Technology bulletin

CSIR-Indian Institute of Chemical Biology

Title: Thermostable insulin formulation for diabetes therapy

INTRODUCTION: The current advocacy of intensive insulin therapy regimens in diabetes patients it met with several clinical problems – insulin is pro-amyloidogenic and forms insoluble aggregates resulting in loss of active insulin molecules and excess insulin requirement; formation of tumor like mass or amyloidoma at the site of repeated insulin injection; gradual loss of excipients and deposition of fibrils in the catheter system of insulin pumps; and temperature-sensitive insulin fibrillation entails storage and maintenance of cold chain. These issues thereby call for a more stable form of formulations that would cater to the increasing global demand.

CHALLENGE/APPLICATION DOMAIN: Biotechnology and Medicine

Opportunity

Huge global demand for thermostable insulin

No such product of is available globally in the insulin market.

STAGE OF TECHNOLOGY DEVELOPMENT: Screening and in vivo validation of four amino acid containing 77 small tetrapeptides with potent inhibition of both heat and storage induced insulin fibrillation. Molecular structural basis of peptide-insulin interaction and possible mechanism for thermostability has been determined. Peptides can maintain insulin in the active form without any loss for months, prevent in vivo amyloidoma formation, require no other toxic excipients and is compatible with various commercial insulin preparations. In addition, these are non-toxic, non-immunogenic and heat-stable.

REFERENCES/ PATENTS:

a) Mukherjee M, Das D, Sarkar J, Banerjee N, Jana J, Bhat J, Reddy G J, Bharatam J, Chattopadhyay S, Chatterjee S, **Chakrabarti P***. Prion Derived Tetrapeptide Stabilizes Thermolabile Insulin via Conformational Trapping. **iScience** (Cell Press). **2021** May 21;24(6):102573. DOI: https://doi.org/10.1016/j.isci.2021.102573

b) Das D, Paul A, Maity SK, Chatterjee S, **Chakrabarti P***. Subcutaneous amyloidoma models for screening potential anti-fibrillating agents in vivo. **STAR Protoc** (Cell Press)**. 2021** Dec 14;2(4):101027. doi: 10.1016/j.xpro.2021.101027.

PROJECT INVESTIGATORS :

Dr. Partha Chakrabarti (CSIR-IICB, Kolkata)

Dr. Subhrangsu Chattrerjee (Bose Institute, Kolkata)

Dr. Samit Chattopadhyay (Ex Director CSIR-IICB)

Dr. B. Jagadeesh (CSIR-IICT)