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CHANGES IN GONADOTROPHINS DURING THE EGG LAYING CYCLE IN FAYOUMI HENS

(With 3 Tables)

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التغييرات فى الهرمونات المنبهة للغدد الجنسية أثناء
دورة وضع البيض فى الدجاج الفيومـــى

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لوحظ زيادة مستوى هرمون الحاث لحويصلات جراف فى الغدة النخامية بعد ٨ ساعـــــات ٣٢ ساعة من وضع البيض بينما وصل لأقل مستوى فى الغدة النخامية عند ١٦ ساعة بعد وضع البيض ـ أما أعلى مستوى من هذا الهرمون فى المصل فقد لوحظ فى الدجاج ٨ ساعات بعد وضع البيضـة وأقل مستوى له فى المصل لوحظ بعد ٣٢ ساعة · أما بالنسبة لهرمون التبويض فكان أعلـــــى مستوى فى المصل وقت وضع البيض · بينما أقل مستوى بعد ٨ ساعات من وضع البيض بينمـــا لوحظ بعد ٨ ساعات من وضع البيض فى الغدة الناخمية · وقد أوضح ذلك ضرورة وجود الهرمون الحاث لحويصلات جراف وهرمون الإباضة فى أعلى مستوى فى المصل لاحداث العضوع الكامـــل لحويصلات كما لوحظ تغيير دورى فى مستوى البرولاكتين فى دم الدجاج أثناء دورة وضع البيـــض كان أعلى مستوى فى المصل بعد ١٦ ساعة بينما أقل مستوى له كان بعد ٢٤ ساعة ·

SUMMARY

The present study was done to clarify the cyclic variation in follicle stimulating hormone, (FSH) ovulation inducing hormone (OIH) and prolactin (PRL) in pituitary and serum of Fayoumi hens during egg laying cycle.

The results obtained from this study revealed that, pituitary FSH was significantly increased at 8 and 32 hours, while minimal concentration was observed at 16 hours after egg laying. High FSH level in serum was observed at 8 hours after egg laying. Maximal level of serum OIH was observed at 32 hours after oviposition, while minimal level was observed at 8 hours while its activity was only detected at 8 hours after oviposition in the pituitaries. This lead to suggest that both FSH and LH surges are necessary to induce maturation of the next follicle. Maximal concentration in serum prolactin was obtained at a time of 16 hours after egg laying, and minimal at 24 hours. Pituitary prolactin tended to be steady during egg laying cycle except at 24 hours after egg laying. Thus the prolactin level in the blood of Fayoumi hens showed cyclic variation during the ovulatory cycle, being low at the preovulatory stage.

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INTRODUCTION

The classical concept of regulation of ovarian functions by hypothalamic and hypophysial hormones has been confirmed in fowls by several investigators. Ovulation in hens occurs within 15-75 minutes after egg laying (STURKIE, 1976). Immediately after ovulation there is increased released of FSH (SALEH, et al. 1977). This endogenous elaboration of FSH beside small levels of LH stimulates the growth of the next follicle to get ready for ovulation and multiple growth of the follicle (GILBERT and WOOD-GUSH, 1970). IMAI and NALBANDOVE (1971) found that there was an initial release of FSH in the plasma one hour after ovulation. The FSH value of this peak was lower than a second peak which occurred 11 hours prior to ovulation.

The release of ovulation inducing hormone (OIH) into blood stream varies with the different breeds of hens depending on the duration of the laying cycle. In 20-24 hours laying cycle, the hormone is released into circulation with highest peak at a 4-8 hours before ovulation (HARVEY, et al. 1979). In case of hens with long laying cycle, the peak of LH in plasma was observed at 16 hours before oviposition.

STEVENS (1988) found that there was significant depression in plasma prolactin level immediately before and during preovulatory peak of OIH.

The aim of the present work was to study the cyclic variations in follicle stimulating hormone, ovulation inducing hormone and prolactin in the pituitary and serum of Fayoumi hens during the egg laying cycle.

