

**University of British Columbia**  
**School of Kinesiology**  
**Kin 483A: Advanced Seminar in Systems Biology, Exercise and Health**  
**2023W Term 2**

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**Course Code and Title:** KIN 483A 001 (previously offered as KIN 489D)

**Class location:** Hennings 201

**Class Meeting time(s):** Tues Thurs 12:30-2:00 (BE ON TIME)

**Instructor Name:** Dr. David Wright

**Contact Information:** david.wright@ubc.ca

**Office Hours:** By appointment

**TA:** AnnaLaura Bellucci, annab95@student.ubc.ca

**Acknowledgement**

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the Musqueam people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on their culture, history, and traditions from one generation to the next on this site.

**Course Description**

This course will provide an introduction to the physiological and biochemical changes that occur in skeletal muscle, adipose tissue and liver following a single bout of exercise and with exercise training. This course will also examine and discuss interactions between exercise, nutrition and commonly prescribed medications used for the treatment of diabetes and cardiovascular disease.

**Rationale**

Exercise has profound effects on how the body utilizes carbohydrate and fat as fuel sources. For example, even a single session of exercise can improve how the body disposes of glucose. While the beneficial effects of prescribing exercise as a means to improve metabolic health have been known for decades, it is common that other lifestyle interventions and/or pharmacological approaches would be initiated at the same time. Given this, it is important to understand the interactions between exercise, nutrition and pharmaceutical interventions and the underlying mechanisms mediating these effects.

**Aims and Outcomes**

Students will learn about the physiological and biochemical adaptations which occur with exercise and how exercise interacts with, and impacts the effects of nutritional and pharmaceutical interventions.

**Educational Outcomes:**

- Understand the strengths of weaknesses of preclinical rodent models used in exercise and nutrition research
- Understand how an acute bout of exercise and exercise training impacts how skeletal muscle utilizes carbohydrate and fat
- Understand how acute exercise and exercise training impacts the breakdown and release of fat from adipose tissue
- Understand how exercise training can increase the oxidative capacity of skeletal muscle, adipose tissue and liver
- Understand the signals which are involved in mediating the beneficial effects of exercise

- Understand the effectiveness of popular “diets” (ketogenic diet, time restricted feeding etc.) on improving metabolic health
- Understand interactions between nutrition and exercise in regulating metabolic health
- Understand the interactions between exercise and commonly prescribed medications including metformin, statins and antipsychotics

### **Specific Learning Objectives:**

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

1. Describe the effects of acute exercise and exercise training on skeletal muscle, adipose tissue and liver and how these adaptations impact whole body carbohydrate and fat metabolism
2. Identify signals mediating the effects of exercise on various tissues in the body
3. Summarize strengths and weaknesses of preclinical rodent models used in exercise physiology research
4. Describe the evidence demonstrating the effectiveness of popular diets on improving metabolic health
5. Discuss the interactions between exercise and diet on glucose and lipid metabolism
6. Identify how exercise impacts the effects of medications including metformin, statins and antipsychotics and vice versa

### **Format and Procedures:**

Delivery: Class will primarily be delivered in-person with supplemental material (recorded lectures, podcasts etc.) occasionally provided to build upon what is covered in class.

Attendance: Although attendance will not be taken it is strongly encouraged that students attend all classes. Lecture slides posted on Canvas will provide a cursory snapshot of the lecture, but this will be heavily supplemented with information covered in class. You are also responsible for getting your own notes from class as well as information pertaining to changes in the course outline, readings, assignments, and any tests or exams.

Email: I will attempt to respond to emails within 24 hours of receiving them and will generally do so during regular working hours (M-F 08:00-5:00). Email is not the best medium to explain concepts covered in class that require clarification. In this instance students are strongly encouraged to set up a meeting either in person or virtually (Zoom, Teams etc).

Technology in the classroom: Electronic devices can be used in the classroom for taking notes. Please make sure that you stay focused on the material being taught and avoid surfing the web, checking email etc. Please be respectful of others in the class and have cell phones on silent mode at all times.

Class notes: PowerPoint slides will be posted on Canvas ~ 24 hours prior to class. Please keep in mind that notes provide a general over view of what is covered in class and will be heavily supplemented during the lecture. Thus, regular attendance is strongly encouraged.

### **Policies and Expectations**

Academic Accommodation for Students with Disabilities: The University's goal is to ensure fair

and consistent treatment of all students, including students with a disability, in accordance with their distinct needs and in a manner consistent with academic principles. Students with a disability who wish to have an academic accommodation should contact Access and Diversity without delay.

