**MSC1108W. Animal Models of Human Diseases**

Course director: Gaspard Montandon.

● **Overview:** 0.25 FCE. From February to April

● **Location:** TBD.

● **Objectives:**

Animal Models of Human Diseases is a short course covering a wide variety of animal models which aim at reproducing human diseases and identifying new therapeutic solutions. Biomedical research relies on animal models to new mimic human diseases, identify new mechanisms, and discover new therapies for human diseases. Various technologies are used to develop new animal models such gene editing (mutagenesis, transgenics, gene knockout, etc.), tissue injury, and chemically induced diseases. Animal models range from cells to organism levels and include insects, fish, rodents, and more complex mammals. This module aims to expose the students to a wide range of animal models, the ethical use of animal models, and to a better understanding of the strengths and limitations of animal models.

The concept of animal model validity including predictive, face, and construct validity will be presented, studied, and applied to the student’s research topic. A few articles are provided to better understand these concepts.

12 one-hour lectures will be presented by scientists from the University of Toronto and affiliated hospitals in different disciplines including development, cardiovascular diseases, respiratory diseases, cancer, infection, organ injury, neurological disorders, and animal ethics.

● **Reading:**

**- Mandatory reading.**

***P. Willner and P.J. Mitchell***. *The validity of animal models of predisposition to depression*. *Behavioural Pharmacology* 2002; 13:169–188. Pdf file available on Quercus.

**- Recommended reading*.***

***William T. McKinney Jr., William E. Bunney Jr***. *Animal Model of Depression*. Review of Evidence: Implications for Research. Arch Gen Psychiatry. 1969;21(2):240-248. Pdf file available on Quercus.

***Paul Willner***. *The validity of animal models of depression*. Psychopharmacology (1984) 83:1 – 16.

**● Evaluation:**

***- 16%*** ***Participation and weekly assignments***. For in-person lectures, presence will be noted. For Zoom lectures, participants are required to turn their video on and display their names so attendance can be noted. For each lecture, students will write a short paragraph on the animal models presented or used by the lecturer. The assignment is due the following week. For each lecture presented in class, determine whether the validity criteria apply and are satisfied. If the lecturer presents many animal models, choose one and use the validity criteria as proposed by Willner (2002). ***In Quercus, fill weekly assignment forms for each lecture.***

For each assignment submitted to Quercus, the student will receive 2%. **8 lectures x 2% = 16%.**

***- 30% Written assignment***. Provide a 2-4-page report summarizing the animal models currently used by the student. Detailed instructions to be provided in February 202. **Deadline TBD**.

***+ Introduction (2%)***. Introduce the human disease(s) that you are studying. Present the animal model(s) that you are using in your research. Example: Asthma. Allergic challenges in rats.

**+ *Methods (2%)***. Shortly present the types of experiments or techniques that you are performing in your research. *Examples: Allergic challenges and measurements of respiratory variables in adult rats.*

***+ Validity criteria (4%)*.** Test the predictive, face, and construct validity criteria of your models. Provide examples of experiments or studies.

***+ Strengths and flaws (4%).*** Based on the validity criteria and previous studies, describe the strengths and flaws of your models to study your human disease.

***+ Innovative animal models (4%).*** Propose animal models (combination of animal model of diseases and experimental approaches) that could provide better answers or solutions to your research topic.

***+ Translation (4%).*** Explain how your research (animal models and experimental approaches) can provide therapeutic solutions to human diseases.

***- 24%. Short oral presentation of the student’s research and animal model(s).*** Presentations will take place the last week of the course (see schedule).

***- 30% multiple choice questions and short-answer questions***. **Exam TBD**.

8 multiple-choice questions and 5 short-answer questions from the material presented by lecturers as well as the mandatory reading. Exam is performed online with Quercus in-person with open books.

(8 multiple questions x 2%) + (5 short-answer questions x 4%) = 40%

- 10 lectures. From February to March.

- Students’ presentations. April.

- Exam: April.

**Tentative lectures by scientists**

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| Lecture # | Animal models | Disease | Speakers | Institutions | Date |
| 1 | **Introduction to animal models** | - | Gaspard Montandon | Unity Health Toronto |  |
| 2 | **Pros and cons of animal models** | - | Gaspard Montandon | Unity Health Toronto |  |
| 3 | **C. elegans** | Parasitology | Peter Roy | University of Toronto |  |
| 4 | **Ethical Use of Animal Models** | Ethics | Kerri Nielsen | University of Toronto |  |
| 5 | **Genetic models** | Genetic diseases | Lucy Osborne | University of Toronto |  |
| 6 | **Genetic diseases in zebrafish** | Genetic diseases | Yara Zayed | Unity Health Toronto |  |
| 7 | **Lung cancer** | Cancer | Kelsie Thu | Unity Health Toronto |  |
| 8 | **Imaging in rodents** | Cancer | Brian Nieman | Sick Kids |  |
| 9 | **Zebrafish in neuroscience** | Neuroscience | Tod Thiele | University of Toronto |  |
| 10 | **Mouse models at Jackson Labs** | Mouse models | Katie Zyuzin | Jackson Labs |  |
| 11 | **Students’ presentations** |  |  |  |  |
| 12 | **Students’ presentations** |  |  |  |  |
|  | **Exam** |  |  |  |  |
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**Deadlines:**

- March. Deadline to drop the course.

- April. Written assignment.