

Comprehensive Biochemistry 504B

Course Description and Overview

The first two parts of this course are to introduce students to the basic biology of eukaryotic cells, including pathogens, their organelles and trafficking. The third part of the course addresses what happens when these basic functions are disrupted, leading to human disease.

The text will provide basic information that **will be supplemented with 1-2 major review articles on each specific topic**. These will be integrated into the lectures and discussions. In some cases, students will be asked to interpret 1-2 salient current papers in the field. All lecture notes will be available on line at the SUNY website.

Objectives. By the end of this course, students should be able to:

- Understand the origins of eukaryotic cells, including parasitic ones and their special adaptations to aerobic and anaerobic life; comparisons with prokaryotic and fungal pathogens
- Understand the internal organization of the eukaryotic cell, including

Membrane structure and the transport of small molecules across them

Electrical properties of membranes

Intracellular compartmentalization, protein sorting, and vesicular trafficking

Energy conversion in mitochondria and chloroplasts

Cell communication and signaling

- Understand what happens when cellular organization is disrupted, including

Disorders in amino and nucleic acid metabolism

Disorders in fatty acid and cholesterol metabolism

Disorders in mitochondrial functions

Neurodegenerative disorders

Stem Cell research and treatment of disease

Type I and II Diabetes and disorders in carbohydrate metabolism

Grading There will be 3 exams which will be weighed equally. These will either be “in class or take home exams”. The total number of points will be tallied at the end of the course, curved, and students will be assigned a letter grade (A – E). Correct answers will be posted by the instructors for each exam.

Class participation will be evaluated especially when specific papers are assigned for discussion.

Written papers will not be assigned. There is NO mechanism for extra credit. Make up exams are at the discretion of the staff.

Course Coordinators are:

Jan Keithly - DAI 3112: 473-2692 - keithly@wadsworth.org

Susan Madison-Antenucci

Joe Mazurkiewicz – AMC MS507A: 262-5381 mazurkj@mail.amc.edu

This is a team-taught course. The addresses/phones of lecturers are:

M. Caggana	mxc08@health.state.ny.us	ESP E-457	473-3854
S. Chaturvedi	schaturv@wadsworth.org	DAI 3104	474-4177
M. Fasullo	mfasullo@ordwayresearch.org	CMS 3229	641-6418
M. Koonce	koonce@wadsworth.org	ESP C-460	486-1490
N. Lowry	natashalowry@nynsci.org	GEN	
S. Madison-Antenucci	susanma@wadsworth.org	DAI 3100	474-4177
C. Mannella	carmen@wadsworth.org	ESP E-257	474-2462
D. Kay	dmk11@health.state.ny.us	CMS 2019	473-4468
A. Pendleton	apendlet@wadsworth.org	DAI 4089	486-3808
D. Symula	symula@wadsworth.org	ESP	408-2396
T. Wagenknecht	terry@wadsworth.org	ESP C-300	474-2450

DAI = David Axelrod Institute

ESP = Empire State Plaza

AMC = Albany Medical College

CMS = Center for Medical Science

Office Hours Vary: contact each lecturer by e-mail or phone

Changes in Rooms, Cancellations, or Times of Class will be e-mailed to students by the course coordinators. **Therefore, e-mail addresses of students are kindly requested at the beginning of the course.**

Prerequisites

There are no specific prerequisites for matriculated students in this course.

Non-matriculated students are admitted with the permission of the instructors, and should have had an undergraduate course in basic cell biology and biochemistry.

Comprehensive Biochemistry: The Biochemical and Molecular Basis of Human Disease

BMS 504B/AMC 626

Spring 2009

3 CREDITS

Tu/Th 9:00-10:30 am (1 ½ hour)

ROOM@AMC: MS 316

Course Coordinators:

J. Keithly/S. Madison-Antenucci (BMS);
J. Mazurkiewicz (AMC)

Recommended Text:
Alberts or Stryer

PLEASE NOTE: Lectures are available at <http://eres.ulib.albany.edu/>
Click on electronic reserves index and select "BMS504B" or "keithly". The password is "biochemistry".

