

## Chemistry 560 – Cell-Based Assays for Drug Loaded Nanoparticles

Spring 2020 – February 11<sup>th</sup> through March 11<sup>th</sup>

Prof. Jeremy Wulff | [wulff@uvic.ca](mailto:wulff@uvic.ca)

**Lectures:** Tuesdays and Wednesdays 1:00pm–2:20pm PST

**Location:** Clearihue B021 (Note room changed to B019 for Feb 25<sup>th</sup>)

**CourseSpaces URL:** tbd

### Summary:

This module is intended to provide students with an awareness of *in vitro* cell-based assays used in drug development. Although the emphasis is intended to be on assays of specific utility in characterizing drug loaded nanoparticles, the content will be generally applicable to the *in vitro* characterization of any drug candidate.

The material for this module will be delivered through a series of eight 1.5-hour sessions. Professor Wulff will present the first two lectures (Feb. 11<sup>th</sup> and 12<sup>th</sup>), and then there will be a 1-week break for students to work on a data-analysis assignment and prepare their own presentations.

Class will reconvene on Feb. 25<sup>th</sup> with two weeks of student presentations on a variety of topics related to cell-based assays.

In addition to crafting a teaching lecture on one of the assigned topics, each student will be required to generate a short homework assignment for completion by the other students in the class, along with a marking guide and grading rubric. Each assignment will be due at the beginning of the following class. Dr. Wulff will then evaluate the assignments according to the provided marking key. In this way, students will acquire practice at generating lecture-style content and in setting student assignments.

The final week of class (March 10<sup>th</sup> and 11<sup>th</sup>) will take place in the CAMTEC Centre for Biomolecular Sample Preparation, where the facility manager (Rebecca Hof) will guide students through some hands-on laboratory exercises.

Students' final grades will be based on their performance on the homework, the quality of their assignment questions, and the effectiveness of their presentations. Grades will also be awarded for in-class participation. There is no final examination for this module.

## Learning Objectives:

1. Learn modern cell based assay techniques.
2. Acquire a basic understanding of the execution, data collection, limitations, and data interpretation of cell based assays.
3. Acquire in-depth understanding of a particular assay.
4. Develop the ability to teach an assay technique to a class of students, including creation of: (1) an appropriately paced teaching lecture; (2) an appropriate assignment about the presented material; and (3) an answer key with marking rubric.

## Evaluation and Grading:

Class presentation	50% – 35% in class presentation – 10 % assignment preparation – 5% answer key and marking rubric
Assignment #1 (from Prof. Wulff)	10%
Additional Assignments (from students)	30%
Participation in in-class discussions	10%

## Course Outline:

### **Week 1:**

Feb 11 <sup>th</sup> , 2020 – J. Wulff	Course overview. Introduction to drug development and preclinical <i>in vitro</i> assays. Introduction to cell lines (primary vs. immortal, common cell lines). Introduction to standard anti-proliferative cell assays (EC <sub>50</sub> vs GI <sub>50</sub> ).
Feb 12 <sup>th</sup> , 2020 – J. Wulff	Anti-proliferative cell assays (data analysis and interpretation). p-Values and statistics. Introduce assignment #1. Assign presentation topics.

### **Week 2:**

Feb 18 <sup>th</sup> , 2020	(No Class) UVic Graduate Student Research Day.
Feb 19 <sup>th</sup> , 2020	(No Class) Complete assignment 1.

### **Week 3:**

Feb 25 <sup>th</sup> , 2020	Student presentation #1 & 2. **Note room change to B019 today only** Assignment #1 due.
Feb 26 <sup>th</sup> , 2020	Student presentation #3 & 4.

### **Week 4:**

March 3 <sup>rd</sup> , 2020	Student presentation #5 & 6.
March 4 <sup>th</sup> , 2020	Student presentation #7 & 8.

### **Week 5:**

March 10 <sup>th</sup> , 2020	Biolab exercises (Sci B214)
March 11 <sup>th</sup> , 2020	Biolab exercises (Sci B214)

## Possible Topics

- Motility and migration assays
- 3-D culturing methods (matrigel vs. collagen vs. other methods)
- Tumor spheroids (generation and maintenance)
- *In vitro* cancer stem cells and cancer progenitor stem cell experiments
- Microfluidics
- Proteomics (expression profiles)
- RNAseq/RT-qPCR
- Metabolomics
- Epithelial cell assays / CaCo & PUMA / membrane transport assays / blood brain barrier assays
- Cell Death assays (necrosis / apoptosis / necroptosis / autophagy)

*Feel free to suggest additional topics.*

## Academic Integrity:

Instances of plagiarism, copying during exams, or other abuses of academic integrity will be dealt with according to the University of Victoria's academic integrity policy. (see: <https://web.uvic.ca/calendar2019-01/undergrad/info/regulations/academic-integrity.html>). The homework assignments should be completed individually (i.e. you should be writing up your answers by yourself) but I encourage students to discuss the lecture material and course content before completing each assignment.

## Equity and Good Behaviour:

The University of Victoria promotes a safe, respectful and supportive learning, working, and living environment. University policies prohibit discrimination, harassment, and sexualized violence. The Equity and Human Rights office (EQHR) is a resource for all UVic community members, including students. EQHR provides education, information, assistance and advice in aid of building and supporting an inclusive and respectful campus. When issues and concerns arise, EQHR assists those involved through the range of support and resolution options available under the Sexualized Violence Prevention and Response policy and Discrimination and Harassment policy. EQHR staff are available by appointment—contact information and resources can be found at <https://www.uvic.ca/equity/>.

The Department of Chemistry expects everyone participating in university activities in the department to model respectful behaviour and abide by applicable University policies. For more information please contact: Sandra Carlson, Department Secretary: [dsecchem@uvic.ca](mailto:dsecchem@uvic.ca) or in person at Elliot 301.