تحكم الغـدة النخاميـة وتحت السرير البصرى فى دورة الاباضـةفى الدجاج

سهيرى • صالح ، م• هس • الموجى ، س • سكر ، ز• هـ• على

ف ـ ا ـ سليمان

الملخص العربى

تناول هذا البحث تقدير **كل** من الحاثة الجرابية اللوتيينية فى الغدة النخامية وكذلك فى مصل دم الدجاج البياض ـ دقى ٤ ـ **وذلك** قبل وضع البيض بمدة ٢٤ ، ١٦ ، ٨ ساعات على التوالى ، كما تم تقدير هرمونات تحت السرير **البصرى** المحررة للهرمونات سالفة الذكر كما اشتمل البحث على تعيين وزن المبيض ، وحجم **البويضة** ومحتواتها من فيتامين ج •

ولقد أسفر البحث عن النتائج الآتية :

١ ـ فى الفترة ما بين ١٦،٢٤ ساعة قبل وضع البيض تبين نقص مستوى الهرمونات المحررة للحاثة الجرابية **والحاثة اللوتيينية** •

٢ ـ صاحب هذا النقص زيادة مبدئية فى محتوى الدم من الحاثة الجرابية اتبعها نقص أدى الى زيادة الحاثة اللوتيينية عند حوالى ١٦ ساعة قبل وضع البيض وقل محتوى حويصلة غراف من فيتامين ج •

٣ ـ قبل وضع البيض بثمانى ساعات لوحظ نقص فى محتوى كل من الغدة النخامية والدم من الحاثتين الجرابية **واللوتيينية** •

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HYPOTHALAMIC AND PITUITARY CONTROL OF THE OVULATORY CYCLE OF HENS.

(4Tables and 5 Figers)

By

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(Received at 12-11-1975).

Determination of the FSH and LH contents of Pituitaries and sera of Dokki-4 laying hens were made at 24, 16 and 8 hours before ovulation. The gonadotrophin-releasing hormone contents of the hypothalamic of such hens were also determind. The weights of the ovaries were recorded with reference to their follicle diameter and ascorbic acid contents of the cellular structures of the greafian follicle wall.

The findings indicated a sequence of events characterized by increased depletion of the gonadtrophin-releasing hormone contents of the hypothalami during periods of 24 and 16hours before ovulation. Such changes were accompanied with an initial increase in the serum FSH content followed by its decrease giving chance for a subsequent increase in LH content of the serum at a time 16 hours before ovulation. Such an increase in LH activity was accompanied with ascorbic acid depletion from the follicular wall of the ovaries.At a time 8 hours before ovulation the pituitary and serum gonadotrephin content was low, while the releasing hormone was retained in the hypothalamus.

INTRODUCTION

The classical concept of regulation of gonadal functions by pituitary hormones has been confirmed chicken (NALBANDOV, (1959 a), TIENHOVEN. (1959); FERRANDO and NALBANDOV (1969); and AMIN and CILBERT, (1970). The fowl, like mammals is dependent upon pituitary gonadotrophins for normal gonadal development and functions. The functions of FSH and LH has been identified (STOCKELL and CUNNINGHAM, (1969). Gonadotrophin-releasing hormones have also been identified in the hypothalamic tissues of birds (NELSON, NORTON and NALBANDOV, 1965 ; HEALD, FURNIVAL and ROOK-LEDGE 1967: Heald, ROOKLEDGE, FURNIVAL and WATTS, 1968; JACKSON and NALBANDOV, 1969 ; SCANES and FOLLETT, 1973; and KATUHIDE, MICHIHARN and MINORU, 1974).

Trials have been made to induce premature ovulations a procedure which could be of value in increasing egg production by native breeds of hens. (FRAPS, OLSEN, and NEHER, 1942; and FRAPS, RILEY, and OLSEN,1942). Such birds are favoured by consumers for the teste of their meat and eggs. The work repo ted in this paper was done to give information regarding the hormonal control of the ovulatory cycle in our native breed of chickens Dokki-4.

