

Course Title: Virus Replication

Course Location: MS3290 (Medical Sciences Building)

Course Time and Date: Fridays 2-4 PM from Oct 20 – Nov 24 inclusive

Course Instructor(s): Martha Brown

Instructor Contact Information (email): martha.brown@utoronto.ca

Additional Lecturers (list name, email, Department): none

Course Overview:

This course will consider new developments in understanding the ways in which viruses and viral proteins interact with host cells to generate thousands of progeny virus particles from a single infected cell. This version of the course is for students with no background courses in virology at the undergraduate or graduate level. The first class will comprise a discussion of virus replication in the context of selected viruses, to set the stage for specific papers that will be covered in the subsequent weeks. Classes consist of student presentations of selected papers from the literature, followed by class discussion. Papers for presentation will be distributed a week in advance of the presentation. Assessment is based on presentation of one or more papers (depending on class size), participation in class discussion and a written assignment. The upcoming version of the course will include a look at different aspects of SARS-CoV-2 replication. Specific topics likely will include the following: the need for proteolytic activation of incoming virions in order for them to enter the cell, the role of the host proteasome for successful delivery of the incoming viral genome to the cytoplasm, genome expression, role of the autophagy pathway in assembly and release of progeny virions, how progeny virions utilize the autophagy pathway without being degraded.

Course Objectives:

- To develop an appreciation of the beauty of virus interactions with their host cells
- To develop an appreciation for the controlled sequence of events that begins with endocytosis of the incoming virion and culminates in delivery of the incoming genome to the appropriate compartment within the cell for replication
- To develop an appreciation for the way in which the genome is organized and for the basis for temporal regulation of expression
- To develop an appreciation of the mechanisms that govern packaging of the viral genome into a single virion that will be able to infect a new cell that will go on to produce thousands more virions

Marking Scheme:

Presentation 30 %

Participation/discussion 20%

Take-home exam 50% (questions distributed in last class; papers due two weeks later)

The presentation is an in-depth look at a paper assigned by the instructor. It may be given by one or two students, depending on the size of the class. The presenters will give appropriate background for the paper, then go through the paper, explaining the experimental approach and the data in each figure, challenging the interpretation where appropriate, and linking the paper to those covered in previous weeks. It is expected that there will be considerable class discussion with participation from all students in the class and the instructor.

The take-home exam typically includes two questions – one which gets students to pull together the material covered in the course and the other which gets students to go to the literature to research a topic related to some aspect of replication of a virus that was not covered in the course. Each written answer is expected to be ~ 10 pages in length, double-spaced.

If you anticipate missing a class you must let the instructor know in advance. You will still be responsible for the material covered in that class.

The basic outline for what will be covered in the six weeks is below:

Week 1: Overview of select virus groups in terms of genome organization and gene expression

Week 2: Proteolytic activation of incoming virus - How? Where?

Week 3: Role of the host proteasome for successful genome delivery to the appropriate cellular compartment for genome expression and replication

Week 4: A look at organization of the genome and temporal control of its expression

Week 5: Assembly/Packaging – how new virions are put together

Week 6: How virion release makes use of the autophagy pathway without the virions being degraded