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Effect of Titanium Trichloride on Protein Contents of Foetal Organs During Various Period of Gestation in Rats

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ABSTRACT

Protein contents have been studied in the of foetal organs during various period of gestation in rats liver, kidney and placenta of pups dilevered from mother exposed to titanium trichloride. A significant decrease in protein contents was observed during organogenesis liver and placenta of pups at 0.36 ml/kg of dose of titanium trichloride administrated from 6th to 14th day of gestation. However no significant changes were observed during foetal development (15th to 20th day of gestation). The wet weight of foetal liver and Placenta was significantly decreased during treatment from 6th to 14th and 15th to 20th day of gestation at 0.36 ml/kg of daily dose and 9 th days at 0.72 ml/kg of single dose. It appears that titanium may inhibit certain key enzyme necessary for protein synthesis and thus decreased the protein contents in foetal liver and placenta without any effect on kidney.

Key words: Biochemical alteration, foetal organs, titanium trichloride, pregnancy.

1. INTRODUCTION

Titanium, which is a grey metal, highly flammable, lustering nature and non corrosive resistance, so used in explosive, electronic devices, paints and cosmetics. It is also used in confectioning, food and dairy industries as a potential additive.[1-3] it's general toxicity is well established and it is also known to induce mutagenicity. Schroeder and Mitchener (1971) have studied the toxic effect of titanium on the reproduction of mice & rats. Schroeder et al. (1963) have reported the presence of titanium in the tissue of nem born infants indicating that titanium cross the placenta barrier and transported to fetuses. Exposure of titanium trichloride to pregnants rats during different gestation period is known to induce embryo toxicity however, the overall mechanism is not known.The ratio of males and females disturbed & the no. of runts increased. Skurko & Brahonva (1973) have reported some dystrophic changes in the mycocardium, liver & kidney along with biochemical parameters mainly the abnormalities in protein metabolism. Therefore, the present studies have been undertaken to assess the effect of titanium trichloride on protein contents and wet weight of placenta & foetal organs of rats.

2. MATERIALS & METHODS

Adult Wister female rates (140-+10g) of proven fertility were selected from the department animals colony. These animals were maintained under uniform husbandry conditions of light & temperature (26-+.c)and were given Hindustan Gold Mohur rat palleted diet and water ad libitum. Females were caged with males in the ratio 2:1. Mating was confirmed by the presence of the vaginal plug & spermatozoa in the vaginal smear & the day considered as day 1 of pregnancy.

Doses of titanium trichloride,0.36 ml/kg (LD_{50} 4.30 g-kg which was equivalent to 3.6 ml-kg Malik and Prakash 1996) were prepared in aqueous medium & were administered orally daily from 6^{th} to 14^{th} & 15^{th} to 20^{th} day of gestation.titanium trichloride was also administered at single does orally at 0.72 ml-kg on 9^{th} & 15^{th} day of gestation separates sets of animals.Animals were sacrificed on day 21^{st} day of gestation (a day before delivery).The uterine horns were removed by caesarian section, placenta & liver, kidney of fetuses were removed,cleared for whole weight processed for biochemical estimation,(lowry et al method)of wet protein.The result obtained were for analysed statistically using analysis of variance (ANOVA).

3. RESULTS AND DISCUSSION

3.1 Effect on the wet weight of fetal liver & kidney

Exposure of titanium trichloride at 0.36 ml-kg of dose daily from 6^{th} to 14^{th} day & 0.72 ml-kg of single on 9^{th} & 15^{th} day of gestation showed significant reduction in the wet on fetal liver 7 placenta (table-1)

Table No. 1. Effect of titanium trichloride on the wet weight of Liver, Kidney and Placenta of foetal during various period of gestation

