Engineering an Anti-Inflammatory Drug Delivery System for Islet Transplantation

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Type 1 diabetes mellitus (T1D) affects three million individuals in the United States alone, resulting in approximately $15 billion in healthcare costs annually. T1D results from the autoimmune destruction of native pancreatic islets. Current treatments are limited to exogenous insulin injections, which delay, but cannot prevent, diabetes-related complications, because insulin injections cannot mimic native cellular response to blood glucose levels. clinical islet transplantation (CIT) offers patients a cell-based therapy that can reduce secondary complications. While CIT has demonstrated the feasibility of cell therapy to cure diabetes, islet grafts are short-lived, in part because of a hostile transplant site. This project seeks to mediate the innate immune response and inflammatory reaction the body creates from the trauma of surgery. Surgical trauma during Clinical Islet Transplantation and the presence of foreign biomaterials in the body causes a pro-inflammatory response, which limits islet cell survival. Through the use of localized drug delivery, we can deliver an anti-inflammatory with a sustained release in response to its environment via degrading microspheres. The microparticle system we opted to use is polypropylene sulfide, as it is antioxidant, and degrades in the presence of free radicals, which is expected to have a higher concentration in the inflamed location. The drug we chose to deliver is salicylic acid (SA) which is an anti-inflammatory that can mediate the innate immune response at the transplant site. SA's anti-inflammatory properties come from its ability to suppress cyclooxygenase, which is an enzyme responsible for the production of pro-inflammatory entities.

Awards Won:
Third Award of $1,000