PoND Research Day Symposium

Friday, August 21, 2020

6:45 am – 3:00 pm, Pacific Standard Time

With plenary speaker Dr. John Lewis, University of Alberta

Time	Session	Chair
6:45 – 7:00 am	Introductions	
7:00 – 8:00 am	**Plenary speaker:** Dr. John Lewis, University of Alberta Frank and Carla Sojonky Chair in Prostate Cancer Research, Founder and CEO, Entos Pharmaceuticals; Founder and CEO, Nanostics Precision Health; Co-Founder Oisin Oncology	Prof. Matt Moffitt
8:00 – 9:00 am *8:00 – 8:20 am* *8:20 – 8:40 am* *8:40 – 9:00 am*	**Long student talks:** Sophie Lemay Helia Hosseini Xiaolei Hu	Prof. Cornelia Bohne
9:00 – 9:15 am	Break	
9:15 – 10:15 am	Short student talks	Prof. Jeremy Wulff
10:15 – 10:30 am	Break	
10:30 – 11:15 am	Short student talks	Prof. Afsaneh Lavasanifar
11:15 – 11:45 am	Lunch	
11:45 am – 1:45 pm *11:45 am – 12:05 pm* *12:05 – 12:25 pm* *12:25 – 12:45 pm* *12:45 – 1:05 pm* *1:05 – 1:25 pm* *1:25 – 1:45 pm*	**Industry talks:** Marianne Stanford, IMV, Vice President, Research and Development Fred Leduc, Immune Biosolutions, CEO and Founder Samuel Clarke, Precision Nanosystems, Director of R&D Troy Loss, Eupraxia, Senior Director of Chemistry, Manufacturing and Controls Darren Rowles, Sona Nanotech, President and CEO Maria-Fernanda Zuluaga, Evonik, Senior Scientist, R&D	Prof. John Oh (first hour) Prof. Magdalena Bazalova-Carter (second hour)
1:45 – 2:00 pm	Break	
2:00 – 3:00 pm	Industry panel: • EDI • Effects of COVID • Differences between academia and industry • How to get a job in industry – life after graduate studies!	Prof. Matt Moffitt

Abstracts

Sophie Lemay

A 3D printed cell-laden hydrogel eye model for brachytherapy applications *in vitro*

Sophie Lemay[1,2], Philippe Gros-Louis[1,3,4], Jonathan Lévesque[1,5], Solange Landreville[1,3,4], Marc-André Fortin[1,2]

[1]Centre de Recherche du Centre Hospitalier Universitaire de Québec-UL, Axe Médecine régénératrice, Qc, Canada. [2]Département de génie des mines, de la métallurgie et des matériaux et Centre de recherche sur les matériaux avancés (CERMA), U.Laval, Qc, Canada. [3]Département d'ophtalmologie et d'ORL-CCF, Faculté de médecine, U.Laval, Qc, Canada.[4]Centre de recherche en organogénèse expérimentale de l'Université Laval/LOEX et Centre de recherche sur le cancer de l'Université Laval, Qc, Canada. [5]*Cégep Garneau, Qc, Canada*.

Uveal melanoma (UM) is the most frequent type of eye cancer and 80% of these tumors are located in the choroid[1]. UM is usually treated by brachytherapy or external radiotherapy. In this treatment, an episcleral plaque containing radioactive sources is placed on the patient's sclera through surgery. UM is known to be a type of cancer that shows a wide range of radiosensitivity among the different cells that composes a tumour[2]. However, radiosensitivity data are not taken into account in the current dosimetry models used to prepare the treatment. This project aims at developing, by 3D printing, an eye-shaped cell-laden hydrogel scaffold that could be used for studying the effect of radiotherapeutic treatments on different types of cells that are associated with different radiosensitivity. The developed hydrogel formulation is composed of collagen type I (COL), alginate (ALG) and xanthan gum (XG). ALG and XG are improving the mechanical and printing properties of the hydrogel and COL is naturally found in the eye. The hydrogel is printed on a half-sphere lattice supports with a diameter of 25 mm, close to the diameter of human eyes. Different hydrogel concentrations were tested to optimize its viscosity. Optimal viscosity was found to be 1.35% (w/v) ALG, 1.7% (w/v) XG and 1 mg/ml COL. The print code was adapted to allow the printing on half-sphere lattice supports and a custom petri dish was created. A first prototype of this model has been successfully printed without cells. Future work will include encapsulation of the 92.1, Mμ2 and Mel270 cell lines and investigation of the cell viability by live/dead tests. Overall, this project aims at evaluating the impact of cellular radiosensitivity on the response of UM treatment.

