

HUMNNUTR 7630 – ADVANCED NUTRITION AND METABOLIC DISEASES

AU23, 3 CREDIT HOURS, G

**Instructor: Ouliana Ziouzenkova, PhD
(Dr. Z)**

Office: Campbell Hall 331A

Email: ziouzenkova.1@osu.edu

Office Hours: Zoom meeting by appointment

Course Information

Course times and location: TBD

Mode of delivery: In-Person or distance learning delivery

Course Overview

Description / Rationale

Metabolic diseases influence almost every major chronic illness we face today (i.e. cardiovascular disease, cancer, diabetes, Alzheimer, etc.). This course provides an in-depth evaluation of multiple factors in the development of major chronic conditions and identifies the role of personalized nutrition in the prevention and treatment of these conditions.

Relation to Other Courses

Prerequisites: 7761 or instructor permission

Prerequisite Knowledge: Prior coursework in biochemistry, physiology, and/or genetics or their equivalent is recommended

Learning Objectives

By the end of this course, students will be able to:

1. Be familiar with theories (including nutricentric, neuroendocrinocentric, genetic, infectious and inflammatory, environmental) underlying major chronic metabolic diseases, as the basis for individualized nutrition.
2. Learn application of omics and genetic methods to the identification of mechanisms underlying effects of nutrient and metabolites on prevention, pathogenesis, or treatment of chronic metabolic diseases.
3. Analyze the design of clinical trials which lead to actionable results, and those which are null or inconclusive.
4. Appreciate the complexity in generating dietary and nutritional guidelines for reduction of risks of chronic metabolic diseases.
5. Critically assess current literature related to diet and chronic metabolic diseases, formulating novel research questions, and designing appropriate experiments to address these questions.

Course Materials

Required

The course will not rely on a single text and will require reading and interpreting current and historical literature that may include unfamiliar methodology and terminology. Therefore, it is critical that students frequently discuss questions and concerns with their professors, peers and other colleagues. It is absolutely essential to read the suggested materials, even if they are not specifically assigned during lectures. Although important concepts in the biology of metabolic disease will be presented briefly at the beginning of the quarter, it will be assumed that students have a working knowledge of basic statistical and molecular biology principles.

Texts required as background for the course include:

E-books from Thompson library can be downloaded at <https://library.osu.edu/finding-and-linking-to-e-books>. Use ISBN or cat No for your search.

- Advances in nutraceuticals and functional foods: concepts and applications / edited by Sreerag Gopi, PhD, Preetha Balakrishnan, PhD, 2021
ISBN: 9781003277088 (ebook); Thompson Library cat No QP144.F85 (pages 59-79; p173-199)
<http://proxy.lib.ohio-state.edu/login?url=https://library.ohio-state.edu/record=b9452018~S7>
- Principles of nutrigenetics and nutrigenomics: fundamentals of individualized nutrition / edited by Raffaele De Caterina, J. Alfredo Martinez, Martin. Amsterdam : Academic Press, 2020
ISBN: 9780128045879 (ebook); Thompson Library cat No QP144.G45
<http://proxy.lib.ohio-state.edu/login?url=https://library.ohio-state.edu/record=b9091273~S7>
- Nutritional epigenomics / edited by Bradley S. Ferguson. London, United Kingdom: Academic Press, an imprint of Elsevier, 2019, ISBN 9780128173107; Thompson Library cat No QP144.G45
<http://proxy.lib.ohio-state.edu/login?url=https://library.ohio-state.edu/record=b9091099~S7>
- Fundamentals of clinical trials / Lawrence M. Friedman, Curt D. Furberg, David L. DeMets, David M. Reboussin, Christopher B. Granger. New York: Springer, 2015, ISBN: 9783319185392; Thompson Library cat No R853.C55
<http://proxy.lib.ohio-state.edu/login?url=https://library.ohio-state.edu/record=b7920090~S7>

Supplemental / Optional

FUNDAMENTALS (book for self-study):

