



Effect of iron oxide nanoparticles on thyroid hormones in rats

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ABSTRACT

Background: Iron oxide nanoparticles as contrast elements causing the cancer cells used in MRI and heat therapy are extensive. However, the effects of nanoparticles on human health have not been fully investigated. Objectives: In this study, iron oxide nanoparticles effects on thyroid hormones (T3 and T4) and TSH in adult male Wistar rats were studied. Materials and methods: Three experimental groups of mice daily for 15 days, with concentrations of iron oxide nanoparticles $\mu\text{g/kg}20$, $\mu\text{g/kg}50$ and $\mu\text{g/kg}150$ was dissolved in one ml of distilled water, by gavage tube. Results: Serum T3 levels in experimental and control groups showed no significant change Serum T4 levels in the experimental group receiving the highest dose showed a significant increase compared to control group. Also Yrmy TSH hormone concentration in the groups receiving the medium and maximum doses significantly lower than the control group shows. Conclusion: Experimental results show that iron oxide nanoparticles at high concentrations inhibits the Ndkryny pituitary axis - the hypothalamus And thyroid gland can cause malfunctions Appear to be iron oxide nanoparticles at high concentrations is toxic effect on thyroid function.

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Introduction

Some nanoparticles, such as iron, cobalt and nickel for magnetic properties and their stability are known to Magnetic nanoparticles .(5/1) Due to the physiochemical characteristics of the iron oxide nanoparticles have been widely used in research invivo and invitro. (Eun-jnng Park et al 2010)

The nanoparticles have many biomedical applications including tissue reconstruction, Safety Survey, Biological fluid disposal poisoning, heat therapy of cancer cells etc. are (Mirkovic et al 2010) This is another important application of nanoparticles in MRI. MRI is now a standard method in medical diagnostics is now (Ka-wing Au et al 2008). Using iron oxide nanoparticles as a drug transfer to treat cancer dates back to 1970 and has continued until now (Sengei et al 1978 and Schere et al 2002). Despite the use of these nanoparticles on human health effects is not yet fully known (Eun-jnng Park et al 2010). Iron oxide nanoparticles include increased concentrations of cytokines and inflammatory responses the increased expression of genes related to these responses are worse (Eun-jnng Park et al 2010). Many of these nanoparticles have proven mild toxic effects (Eun-jnng Park et al 2010). Apopa and colleagues in 2009 reported that iron oxide nanoparticles are increased endothelial cell permeability. Nanoparticles because of their shape and size that can pass through physiological barriers Instead of having harmful effects However, our information about its toxicity is very low and limited (Stone et al 2007 in the In this study, I believe that prolonged exposure to iron oxide nanoparticles resulted in the disruption of thyroid hormones (T3

and T4) and TSH are Many studies have shown that thyroid hormone system plays an important role in the metabolic tissues plays HrkvnH and endocrine system dysfunction, irreversible damage to the tissues to enter. Safety Survey, Biological fluid disposal poisoning, heat therapy of cancer cells etc. are (Mirkovic et al 2010). This is another important application of nanoparticles in MRI MRI is now a standard method in medical diagnostics is now (Ka-wing Au et al 2008) Using iron oxide nanoparticles as a drug transfer to treat cancer dates back to 1970 And has continued until now (Sengei et al 1978 and Schere et al 2002 Despite the use of these nanoparticles on human health effects is not yet fully understood (Eun-jnng Park et al 2010). Inflammatory responses, including increased concentrations of iron oxide nanoparticles and also increased expression of genes related to cytokines may trigger these responses (Eun-jnng Park et al 2010) Many of these nanoparticles have proven mild toxic effects (Eun-jnng Park et al 2010). Apopa and colleagues in 2009 reported that iron oxide nanoparticles are increased endothelial cell permeability Nanoparticles because of their shape and size that can pass through physiological barriers and Instead of having harmful effects However, our information about its toxicity is very low and limited (Stone et al 2007) In this study, I believe that prolonged exposure to iron oxide nanoparticles resulted in the disruption of thyroid hormones (T3 and T4) and TSH are. Many studies have shown that thyroid hormone system plays an important role in the metabolic tissues plays every each disorder in endocrine system dysfunction, irreversible damage to the

tissues to enter. In this study the effects of different amounts of iron oxide nanoparticles has been studied on the concentration of thyroid hormones To an authentication information associated with endocrine and metabolic effects of body Fyalyt Ibn nanoparticles on offer. And areas for increased protection of these nanoparticles

