قســـــم : التشريح والهستولوجيا - كلية الطب البيطرى - جامعة أسيوط.
رئيس القســم : د / عبد الله حفنى طـــه.

تحليل نوعى وكمى لمختلف أنواع الخلايا فى الفص الأمامى للغدة النخامية فى ذكور الماعز على مدار السنة

عبد الله حننى طه ، أحمد حسن سيد ، جمال كامل ، عصـــادل الكـــــرداوى

تم دراسة التحليل الكمى والتوزيع التوبوغرافى لمختلف أنواع الخلايا فى الفص الامامـــــى للغدة النخامية لذكور الماعز اثناء فصول السنة المختلفة باستخدام صبغة حامض البيرفورميـــك الالسيان الازرق - صبغة شيف للحمض الفوق ايودى - اورنج ج .

واسفرت النتائج على مايلـــــى :

١- تزداد نسبة الخلايا الحاثة للنمو والخلايا اللبنية والخلايا الكارهة للون اثناء فصل الصيف.

٢- تزداد الخلايا الحاثة الجرابية والخلايا الحاثة للنسيج البينى للخصية فى النشاط والعدد اثناء فصلى الخريف والربيع.

٣- تزداد الخلايا الحاثة الدرقية والخلايا الحاثة الكظرية فى النشاط والعدد اثناء فصـــل الشـــتاء.

٤- يعتمد التوزيع التوبوغرافى للخلايا المختلفة فى الفص الامامى للغدة النخامية على عـــدد هذه الخلايا ونشاطهـــا .

Dept. of Anatomy & Histology,
Faculty of Vet. Med., Assiut University,
Head of Dept. Dr. A. Hifny.

QUALITATIVE AND QUANTITATIVE CELL TYPE POPULATION IN THE PARS DISTALIS OF THE PITUTARY GLAND IN THE MALE GOAT AROUND THE YEAR

(With 2 Tables & 5 Figures)

By

A. HIFNY, A.H.S. HASSAN, G. KAMEL and A. EL-KERDAWY

(Received at 2/4/1982)

SUMMARY

The quantitative analysis, the topographical loclaization and the histochemical studies of the different cell forms in the pars distalis of the pituitary gland of 36 mature buckling during the year were performed.

During summer and spring seasons, the LTH-cells showed a moderate degree of cellular activities and their percentage were highly increased (15.27%, 15.24%). The STH-cell and the chromophobes showed their maximal percentages (20.26%, 45.20%) during summer. The FSH-and ICSH-cells were significantly increased in number reaching about 10.46% and 5.44% respectively of the total cell count and were found in a condition of maximal activity in autumn. The percentage of TSH- and ACTH-cells were siginificantly high (10.20%, 1.95%) and exhibited maximal signs of cellular activity during winter.

The topographical localization of the different cell forms varied among the various regions of the pars distalis during different seasons of the year attributing to the percentage as well as the activities of these cell forms.

INTRODUCTION

The environmental influences as well as the experimental intervention produce not only distinct morphological changes in the different cell types of pars distalis but also a significant variation in the proportion and topographical localization of each cell type.

Numerous studies were carried out on the cytology of pars distalis in sheep (CLARKE & PURVES, 1960; PURVES, 1961; STOKES and BODA, 1968; HASSAN et al, 1981 and ABO EL-MAGD, 1981); in bovine (MIKAMI, 1970); in buffalo (KANDIL, 1975) and in male camel (FAHMY and NASR, 1963 and BAIOUMY, 1979). However, references dealing with the numerical proportions, topographical localization and histochemical properties of the different cell types in the pars distalis of male goat were not found in the available literature as might be expected.

Therefore, in the present work, quantitative analysis and topographical localization as well as histochemical studies of the different cell forms in the pars distalis of male goat were performed during different seasons of the year.

MATERIAL and METHODS

The present study was carried out on thirty-six pituitary glands of two years old male baladi goat (buckling) during different seasons of the year.

The pituitary glands were carefully and immediately taken affter slaughtering, fixed in formol-sublimate, then washed, dehydrated, cleared and embedded in paraffin. Step-serial sections were cut sagittally at 5 Um thick.

The following stains were adopted:

a. Harris Haematoxylin and Eosin for general histological examination (After Harris, 1960).
b. Performic acid, Alcian blue (pH 0.2), Periodic acid Schiff, Orange G (PFA/AB/PAS/OG) method (HEATH, 1965) was used to differentiate the glandular cell-forms in the pars distalis (LTH-, STH-,TSH-,ICSH, and ACTH- cells).

