Nanomedicines in Oncology PHM1135
Leslie Dan Faculty of Pharmacy, University of Toronto

Course Description: This course covers a range of topics that pertain to the development and application of nanomedicines in oncology. Students will gain an understanding of the biological barriers to drug delivery in oncology as well as the tremendous heterogeneity in cancer and the challenge this presents for treatment. The concepts of passive and active targeting of nanomedicines will be covered with critical assessment of the enhanced permeability and retention effect. A detailed overview of the most advanced nanotechnology-platforms for drug delivery (i.e. liposomes, block copolymer micelles and polymer-drug conjugates) will be provided with additional discussion of new emerging platforms. The integration of imaging in drug development and development of theranostics and therapeutic-diagnostic pairs will also be discussed. Special emphasis on critical evaluation of scientific literature and pre-clinical/clinical studies will be made throughout the course.

Lecture Schedule:

Week	Topic	Total Contact Time = 26h	Date/Lecturer
1	Introduction to Nanomedicines in Oncology	Total Time: 2h 2h: lecture and discussion	Wed. Sept 13 12pm – 2pm EST Prof. C. Allen
2	Biological Barriers to Drug Delivery in Oncology	Total Time: 2h 2h: lecture and discussion	Wed. Sept 20 12pm – 2pm EST Prof. C. Allen
3	Targeting Solid Tumors: The EPR Effect Deconstructed	Total Time: 2h 2h: lecture and discussion	Wed. Sept 27 12pm – 2pm EST Prof. C. Allen
4	Heterogeneity in Cancer: Impact on Design and Effectiveness of Nanomedicines	Total Time: 2h 2h: lecture and discussion	Wed. Oct 4 12pm – 2pm EST Prof. C. Allen
5	Nanotechnology Platforms – Polymer-Drug Conjugates	Total Time: 2h 2h: lecture and discussion	Wed. Oct 11 12pm – 2pm EST Prof. C. Allen
6	Nanotechnology Platforms – Block Copolymer Micelles/Polymer Nanoparticles	Total Time: 2h 2h: lecture and discussion	Wed. Oct 18 12pm – 2pm EST Prof. C. Allen
7	Nanotechnology Platforms – Liposomes	Total Time: 2h 2h: lecture and discussion	Wed. Oct 25 12pm – 2pm EST Prof. C. Allen
8	Nanotechnology Platforms – New	Total Time: 2h 2h: lecture and discussion	Wed. Nov 1 12pm – 2pm EST Prof. C. Allen
9	Nanotechnology for Delivery of siRNA	Total Time: 2h 2h: lecture and discussion	Wed. Nov 8 12pm – 2pm EST Dr. Jamie Evans
10	Drug Combinations and Nanotechnology for their Delivery	Total Time: 2h 2h: lecture and discussion	Wed. Nov 15 12pm – 2pm EST Dr. Jamie Evans
11	In Class Presentations and Discussion	Total Time: 3h 2h: in-class presentations and discussion	Wed Nov 22 12pm – 2pm EST Prof. C. Allen
12		Total Time: 3h 2h: in-class presentations and discussion	Wed Nov 29 12pm – 2pm EST Prof. C. Allen

Assessment Format and Schedule

Assessments	
Assessment #1	**Midterm Exam** (covers material from lectures 1-5 inclusive) **Weighting = 40%**
Assessment #2	**Oral Presentation** – students will be asked to prepare a 15 min presentation on a drug relying on formulation in an advanced delivery technology that has reached clinical evaluation. In the presentation the students should review method of preparation and physico-chemical characterization of the formulation, pre-clinical pharmacokinetics, biodistribution and efficacy data and discuss clinical data (if any is available) or provide an overview of clinical trials that are ongoing. The students will be expected to discuss shortcomings and strengths of the studies that have been conducted and suggestions for improvements. The students will either work individually or in groups depending on course enrollment. **(Presentations in weeks 11 and 12)** **Weighting = 20%**
Assessment #3	**Grant proposal** – students will be required to write an operating grant proposal on development of a nanomedicine for a specific application in oncology. The grant proposal must include rationale, hypothesis and objectives, review of background literature and a detailed description of experimental methods as well as potential scientific and/or clinical impact of the research. A budget must also be provided for the duration of the granting period (minimum of 3 years). A detailed outline of the required components for the proposal will be provided to students. **Weighting = 40%**