Material and Methods

Thirty three Dokki-4 hens of an ages of one year with an average weight of 1.5 kg were used. Each hen was kept in a separate cage. Records of oviposition were kept for 3 weeks. The time of laying eggs was at dawn or early in the morning every 24 to 25 hours. In order to obtain hens at different stages of the ovulatory cycle. The sampling started immediatly after laying of an egg, and at 8 hours intervals. This was on the basis that ovulation occurs within 30 minutes after the egg is laid. These represnted three stages of formation of the egg. Further confirmation was done by observing the components and placement of the eggs in the reproductive tract, according to WARREN and SCOTT, (1935). The time immediatly after laying the egg and the presence of another ovulated egg with its yolk in the infundibulum was considered as zero time, about 24 hours before ovulation. The Second stage was confirmed by formation of egg albumin and membranes after reaching the uterus and early calcification of the shell membrans. The third stage corresponded to the presence of an egg in the uterus with the formation of the shell material 8 hours before laying.

The ovaries were weighed and the diameter of the largest greafian follicles were measured with calipers.

Blood samples were collected at the time of decapitation and equal volumes of the sera of every hen in identical groups were pooled together.

The hypothalami of the hens ateach stage were also pooled together and stored in acetone. An HCL extract of gonadotrophin releasing hormones were prepared. Each hypothalamus equivalent was dissolved in 4.Cml saline. The gonadotrophic-releasing activity of the hypothalami of the hens at the three stages were determined by the use of one-day old chicks. The potency of the total activity per hypotahalamus was indicated by their stimulating effect on their testes, after being injected subcutaneously on 4 succissive days.

The pituitaries of the hens of each stage were weighed and pooled together then dried with acetone. A saline suspension of the pituitaries of each stage were prepared so that each mg fresh pituitary was contained in 0.4 ml saline. The proteins of the pooled sera of the hens of each stage were separated with acetone and acetone ether mixture as described by CARTLAND and NELSON (1937). Serum proteins were then immulsified by saline to bring them back to the original volume of serum. The total content of FSH and LH of 1.0 mg pituitary or 1.0 ml serum was determined. The hormone potencies were recorded in terms of 1.U. by Calculation from respective standard log-dose respone curves.

Histological examination of the ovaries of hens at the phases of the ovulatory cycle were made to study the distribution of ascorbic acid in the cell layers of the follicular wall using the silver method for Ascorbic acid, (PEARSE, 1969).

Results

1. *The Ovary :*

The mean values of the ovary weights during the three different stages of the ovulatory cycle did not show significant differences. On the other hand the largest diameter of the greafian follicles was attained during the third stage being 4.22±0.09 cm, as compared to 2.92±0.11 and 2.93±0.17 cm during the first and second stage respectivilty (Table 1).

TABLE 1. Ovarian weight, follicle diameter and body weight of Dokki-4 laying hens during the Ovulatory Cycle.

Hours before ovulation	No. of hens	Body weight in g	Ovarian weight in g	Follicle diameter (cm)
24 (group I). . . .	12	1470.50 ±62.20	2.80±0.57	2.92±0.11
16 (group II) . . .	12	1524.33 ±84.30	2.43±0.34	2.93±0.17
8 (group III) . . .	7	1237.43 ±49.57	2.76±0.25	4.22±0.09

Values indicate means ± standard error.

The ascorbic acid content of the structures of the follicular wall showed different pictures of distribution according to the phase of ovulatory cycle. At a time 24 hours before ovulation the ascorbic acid was mainly concentrated in the granulosa cells which were deeply stained (Fig. III). The middle venous layer was also rich in ascorbic acid.

The ovaries of the hens at a time 16 hours before ovulation gave an indication of the depletion of the granulosa cells from the ascorbic acid. This vitamin started to accumulate in the inner vascular net work of the theca interna. The ascorbic acid of the inner Venous layer was geatly reduced (Fig, IV).

At a time 8 hours before ovulation, accumulation of the ascorbic acid started to appear in high concentration at the junction of the thecal tissue and the granulosa cell layer. Ascorbic acid was predominant in the middle venous layer (Fig. V).

II. *Gonadotrophins* :

Maximal level of FSH in the serum was reached at the initail Post-ovulatory stage. The second and third stages, showed minimal levels of FSH in the pituitaries and serum, (Table II and Fig, I, II).

TABLE 2. **FSH content of the pituitarres and sera of Dokki-4 laying hens during the ovulatory cycle.**

Hours before ovulation	Tested material	mouse ovary weight(mg)100 g body weight	I.U.
24 (group I)	Pituitary (1mg)	40.23±3.82	0.91
	Serum (1ml)	80.67±3.70	145.80
16 (group II)	Pituitary (1mg)	37.55±2.49	2.94
	Serum (1ml)	61.19±3.27	24.75
8 (group III)	Pituitary (1mg)	25.08±1.47	0.96
	Serum (1ml)	54.20±3.94	13.20

Values indicate means ± Standard error, Significantly different from each other at $P < 0.01$ except serum II, III.

