قســـم : التشـــريح والهستولوجيا.
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دراسة كمية هستولوجية على الغدة الدرقية في النعـــــاج اثناء دورة الشبق وفـترات الحمـــــــل المختلفـــه

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استخدم في هذا البحث ستة وثلاثون من النعاج لدراسة التغيرات الهستولوجيـة في الغدة الدرقية أثناء دورة الشبق وعلى فترات مختلفه متتالية من الحمل (٣٠، ٦٠ ، ٩٠، ١٢٠، ١٤٠، ١٥٠ يوما).

وقد أوضحت الدراسات زيادة نشاط الغدة الدرقية في المرحلة الجرابية وكذلـك من اليوم ٩٠ الى اليوم ١٥٠ من الحمـــل.

كما لوحظ أن اقـل نشـاط للغدة كان في مرحلة الســكون من الدورة التناسلية.

هذا وقد كانت الخلايـا الجار درقيـــة أكثر وضوحا في الفترة الأخـــيرة مـــن الحمـــل عنها في المراحل التناسلية الأخرى.

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QUANTITATIVE HISTOLOGICAL STUDIES ON THE THYROID GLAND OF EWE DURING ESTRUS CYCLE AND PREGNANCY

(With 3 Tables & 7 Figs.)

By
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SUMMARY

The mean number of follicles per-field, follicular diameter, the follicular cell number and height, nuclear diameter and the volume of colloid were determined and statistically analysed in the thyroid gland of thirty six ewes during the different periods of estrus cycle and pregnancy.

The secretory activity of the throid gland was higher during the follicular phase of estrus cycle as well as the late stages of pregnancy (90-150 days) comparing to those of the luteal phase of the cycle and the early stages of pregnancy. However, the minimal activity was recognized during anestrus. The parafollicular cells were more frequently encountered during the late stages of pregnancy.

INTRODUCTION

The relationship between the thyroid status and reproductive functions received considerable attention during the past decades (SANCHEZ- FRANCO, et al. 1973; ZANINOVICH, 1973; MONTOYA, et al. 1975; BURROW, 1975 and SINGH, et al. 1985). On the other hand, information concerning alterations of indexes of thyroid gland in respect to estrus or pregnancy in domestic animals are inadequate and rather conflicting. No significant variations were observed in the thyroid function during pregnancy in sheep (HENNEMAN, et al. 1955) and goat (FLAMBOE and RENEKE, 1959). In contrast, the functional activity of the thyroid gland was maximal during estrus and increased only at the end of pregnancy in both cows and buffaloes (SOLIMAN, et al. 1963, 1973 and AFIEFY, et al. 1979).

In veiw of the incomplete data concerning the thyroid status in relation to reproductive function in sheep, the present work was designed to study the quantitative morphological changes in the thyroid gland of the ewe during the estrus cycle and pregnancy.

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MATERIAL and METHODS

Thirty-six yearling balady ewes were used during the course of the present investigation. The ewes were maintained on pasture at the animal research station Faculty of Agriculture, Assiut University.

The determination of onset of estrus was by mean of marker ram. The ewes in estrus were bred by this ram. Four ewes were weighed and slaughtered at the follicular phase, luteal phase, anestrus and 30, 60, 90, 120, 140, 150 days of pregnancy.

The thyroid glands were immediately obtained after slaughtering and weighed. Small pieces of thyroid tissues were fixed in Bouin's fluid and processed for histological examination. The sections were stained with haematoxylin & eosin and periodic acid Schiff's technique.

The microscopic measurements were made with calibrated screw micrometer. The following quantitative histological parameters were recorded for each sample. The diameter were counted from 100 randomly selected follicles in the peripheral and central lobules of each gland. The follicular diameters up to 39.9 U, from 40 up to 80 U and more than 80 were considered to be small, medium and large follicles respectively. The percentage of the small-, medium-, and large-sized follicles was calculated in the peripheral and central lobules of each gland. The number of follicles per 50 microscopic fields in each gland was determined at a magnification of 10x40. The height and number of the follicular cells were counted per ten follicles from each size at both the peripheral and central lobules. The colloidal volume was calculated according to the formula for a rotary ellipsoid $V = \frac{JT}{} D d^2$ (DOCKE and KOLOCZEK, 1966). D represent the greatest colloidal diameter and d represent the smallest diameter.