**Academic Integrity:** All UBC students are expected to behave as honest and responsible members of an academic community. Breach of those expectations or failure to follow the appropriate policies, principles, rules, and guidelines of the University with respect to academic honesty may result in disciplinary action. It is your responsibility to become familiar with the University of British Columbia's Academic Honesty and Plagiarism Policies, as well as the Student Declaration and the consequences of violating these policies. The use of generative AI tools, including ChatGPT and other similar tools, to complete or support the completion of any form of assignment in this course is not allowed and would be considered academic misconduct.

## Readings and Resources

There is no formal textbook required for this course, nor is there a formal reading list. For those interested in further reading on given topics, a supplemental reading list will be provided at the end of each class. Please note that information covered in these readings, that are not discussed in class, will not be examinable.

## Evaluation

1. Quizzes (10%, 3.33% each): There will be 3 quizzes given throughout the semester. These assessments will be completed ~ 2 weeks prior to each of the three exams throughout the semester and are designed to allow students to become familiar with the information that will be covered in the upcoming exam.
2. Exams (90%, 30% each): There will be three exams given in the semester at ~ 4-week intervals. Exams will be short answer and multiple choice. While there will be general concepts that carry over between exams, the exams will not be cumulative in nature.

Term tests will not be rescheduled for any reason other than a medical issue or family emergency. Written documentation must be presented in order for the test to be rescheduled. If you do not contact your instructor, you will be given a score of zero on the assessment.

## Tentative Course Schedule

The topics and assessment for the semester are listed below, although this may be subject to change.

<i>Date</i>	<i>Topic</i>	<i>Assessments</i>
Week of January 8	<ul style="list-style-type: none"><li>- Introduction to class, format, expectations, grading etc, utility of animal models</li><li>- Effect of exercise on whole body substrate oxidation</li><li>- Exercise and skeletal muscle glucose metabolism</li></ul>	n/a
Week of January 15	<ul style="list-style-type: none"><li>- Exercise and skeletal muscle mitochondrial</li></ul>	n/a

	<ul style="list-style-type: none"> <li>and GLUT4 biogenesis</li> <li>- Exercise and lipid utilization</li> </ul>	
Week of January 22	<ul style="list-style-type: none"> <li>- Exercise training and adipose tissue and liver metabolism</li> </ul>	Quiz#1 <b>January 24</b>
Week of January 29	<ul style="list-style-type: none"> <li>- Adipose tissue mitochondria, TZDs and exercise</li> <li>- Adipose tissue browning and exercise</li> </ul>	n/a
Week of February 5	<ul style="list-style-type: none"> <li>- Review for Exam#1</li> <li>- Exam #1</li> </ul>	Exam #1 <b>February 9</b>
Week of February 12	<ul style="list-style-type: none"> <li>- Exerkines -IL-6</li> </ul>	n/a
Week of February 19	<ul style="list-style-type: none"> <li>- Mid-term break no class</li> </ul>	n/a
Week of February 26	<ul style="list-style-type: none"> <li>- Exerkines -GDF15</li> <li>- Obesity and inflammation</li> </ul>	Quiz #2 <b>March 2</b>
Week of March 4	<ul style="list-style-type: none"> <li>- Obesity and mitochondrial dysfunction</li> <li>- Obesity and ectopic lipid deposition</li> </ul>	n/a
Week of March 11	<ul style="list-style-type: none"> <li>- Exam #2 review</li> <li>- Exam #2</li> </ul>	Exam #2 <b>March 16</b>
Week of March 18	<ul style="list-style-type: none"> <li>- Exercise in the treatment of insulin resistance</li> <li>- Anti-inflammatory effects of exercise</li> </ul>	n/a
Week of March 25	<ul style="list-style-type: none"> <li>- Ketogenic diets in the treatment of obesity and insulin resistance</li> <li>- GLP1r agonists and obesity</li> </ul>	n/a
Week of April 1	<ul style="list-style-type: none"> <li>- Metabolic side effects of antipsychotic medications</li> <li>- Lifestyle interventions to treat the side effects of antipsychotics</li> </ul>	Quiz #3 <b>April 6</b>

Week of April 8	<ul style="list-style-type: none"> <li>- Exercise and metformin interactions</li> <li>- Interactions between statins and exercise</li> <li>- Review for final exam</li> </ul>	n/a
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Note: The final exam will be given during the final exam period April 16-27. Once the exam schedule is posted, I will update the class