

MPTX 500: Mechanisms of Cell Signaling [Fall 2009]

Part 1: Principles of Cell Signaling Systems

Wed	Aug 26	Overview of the Course / Protein Interaction Networks	Roger Duncan
Fri	Aug 28	Purpose, Principles, Components, and Mechanisms of Cell Signaling	Axel Schönthal
Wed	Sept 2	Protein scaffolds and their roles in signaling	Curtis Okamoto
Fri	Sept 4	Protein-protein interactions via conserved domains: SH, PH, zippers	Ian Haworth
Wed	Sept 9	Second messengers: cAMP, calcium, etc.	Enrique Cadenas
Fri	Sept 11	Imaging Signal Transduction: Real Time Dynamics	Sarah Hamm-Alvarez
Wed	Sept 16	G Protein Coupled Receptors and Heterotrimeric G Proteins	Jeannie Chen

Part 2: Signal Transduction through Protein Kinases

Fri	Sept 18	Growth Factor / Cytokine Signaling: Essential for Life, Role in Disease	Wei Li
Wed	Sept 23	Protein Kinases 1: What are They?	Wei Li
Fri	Sept 25	Protein Kinases 2: How to get to know them?	Wei Li
Wed	Sept 30	Protein Kinase C	Rayudu Gopalakrishna
Fri	Oct 2	Projects and Discussion	Faculty 1st Module

Part 3: Cell Signaling through Ion Channels

Wed	Oct 7	Ligand Gated Ion Channels	Daryl Davies
Fri	Oct 9	Voltage Gated Ion Channels	Daryl Davies
Wed	Oct 14	Voltage Gated Ion Channels	Daryl Davies
Fri	Oct 16	Midterm Exam (Aug 26-Oct 14)	Faculty, 1st Half

Part 4: Signal Transduction Regulation of Gene Expression

Wed	Oct 21	Wnt Signaling	Michael Kahn
Fri	Oct 23	Signal Transduction Pathways that Regulate Co-activator Function	Michael Kahn
Wed	Oct 28	Steroid receptors / Nuclear receptors	Gerry Coetzee
Fri	Oct 30	Epigenetic Regulation of Gene Expression	Woojin An
Wed	Nov 4	Signal Transduction Pathways that Regulate Transcription	David Ann
Fri	Nov 6	Projects and Discussion	Faculty 2nd Module

Part 5: Signal Transduction Regulation of Physiological Responses

Wed	Nov 11	Immunology Signaling	Markus Muschen
Fri	Nov 13	Immunological 2	Markus Muschen
Wed	Nov 18	Signal Transduction Pathways Involved in Cancer	Axel Schönthal
Fri	Nov 20	Signal Transduction Involving the PI3K / PTEN Pathway	Bangyan Stiles
Wed	Nov 25	Signal Transduction by Oxidative Stress and NO	Derrick Han
Fri	Nov 26	No Class - Thanksgiving holiday	
Wed	Dec 2	Signal Transduction Pathways that Regulate Translation	Roger Duncan
Fri	Dec 4	Signal Transduction Pathways that Regulate Apoptosis	Roger Duncan
Fri	Dec 11	Final exam (Oct 21-Dec 4)	Faculty, 2nd Half

Wednesday & Friday, 1 - 3 pm, [PSC 104](#) School of Pharmacy Building

Course Overview:

Course Coordinator: Roger Duncan
Room 210A (School of Pharmacy)
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Course Faculty:

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Course Description: Cell signaling involves the communication of information eliciting physiological responses via intermolecular networks, frequently involving protein kinase cascades and phosphorylation-based alterations in effector protein activities. These networks are akin to the *brains* that control and regulate cell, tissue and organism behaviors. Understanding the elements of cell signaling is key to understanding how cells function.

Prerequisites: INTD 561 (or a similar advanced course covering gene expression and its regulation) is recommended. A rigorous course in molecular and/or cell biology should provide adequate background. First year students wishing to enroll should discuss his/her background with Dr. Duncan or the PIBBS coordinator before enrolling.

Meeting Time / Place: Wednesday & Friday, 1-3 PM, Room **PSC 104** (Pharmacy School Building).

