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Decellularized Pancreatic Tissue

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ABSTRACT

Diabetes mellitus is a pancreatic condition caused by either an autoimmune destruction of insulin producing beta cells or failing pancreatic beta cells. Current treatments address symptoms but do not successfully replace these malfunctioning tissues. Pancreas and islet transplantation are very limited due to the shortage of donors. The decellularization of pancreatic tissue provides a native tissue matrix, applicable for various tissue engineering investigations. Through the process of decellularization, it is possible for the extracellular matrix (ECM) to maintain the chemical and structural integrity of the original tissue. It can then be used as a scaffold material through the additions of different cell populations, including stem cells, allowing them to differentiate. Other methods include fabricating a native ECM powder from the decellularized tissue from which hydrogels can be constructed.

This project involves the decellularization of an isolated rat pancreas. Using a static rocker and later a perfusion system set up, the pancreas sections will be decellularized using 0.5% sodium dodecyl sulfate (SDS) and 1% Triton X-100 buffers in order to remove all the cellular components from the pancreatic tissue. After decellularization, the pancreas tissue will be lyophilized and prepared into pancreas extracellular matrix powder. The powder can be used to form hydrogels, mimicking the pancreatic tissue. I have successfully decellularized pancreas sections and am currently quantifying decellularization efficiency by counting the remaining cellular nuclei using DAPI staining and ImageJ software. It is predicted that the native tissue matrix of the pancreas can serve as promising material in developing engineered pancreatic tissue.

Key Words: decellularization, ECM, pancreas, lyophilized, perfusion, hydrogels

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