Optimization of adipose-derived mesenchymal stem cells spheroids for migration studies in space-time warped environments



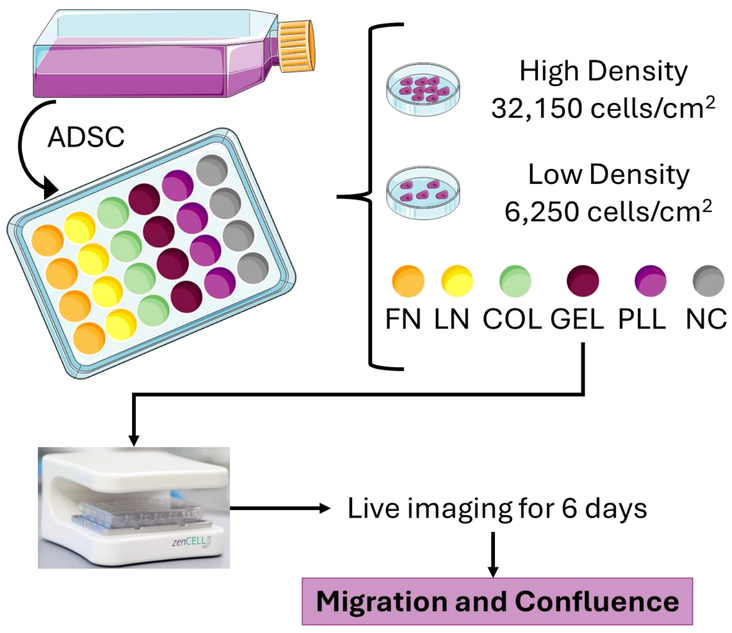
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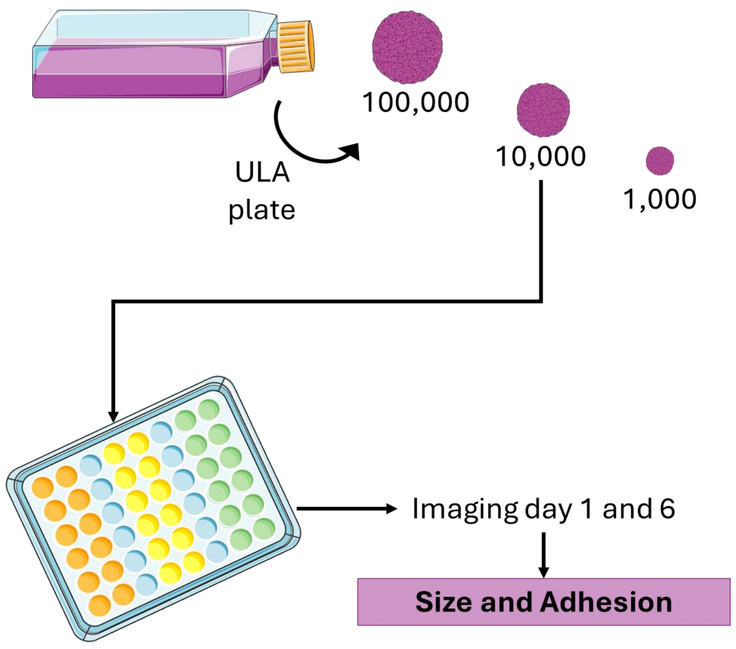
Cell migration characterizes immune response, tissue regeneration, and embryogenesis, and serves as a hallmark of metastatic progression[1]. Migration is regulated by chemical cues, and physical factors including stiffness, topography, and external forces like gravity[2]. On soft viscoelastic substrates, force typically change over time and cells adhesion is less stable, displaying nuclear and cytoskeletal alterations and forming clusters that deform the substrate proportionally to cell number[3]. This preliminary work, in the context of the **INTERCELLAR** project (FIS-2023-00416), aims to investigate the influence of cluster mass (related to cell number) and surface coating on the migration of adipose-derived mesenchymal stem cells (ADSCs) spheroids.

Methodology

ADSC were seeded on 5 mg/ml **agarose** and 20 mg/ml **dextran** gels[4], at different seeding densities. Coatings of f**ibronectin** (FN), **laminin** (LN), **poly-l-lysine** (PLL), **gelatine** (GEL), **collagen** (COL) and **no coating** (NC), were tested for cell migration and confluence with live imaging using the ZenCellOwl.