Lex Date Instructor and Topic

Part 1: General Eukaryotic Cell Structure and Function

- | | | | |
|---|------|----|---|
| 1 | 1/22 | Th | Dr. Mazurkiewicz. Endosomes/Lysosomes I : endocytic recycling; receptor down regulation and multivesicular bodies; endosomes and cell signaling. |
| 2 | 1/27 | Tu | Dr. J. Mazurkiewicz
Endosomes II: clathrin-independent endocytosis; mechanisms of cargo selection. |
| 3 | 1/29 | | Dr. Mazurkiewicz.
Intracellular Proteolysis: mechanisms of lysosomal-dependent proteolysis, e.g. autophagocytosis; ubiquitin-dependent proteolysis and the 26S proteasome. |
| 4 | 2/03 | | Dr. M. Koonce
Golgi Architecture and Membrane Trafficking: Structure; the role of cytoplasmic motors and the cytoskeleton to and from the Golgi. |
| 5 | 2/05 | | Dr. M. Koonce
Golgi Dynamics: Assembly, trafficking between membrane stacks; Golgi dynamics during cell division. |
| 6 | 2/10 | | Dr. T. Wagenknecht
Calcium Signaling: calcium signaling pathways, calcium channels and pumps, spatial/temporal properties of calcium signals, CaM-kinase. |

- 7 2/12 **Dr. T. Wagenknecht**
Calcium Signaling in Muscle: review of muscle biology, excitation-contraction coupling, skeletal and heart diseases involving defective calcium signaling.

NO CLASS FEB 15-21 WINTER BREAK

- 8 2/24 **EXAM I in Class (Lect 1-7; 20 Pts/lect = 140)**

Part 2: Pathogen Cellular Structure and Function

- 9 2/26 **Dr. Sudha Chaturvedi**
Trafficking in Eukaryotic Pathogens I: Fungi
- 10 3/03 **Dr. Sudha Chaturvedi**
Trafficking in Eukaryotic Pathogens I I
- 11 3/05 **Dr. Amanda Pendleton**
Interactions of Microbial Pathogens with Host Cells: Entry and intracellular survival.
- 12 3/10 **Dr. Amanda Pendleton**
Interaction *Yersenia pestis* with Host Cells
- 13 3/12 **Dr. Jan Keithly.**
Parasitic Protist Organelles I – Size isn't everything: Mitochondria, Hydrogenosomes, and Mitosomes
- 14 3/17 **Dr. Carmen Mannella**
Mitochondrial Disorders: Biochemistry and structural biology
- 15 3/19 **Dr. Jan Keithly.**
Protist Organelles II: Compacted genomes & structures - Nucleomorphs and Apicoplasts
- 16 3/24 **Dr. Susan Madison-Antenucci**
Specialized Organelles, Trafficking and Disease in Haemoprotozoa: African Trypanosomes

- EXAM II Take Home (Lect 9-16; 20 Pts/lect = 160 pts)**

Part 3: When Cells go Very, Very Wrong!

- 17 3/26 **Dr. Denise Kay:**
Human Neurodegenerative Diseases I: Genetics
- 18 4/02 **Dr. Denise Kay:**
Neurodegenerative Diseases II
- 19 4/07 **Dr. Natasha Lowry**
Stem Cell Research: An Overview

April 8-13 NO CLASSES: Spring Break

- 20 4/14 **Dr. Natasha Lowry**
Stem Cell Research: Applications for the Treatment of Neurodegenerative Disorders
- 21 4/16 **Dr. Derek Symula**
Cholesterol Metabolism and Associated Pathologies.
- 22 4/21 **Dr. Fasullo**
Nucleic Acid Metabolism and Associated Pathologies
- 23 4/23 **Dr. Caggana**
Protein energy malnutrition, cystic fibrosis, cystinuria, and screening for disorders of amino acid metabolism (PKU,MSUD, and homocystinuria).
- 24 4/28 **Dr. Caggana**
Amino acid degradation disorders (those not screened) and the reacid cycle defects.
- 25 4/30 **Dr. Arlene Ramsingh**
Glucose Metabolism Pathologies. Type I diabetes - autoimmune disease with specific destruction of the beta cells; genetic predisposition; environmental triggers, treatment
- 26 5/05 **Dr. Arlene Ramsingh**
Glucose Metabolism Pathologies. Type II diabetes - course of disease, genetic and environmental influences.

FINAL TAKE HOME (Lect 17-26; 20 pts/lect = 200 pts)
GRAND TOTAL POSSIBLE = 400 POINTS