MOLECULAR MECHANISMS OF CELLULAR ENERGETICS AND DIFFERENTIATION

- Molecular Cell Biology, by Lodish et al., W.H. Freeman; 8th Edition, 2016, ISBN: 9781464183393 Chapter 9.7 (pages 404-409), Chapter 16 (pages 734-770)
**No eBook available for the most recent edition*

Course Requirement/ Evaluation

Students in this course are expected to:

1. Complete the Midterm Exam
2. Give 2-3 in-class presentations that will focus on the following themes: a) critical evaluation of the literature of a topic in the field, b) a controversy in the field, c) development of a canonical hypothesis in metabolic disease research, d) the interaction of metabolic disease with a diet or nutrient. The purpose of this exercise is to test comprehension of the principles discussed in class. The number of presentations will be based upon the number of students enrolled in the class and will be determined each semester.
3. Complete the Final Assignment: Design two experiments related either to the prevention, or to the treatment of a metabolic disease of your choice.

Grades

Performance will be evaluated based upon attendance, performance on the assignment and oral presentations, and the exam.

Activity	Points
Midterm Exam	130
Oral Presentations	270
Final Assignment	200
TOTAL	600

See below for assignment descriptions and due dates.

PROJECT SUBMISSION

Projects are either to be emailed to Ziouzenkova.1@osu.edu or uploaded by 11:59pm on Carmen, on the designated due date.

LATE ASSIGNMENTS

The assignment and the exam are to be completed and submitted on the dates listed in the course syllabus. If students encounter a problem, they must notify the instructor prior to the due date, and accommodations may be negotiated. Otherwise, late assignments will be reduced a letter grade by 10% for each day they are late. Assignments over four days late will be given an automatic zero.

Grading Scale

Letter Grade	Percentage	Points
A	93-100%	558-600
A-	90-92%	540-552
B+	87-89%	522-534
B	83-86%	498-516
B-	80-82%	480-492
C+	77-79%	462-474
C	73-76%	438-456
C-	70-72%	420-432

D+	67-69%	402-414
D	60-66%	360-396
E	≤59%	≤354

Assignment Descriptions

- Midterm Exam:** Material will cover the first 8 weeks of the course. It will include description of the major pathways underlying metabolic diseases.
- In-Class Presentations:**

All presentation should be 10-15 min, and should use one of the following formats:

 - **Discussion presentation:** Identify a controversy related to a theoretical or established concept based on the provided research publication. Two students will work together. Prepare for the discussion how original or improved concept can change the prevention or treatment of chronic metabolic diseases.
 - **Presentations related to macronutrients:** Use PubMed to identify 2 original research publications related to the use of macronutrient or specific dietary patterns in the prevention and treatment of chronic metabolic diseases. First describe the problem, goal, design, and finding in this paper in-brief. Focus the bulk of your presentation on the differences in the design of these publications.
 - **Presentations related to micronutrients:** Use PubMed to identify 2 original research publications related to the use of micronutrients in the prevention and treatment of chronic metabolic diseases. First describe the problem, goal, design, and finding in this paper in-brief. Focus the bulk of your presentation on the differences in the design of these publications.
- Final Assignment:** Overall objective is to design two experiments related either to the prevention, or to the treatment of a metabolic disease of your choice. Some additional instruction as you construct your experiments:
 - The proposed experiments SHOULD BE RELATED TO NUTRITION!
 - It is possible to have the same background and significance for the two experiments, with a single central hypothesis, and two separate specific aims that address the central hypothesis.
 - One of the experiments could be a mechanistic or 'omics' experiment identifying the role of a given macro- or micro-nutrient in chronic metabolic disease.