Course Information: Will be periodically posted on the Blackboard website (totale.edu.usc).

Important Dates: Midterm Exam (October **16, 1-3 PM**).
Exams: Final Exam (December **11, 1-3 PM**).

Overall Grading: Midterm Exam: 40%
Final Exam: 40%
Presentations: 20%

EXAMS: In class, short essay. Bring your brain and deductive powers, nothing else.

PRESENTATIONS: Students will develop a research project, which will be written up in the form of a brief research strategy with background and references (described in detail below). The project will be developed in response to a specific question provided by the faculty, and distributed to the class 2 weeks before the presentation date. An example question is listed below.

•**Presentation Teams:** Students will be divided into assigned groups (probably 4 persons per group, but the numbers will depend on the number of students enrolled). Students within the group will work as a team to answer the question, and present their oral and written results.

There will be two projects/presentations per semester. Different groups will be assigned for each project.

•**Oral Presentation:** Each student group will have about 30 min to describe the background for their

research project, and their strategy for accomplishing it. Background should provide sufficient detail that all listeners will clearly understand the foundation and principles for the research strategy that will be described. Strategies should provide sufficient detail that the listener can fully appreciate and evaluate the step-by-step aims and results and whether they adequately achieve the goal.

•**Written Presentation:** Each student group will submit a brief report¹ (500-1000 words, approximately 2-3 pages (exclusive of figures (should these be used) and references)) to the course coordinator by the Monday following the oral presentation, summarizing their response to the question. References must be included; typically 3-10 should suffice.

•**Participant Review:** Each member of each group will evaluate the participation of the other members in the group. Individual evaluations will *not* be shared between group members; the summary score will be all that is reported.

•**Presentation Score:** Each presentation will be scored on a 100 point scale. The oral presentation will account for 40 pts.; the written portion for 40 pts; and the participant evaluation 20 pts. In the final accounting of points for the entire course, each presentation will count for 10%. Hence a score of, for example, 90 points on presentation 1 will convert to 9 points in the overall course score.

•**Example and Rationale:** The course seeks to foster peer interaction and collaboration in problem solving. This course also attempts to emphasize practical applications of cell signaling research in problem-oriented questions.

An example question might be:

Mitochondrial signaling initiating apoptosis has recently been shown to be dependent on the function of the chaperone proteins Hsp90 and TRAP. Describe why this would be relevant to cancer biology and treatment, and a specific strategy to identify a mitochondria-specific agent to enhance cancer cell apoptosis by targeting this Hsp90-mitochondria axis. In preparing your answer, you should use all available resources in establishing the foundation but do not merely reiterate strategies in published resources when presenting your own research strategy; try to develop something novel.

1. Plagiarism is the copying of text from published manuscripts, books, websites, etc. A sentence taken from a primary source in which only one word, for example the verb, is changed is still plagiarism. Even retaining one clause in a complex sentence, completely intact or minimally altered, represents plagiarism, if it is done intentionally. Primary text from a published report can be used if it is specifically attributed to the original author, using quotes and a reference. However, this is generally a poor writing practice and should be avoided unless the original authors' phrasing is so compelling as to warrant it. If quoted material is used, it should be kept to a minimum.

Plagiarism is severely penalized as specified in the USC Code of Student conduct, as well as by the standards of ethical science. The severity of penalty applied to plagiarism on the reports will range from a significant point deduction (e.g. 20 points on a 100 point scale) to a severe point deduction (up to "no grade", or 0) to assessing a grade of "F" for the entire course. The severity will be determined by the Course Coordinator in consultation with the faculty. For example, the incorporation of a minimal number of copied sentences or clauses would be a more minor offense. The reproduction of a complete segment from a published report, incorporating minor changes to give the appearance of originality, would be a major offense, clearly indicating intentional deception.

Submitting a report that is not the student's/group's original work is equally unacceptable, and will be severely penalized as a major breach of ethical behavior.

Students who are still gaining proficiency in English may obtain minor guidance from persons with English language skills after the student has prepared the "final" form of their paper, but this should not include significant re-writing for content by the assisting individual. This should be less of an issue in these projects since students will be working in groups.