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The effect of nickel sulphate on bone composition in mice

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Abstract

To find the effect of Nickel sulphate of the bone of mice.In this study the animals were divided into control and three experimental groups I, II and III according to the dose of nickel sulphate ($NiSO_4$) administered orally to them i.e. 5.1, 11.7 and 24.2 mg/kg body weight, respectively. The femur bones were obtained by sacrificing the animals three weeks after weaning them once a week. The percentage loss between the wet weight and dry weight of femur in experimental groups I, II and III, the percentage loss was 31.6+1.6, 34.2+1.9 and 36.8+2.6 respectively, while in control animals was found to be 29.5+1.5. In the three experimental groups the percentage loss between the wet weight in wet water and dry weight in wet water was in the three 38.6+1.7, 41.5+2.8 and 49.1+2.9 respectively in the three experimental groups and 33.1+2.4 in the control group. Results indicates that there was a low deposition of bone mass (10-16%) due to the effect of nickel sulphate.

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Introduction

The bone is considered as a component of extracellular matrix (Katz 1980; Lakes 1993). The percentage of water about 26% of bone volume (Pidaparti *et al.,* 1996) and is believed to facilitate interactions between the other bone extracellular matrix like minerals and the organic matrix. Organic matter accounts for one-third (30-35%) of dry weight of bone and the rest it constituted by inorganic matter (Glimcher 1959; Gony *et al.,* 1964). The trace metals thought play several roles in synthesis of bone, calcification and diseases of the connective tissue (Al-Rawi Al-Talabani 2005; Abass 2013). It has been an increasing concern about the entry of potentially harmful substances and trace elements into the food chain destined for human consumption (Mailman 1980; Lacher and Goldstein 1997). The aim of this study was to determine the effect of $NiSO_4$ on the composition of organic and inorganic components of bone.

Materials and methods

Twenty eight adult male mice Balb / C weighing 30-38 gm were the targets for this experimental study. The experimental animals were divided into three groups and were daily administered $NiSO_4$ doses of 5.1, 11.7 and 24.2 mg / Kg of body weight.

Weight of each mice was recorded once a week for twenty one days (for three weeks), then sacrificed and the femur bone was taken out, the bone marrow was flushed out with normal saline after careful removal of soft tissues.

The wet weight and dry weight of bone were taken within 6 hours after sacrifice. The collected data were listed in table 1 which shows the changes in the femur weight of dry bone and wet bone comparing with the control group, while table 2 indicate the analysis of these changes.

Results and discussion

The collected measurement in this research were depicted in Table 2 which indicate the differences in weight due to the effect of $NiSO_4$ comparing with control group (which does not exposed to nickel sulphate).

Table 1. Changes in wet weight and dry weight of femur in control and experimental groups.

Sample	Wet. Weight (Mg) .1	Dry Weight (Mg) .2	Wet. Weight Wet. Water (Mg) .3	Dry Weight Wet. Water (Mg) .4
Control	36.1 ± 2.4	26.1 ± 1.6	33.0 ± 2.2	20.2 ± 1.3
5.1 $NiSO_4$	34.9 ± 3.3	25.1 ± 1.5	32.2 ± 2.2	19.8 ± 1.3
11.7 $NiSO_4$	32.0 ± 2.2	20.1 ± 1.3	29.9 ± 1.8	18.9 ± 1.2
24.2 $NiSO_4$	28.2 ± 1.7	17.2 ± 1.2	26.8 ± 1.5	11.9 ± 1.6

The effect of different doses of $NiSO_4$ (5.1, 11.7 and 24.2 mg/kg) on bone composition especially on the bone collagen matrix have been studied (Deluca 1977; Chettle 1981; Hock 1986; Yamaguchi *et al.,* 1987). There was a significant decrease in both wet and dry weight of the femur bone with 11.7 and 24.2 mg/kg , while in control and 5.1 mg/kg, the percentage decrease was non-significant ($p>0.05$), the same observations were made by the wet and dry samples as depicted in Table 1 and Table 2 respectively. The percentage change in both dry weight and dry wet weight indicates that there is an increase in weight loss with $NiSO_4$ dose administered.

The percentage increase in weight loss is suggestive of low cellular synthesis of bone mass in $NiSO_4$ treated animals as compared to control. These results proved noticeable findings in the experimental animals treated with nickel sulphate due to various stimulating conditions and showed that there was a low deposition of bone mass (Povilles 1989; Gathwan *et al.,* 2017).

Table 2. The percentage changes in wet weight and dry weight of femur in control and experimental groups.

Sample	% Weight (Mg) loss Between 1& 2	% Weight (Mg) loss Between 3 & 4
Control	29.5 ± 1.5	33.1 ± 2.4
5.1 $NiSO_4$	31.6 ± 1.6	38.6 ± 1.7
11.7 $NiSO_4$	34..2 ± 1.9	41.5 ± 2.8
24.2 $NiSO_4$	36.8 ± 2.6	49.1 ± 2.9

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