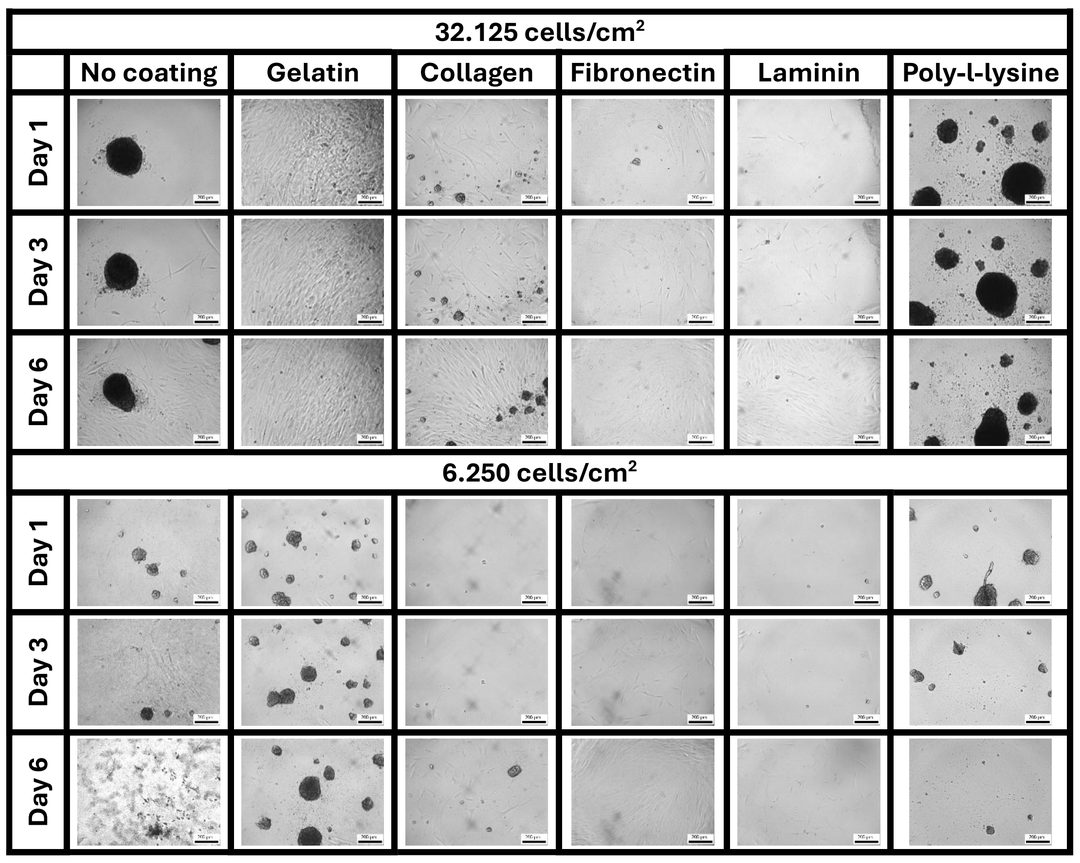


Different cell numbers were seeded in ultra-low adhesion (ULA) plates for 24 hours. The spheroids were then transferred to 96-well plates on agarose/dextran gels with coatings of FN, LN and COL and spheroids size and adhesion were analysed at day 1 and 6 with brightfield imaging.

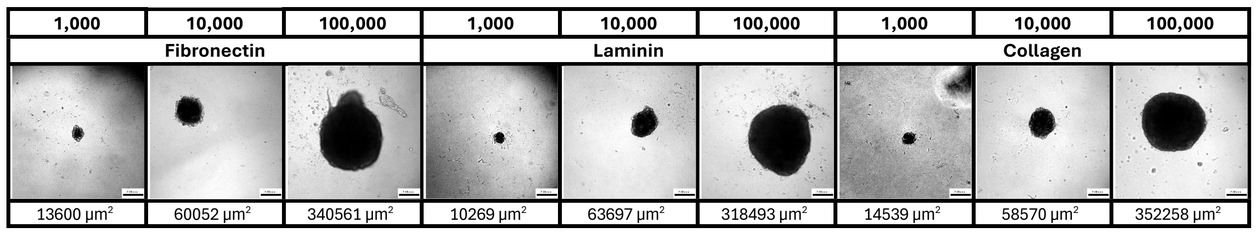


Results

Fibronectin, laminin and collagen allow for better adhesion and migration with both densities.

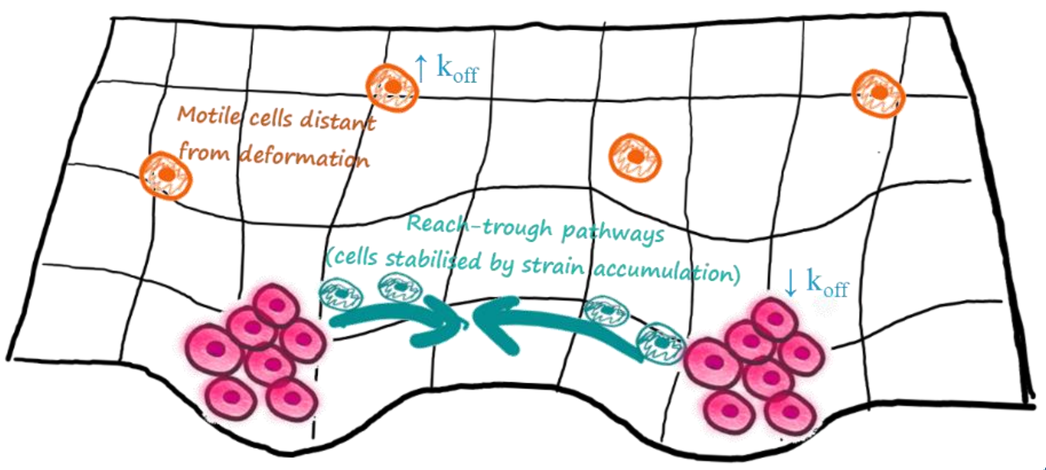


The area of the spheroids increased with the cell number



Future work

We will determine the cells migration speed on the different coatings and if the deformation of the substrate can influence cell behaviour



References

1. Guan, J.-L. Springer Science & Business Media (2008), 2. Wu, D. et al. Comprehensive Biotechnology 521–528 (2011) 3. Califano, J. P. et al. Cell Mol Bioeng 3, 68–75 (2010) 4. Guazzelli N. et al. Mater Today Bio, 101832 (2025)

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