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THE CREATION OF A VAGINAL EPITHELIAL SHEET USING MESENCHYMAL STEM AND VAGINAL EPITHELIAL CELLS AND AN ACELLULAR MATRIX

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Aim of the Study: Cloacal malformations are associated with recurrent surgical interventions and impaired long term outcome, particularly for those at the most severe end of the spectrum. A bespoke tissue engineered (TE) approach to providing vaginal tissue might reduce the need for urogenital mobilisation, limit concomitant bladder dysfunction and simplify surgery for a subgroup of patients.

Having produced a collagen based acellular matrix with acceptable levels of DNA and proteoglycans and intact basement membrane (positive for collagen IV and laminin), we are currently focused on combining vaginal epithelial cells and adipose derived mesenchymal stem cells (AD-MSC) to produce an intact vaginal epithelium with the long term goal of mucosal functionality.

Methods: Vaginal tissue was harvested from pigs and de-cellularised using a standardized in house protocol. Sterilisation processes incorporating hydrogen peroxide or peracetic acid at various concentration and duration were compared. AD-MSC and vaginal epithelial cells were isolated from abdominal fat and vaginal mucosa. Both cell populations were expanded and individually seeded onto sterile acellular vaginal mucosa for 5 and 10 days. Cell-scaffold interaction was assessed by routine histology and the presence of residual bacteria or fungi was assessed microbiologically.

Main Results: Sterile scaffold was produced using two 90 minute cycles of 1% peracetic acid interspersed with wash cycle with sterile water. Both cells populations survived to the end of the 5 and 10 day seeding period, staining for potential differentiation of the AD-MSC towards an epithelial lineage via pan cytokeratin together with cell proliferation (Ki-67 cell marker) is currently in progress

Conclusion: The basic components required to create functional epithelium have been identified and early data indicates that cell –scaffold interaction to create a potentially functional epithelium is possible. This study demonstrates proof of principle for a novel application of technology that may confer clinical benefit.