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Development of PeptiGel®-based 3D *in-vitro* model of Epithelial Ovarian Cancer

The Challenge

Epithelial Ovarian Cancer (EOC) is one of the most common causes of cancer related deaths for women worldwide. This has been partly attributed to the development of tumours that are chemotherapy resistant and partly to a lack of mechanistic understanding of the pathogenesis and metastasis of the disease. A proper mechanistic understanding of the EOC pathology and metastasis requires the development of robust experimental models of EOC and its interaction with the surrounding microenvironment. This often requires the use of physiologically relevant biomaterials to mimic the tissue microenvironment.

The Solution

The aim of the study was to investigate the effect of biomaterial stiffness and functionalisation with different ECM proteins (Normal and functionalised PeptiGel® Alpha 1-4) on the growth and survival of ovarian cancer cells. Based on our preliminary screening, PeptiGels® Alpha 4, Alpha 4-RGD and Alpha 4-GFOGER hydrogels were selected for further study as they demonstrated the most promising cell viability results. Ovarian cancer cells were grown in the hydrogels for 4 weeks and cultured cells were analysed at regular timepoints.

The Science

Animal-free peptide hydrogels (PeptiGels®) from Cell Guidance Systems are well defined synthetic hydrogels with no batch-to-batch variation. Additionally, Cell Guidance Systems offers hydrogels with different stiffness and functionalisation with various ECM proteins enabling an in-depth systematic analysis of the effects of ECM properties on cell growth and phenotype.

In association with 3DBioNet and UCL

Cell Guidance Systems hydrogels enable us to control the composition of the cellular environment in an easy and reproducible manner. This allows for the study of the interaction of cancer cells with biomechanical and biochemical features of their environment and for underpinning the role of the latter on the treatment response and the disease evolution, i.e. metastasis.

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The Results

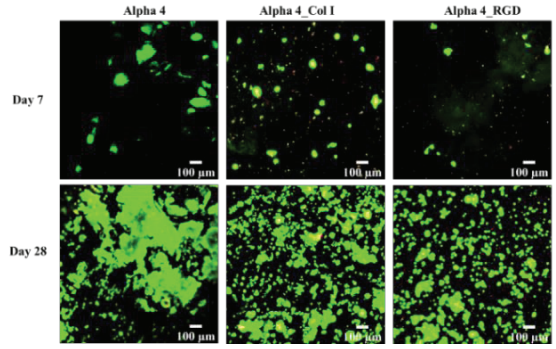

Figure: Fluorescent images show the presence of live (green) and dead (red) ovarian cancer cells (A2780) within various indicated hydrogels on day 7 and 28.

Analysis of cell viability within different PeptiGels® showed that PeptiGel® Alpha 4 (soft gel) was better suited for long term 3D growth of ovarian cancer cells (data not shown). Alpha 4 hydrogel functionalisation showed that PeptiGel® Alpha 4-GFOGER facilitated earlier cellular growth (day 7) in culture, as compared to PeptiGes® Alpha 4 and Alpha 4-RGD hydrogels. However, at day 28 of culture, all hydrogels tested supported the growth of ovarian cancer cells. Bigger, and less homogenous, clusters of cells were observed on the unfunctionalised gels when compared to Collagen (GFOGER) and fibronectin (RGD)- functionalised hydrogels which showed similar behaviour in terms of the size and distribution of cell aggregates.

The Future

Further studies will carry out an in-depth analysis of different hydrogel functionalisation on cellular viability and their effect on ovarian cancer's resistance to chemotherapy *in-vitro*.