3D Printed Nanoengineered Sublingual Patch with Viral-mimetic Nanoparticles for Non-invasive Delivery of Insulin

Principal Investigator
Dr. Arunkumar Palaniappan
Assistant Professor
Centre for Biomaterials, Cellular and Molecular Theranostics (CBCMT)

Co-Principal Investigator
Dr. Sankar Ganesh Devaraj
Assistant Professor
School of BioSciences and Technology (SBST)

Co-Principal Investigator
Dr. Sunil PM
Professor & Head
Sree Anjaneya Institute of Dental Sciences

***

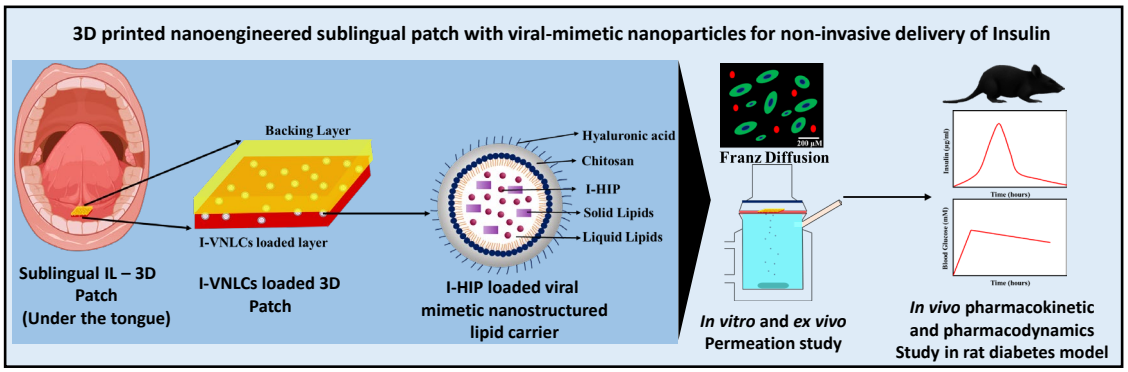
Name of the Funding Agency
Indian Council of Medical Research (ICMR)

Name of the Scheme
Investigator-Initiated Research Proposals

Sanctioned Amount (in Rupees)
Rs. 46,69,785

Duration of the Project (years)
3

Graphical Abstract



Project Description:

Diabetes is a group of metabolic diseases that are caused due to the increased glucose level in blood that resulted in high mortality and morbidity rate in India and around the globe. In case of Type I diabetes, Insulin is injected for the whole of their life while in case of Type II diabetes, it is administered in the long run when other drugs do not work. Frequent injection of Insulin creates trypanophobia and often results in even skipping of few doses, leading to hyperglycemia-mediated severe symptoms and sometimes resulting in death. Thus, there is a strong need for patient-friendly, non-invasive insulin delivery systems. Sublingual delivery systems are explored as potential patient-friendly insulin delivery systems. However, they are limited by their inability to deliver therapeutically relevant insulin in circulation. 3D printed sublingual patch with insulin-loaded viral-mimetic nanoparticles (IL - 3D Patch) could deliver therapeutically relevant dose in circulation and aid in maintaining the blood glucose level in circulation. In this project, Insulin loaded viral mimetic nanoparticles (I-VNLC) will be synthesized through the hydrophobic modification of insulin, loading them onto NLC, followed by coating with polyelectrolytes to provide zwitterionic surface. The nanoparticles will be loaded onto the 3D print oro-mucosal patch. Insulin permeation studies, PK & PD studies will be performed using in vivo diabetic model studies.

Products/ Instruments/ Results/ Outreach Activities (Pictures)