



**University of zabol**

**Graduate school**

**Faculty of science**

**Department of biology**

**The Thesis Submitted for the Degree of Master of Science**

**(In the field of Genetics)**

**Title:**

**The effects of different doses of gold nanoparticles on *GLUT4* gene expression in**

**Diabetic rats**

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**January 2023**

## Abstract

Type 1 diabetes is an endocrine disorder that occurs due to a defect in the secretion of insulin from the beta cells of the pancreatic islets or the creation of insulin resistance in the tissues. The structure of GLUT4, the glucose transporter gene, is expressed in the liver tissue and is necessary for the physiological control of glucose-sensitive genes. and the reduction and suppression of its expression leads to defects in glucose-stimulated insulin secretion. Considering the increasing use of gold nanoparticles in the country and the therapeutic use and drug delivery of gold nanoparticles in the medical industry, this shows the importance of this issue. The purpose of this research is to investigate the effects of different doses of gold nanoparticles on *GLUT4* gene expression in diabetic rats. In this research, 30 mice with an age of 2 to 3 months and an average weight of 160 to 300 grams were studied and divided into 6 groups of 5 including: healthy control, diabetic control, diabetic under the influence of 10 nm nanoparticle, diabetic under the influence of 50 nm nanoparticle, healthy Under the influence of 10 nm nanoparticle and healthy under the influence of 50 nm nanoparticle were divided. Diabetes was induced by intraperitoneal injection of streptozotocin at the rate of 64 mg per kilogram of body weight. 48 hours later, the groups treated with gold nanoparticles were also injected intraperitoneally with 22 micrograms per kilogram of body weight, and 24 hours later, the animals were dissected. The blood sugar of the animals was measured in two stages with a digital glucometer. At the end of the period, the animals were killed and after dissection, samples of liver tissue were placed in RNA later solution to check the expression of glucose transporter gene using real time PCR technique. Finally, all the data were compared in different groups using SPSS software and one-way analysis of variance test. ( $P < 0.001$ ) The results of the present study showed that the induction of diabetes increases the expression of *GLUT4* gene compared to the healthy group, which was not significantly observed. Also, the injection of gold nanoparticles in the diabetic group significantly increases the *GLUT4* gene expression compared to the healthy group. In addition, in the healthy group with the injection of gold nanoparticles, the expression of *GLUT4* gene showed a significant increase compared to the healthy group, in all groups of nanoparticles, the size of 50 nm was associated with more gene expression than the size of 10 nm at a significant level. As a result, it can be said that gold nanoparticles have a positive effect on *GLUT4* gene expression and can reduce blood sugar in this way.

**Keywords:** Rattus, Type 1 diabetes, *GLUT4* GENE, Gold nano particles, Real time PCR