Dose administrated	Treatment	Liver	Kidney	Placenta
0.72 ml/kg of body wt.	C	0.274±0.02	0.029±0.002	0.517±0.03
On 9^{th} day of gestation	E	0.152±0.01*	0.027±0.001	0.461±0.02
On 15^{th} day of gestation	E	0.213±0.01	0.032±0.002	0.419±0.02
0.36 ml/kg of body wt.				
From 6^{th} to 14^{th} day of gestation	E	0.144±0.01*	0.027±0.001	0.430±0.02
From 15^{th} to 20^{th} day of gestation	E	0.177±0.01*	0.027±0.001	0.468±0.03

3.2 Effect on total protein contents

Daily exposure of titanium trichloride during organogenesis period(from 6^{th} to 14^{th} day of gestation) at 0.36 ml-kg of doses showed significant reduction in total protein in liver & placenta where as during a fetal development (15^{th} to 20^{th} day) period no significant changes where observed in placenta & fetal organs (table-2).

Table No. 2. Effect of titanium trichloride on foetal protein contents during different period of gestation.

Dose administrated	Treatment	Liver	Kidney	Placenta
0.72 ml/kg of body wt.	C	7.43±0.31	6.2±0.32	7.25±0.53
On 9^{th} day of gestation	E	6.21±0.41	6.97±0.41	7.73±0.48
On 15^{th} day of gestation	E	6.42±0.43	5.83±0.66	7.03±0.57
0.36 ml/kg of body wt.				
From 6^{th} to 14^{th} day of gestation	E	5.61±0.35*	5.20±0.29	4.15±0.33*
From 15^{th} to 20^{th} day of gestation	E	6.80±0.43	5.46±0.54	7.41±0.64

Environmental toxicants which induce reproductive toxicity in female rats produce structural & functional changes which ultimately leads to induced toxic effect like mutations or carcinogenic manifestation. Metabolism & physiology during pregnancy differs considerably to that of normal cyclic rats de to the presence of fetus & placenta. Indubala (1983) reported that metabolism of carbohydrates, proteins & fats is altered in the presence of placental hormones. Lipoproteins are the main constituent of the cell membrane which facilitate the entry of lipophilic compound into the cell. These compounds either enhance the protein formation or results in its degradation. Increase in the wet weight of organs is use to the increased protein synthesis or due to the inhibitions of electrolytes into the cell which causes oedema. The wet weight increased as the new protein are added to the new mass. Mathur & Mathur (1994) have reported that when beryllium nitrate administered to pregnant of rats, it caused significant decreased in the mean wet weight of fetuses & placenta, As protein are building blocks of the tissues, any alternation in this parameters elicits alteration in physiological function of the vital organs. Protein synthesis is much more active in fetal & newborn rat liver in the adult as these protein are used for its development. Master *et al*. (1969) & Morgan (1964) have indicated that material serum proteins are broken down proteolytically & transferred to fetus for nourishment, the synthesis of protein in the material liver would, therefore play an important role in providing nutrients to the growing fetuses. Paternain *et al* (1990) observed a significant

reuction in the wet weight of liver & kidney when a dose of 150 mg-kg-day dose of vanadium was given orally. In present finding the administration of the filtration of the titanium trichloride 0.36ml-kg from 6^{th} to 14^{th}, 15^{th} to 20^{th} & 0.72ml-kg on 9^{th} day of gestation showed significant reduction in the wet of the liver. Significant reduction in the protein contents observed in the liver & placenta during 6^{th} to 14^{th} day of gestation, where as no changes observed on 9^{th} day. It could be envisaged that titanium administered may inhibit certain key enzymes necessary for protein synthesis. It is also known that during states of maternal protein under nutrition, fetal amino acid levels are maintained presumably by maternal tissue catabolism. But placenta act as a carrier for protein contents by the effect of titanium trichloride & inhibit the protein synthesis in fetal liver & placenta. During fetal development were embryological process have been completed & placenta is mature. Therefore, titanium tricholride could not induce any changes in protein contents in liver, kidney & placenta.

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