

Use of a hydrogel material for *in-vitro* vascular applications: A Promising Approach for Medical device characterization.

In recent years, there has been significant interest in creating more advanced *in-vitro* cell culture vascular models to improve pre-clinical screening of medical therapies and devices, and the expanding research field of hydrogels as a culture biomaterial holds promise to meet this need. Hydrogels are now commonly employed in various biomedical areas such as ophthalmology, drug delivery, and cardiovascular applications, and this is due to their unique properties such as biocompatibility and ability to mimic extracellular matrix (ECM). There remains a need for hydrogels with good bio-compatibility index that can serve as robust 3D *in-vitro* vascular culture material suitable for both mechanical and biological characterization of innovative medical therapies and devices.

The bio-compatibility index of this hydrogel was assessed using human endothelial cells (EC) and smooth muscle cells (SMC). EC/SMC mono-culture viability profiles using the hydrogel showed a slight increase as compared to the control after seven days of culture. Immune response of the EC/SMC co-culture was found to be bio-responsive in terms of IL-6, IL-8 and TNF- α when treated with 1 μ M/ml of dexamethasone (anti-inflammatory agent) and exposed to 1 μ g/ml of lipopolysaccharides (pro-inflammatory stimulus). Furthermore, physio-chemical and bio-degradability (hydrolysis) study of this hydrogel showed a fluid uptake of 205% and a less than 10% degradation profile as compared to the control.

In conclusion, this study is using a hydrogel material to create an *in vitro* 3D co-culture human vascular model for structural and biological pre-clinical testing of medical therapies and devices.

Keywords:

Hydrogel, *in-vitro* vascular model, EC, SMC, EC/SMC