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Bio fabrication of smart microcapsules containing insulin secreting pancreatic islet cells: Potential applications in diabetes mellitus

Regenerative medicine offers an opportunity to restore or establish normal "pancreatic function". Type 1 diabetes mellitus (T1DM) is a disease, characterized by lack of pancreatic islet function. Whole tissue transplantation appears to be a viable alternative in the management of T1DM due to limitation of exogenous insulin therapy. This study aims at fabrication and evaluation of smart biomaterials such as alginate-chitosan in microcapsule encapsulating insulin-secreting pancreatic islet cells using an automated novel specialized spraying nozzle. Microcapsules were characterized for permeability, stability, and cell viability. Microencapsulated β TC-6 cells were transplanted intraperitoneally into streptozotocin (STZ) induced diabetic mice and monitored for a decrease in blood glucose level and cell implant tolerance. Spherical microcapsules with diameter in the range of 250-350μm were prepared at an air flow rate of 250L/hr. Since the process is automated, this allows for small or large-scale production with minimal batch-to-batch variation. Microencapsulated β TC-6 cells in alginate capsules demonstrated prolonged viability. Mice that received microencapsulated β TC-6 cells maintained normoglycaemia for the study period of around 35 days. However, the mice that received naked pancreatic islet cells rejected the graft within 1 or 2 days. In conclusion, microcapsules produced by the specialized nozzle were reproducible with narrow size distribution. Our findings using mice in the *in vivo* studies revealed that transplantation of microencapsulated β cells may be a viable alternative in the management of T1DM with greater immune acceptance.

Biography

Martin J D'Souza has obtained his PhD degree from the University of Pittsburgh, PA, USA. He is a Professor and Director of Graduate Programs in the College of Pharmacy at Mercer University in Atlanta, Georgia. He also serves as the Director of the Clinical Laboratory and Co-Director of the Center for Drug Delivery Research. He has graduated over 50 PhD students and has published over 100 manuscripts. He has been the recipient of several research grants from the National Institutes of Health (NIH), the American Diabetes Association, the Georgia Cancer Coalition, and Georgia Research Alliance. He serves on several Editorial Boards and is a journal reviewer for over 10 scientific journals and has several patents issued in the area of Nanotechnology.

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