BIOPHYSICAL MODULATION OF MACROPHAGES BEHAVIOUR IN 3D MICROENVIRONMENTS. ROLE OF MATERIAL SURFACE PROPERTIES AND SHEAR STRESS ON MECHANOSENSING AND MECHANOTRANSDUCTION.

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Abstract: Successful implant integration is closely tied to the fate of the immune response, which involves recruitment – amongst others – of macrophages. To participate in the host defence, macrophages must continuously probe their environment and quickly respond by translating extracellular cues into intracellular signals, leading to adaptive cellular responses. Previous transcriptomic analysis performed on macrophages cultured on different substrates have revealed changes in the expression of genes associated with integrin formation and cytoskeletal reorganization[1]. However, none of these studies considered the influence of shear stress, which is characteristic of 3D microenvironments and can contribute to alterations in gene expression, cellular function, and fate[2,3,4,5].
This research project aims to provide mechanistic understanding on the role of biomaterial surface properties on macrophages behaviour by i) analysing the combined influence of biomaterial- and fluid flow-induced membrane remodelling on macrophage behaviour, migratory potential, and proliferation; ii) investigating the coordinated recruitment of integrin-associated signalling proteins in response to changes in surface stiffness and topography under the influence of shear stress.
Outcomes of this research can inform the design of materials for regulating macrophage behaviour and have broader implications for understanding the biomechanics of various cell types in complex physiological environments.

Key words: *Biomaterials, macrophages, integrins, shear stress.*

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