Dynamic Organ-on-a-Chip models: Bringing Bio-relevance to *In vitro* Evaluation of Nanoparticles

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Microfluidics, manipulation of fluids at the sub-millimetre scale, has given rise to biomimetic systems called organ-on-a-chip to evaluate therapies under conditions mimicking *in vivo* dynamic conditions and the microstructures of biological barriers.[1] My talk will focus on our research on evaluating nanotherapies using dynamic organ-on-a-chip models. We will focus on two novel models developed in our lab. We will highlight recent results from the Labouta Lab on the use of placenta-on-a-chip models for screening safe therapies during pregnancy. We have also developed a vessel-on-a-chip model using vascular endothelial cells subjected to a shear stress within the physiological range, 1 dyne/cm2. Using this model, we examined the effect of wall shear stress on the interaction of nanoparticles with the endothelium in regards to cell viability, cell internalization of nanoparticles, as well as their effect on the cell transcriptome. The results of this work will direct future studies towards the use of in vitro approaches for improving in vitro-in vivo correlation.

[1] Shojaei, et al. Biochimica et Biophysica Acta (BBA) - Molecular Basis of Disease **2021**,1867(7), 166131.