Ultrastructural study for the gonadotrophs and somatotrophs of the pituitary gland in aging rabbits of local bread (oryctolagus cuniculus)

Idrees khalaf Thamer

Department of Anatomy and Histology , College of Veterinary Medicine , Tikrit University , Tikrit , Iraq

Abstract

Eighteen rabbit of local bread were classified into3 groups A, B, and C
Group A were 6 rabbits of age one year
Group B were 6 rabbits of age three year
Group C were 6 rabbits of age five year
The whole animals were accomidated for one month before the study, after that the whole animals were exposed to intensive dose of chloroform and then scarified to obtain the pituitary gland by doing anatomical technique EM processing technique. was done and finally the pituitary gland were examined at the anterior lobe (pars distalis) to demonstrate the somatotrophes and gonadotrophes (FSH and LH) secreting cells .
The present study revealed that somatotrophes and gonado trophes were containing spherical and oval nuclei at one year of age with presence of abundant secretary granules in its cytoplasm associated with Golgi apparatus, these structures were decreased in number and size proportionally with increase of the age of animal at 3 and 5 years .

Introduction

The studies of the pituitary gland tissue in laboratory animals in regarding to the electron microscopy are few. However there are development of various techniques in regarding with molecular biology . secretion of pituitary cells . immunocytochemistry at light and electron microscopic level were done (1,2).
Certain techniques were done in combination with ultra - structural studies have contributed a great deal to our understanding of the ultra- structural of pituitary tumors (3) .
The purpose of the present study was to investigate the effect of age on the certain types of the pituitary gland cells and to show the effect of these cells on the growth impairment and gonadogenesis of the aging rabbits.

Literature review

Hara *et al* (4) detected quantities of morphological analysis related with the average sectional areas of prolactin and GH – secreting cells were smaller in size that those of control .
The secretion of pituitary hormones constitutes a complex process comprising stimulatory and inhibitory mechanisms of the pituitary as well as the action of intraglandular paracrine agents (5) .
Gomez and pucciarelli (2) demonstrated the ultra-structural change in somatotrophs of pituitary cells of the rat post weaning with low −protein diet.
Milosevic *et al* (6) described the effect of the age and nutritional status in rat they found that gonadotroph population are affected and the population is decreased, otherwise (7) found an increase in the corticotroph population suggestive of a stimulation of the hypothalamns - hypophyseal- adrenal axis, induced by the protein- calorie under nutrition.
Console *et al* (8) attributed that somatotroph, lactotroph, gonadotroph and thyrotroph cell population may be associated with increased of the chromophoble population comprising both immature forms with scarce secretory granules and degranulated in relative cell .

Materials and methods

Eighteen rabbit were using in the present study , classified in to the following groups.
Group A : at age one year
Group B : at age three years
Group C : at age five years
The whole animals were accomidated for one month before the study the whole animals were scarified after giving intensive dose of chloroform inside sealed glass box of 30x30 cm^3 of dimensions .
The anatomical technique was done to dissect the skull of each one by doing a sagittal and coronal incisions in the skull by the aid of surgical blade and chisel.
The brain was removed carefully immersed in distilled water for 10 minute to remove the blood clot and debris of tissues . After that the pituitary gland gloved of each specimen of brain was manipulated at the base of the brain (diencephalon) and extracted carefully . The anterior lobe of the gland was put immediately in 3% glutaraldehyde buffer at PH. 7.4 for fixation for 3 hours and post fixed with osmic acid at 1% in phosphate buffer PH. 7.4 for one hour. The samples then processed and embedded in araldite. The sections obtained were 1nm thickness , stained with toluidine blue, ultrathin sections were mounted on copper grids, stained by uranyl acetate and lead citrate (9) and examined by Philips Transmission Electron microscopy at the college of medicine , Al-Nahrain university.

Results

The ultrastucture of GH cell and goradotrophe cells (FSH and LH _ Secreting cells) at age one year demonstrated . the presence of the these cells with oval and spherical nuclei and its chromatin was scattered in it (fig 1).
The nuclear membrane was appeared as a white zone containing minute pores . The cytoplasm had a great number of expanded and dilated golgi complexes (Fig2).

The somatotrophs (GH cells) appeared enriched with dense chromatin in nucleus. The cytoplasm was containing a great number of large size of white secretory granules (Fig 3) .