Total and differential counts for all cell types in the pars distalis were performed. The cells were counted in nine regions representing the pars distalis (Fig. 1). Within each region, five microscopic fields were randomly selected and the number of each cell type was counted. The size of all cellular forms was measured with an eye-piece micrometer scale which was caliberated with a stage micrometer to the nearest micron. The

results were statistically analyzed according to SNEDECOR (1967).

RESULTS

The various cell types in the pars distalis were differentiated, as well as, their state of activity was distignuished according to the staining affinity of the secretory granules and size and shape of each type of these cells during different seasons of the year (Table 1). In addition, total and differential cell counts as well as topographical localization of the pars distalis cells were conducted (Table 2). The frequencies of the pars distalis cells during annulacycle are illustrated (Fig. 3).

Lactotropic cells:

Among the different seasons of the year, the minimal percentage (14.85%) of the LTH-cells was demonstrated during winter. During this season the lowest concentration of these cells was recognized in the centeral region of pars distalis. However, the highest was found in the ventrocaudal region in summer. The maximal percentage (15.27%) was observed at summer (Fig. 2,3). These cells were relatively smaller in size (11 Um) and deep orange in colouration with abundant coarse secretory granules in winter (Fig. 4) than in the other seasons (Table 1).

Somatiotropic cells:

The mean percentage of these cells was found to be significantly lower in autumn and winter than in the other seasons (Table 2). The highest concentration of STH-cells was found in the midcaudal region and during spring. However, their minimum concentration was present in the midventeral region and during autumn. Around the year the STH-cells appeared large in size (12. Um) and relatively more active in summer than in other seasons (Table 1).

Thyrotropic cells:

The maximal mean percentage of the TSH-cells 10.20% was demonsterated in winter, and was significantly decreased during summer (7.60%). The midrostral region contained the highest concentration of these cells during winter and autumn, but the dorsocaudal region contained the lowest number at summer. In winter the TSH-cells were relatively large in size (17 Um), paler in stain and contained fewer course granules (Fig. 5) than in other seasons (Table 1).

Follicle-stimulating hormone cells:

The mean percentage of these cells varied significantly; it was higher in autumn (10.46%) and lower in summer (6.23%). The dorsorostral region of pars distalis showed the highest concentration of FSH-cells, while the central region showed the lowest one. The FSH-cells (Fig. 5) were large in size (17 Um), their cytoplasm contained very few secretory granules and stained faint violet after PFA/AB/PAS/OC stain in autumun than in the other seasons (Table 1).

Interstitial cell stimulating hormone cells:

The highest mean percentage of ICH-cells was demonstrated during autumn, but this percnetage was significantly decreased during the other seasons of the year (Fig. 2). The topographical studies revealed that the ventrocaudal region contained the highest ICSH-cell concentration, however, the lowest concentration was found in the middorsal region of pars distalis. The ICSH-cells (Fig. 5) were large in size (18 Um), contained fewer cytoplasmic secretory grenules and were stained paler red during autumn than in the other seasons of the year (Table 1).

Corticotropic cells:

No significant difference could be found between the mean percentage of ACTH-cells during summer and autumn (1.33% and 1.52%). However, this percentage was increased at winter (1.95%) and decreased at spring (1.21%). The central region of the pars distalis contained the highest concentration fo ACTH-cells, but the middorsal region contained the lowest one. During winter,these cells appeared polyhedral in shape and measured about 8 Um in dimaeter. Their secretory granules were not easily visible. The degranulation of these cells affected its staining reaction and appeared pale red in colouration.

Chromophobe cells:

There was a significant difference in the mean percentage of the chromophobe cells during the year. The highest mean percentage (45.20%) was demonstrated during summer, while, the lowest one (39.50%) was observed in autumn. Among the various regions of pars distalis, the midcaudal one contained the highest of chromophobes, while the dorsocaudal region contained the minimal concentration.

DISCUSSION

The correlation between the quantitative analysis and topographical studies with the histochemical properties is more convientent to obtain a relatively complete picture about the structure and function of the different cells types of pars distalis of buckling arround the year.

The LTH-cells did not show any significant changes regarding their size,shape and staining affinity during the year. However, in winter these cell percentage was significantly decreased. These results greatly support thefindings of SHERWOOD and McSHAN (1977) and ABO-ELMAGD (1981) who mentioned that the lactotropic hormone acts synergistically with ICSH to stimulate or inhibit the testis.

The STH-cells of buckling were associated with the metabolic activity of whole animal body, thus they could be expected to be changed with reproductive activity. These findings are in agreement with ABO-ELMAGD (1981) in sheep; MIKAMI (1970) in bovine; KANDIL (1975) in buffalo and BAIOUMY (1979) in male camel.

