

PHGY 515 Blood-Brain Barrier in Health & Disease (3 credits)

Time: Tuesdays and Thursdays: 1:05 – 2:25 pm

Place: MCMED 1101

GENERAL INFORMATION

Coordinator:

Dr. Masha Prager-Khoutorsky

Tel: (514) 398-1818; email: masha.prager-khoutorsky@mcgill.ca

Office hours: by appointment

Prerequisite: Background knowledge in molecular neuroscience, physiology, and immunology (PHGY 313 and 314 or equivalent) and permission of the instructor.

COURSE DESCRIPTION

The course will focus on the molecular and cellular mechanisms underlying the organization and regulation of the blood-brain barrier (BBB). It will also highlight neurological diseases associated with the impairment of BBB and provide an overview of experimental approaches to study BBB. The course will utilize a novel *mock* journal editorial board format which aims to encourage class participation and to teach critical analysis of scientific articles. An introductory lecture will be given by the Editor-in-chief of the mock journal – Dr. Masha Prager-Khoutorsky. Further background will be given by several guest speakers who are experts in various aspects of BBB physiology in health and disease. Each week, a student will present a research article related to the taught topic and act as a pseudo-author/defender of the presented paper. An additional student will act as a reviewer, and students will alternately act as pseudo-author/defender or a reviewer of the presented papers. Topics will include: roles of astrocytes, endothelial cells, pericytes, and neurons in the maintenance of BBB; neurological disease associated with the disruption of the BBB; methodologies to study BBB *in vivo* and *in vitro* in animal models and in humans; and strategies for drug delivery and penetration across the BBB. By the end of the course each student should write and submit a mock grant to the course coordinator, and present and defend the grant proposal.

Fall 2022 Course Schedule

<u>DATE</u>	<u>TOPIC</u>	<u>LECTURER</u>
Thursday, Sept. 1	Introductory lecture, Peer review & grant writing	Dr. Prager-Khoutorsky
Tuesday, Sept. 6	Introduction and building blocks of the Blood-brain barrier (BBB) (lecture)	Dr. Prager-Khoutorsky
Thursday, Sept. 8	BBB development (paper#1)	Dr. Prager-Khoutorsky
Tuesday, Sept. 13	Neurovascular coupling, Choroid plexus and CSF production (lecture)	Dr. Hamel
Thursday, Sept. 15	Neurovascular coupling (paper#2)	Dr. Prager-Khoutorsky
Tuesday, Sept 20	BBB in Alzheimer's disease (lecture)	Dr. Hamel
Thursday, Sept 22	BBB in Alzheimer's disease (paper#3)	Dr. Prager-Khoutorsky
Tuesday, Sept. 27	Introduction to PET imaging (lecture)	Dr. Kostikov
Thursday, Sept 29	PET studies of the BBB and efflux proteins in health and disease (lecture)	Dr. Kostikov
Tuesday, Oct 4	Drug transport through the BBB (paper#4)	Dr. Prager-Khoutorsky
Thursday, Oct. 6	Barrier cells and Multiple Sclerosis (lecture)	Dr. Jo Anne Stratton
Tuesday, Oct. 11	No Class – Fall Break	
Friday, Oct. 14	BBB in Multiple Sclerosis (paper#5)	Dr. Prager-Khoutorsky
Tuesday, Oct 18	Neural barriers in Pain (lecture)	Dr. Zhang
Thursday, Oct. 20	Neurovascular unit in vitro (paper#6)	Dr. Prager-Khoutorsky
Tuesday, Oct. 25	BBB in circumventricular organs (lecture)	Dr. Prager-Khoutorsky
Thursday, Oct. 27	BBB regulation in circumventricular organs (paper#7)	Dr. Prager-Khoutorsky
Tuesday, Nov. 1	BBB & brain tumors	Dr. Diaz
Thursday, Nov. 3	Aging & BBB (paper#8)	Dr. Prager-Khoutorsky

<u>DATE</u>	<u>TOPIC</u>	<u>LECTURER</u>
Tuesday, Nov. 8	CANCELLED	
Thursday, Nov. 10	Optical approaches to manipulate BBB in humans (lecture)	Dr. Diaz
Tuesday, Nov. 15	Introduction to MRI (lecture)	Dr. Rudko
Thursday, Nov. 17	Traumatic brain injury & BBB (paper#9)	Dr. Prager-Khoutorsky
Tuesday, Nov. 22	MRI in animal models (lecture)	Dr. Rudko
Thursday, Nov. 24	BBB disfunction & EC profiling (Paper #10)	Dr. Prager-Khoutorsky
Tuesday, Nov 29	Mock grant presentations	Dr. Prager-Khoutorsky
Thursday, Dec. 1	Mock grant presentations	Dr. Prager-Khoutorsky

EVALUATION

There is no exam for this course. Presentation and discussion of research papers and ability to critically assess information will account for 50% of the grade. This includes presentations of research articles as a pseudo-author/defender (10%), as a paper reviewer (10%), and in-class participation (10%), which will be based on class attendance, participation in discussion of research articles and the reviewer panel discussion, interaction during lectures (e.g. asking questions). Every student will also write and submit short “reviewer comments” (<half a page) towards the mock editorial discussion of a presented research paper every week (10 papers per course, 20%), to be submitted prior to the class via *myCourses*. The remainder of the grade is derived from a mock grant (25%) and an oral presentation of the grant (25%). The topic of the mock grant will be decided between the instructor and each of the students. The details of this assignment (format, deadlines, etc.) and a list of the presented research papers will be provided at a later date to registered students of the course. All assignments must be original (see statement on academic integrity). Late submissions are subject to standard penalties (penalty of 10% per day late (including weekends and holidays), up to a maximum of three full days past the assignment deadline, after which submissions for the assignment will not be accepted.

ON TEACHING MATERIALS

Instructor-generated course materials (handouts, notes, summaries, exam questions, etc.) 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: <https://www.mcgill.ca/tls/instructors/course-design/outline>

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 for more information). Every student has the right to write term papers, examinations and theses in English or French, except in courses where knowledge of a language is one of the objectives of the course. In the event of extraordinary circumstances beyond the University’s control, the content and/or evaluation scheme in this course is subject to change.