

Biochem 645: Molecular Control of Metabolism and Metabolic Disease

2131 Biochemistry (420 Henry Mall)

1:00-2:15 Tuesdays & Thursdays, Fall Semester

Guiding theme. Mammals go through fast-feed cycles. This requires adjustments in fuel utilization and in the regulation of metabolic pathways. The course will examine the various physiological states and how they affect metabolic pathways. We will also discuss a number of special topics related to the unique roles of various tissues and to metabolic pathways in disease states, including diabetes, cancer, inflammation, and age-related disease processes.

Class format. The class is taught in a “flipped” format. The primary material is available in online videos, each accompanied by an auto-graded online quiz. This format allows class time to be devoted to guided exercises and dialogue with the instructors and other members of the class.

Quizzes. You must take each quiz before the corresponding class for its topic. (Access to the quiz is available until the class meets.) You may take the quiz as many times as you wish. Only the best score will be recorded. You must work alone on the quiz.

Class exercises. You may work alone or with 1-2 fellow students on each class exercise. Each student must turn in a class exercise by the end of the class.

Part 1 Intermediary Metabolism

Assigned Reading

Devlin's Textbook of Biochemistry with Clinical Correlations

Chapter 21: Metabolic Interrelationships

1. Thurs 09/07

Course Introduction (Attie)

Videos

- Welcome to Biochem 645!
- Carbohydrate Metabolism 1

2. Tues 09/12

Carbohydrate Metabolism 2 (Attie)

Videos

- Review of Glycolysis
- PFK & Pasteur

3. Thurs 09/14

Carbohydrate Metabolism 3 & ChREBP (Attie)

Videos

- Glucokinase, glucose transport
- ChREBP

4. Tues 09/19

Fatty Acid to Glucose?

Pyruvate Metabolism, Steady-States (Attie)

Videos

- Fatty Acid to Glucose?

- Pyruvate Dehydrogenase
- Steady State

5. Thurs 09/21 Ketone Body Metabolism & β -oxidation (Attie)

Videos

- Ketone Body Metabolism

6. Tues 09/26 TCA Cycle & Carbonyl Chemistry (Attie)

Videos

- TCA Cycle
- Carbonyl Chemistry

7. Thurs 09/28 Glycogen Metabolism & Gluconeogenesis (Anderson)

8. Tues 10/03 Lipogenesis & Lipoprotein Metabolism (Attie)

Videos

- Lipogenesis 1
- Lipogenesis 2
- Lipoprotein Metabolism

9. Thurs 10/05 Cholesterol Metabolism (Attie)

Videos

- Cholesterol Synthesis
- Discovery of the LDL Receptor
- SREBP

Mon 10/09 Exam 1 (evening)

10. Tues 10/10 Mitochondrial metabolism 1 (Engin)

12. Thurs 10/12 Mitochondrial metabolism 2 (Engin)

13. Tues 10/17 Mitochondrial metabolism 3 (Engin)

14. Thurs 10/19 The Unfolded Protein Response & Autophagy (Engin)

15. Tues 10/24 GL/FFA cycle, hormonal regulation of lipolysis, lipid droplet biology (Merrins)

16. Thurs 10/26 β -cell biology and diabetes (Merrins)

17. Tues 10/31 Cycles, shuttles, and shunts (Anderson)

18. Thurs 11/02 Metabolic signaling; primary & secondary messengers (Anderson)

Mon 11/06 Exam 2 (evening)

19. Tue 11/07 Insulin signaling & insulin resistance (Lamming)

19. Thurs 11/09 mTor & Regulatory Nodes (Lamming)

- 20. Tues 11/14** **Cancer Metabolism (Lamming)**
21. Thurs 11/16 **Cold exposure and sympathetic nervous system metabolism-1**
 (Merrins)
- 22. Tues 11/21** **Cold exposure and sympathetic nervous system metabolism-2**
 (Merrins)
- Thursday, 11/23** **Thanksgiving**
- 24. Tues 11/28** **Exercise, aging, & metabolic disease (Lamming)**
25. Thurs 11/30 **Epigenetics (Anderson)**
26. Tues 12/05 **Alzheimer's and other degenerative diseases (Anderson)**
26. Thurs 12/07 **Inflammation (Anderson)**
27. Tues 12/12 **Hypothalamic control of metabolism and circadian rhythms**
 (Merrins)
- Final Exam**