currently being performed to evaluate endothelial cells (ECs) proliferation and confluence on the lumen side and to verify smooth muscle cells (SMCs) adhesion on the outer surface and their migration inwards.


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**Endothelialisation of Bio-functionalised Nanocomposite with Progenitor Stem Cells**

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**Objective/Aims:** Endothelial dysfunction/ the lack of an endothelium associated with cardiovascular grafts is a major cause of graft failure which is linked to thrombosis and related complications. This study aimed to 1) bio-functionalise a nanocomposite biomaterial, Polyhedral Oligomeric silsesquioxane (POSS PCU) which has ideal properties for cardiovascular grafts and to 2) induce endothelialisation by capturing progenitor cells from peripheral blood.

**Methods:** 1) Bio-functionalisation of the nanocomposite polymer: bioactive RGD peptide, which is a functional domain of an extracellular matrix component, fibronectin was synthesised using fmoc chemistry. A lauric acid hydrophobic “tail” was also attached to optimise the RGD orientation on the biomaterial. The peptide was covalently attached to POSS PCU. The presence and the biophysical effect of RGD on the nanocomposite was tested. 2) Progenitor cells were extracted from peripheral blood, which was obtained from adult healthy volunteers and cultured on bio-functionalised nanocomposite biomaterial. The degree of cell adhesion, proliferation was tested with Alamar Blue assay. Endothelialisation was confirmed with electron microscopy and SEM. Immunostaining was also performed with endothelial cell markers, CD34, CD31 and eNOS.

**Results:** Water contact angle measurement indicated that bio-functionalisation has increased hydrophilicity of the nanocomposite polymer. EPC cell counting indicated that more cells were adhered to bio functionalised nanocomposite and Alamar blue indicated a greater presence of cells on bio-functionalised nanocomposite. Electron microscopy and SEM provided evidence for endothelial colony formation. Immunostaining confirmed the presence of endothelial cell markers.

**Conclusion:** Bio-functionalised nanocomposite polymer induced endothelialisation by capturing progenitor cells from peripheral blood.

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**Multilayered chitosan scaffold for bile duct reconstruction**

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Bile duct injuries are associated with upper abdominal operations and biliary tract surgical procedures. Their overwhelming majority is caused by laparoscopic cholecystectomy and are considered a true health and financial emergency (1). Their repair carries a significant mortality rate and can run 4.5 to 26.0 times the cost of the uncomplicated procedure. The standard treatment of neoplastic or degenerative/flogistic diseases that cause stenosis of the main biliary duct involves the resection of the extrahepatic biliary duct and the subsequent tension-free anastomosis between the bile duct stump and the intestine (Roux-en-Y hepaticojejunostomy). Often, this treatment is burden with septic complications (cholangitis) and/or anastomotic stenosis. Post-operative cholangitis, one of the most common complication in hepatobiliary surgery, accounts for 8-22% of patients following hepaticojejunostomy (2), and affects more than 50% of pediatric patients following Kasai’s operation for biliary atresia. Considering these common post-operative complications (cholangitis and stenosis), the present work aimed at developing a novel highly biocompatible chitosan-based polymeric scaffold in form of a tube to be used as a substitute of the human main bile duct. Polymeric tube-shaped scaffolds were manufactured by casting a chitosan solution, prepared, as previously described (3), into cylindrical mold constituted by two coaxial plastic tubes. The solution was, then, frozen and gelified (3). The reproducibility of the method was evaluated by assessing physical parameters of the scaffold such as swelling index, while porosity and micro-structural characteristics were assessed by using electron-scanning microscopy. Permeability experiments through the gelled scaffold were carried out in a Resomat II apparatus using a concentrated bovine bile solution in the donor compartment and measuring the concentration of the permeated bile acids in the receptor compartment. Dynamometric measurements were performed to determine the elastic modulus and the elongation to break in axial direction, as well as the resistance to