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Pathological Study of Intestine and Liver in Broiler Chickens after Treatment with Different Levels of Silver Nanoparticles

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Abstract: Silver nanoparticles are the most effective antimicrobials that have been used by human for many years and also used as an additive and compatible to the biological system. This study has carried out in a completely randomized design with four treatments four repetitions at 0, 300, 600 and, 900 ppm of silver nanoparticle levels. At the end of experiment, some microspocic section s of intestine and liver of broiler chicken was prepared for examination of probable changes. There were no statistically significant differences in the effects of different levels of silver nanoparticles about intestine and liver tissue. However, the height of brush borders increased after treatment of silver naniparticles and so this increase found for absorption and conversion ratio. The results showed that different levels of silver nanoparticles had no significant difference on cell changes of liver tissue.

Key words: Brush Border · Broiler chicken · Pathologic studies · Silver Nanoparticles

INTRODUCTION

It is known that Silver nanoparticles are important nanoparticles and have many extended application in human health. It is determined that this matter is a disease preventive matter. Based on historical documents, it was used by Iranian kings about 2000 years ago who as silver powder in boiled water. These compounds are the most effective antimicrobials for human and are compatible to the biological systems [1-4]. It is known that silver nanoparticles are effective on a wide spectrum of bacteria such as *E. coli*, *Vibriocolira*, *Salmonella*, *Pseudomonas tiphy Aorejinoza*. There is no resistance against silver nanoparticles because they effect on different parts and enzymes. Since human cells are organized as tissue form, nanoparticles have no adverse effects on human cells [1].

Some studies showed the effects of silver nanoparticles on fetal growth and morphology [3] and also examination of effect of silver nanoparticles on performance of intestinal microbial flora and morphological entrosyt quail duodenum done [2-4]. The aim of this study is examination of the Application of different levels of silver nanoparticles in food on tissue change in intestine and liver tissue of broiler chickens.

MATERIALS AND METHODS

This study was performed on 308 broiler chickens (240 Ross) in a completely randomized design with four treatments and four replicates at 0, 300, 600 and 900 ppm silver nano particles levels. 15 chickens were put in each cage with an average weight of 39 gr. At the beginning of experiment, chickens feed with sugar- water solution (5%). dietary food in treatment groups are as following:

Treatment 1 = Control treatment. Based on NRC 1994 that stated poultry food needs no silver nanoparticles.
Treatment 2 = Control treatment + 300 ppm silver nanoparticles.
Treatment 3 = Control treatment + 600 ppm silver nanoparticles.
Treatment 4 = Control treatment + 900 ppm silver nanoparticles.

The calculated amount of energy for all stages of development is the same and is equal to 2900 kcal/kg at the end of the period. Some parts of intestine and liver were prepared as microscopic sections to examine the cell and tissue changes after treatment of different levels of

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silver nanoparticles the prepared liver and intestine sections were kept in formalin solution.

RESULTS AND DISCUSSION

Pathological Examination Of Intestine Sections

A-1: The microscopic study of intestinal tissue in treatment 1 (Control = without silver nanoparticles, showed no atrophy and no necrosis in epithelium cylindrical surface and degenerative changes. The examination showed filtration of single nuclear inflammatory cells in epithelium with a ratio of one inflammatory cell per 3-7 epithelial cells. Low to moderate changes in filtration of inflammatory cells in laminapropria is seen without accumulation of in inflammatory follicular cells. Another effect was seen in the diameter of muscular and other layers that were not significantly changed. Also the presence of polymorphonoclear cells in intestine laminapropria was showed the significant change. The height of naps (Brush border) was little (Figure 1).

A-2: The microscopic study of intestinal tissue treatment 2 (300 ppm silver nanoparticle) showed no atrophy in Intestinal naps and necrosis and degenerative changes in the epithelium cylindrical surface. Infiltration of single nuclear inflammatory cells is present in epithelium with the ratio of one inflammatory cell per 3-7 epithelial cells. Low to moderate infiltration of single nuclear inflammatory cells in laminapropria without accumulation of inflammatory follicular cells was found. And then the diameter of muscular and other layers were not significantly changed. Presence of polymorph nuclear cells at intestine laminapropria was significantand also the height of naps (Brush border) was average.

