Blood-material interactions from a bleeding perspective

Maud Gorbet[1], Matthew Robichaud[1], Kassem Ashe[2]

[1]*Material Interactions with Biological Systems Laboratory*

Systems Design Engineering, University of Waterloo, Ontario, Canada

[2] *St. Mary's General Hospital, Kitchener, Ontario, Canada*

Abstract

Despite years of research, we have yet to design materials that are truly blood compatible: cardiovascular implant recipients continue to require lifelong anticoagulant therapy while heparin is also routinely needed during cardiopulmonary bypass surgery and hemodialysis. Significant efforts have been undertaken to characterize blood-material interactions and better understand the mechanisms involved in cell activation and the interplay between the coagulation, fibrinolytic and complement systems. Due to the higher prevalence of clotting complications, blood-material interactions are most often characterized from a thrombotic perspective. However, the outcome of cardiopulmonary bypass surgery can also be excessive bleeding. While the incidence of excessive postoperative bleeding may be reported to be as low as 6%, these patients require a significant volume of blood transfusion, often need additional surgery and have a higher risk of morbidity. In this talk, we will discuss how contact with biomaterials and the stresses that blood cells are exposed to during CPB can result in a loss of functionality and contribute to bleeding complications. To provide further context to the discussion, recent *in vivo* data will also be presented.

Biography

Maud Gorbet graduated from the Université de Technologie de Compiègne (UTC) in biological engineering, option Biomateriaux, in 1993 and after working in a canadian biomedical company pursued her PhD in chemical engineering at the University of Toronto (Canada) investigating the mechanisms of material-induced thrombosis *in vitro*. As a Senior Biomaterial Scientist at Rimon Therapeutics Ltd, a Toronto startup, she worked on the biological efficacy and safety of wound healing biomaterials. Her strong research interests in understanding the mechanisms involved in material's biocompatibility led her to join the University of Waterloo (UW) in 2007. Her research program involves the development of better *in vitro* models and tools to assess biocompatibility and the study of the mechanisms involved in material-induced cell activation. Over the past 10 years, she has collaborated with start-up companies, ophthalmic industries, clinicians, scientists and engineers both nationally and internationally (France, Australia and the USA). She also enjoys teaching about medical devices and biocompatibility. She recently spearheaded the creation of the biomedical engineering undergraduate program at UW and was appointed Director of the biomedical engineering program for its initial 5 years and is currently the interim chair for Systems Design Engineering.