Manchester BIOGEL

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Characterisation of pancreatic cancer cells response to PeptiGels® that mimic healthy and tumour tissue properties

The Challenge

The communication of cells with their environment is vital to understand the intracellular processes, and this research area has been very dynamic in cell and cancer biology. Nowadays, available matrices to study those interactions have tuneable mechanical properties. However, the extracellular matrix (ECM) in tissues of different organs and cellular settings has very different chemical properties, such as ionic strength, charge, pH and ECM ligands. Currently available substrates do not offer both the mechanical and biochemical tuneability necessary to recreate cancer tissues.

The Solution

Manchester BIOGEL offers peptide hydrogels, PeptiGels® with tuneable stiffness between 1 and 20 kPa and pH (7.4 and 6.0), thus mimicking a range between healthy and cancer tissues for both features. This opportunity to simultaneously modulate biochemical and mechanical properties creates a unique range of applications in mechanobiology and cancer.

The Science

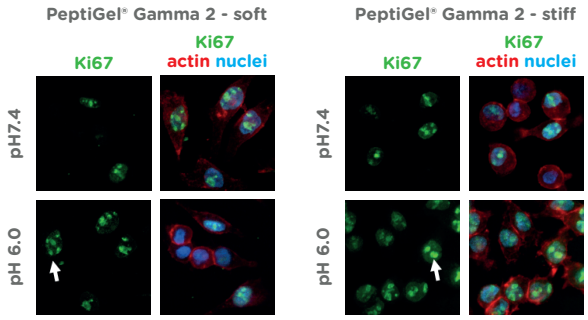
Most solid carcinomas, such as pancreatic ductal adenocarcinoma (PDAC), are characterised by the formation of a large amount of connective or fibrous tissue around the tumour that hampers drug delivery, controls the growth and spread of tumours and regulates their resistance to chemotherapy. This acidic, fibrous tissue affects the behaviour of cancer cells from their ability to proliferate and survive.

READ MORE
Find out the latest results from this Innovate KTP funded project (KTP12102) at http://biomechanicalregulation-lab.org

We were excited to use Manchester BIOGELS PeptiGels® as a platform for cell biology studies and essentially tailor the hydrogel properties to mimic the mechanical and chemical environment of both healthy and cancer tissue. We went onto explore independently the influence of each on cell activation, survival and growth and are now investigating details mechanotransduction on signalling pathways.

Dr Armando Del Rio Hernandez
Department of Bioengineering, Imperial College London

The Results



Images represent immunofluorescent staining of Pancreatic Adenocarcinoma Suit-2 cell line cultured on gamma 2 (soft, healthy tissue mimicking) and alpha 2 (stiff, tumour mimicking) peptide gels with low (6.0) and normal (7.4) pH.

Stiff and acidic (tumour mimicking peptide gels) induce a biomechanical response in Pancreatic Ductal Adenocarcinoma suit-2 cells resulting in an increased proliferation (Ki67 marker – increased expression indicated with white arrows).

The Future

PeptiGel® matrices open up the potential to investigate details of mechanotransduction signalling pathways involved in cancer cell activation and survival.