The data for each parameter was subjected to statistical analysis according to SENDECOR and COCHRAN (1967).

RESULTS

The mean values of the different quantitative parameters of the thyroid gland in ewes during estrus cycle and pregnancy are presented in table 1,2,3.

The relative thyroid weight (Table 1) during anestrus was higher than those during follicular and luteal phases of the reproductive cycle, however, at 140 & 150 days of pregnancy it was lower regarding those in the other pregnancy periods.

The morphometeric data revealed the thyroid gland of the ewe to be composed of different-sized follicles (Table 2). Most of the thyroid follicles was rounded or oval in shape, whereas some others were irregular.

The percentage of the small-sized follicles (Up to 39.9 U) was found to be higher in the peripheral lobules while the percentage of the large-sized follicles (more than 80 U) dominated in the central lobules of the thyroid gland in non-pregnant and pregnant ewes. At 120, 140 and 150 days of pregnancy both peripheral and central lobules exhibited a marked increase in the pregnancy of the small-sized follicles, while the large- sized follicles were relatively diminished (Table 2).

The mean number of follicles per field (Table 3) was found to be higher in the follicular than in the luteal phase of the cycle, however the least number was observed in anestrus. During pregnancy, the number of follicles per field was positively correlated with the advances in days of pregnancy.

The maximal folliclular diameter (89.12 U) and colloidal volume (242.01 mm^3) were demonstrated during anestrus. While the minimal mean follicular diameter (36.82 U) and colloidal volume (2.224 mm^3) were observed at 150 th day of pregnancy (Table 3).

The maximal hight of the follicular cells was 10.31 U and observed at 150 days of pregnancy (Table 3). It was formed of columnar cells with large rounded basally situated nuclei (Fig. 7). Moreover, these cells were relatively higher in the follicular phase (Fig. 2) than those in the luteal phase (Fig. 3). The lowest follicular cells (5.87 U) were demonstrated at anestrus (Fig. 1).

The nuclear diameter was largest at 140 and 150 days of pregnancy and smallest at anestrus (Table 3). Intracytoplasmic droplets were clearly demonstrated in the apical part of the follicular cells during follicular phase and from 90 up to 150 days of pregnancy (Fig. 4-7).

The parafollicular or C-cells were located between the follicular cells and the basement membrance of the thyroid follicles. They had clear faintly stained cytoplasm with large rounded vesicular nuclei. The cells were more frequently met with during the late stages of pregnancy than in the other periods of the reproductive cycle (Fig. 7 a,b).

DISCUSSION

The present study revealed that the relative thyroid weight of the ewe high during anestrus and low at 140 and 150 days. In cows, AFIEFY, et al. (1970) observed a significant increase in the thyroid weight during proestrus. However, in buffaloes, BARAKAT, et al. (1971) demonstrated a relative increase in the thyroid weight during estrus and late pregnancy. Otherwise, SOLIMAN, et al. (1973) reported that the heaviest thyroid weight in buffaloes was noted during proestrus and late pregnancy.

According to MEISSNER (1978), INGBAR and WOEBER (1981) SNELL (1984) and SINGH, et al. (1985) the increased activity of the thyroid gland is associated with several histological features. The follicles became small in size and contained less amount of colloid. The height of the follicular cells increased. The apical part of the follicular cells contained increased amount of intracytoplasmic droplets that represented engulfed colloid.

The work herein indicated that the thyroid gland exhibited sings of increased secretory activity during follicular phase as well as from 90 up to 150 days of pregnancy compared to those in the other stages of reproductive state.

