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Histogenesis of thyroid gland in White Leghorn chickens

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I INTRODUCTION

Thyroid is a unique endocrine gland whose function is under the direct control of the thyrotrophic hormone of the anterior pituitary. It is responsible for the carbohydrate, protein and lipo-regulatory mechanisms (Singh et al., 1992). Birds have a widely separated pair of thyroid lobes one on each side of the trachea at the level of the clavicle (Al-Samarrae et al., 1992). Foetal thyroid glands respond to environmental temperature changes which is important in the neuro endocrine function of the foetal body. Foetal hypoglycemia may also lead to change in the foetal thyroid gland by altering the peripheral utilization of the thyroid hormone. Such changes if prolonged, may contribute to the decreased rate of foetal growth and maturation (Andrianakis et al., 1990).

Extensive microanatomical studies have been carried out in mammalian thyroid. However, research works on avian thyroids are limited. Hence, the present work has been undertaken in detail on the topographical aspect for better understanding of the thyroid gland in the domestic fowl.

II MATERIALS AND METHODS

Live embryos from sixty fertile eggs of White Leghorn breed were collected from the 2nd day of incubation to 20th day of incubation at an interval of two days, from a commercial hatchery at Namakkal.

The materials for the thyroid from the embryos of 2nd day to 12th day were obtained by serial sectioning of the cephalic end of the embryos transected at the middle of the body in between the forelimb and hind limb buds (Weesner, 1960).

The materials for the 14th day to 20th day of incubation were got by dissecting out the thyroid from its location with the surrounding structures. The materials collected were fixed in different fixatives. The fixed material were dehydrated in ascending grades of alcohol, cleared in xylene and embedded in paraffin (58-60˚ C). Sections of 5-6 µm thickness were cut and used for different staining techniques.

III RESULTS AND DISCUSSION

The thyroid primordium was observed on the floor of the pharynx on the second day of incubation as stated by Merryman and Buckles (1998).

The thyroid primordia migrates towards the lateral aspect of the neck as a structure on the sixth day of incubation. On the eighth day of incubation the cells were observed as clusters and on twelfth day, the cells were arranged in the form of cords (Fig.1). A well-developed collagenous capsule separated the thyroid from the parathyroid. A small amount of PAS positive material was observed in the primordial cells in the present study. Stoll and Blanquet (1953) reported that the thyroids are functional and secrete thyroxine after 10-11 day of incubation. The present observation confirms the earlier reported findings.

On the fourteenth day of incubation the center of the thyroid gland was differentiated into spherical thyroid follicles, but the peripheral area of the gland was not fully differentiated. The central follicles were lined by cuboidal cells. The present observations are in confirmation with the findings of Romanoff (1960). A very few lightly stained parafollicular cells were also noticed were considered as the developing parafollicular cells. A capsule differentiated into three layers. Yaswant Singh and Bharadwaj (1982) reported the presence of three layers in the capsule of the adult white leghorn chicken.

On the sixteenth day of incubation, the entire thyroid gland was differentiated into thyroid follicles (McNabb F.A., 2006). The thyroid follicles were usually round to oval but varying number of irregular, bilobed, evaginated and invaginated follicles were also recorded. The active follicles were usually smaller when compared to the inactive follicles. However, the diameter of the follicles showed a tendency to increase in size (Fig.2). These observations were in agreement with the reports recorded by Mathur (1971) and Roy (1971) in mammals. The interfollicular connective tissue was more which divided the gland into lobules. The above observations suggested that the thyroid gland was functional on the sixteenth day of incubation. The active follicles were small and spherical in shape which was lined by cells varying from cuboidal to low columnar. The cytoplasm was basophilic and finely granular in appearance. The nuclei were spherical to oval which appeared to be vesiculated with diffused chromatin material and occupied a greater proportion of the cell cytoplasm. A few follicular cells with pyknotic nuclei filled with colloid were also observed. Small and medium sized follicles dominated the larger ones which is in accordance with the findings of Yaswant Singh and Bharadwaj (1982).

Most of the cells presented a clear cytoplasmic supranuclear zone and a finely granular infranuclear zone. Larger cells with spongy cytoplasm containing refractile granules were seen occasionally among the follicular cells (Nadler *et al*, 1964).

The inactive follicles were large, swollen with considerable amount of accumulation of colloid. The lining cells were reduced very much in their heights and became almost squamous in their shape. The nuclei were flattened, elongated, hyperchromatic and their nuclear details were not clear.

On the eighteenth day of incubation, the thyroid follicles were spherical and were lined by cuboidal epithelium and some parafollicular cells were also observed. On the twentieth day of incubation, the gland showed both active and resting thyroid follicles. On the twentieth day of incubation the glands were functionally competent enough to meet out the post hatch life.

