



SHORT COMMUNICATION

Effects of Alcohol Consumption during Pregnancy and/or Lactation on the Morphology of Thyroid Gland in Male Wistar Rat Offspring

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ARTICLE HISTORY

Received: February 04, 2011
Revised: March 29, 2011
Accepted: March 31, 2011

Key words:

Alcohol
Lactation
Pregnancy
Thyroids
Wistar rat offspring

ABSTRACT

The investigation was conducted to document the effect of alcohol on the morphology of thyroid gland of male rat offspring whose dams consumed alcohol during pregnancy and/or lactation. Seventy-five female rats divided into three groups, 1, 2, and 3, of 25 each and their offspring were used. Group 1 served as control (C), group 2 was exposed to alcohol during pregnancy and lactation (APL) while group 3 was exposed to alcohol during lactation only (AL). At day 35 and 49 postpartum 5 male rat offspring were randomly selected from the three groups and sacrificed. After the sacrifice, the thyroids were dissected out and their absolute and relative weights determined. Thereafter, the thyroid tissues were prepared for routine histological examination. The results of the investigation showed significant reduction ($P < 0.05$) in the weights of the thyroid and thyroid follicles. There was also disorganization and desquamation of follicular cells. Our findings suggest that alcohol intake during pregnancy and/or lactation could be injurious to the thyroid glands of the offspring.

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To Cite This Article: Onu JE, BO Oke, PC Ozegbe and JO Oyewale, 2011. Effects of alcohol consumption during pregnancy and/or lactation on the morphology of thyroid gland in male Wistar rat offspring. *Pak Vet J*, 31(4): 357-359.

INTRODUCTION

The consumption of alcohol is firmly established in the society probably since the accidental discovery of fermentation by yeast (Cornwell and Cornwell, 1997). Effects on virtually every major system and organs have been observed in alcoholic patients (Onu *et al.*, 2010a). Statistics indicate that alcohol consumption is on the increase (Van-Beer, 2008) and is consumed by people for a variety of reasons. Such reasons include entertainment and as a means of reducing stress and emotional upset and these reasons do not go away when women get pregnant (Anonymous, 2005). It has been observed that alcohol consumption during pregnancy leads to fetal alcohol syndrome (FAS) in humans and other species which is characterized by growth deficiency, microcephaly and central nervous system dysfunction (Maisto *et al.*, 1999). Since the recognition of FAS, numerous animal studies over the years have demonstrated the deleterious effects of alcohol administration during pregnancy and lactation on the offspring (Onu *et al.*, 2010b). The effects of maternal alcohol ingestion on some parts of the body of

neonates in both human and experimental animals have been reported (Assadi, 2007)

There is paucity of data in the literature on the effects of alcohol on the morphology of thyroid gland in offspring whose dams were exposed to alcohol during pregnancy and/or lactation. The aim of this study is to evaluate, using rat model, the effects of alcohol on the morphology of thyroid gland in male Wistar rat offspring whose dams were exposed to alcohol during pregnancy and/or lactation.

MATERIALS AND METHODS

Seventy five female Wistar rats aged between 4 and 5 weeks were used in this investigation. The animals were handled with minimal suffering and in accordance with the stipulations of the committee on animal rights and welfare of the University of Ibadan, Nigeria. The female rats were obtained from the Laboratory Animal Unit, Faculty of Veterinary Medicine, University of Ibadan, Nigeria. All the animals were fed water and commercial diet (Bendel Feed and Flour Mills, Plc, Ewu, Nigeria) *ad*

libitum throughout the duration of the study. After acclimatization for five weeks, the rats were randomly assigned to three equal major experimental groups. Group 1 served as control, group 2 was exposed to alcohol from pregnancy to lactation (APL) while group 3 was exposed to alcohol during lactation only (AL).

At the commencement of the study, the female rats weighing 145-170g were bred overnight by introducing 1 male rat into a cage housing 5 female rats. Day 1 of pregnancy was presumed after observing copulation plug the following morning.

Following pregnancy detection, each rat in group 2 (APL) was given 2g/kg BW 30% ethanol per os daily while the rats in group 1 and 3 (AL) were given a corresponding volume of distilled water. This treatment continued daily throughout pregnancy. Following parturition, the lactating rats in group 3 (AL) were given the same quantity of ethanol daily and this treatment continued throughout lactation in the two alcohol-exposed groups (APL and AL) until the offspring were weaned at day 21 postpartum.

At day 35 and 49 postpartum, 5 male rat offspring from the 3 groups (Control, APL and AL) were sacrificed and their thyroid gland dissected out and their weights determined using Metler's Analytical Balance (MICROWA SWISS 5540). The weights obtained were then expressed as percentage of gross body weight (Relative organ weight) (Riser and Shirer, 1967) for comparison. The thyroid tissues were fixed in 10% formalin. Thereafter, the trimmed thyroid tissues were dehydrated through a graded series of ethanol (50, 70, 90 and 100%), cleared in xylene, infiltrated with paraffin, embedded in paraffin. Sections (5-6µm in thickness) were stained with haematoxylin and eosin (H&E) and evaluated for histopathological changes under a light microscope.

