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## Anatomical and histological studies of accessory adrenal nodules in large white Yorkshire pig

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### Abstract

The present study was carried out on 12 pairs of adrenal glands from recently slaughtered pigs of both genders of 6-12 months age group. The accessory cortical nodules are present on the adrenal gland capsule. Microscopically, these accessory nodules in the capsule were similar to adrenal cortex surrounded by the connective tissue fibres containing the zona glomerulosa cells in the centre. The shape of the cells were cuboidal. Medullary portion and other regions of cortex; zona fasciculata and reticularis were absent in these nodules.

**Keywords:** Adrenal gland, large white Yorkshire pig

### Introduction

The adrenal gland is one of the most important organ because it plays a significant role in the body activities and essential for the maintenance of whole life. The adrenal gland is called the suprarenal gland because it is situated on the cranio-medial aspect of the kidney. It regulates many physiological functions both in foetal and postnatal life (Hill, 2007). The adrenal gland is an indispensable organ that takes part in the formation of hypothalamic pituitary adrenal axis (HPA) termed as body's stress system. HPA mainly controls the levels of cortisol and other important stress related hormones (Hu and Funder, 2006; Pippal and Fuller, 2008) [8, 15]. Each adrenal gland has two distinct structures, the outer adrenal cortex and inner medulla, both of which produce hormones. The presence of accessory adrenal nodules in some animals such as the horse, dog, and sheep has been demonstrated in some studies.

The adrenal cortex is subdivided into three (Dellman, 1993) [6] or four (Bacha and Wood, 1990) [2] distinct zones of epithelial cells. The outermost zone is called zona glomerulosa in ruminants and is formed of irregular clusters and cords of cells in the horse, donkey, pig and carnivores. This zone is called zona arcuata because the cells are arranged into arcs (Banks, 1993; Prasad and Sinha, 1981) [4, 17]. The zona fasciculata, the widest zone of the adrenal cortex arc consists of radially arranged cords of cuboidal or columnar cells. The foamy appearance of the cells is caused by the presence of numerous vacuoles, when lipid is removed in processing. The zona reticularis consists of cells disposed as freely anastomosing cords. The cells are roughly the same in morphological features as the cells of the zona fasciculata, but their nuclei and cytoplasm have darker staining. There are two types of chromaffin cells in the adrenal medulla. The granules of epinephrine cells are smaller and less electron-dense compared to 2 norepinephrine cells (Coupland and Weakley, 1968) [5]. The norepinephrine cells contain a large spherical nucleus while chromaffin cells contain a full complement of cytoplasmic organelles. The cortex produces aldosterone, cortisol and androgens which are responsible for the regulation of blood pressure, electrolyte balance, glycogen and lipid metabolism, and estrogen biosynthesis, respectively. It is known that the cells situated at the periphery of the medulla produce adrenalin and, therefore, are called A cells; the cells in the central part of the medulla secrete noradrenalin (norepinephrine) and are denoted N cells (Hullinger and Andrisani, 2006) [9]. Both adrenaline and nor adrenaline provoke a quick response on diverse organs in stress situation.

In this investigation, the presence of accessory adrenal nodules and their histological structures in miniature horses were studied.

## Materials and Methods

12 pairs of adrenal glands from recently slaughtered pigs of both genders of 6-12 months age group were collected from local abattoir, Bikaner. The investigation of the organs was carried out in the Department of Veterinary Anatomy, CVAS, RAJUVAS, Bikaner. The following studies were made in the collected samples.

## Histological and Histochemical examination

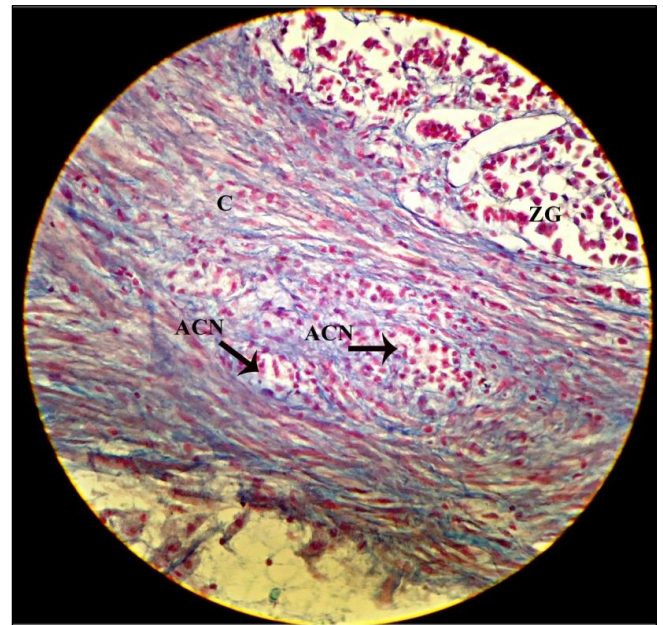
For histomorphological and histochemical studies, the samples were preserved either in 10% formalin or Bouin's fluid for 48 hrs and 18 hrs, respectively. The tissues were washed overnight in running tap water, dehydrated in ascending order of alcohol (50%, 70%, 90% and then Absolute I, II and III), cleared in cedar wood oil and finally impregnated with paraffin. Paraffin blocks were prepared, numbered and stored at 4 °C. m thickness were made by Rotary microtome then in refrigerator. Sections of 6-8 taken on albumenized slides and kept overnight in hot air oven at 36 °C and finally staining for general histomorphological and histochemical observations.

