RESEARCH ARTICLE

Anti-Hyperglycemic Activity of Silver Nanoparticles in Diabetes Induced Rats

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ABSTRACT

Silver nanoparticles have many biological approaches. In our present study silver nanoparticles were used to treat the dextrose induced diabetic rats. Silver nanoparticles treated diabetic rats showed good results. In this present study we got good results for glucose, SGPT and SGOT biochemical parameters. Diabetic rats treated with silver nanoparticles decreased the glucose levels. The SGOT and SGPT levels were decreased when treated with silver nanoparticles. The administration of silver nanoparticles was done with intra peritoneal injection to the rats. The diabetic rats treated with silver nanoparticles showed very low effect on lipid profile. Significant results obtained for LDL cholesterol. Silver nanoparticles decreased the LDL Cholesterol. Our present study showed the significant results for dextrose induced diabetic rats treated with silver nanoparticles.

Key Words: Diabetes; Glucose; Lipid profile; SGOT; SGPT; Silver nanoparticles

INTRODUCTION

The diabetes is a metabolic disease. Diabetes results due to hyperglycemia, which continues growing to be major worldwide epidemic. It is estimated that in the 2025 the prevalence can be of 380 million [1]. Type 2 diabetes mellitus is the most common form of diabetes, with more than 90% of diabetes cases, its varying prevalence among different racial and ethnic groups. The diabetes has been described as a new epidemic in the paediatric population in America because the overall 33% increase in the incidence and prevalence of diabetes observed during the last decade [2]. Similarly, Europe the incidence of diabetes in childhood has been rising by 3.9% each year during recent years [3]. In the case of Mexico, the proportion of adults diagnosed with diabetes in 2012 was 9.2%, while in 2000 and 2006 was 4.6% and 7.3% respectively. The increases in incidence and prevalence of diabetes in children and adults justify the study of new techniques and therapeutic procedures that can help to mitigate the effects of this serious disease.

The nanotechnology is commonly defined as the manipulation of matter about the nanometers order (1-100 nm) to create materials with novel properties and functions with a possible wide range to applications [4, 5]. The nanomedicine is the application of the nanotechnology to medicine. Because of the similarity in the domain of size of nanotechnology with the biological structures and certain functional properties it is expected to make significant advances in the areas of gene therapy, imaging and novel drug discovery and drug delivery in the treatment of diseases like diabetes and cancer [6, 7]. The cancer is a studied disease in nanomedicine, with nanostructures development with powerful therapeutic functions. Liposomes, polymer micelles and dendrimers are nanostructures responsible to carry drugs and small interfering RNA into target cells resulting in a powerful therapeutic modality [8-11].

MATERIAL AND METHODS

Silver nanoparticles solution was purchased from Nano Green Technology LTD, India. The size of silver nanoparticles was 50nm. Normal healthy male Wistar albino rats, [9-12] weeks old with an average weight of 200-250gm were procured from the Mahaveer Enterprises, Bagh Amberpet, and Hyderabad. They were housed in polypropylene cages and fed with a standard chow diet and water ad libitum. The animals were acclimatized to the conditions by maintaining them at a temperature 25±2°C and relative humidity 55±10 at 12 hour each at dark and light cycle for about 7 days prior to dosing and during the commencement of experiment. All experimental procedures involving animals were conducted in accordance with the guidelines of Committee for the Purpose of Control and Supervision on Experiments on Animals (CPCSEA)011/NCP/IAEC/2015).

Induction of experimental diabetes Dextrose was used to induce diabetes mellitus in normoglycemic male albino wistar rats. A freshly prepared solution of dextrose was given as feed orally at 6.6 g/kg bw of weight. Total 18 rats were used in the experiment. The animals were randomly divided into 3 groups of 6 rats in each group. The nanoparticle solution was administered by intra-peritoneal injection to the rats at the dose of 2ml/200gms/bw.

Group I: Normal rats

Group II: Diet induced diabetes diseased rats

Group III: Diet induced diabetic rats treated with silver nanoparticles (2ml/200gms/bw)

Estimation of glucose: The collected serum samples of different study group were subjected to the serum glucose level estimation by enzymatic GOD-POD method as per Braham and Trinder.

Estimation of total cholesterol: Total cholesterol in the plasma, erythrocytes and tissues was estimated by the enzymic method described by Allain et al. (1974).

Estimation of triacylglycerides: Triacylglycerol in the plasma and tissues were estimated using the diagnostic kit based on the enzymic method described by McGowan et al. (1983).

Estimation of HDL-cholesterol: HDL-cholesterol was estimated using the diagnostic kit based on the enzymic method described by Izzo et al. (1981).

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Received: October 13, 2020. Accepted: November 05, 2020. Published: November 12, 2020

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J Nanosci Nanomed Vol.4 No.3. 2020 4
Estimation of LDL & VLDL Cholesterol: LDL and VLDL Cholesterol were estimated by the standard formula as follows and were expressed as mg/dl.

Calculation

\[ \text{VLDL} = \frac{\text{Triglycerides}}{5} \]

\[ \text{LDL cholesterol} = \text{Total cholesterol} - (\text{HDL cholesterol} + \text{VLDL cholesterol}) \]

Remaining biochemical parameters are estimated in the diagnostic center.

Statistical analysis

Results were expressed as mean±SD for six rats in each experimental group. Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) 9.05 software. The data were analyzed using one-way analysis of variance (ANOVA) and group means were co-pared with Dunnett's Test P-values < 0.05 were considered as significant.

RESULTS AND DISCUSSION

In the present study we evaluated the possible therapeutic effect of silver nanoparticles on dextrose induced diabetic rats. There are various kinds of nanoparticles that are evaluated for their use as drug delivery systems [12]. The nanoparticles have a great role in medical and biological applications [13]. Our results showed a great reduction in blood glucose level in diabetic groups treated with SNPs (Table 1). This showed a great anti diabetic activity of those nanoparticles. There were significant changes in the serum, SGOT and SGPT levels in the rats when treated with silver nanoparticles. Table showed the normal rats have blood glucose levels of 134.50mg/dl. The diabetic rats have glucose levels of 428.67mg/dl. Silver nanoparticles in diabetic rats decreased the blood glucose levels of 193.33mg/dl. Here Silver nanoparticles worked effectively and reduce the blood glucose levels in diabetic rats. The SGOT and SGPT levels are also decreased when treated with silver nanoparticles. The SGOT levels in normal rats was 145.30±4.03* while in diabetic rats it was 166.05±3.00*. The diabetic rats treated with silver nanoparticles were more effective in decreasing the SGOT levels. Similarly, the silver nanoparticles reduced the total proteins from 9.75g/dl to 7.70g/dl. This was close to the normal rats' total proteins mean 5.95±0.19.

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None

REFERENCES


