



HUMAN CELL BIOLOGY--BIO315HF

Professor Danton H. O'Day
University of Toronto at Mississauga

Introduction

INSTRUCTOR

Professor Danton H. O'Day, Ph.D.
Department of Biology--Room 2003
University of Toronto at Mississauga
Email: bio315h@utm.utoronto.ca

Contact the course instructor if you require general help on lecture material. Make sure you have read the online lecture material and any pertinent textbook chapters prior to seeking help from your instructor.

Introduction

The cell is the "unit of life". Its survival and function requires an ongoing, dynamic interaction between all of its internal components. These internal functions must also work in concert with events occurring both at the cell surface and in the extracellular environment. The goal of this course is to teach students about these interactions so that they begin to understand to complexity of cellular structure and function. We will do this by first dismantling the cell and discussing many of its constituents. After discussing how they function and how they interact with other components, we will begin to show how the cell is more than the sum of its parts.

Student Responsibilities

Every student must read the lectures prior to class and be prepared to discuss the content. The lectures will focus on clarifying and extending the understanding of essential concepts. It will not involve a reiteration of the online facts. Instead it will show the importance of the material and will involve the discussion of current issues based on student interest.

Course Rules

- You must attend tutorials; attendance will be taken; missed tutorials will affect your "contribution to tutorials" mark
- Lectures are optional but if you miss a lecture, it is your responsibility to catch up
- Talking is a No-No during class discussions; students who carry on conversations will be asked to leave
- If you have a question, raise your hand to ask a question
- If you have difficulties, don't wait until the day before the test to ask for help
- We won't be rescheduling tests or the test make-up date, so make up a schedule now

About Tutorials

The tutorials have been designed to complement the lecture material and to help you as you understand the complexity of cell function. Your Teaching Assistant will discuss how he/she will run the tutorials during your first tutorial session.

Teaching Assistants

For help with tutorial material contact your teaching assistant not Professor O'Day. Setting up an appointment via email is the best way to guarantee a respectable amount of time for discussing lab related

material. When meeting with your TA be sure to bring all of your work. Don't expect answers to problems when you haven't attempted to solve problems independently.

Textbook & Supplementary Reading

There is no required textbook since none is appropriate to our course content. Any current Cell/Molecular Biology text can be used as a reference.

Lecture Overview

Note: Students are required to read the specific on-line lecture material before coming to lecture. In lecture we will discuss the important concepts covered in the on-line material for that lecture and their implications. In mandatory tutorials, we will cover some fundamentals to help you better understand the lecture content.

Part I. Cell Adhesion, Communication and Signal Transduction

Sept. 14	Introduction to Human Cell Biology
Sept. 14	The Human Cell Membrane
Sept. 21	Junctional Adhesion Complexes: Skin, Guts, Heart & Sperm
Sept. 21	Gap Junctions and Communication in the Heart and Glands
Sept. 28	Adhesion Molecule Types & Functions
Sept. 28	Signal Transduction & Erectile Dysfunction
Sept. 5	Insulin and Sugar Mobilization: cAMP Signaling from Receptor to Function
Oct. 5	Muscarinic Receptors: This Lecture Ends in Tears
Oct. 12	Thanksgiving: No Class
Oct. 19	Signal Transduction and Alzheimer's Disease: Calcium & Calmodulin

We begin with cellular compartmentalization and how information flows inside the cell. This will lead to the structure and function of the cell membrane with a focus upon how cells adhere to each other and how they communicate. As transducers of extracellular events that lead to cellular responses, receptors in the cell membrane will be analyzed, leading to a discussion of how an extracellular signal such as a hormone can lead to a cellular response. This area of signal transduction will introduce the diversity of cellular signaling while focusing on well characterized systems beginning with cyclic AMP-mediated signalling. After Thanksgiving, a one hour term test will be given. I will discuss the organization of the test at the start of October.

