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Assessing biocompatibility of porcine tissue for hernia repair using flow cytometry

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The current standard for abdominal hernia repair uses synthetic meshes, which often break down, leading to complications and a high rate of recurrence. A biologic prosthetic, derived from animal tissue, would provide a more natural substrate for tissue remodeling and an improved host response. The success of a biologic material for tissue repair first depends on preventing an immune reaction post implantation. Engineering an appropriate construct requires removal of cells from the donor tissue, stabilization of the resulting collagen matrix with cross-linkers, and sterilization prior to implantation. The central tendon of the porcine diaphragm is a novel material for use as a biologic implant. This study is a preliminary investigation of the biocompatibility of porcine diaphragm as a hernia mesh material. Diaphragm tissue was de-cellularized by one of two methods and cross-linked with one of two chemical agents. Combinations of these two treatments were cultured with mouse fibroblast cells. Viability was assessed with flow cytometry, using propridium iodine to stain non-vital cells. Cell viability on treated tissue was compared to untreated tissue and control cell sets. Results indicate superior biocompatibility of one preparation, with viability high enough to warrant further studies. The next step will be implantation of the material into an animal model. With successful preparation, biological constructs can improve the host tissue response and reduce the need for revision surgery, thereby replacing conventional synthetic meshes for hernia repair.