pharmacoeugenetics- i.e. variations in individual responses to drugs

We will start at biochemistry and move into live cell and whole animal approaches. Here, we also have a great many possibilities to explore methodology- imaging techniques, proteomics both small and large scale, biophysical approaches to protein/protein interaction and trafficking (BRET/FRET/FLIM/FRAP etc.). Concepts will include those mentioned above and the changing nature of drug selectivity which follows recent developments. This will get us into the range of techniques which will allow us to come full circle and repose our questions in a physiological context.