CONFÉRENCES DE RECRUTEMENT

AXE IMAGERIE ET INGÉNIERIE

AXE CANCER

CENTRE DE RECHERCHE DU CENTRE HOSPITALIER DE L'UNIVERSITÉ DE MONTRÉAL

Lundi le 3 avril 2017

Amphithéâtre du CRCHUM, local R05.210 et 220

Conférences organisées par Dr Guy Cloutier

Horaire : 10h, présentation du Dr François Yu

1h30, présentation du Dr Eric Strohm

2h30, présentation du Dr François Bordeleau

Conférence de 10h : Plateforme théragnostique ciblée par ultrasons et microbulles : Applications en oncologie et en cardiologie

Conférencier: Dr François Tchi-Ho Yu, Research Instructor, Center for Molecular Imaging and Therapeutics, Heart and Vascular Institute, University of Pittsburgh, USA

Parcours du candidat: Dr Yu a obtenu son baccalauréat en génie électrique de l'École Polytechnique de Montréal puis son doctorat à l'Université de Montréal en génie biomédical au Laboratoire de Biorhéologie et d'Ultrasonographie Médicale, dirigé par le Dr Guy Cloutier. Ses travaux de thèse ont porté sur la modélisation et la caractérisation ultrasonore de l'agrégation érythrocytaire et de ses impacts étiologiques sur la thrombose veineuse. Dr Yu a ensuite poursuivi ses études postdoctorales à l'Université de Pittsburgh sur l'imagerie endovasculaire ultrasonore de la vasa vasorum dans les plaques athéromateuses et a obtenu une bourse postoctorale du FRQS pour développer une approche de chimiothérapie ciblée par microbulles et ultrasons. Dr Yu occupe depuis 2014 un poste de chercheur associé à l'Université de Pittsburgh où il s'intéresse aux applications thérapeutiques des agents de contraste ultrasonore.

Résumé de la présentation: Les microbulles injectées par voie intraveineuse permettent d'augmenter le contraste sanguin en imagerie ultrasonore, notamment pour quantifier la fonction cardiaque et la perfusion sanguine. L'interaction des ultrasons avec les microstructures gazeuses provoque des oscillations mécaniques qui peuvent être exploitées pour des applications thérapeutiques novatrices et ciblées. L'exploration thérapeutique de cette plateforme théragnostique est en essor («*BBB opening», «sonothrom-bolysis», «sonoporation»*) et les paramètres acoustiques, chimiques, cellulaires et physiologiques gouvernant cette plateforme sont de mieux en mieux compris. Cette présentation mettra en évidence deux applications théragnostiques ciblées par ultrasons:

1- Il sera démontré qu'il est possible de cibler la livraison de doxorubicine à l'aide de microbulles chargées de liposomes chimiothérapeutiques qui sont activées par un pulse ultrasonore. Cette activation locale permet la libération contrôlée et ciblée de doxorubicine dans la circulation tumorale et promet de diminuer la cardiotoxicité.
2- Il sera également décrit une approche thérapeutique de sonoreperfusion microvasculaire afin de traiter l'obstruction microvasculaire cardiaque dans le cadre des interventions endovasculaires coronariennes. Il sera démontré que les oscillations des microbulles activent la phosphorylation des NOS dans les cellules endothéliales et provoquent une augmentation de la concentration d'oxide d'azote (NO) et de la perfusion sanguine. Les oscillations des microbulles permettent également la dégradation mécanique et enzymatique des microthrombus et permet de rétablir la microcirculation vasculaire dans un modèle animal d'obstruction microvasculaire.

