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SHORT COMMUNICATION

DISTRIBUTION OF LIPIDS AND PHOSPHATASES IN ADRENAL GLAND DURING PRENATAL DEVELOPMENT IN GOAT (*Capra hircus*)

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ABSTRACT

To elucidate the distribution of lipids, acid and alkaline phosphatase in different parts of adrenal gland at various stages of gestation in goat the present study was conducted on 24 healthy and normal foetii of non-descript goat (*Capra hircus*) varying from day old to 150 days of gestation at CVS&AH, Mathura (India) The foetii were assigned into three groups according to their gestational ages: group I (0-50 days), group II (51-100 days) and group III (101 days - till term). Capsule showed traces to negative reaction in group-II but was devoid of lipids in group-III. Cytoplasm of foetal cortical cells and definitive cortex showed slight reaction for lipids but showed moderate reaction as the age advanced. The cytoplasm of medullary cells was devoid of lipids. Capsule showed moderate, whereas foetal cortex showed weak acid and alkaline phosphatase reactions.

Key words: Acid and alkaline phosphatase, adrenal, lipid, prenatal goat

INTRODUCTION

The distribution of lipids in adrenal gland has been studied previously in various animals (Cater and Lever, 1954), pig (Bielanska-Osuchowska, 1989), camel (Nagpal *et al.*, 1991), buffalo calves, etc. (Singh *et al*., 1999). Foetal adrenal cortex is involved in the initiation of parturition in sheep as evidenced by increased corticosteroid secretion by foetal adrenals and elevated foetal plasma corticosteroid concentrations towards the end of gestation (Basset and Thorburn, 1969). The necessity of ovine fetal adrenal for the onset of normal parturition has previously been demonstrated (Drost and Holm, 1968). Acid and alkaline phosphatase enzymes are involved in a variety of metabolic activities such as permeability, growth and cell differentiation, protein synthesis, absorption and transport of nutrients, gonadal maturation, and steroidogenesis (Ram and Sathyanesan, 1985).However, very little attention has been paid towards the distribution of lipids and acid and alkaline phosphatase in adrenal gland of prenatal goat. The present study was aimed to elucidate the distribution of lipids, acid and alkaline phosphatase in adrenal gland in different parts of gland at various stages of gestation in goat.

MATERIALS AND METHODS

The present study was conducted on 24 healthy and normal foetii of non-descript goat (*Capra hircus*) from 0-150 days of gestation at the College of Veterinary Science and Animal Husbandry, Mathura (India). An approval from the Animal Ethic Committee, DUVASU, Mathura (India) was obtained prior to the commencement of study in 2013. Immediately after collection, the umbilical cord of foetii were ligated properly and cleaned with cotton soaked in water to remove amniotic fluid. Each foetii was measured for its crown rump length with the help of a nylon tape and weighed. The approximate age of foeti was estimated by using the formula devised by Singh *et al.* (1979) for goat. The foetii were assigned into three groups according to their gestational ages *viz.*, groups I (0-50 days), group II (51-100 days) and group III (101 days-till term). In group I the whole embryo and in remaining groups adrenal glands were collected and fixed in 10% neutral buffered formalin.

The paraffin blocks were prepared by acetone benzene schedule by using paraffin of 46-48^{0}C melting point (Luna, 1968) and transverse sections of adrenal glands of 15 µm thickness were obtained on glass slide with the help of a rotatory microtome. For lipid distribution study acetone-Sudan black method for bound lipids was employed (Pearse, 1968). For acid and alkaline phophatases the sections were stained with Gomori`s method (Pearse 1968).

RESULTS AND DISCUSSION

In group-I the walls of blood vessels showed moderate reaction for lipids while cytoplasm of foetal cortical cells showed weak reaction. In group-II capsule showed traces to negative reaction throughout the gestation period. The wall of blood vessels showed weak reaction as the age advanced and cytoplasm of foetal cortical cells and definitive cortex showed weak reaction but showed moderate reaction as age advanced (Fig. 1; Table 1). In group-III capsule was devoid of lipids , foetal cortex and definitive cortex (zona glomerulosa and zona fasciculata) showed intense reaction and intensity increased as age advanced (Fig. 2; Table 1). Corticosteroids synthesized by adrenal cortex are important aspect of lipid metabolism (Christie, 1981). El-Maghraby and Lever (1980) demonstrated the presence of discrete lipid droplets in the cortical cells of rat foetus at approximately 18 day of intrauterine life. Coupland and Weakley (1968) observed a variable number of lipid droplets in the cortical cells of the rabbit foetuses. Bielanska-

Table 1: Histochemical reactions in adrenal gland of prenatal goat in different groups

Parameters	Histochemical studies (group I, II & III)			
	Sudan Black-B		AKP	ACP
	Group I & II	Group III		
Capsule	+ to -	-	++	++
Foetal cortical cells	+ to ++	+++	-	+
Definitive cortical cells	+ to ++	+++	-	-
Medullary cells	-	-	-	-
Wall of blood vessels	+	-	++	-
Wall of sinusoids	+	-	++	-