IV THYROID COLLOID

The thyroid follicles were filled with homogenous colloidal mass. A peripherally serrated zone was noticed in number of follicles. Vacuoles of variable sizes and numbers were seen abundantly at the periphery and occasionally in the central part of the colloid. In the follicles lined by simple cuboidal or low columnar epithelium, the colloid was predominantly basophilic whereas in the follicles lined by simple squamous epirthelium, it was acidophilic in all the age groups studied. The colloid appeard basophilic in the peripheral follicles and eosinophilic in the central follicles. But in the active follicles it was homogenously basophilic throughout, irrespective of the region (Beresford, 1983).

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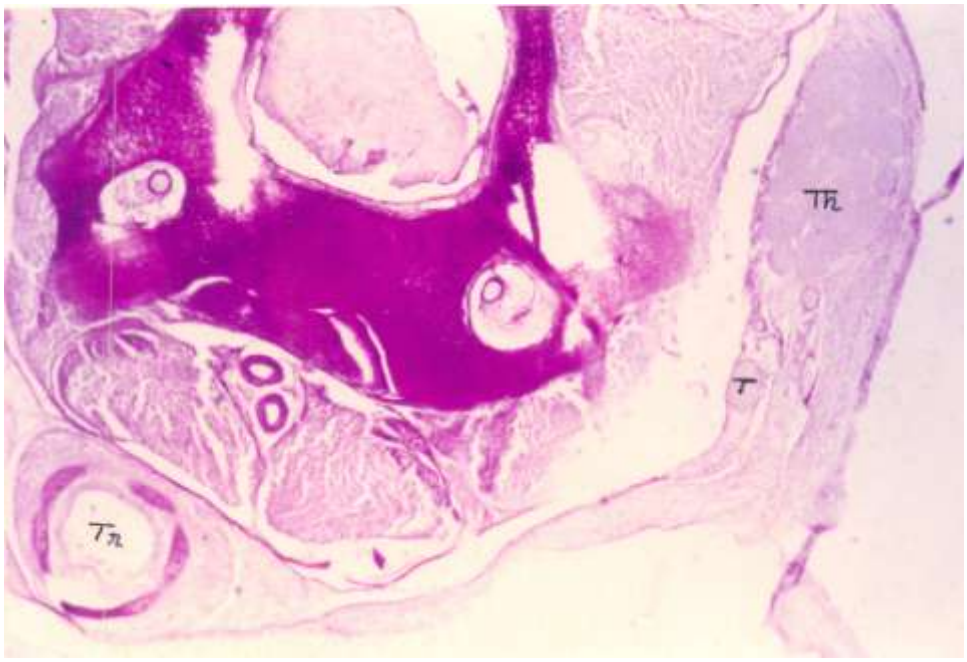

Fig.1 Photomicrograph showing the left thyroid from an 8 day old embryo.

T- Thyroid Th- Thymus Tr – Trachea

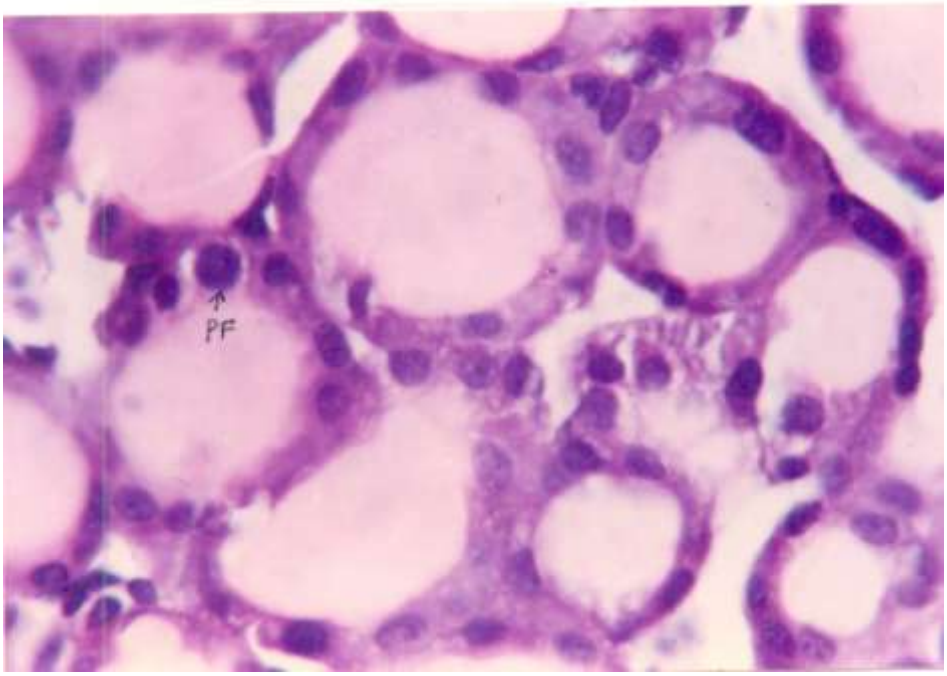

Fig.2 Photomicrograph showing the active thyroid follicles in 18 day old embryo.