

C19. Evaluation Of Protein Coating Strategies For Enhanced Re-endothelialization Of Biological Heart Valve Scaffolds

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OBJECTIVES: Tissue engineered heart valves may be improved by coating strategies to improve their in-vitro reseeding and in-vivo integration. In this study we evaluated the extent of the re-endothelialization depending on 5 different coating strategies.

METHODS: Ovine heart valves were mounted in a novel culture device (dHV) after standard detergent decellularization. Endothelial cells (EC, 300.000 per cusp) were seeded on untreated cusps (A) vs. cusps pre-coated with synthetic laminin (group B), sarcoma cell line-derived laminin (C), fibronectin (D), an autologous plasma protein mixture (E) or gelatine (F) and cultured for up to a week. Monolayer controls were achieved by identical coating of culture dishes. Evaluation at 1/3/6/24 and 48 hours or one week consisted of confocal and electron microscopy, western blot and DNA analysis.

RESULTS: Initial endothelial cell attachment at 3 and 6 hours was in favour of group B and D. The observed differences between different coating protocols were even more prominent in monolayer controls. These differences were detectable for up to 48 hours. Three-dimensional reconstruction of the endothelial surface revealed areas of confluent EC layer at 48 hours. Surprisingly, LDL uptake and cell viability were comparable in all groups, independent of coating, although cell metabolism revealed differential behaviour comparing arterial vs. venous EC.

CONCLUSIONS: Initial cell attachment and surface repopulation of detergent decellularized heart valves could be promoted by protein coating techniques, most effectively by using fibronectin. Despite the well-known superior suitability of dHV, surface modification strategies may further enhance an autologous repopulation upon implantation.