A-3: The microscopic study of intestinal tissue treatment (600 ppm silver nanoparticles) showed no atrophy in intestinal naps and no necrosis and degenerative changes in the epithelium cylindrical surface. The infiltration of single nuclear inflammatory cells is present in epithelium with a ratio of one inflammatory cell per 3-6 epithelial cells. This examination also showed Low to moderate infiltration of single nuclear inflammatory cells in laminapropria without accumulation of inflammatory follicular cells. The diameter of muscular and other layers were not significantly changed and the presence of polymorphonoclear cells at intestine laminapropria was significant. Finally the height of naps (Brush border) in this treatment was more.

A-4: The microscopic study of intestinal tissue treatment 4 (900 ppm silver nanoparticles) showed no atrophy in intestinal naps and no necrosis and degenerative changes in the epithelium cylindrical surface. The infiltration of single nuclear cells in epithelium is seen with a ratio of one inflammatory cell per 5-8 epithelial cells. Low to moderate infiltration of single nuclear inflammatory cell in laminapropria was seen along with accumulation of inflammatory follicular cells. Changes in the diameter of muscular and other layers were not significantly changed. The presence of polymorphonoclear cells in intestine laminapropria was significant. And also the height of naps (Brush border)was more

Pathological Examination of liver Sections

B-1: The microscopic study of liver tissue in treatment 1(without nanoparticles silver) showed Maintenance in The tissue structure. The sections showed mild sinusoid congestion and mild infiltration in vessels around inflammatory cells. No fibrosis in paranshym and no necrosis in liver cells found. In this survey liver cells showed any cytoplasm vacuole and finally no degenerative changes in liver cells and cytoplasmic inclusion not seen.

B-2: The microscopic study of liver tissue in treatment 2 containing 300 ppm silver nanoparticles proved maintenance in tissue structure. We showed mild sinusoid Congestion and mild infiltration of inflammatory cells around vessels. Also Fibrosis is not seen in parenchyma. There was no necrosis in liver cells without cytoplasm vacuole, degenerative changes and cytoplasmic inclusions.

B-3: The microscopic study of liver tissue in treatment 3 containing 600 ppm silver nanoparticles proved the stability in the tissue structure and mild sinusoid congestion along with mild infiltration of inflammatory cells around the vessels. We also notice no Fibrosis in parenchyma. Liver cells are without necrosis, without cytoplasm vacuole, degenerative changes and cytoplasmic inclusion.

B-4: The microscopic study of liver tissue in treatment 4 containing 900 ppm silver nanoparticles showed the stability of the tissue structure and no sinusoid congestion. This survey showed mild infiltration of inflammatory cells around vessels and no fibrosis in Parenchyma. And also There are liver cells with necrosis around blood vessels. Liver cells are without cytoplasm vacuole, degenerative changes and cytoplasmic inclusions.

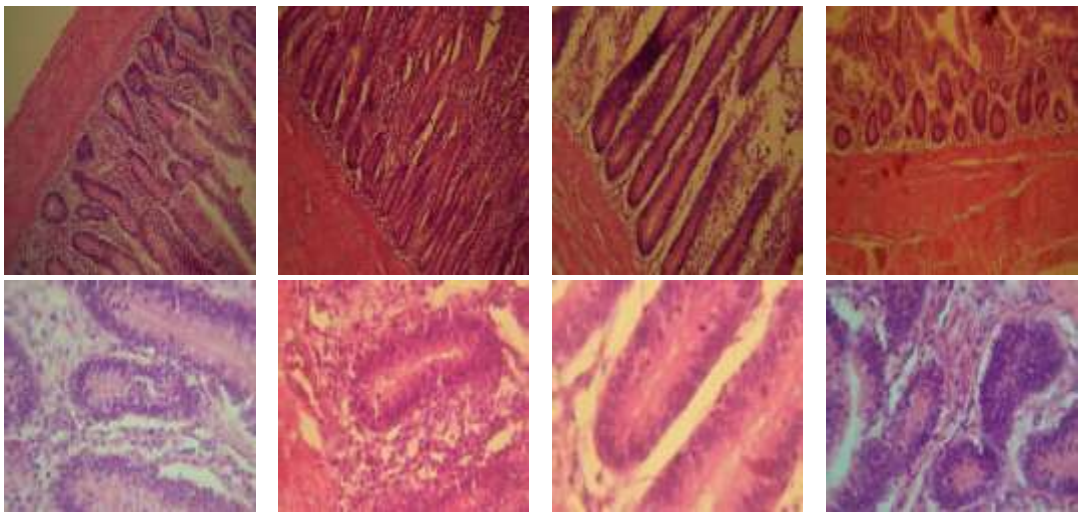

Fig. 1: Pathological examination of treatment 1 (without silver nanoparticles) in the intestinal sections