In winter the TSH-cells reached their maximal number and activity, but in summer their number as well as their activities were decreased. This enviromental alteration might represent a compensatory response to the stimulation depletion or of the peripheral hormone pool resulting from either increase or decrease in the rate of thyroxin metabolism by the peripheral tissue (STDNEY and KENINETH,1974; WEST and NORDAN,1976 and ABO-ELMAGD, 1981).

The gonadotropic cells (FSH- and ICSH-cells) were observed in a maximal state of cellular activity during autumn season. This observation was attributed to the great functional activity of both FSH- and ICSH-cells required for spermatogenesis leading to high reproduction during this season. These results are in accordance with ASDELL (1964), CLARKE and FORSYTH (1964), NICOLLS (1971), WEST and NORDAN (1976), ROBERTSON (1977) and ABO-ELMAGD (1981).

The increased activity of the ACTH-cells during autumn and winter supports greatly the existence of close functional relationship between the gonads and adrenal cortex which mediated through these cells in pars distalis of buckling.

The significnat difference in the mean percentage of chromophobes during the different seasons of the year suggested that these cells have the ability to differentitate into any other type of secretory glandular cells in pars distalis and vice versa. This view is supported by ABO-ELMAGD (1981) and HASSAN et al, (1981) in sheep as well as HAM and CORMACK (1979) in man.

In the present study, the topographical localization of the different cell forms in the pars distalis of buckling is not similar to that obtained by ABO-ELMAGD (1981) in sheep; MIKAMI (1970) in bovine and BAIOUMY (1979) in male camel. This view could be attributed to the differences in species, sex, age and state of reproduction of the animals used by the aforementioned others.

REFERENCES

Abo-El-Magd, A.A. (1981): Histomorphological studies on the pituitary gland of the sheep. Thesis for M.V.Sc. (Histology) Fac. of Vet. Med., Assiut University.

Asdell, S.A. (1964): Patterns of Mammalian Reproduction. 2nd ed. Dornell Univ. Press (Comstock,Ithasa,New York.

Baioumy, A.A. (1979): Histological and histochemical studies of the pituitary gland in male one humped camel (Camelus dromedarius) in different ages. Thesis for Ph.D. (Histology) Fac. of Vet.Med.; Zagazig Univ.

Clarke, J.R. and Purves, H.D. (1960): Two types of acidophil cells in the adenohypophysis of the sheep. Endocrinol., 20' VI.

Clarke, J.R. and Forsyth, I.A. (1964): Seasonal changes in the adenohypophysis of the vole (Microtus agrestis). General and Comp. Endocr., 4' 243.

Fahmy, M.F. and Nasr, H. (1963): Morphological study of the pituitary gland of the adult male camel (Camelus dromedarius) 4th, Ann., Vet., Congress.

Ham, A.D. and Cormack, D.H. (1979): Histology, 8th ed. J.B. Lippincott comp., Philadelphic and Toronto.

Hassan, A.H.S.; Kamel, G. and El-Homosi (1981): The effect of zerenol implatation on some endocrine glands and gonads in fat-taild lambs. I. The pituitary gland (Pars distalis). Zeit. Fur Mikro. Anat. 5, Vol. 95.

Kandil, M.H. (1975): Histological and histochemical studies of the adenohypophysis of the buffalo with special reference to the changes in the estrous cycle. Thesis for Ph.D., Fac. of Vet. Med., Cairo Univ.

Mikami, S. (1970): Light and electron microscopic investigations of six types of glandular cells of the bovine adenohypophysis. Z. Zollforsch. Vol. 1054 457.

Nicolls, K.B. (1971): A light microscopic study of nuclear and cytoplasmic size of the aggregate acidophil population in the hypophysis cerebri; pars distalis of adult male deer (Odeccileus hemionus) relative to seasons of the photoperiod and antler cycles. Z. Zellforsch Mikroscop. Anat., 115 (3), 314.

Pyrves, H.D. (1961): Morphology of the hypophysis related to its function. Young, W.C. (ed); Sex and Internal Secretions, 1:161, Baltimore, Willisms and Wilking.

Robertson, B.A. (1977): Reproduction in the ewe and goat. Part II. Cited by Cole and cupps (1977). Report. In Domes. anim. 3ed edit. Acad. Press, New York, San Francisco, London.

Sherwood; D.D. and Mcshan, W.H. (1977): Gonadatropins. In: Reproduction in domestic animals. (ed. by Cole and Cupps). Acad. Press. New York, San Francisco, London.

Stdney, H.I. and Kenneth, A.W. (1974): The thyroid gland. In: textbook of endocrinology. (eds. WILLIAMS); edit. W.B. Saunders company. Philadelphia, London, Toronto.

Stokes, H. and Boda, J.M. (1978): Immunofluorescent localization of growth hormone and prolactin in the adenohypophysis of foetal sheep. Endocrinology, 83' 1362.

