Metformin encapsulated O-Carboxymethyl chitosan nanoparticles for metformin delivery to pancreatic cancer cells

Snima K.S, R.Jayakumar and Vinoth-Kumar Lakshmanan
for Nanosciences and Molecular Medicine, Amrita Institute of Medical Sciences & Research Centre Campus, Cochin, Kerala
Email: vinothlakshmanan@aims.amrita.edu

Pancreatic cancer has the worst mortality rate and lowest overall survival among all cancers. Pancreatic cancer is difficult to diagnose and treat and has a very high mortality rate. Recent studies have shown that metformin, a widely used anti-diabetic drug could inhibit the growth of pancreatic of pancreatic cancer cells. However, the low bioavailability and short half-life of metformin limits its application as an anticancer drug. To overcome this, we developed metformin loaded O-carboxymethyl chitosan (O-CMC) nanoparticles (NPs) by ionic-gelation method. The prepared NPs of 240 ± 50 nm size with spherical morphology exhibited a pH sensitive release of metformin in vitro. Nearly half of the drug was released from the NPs within the first 10 hours at pH 7.4 and 72% was released after 70 hours. In toxicity studies with mouse fibroblast cells (normal cells) and pancreatic cancer cells, metformin and O-CMC metformin NPs showed 40% more toxicity than bare ones on pancreatic cancer cells. The O-CMC metformin NPs found to be more hemocompatible and safe for intravenous administration and will enhance the controlled release of metformin at physiological pH possibly increase drug bioavailability decreasing its renal clearance.

ACKNOWLEDGEMENT
The authors are thankful to the Science and Enigneering Research Board (SERB) Department of Science and Technology (DST), Govt. of India for their financial support for this work under (SR/FT/LS-147/2009).