## Result and Discussion

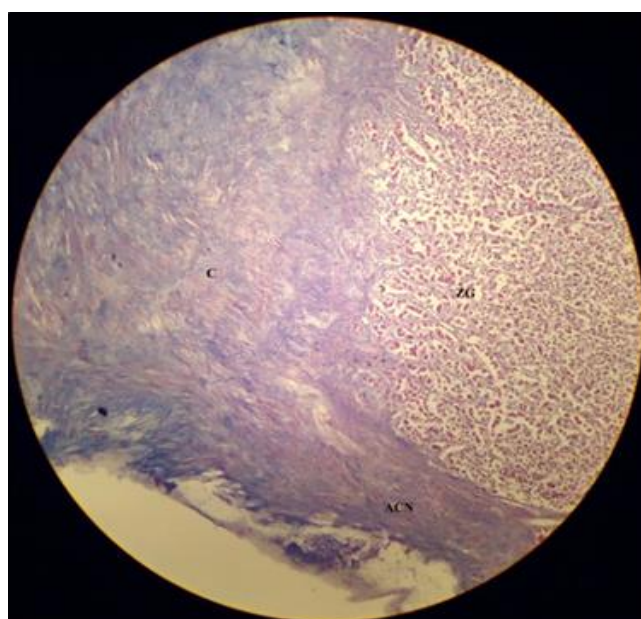
The adrenal gland of Large White Yorkshire consisted of two distinguished parts that were stroma and parenchyma. The stroma was composed of capsule and trabeculae. The parenchyma consisted of outer adrenal cortex and inner medulla. which simulated the observation of Hullinger (1978) in the dog and Kour *et al.* (2017) [11] in Bakerwali goat.

Accessory cortical nodules are abnormalities of the adrenal glands. These nodules are commonly found near the adrenal glands. These nodules were also present in the same location in Large White Yorkshire pig and only contained the adrenal cortex. In present study, there were accessory adrenal cortical nodules in the capsule which were surrounded by the connective tissue fibres containing the zona glomerulosa cells in the centre. It was in accordance with the reports of the Smollich (1967) [20] in cattle, Prasad and Yadava (1972) [18] in buffalo calf, Nagpal *et al.* (1991) [12] in camel, Panchal *et al.* (1998) in sheep, Sanyal *et al.* (2005) [19] in goat, Nama *et al.*

(2009) [13] in sheep and Kour *et al.* (2017) [11] in Bakerwali goat. Prasad and Sinha (1980) [16] in dog and Badaway *et al.* (1982) [3] also observed the zona glomerulosa cells in the accessory cortical nodule which was in disagreement with the findings of the Holmes (1961) in ferret, Nagpal *et al.* (1991) [12] in camel and Ahmadpanahi (2007) [1] in Caspian miniature horses found that there were arrangement of glomerulosa, fasciculata and reticularis in the cells of cortical nodule. Jamdar and Ema (1983) [10] and Sanyal *et al.* (2005) [19] stated that there were melanin containing cells in the capsule of adrenal gland of goat. These observations were not found in the present study.



**Fig 1:** Photomicrograph of adrenal of pig showing the accessory cortical nodule in the adrenal gland capsule and zona glomerulosa. ACN-Accessory cortical nodule, ZG-Zona glomerulosa. (PAS Alcian blue method pH 2.5, 400X)



**Fig 2:** Photomicrograph of adrenal of pig showing the accessory cortical nodule in the adrenal gland capsule and zona glomerulosa. ACN-Accessory cortical nodule, C- Capsule, ZG- Zona glomerulosa. (PAS Alcian blue method pH 2.5, 100X)

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