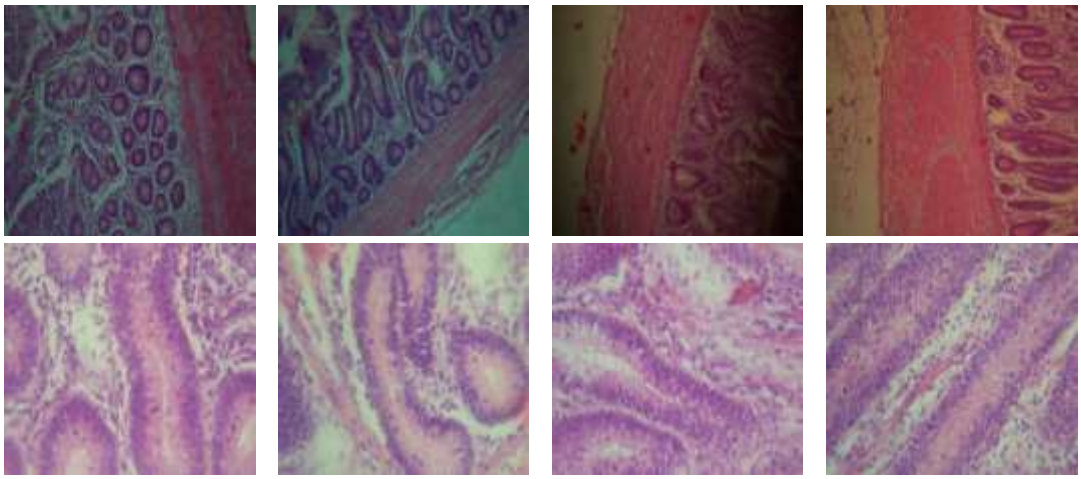

Fig. 2: Pathological examination of treatment 2 (containing 300 ppm silver nanoparticles)

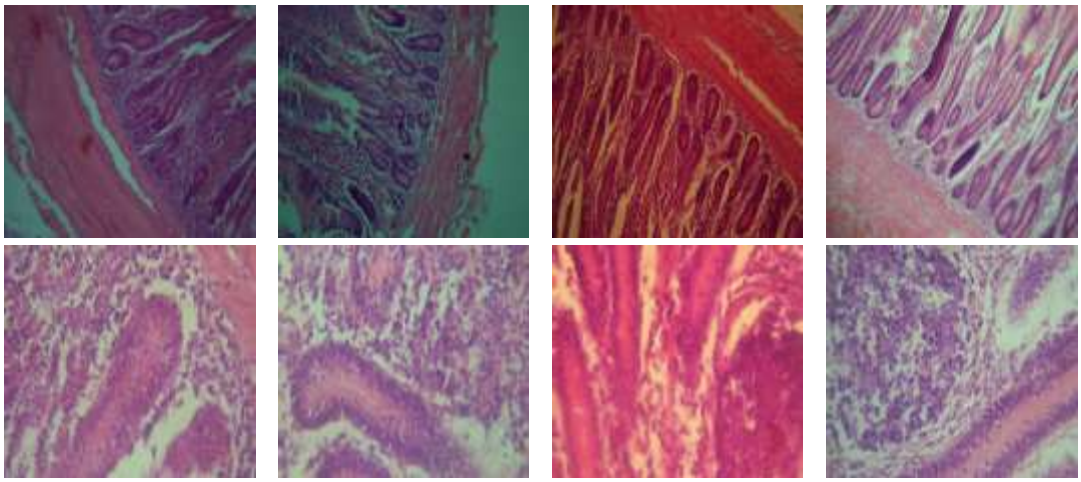

Fig. 3: Pathological examination of treatment 3 (containing 600 ppm silver nanoparticles) On the intestinal tissue

