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Bio-fabrication and evaluation of alginate chitosan microcapsules of Insulin secreting β TC-6 cells in the treatment of Type 1 diabetes mellitus

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Type 1 diabetes mellitus (T1DM) is a disease, characterized by lack of pancreatic islet function. Whole tissue transplantation appears to be viable alternative in the management of T1DM due to limitation of exogenous insulin therapy. This study aims at fabrication and evaluation of alginate-chitosan microcapsule encapsulated insulin secreting β TC-6 cells using specialized spraying nozzle. Microcapsules encapsulated with β TC-6 cells were fabricated using novel spraying device producing uniform spherical microcapsules. Microcapsules were characterized for permeability using molecular weight markers, stability, and cell viability using live dead staining kit. Microencapsulated β TC-6 cells were transplanted intra-peritoneally in streptozotocin (STZ) induced diabetic mice and monitored for decrease in blood glucose level and immune acceptance. Spherical microcapsules with diameter in the range of 250-350 µm were prepared at an air flow rate of 250 L/hr. Microencapsulated β TC-6 cells in alginate capsules demonstrated prolonged viability. Mice in microencapsulated cells group received microencapsulated β TC-6 cells maintains normoglycemia for 35±5 days before rejection. However, mice in unencapsulated cells group received naked β TC-6 cells rejected graft within 1 or 2 days and exhibit both cellular and humoral immune responses. CD4 T-cells mediated Th2 response i.e. humoral response was predominant in microencapsulated β TC-6 cells group and that was further confirmed from elevated levels of CD45R. Microcapsules produced by specialized nozzle were reproducible with narrow size distribution and in addition provides flexibility in producing different sized capsules. Our findings for *in-vivo* study revealed that transplantation of microencapsulated β TC-6 cells may be a viable alternative in the management of T1DM with greater immune acceptance.

Biography

Amit Bansal has completed his MS in Pharmaceutical Sciences from Temple University and is currently pursuing his PhD at Mercer University, School of Pharmacy. His research work at Mercer University is focused on the development and evaluation of nanoparticulate vaccine as delivery vehicle thereby, achieving sustained release of the vaccine with the aid of biodegradable polymers. He has prior research experience in the formulation development of immediate and modified release dosage forms, chemical modification of polymers and on the permeability of anticancer drugs across blood brain barrier (BBB). He has published one research paper, and has been the Co-author of one review article and a book chapter.

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