Weat, N.O. and Nordan, H.C. (1976): Cytology of the anterior pituitary at different times of the year in normal dear (Odocoileus hemionus membranus). Can. J. Zool. 54 (11).

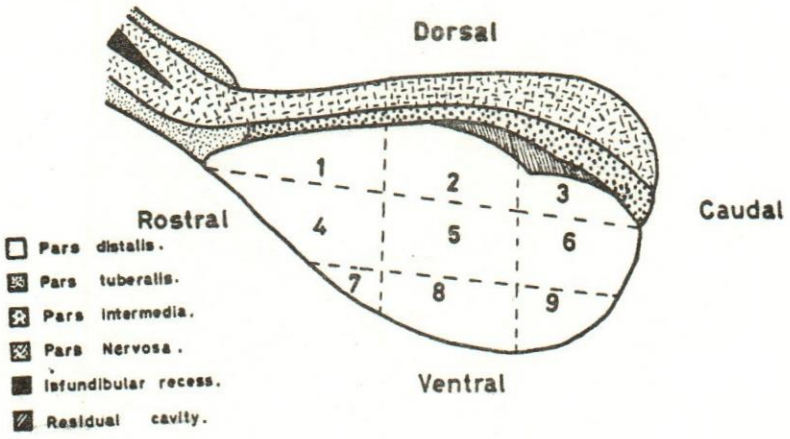
Dorsal
Rostral
Caudal
Ventral
1
2
3
4
5
6
7
8
9
Pars distalis.
Pars tuberalis.
Pars intermedia.
Pars Nervosa.
Infundibular recess.
Residual cavity.

Fig. (1)

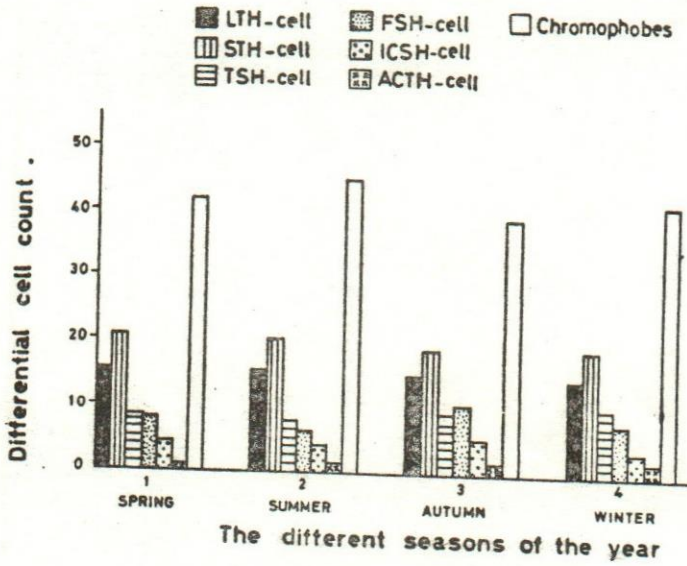
LTH-cell
STH-cell
TSH-cell
FSH-cell
ICSH-cell
ACTH-cell
Chromophobes
Differential cell count.
50
40
30
20
10
0
1
SPRING
2
SUMMER
3
AUTUMN
4
WINTER
The different seasons of the year

Fig. (2)

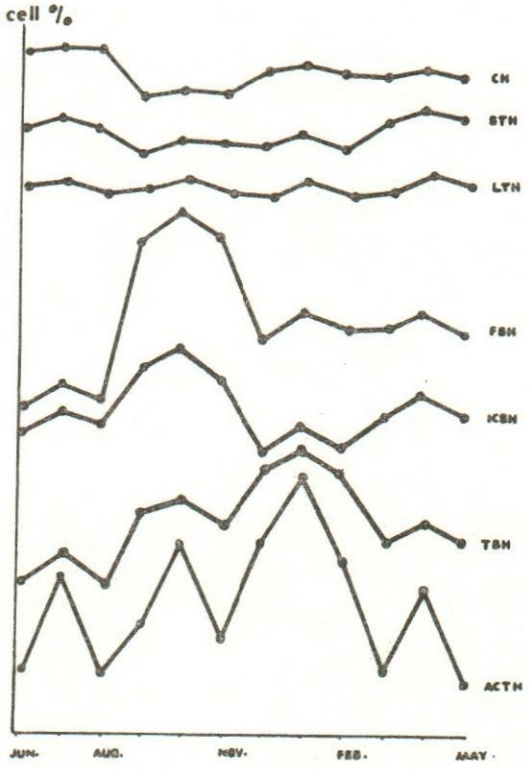

Fig. (3)

Fig. (4)

Fig. (5)