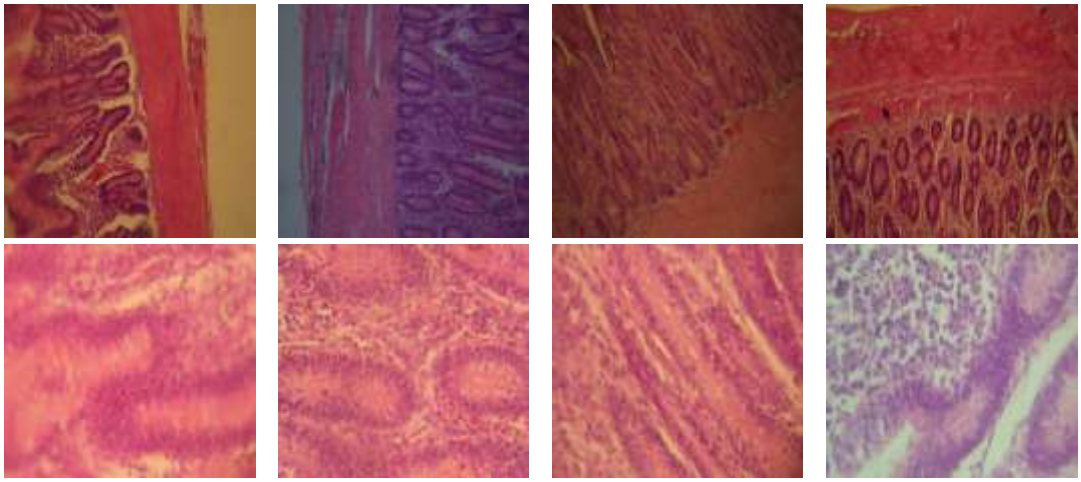

Fig. 4: Pathological examination of treatment 4 (containing 900 ppm silver nanoparticles) on the intestinal tissue

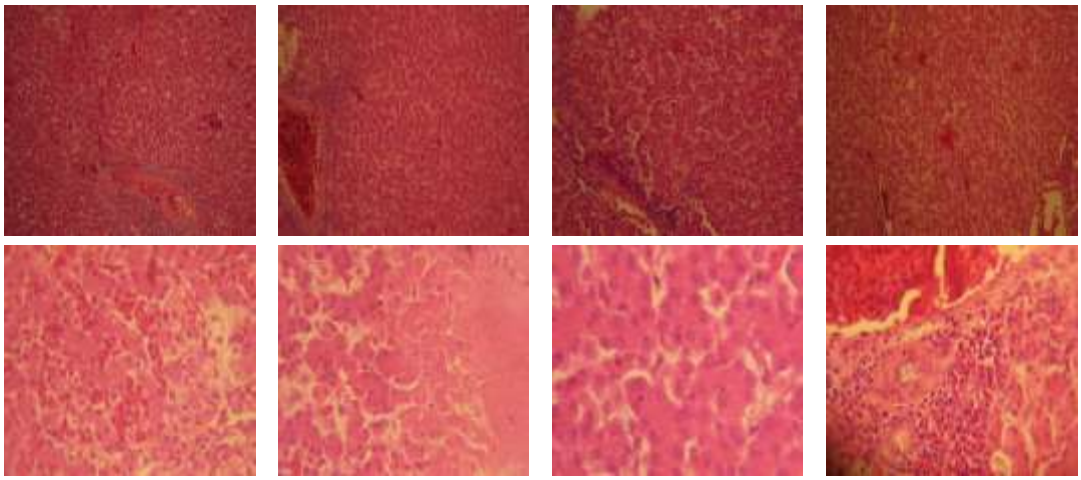

Fig 5: Pathological examination of treatment 1 (without silver nanoparticles) on the liver tissue