TABLE 3. **LH content of the pituitaries and sera of Dokk-4 laying hens during the ovulatory Cycle.**

Hours before Ovulation	Tested Material	Corpora haemorrhagica per mouse	I.U.
24 (group I) . . .	Pituitary	2.50 ± 0.15	3.34
	Serum	1.79 ± 0.11	2.45
16 (groupII). . .	Pituitary	2.27 ± 0.14	3.02
	Serum	2.19 ± 0.08	2.92
8 (group III) . .	Pituitary	1.18 ± 0.23	1.87
	Serum	1.00 ± 0.21	1.73

Values indicate means±Standard error, seignificantly different from each other at $P < 0.01$, except pituitary and serum of I, II.

The concentration of LH of the pituitaries during the first and second stages was high as compared to that observed during the third stage. Moreovere, the highest concentration of LH in the serum of hens was observed during the second stage when the egg albumin and membranes were formed, (Table III, Fig, I, II).

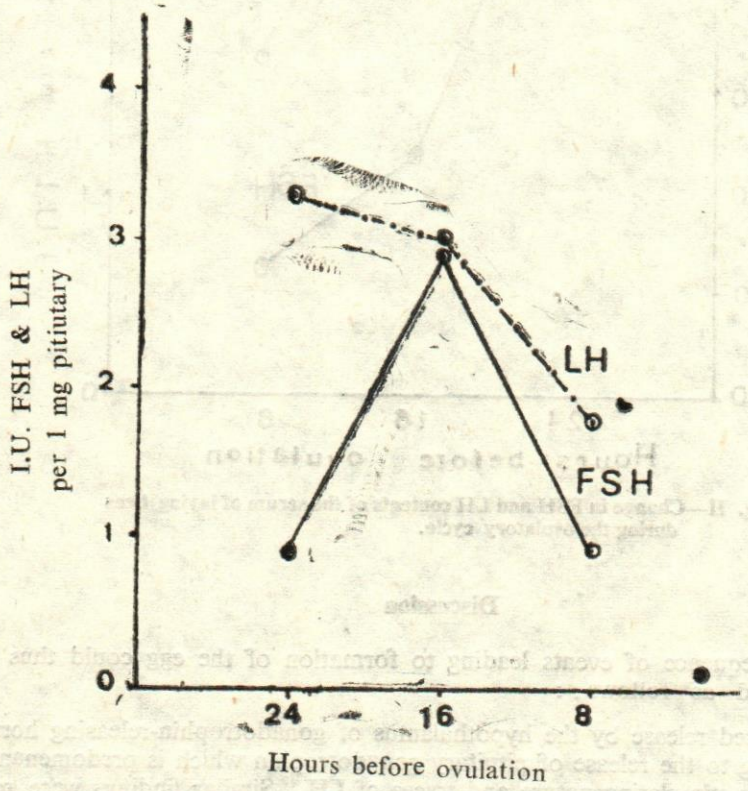

Fig. I.—Change in FSH and LH contents of the Pituitary of laying hens during the ovulatory cycle.

The gonadotrophin-releasing hormone content of the hypothalamus was negligible during the periods 24 and 16 hours prior to ovulation. At the stage of 8 hours precvulatory the concentration of the gonadotrophin-releasing hormone was higher than that observed during the other stages of the ovulatory cycle (Table IV).