Regardless of the topic, a successfully submission should contain the following sections:

 - Background and significance.**
 - Hypothesis.** This tentative statement that proposes a possible link between macronutrient or micronutrient and a metabolic disease
 - Experimental design and methods.**
 1. Provide an ethical statement for use of humans or animals
 2. Describe the plan of experiments and controls
 3. Include the number of subjects or animals/cells for the mechanistic experiments
 4. Describe the methods to be used based on the search of PubMed <http://www.ncbi.nlm.nih.gov/pubmed/> Briefly describe the method.
 5. Describe quality of nutrient and a concentration that will be used. Address physiological relevance of this concentration and feasibility of your experiment from the standpoint of absorption, toxicity, etc.
 6. Discuss what data/results will be collected (outcome parameters)
 7. Discuss statistical test that will be used for data analyses

- iv. **Expected Results**
- v. **References**
 - Provide references from PubMed: <http://www.ncbi.nlm.nih.gov/pubmed/>
 - Blogs and public website are not scientifically reviewed documents and will not be accounted as citations.
- vi. **Additional Considerations:**
 - Graphics are good, but not mandatory.
 - Figures should be accompanied by a figure legend
 - Good, original, well executed and described graphics, that are relevant to this project could be accounted as bonus points.
 - **Scientific writing** should be easy to read and understand. You want to present your ideas in an exciting manner and to be specific with details of the topic you are focusing on. Prior to submission, read through your proposal for Content, Clarity, and Style. Also, remember quotations are not permitted in a scientific proposal - instead cite the original paper.

The Thompson Library provides consultations about writing proposals and searching the literature if you need additional assistance.

Course Policies

Communication

CANVAS: All students are required to use Canvas. Course announcements, including grades, will be posted on the course web site. To gain access, go to the following website: <http://carmen.osu.edu>, enter your OSU username and password, and click on HUMN NUTR 3780H. **Please plan to check CANVAS for news and announcements regularly.**

EMAIL:

The university's official mode of communication is via university email. Students should use their BuckeyeMail when emailing their professor, and faculty will use their OSU email when emailing students. Use email as one way to communicate with the professor. In most cases, emails will be answered within 24 hours (exceptions may include emails sent on the weekends or holidays). Please send emails via CarmenCanvas. Since many students send emails from other non-OSU accounts, messages may be filtered into the junk email folder, and subsequently may never be read. It is best to use your OSU email accounts when sending messages about the course.

The following are my expectations for how we should communicate as a class. Above all, please remember to be respectful and thoughtful.

- **Writing style:** While 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. Informality (including an occasional emoticon) 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. Remember for the Final Assignment 1, PubMed is the reliable and accountable source for your information)

- **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.

Response Times: I am providing the following list to give you an idea of my intended availability throughout the course. (Remember that you can call **614-688-HELP** or use 8help@osu.edu at any time if you have a technical problem.)

- **Grading and feedback:** For large assignments, you can generally expect feedback within **7 days**.
- **E-mail:** I will reply to e-mails within **24 hours on school days**.
- **Discussion board:** I will check and reply to messages in the discussion boards every **24 hours on school days**.

Etiquette

Students are expected to participate in all classes and provide critical input to discussions. As a member of a community of learners, it is your responsibility to exhibit professional behavior and decorum in all modes of communication. Following the rules of etiquette in the classroom, and on the Internet (netiquette), helps improve the readability of your messages, keeps conversations focused, increases trust, and creates a more positive experience for all participants. Etiquette includes, but is not limited to, the following guidelines:

- Honor people's rights to their opinions; respect the right for people to disagree.
- Be professional; use language that is not considered foul or abusive.
- Respond to peers honestly but thoughtfully, respectfully, and constructively.
- Avoid writing in all caps – it conveys shouting and anger.
- Avoid colors like red and green for accessibility reasons; avoid font styles, colors, and sizes that are difficult to read.
- Address the ideas, not the person, when responding to messages or discussions.
- Be careful when using sarcasm or humor – without social cues like facial expressions or body language, a remark meant to be humorous could come across as offensive or hurtful.
- Don't distribute copyrighted materials, such as articles and images (most things online are not licensed as "fair use"). Share links to those materials instead and be sure to properly cite all sources to avoid unintentional plagiarism.

Technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** 8help@osu.edu
- **TTY:** 614-688-8743

Technology necessary for this course:

- Technology skills required for this course include a computer with access to the internet, ability to use Word processing and Presentation software (e.g. Word, Powerpoint, or open-access equivalents, e.g. Google Docs, Google Slides), use of Carmen.

Course Schedule

*This schedule is tentative and may change based upon the availability of guest lecturers, university holidays, etc.

WEEK	TOPIC	ASSIGNMENT
Week 1	Risk and mortality assessment of chronic metabolic diseases. Assessment of incidence and prevalence using databases and research analytics. <i>Meets Learning Objective 1-3</i>	De Caterina: p.549-557; Friedman: p 95-102.
Week 1	Cardiometabolic clusters of diseases: holistic view based upon current theories of disease origin. <i>Meets Learning Objective 1</i>	De Caterina: p.211-223,447-457.
Week 2	The role of dietary patterns and dietary composition in pathogenesis of atherosclerosis	De Caterina: p.469-483.
Week 2	Personalized nutrition for treatment of cardiometabolic diseases <i>Meets Learning Objective 3-5</i>	De Caterina: p.175-181,355-361.
Week 3	Non 'nutritional role' of nutrients in regulation of blood pressure and in pathogenesis, prevention, or treatment of cardiometabolic clusters of diseases <i>Meets Learning Objective 1</i>	De Caterina: p.227-231,309-317.
Week 3	Student presentations	
Week 4	Student presentations	Submission of Presentation Slidedeck to Ziouzenkova.1@osu.edu
Week 4	Macronutrients as neuroendocrine modifiers in metabolic diseases. Methods to study neuroendocrine effects of diets and nutrients. <i>Meets Learning Objective 1-3</i>	De Caterina: p.159-167.
Week 5	Shift in obesity paradigm from nutritional to neurocrine disease: pro- and cons- arguments <i>Meets Learning Objective 1-4</i>	De Caterina: p.431-441.
Week 5	Metabolic syndrome and the spectrum of its complications. Theories and their relation to nutrition and dietary patterns. <i>Meets Learning Objective 1</i>	De Caterina: p. 441-447,499-513; Ferguson: Chapter 9 (p.135-146), Chapter 11 (p.67-180), Chapter 12 (p.191-197).
Week 6	Midterm Exam: Nutrition and metabolic neuroendocrine cluster of diseases.	
Week 6	Strategies to study the effects of nutrients and mechanisms of their action in complex heterogenous metabolic disorders: the use model organisms, translational approaches. <i>Meets Learning Objective 1,4,5</i>	De Caterina: p.519-525.
Week 7	Strategies to study the effects of nutrients and mechanisms of their action in complex heterogenous metabolic disorders: Synthetic and systemic approaches (including organogenesis, multiculture systems, nanotechnology, and computational modeling). <i>Meets Learning Objective 2,3,5</i>	Gopi: p. 173-199; De Caterina: p. 525-529; Friedman: p.102-114.

