

**ANIMSCI 7761/HUMNTR 7761**  
**Macronutrient Metabolism**  
**Autumn, 2022**

**Lecture:** MWF at 9:35 to 10:55 am. The class is in an in-person setting, with synchronous lectures in CarmenZoom. Through October 12, class will meet in Agr. Adm, Room 108. After October 12, class will meet in Jennings, Room 136. Students participating virtually are expected to sign in during class time via Carmen to participate in lectures, even if lectures are recorded.

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**Description:** In-depth treatment of digestion, absorption, transport, and utilization of dietary protein, carbohydrates and fat for energy production and fat deposition in humans and other higher animals.

**Credit:** 4 Hours (G)

**Prerequisites:** Biochemistry 4511 or equivalent, Human Nutrition 2310 or Animal Sciences 3130, or permission of instructor

**Recommended Text:** Biochemical, Physiological, and Molecular Aspects of Human Nutrition- Martha H. Stipanuk and Marie A. Caudill (4th edition) and Molecular Cell Biology (9th edition; 8<sup>th</sup> edition also will suffice) – Harvey Lodish and others

**Background Recommended Text:** Any biochemistry text; Harper's or Lehninger's Biochemistry are recommended.

**Supplemental Articles:** Protein, carbohydrate, and lipid metabolism is a rapidly expanding field of science. To provide the most current information in the field, supplemental articles will be provided on Carmen in addition to the above texts.

**Course Objectives:**

1. Digestion, absorption and integrated metabolism of dietary proteins, carbohydrates, and lipids.
2. Specific hormonal and nutritional regulation of protein, carbohydrate, and lipid metabolism.
3. Influence of dietary proteins, carbohydrates, and lipids on disease states.
4. Comparative metabolism of carbohydrates and lipids in humans and other species.

## Attendance and participation requirements:

Because this is an online synchronous course, your attendance is based on your online activity and participation. The following is a summary of students' expected participation:

- **Participating in online activities for attendance: THREE TIMES PER WEEK**  
You are expected to log in to the course in Carmen every week for the live classes. During most weeks, you will probably log in many times. If you have a situation that might cause you to miss an entire week of class, discuss it with the instructors *as soon as possible*.

## Office hours: **OPTIONAL**

Office hours can be arranged upon request.

## Course technology:

### Technology support

For help with your password, university email, Carmen, or any other technology issues, questions, or requests, contact the Ohio State IT Service Desk. Standard support hours are available at [ocio.osu.edu/help/hours](https://ocio.osu.edu/help/hours), and support for urgent issues is available 24/7.

- **Self-Service and Chat support:** [ocio.osu.edu/help](https://ocio.osu.edu/help)
- **Phone:** 614-688-4357(HELP)
- **Email:** [servicedesk@osu.edu](mailto:servicedesk@osu.edu)
- **TDD:** 614-688-8743

### Technology skills needed for this course

- Basic computer and web-browsing skills
- Navigating Carmen ([go.osu.edu/canvasstudent](https://go.osu.edu/canvasstudent))
- CarmenZoom virtual meetings ([go.osu.edu/zoom-meetings](https://go.osu.edu/zoom-meetings))
- Recording a slide presentation with audio narration ([go.osu.edu/video-assignment-guide](https://go.osu.edu/video-assignment-guide))
- Recording, editing, and uploading video ([go.osu.edu/video-assignment-guide](https://go.osu.edu/video-assignment-guide))

### Required equipment

- Computer: current Mac (MacOs) or PC (Windows 10) with high-speed internet connection
- Webcam: built-in or external webcam, fully installed and tested
- Microphone: built-in laptop or tablet mic or external microphone
- Other: a mobile device (smartphone or tablet) to use for BuckeyePass authentication

### Required software

- Microsoft Office 365; All Ohio State students are now eligible for free Microsoft Office 365. Full instructions for downloading and installation can be found at [go.osu.edu/office365help](https://go.osu.edu/office365help).
- Free downloaded trial version of Spartan Dairy Ration Evaluator ([www.spartandairy.msu.edu](http://www.spartandairy.msu.edu))

### Carmen access

You will need to use BuckeyePass ([buckeyepass.osu.edu](https://buckeyepass.osu.edu)) multi-factor authentication to access your courses in Carmen. To ensure that you are able to connect to Carmen at all times, these are the recommended steps:

- Register multiple devices in case something happens to your primary device. Visit the BuckeyePass - Adding a Device help article for step-by-step instructions ([go.osu.edu/add-device](https://go.osu.edu/add-device)).

