Effect of Selenium Nano-Particle on the Hepatic Changes in Rat

Khatere Khosravian Dehkordi

Teacher of Education Graduate, Student of Animal Physiology, Islamic Azad University, Shahrekord Branch, Shahrekord, Iran

Abstract: The aim of this study was to investigate the effect of oral administration of nano selenium on the hepatic changes. Thirty rats were randomly divided into 3 groups (n=10). Groups 1 and 2 were considered as treatment groups and the nano-selenium and sodium selenite were fed orally with a concentration 1mg/kg by gavage method. On days 10 and 20 after administration liver structure was evaluated. The results showed that in comparison with respective control rats, exposure to nano-Se and selenite sodium has produced changes in the hepatocytes and the sinusoids. The changes in the hepatocytes were principally summarized as hyperemia into sinusoids and inflammatory cells infiltration.

Key words: Nano Selenium • Liver • Hyperemia • Inflammatory Cells

INTRODUCTION

Reactive oxygen species (ROS) is produced by metabolism of various compounds and viruses that are involved in the histopathogenesis of hepatic structure. Cellular function affected by variety of molecules due to ROS reaction [1-3]. The balance between the genesis and consumption of the ROS leads to homeostasis generally [4]. But, an over formation of the ROS and also decline antioxidant defense usually is delineated as the oxidative stress [5]. The selenium (Se) is an essential trace element which plays an important role in a number of biological processes. Se at nano size (nano-selenium) contains effectiveness in activities of the cellular characteristics of structural components in liver when compared with selenomethionine in mice [5]. Se is encoded in the selenoprotein mRNA where is used Potential in a plethora of applications for their ability to collect most of these structures, such as nanotubes, nanofibers, nanocrystals, nanorods, nanocapsules and nanowire stems [6].

In the present study, an effort was made to appraise the alteration of the potential of Se nanoparticles in the liver tissue of male rats.

MATERIALS AND METHODS

Experimental Design: Thirty adult Wistar rats were selected and housed under standard conditions with free access to water and food. Temperature (22 ±1°C) were controlled in cages with fresh air on a 12-hour day/night cycle. Animals were randomly divided into three groups; then were orally received nano-selenium (group I) and selenite sodium at 0.10 mg/kg BW (group II) for 20 sequential days. The group III was considered control group. Five animals from each group were anesthetized and euthanized by cervical dislocation after 10 and 20 days of exposure to Se nanoparticles and selenite sodium. The research protocol was approved by the Animal Care and Experiment Committee of the University.

Histopathology: After euthanizing the animals, fresh parts of the liver from each rat were cut rapidly and fixed in buffered formalin (10%), then dehydrated by grades of ethanol (70% to 100%). Dehydration was continued by clearing the specimens in two changes of xylene. The tissue sections (5 im) were stained by haematoxylin and eosin (H and E). Tissue sections from the control and treated rats were monitored and photographs were gotten by an optical microscope (Olympus, Tokyo, Japan) for changes in architecture of liver.

RESULTS AND DISCUSSION

No mortality was observed during the nano-Se and selenite sodium administration periods of 10 and 20 days in any of the experimental groups of the present study.
and no alterations were observed in the appearance and behavior of nano-Se and selenite sodium-treated rats in comparison with the control group.

In comparison with the control group (Figure 1), histopathological changes were detected in the liver tissue of rats that was treated with Se nanoparticles and selenite sodium.

In nano-selenium group, the hepatic sinusoids hyperemia was observed that there was more on 20 days than the 10 days. There is accumulation of inflammatory cells around blood vessels in the further liver cells (Figure 2).

In sodium selenite group (Figure 3), were observed severe congestion of the sinusoids. Accumulation of inflammatory cells was observed around the hepatic artery and the severity of the injury was so that the focal accumulation of inflammatory cells could be identified. The appearance of lymphocytic infiltration with extravasation of red blood cells in the liver tissue may lead that nano-Se and selenite sodium interfere with the antioxidant defense mechanism, conducting to reactive oxygen species (ROS) production which, in turn, may stimulate an inflammatory response. Inflammatory cells infiltration was seen in sinusoids and hepatic artery of nano-Se and selenite sodium-treated rats. The infiltrated cells were mainly lymphocytes cells [7-12]. Xie et al. [13] showed that nano-SiO₂ cause periportal mononuclear infiltration in the liver, as well as hepatocyte necrosis. In other study, Nishimory et al. [14] compared the effects of different dosages of nano-particles (SiO₂) on liver histology and function in mice. They found that dose of 100 mg/kg had not toxic effect on the liver. Sharma et al. [15] displayed that Zinc oxide nanoparticles induce oxidative DNA damage as well mitochondrial damage, genotoxic and apoptotic cell effects over human liver cells. Neyrinck [16] showed that when the hepatic tissue exposure of golden nanoparticles occur hyperplasia of the Kupffer cells. He suggested that might be correlated with the amount of injurious to the hepatic tissue induced by golden nanoparticles [16].

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REFERENCES