The examination of sections at age 3 years demonstrated that there was many small size cells of somatotrophen and gonadotrophen. The cytoplasm of these cells had rounded and large secretory granules with a number lesser than of age 1 year. (Fig 4)

The cell membrane appeared more thicken to that of age at one year (Fig 5)

At age 5 years, showed peripheral granules near to the cell membrane of the gonadotrophes and GH cells. The Golgi complexes were expanded (Fig 5).

The cell membrane was beaded with ribosomes . The secretory granules in the cytoplasm of these cells were less in number and small in size in comparison to that of 1,3 years of age and the nuclei of these cells were irregular in shape and displaced peripherally (Fig 6).

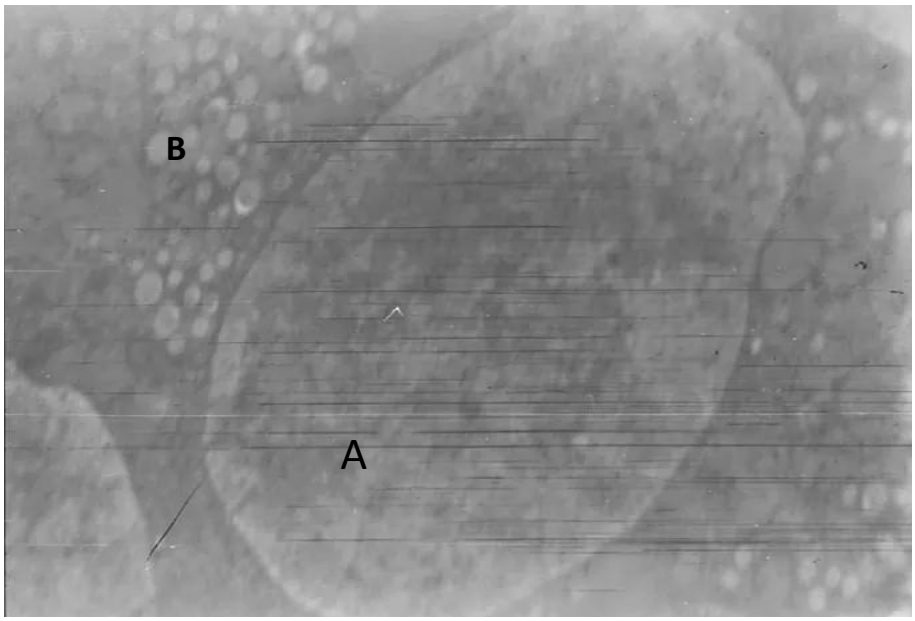

Fig.(1) show A- Oval nucleus with chromatin B- Secretory granules in cytoplasm of pituitary gland in rabbit.(× 14000).

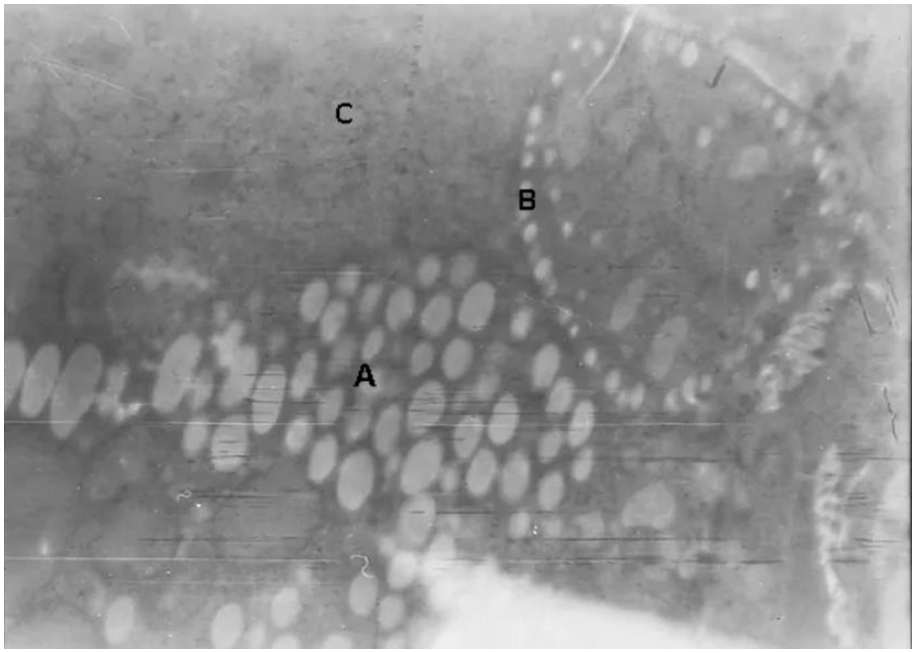

Fig. (2) show A- Large secretory granules B- Nuclear membrane C- Golgi apparatus pituitary gland in rabbit.(× 14000).