Week 7	Student presentations	
Week 8	Student presentations	Submission of Presentation Slidedeck to Ziouzenkova.1@osu.edu
Week 8	GI disorders: Interaction of nutrients, host tissues, microbiome and environmental factors. <i>Meets Learning Objective 1,2</i>	De Caterina: p.403-411; Ferguson: Chapter 15 (p.231-242).
Week 9	GI impact on nutrient availability: Advantages and limitation of in vitro and in vivo approaches <i>Meets Learning Objective 2-5</i>	Gopi: p. 59-79; De Caterina: p.411-423.
Week 9	Advantages and limitation in studying nutrients in model system of GI of in vitro and in vivo approaches. <i>Meets Learning Objective 2-5</i>	Zhang &Zhu. Untargeted Metabolomics Sensitively Differentiates Gut Bacterial Species in Single Culture and Co-Culture Systems PMID: 35557670
Week 10	Infectious diseases and nutrition: emerging views and the role of food safety. <i>Meets Learning Objective 1,5</i>	Sanchez et al Cooperative Metabolic Adaptations. PMID: 30100182
Week 10	Spectrum of chronic liver diseases. Concepts and the role of nutrition. <i>Meets Learning Objective 1,5</i>	De Caterina p.383-389
Week 11	Analysis of metabolism in peripheral tissues: Benefits and pitfalls of biomarker usage. <i>Meets Learning Objective 2-5</i>	De Caterina p.75-81,
Week 11	Student presentations. Micronutrient diets and metabolic disorders (a. prevention; b. treatment)	
Week 12	Student presentations	
Week 12	Student presentations	Submission of presentation Slidedeck to Ziouzenkova.1@osu.edu
Week 13	Nutrition of the brain and autonomous metabolism in etiology of brain diseases <i>Meets Learning Objective 1,4,5</i>	De Caterina p.147-155
Week 13	Imaging methods in studying of CNS and its interaction with peripheral tissues in response to diet. Brainbow models: limitation and advantages. <i>Meets Learning Objective 2,5</i>	Weissman et al Brainbow: New Resources and Emerging Biological Applications for Multicolor

		Genetic Labeling and Analysis PMID: 25657347
Week 14	Nutrient impact on brain functions: Single cell analysis and physical methods and application <i>Meets Learning Objective 3-5</i>	El-Nachef et al. A Rainbow Reporter Tracks Single Cells. PMID: 32619493
Week 14	Nutrient impact on brain functions: Current theories on cognitive dysfunctions and dementia <i>Meets Learning Objective 1-4</i>	Ferguson 85-93, Chapter 6 119-127
Week 15	Gut-brain crosstalk in nutritional diseases: Non-nutritional role of nutrients <i>Meets Learning Objective 1,5</i>	De Caterina p.377-383,489-499
Week 15	Diet, Nutrition, and bone marrow diseases. Future dietary strategies to increase longevity. <i>Meets Learning Objective 1-5</i>	Submission of Final Assignment Ziouzenkova.1@osu.edu

Institutional Policies

Academic Integrity

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*, 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 I recommend that you review the *Code of Student Conduct* and, specifically, the sections dealing with academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am 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 me. Other sources of information on academic misconduct (integrity) to which you can refer include:

- The Committee on Academic Misconduct web pages ([COAM Home](#))

- *Ten Suggestions for Preserving Academic Integrity* ([Ten Suggestions](#))
- *Eight Cardinal Rules of Academic Integrity* (www.northwestern.edu/uacc/8cards.htm)

Accessibility 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; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Accessibility of course technology: This course requires use of Carmen (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. [Carmen \(Canvas\) accessibility documentation](#).

Grievances

According to University Policies, available from the Division of Student Affairs, if you have a problem with this class, "You should seek to resolve a grievance concerning a grade or academic practice by **speaking first with the instructor or professor**. Then, if necessary, with the department chairperson, college dean, and provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23, which is available from the Office of Student Life, 208 Ohio Union."

Copyright Disclaimer

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.

- **Course Audio and Video Recording:** Video or audio recording of classes without the explicit written permission of the instructor/professor is a violation of the Code of Student Conduct or Students who wish to record their classes must first obtain written permission of the instructor/professor. Otherwise, such recording constitutes a violation of the Code of Student Conduct.
- **Student Generated materials:** Any materials generated by a student(s) is copyrighted. Permission must be obtained to use these materials other than the intended purpose inside the course.
- **Course materials:** These materials are copyrighted and are owned by the author. Copyrights have been secured or they are considered fair use inside/for the course but this does not apply to uses outside of the course.

Mental Health Statement

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's Counseling and Consultation Service (CCS)** by visiting 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 Suicide Prevention Hotline at 1-800-273-TALK or at suicidepreventionlifeline.org.**

Diversity Statement

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