ROBERTSON (1977) reported that the level of estrogen was greatly increased during follicular phase in ewe. Also, SALEM, et al. (1983) found that estrogen level was gradually increased and attained three times its normal value during late pregnancy in ewes. Estrogen stimulate production of thyroxin binding globulin (TBG) and the response of TBG to estrogen is dose- related (ZANINOVICH, et al. 1971). Recently, WOEBER (1978) and INGBAR and WOEBER (1981) announced that estrogen is responsible for the increased binding capacity of TBG and serum total T_4 and T_3. The consequences of increased binding capacity of TBG result in a

decrease in the free thyroxin level, which is immediately compensated for, by an increase in thyroxin production from the thyroid gland. Therefore, the increased activity of the thyroid gland of ewe during follicular phase as well as late pregnancy (90-150 days) is probably due to the increased level of estrogen compared to the other phases of reproduction. Such phenomenon has been demonstrated by PIPES, et al. (1958); SOLIMAN and SAID (1960); ABDO (1962); SOLIMAN, et al. (1963, 1964) and AFIEFY, et al. (1970) who stated that the thyroid function in cow and buffaloe was maximal during estrus phase and toward the end of pregnancy. Moreover, ABDO, et al. (1969) studied the histology of the camel thyroid and found a slight increase in its activity during the last period of pregnancy. On the other hand, AYOUB, et al. (1974) reported that the functional activity of the thyroid gland during pregnancy was lower than that observed in non-pregnant and lactating goat. The result in case of goat, however, is different from that in ewes because of the continual persistance of corpus luteum and low level of estrogen along all period of pregnancy (ROBERTSON, 1977).

Exposure to high ambient temperature (28-38°C) causes a suppression of the basal metabolic rate, iodine uptake and release as well as peripheral utilization of thyroid hormones in mammals and birds (CHAFFEE and ROBERTS, 1971). So, it seems likley that the decreased secretory activity of the thyroid gland during anestrus is primerly due to heat acclimation.

The present findings encourage the speculation that the thyroid of the ewe was relatively active during follicular phase as well as from 90 to 150 days of pregnancy, however the minimal activity was recognized during anestrus.

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Table (1)
Mean values of the relative weights of the thyroid glands during reproductive cycle and pregnancy

Reproductive State	No. of animal	Weight of both lobes (gm)	Mean body weight (kg)	Thyroid weight (mg) / Body weight (kg)
Anestrus	4	3.53	27.5	12.80
Follicular phase	4	1.57	26.0	6.04
Luteal phase	4	1.61	25.50	6.31
Pregnancy:				
30 days	4	3.01	45.20	6.66
60 days	4	2.48	37.66	6.59
90 days	4	2.38	36.30	6.56
120 days	4	2.90	46.60	6.22
140 days	4	2.26	42.80	5.28
150 days	4	2.42	48.00	5.04

Table (2)
Mean values of diameter and percentage (in parenthesis) of the thyroid follicles of ewes during reproductive cycle and pregnancy

Reproductive state	Peripheral follicles			Central follicles		
	Small	Medium	Large	Small	Medium	Large
Anestrus	34.4 (20.0%)	64.8 (40.0%)	117.2 (40.0%)	-	66.7 (33.0%)	162.5 (47.0%)
Follicular phase	34.5 (26.7%)	70.2 (53.3%)	80.7 (20.0%)	-	55.4 (31.3%)	100.0 (61.3%)
Luteal phase	28.0 (31.3%)	56.8 (56.3%)	68.8 (12.5%)	-	55.4 (37.5%)	119.3 (62.5%)
Pregnancy:						
30 days	29.3 (30.0%)	59.3 (62.0%)	100.0 (8.0%)	-	64.8 (22.7%)	107.9 (77.3%)
60 days	34.40 (35.0%)	51.78 (75.0%)	-	-	62.2 (46.7%)	109.9 (53.3%)
90 days	25.2 (40.0%)	50.6 (60.0%)	-	-	65.2 (57.1%)	99.8 (42.9%)
120 days	35.5 (36.6%)	55.9 (36.4%)	-	36.6 (6.3%)	62.4 (81.3%)	98.4 (12.5%)
140 days	25.8 (40.0%)	55.2 (60.0%)	-	35.5 (40.0%)	57.6 (60.0%)	-
150 days	18.0 (56.3%)	50.0 (43.8%)	-	30.1 (86.7%)	49.2 (13.3%)	-

Table (3)

Number of follicles per-field, follicle diameter, number and height of follicular cell, nuclear diameter and volume of colloid in the thyroid gland of ewe during estrus cycle and pregnancy