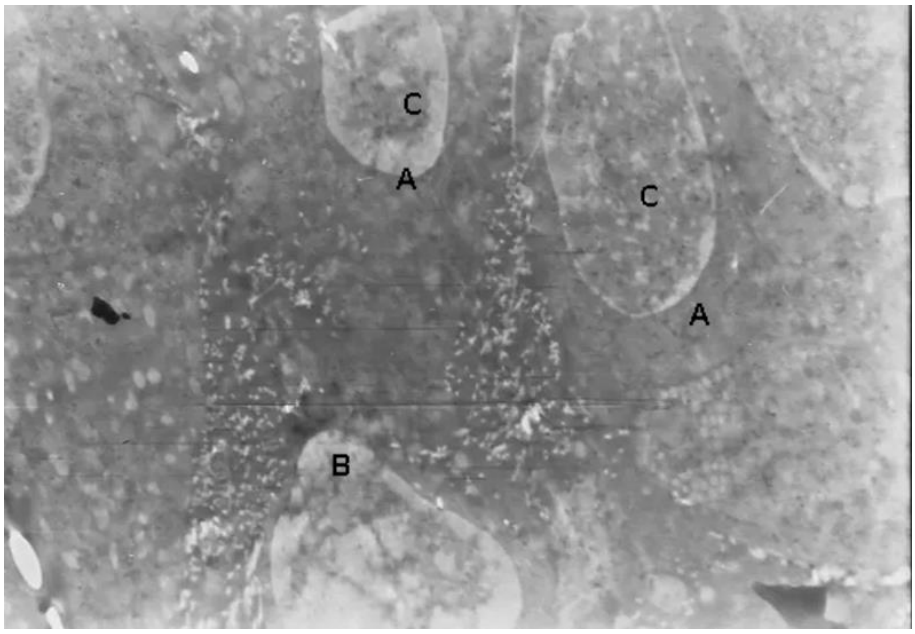

Fig.(3) show A- Nuclei of gonadotroph B- Golgi complex with secretary granules C- Plugs of chromatin in Nuclei of pituitary gland in rabbit. (× 14000).

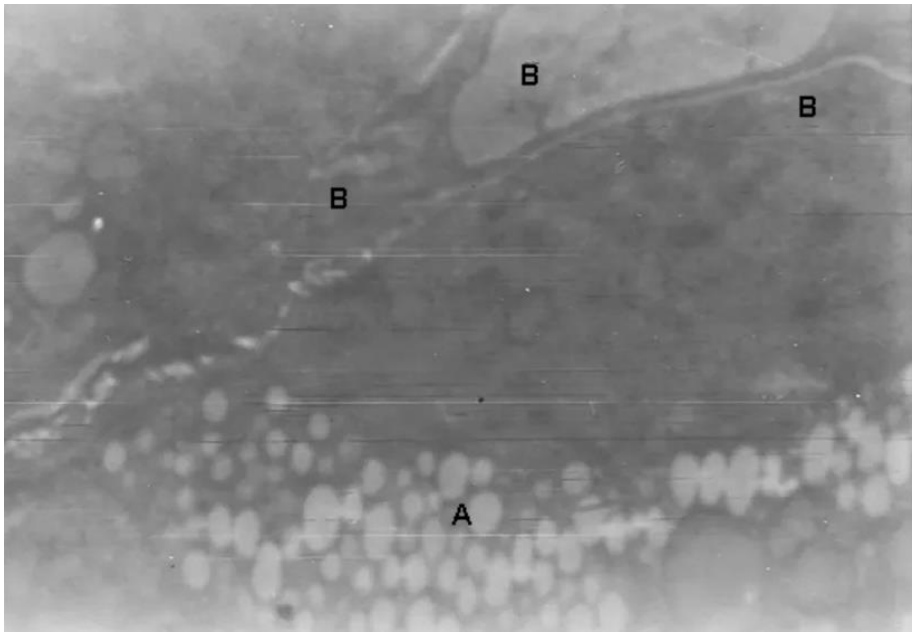

Fig.(4)show A- Small spherical secretory granules of somatotrophe B – Cell of chromophob of pituitary gland in rabbit. (× 14000).

