Cell-like Hydrogel Microparticles for Mechanobiology

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The study of the interplay between forces experienced by cells and tissues, their mechanical properties and the resulting biological responses provides insights into new mechanisms involved in the pathogenesis of multiple diseases. In this scenario, in recent years, hydrogel microparticles have shown their potential as unique tools to investigate physical forces at cell-scale levels and as constituent components of novel materials able to mimic cell and tissue physical properties.

Here we illustrate the production, characterization and functionalization of standardized polyacrylamide microparticles mimicking cells in size and elasticity. We show that these particles can be used as mechanical standards to validate and cross-compare cell mechanical measurements, as stress sensors able to interact with cells and sense forces through their deformation, as a simplified cell model to investigate cell circulation in living organism and as building blocks of novel 3D scaffolds to explore mechanosensing in vitro.