



Biochem 645

Molecular Control of Metabolism and Metabolic Disease

Fall 2018

Credits: 3

<https://canvas.wisc.edu/courses/104715>

Course Designations and Attributes

Breadth - Biological Sci. Counts toward the Natural Sci req

Level - Advanced

L&S Credit - Counts as Liberal Arts and Science credit in L&S

Meeting Time and Location

2131 Biochemistry Building (420 Henry Mall)

1:00-2:15 Tuesdays & Thursdays

Instructional Mode

Course mode of instruction: blended.

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.

Specify how Credit Hours are met by the Course

For each credit: One hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks.

INSTRUCTORS AND TEACHING ASSISTANTS

Dr. Alan Attie

Office hours by appointment

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Dr. Rozalyn Anderson

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Dr. Feyza Engin

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Dr. Dudley Lamming

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Dr. Matt Merrins

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OFFICIAL COURSE DESCRIPTION

Course Description

Examination of various physiological states and how they affect metabolic pathways. Discussion of a number of special topics related to the unique roles of various tissues and to metabolic pathways in disease states, including adipocyte biology, beta-cell biology, epigenetics, inflammation, and aging related diseases. Enroll Info: None

Requisites

[BIOCHEM 501](#) or [508](#) or graduate standing

LEARNING OUTCOMES

Course Learning Outcomes

Students will

- Understand the adjustments in fuel utilization and in the regulation of metabolic pathways required by mammalian fast-feed cycles.
- Examine how various physiological states affect metabolic pathways
- Discuss the unique roles of various tissues and metabolic pathways in disease states, including diabetes, cancer, inflammation, and age-related disease processes.
- Synthesize knowledge and use insight to better understand the molecular control of metabolism and metabolic disease

GRADING

| | |
|--------------------|-------------|
| 26 class exercises | 1/3 |
| 26 Quizzes | 1/3 |
| 3 Exams | 1/3 |
| Total | 100% |

A = 90 – 100%
AB = 86 – 89.9%
B = 80 – 85.9%
BC = 76 – 79.9%
C = 65% – 75.9%
D = 55% – 64.9%
F = 0% – 54.9%

COURSE MATERIALS

Recommended textbook

Textbook of Biochemistry with Clinical Correlations, 7th Edition
Thomas M. Devlin (Editor)
ISBN: 978-0-470-28173-4
Jan 2010

Other course materials

Videos and all the teaching materials are freely available through the course web site.

EXAMS, QUIZZES, & OTHER MAJOR GRADED WORK

Exams. There will be two evening exams and a third exam during the final exam time slot (exam date/time below).

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.

HOMEWORK & OTHER ASSIGNMENTS

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.

RULES, RIGHTS & RESPONSIBILITIES

- See the Guide's [Rules, Rights and Responsibilities](#)

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be

forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: “The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA.” <http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php>

DIVERSITY & INCLUSION

Institutional statement on diversity: “Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world.” <https://diversity.wisc.edu/>

Part 1 Intermediary Metabolism

1. Thurs 09/06 Course Introduction & Carbohydrate Metabolism 1 (Attie)
2. Tues 09/11 Carbohydrate Metabolism 2 (Attie)
3. Thurs 09/13 Carbohydrate Metabolism 3 & ChREBP (Attie)
4. Tues 09/18 Fatty Acid to Glucose? Pyruvate Metabolism, Steady-States (Attie)
5. Thurs 09/20 Ketone Body Metabolism & β -oxidation (Attie)
6. Tues 09/25 TCA Cycle & Carbonyl Chemistry (Attie)
7. Thurs 09/27 Glycogen Metabolism & Gluconeogenesis (Anderson/Rhoads)
8. Tues 10/02 Lipogenesis & Lipoprotein Metabolism (Attie)
9. Thurs 10/04 Cholesterol Metabolism (Attie)
- Mon 10/08 Exam 1 (evening)

Part 2 Mitochondrial Metabolism

10. Tues 10/09 Mitochondrial metabolism 1 (Engin)
12. Thurs 10/11 Mitochondrial metabolism 2 (Engin)
13. Tues 10/16 Mitochondrial metabolism 3 (Engin)

Part 3 Metabolic Flexibility

14. Thurs 10/18 The Unfolded Protein Response & Autophagy (Engin)
15. Tues 10/23 Cycles, shuttles, and shunts (Anderson)
16. Thurs 10/25 Metabolic signaling; primary & secondary messengers (Anderson)

17. Tues 10/30 GL/FFA cycle, hormonal regulation of lipolysis, lipid droplet biology (Merrins)

18. Thurs 11/01 β -cell biology and diabetes (Merrins)

Mon 11/05 Exam 2 (evening)

Part 4 Signaling and Regulation

19. Tue 11/06 Insulin signaling & insulin resistance (Lamming)

19. Thurs 11/08 mTor & Regulatory Nodes (Lamming)

20. Tues 11/13
1 Cold exposure and sympathetic nervous system metabolism-
(Merrins)

21. Thurs 11/15
2 Cold exposure and sympathetic nervous system metabolism-
(Merrins)

22. Tues 11/20 Cancer Metabolism (Lamming)

Thurs 11/22 Thanksgiving

Part 5 Integrated Metabolism

24. Tues 11/27 Exercise, aging, & metabolic disease (Lamming)

25. Thurs 11/29 Hypothalamic control of metabolism and circadian rhythms
(Merrins)

26. Tues 12/04 Epigenetics (Anderson)

26. Thurs 12/06 Alzheimer's and other degenerative diseases (Anderson)

27. Tues 12/11 Inflammation (Anderson)

Sat 12/15 Final exam (10:05AM - 12:05PM, Location TBD)