Ain Shams University
Faculty of Women for Arts, Science and Education
Zoology Department

Nanotechnology Studies as a New Approach for Treatment of Gastric Ulcers in Male Albino Rats

Submitted to the Department of Zoology, Faculty of Women, Ain Shams University, in the partial fulfillment of the requirements for the degree (PhD.) of Science in Genetic and Molecular Biology

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Ain Shams University

2020

Qualification

Name: **Rana EL-Sayed Bedair Abdel Wahab EL-Hanafy**

Scientific degree: **M.SC.**

Faculty: **Faculty of women for Arts, Science and Education**

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Abstract

Abstract

Gastric ulcers: disturbance in the gastric mucosa affect many people all over the world. It developed as an imbalance between the protective and aggressive factors. The objective of this study was designed to investigate the effect of gold nanoparticles (AuNPs) on treatment of peptic ulcers with using zinc as a conveying element to deliver the 250 µg/kg body weight (b.w.) AuNPs to the affected sites. Ulceration was induced by a single oral administration of indomethacin (IND) (30 mg/kg b.w). These treatments were carried out with zinc motor loaded with different sizes of AuNPs with green solid state laser doses. Rats were divided into nine groups (six per each). Group 1 (control group): Rats were administered orally distilled water (dist. H_2O). Group 2(ulcerated rats): rats were administered a single oral dose (30 mg/kg) of IND dissolved in 5% sodium bicarbonate. Groups (3): ulcerated rats were administered single oral dose (250µg/kg.b.wt.) of zinc. Group (4 & 5): ulcerated rats were administered single oral dose of 250µg (13 nm and 42 nm) gold nanoparticles (AuNPs) respectively dissolved in aqueous solutions of zinc respectively. Group (6 & 7): ulcerated rats were administered single oral dose of 250µg (13nm and 42nm) of AuNPs dissolved in aqueous solutions with zinc and after 2 hours exposed to 532 nm green solid state laser for 10 minutes respectively. Group (8 &9): ulcerated rats were administered single oral dose of 250µg (13nm and 42nm) of AuNPs dissolved in aqueous solutions with zinc then 2 hours later exposed to 532 nm green solid state laser for 15 minutes respectively. After 7days, animals were scarified. Stomach was removed and immediately stored at –80°C for molecular, histological and biochemical analysis.

DNA fragmentation assay and the expression level of caspase-3, BAX and BCL-2 genes were evaluated in ulcerated gastric tissues using qRT-PCR.

From genetic results we noted that, the highest level of DNA fragmentation was observed in ulcerated group. While this level was reduced

after nanoparticles, zinc and laser exposure for 10 and 15 mins. Moreover, the use of gold nanoparticles with zinc and laser were significantly downregulated the expression levels of both caspase-3 and BAX gene after AuNPs treatment as compared to ulcerated group, indicating a proapoptotic effect through caspase pathway. Also, significant increase in expression level of BCL-2 was detected as compared to ulcerated group indicated that gold nanoparticles exerted potent anti-apoptotic effect through BCL-2 pathway. The significantly increased ($p \leq 0.5$) Malondialdehyde level by indomethacin were effectively reduced following treatment with gold nanoparticles with zinc and with laser at 250µg/kg b.w. Moreover, the gold nanoparticles with or without zinc and laser significantly decreased activity of superoxide dismutase (SOD), Catalase (CAT) , nitric oxide (NO) and glutathione-S-Transferase (GST) in the ulcerated rats but significantly reduced activity of Malondialdehyde (MDA). Conclusion: The present data indicated potent gastro treatment effect by using gold nanoparticles with zinc (conveying element) and laser which also produced an inhibitory effect against ulceration via antioxidative effect.

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