- Request passcodes to keep as a backup authentication option. When you see the Duo login screen on your computer, click **Enter a Passcode** and then click the **Text me new codes** button that appears. This will text you ten passcodes good for 365 days that can each be used once.
- Download the Duo Mobile application ([go.osu.edu/install-duo](https://go.osu.edu/install-duo)) to all of your registered devices for the ability to generate one-time codes in the event that you lose cell, data, or Wi-Fi service

If none of these options will meet the needs of your situation, you can contact the IT Service Desk at 614-688-4357(HELP), and IT support staff will work out a solution with you.

### **Academic integrity and collaboration:**

- **Exams:** You must complete the midterm and final exams yourself, without any external help or communication during in-class exam periods or on the final exam.
- **Written assignments:** Your written assignments, including discussion posts, should be your own original work. In formal assignments, you should follow [MLA/APA/Chicago etc.] style to cite the ideas and words of your research sources. You are encouraged to ask a trusted person to proofread your assignments before you turn them in, but no one else should revise or rewrite your work.
- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with an instructor.
- **Collaboration and informal peer-review:** The course includes many opportunities for formal collaboration with your classmates. Although study groups and peer-review of major written projects is encouraged, remember that comparing answers on a quiz or assignment is not permitted. If you're unsure about a particular situation, please ask ahead of time.

### **Discussion and communication guidelines:**

The following are expectations communicating as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** Although there is no need to participate in class discussions as if you were writing a research paper, you should remember to write using good grammar, spelling, and punctuation. A more conversational tone is fine for non-academic topics.
- **Tone and civility:** Let's maintain a supportive learning community where everyone feels safe and where people can disagree amicably. Remember that sarcasm doesn't always come across online.
- **Citing your sources:** When we have academic discussions, please cite your sources to back up what you say. For the textbook or other course materials, list at least the title and page numbers. For online sources, include a link.
- **Backing up your work:** Consider composing your academic posts in a word processor, where you can save your work, and then copying into the Carmen discussion.

### **Academic integrity policy:**

See **Descriptions of major course assignments**, above, for my specific guidelines about collaboration and academic integrity in the context of this online class.

## **Ohio State's academic integrity policy**

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the university's *Code of Student Conduct* ([studentconduct.osu.edu](http://studentconduct.osu.edu)), and that all students will complete all academic and scholarly assignments with fairness and honesty. Students must recognize that failure to follow the rules and guidelines established in the university's *Code of Student Conduct* and this syllabus may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the university or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the university's *Code of Student Conduct* is never considered an excuse for academic misconduct, so we recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

**If the instructor suspects that a student has committed academic misconduct in this course, she/he is obligated by university rules to report my suspicions to the Committee on Academic Misconduct.** If COAM determines that you have violated the university's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the university. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact an instructor.

Other sources of information on academic misconduct (integrity) to which you can refer include:

- Committee on Academic Misconduct web page ([go.osu.edu/coam](http://go.osu.edu/coam))
- *Ten Suggestions for Preserving Academic Integrity* ([go.osu.edu/ten-suggestions](http://go.osu.edu/ten-suggestions))
- *Eight Cardinal Rules of Academic Integrity* ([go.osu.edu/cardinal-rules](http://go.osu.edu/cardinal-rules))

## **Copyright for instructional materials**

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

## **Safe and Healthy Buckeyes**

As of Aug. 2, all students, faculty and staff are required to wear masks in classrooms and other shared indoor spaces, regardless of their vaccination status. These include common areas, conference rooms, shared office spaces, hallways, buses and shared vehicles on all Ohio State campuses. Individuals should not eat in classrooms. Individuals can take an occasional drink, but should take masks off only as necessary.

Masks continue to be required outdoors for unvaccinated individuals when they cannot maintain physical distancing. Vaccinated people are not required to mask outdoors. Read more on the [Personal Safety Practices](http://Personal Safety Practices) page. See: <https://safeandhealthy.osu.edu/> for additional guidelines and resources; as well as for any updates from the university regarding changes in policy and procedure.

## **Disability Accommodations**

The university strives to make all learning experiences as accessible as possible. In light of the current pandemic, students seeking to request COVID-related accommodations may do so through the university's request process, managed by Student Life Disability Services. If you anticipate or experience academic barriers based on your disability (including mental health, chronic, or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

### **Counseling and Consultation Services/Mental Health**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life Counseling and Consultation Services (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling (614) 292- 5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on-call counselor when CCS is closed at (614) 292-5766 and 24 hour emergency help is also available through the 24/7 National Prevention Hotline at 1-(800)-273-TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

David Wirt, [wirt.9@osu.edu](mailto:wirt.9@osu.edu), is the CFAES embedded mental health counselor. He is available for new consultations and to establish routine care. To schedule with David, please call 614-292-5766. Students should mention their affiliation with CFAES when setting up a phone screening.

