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## Synergism of gold nanoparticles with microwaves in killing leishmania major promastigots and amastigotes

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**Introduction:** Due to the wide spectrum of antiparasitic drugs for leishmaniasis and their inadequate success, conductors of this project were intended to study the effects of conventional physical therapies such as thermotherapy on Leishmania parasites. Because in this way, a temperature above 37 degrees (sometimes up to 50 degrees), the heating temperature of surrounding tissues can be injured to them, it is anticipated using gold nanoparticle can be acted as a localize heat-sensitizer in the lesion and provides a more effective efficacy in the treatment. As well as to increase the temperature, the microwaves was applied and the effect of thermotherapy in the presence of gold nanoparticles and microwave radiation at a frequency of 2450 MHz was determined on the survival of Leishmania parasites.

**Materials & Methods:** Part one study was designed on the promastigotes. Parasite Leishmania major strain MRHO/IR/75/ER was cultured with RPMI-1640 medium in standard culture conditions and after reaching the stationary phase, the parasite suspension concentration 2\*106parasites per 200 µl was incubated with gold nanoparticles for 2 hours. After washing, thermotherapy was completed by microwave irradiation. 48 hours later, the percentage survival of parasite was determined using Alamar Blue.

The second part of the study was performed on amastigotes. After culturing and proliferating of J744 cells, a cell suspension was prepared containing with 4\*106 of the macrophages that incubated with 4\*107 of the promastigotes for 24 hours at 35°C in a culture medium supplemented with 20% FBS in the presence of 5% CO2. At this period the promastigotes converted to amastigote form. Then, the infected macrophages were incubated with the gold nanoparticles and were inserted under microwave irradiation. After 24 hours, the number of amastigotes into the macrophages was determined after Giemsa staining by a light microscope.

**Results**: Increased exposure time of the microwave to the promastigotes in the presence of gold nanoparticles was caused a significant decline in promastigotes survival percentage in comparison with similar samples without GNPs. The least survival of amastigotes was recorded in the groups containing GNPs. Also, moreover that the microwave radiation at longer periods have provided more decline in survival of the promastigotes, the presence of gold nanoparticles during the microwave radiation, was more killing for promastigotes and amastigotes in comparison with microwave only.

**Conclusion:** Thermotherapy using microwave radiation in the presence of gold nanoparticles can cause death of promastigotes and amastigotes.

## Biography

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Research Interests: Improvement of Photodynamic and Sonodynamic Therapies using Nanoparticles in Cance and Leishmaniasis treatment as in vitro and on animal models

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