Bio Phys TO

Lunchtime Seminar Series

WHEN?
January 16, 2024
12:00-1:00PM

WHERE?
McLennan Physical Laboratories
255 Huron Street
Rm. 606

WHY?
Join us for pizza and an opportunity to learn and engage with members of the UofT Biophysics community!

SPEAKER

Dr. Mike Thompson

Department of Chemistry – University of Toronto
Fellow of the Royal Society of Canada

Engineering anti-fouling surface chemistry for theranostics: from early-stage cancer detection to biocompatible medical device materials

Our research concerns the development of a chemispassive surface that is being employed to modify a number of devices used in medicine. The interaction of substrates with the components of biological fluids has constituted a research problem over many years. In our work, we have designed an ultra-thin surface modification monolayer that displays remarkable antifouling properties. For applications, we are working on surface modification of materials used in bypass surgery and renal dialysis, and in catheter technology, and on prevention of fouling of a biosensor employed for cancer detection. With regard to bacterial adhesion on materials used for catheter fabrication, we have worked primarily with samples containing relatively high concentrations of E.coli, pseudomonas, candida (fungus) and staphylococcus aureus both in static and dynamic experiments. The results of these experiments involving extensive fluorescence microscopy show a dramatic reduction in bacterial adhesion caused by the ultra-thin covalently-attached monolayer. In terms of thrombogenicity, it is known that micro-clots can form on polymers exposed to blood leading to medical consequences such as cognitive disability. Our research on the polymer (or steel) surface-blood interaction shows an over 90% reduction of thrombus formation is achieved. Importantly, unlike many coatings, our surface-modified materials can be subjected to standard sterilization protocols without suffering damage. With respect to cancer detection we are developing an electrochemical sensor for the detection of an early stage biomarker for ovarian cancer. This involves both surface anti-fouling chemistry in serum combined with an attached probe for lysophosphatidic acid, the marker of choice. We are now able to detect the maker at concentrations reflective of stage 1 disease development.

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