

## Influence of Nano-Silver on Primary Follicles of Ovary via Intraperitoneal Injection in Rats

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**Abstract:** Nano-silver has been widely used in medical biology. These nanoparticles could move into the circulation system by traversing the blood-lung barrier and thus, distribute through the whole body. The present study investigated the effect of nano-silver on ovary. Nano-silver at concentrations of high-dose (10ppm) and low-dose (1ppm) were intraperitoneally injected into rats. The rats were sacrificed after the 30 days of inject period and the ovaries were obtained for histopathology observation. Results show that in groups which received nano-silver for 30 days, we observed a decrease in follicles numbers. No destructive effects were seen in control group. According to this study, we can propose that administration of nano-silver to the ovary appeared to have an inhibitory effect on ovulation induction.

**Key words:** Nano-silver • Ovary • Rat • Peritoneal injection

### INTRODUCTION

Despite the fact that nanotechnology is often described as a future technology, few realize that nanomaterials are actually already being used in a wide variety of consumer product and that the number of commercially available products seem to be increasing rapidly [1-4]. Although the applications of nanoparticles are increasing broadly in every field, concern about their environmental and health impacts remains unresolved [2-8]. Silver is a naturally occurring precious metal, most often as a mineral ore in association with other elements. It has been positioned as the 47<sup>th</sup> element in the periodic table, having an atomic weight of 107.8 and two natural isotopes 106.90 Ag and 108.90 Ag with abundance 52% and 48%. Metallic silver was used for surgical prostheses and splints, fungicides and coinage. Soluble silver compounds, such as silver salts, have been used in treating mental illness, epilepsy, nicotine addiction, gastroenteritis and infectious diseases, including syphilis and gonorrhea. The use of silver nanoparticles in medicine has become a topic of discussion in research [3,9].

Silver nanoparticles could move into the circulatory system by traversing the blood-lung barrier and, thus, distribute the whole body. To date, little is understood concerning the distribution, accumulation and target organ of silver nanoparticles in organisms. Moreover,

there have been some reports indicating that nanoparticles move into placenta [9]. This study investigated the influence of silver nanoparticles on ovary via intraperitoneal injection.

### MATERIALS AND METHODS

**Laboratory Animals:** Adult Wistar female rats with the average weight of 200g were obtained from the Shahrekord University. The animals were kept at 25 °C with enough humidity. The rats were fed standard diets.

**Animals' Treatment:** Rats were randomly divided into four groups of seven animals. Each group was kept in a separate cage. Group 1 was the control group and group 2 served as normal control and in each injection received only normal saline. Group 3 rats, which received high dose (10ppm) of nano-silver through intraperitoneal injection, group 4 rats which received low dose (1ppm) through the same procedure. The treatment went on for four weeks.

**Histological Examination:** The rats were sacrificed and the ovary tissues were separated. The ovaries were fixed with buffer formalin solution in order to conduct histopathology experiments. Histological sections were prepared from the ovaries and these were stained and examined under a light microscope.

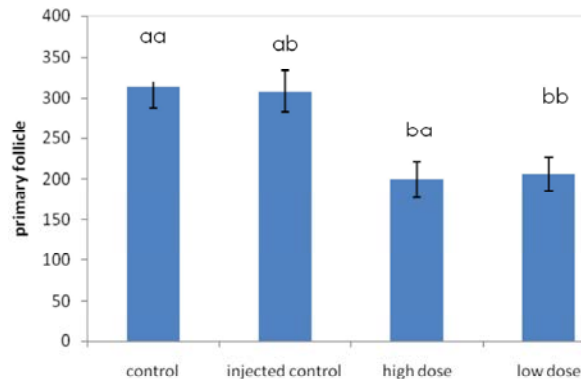


Fig. 1: Effect of nano-silver on primary follicle number. Values represent the mean  $\pm$  the standard deviation obtained from at least seven independent experiments. Data were statistically calculated by one way ANOVA and Tukey's test. Different letters above bars indicate the presence of significant differences ( $p < 0.05$ ).

**Statistical Analysis:** The data were analyzed and compared by using the statistical test including analyses of variances and Tukey test. P values less than 0.05 were considered as significant.

## RESULTS AND DISCUSSION

The results of this study showed that in groups, which received nano-silver at concentrations of high-dose (10ppm) and low-dose (1ppm) via intraperitoneal injection, number of primary follicles decreased. There is a significant difference between treatment groups and control groups (Figures 1).

The introduction and other report on nanoparticles summarize the main conclusions on toxicity of nanoparticles [7]. The results of this study demonstrated that in groups, which received nano-silver with doses 1ppm and 10ppm via intraperitoneal injection, the number of primary follicles is reduced. This matter can express that nano-silver affected ovulation and caused inhibition of it. Probably, it is for this reason that this nanoparticle after entering into the blood, could move into body organs, such as ovaries and penetrate inside cells [1] and cause oxidative stress that leads to activation of oxidative stress factors in ovary cells further leading to apoptosis [5]. On the other hand, the entering of this nanoparticle into cells causes decreasing antioxidants, after cells confront with increasing oxidative and activation caspase cascades inside the cell, finally giving cause to occur apoptosis [6-10]. Therefore, in rats which received nano-silver we can propose that nano-silver causes increasing apoptosis inside cell and the reduction of ovulation.

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