

# Course Outline: EDKP 445 – Exercise Metabolism

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## General Information

University: McGill (downtown campus)

Course #: EDKP 445

Term: Winter

Year: 2022

Course pre-requisite(s): EDKP 395 (Exercise Physiology)

Course schedule: Monday and Wednesday, 1:05 pm – 2:25 pm

Number of credits: 3.0

Course location: Virtual via Zoom and Currie Gymnasium room 305/306

## Instructor

Tyler Churchward-Venne, Ph.D.

E-mail: [tyler.churchward-venne@mcgill.ca](mailto:tyler.churchward-venne@mcgill.ca)

Phone: (514) 398-4184 ext. 00839

Physical office location: Currie Memorial Gymnasium,  
475 Pine Avenue West, Room A205

Office hours: Virtual or in-person meetings can be scheduled by appointment via e-mail

## Teaching Assistant

Sarkis Hannaian, M.Sc.; Ph.D. student

E-mail: [sarkis.hannaian@mail.mcgill.ca](mailto:sarkis.hannaian@mail.mcgill.ca)

Office hours: Virtual or in-person meetings can be scheduled by appointment via e-mail

## COURSE OVERVIEW

Metabolism refers to the sum of biochemical reactions occurring in a living organism. The focus of this course is on key metabolic, biochemical, and molecular processes that occur during and after physical exercise. Transitioning from rest to exercise places unique metabolic demands on the body causing the rate at which certain biochemical reactions occur to change dramatically; this process constitutes *metabolic control*. The first part of the course emphasizes aspects and principles of basic biochemistry that are particularly relevant to exercise metabolism and the molecular regulation of skeletal muscle adaptation. The second part of the course emphasizes carbohydrate, lipid, and protein related metabolism and their regulation via exercise. Attention is also given to contemporary nutritional approaches that modify metabolism during and after exercise, as well as topics such as exercise fatigue, bone metabolism, body composition management of elite athletes, and sex-differences in the metabolic response to exercise.

## INSTRUCTIONAL METHOD

The instructional methods used in this course will encompass lectures, assigned readings, group presentations, and peer evaluation.

## SUPPLEMENTARY COURSE MATERIALS

1. Tiidus PM, Tupling AR, & Houston ME. *Biochemistry Primer for Exercise Science*, 4<sup>th</sup> Edition. Human Kinetics, Champaign IL, USA, 2012.

*Note:* A limited number of reserved copies are available at the McGill University Humanities and Social Sciences Library. Please use the following link to check availability: <https://mcgill.on.worldcat.org/courseReserves/course/id/14759315>

## LEARNING OUTCOMES

Upon completion of this course, the student will:

1. Be able to describe and explain key metabolic reactions and how they are regulated during and after physical exercise.
2. Be able to describe and explain the separate and integrative responses of fuel metabolism (i.e. carbohydrate, lipid, and protein/amino acid) to exercise.
3. Be able to describe and explain the mechanisms underpinning some key contemporary nutritional supplements/dietary practices to augment exercise metabolism, adaptation, and/or performance.
4. Improve their oral communication/presentation skills and enhance their capacity to work effectively with others on a group assignment.

## COURSE CONTENT AND SCHEDULE (\*subject to change\*)

| Date  | Description   | Readings       |
|---|---|----------------|
| January 5   | Course introduction   |                |
| January 10  | Amino acids, peptides, and proteins                             |                |
| January 12  | Enzymes   |                |
| January 17  | Gene transcription and protein synthesis                        |                |
| January 19  | Mechanisms of exercise-induced muscle hypertrophy (GL)          | 1              |
| January 24  | Mechanisms of exercise-induced mitochondrial biogenesis         | 2              |
| January 26  | Energy systems and bioenergetics                                |                |
| January 31  | Oxidative phosphorylation I                                     |                |
| February 2  | Oxidative phosphorylation II                                    | ***DUE DATE*** |
| February 7  | Midterm examination   |                |
| February 9  | Carbohydrate metabolism I                                       | 3              |
| February 14   | Carbohydrate metabolism II                                      |                |
| February 16   | Metabolic and biochemical contributors to exercise fatigue (GL) | 4              |
| February 21   | Lipid metabolism I  | 5              |
| February 23   | Lipid metabolism II   |                |
| February 28   | Reading week  |                |
| March 2   | Reading week  |                |
| March 7   | Protein/amino acid metabolism I                                 | 6              |
| March 9   | Protein/amino acid metabolism II                                |                |
| March 14  | Managing nutrient availability for physique optimization (GL)   |                |
| March 16  | Bone metabolism: effects of exercise and nutrition (GL)         | 7              |
| March 21  | Ergogenic aids in sport and exercise (GL)                       |                |
| March 23  | Sex differences in metabolism (GL)                              | ***DUE DATE*** |
| March 28  | ***Group presentations***                                       |                |
| March 30  | ***Group presentations***                                       |                |
| April 4   | ***Group presentations***                                       |                |
| April 6   | ***Group presentations***                                       |                |
| April 11  | ***Open class***  | ***DUE DATE*** |
| Lectures will be posted on the EDKP 445 myCourses website; GL = Guest Lecture |   |                |