- = Negative, + = Mild, ++ = Moderate, +++ = Intense;
AKP = alkaline phosphatase; ACP = acid phosphatase

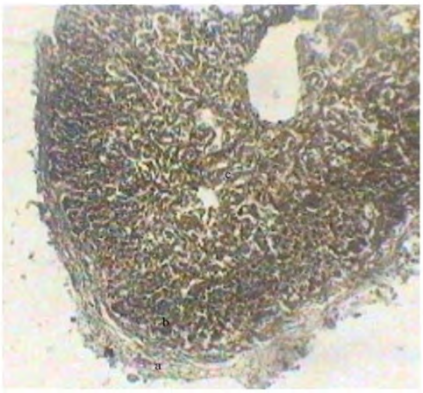

Fig. 1: Photomicrograph of adrenal gland of 69 days old goat foetus showing negative Sudan Black-B reaction in the capsule (a), moderate reaction in the cortex (b) and negative reaction in medulla (c) Sudan Black-B X10

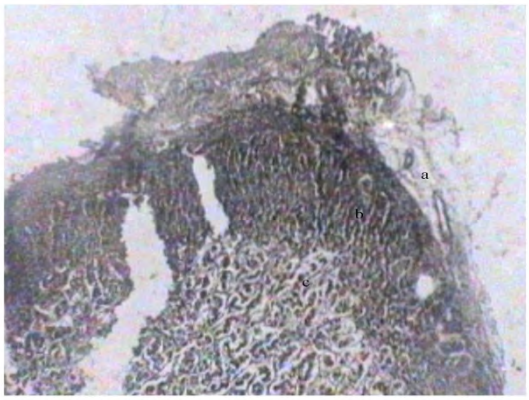

Fig. 2: Photomicrograph of adrenal gland of 118 days old goat foetus showing negative Sudan Black-B reaction in the capsule (a), moderate reaction in the cortex (b) and negative reaction in medulla (c) Sudan Black-B X10

Fig. 3: Photomicrograph of adrenal gland of full term goat foetus showing moderate acid phosphatase reaction in capsule (arrow). Gomori (modified) stain X10

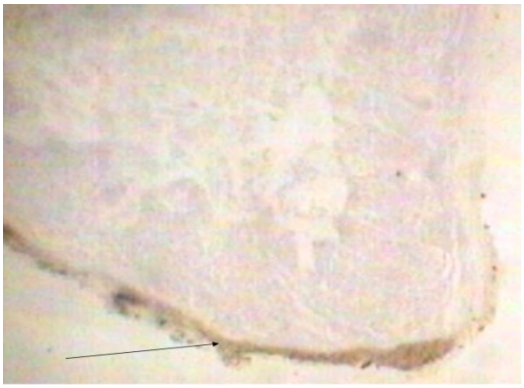

Fig. 4: Photomicrograph of adrenal gland of 107 day old goat foetus showing moderate alkaline phosphatase reaction in capsule (arrow). Gomori stain X10

Osuchowska (1989) reported that the differentiated FC (foetal cortical) cells of adrenal gland of pig foetuses had fewer amounts of lipid droplets as compared to the definitive cortical cells. Hakeem *et al.* (1993) observed that zona glomerulosa and zona fasciculata were intensely positive for lipids in goat foetuses but the cytoplasm of medullary cells was devoid of lipids. In present study we observed similar findings as observed by above workers.

Capsule showed moderate acid phosphatase (ACP) positive reaction, whereas foetal cortex showed weak reaction throughout the gestation (Fig. 3; Table 1). Capsule and wall of blood vessels showed moderate positive alkaline phosphatase (AKP) reaction throughout the gestation (Fig. 4 and Table 1). Acid and alkaline phosphatase enzymes are involved in the growth and cell differentiation, protein synthesis, absorption and transport of nutrients; and steroidogenesis (Ram and Sathyanesan, 1985). Dempsey and Wislocki (1946) have remarked that the adrenal alkaline phosphatase plays an important role in metabolism of lipids and possibly in the synthesis of adrenal cortical hormones. Eranko (1951) demonstrated ACPasc (acid phosphatase) positive and negative islets of cells in the adrenal medulla of rat. Bielanska-Osuchowska (1989) observed that ACPase activity was diffuse and very weak in FC (foetal cortical) cells of the adrenal gland of pig foetuses, however, the definitive cortical cells did not manifest any ACPase activity. Capsule and wall of blood vessels showed moderate alkaline phosphatase reaction. Ashok *et al.* (2011) reported strong alkaline phosphatase activity in adrenal and of goat foeti upto 84 days of foetal age. Thereafter a moderate activity upto 122 days was observed which further intensified towards term. They also recorded reduced activity of alkaline phosphatase between 84 and 122 days of foetal life. A weak activity in the subcapsular zone and total absence in the migratory cells observed. Bielanska-Osuchowska (1989) observed similar findings in the foetal pig.

Cytoplasm of foetal cortical cells and definitive cortex showed slight reaction for lipids but showed moderate reaction as the age of animal advanced. Connective tissue of capsule showed moderate, whereas foetal cortex showed weak acid phosphatase and alkaline phosphatase reaction.

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