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A TRACER 3D Co-Culture Tumour Model for Head and Neck Cancer

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Abstract

Cancer-associated fibroblasts (CAFs) are a key component of the tumour microenvironment and have been shown to play an important role in the progression of cancer. To probe these tumour-stroma interactions, we incorporated CAFs derived from head and neck cancer patients and squamous carcinoma cells of the hypopharynx (FaDu) into the Tissue Roll for the Analysis of Cellular Environment and Response (TRACER) platform to establish a co-culture platform that simulates the CAF-tumour microenvironmental interactions in head and neck tumours. TRACER culture involves infiltrating cells into a thin fibrous scaffold and then rolling the resulting biocomposite around a mandrel to generate a 3D and layered structure. Patterning the fibrous scaffold biocomposite during fabrication enables control over the specific location of different cell populations in the rolled configuration. Here, we optimized the seeding densities and configurations of the CAF and FaDu cell tissue sections to enable a robust 3D co-culture system under normoxic conditions. Co-culture of CAFs with FaDu cells produced negligible effects on radiation resistance, but did produce increases in proliferation rate and invasive cell migration at 24 and 48 h of culture. Our study provides the basis for use of our *in vitro* co-culture TRACER model to investigate the tumour-stroma interactions, and to bridge the translational gap between preclinical and clinical studies.