

Syllabus – Physiology of Obesity, Fall 2022

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Attribute: COLL 400, satisfies Kinesiology & Health Sciences major writing requirement

Goals:

- 1) Build your understanding of the current scientific knowledge of the following physiological processes:
 - a) body weight regulation including neural and hormonal control of appetite and metabolism
 - b) mechanisms of diseases associated with obesity and inactivity (from systems level to molecules)
 - c) the role of the fat cell and its secretions in the disease process
 - d) the current treatments for these diseases and the role of exercise
- 2) Refine your skills in synthesizing, evaluating, and presenting science literature
- 3) Create an original research proposal, and deliver an oral presentation/defense of the proposal

Format: A seminar course that combines lectures and class discussion. This is an advanced physiology course that assumes a basic background in physiology and/or cell biology.

Prerequisites: Human Physiology (KINE 204) or Introduction to Molecules, Cell and Development (BIOL 225)

Grading

Research Paper Discussions	70 pts.	Weekly (7 total, 10 pts. each)
Proposal Abstract and References	10 pts.	
Written Research Proposal	80 pts.	
Oral Presentation	40 pts.	
Ask Questions	10 pts.	(5 questions, 2 pts. each)
Quiz #1	40 pts.	
Quiz #2	40 pts.	
TOTAL:	290 pts.	

Quizzes: Quizzes are multiple-choice. It is possible to take a quiz early (if pre-arranged 1 week in advance with instructor). Late quizzes are allowed in case of illness or personal hardship (as

approved by Dean of Students). It is also allowed by choice, but will result in a point deduction (5% if taken within 1 week, 10% after 1 week).

Final Exam: Because this is a seminar course, there is no final exam.

Paper Discussions:

Paper discussions will consist of reading an assigned original research paper, and presenting an assigned figure/table with your small group (**10 pts. each paper, 70 pts. total**).

Your figure/table presentation should include:

- 1) the overall purpose of the experiments
- 2) an explanation of each panel of data, including the methods/approach used (if not obvious)
- 3) the significance of the data and its importance to the paper overall
- 4) any limitations of the data

In class format:

- 1) instructor will present the background, hypothesis, and general methods of the paper
- 2) your small group will have some time to organize your figure/table presentation
- 3) small groups will then present figures to class (divide presentation evenly between individuals)
- 4) instructor will present conclusions, significance, limitations

Missed Discussions: If you are going to miss a paper discussion, you may turn in a detailed written analysis (~4 pages; essay style) which includes the purpose/hypothesis of the paper, an explanation of the data and significance of each figure/table, and overall conclusions, significance, and limitations of the paper. The analysis is **due by 10:00 AM on the day of the discussion**, or points will be deducted (5% if turned in within 1 week, 10% after 1 week). **You will only be able to take this option for 2 paper discussions.**

Final grading:

Final grading is based on the standard scale cut-points (e.g., A=93%, A-=90%, B+=87%, B=93%, B-=80%, etc.), however, if the mean is <80%, then grading is on the curve, with the mean representing the lowest B. Grades are generally not rounded up unless the score is within 0.5 points of the next grade bracket. *There is no opportunity for extra credit assignments in this course.*

Course Project:

You will write a research proposal (**80 pts**) on one of the topics discussed in class and present it to the class (**40 pts**) in a way that a non-scientist could understand. You will also receive credit for submitting an initial draft of your abstract/references (**10 pts**).

The written proposal will should include:

- a) **Abstract** (1 page) written in lay-person terms: describing the rationale for the study (1-2 sentences), the hypothesis (1 sentence), the experimental design (1-3 sentences), and significance of the study (1 sentence).
- b) **Background and Rationale** (2-4 pages): Explain the most relevant studies that provide the rationale for your project. This should include detailed explanations of the pathways/processes you will study, and rationale for specific approaches taken experiment. You may use sub-headings for specific topics. Explicitly state what information is missing from the literature, why it is important for you to provide the missing information, and the experimental strategy you will use to provide the information. This section should cite many references (nearly every sentence) in order to sufficiently explain the current knowledge on the topic and to justify your approach. By the end of this section, the reader should understand why you are doing the study, why it is important, and what general strategy you will take.
- c) **Hypothesis** (1-2 sentences): An affirmative statement of the outcome you predict for a certain experiment or set of experiments. It should be sufficiently focused that it can be tested with a few experiments. [e.g., Increasing asprosin in mice with injection or genetic overexpression will result in weight gain.]
- d) **Study Design** (1 paragraph): Briefly explain the experimental design, test subjects/model, and methods used.
- e) **Methods** (2-3 pages): Provide the details for the subjects or animal model used, treatments given, and each experimental methods used. Include references for specific methods and/or specific approaches.
- f) **Potential Results** (<1 page): Consider the most likely results of your experiments (in support or in opposition to your hypothesis) and explain how you will interpret them.
- g) **Significance** (1 paragraph): Explain how your study would contribute to our knowledge.
- h) **References**: Include at least 12 recent, original research articles related to the proposal topic, and one or more review articles. Proper citation within the text (numbered or author, date) is required and each reference should be listed in the bibliography (listed by number or alphabetical by first author's last name).