Reproductive state	Mean No. of follicles per field	Mean diameter of follicles (um)	Mean No. of follicular cells	Average cell height	Nuclear diameter (um)	Colloidal volume per follicle (um^3)
Anestrus	2	89.12	29	5.87	4.4	242,472
Follicular phase	15	68.18	22	8.51	6.8	70,116
Luteal phase	12	69.26	26	7.50	6.4	83,601
Pregnancy:						
30 days	11	72.36	25	8.59	6.4	87,926
60 days	13	64.57	21	8.33	6.4	57,551
90 days	15	60.19	20	9.63	6.9	35,884
120 days	18	57.77	15	9.73	6.9	29,424
140 days	22	43.48	16	9.99	7.5	6,791
150 days	27	36.82	14	10.31	7.7	2,224

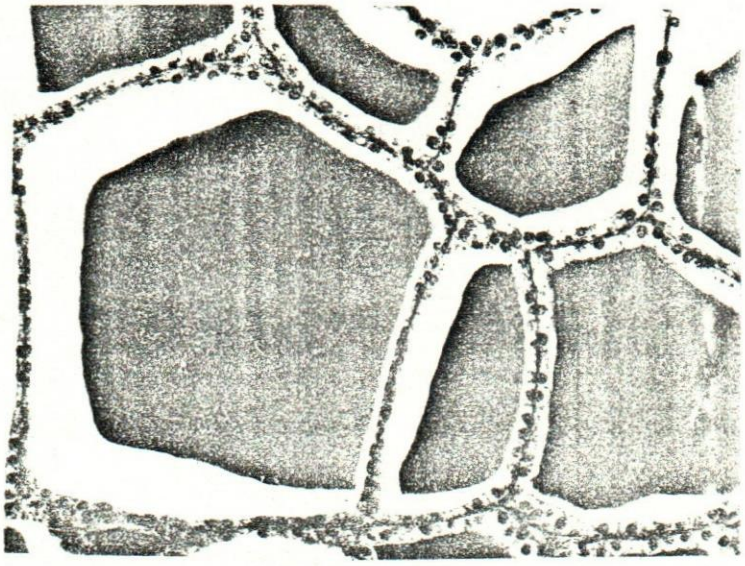

Fig. (1): Thyroid gland of ewe during anestrus showing flattened follicular cells (f) and parafollicular cell (C) (PAS-Haematoxylin X 250)

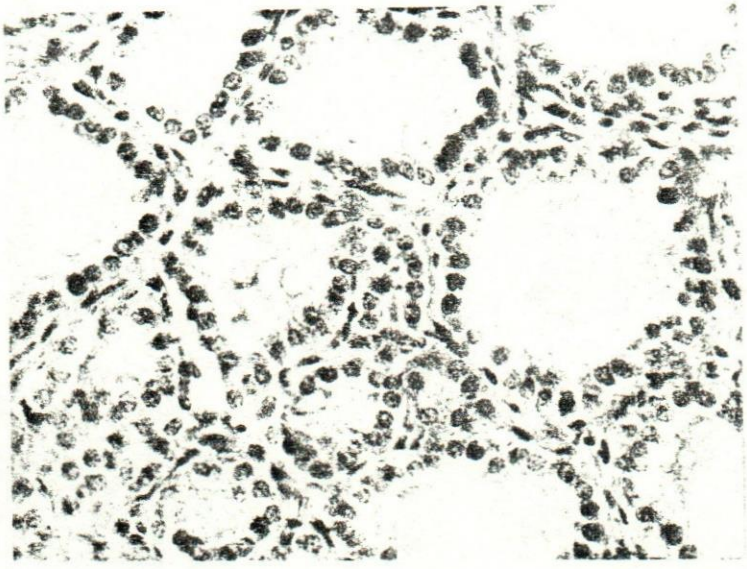

Fig. (2): Thyroid gland of ewe during follicular phase. (Hx & E. X 400)