## COURSE EVALUATION

1. Midterm examination (Monday, February 7<sup>th</sup>).....**30%**
  - *Will cover material from January 5 - February 2, 2022*
2. Group presentation - critical evaluation (In class).....**30%**
3. Participation.....**5%**
4. Final examination (During exam period, date TBA).....**35%**
  - *Will cover material from February 9 - April 11 inclusive, 2022*

**\*\*Students are responsible for all material covered in lectures\*\***

## ASSIGNED READINGS

Assigned readings are designed to complement the information provided in the lectures and will be posted on myCourses in advance.

## GROUP PRESENTATION - CRITICAL EVALUATION

The goal of this group assignment is to concisely and critically evaluate the advertised claim(s) for one of the following: 1) a dietary sports supplement, 2) a diet program, 3) a workout system, or 4) a post-exercise recovery method. Students will form groups of 2 (depending on the total number of students in the course) and select the advertised claim they would like to critically evaluate. Group presentations will be delivered in person (or live via Zoom if necessary because of the COVID-19 pandemic) during regularly scheduled class time towards the end of the course. Each presentation should be 20 minutes in duration and will be followed by a 5-10 minute question period. By **Wednesday February 2, 2022 by 5:00 PM EST**, each group must send the TA (Mr. Sarkis Hannaian) via e-mail 1) the names of their group members, and 2) a PDF copy of the advertised claim they wish to critically evaluate. The TA will either confirm the choice of the advertised claim or request a change if the topic is deemed not suitable or has already been selected. A copy of the finalized presentation should be e-mailed to the TA as a PowerPoint file (pptx. file) on **Wednesday March 23, 2022 by 5:00 PM EST**. The presentation should be appropriately balanced in both breadth and depth. It should provide sufficient and relevant detail, without extraneous information, within the allocated amount of time. The presentation should include the following information:

- Title of the presentation and names of presenters
- Important background information on the topic
- The advertised claim(s) the presentation aims to evaluate
- The research question(s) the presentation aims to address
- Key research findings on the topic based on peer reviewed published literature
- Underlying metabolic and/or biochemical mechanisms of action
- The presenter's overall evaluation and conclusion on the advertised claim(s)

**\* A grading rubric for the group presentation will be supplied**

Each group member is expected to contribute to presentation, both in terms of its development and delivery. Below are some presentation tips to consider that may be useful:

- Practice your presentation
- Speak in a clear voice and pay attention to pace (presenters tend to speak too fast)
- Minimize use of text on your slides

- Any included text should be large and easy for people to read
- Emphasize figures and diagrams (a picture is worth a thousand words)
- Focus on clarity of the presentation
- A good rule of thumb is 1 slide per minute of presentation time

## PARTICIPATION

Students are expected to attend the group presentations of their peers and ask questions following the presentations. Each student will be required to fill out a grading rubric/comment form for one (1) group presentation and submit it to the TA (Mr. Sarkis Hannaian) as a Word file (doc or docx. file) via e-mail by **Monday April 11, 2022 by 5:00 PM EST**. The grading rubric/comment form to be filled in will be supplied by Dr. Churchward-Venne. Students will be informed in advance regarding which group presentation they will be expected assess via the grading rubric/comment form.

## SUMMARY OF IMPORTANT SUBMISSION DATES

\*\*\***February 2, 2022 by 5:00 PM EST:** Send the TA via e-mail 1) the names of their group members, and 2) a PDF copy of the advertised claim they wish to critically evaluate.