Part II. The Cytoskeleton, Intracellular Trafficking & Disease

Oct. 19	Motoring along on Microtubules
Oct. 26	1st Midterm Test (2 hours; lecture room)— Makeup test 8AM, Sat. Nov. 14
Nov. 2	Allergens and Myosins; Actin & Infection
Nov. 2	Leukocytes, WASPs and ROCK & Rho
Nov. 9	Influenza Virus and HIV Entry
Nov. 9	Lysosomes: Death by Enzyme Malfunction
Nov. 16	Tay Sachs: A Protein Targetting Disease
Nov. 16	COPs, SNARES, Rabs & Huntington's Disease
Nov. 23	Cell Biology of Cancer
Nov. 23	Epidermal Growth Factor Signal Transduction and Breast Cancer
Nov. 30	Nucleocytoplasmic Transfer
Nov. 30	Nuclear and Nucleolar Localization Sequences

Final Exam (3 hours; during final exam period)

Cell signalling requires that pathways can intercommunicate to ensure proper functioning. After examining this we will concentrate on a few intracellular systems that are regulated by signalling events. In addition if the cellular events are to function properly they must be organized within the cell. Here we will examine the cytoskeletal system of cells and how their involvement in cell shape and motility. The subject of biomembrane fusion will also be discussed. All of these component structures and events will ultimately be linked together to explain issues such as cancer cell metastasis. The second term test will cover all lectures up to that point.

The lysosome is a simple structure with critical cellular roles. The way proteins and other components are targeted to specific cellular locales such as lysosomes will be covered followed by an analysis of how the cytoskeleton moves proteins and organelles within the cell. Receptor mediated endocytosis and intracellular vesicular movements will complete the picture and bring us back to our first and subsequent lecture topics. All of this information will all be integrated through the analysis of how normal and cancer cells move.

TUTORIAL SCHEDULE 2009

IMPORTANT—Read this carefully

- Attendance to tutorials is expected; if you miss a tutorial marks may be deducted from your “Contribution to Tutorial” grade; medical excuses are not required for missing a tutorial
- Attendance on test dates is mandatory
- You must show up at your assigned tutorial section
- You must read the online tutorial material and any articles prior to attending the tutorial
- Tutorials will complement lecture material as well as cover important information not discussed in lectures
- Student participation is expected and will contribute to part of the tutorial grade
- Tutorial material will be covered in lecture tests as well as in tutorial tests

Week of

Topic

Sept. 14	1. Cadherins, Catenins & Bacterial Invasion <i>Background Reading: Techniques: Immunofluorescence, GFP-tagged proteins and Western Blotting</i>
Sept. 21	2. Desmosomes & Disease: A Review
Oct. 28	3. Membrane Signaling Complexes & Pharmaceutical Development
Oct. 5	4. Tutorial Test 1 (50 Min; in tutorial section)— Makeup test 8AM, Sat. Nov. 14, 2009
Oct. 12	5. Thanksgiving
Oct. 19	6. Receptor Mediated Endocytosis: The Basics
Oct. 26	7. Receptor Mediated Endocytosis: Cholesterol & Cholesterolemia
Nov. 2	8. Receptor Mediated Endocytosis: Iron Uptake
Nov. 9	9. Tutorial Test 2 (50 Min; in tutorial section)—Makeup test 8AM, Sat. Nov. 14, 2009
Nov. 11	10. Receptor Mediated Endocytosis: Epidermal Growth Factor
Nov. 16.	11. Lysosome-Related Organelles (LROs): Melanosomes & Three Syndromes I
Nov. 23.	12. Atherosclerosis: Caveolae and transcytosis

Important Dates/Grading Scheme

2009

Important Notes

1. Test Dates. The scheduled dates for tests and quizzes will not be changed. If a scheduled test or quiz conflicts with a cultural or religious holiday/event you must provide written documentation as soon as the date of that event becomes public knowledge.

2. Make-up Tests. See Dates below. To be fair: makeup tests will be proportionately more difficult since students will have more time to study for them than students who wrote on the original date. Makeup tests will all be essay format.

3. Test/Exam Format: This will be discussed in lecture/tutorial approximately 1 week prior to the test

4. We will not answer email questions about the format of tests, make-up tests or the final exam.

Tests	Dates	Weight
Tutorial Test 1 (50 min; in tutorial)	October 5	10%
Lecture Test 1 (2 hours; in lecture)	October 26	30%
Tutorial Test 2 (50 min; in tutorial)	November 9	15%
Contribution to Tutorials		5%
Final Lecture Exam (3h)	Examination Period	<u>40%</u>
Total		100%

Makeup Test Dates (These will not be changed):

1st Midterm Test & Tutorial Tests 1&2—Makeup test 8AM, Sat. Nov. 14, 2009

-Students who miss more than one test will write them all on this date

Final Lecture Exam—To Be Determined by the Registrar's Office

©Copyright 1998-2009 Danton H. O'Day