The oral presentation should:

- a) be ~8 minutes in length (~8 Powerpoint Slides)
- b) be composed to communicate with a lay audience (mostly pictures, minimal text)
- c) be in **Assertion-Evidence Format** (each slide has a conclusive title and visual image to provide evidence or support for the title)
- d) include a simple visual model of the pathway, process, or problem to be examined
- e) provide a clear rationale for the study and why the question is important
- f) include simple explanations of the approaches and techniques to be used (pictures or diagrams are most effective) and their limitations
- g) include predicted results and what they would mean

Ask Questions: You will be expected to ask a total of 5 questions of 5 different speakers during the student talks (**2 pts. each, 10 pts. total**).

Topics:

- I. Overview of Diseases of Obesity/Inactivity in U.S., Metabolic Syndrome
- II. Neural and Hormonal Control of Appetite and Metabolism
- III. Causes of Obesity and Treatments
- IV. Adipose Tissue and Adipocytokines
- V. Physiological and molecular mechanisms of Type-II diabetes, and how exercise and weight reduction counteract its effects
- VI. Physiological and molecular mechanisms of hyperlipidemia (high blood lipids and cholesterol) and methods of treatment
- VII. Physiological and molecular mechanisms of hypertension (high blood pressure) and methods of treatment
- VIII. Physiological and molecular mechanisms of cardiovascular disease, and how exercise and weight reduction counteract its effects

Additional Resources (Information from these sites can be cited in your paper):

American Heart Association (www.americanheart.org)

National Heart, Lung, and Blood Institute (www.nhlbi.nih.gov)

National Institute of Diabetes and Digestive and Kidney Diseases (www.niddk.nih.gov)

American Diabetes Association (www.diabetes.org)

Center for Disease Control (cdc.gov)

Accommodations: It is the policy of William & Mary to accommodate students with disabilities and qualifying diagnosed conditions in accordance with federal and state laws. Any student who feels s/he may need an accommodation based on the impact of a learning, psychiatric, physical, or chronic health diagnosis should contact Student Accessibility Services staff at 757-221-2512 or at sas@wm.edu to determine if accommodations are warranted and to obtain an official letter of accommodation. For more information, please visit www.wm.edu/sas. Department Diversity Plan: <https://www.wm.edu/as/kinesiology/diversity-plan/index.php>.

Physiology of Obesity - Fall 2022 Schedule

Thurs., Sept. 1	Lecture #1: Overview of Diseases of Obesity/Inactivity in U.S.
Tues., Sept. 6 Thurs., Sept. 8	Lecture #2: Neural and Hormonal Control of Appetite and Metabolism Paper #1 and general information about scientific journals
Tues., Sept. 13 Thurs., Sept. 15	Lecture #3: Causes of Obesity Paper #2 [Project Topic Due]
Tues., Sept. 20 Thurs., Sept. 22	Lecture #4: Treatments, Abdominal Obesity Paper #3
Tues., Sept. 27 Thurs., Sept. 29	Lecture #5: Adipocytokines, Leptin Resistance Paper #4 [Abstract/References Due]
Tues., Oct. 4 Thurs., Oct. 6	Lecture #6: Brown Adipose Tissue, Diabetes Paper #5
Tue., Oct. 11 Thurs., Oct. 13	QUIZ #1 FALL BREAK
Tues., Oct. 18 Thurs., Oct. 20	Lecture #7: Diabetes – Mechanisms and Treatments Lecture #8: Genetics/Epigenetics of Diabetes and Obesity [1st Draft Due] Dyslipidemia
Tues., Oct. 25 Thurs., Oct. 27	Paper #6 Lecture #9: Hypertension
Tues., Nov. 1 Thurs., Nov. 3	ELECTION DAY Lecture #10: Cardiovascular Disease
Tues., Nov. 8 Thurs., Nov. 10	Paper #7 Lecture #11: Cardiovascular Disease
Tues., Nov. 17 Thurs., Nov. 19	QUIZ #2 Student Presentations
Tues., Nov. 22	Student Presentations
Tues., Nov. 29 Thurs., Dec. 1	Student Presentations - Remote Student Presentations
Tues., Dec. 6 Thurs., Dec. 8	Student Presentations Student Presentations [2nd Draft Due]
Mon., Dec. 12, 2:00 Sharp [Revised, Final Presentation Powerpoint Due]	

Discussion Papers

- 1) Halaas, et al. Weight-reducing effects of the plasma protein encoded by the obese gene. Science 269:543-6, 1995.
- 2) Duerrschmid, et al. Asprosin is a centrally acting orexigenic hormone. Nature Medicine 23:1444-53, 2017.
- 3) Li, et al. An exercise-inducible metabolite that suppresses feeding and obesity. Nature 606:785-790, 2022.
- 4) Lotta, et al. Human gain-of-function MC4R variants show signaling bias and protect against obesity. Cell 177:597-07, 2019.
- 5) Jastreboff, et al. Tirzepatide Once Weekly for the Treatment of Obesity. New England Journal of Medicine 387:205-216, 2022.
- 6) Student's Choice:

Suez, et al. Personalized microbiome-driven effects of non-nutritive sweeteners on human glucose tolerance. Cell 185:1-22, 2022.

Li, et al. Local hyperthermia therapy induces browning of white fat and treats obesity. Cell 185:1-18, 2022.
- 7) Student's Choice:

Zhao, et al. Gut bacteria selectively promoted by dietary fibers alleviate type 2 diabetes. Science 359:1151-6, 2018.

He, et al. Gut intraepithelial T cells calibrate metabolism and accelerate cardiovascular disease. Nature 566:115-119, 2019.

Zhao, et al. Partial Leptin Reduction as an Insulin Sensitization and Weight Loss Strategy. Cell Metabolism 30:1-14, 2019.