Conférence de 1h30 : Biomedical applications of ultrasound and photoacoustic imaging

Conférencier: Dr Eric Strohm, post-doctoral fellow, Department of Mechanical and Industrial Engineering, Institute of Biomaterials and Biomedical Engineering, Ted Rogers Centre for Heart Research, University of Toronto, Canada

Parcours du candidat: Eric Strohm received his B.Sc. degree in Physics from McMaster University in 1999. From 2002-2007, he was employed as a member of research staff at the Xerox Research Centre of Canada. He received his M.Sc. degree in 2009 and Ph.D. degree in 2013 in Biomedical Physics from Ryerson University, where he was supported through a NSERC postgraduate scholarship. He is currently a Postdoctoral Fellow in the Cellular Mechanobiology Laboratory at the University of Toronto, where his research interests focus on the development of quantitative ultrasound imaging techniques for high throughput screening applications in tissue engineering.

Résumé de la présentation: Ultrasound is a versatile imaging modality that has a broad range of biomedical applications, where the image contrast depends on variations in the biomechanical properties of tissues. Photoacoustic imaging is an emerging imaging modality where the contrast predominantly depends on the optical absorption properties. Through an appropriate selection of laser wavelength, endogenous (blood, lipids, melanin) and exogenous (dyes, nanoparticles) chromophores can be selectively imaged. A quantitative analysis of the ultrasound and photoacoustic frequency dependent signals can be used to extract information about the structural and biomechanical properties for tissue characterization applications. In this talk, I will discuss ultrasound and photoacoustic imaging and quantitative analysis techniques in the 10-1000 MHz frequency range, including in vitro imaging and classification of single cells, quantitative assessment of blood, tissues, and tumors, high throughput screening applications, and in vivo evaluation of theranostic nanoagents for cancer therapy. Improved ultrasound and photoacoustic quantitative methods can help our understanding of cell and tissue based mechanisms in disease, and ultimately lead to better clinical diagnostic imaging techniques.

Conférence de 2h30 : The physical side of tumor progression: Combining 3D engineered scaffolds and a novel imaging method to study cell response to mechanical cues in the tumor microenvironment

Conférencier: Dr François Bordeleau, post-doctoral fellow, Department of Biomedical Engineering, Vanderbilt University, USA

Parcours du candidat: Dr Bordeleau completed his B.Eng. degree in Engineering Physics at Laval University, his M.Sc. in Physics and Ph.D. in Cellular and Molecular Biology at the same university in Quebec city. He got recruited as a post-doctoral fellow at the Meinig School of Biomedical Engineering at Cornell University. The laboratory of his supervisor recently moved to Vanderbilt University where he is currently located. His current research interests are on the importance of cell and extracellular matrix mechanics in determining cell fate and pathological outcome, matrix stiffness-mediated regulation of alternative splicing, intermediate filaments cytoskeleton involvement in cell mechanical activity and signaling, 3D extracellular matrices, mechanical cues, cell mechanosensing and cell migration.

Résumé de la présentation: The ability of cells to elicit reactions to mechanical cues and properly interact with the extracellular matrix (ECM) is crucial during both organogenesis and pathological processes. This is particularly true during tumor progression, where the ECM progressively stiffens over time due to increased ECM deposition and crosslinking. In this context, combining engineered models of the tumor microenvironment and novel tools to assess associated cell response can help us gain valuable insight to understand how the physical properties of the tumor microenvironment facilitate tumor progression. In the first part of my talk, I will focus on my work on engineered 3D ECM scaffolds. Notably, using non-enzymatic ribose-mediated glycation crosslinking methods, the stiffness of a collagen scaffold can be tuned independent of its architecture. Using this system, we have demonstrated that matrix stiffness influences both angiogenesis and leakiness of the tumor vasculature. In the second part of my talk, I will present a novel approach that uses quantitative polarization microscopy (QPol) to directly measure cell contractility. In fact, the optical anisotropy map measured by QPol is linked to the cell's contractility state in both 2D and 3D culture conditions. Furthermore, QPol can be used to image complex biological systems, including tumor sections. Together, this novel QPol imaging method and the use of engineered 3D scaffolds provide a powerful toolbox to study the role of mechanical cues in tumor progression. Moving forward, I will present how these methods integrate with my research program.