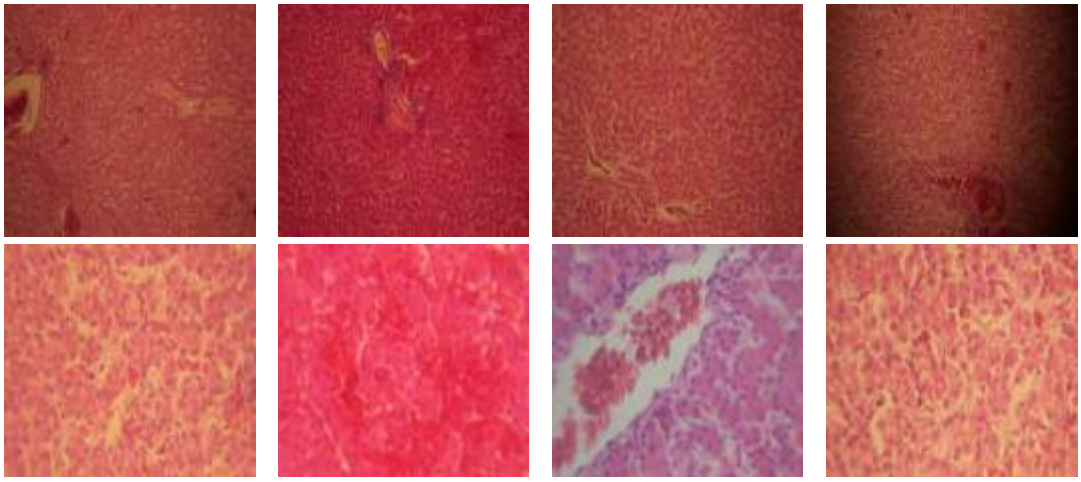

Fig. 6: Pathological examination of treatment 2 (containing 300 ppm silver nanoparticles) on the liver tissue

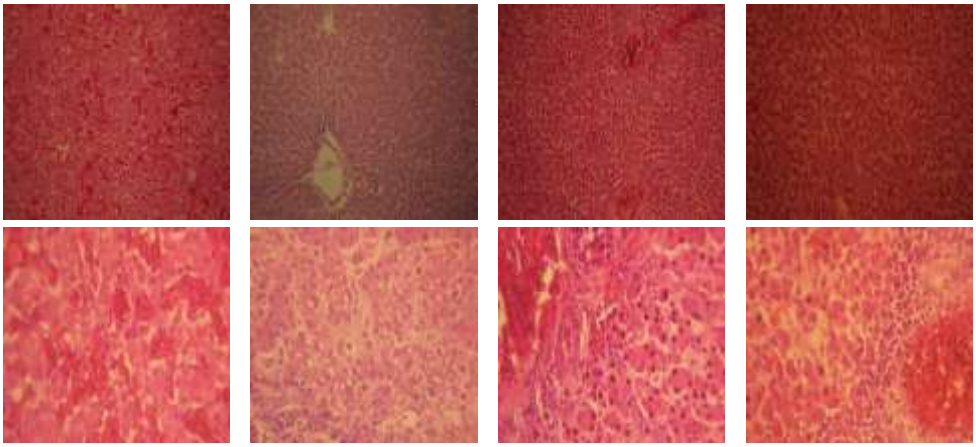

Fig. 7: Pathological examination of treatment 2 (containing 600 ppm silver nanoparticles) on the liver tissue

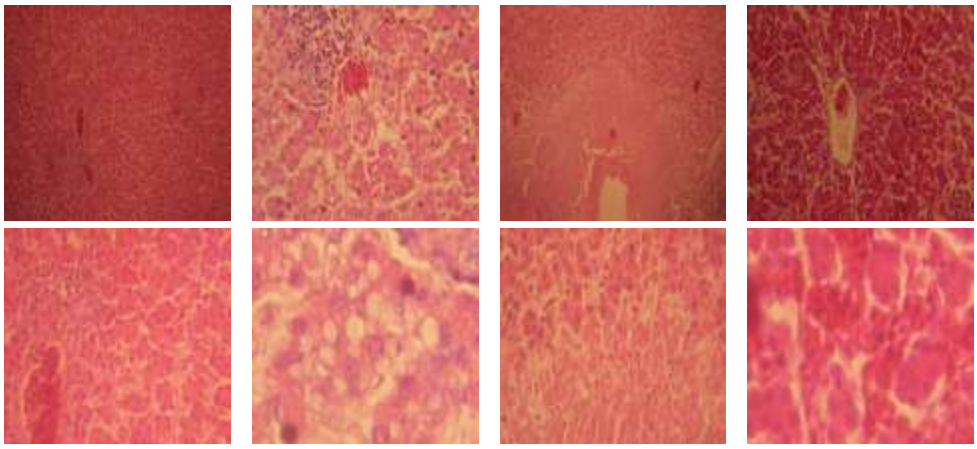

Fig. 8: Pathological examination of treatment 4 (containing 900 ppm silver nanoparticles) on the liver tissue

CONCLUSION

The result of this study showed no significant change in the diameter of muscular and other layers of the intestine and also there is a significant presence of polymorphonuclear cells. Increase in Nap brush border height that absorbs the nutrients in the intestine along with the increase in silver nanoparticles was seen, thus absorption and conversion coefficient, increased. This proved in previous studied [2-3]. Generally, no significant differences has been seen in the effect of different levels of silver nanoparticles in the liver tissue cells, including tissue structure, fibrosis in parenchyma, inflammatory cell infiltration and sinusoid congestion.

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