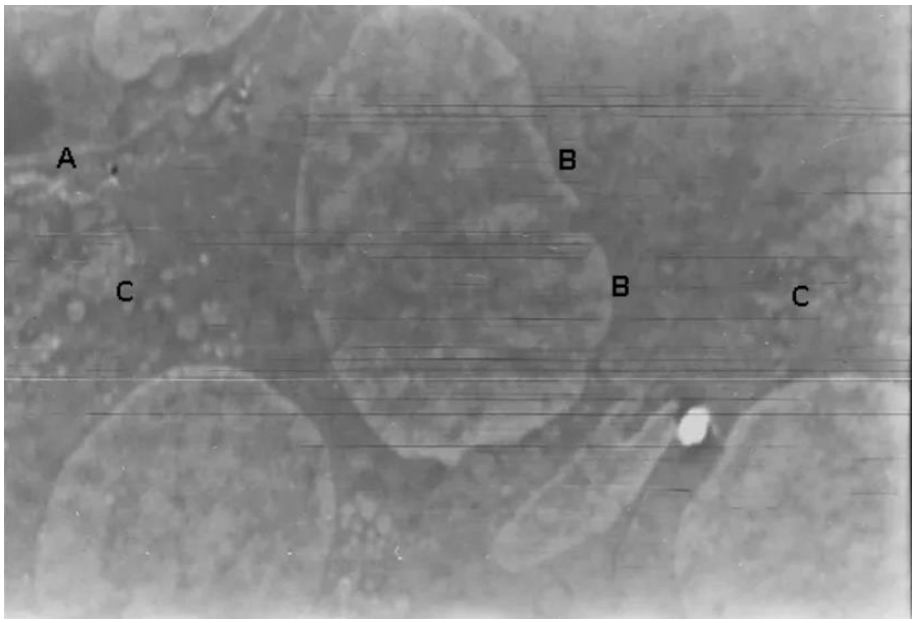

Fig.(5) show A- Thickened cell membrane B- Irregular nuclei C- Small secretory granules with Golgi apparatus of pituitary gland in rabbit. (× 14000).

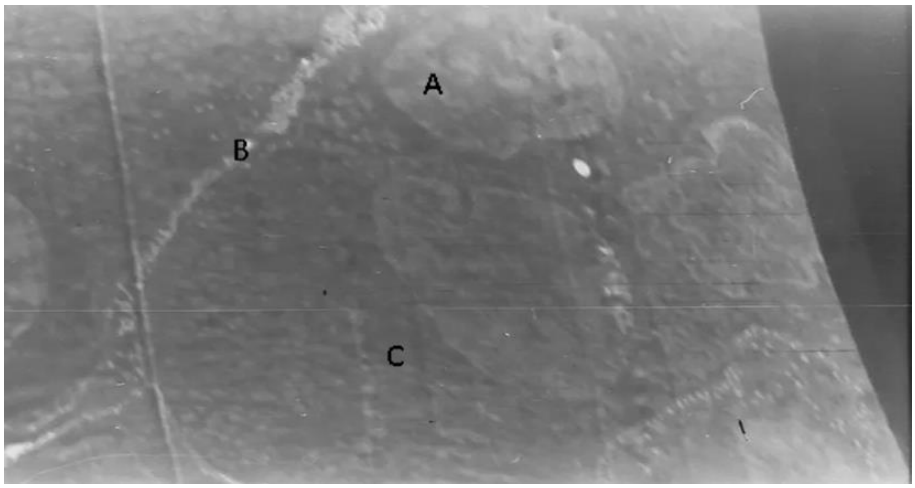

Fig.(6) show A- 5 years, displaced nucleus nearby the cell membrane B- Thickened cell membrane C- Minute secretary granules in pituitary gland of rabbit. (× 12000).

Discussion

The present study determined the location of gonadotrophes and somatotrophes in the pars distalis of the anterior lobe of the pituitay gland for whole groups of aged animals. The study demonstrated that the aged animals involved with the cells (FSH and LH secretory hormones) which are released the hormone by exocytosis from its RER via Golgi stack , the somatotrophen , showed cells of less in size and less in number also its distribution related to the age, that means decreased proportionally with the advancing in age and this suggestion is corresponding to that of (10)when referred that age_ related change in the structure and hormone profile of pituitary and thyroid gland of male rabbits .