The data generated from the measurements were subjected to analysis of variance using SAS. For the statistical tests, ($P < 0.05$) was statistically significant.

RESULTS

Table 1 shows that alcohol significantly decreased ($P < 0.05$) the absolute and relative weights of thyroid gland in APL at day 35 and 49 and in AL at day 35 relative to the control. At day 35 and 49, the thyroid gland of rat offspring of control showed normal thyroid histology with follicular cells lining the basement membrane. However, there was disorganization of follicular cells and basement membrane and also desquamation of follicular cells of the thyroid gland of APL and AL (Fig. 1).

DISCUSSION

The decreased relative weights of the thyroid gland of male Wistar rat offspring obtained in this investigation is similar to the observation of Yamamoto *et al.* (1989). These authors fed adult Sprague-Dawley rats 20% ethanol for 4 weeks prior to mating and 30% ethanol throughout pregnancy and observed significant decrease in weights of fetal thyroid gland. The mechanism by which alcohol exposure from pregnancy to lactation and during lactation

led to reduction in the weights of thyroid gland is difficult to be explained. However, decreased plasma thyroid stimulating hormone (TSH) which promotes cell growth in the thyroid gland has been reported in newborns exposed to alcohol during pregnancy (Anonymous, 2006). Therefore, the decreased weights of the thyroid gland could be due to lack of thyrotropin-releasing hormone (TRH) from the hypothalamus. The hypothalamus of the neonates could have been affected by the alcohol consumed by the dam from pregnancy to lactation because alcohol is a neurotoxin (Maisto *et al.*, 1999) and could have disrupted the release of TRH leading to inadequate stimulation of the thyroid gland.

In conclusion, the results of this investigation suggest that alcohol consumed during pregnancy and/or lactation could be harmful to the organs of the offspring including the thyroid.

Acknowledgement

The authors are indebted to the Committee of Deans of Usmanu Danfodiyo University, Sokoto for sponsoring this research work.

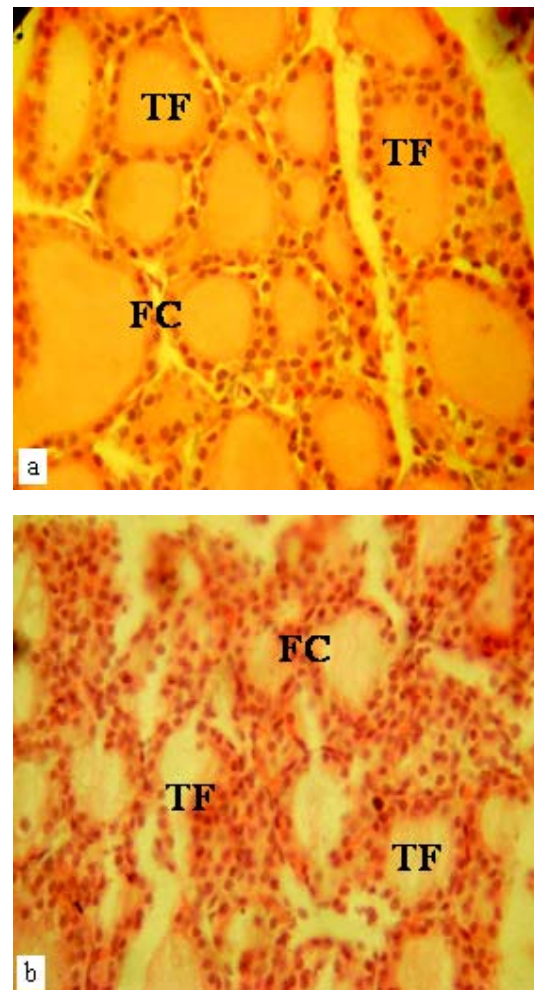


Fig. 1: Photomicrograph of thyroid gland of male rat offspring at day 49, a) control showing normal thyroid follicular (TF) cells lining the basement membrane, and b) thyroid gland of APL and AL showing disorganized follicular cells (FC) and smaller follicles at day 35 and 49. 600X; H&E Stain.

Table 1: Comparison of absolute and relative weight of thyroid gland of male rat offspring whose dams were exposed to alcohol during pregnancy and lactation (APL) and not (ALP) and during lactation only (AL)

Age (days)	Absolute weights			Relative weights		
	Control	APL	AL	Control	APL	AL
35	3.00±0.22 ^a	1.20±0.12 ^c	3.00±0.22 ^b	0.006±0.0002 ^a	0.003±0.0002 ^c	0.005±0.0003 ^b
49	4.80±0.25 ^a	1.42±0.22 ^b	4.80±0.25 ^a	0.006±0.0002 ^a	0.002±0.0002 ^b	0.005±0.0001 ^a

Mean±SEM along the same row with different superscript differ significantly (P<0.05).

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