### **Creating an environment free from harassment, discrimination, and sexual misconduct**

- The Ohio State University is committed to building and maintaining a community to reflect diversity and to improve opportunities for all. All Buckeyes have the right to be free from harassment, discrimination, and sexual misconduct. Ohio State does not discriminate on the basis of age, ancestry, color, disability, ethnicity, gender, gender identity or expression, genetic information, HIV/AIDS status, military status, national origin, pregnancy (childbirth, false pregnancy, termination of pregnancy, or recovery therefrom), race, religion, sex, sexual orientation, or protected veteran status, or any other bases under the law, in its activities, academic programs, admission, and employment. Members of the university

community also have the right to be free from all forms of sexual misconduct: sexual harassment, sexual assault, relationship violence, stalking, and sexual exploitation.

- To report harassment, discrimination, sexual misconduct, or retaliation and/or seek confidential and non-confidential resources and supportive measures, contact the Office of Institutional Equity:
  1. Online reporting form at [equity.osu.edu](https://equity.osu.edu),
  2. Call 614-247-5838 or TTY 614-688-8605,
  3. Or Email [equity@osu.edu](mailto:equity@osu.edu)
  
- The university is committed to stopping sexual misconduct, preventing its recurrence, eliminating any hostile environment, and remedying its discriminatory effects. All university employees have reporting responsibilities to the Office of Institutional Equity to ensure the university can take appropriate action:
  - All university employees, except those exempted by legal privilege of confidentiality or expressly identified as a confidential reporter, have an obligation to report incidents of sexual assault immediately.
  
  - The following employees have an obligation to report all other forms of sexual misconduct as soon as practicable but at most within five workdays of becoming aware of such information: 1. Any human resource professional (HRP); 2. Anyone who supervises faculty, staff, students, or volunteers; 3. Chair/director; and 4. Faculty member.

This course adheres to The Principles of Community adopted by the College of Food, Agricultural, and Environmental Sciences. These principles are located on the Carmen site for this course; and can also be found at <https://go.osu.edu/principlesofcommunity>. For additional information on Diversity, Equity, and Inclusion in CFAES, contact the CFAES Office for Diversity, Equity, and Inclusion (<https://equityandinclusion.cfaes.ohio-state.edu/>). If you have been a victim of or a witness to a bias incident, you can report it online and anonymously (if you choose) at <https://studentlife.osu.edu/bias/report-a-bias-incident.aspx>.

#### **Accessibility of course technology:**

This online course requires use of CarmenCanvas (Ohio State's learning management system) and other online communication and multimedia tools. If you need additional services to use these technologies, please request accommodations with your instructor.

- [Canvas accessibility \(go.osu.edu/canvas-accessibility\)](https://go.osu.edu/canvas-accessibility)
- Streaming audio and video
- CarmenZoom accessibility ([go.osu.edu/zoom-accessibility](https://go.osu.edu/zoom-accessibility))

#### **Emergency Accommodations:**

With valid documentation of an emergency situation, such as illness due to COVID-19 or otherwise, instructors will work with students to provide reasonable accommodation.

#### **Late assignments:**

Late submissions will not be accepted without valid documentation. Please refer to Carmen for due dates.

## Grading:

Kinetics problem set: 20 points (Problem is posted on Carmen, and students will email their final reports back to the instructor in pdf format)

Exam 1: 90 points (108 Agr. Admin. Bldg.)

Exam 2: 90points (108 Agr. Admin. Bldg.)

Exam 3: 100 points (136 Jennings Hall)

Exam 4: 100 points (136 Jennings Hall)

Comprehensive Final Exam: 100 points (136 Jennings Hall)

**Total Points = 500**

## Grades:

A 500-465 (100-93.0%)

A- 464-450 (92.9- 90.0%)

B+ 449-435 (89.9-87.0%)

B 434-415 (86.9-83.0%)

B- 414-400 (82.9-80.0%)

C+ 399-385 (79.9-77.0%)

C 384-365 (76.9-73.0%)

C- 364-350 (72.9-70.0%)

D+ 349-335 (69.9-67.0%)

D 334-300 (66.9- 60.0%)

E Below 300

Date	Lesson	Lodish	Stipanuk	Instructor
8.24	Enzymes.	58-67, 95-103	244-255	Firkins
8.26	Structure and digestion of carbohydrates	50-51	Chap 3, 8	Firkins
8.29	Fiber.		159-168	Firkins
8.31	Glucose transport.	470-477, 507-509, 960-964	Chap 7	Firkins
9.2	Hormones and homeostasis in carbohydrate metabolism	676-680, 688-690	234-238	Firkins
9.7	Glycolysis and gluconeogenesis.	515-520	Chap 10	Firkins
9.9	Glycogenesis and glycogenolysis	683-687	Chap 12	Firkins
9.12	Mitochondrial function.	520-522, 531-535	Chap 10	Firkins
9.14	Mitochondrial function.	550-557		
9.16	<b>Midterm exam:</b> Carbohydrates			
9.19	Structure and function of proteins and amino acids.	72-80	Chap 15	Firkins