The anterior pituitary produces hormones that directly stimulate the ovaries and testis, the less production of secretory granules in the cytoplasm reflect . The less production of androgens and estrogen necessary for production and this concept sustain the study of (11) who said that the loss of these two hormones would prevent the maturation of eggs or sperm in the gonad as well as hinder the development of secondary sex feature (12) . These descriptions are correlated with the structure of the GH cells of gonodotrophes according to the age group recorded in the study, Wilson and Wyatt (13) referred that decrease in the level of the somatotrophes did not exhibit any improvement in growth performance of the rabbit and this agree with the concept of present study.

References

1- Gomez, Dumm C.L.A, Pucciarelli, H.M, Terreros, MC (1982): Effect of a low – protein diet on the ultra – structure of somatroph cells in the rat. communication Biologicas 1: 165- 170 .

2- Gomez .Dumm C.L.A, Pucciarelli H.M (1987): Quantitative ultrastactural study of Somatotropic cells in undermourished weanling rate . Acta Anatomica . 129: 200-202 .

3- Chen, C.K (2009): Biomarkers in diagnostic head and neck tumor pathology. J , Chiese , Oncol . Soc . 25 (2) 89-101.

4- Hara, M, Herbert, D.C and Taniguchi, T. (1998): Effects of a low – protein diet on prolactin and growth hormone – producing cells in the rat pituitary gland . Anatomical Record 251 : 37 – 43 .

5- Saeger, W. (1992).Effect of drugs on pituitary ultrastructure . Microscope Research Technique. 20 : 162 – 176 .

6- Milosevic, V . Tritunovic, S and Sekulic (2006): Estradiol and Calcium affect the growth hormone – producing cells in middle – aged rat females . Acta Veterniaria.2-3 (11) 1- 20 .

7- Herbert, D.C and Carrillo, A.J (1982): The hypophyseal – adrenal axis in the protein – Caloric undernourished rat. Hormone and Metabolic Research. 14 : 205 -207 .

8- Console, G.M., Oyhenatt, C, Ferese, C and Gomez Dumm, C.L (2001) : Morphometric and ultrastructural analysis of different pituitary cell population in undernourished monkeys . Brazilian Journal of medical and Biological research. 34 . 65-74 .

9- Mahmoud, M.S and Abdul Hamid, M.(2012): Green tea extract ameliorates liver and pituitary gland toxicity induced by diethy introsamine in male rats. Electron preparation . Journal of American science . 8 (3) .

10 - Esam, B.S., Wafaa, M.Z and Hanan, A-LL .2001: Histological structure and hormonals profile of pituitary and thyroid glands affected by castration and iodine supplementation in male rabbits. Egyptian journal of biology . 3: 38-47.

11 Tanner, J. M (1962): Growth at adolescence Textbook , Blackwell . oxford.

12 Oyhenart, E and Pucciarelli , H.M (1992): Sexual cranial dimorphism in undernourished rats treated with growth hormone. Growth. Development and aging 56: 179-184 .

13 Wilson, D.B and Wyatt, D.P (1988): Growth hormone and prolactin immunoreactivity in the pituitary gland of postnatal little mice . histology and histopathology 1: 309-313 .

دراسة تركيبية فوقية لخلايا موجهات القند والنمو للغدة النخامية للأرانب المعمرة المحلية

ادريس خلف ثامر

فرع التشريح والانسجة ، كلية الطب البيطري ، جامعة تكريت ، تكريت ، العراق

الملخص

ثمانية عشر ارنب محلي تم تقسيمها الى ثلاث مجاميع A , B , C كل مجموعة كانت ست ارانب

بعمر 1 سنة A مجموعة

بعمر 3 سنة B مجموعة

بعمر 5 سنة C مجموعة

جميع الحيوانات تم اقلمتها لمدة شهر قبل الدراسة ثم تم تعريض الحيوانات لمخدر الكلوروفورم بجرعات عالية وبعد ذلك تم تشريح الحيوانات للحصول على الغدة النخامية بطريقة التقنية التشريحية.

تم اجراء التقنية بطرق المجهر الالكتروني لغرض فحص الغدة النخامية عند منطقة الفص الامامي (الجزء القاصي) لبيان الخلايا الموجهة للقند والنمو .

بينت الدراسة الحالية وجود هذه الخلايا ولها انويه كروية الشكل وبيضاوية عند عمر سنة واحدة مع وجود كثرة بالحبيبات الفارزة الكبيرة الحجم في السيتوبلازم مرتبطة مع جهاز كولجي وهذه التراكيب كانت اقل عدداً وحجماً بتقدم العمر للحيوانات عند عمر 3 و 5 سنوات