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Colorado State University

Tissue Decellularization and Antigen Removal by Tissue-Gel Electrophoresis

Bioprosthetic heart valves, currently used to replace defective heart valves in humans, are constructed from animal (xenogeneic) tissues such as porcine aortic valves or bovine pericardium. Mounting evidence suggests that the chemical treatments required to prevent acute immune rejection of xenogeneic tissues are insufficient in the prevention of longer term complications, such as tissue degeneration and calcification, possibly related to chronic immune rejection. Tissue-engineering, a scientific field devoted to the creation of "living" tissue or organ replacements, may offer solutions to these problems. Living tissue-engineered heart valves can be constructed from human or animal tissues, however complete removal of native cells and antigens (decellularization) is required prior to replacement with the patients own cells (recellularization) and implantation.

Researchers in the Department of Clinical Sciences at Colorado State University are developing a novel method for the decellularization of allograft (human) and xenograft (animal) tissues using tissue-gel electrophoresis. Although many decellularization methods have been reported, the most favored techniques employ combinations of hypotonic cell lysis and treatment with ionic and/or non-ionic detergents such as sodium dodecyl sulfate (SDS), sodium deoxycholate, and Triton-X. Mounting evidence suggests that current methods are insufficient and residual detergent from these treatments interfere with the subsequent recellularization process.

Researchers in the Department of Clinical Sciences at Colorado State University have demonstrated an improved decellularization method that offers the potential for better removal of antigens with less detergent residue in bioprosthetic or tissue-engineered tissues. Using the principles of gel electrophoresis, this technique combines the inherent advantages of gel media with the benefits of standard decellularization methods. This exciting new procedure enhances decellularization and antigen removal from biological tissues prior to recellularization, thereby decreasing immune rejection and improving durability of the implant.

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Features and Benefits

- Enhanced removal of cells and antigens from biological tissues.
- Reduced detergent residue and improved subsequent tissue recellularization.
- Physical and biomechanical properties of the scaffold are retained.
- Suitable for a variety of shapes and sizes of allogeneic and xenogeneic tissues.

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