1. Denniston, A. and P. Murray, *Oxford handbook of ophthalmology*. 2009: OUP Oxford.
2. van den Aardweg, G.J., et al., *Cellular radiosensitivity of primary and metastatic human uveal melanoma cell lines.* Investigative ophthalmology & visual science, 2002. **43**(8): p. 2561-2565.

Helia Hosseini

Mobility of Small Molecules in PEO-PPO-PEO Triblock Copolymer (F127 and P104) Hydrogels

Helia Hosseini Nejad

Steady-state and time-resolved fluorescence spectroscopy are employed to characterize different microenvironments within poly(ethy1ene oxide)-poly(propy1ene oxide)-poly(ethy1ene oxide) triblock copolymer hydrogels including F127 (PEO100PPO65PEO100) and P104 (PEO27PPO61PEO27). Quenching singlet excited state probe molecules gave information about the number of different regions inside F127 and P104 hydrogels and accessibility of different quenchers to the excited probe molecules in various locations within the hydrogels. The protection provided for singlet excited state molecules located inside the micelles from quenchers were similar in the case of both F127 and P104 polymers. In addition, the effect of different fluorescent additives and quenchers on the structure of triblock copolymer micelles and mechanical properties of the bulk hydrogel was studied using dynamic light scattering and rheology techniques. Laser flash photolysis was employed to study the mobility of the triplet excited states of the different probe molecules between micellar phase and aqueous phase of F127 hydrogel. F127 micelles could provide protection for hydrophobic probe molecules from the quencher and more hydrophobic molecules could reside longer in the micellar phase of F127 hydrogel.

Xiolei Hu

Direct Polymerization Approach: Synthesis of Imine-bearing Block Copolymer for Enhanced Drug Release

Xiaolei Hu, Jung Kwon Oh*

Concordia University

Department of Chemistry and Biochemistry

7141 Sherbrooke Street W. Montreal, Quebec, Canada H4B 1R6

Effective approaches to synthesize acid-responsive degradable block copolymers through the incorporation of acid-labile imine bonds have been extensively explored for developing smart drug delivery systems with controlled/enhanced drug release. A general method to synthesize imine-containing block polymers is the post-modification reaction, which is usually associated with the challenges such as low conjugation efficiency, batch-to-batch variation and scale-up complexity. Herein, we report a new approach based on direct polymerization to synthesize PEG-b-PBzImMA (ImP) block copolymers bearing pendant imine linkages in hydrophobic block. This method centers on the facile synthesis of a novel methacrylate containing benzoic imine group (BzImMA), which could be polymerized to synthesize a series of well-defined ImPs with tunable functionality utilizing a controlled radical polymerization technique. In response to acidic tumoral conditions (pH = 4.5 - 6.9), pendant imine linkages in ImP underwent acid-catalyzed hydrolysis to generate corresponding aldehyde and amine, causing the dissociation of self-assembled nanoassemblies. Ultimately, such acid-catalyzed hydrolysis of imine linkages contributed to the enhanced/accelerated release of encapsulated Doxorubicin.

Biographies

Prof. John Lewis, University of Alberta, Frank and Carla Sojonky Chair in Prostate Cancer Research

Dr. John Lewis is CEO of Entos Pharmaceuticals, a biotechnology company developing genetic medicines using the Fusogenix drug delivery system. Entos is developing Fusogenix DNA-based vaccine countermeasures for COVID-19 using a rapid vaccine prototyping approach designed to minimize the risk of antibody-dependent enhancement (ADE).

Dr. Lewis holds the Frank and Carla Sojonky Chair in Prostate Cancer Research at the University of Alberta and is a professor in the Department of Oncology, where he chairs the Alberta Prostate Cancer Research Initiative. Dr. Lewis' research interests lie in the areas of nanotechnology and imaging as they relate to infectious disease as well as chronic diseases such as aging and cancer. His group is focused mainly on the study of the spread, or metastasis, of cancer using advanced live imaging techniques.

Dr. Marianne Stanford, IMV, Vice President, Research and Development

Marianne oversees all preclinical research and development activities for cancer immunotherapies and infectious disease vaccines. She also serves as adjunct professor in Microbiology and Immunology at Dalhousie University, as a member of the Vaccine Discovery group of the Canadian Centre for Vaccinology, and as an Associate Member of the Beatrice Hunter Cancer Research Institute.