\*\*\***March 23, 2022 by 5:00 PM EST:** Send the TA via e-mail a copy of the finalized critical evaluation group presentation as a PowerPoint file (pptx. file).

\*\*\***April 11, 2022 by 5:00 PM EST:** Send the TA via e-mail a copy of the completed grading rubric/comment form for the group presentation as a Word file (doc or docx. file).

## LANGUAGE OF SUBMISSION

“In accord with McGill University’s Charter of Students’ Rights, students in this course have the right to submit in English or in French any written work that is to be graded. This does not apply to courses in which acquiring proficiency in a language is one of the objectives.”

« Conformément à la Charte des droits de l’étudiant de l’Université McGill, chaque étudiant a le droit de soumettre en français ou en anglais tout travail écrit devant être noté (sauf dans le cas des cours dont l’un des objets est la maîtrise d’une langue). »

## ACADEMIC INTEGRITY

McGill University values academic integrity. Therefore, all students must understand the meaning and consequences of cheating, plagiarism and other academic offences under the Code of Student Conduct and Disciplinary Procedures” (see [McGill’s guide to academic honesty](#) for more information).

« L’université McGill attache une haute importance à l’honnêteté académique. Il incombe par conséquent à tous les étudiants de comprendre ce que l’on entend par tricherie, plagiat et autres infractions académiques, ainsi que les conséquences que peuvent avoir de telles actions, selon le Code de conduite de l’étudiant et des procédures disciplinaires (pour de plus amples renseignements, veuillez consulter le [guide pour l’honnêteté académique de McGill](#)). »

## ADDITIONAL STATEMENTS

- ✓ The [University Student Assessment Policy](#) exists to ensure fair and equitable academic assessment for all students and to protect students from excessive workloads. All students and instructors are encouraged to review this Policy, which addresses multiple aspects and

methods of student assessment, e.g. the timing of evaluation due dates and weighting of final examinations.

- ✓ Work submitted for evaluation as part of this course may be checked with text matching software within myCourses.
- ✓ © Instructor-generated course materials (e.g., handouts, notes, summaries, exam questions) are protected by law and may not be copied or distributed in any form or in any medium without explicit permission of the instructor. Note that infringements of copyright can be subject to follow up by the University under the Code of Student Conduct and Disciplinary Procedures.
- ✓ As the instructor of this course I endeavor to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with Dr. Churchward-Venne and the [Office for Students with Disabilities](#), 514-398-6009.
- ✓ McGill University is on land which has long served as a site of meeting and exchange amongst Indigenous peoples, including the Haudenosaunee and Anishinabeg nations. We acknowledge and thank the diverse Indigenous people whose footsteps have marked this territory on which peoples of the world now gather.  
« L'Université McGill est sur un emplacement qui a longtemps servi de lieu de rencontre et d'échange entre les peuples autochtones, y compris les nations Haudenosaunee et Anishinabeg. Nous reconnaissons et remercions les divers peuples autochtones dont les pas ont marqué ce territoire sur lequel les peuples du monde entier se réunissent maintenant. »
- ✓ [End-of-course evaluations](#) are one of the ways that McGill works towards maintaining and improving the quality of courses and the student's learning experience. You will be notified by e-mail when the evaluations are available. Please note that a minimum number of responses must be received for results to be available to students.
- ✓ In the event of extraordinary circumstances beyond the University's control, the content and/or evaluation scheme in this course is subject to change.
- ✓ Additional policies governing academic issues which affect students can be found in the McGill Charter of Students' Rights (see [document](#)).
- ✓ McGill has policies on sustainability, paper use and other initiatives to promote a culture of sustainability at McGill. (See the [Office of Sustainability](#).)
- ✓ The use of MC2 devices must, in all cases, respect policies and regulations of the University, including in particular the following:
  - The Code of Student Conduct and Disciplinary Procedures;
  - The Policy Concerning the Rights of Students with Disabilities;
  - The Policy on the Responsible Use of McGill IT Resources.
- ✓ No audio or video recording of any kind is allowed in class without the explicit permission of the instructor.
- ✓ Mobile computing and communication devices are permitted in class insofar as their use does not disrupt the teaching and learning process.