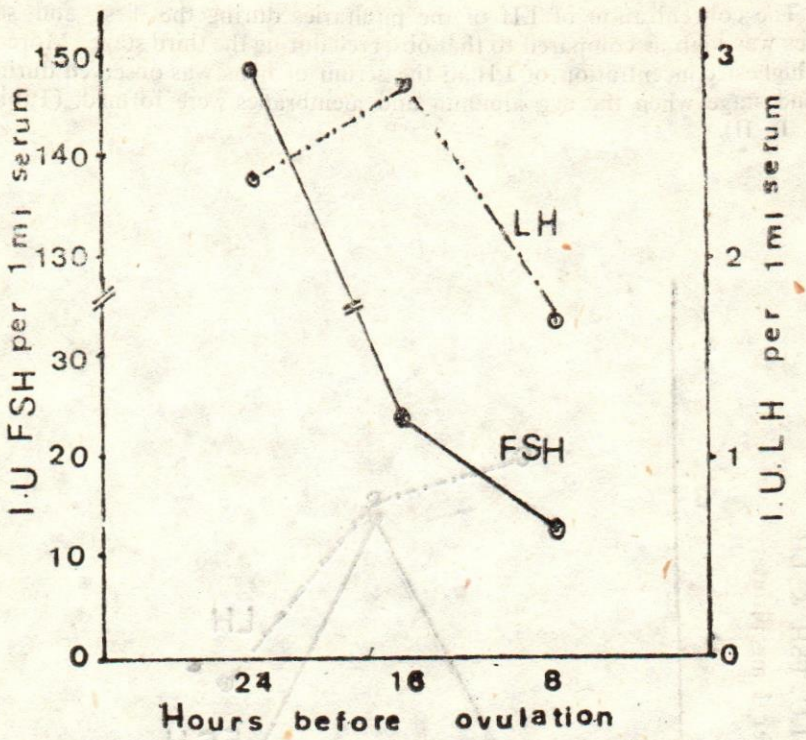

Fig. II—Change in FSH and LH contents of the serum of laying hens during the ovulatory cycle.

Discussion

The sequence of events leading to formation of the egg could thus be summarized as follows :

1— Increased release by the hypothalamus of gonadotrophin-releasing hormone leading to the release of pituitary gonadotrophin which is predomenantly of a follicle-stimulating nature and traces of LH. Similar findings were reported by FRAPS and RILEY (1942) and GILBERT and AMIN, (1969). They found that administration of FSH results in maturation of many follicles and that egge Yolk formation is significantly increased. This picture seems to be extended for approximately 8 hours.

2— The second stage is characterized by the increased release of gonadotrophin-releasing hormone of a nature leading to increased release of LH. This hormone being of an ovulatory nature also has an ovary ascorbic acid depletion effect. The level of circulatory FSH was greatly diminshed, Table (II). OPEL (1960) reported that FSH antagonizes the ovulation inducing action of LH in hypophsectomized hens. Further confirmation has been extended by OPEL and

NALBANDOV (1961) who found the gradual withdrawal of FSH increases the effectiveness of LH in this respect. Under these circumstances there is a continul formation of egg yolk leading to increase of internal pressure and ovulation. As estimated by egg constituents and placement in the reproductive tract, the peak of LH concentration in the blood is reached at a time not les than 8 hours before ovulation. The release of LH is synchroirzed with the escape of the ovum from the oviduct especially the magnum. FERRANDO and NALBANDOV (1969) found that LH takes 6 to 8 hours to bring about ovulation. One should not ignore however the nature and the dose of the hormone used.

3.—During the last eight hours of formation of the egg the pituitary gonadotrophins are greatly depleted from both the pituitary and serum. This stage represents the rapid calcification of the shell membrane. The ovary, parathyroid and other hormones regulating calcium metabolism are mostly concerned with this phase (CHARLES and HOGBAN, 1933: FEINBERY, 1936: and SOLIMAN and SOHAIR., 1974). KATUHIDO *et al* (1974), found that hypothalamic peaks of gonadotrophin-releasing activity of laying hens was at 21 and 8-11 hours before the expected ovulation. The authors suggested that the gonadotrophins released from pituitaries of hens 11 hrs before ovulation, showed a greater ovulation inducing activity than those released by hens 21 before ovulation. This could be attributed to the character of gonadotrophins released.

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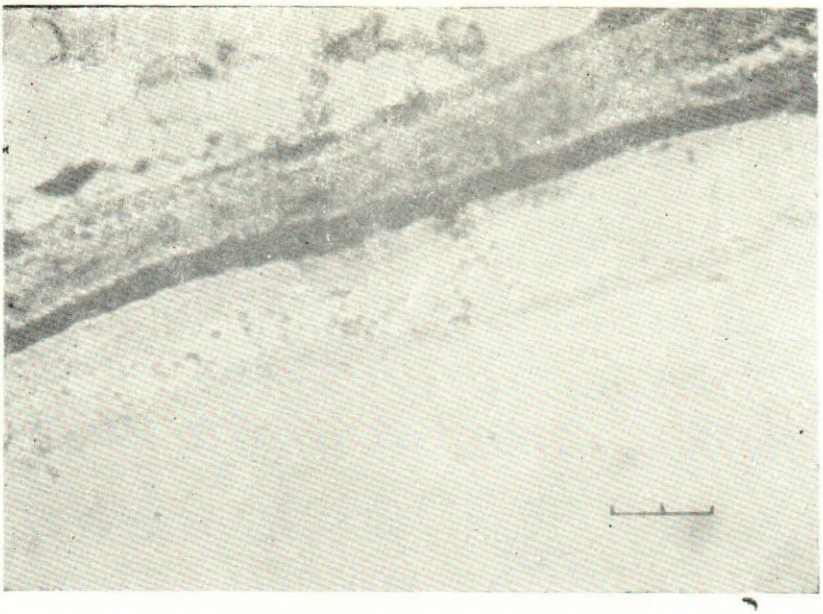