Experimental course

Experimental animals used in this study, adult male Wistar rats weighing 300-250 g were estimated from the animal house of martyr portal was developed Animals tested at an average age of 3-5/2 months. Tested at ambient temperature 25-20 degrees during the day was centigrade And light conditions for 12 hours and 12 hours dark lighting was adjusted Drinking water from municipal tap water and eating animals for food by rats (feed compression) that the Company was prepared feed was barking In this study, experimental animals were randomly divided into two groups as follows:

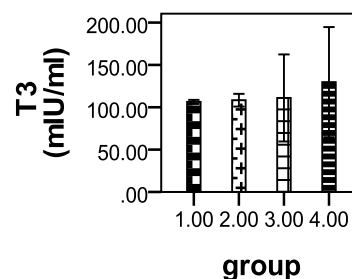
First group: control group consisted of 10 animals tested at the time of the day were fed one ml of distilled water for 15 days.

Second group: experimental group consisted of three sub-groups, each consisting of 10 animals which various amounts of iron oxide nanoparticles of the Institute Yazd nanotechnology solutions were prepared in a milliliter of distilled water with a maximum concentration $\mu\text{g/kg}150$ $\mu\text{g/kg}50$ average concentration and minimum concentration $\mu\text{g/kg}20$, for 15 days of oral gavages was fed through a tube All animals have fifteen days from the end of blood through the veins were retro orbital eye and each sample was centrifuged at 3000 rpm for 15 minutes After separating the serum from the clot by Smplr, were performed to measure the enzyme at a temperature of -20°C were frozen and stored. Viscosity of thyroid hormones (T3 and T4) and TSH by use of ELISA method and using kits purchased from the company making America Monobind specific hormones were measured. The resulting progeny of liver enzyme levels based on the statistical program SPSS and analyzed by ANOVA and Tukey test was The difference in the level $P < 0.05$ was considered significant

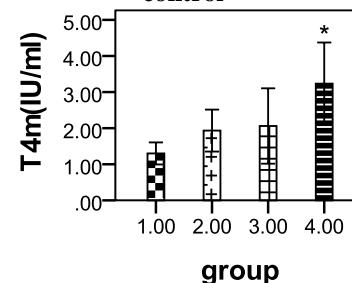
Argument and result:

1-3 Results:

Statistical studies and compared the concentrations of thyroid hormones (T4 and T3) and TSH to receive iron oxide nanoparticles, Asterisks* indicate significant differences at $P < 0.05$ for each test group than the control group Effect of different amounts of iron oxide nanoparticles show that the T3 hormone concentration between experimental and control groups, there is no significant difference Between experimental and control groups with statistical calculations were performed and results are shown in Fig(Fig. 1). T4 hormone concentrations in the groups receiving the intermediate dose, and at least does not show significant differences compared to control group But between the group receiving the highest dose and control groups, there is a significant increase(Fig. 2). TSH hormone levels in the groups receiving the medium and maximum doses significantly lower than the control group shows(Fig. 3). The following charts are the 1.00= number of controls, 2.00= number of dose groups receiving at least 3.00 =number moderate-dose group received 34.00 =number maximum-dose group



maximum-dose group received
Chart No. 1_ serum T3 hormone in experimental and] control



groups
Chart No. 2. Serum T4 hormone in experimental and control

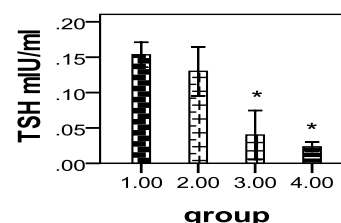


Chart No. 3_ serum TSH levels in experimental and control groups

Argument and result:

The results of this experimental study shows that iron oxide nanoparticles are cause significantly increased in serum hormones, T4 and Significant decrease in TSH hormone serum concentrations . It is possible that these nanoparticles can be applied through the inhibition of endocrine pituitary axis - hypothalamus affects the hypothalamus, which is probably due to decreased TSH High levels of nanoparticles in the blood may inhibit the thyroid gland tissue damage Dydynasyvn T4 Iron oxide nanoparticles are likely to impact on the liver enzymes that synthesize mono-amine oxidase is the main location of the dysfunction of this enzyme The use of monoamine oxidase inhibitors in rats can alter the pattern of TSH release(Et al 2002 Nour ED). Which in turn will lead to a decrease in iodine transport mechanism (Mokhtari, 1386). The resulting changes can be concluded that iron oxide nanoparticles at high concentrations ($\mu\text{g/kg}150$) Toxic effects on the thyroid gland and inhibits the activity of this gland

Resources

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