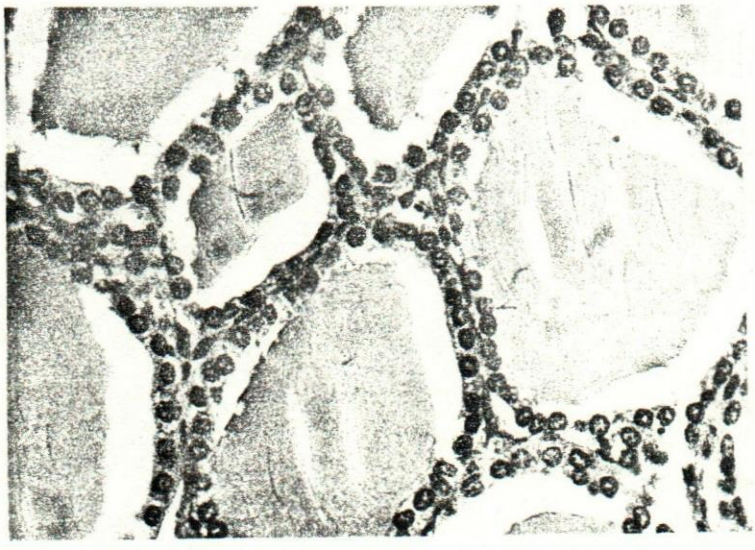

Fig. (3): Thyroid gland of ewe during luteal phase (PAS-Haematoxylin X 250)

Fig. (4)

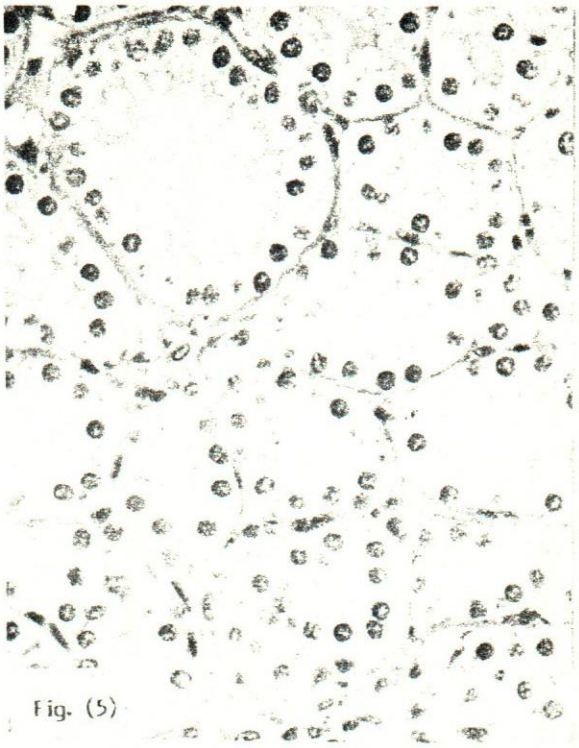

Fig. (5)

Fig. (6)

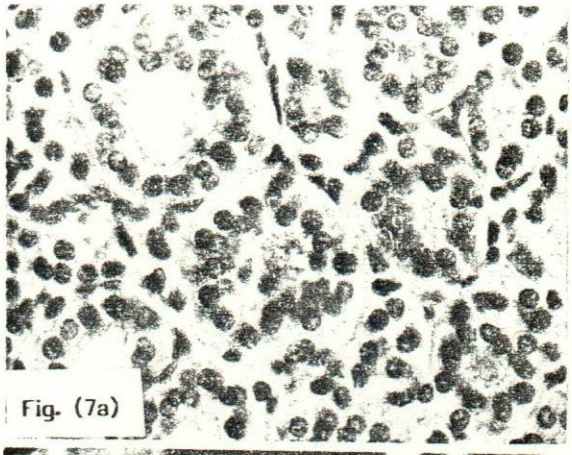

Fig. (7a)

Fig. (7b)

Fig. (4): Thyroid gland of ewe, 90 days pregnancy (Hx & E. X 400)

Fig. (5): Thyroid gland of ewe, 120 days pregnancy (Hx & E. X 400)

Fig. (6): Thyroid gland of ewe, 140 days pregnancy (Hx & E. X 400)

Fig. (7a): Thyroid gland of ewe, 150 days pregnancy (Hx & E. X 400)

Fig. (7b): Higher magnification showing parafollicular of C-cell (C) (PAS-haematoxylin X 1000)