Fig. III. Distribution of Ascoribic acid in the follicular tissues 24 hours before ovulation (every division equals 25μ)

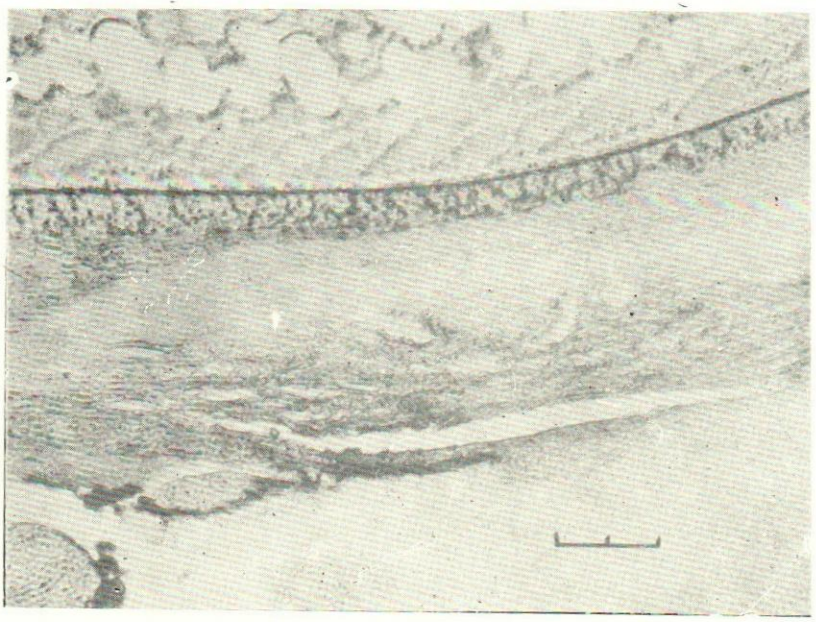

Fig. IV. Distribution of Ascorbic acid in the follicular tissues 16 hours before ovulation. (every division equals 25μ)

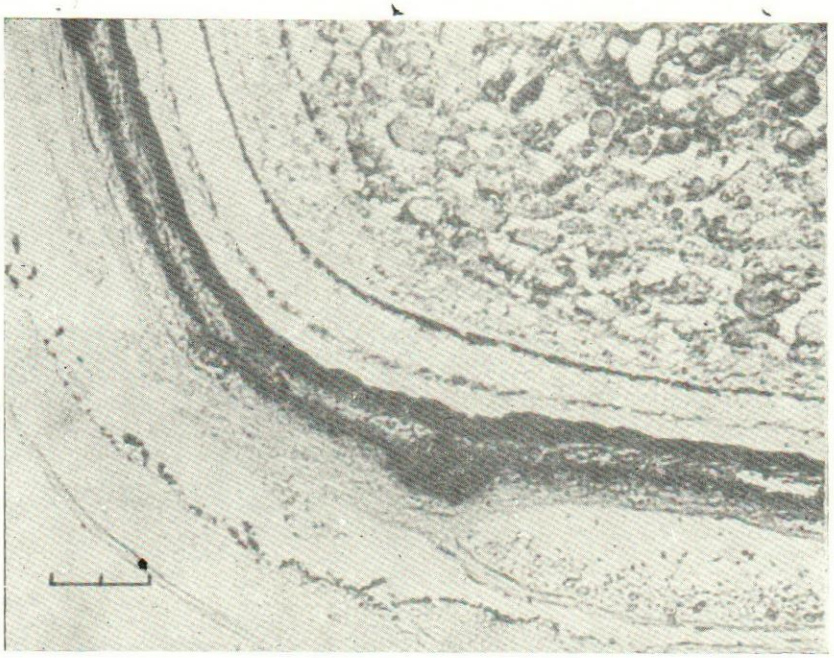

Fig. V. Distribution of Ascorbic acid in the follicular tissues 8 hours before ovulation. (every division equals 25μ).