Before joining the company in 2010, Marianne conducted her postdoctoral training at the Robarts Research Institute and at the Ottawa Hospital Research Institute (OHRI), focusing her research on the use of viruses in the development of novel cancer treatments. While at the OHRI, she worked with Jennerex Biotherapeutics (now SillaJen) in the development of Pexa-Vec for human clinical trials.

She received her BSc and MSc from Memorial University of Newfoundland and her PhD from Dalhousie University. In her spare time, Marianne is involved in science outreach and policy and is the former chair of the Canadian Association of Postdoctoral Scholars.

Dr. Fred Leduc, Immune Biosolutions, CEO and Founder

Frédéric is the CEO and Co-Founder of Immune Biosolutions, a biotech company focusing on the fast discovery and engineering of next-generation biologics through its proprietary chicken antibody discovery platform. Winner of the 2013 National Grand Prize of the Québec Entrepreneurship Contest, Fred received several innovation prizes and entrepreneurship awards, including the Spin Master/Futurpreneur innovation and growth awards, Devtech Bio contests (2013, 2016, and 2017) and several others. Frédéric is an active member of the Canadian life science community (board member of BioQuébec, co-organizer of the Sweet Pharma Day 2019) and entrepreneurial communities. Frédéric holds a BSc in Biotechnology from UQAM, an MSc in Ecotoxicology from McGill University and a PhD in Biochemistry from Université de Sherbrooke.

Dr. Samuel Clarke, Precision Nanosystems, Director of R&D

Dr. Samuel Clarke is an expert in the development of nanoparticles for biomedical applications and has more than 15 years' experience in the field. Samuel is the Director of R&D at Precision NanoSystems Inc. where he is responsible for the development of nanoparticle delivery reagents and applications. Samuel previously worked for STEMCELL Technologies Inc., where he invented, developed and commercialized multiple magnetic nanoparticle technologies for research and cell therapy applications. Samuel studied fluorescent quantum dot nanoparticles for diagnostic applications during his post-doc at the École Normale Supérieure and PhD at McGill University.

Troy Loss, Eupraxia, Senior Director of Chemistry, Manufacturing and Controls

Troy joined Eupraxia Pharmaceuticals in 2016 and is responsible for product development and all the outsourced manufacturing activities for the products that are being developed. Their main product is an extended release intra-articular injection for treatment of osteoarthritis pain, for which Troy has completed the process development and manufacturing, ready for a Phase 2 clinical trial.

Troy joined Northern Lipids in 2008 (now part of Evonik Canada), in the manufacturing group making lipid-based drug products for other companies as a contract manufacturer. The manufacturing suite at Northern Lipids had the capability to make sterile products up to Phase 2.

Troy worked for Angiotech Pharmaceuticals in 2001 as a research associate in formulations group. Here, he contributed to the development of novel drug coated medical devices and formulations designed for local drug delivery. These formulations and device coatings were polymer based and provided sustained release of drugs over various time periods.

Troy holds a BSc (Hon) in Chemistry from UBC and after graduation worked at at Cantest Laboratories in Vancouver, which performed analytical services for multiple industries.

Dr. Darren Rowles, Sona Nanotech, President and CEO

Darren has led Sona Nanotech as President and Chief Scientific Officer (formerly CEO) for three years where he's overseen the transition of the company from a university spinout of St. Francis Xavier University in Antigonish, NS to a leading company in the diagnostics market, with an established brand, technology and products.

A commercially-minded scientist, Darren joined Sona after 14 years' experience in the diagnostic and nanoparticle industry. He previously worked for one of the leading providers of technologies to the global diagnostics market, where he specialised in product manufacture and development in the area of noble metal nanoparticles and lateral flow diagnostics. Darren is a key opinion leader at industry seminars and conferences and acts as an advisory board member to the World Gold Council.

Passionate about corporate social responsibility and the link between business and the community, Darren has led a number of civic improvement projects and mentorship programs in his native Wales, UK. Since 2015 he has been a Grow Movement volunteer consultant, mentoring small business owners in Africa.

Dr. Maria-Fernanda Zuluaga, Evonik, Senior Scientist, R&D

Maria holds a PhD in Pharmaceutical Sciences from the University of Geneva (UNIGE) and has been with Evonik Vancouver Laboratories (VAN) for the past four years. Maria is currently serving as the Senior Scientist, R&D at VAN. She started her professional career in Colombia and then moved to Switzerland for her doctorate and post-graduate work. She then moved to Canada to join the Center for Drug Research and Development (now adMare). Maria's career has focused on the research and development of nanomedicines, particularly lipid nanoparticles. Maria is the author of ten peer-reviewed papers and an inventor on one patent.