Applications of biofluid mechanics and advancements towards organ-on-a-chip

Speaker: Rym Mehri, Postdoctoral Fellow, Mechanical & Aerospace department, Carleton University

Abstract:

In this talk, I will present my previous and current research in the field of biofluid mechanics related to cardiovascular and pulmonary systems and how it can be used for future research using organs-on-a-chip devices.

The work performed during my PhD investigated blood behaviour in microcirculation experimentally and numerically. Red blood cells (RBCs) play an important role in determining the rheological properties of blood due to their unique characteristics. Because of their mechanical properties, RBCs are able to deform and bridge together forming three-dimensional structures called aggregates, which cause variation in blood viscosity and the non-Newtonian behaviour of blood, making it one of the most challenging fluids to model. It is important to quantify these aggregates to understand the conditions of their formation, especially in microcirculation, where their presence could be an indication of pathological conditions such as diabetes and obesity.

My postdoctoral research has been focused on experimental and numerical investigation of pharmaceutical and environmental aerosol delivery to the lungs. Understanding the mechanics of aerosols provides a better understanding of drug delivery. The sizes and dynamics of the inhaled aerosols are crucial to targeting specific sites and diseases. Particle size distribution and aerosol velocity are the most important factors dictating lung depositions. Larger particles generally deposit in the mouth-throat region whereas smaller particles will likely deposit lower in the respiratory tract such as in bronchioles and alveoli. Therefore, increasing particle size risks a larger deposition in the mouth-throat region and reduces the amount of medication delivered to the lungs.

Biography

Rym Mehri is a Postdoctoral Fellow in the Mechanical & Aerospace Engineering department at Carleton University. She has received her M.Sc. in Biomedical Engineering and her Ph.D. in Mechanical Engineering from the University of Ottawa. Her research interests lie within the field of biofluid mechanics, microfluids and lab-on-a-chip devices. Her expertise is focused on Biofluids, investigating the mechanical properties of red blood cells, and the mechanics and properties of pharmaceutical inhaled aerosols for drug delivery, experimentally and numerically. Her future research plans will focus on experimental and numerical work for pulmonary and cardiovascular applications using microfluidic and lab-on-a-chip devices while exploring the use of organs-on-a-chip.