Abstract

Diabetes mellitus (DM) is a life-threatening condition that affects the liver, kidneys and also pancreas, if not treated. Since the last many years, the fabrication of newer antidiabetic medicines using different biomolecules and nanoparticles has obtained a great attention. The *in-vivo* anti-diabetic potential of the GOx/ZnONPs bioconjugate against Alloxan-induced diabetic mice is investigated in this study. The co precipitation method was used for synthesis of zinc oxide nanoparticles (ZnONPs) from zinc nitrate hexahydrate and sodium hydroxide (NaOH). ZnONps shows highest absorbance at 374 nm, analysed by using UV-Visible spectrophotometric. Spherical shape of nanoparticles (Nps) was analyzed using scanning electron microscopy (SEM). The average size was 44 nm when the histogram was plotted. The surface of ZnONps was treated with L-cysteine HCl for immobilization. Glucose oxidase (GOx) was immobilized on Nps after surface modification with gluteraldehyde. According to UV-Visible spectrophotometric measurement, enzyme activity increased after immobilization in comparison with free enzyme.

Furthermore, the GOx/ZnONPs bioconjugate was successfully used to cure diabetic mice induced by Alloxan. In comparison to the diabetic group, the mice treated with the GOx/ZnONPs bioconjugate shows a significant lowering in fasting blood glucose levels and lipid profile. The potency of the GOx/ZnONPs bioconjugate as an antidiabetic drug was further validated by histological investigation. The liver of diabetic mice showed a distorted central hepatic vein, as well as a distorted cell arrangement around the central vein. When compared to control mice, the diabetic kidney had a deformed histomorphology. Pancreatic Islet cells in diabetic mice were deformed. The treatment of diabetic group with the GOx/ZnONPs bioconjugate, on the other hand, resulted in considerable recovery and regeneration of the histomorphology of the central vein of the liver, kidney and islet cells of pancreas. As a result, the GOx/ZnONPs bioconjugate exhibits significant antidiabetic potential and could be a useful nanomedicine for preventing diabetes.