9.21	Protein digestion, transporters, and bioactive peptides.		Chap 9	Firkins
9.23	Protein synthesis and degradation, trafficking	87-94, 104-107, 199-204, 652-659	Chap 15	Firkins
9.26	Amino acid metabolism.		Chap 16	Firkins
9.28	Amino acid metabolism.			Firkins
9.30	Urea cycle, uric acid, and nitrogen balance			Firkins
10.3	Amino acid requirements, growth, and lactation.		Chap 2, 19	Firkins
10.5	Fuels, dieting, and changes of states.			
10.7	Exercise and nutrition		233-241	Firkins
10.10	Comparative digestion and metabolism among species (CHO, protein, lipids).			Firkins
10.12	<b>Midterm exam:</b> Proteins through comparative.			Firkins
10.17	Lipid classification. The role in the membrane structure.	39, Chapter 7, 271-297	Chapter 8,169, chapter13,312,350,359,362,365	Ziouzenkova
10.19	Lipids' contribution to cellular energetic: ketogenesis and mitochondrial b-oxidation and its regulation by fatty acids.	Chapter 12 w/o photosynthesis 371-416	Chapter13, 316-324 Chapter 10, 11,229	Ziouzenkova
10.21	Energetically unproductive oxidation: peroxisomal beta oxidation, endoplasmic omega oxidation,	538,548,619	Chapter13, 316-324 Publication-Based	Ziouzenkova



	detoxification by cytochrome P450.			
10.24	Regulation of energetics in critical metabolic situations: starvation, diabetes, aging	Publication Based, 769	Chapter13, 316-324 Chapter 11 Publication-Based	Ziouzenkova
10.26	Lipids' signaling function: eicosanoids, cannabinoids, sphingomyelins.	Publication 277-295	Chapter 11 Publication-Based	Ziouzenkova
10.28	b-adrenergic pathway in the regulation of lipid mobilization.	Chapter 15	Chapter 11	Ziouzenkova
10.31	<b>Midterm exam:</b> Lipid classification and major functions			
11.2	Lipids and stress response pathways: relation to Ca <sup>2+</sup> mobilization. Diets and neurodegenerative diseases.	Chapter 15	Chapter 11 Chapter 29, 760,771	Ziouzenkova
11.4	Essential lipids. Overview of lipids' post-absorptive trafficking.	Publication-based	Chapter 8,13: 312	Ziouzenkova
11.7	Fatty acid and triglyceride synthesis. Triglyceride storage and mobilization.	Publication-based, 455,464-466, 41,42,530	Chapter 13: 327, 338-342	Ziouzenkova
11.9	Regulation of fatty acid and triglyceride synthesis, storage and mobilization.	Publication based	Chapter 13	Ziouzenkova
11.14	Obesity from thermogenic prospective: Dysbalance of energy intake and expenditure	277-278, 296	Chapter 11, Publication based	Ziouzenkova

11.16	Cholesterol synthesis. Relation to steroid hormones.	40, 386, 765	Chapter 14: 368-375, publications	Ziouzenkova
11.18	Cholesterol influx and efflux: Relation to atherosclerosis.	40, 296, 433-440, 1022	Chapter 14: 375393	Ziouzenkova
11.21	<b>Midterm exam:</b> Lipid synthesis and turnover			
11.28	Regulation of cholesterol synthesis and metabolism. SREBP pathway.	762-767	Chapter 14	Ziouzenkova
11.30	Phospholipid synthesis, participation in PI3 kinase-dependent Ca <sup>2+</sup> mobilization for regulation of muscle activity, neuroregulation, cell death/proliferation and carcinogenesis.	Paper based 748-751	Chapter 13, 11	Ziouzenkova
12.2	Lipids' contribution to metabolic syndrome and chronic systemic inflammation. Reverse cholesterol transport.	659-660, Paper-based, Selected by students	Chapter 14, publication-based	Ziouzenkova
12.5	Insulin receptor pathway in the regulation of lipid storage and synthesis.	paper based	Chapter 11, 14, 18	Ziouzenkova
12.7	Lipid storage and synthesis and de-regulation of inflammation. NFkB pathway.	751,757-760	Paper-based, Chapter 14,13:316	Ziouzenkova
12.12	<b>Final Exam</b> 10:00-11:45 am, last lectures + comprehensive			Ziouzenkova

	portions from both instructors.			
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