MATERIAL and METHODS

Twenty-four laying hens were used. They were allowed a twelve hour light system and layers ration was offered adlibitum. The hens were divided into four groups according to the time after laying the eggs; namely eight, sixteen, twenty four and thirty two hours. Individual serum samples and pituitaries were obtained from each group.

The levels of gonadotrophins in the serum were assayed by radioimmunoassay methods. The OIH level was determined according to STEVENS (1968) while FSH and prolactin levels were estimated according to CATT and TREGEAR (1968). The concentration of OIH, FSH and proloctin in the pituitaries of hens were assayed biologically according to SOLIMAN (1960); BROWN (1955) and HAYDEN, et al. (1980) respectively.

Computation of hormonal concentration of sera and pituitaries was calculated according to the method of FINNEY (1964).

RESULTS

The results obtained, revealed that pituitary FSH level was significantly increased at the stages around oviposition (8 and 32 hours after laying). These values were 6.18±0.44 and 6.04±0.74 iu/mg respectively. Minimal concentration of FSH in their pituitaries (3.96±0.20 iu/mg) was observed at 16 hours after egg laying. Serum FSH showed the

highest level (2.57±0.7 iu/ml) at 8 hours after oviposition. While it was minimal (0.92±0.08 min/ml) at oviposition (Table 1).

OIH activity in the pituitaries of laying hens was detected only at 8 hours after oviposition (Table 2). Maximal level of OIH in the serum of laying hens was observed at 32 hours after oviposition (20.14±0.43 miu/ml) while minimum level was observed at 8 hours after oviposition (17.57±0.36 miu/ml).

Maximal level of prolactin in serum was observed at 16 hours after egg laying (Tabe 3) which was 4.70±0.25 iu/ml while it was at its lowest level (2.81±0.10 iu/ml) at 24 hours after egg laying. pituitary prolactin level tends to be stable except for a mild decrease at 24 hours after oviposition (Table 3).

DISCUSSION

Ovulation in hens is synchronized with oviposition. It usually occurs within 15-75 minutes after egg laying (STURKIE, 1976). It is thus acceptable to consider that the group representing 32 hours after egg laying represent 0 time of egg laying and ovulation time, highest level of blood OIH and lowest level of FSH were observed and retained in the pituitary as indicated from their concentration. The group of 8 hours after egg laying are at the same time 24 hours before the following egg is laid. Also 16 hours after laying represent the stage of formation of the egg. The period following egg laying extending to the middle of the cycle represent mainly growth of the next graafian follicle, characterized by increase synthesis and release of FSH especially at 8 hours postovulatory. The pituitary is almost evacuated from its FSH at 16 hours after or before egg laying. Serum FSH is then maintained and augmented by the LH in blood to maintain growth of graafian follicle ready to ovulate. These finding agree with SALEH, et al. (1977).

Serum prolactin was maximal at a time of 16 hours after egg laying and minimal at 24 hours. Pituitary prolactin tended to be steady during egg laying cycle except at 24 hours after egg laying. These findings suggest increased release of prolactin at 16 hours and partial evacuation of pituitary at 24 hours. Such findings suggest the role of prolactin during egg laying cycle is association with the steroidogenesis (AMIN and GILBERT, 1970). Another observation is that serum prolactin during ovulatory cycle of the hens is inversely proportional with serum FSH level and it appears before the ovulatory peak of LH. This finding has also been observed by NAKAJO and IMAI (1961) and SCANES (1977).

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Table (1)

FSH levels in the pituitaries and sera of Fayoumi hens during the egg laying cecle

Time after egg laying (hours)	Pituitary FSH (iu/mg)	Serum FSH (miu/ml)
8	6.18±0.44[a]	2.57±0.70[a]
16	3.96±0.20	1.00±0.13
24	5.04±0.78	1.17±0.44
32	6.04±0.74[a]	0.92±0.08

± Standard error.
a : Significantly higher than other groups at P/ 0.05.

Table (2)

Changes in the concentration of OIH in the pituitaries and sera of Fayoumi hens during the egg laying cycle

Time after egg laying (hours)	Pituitary OIH (iu/mg)	Serum OIH (miu/ml)
8	0.65±0.03	17.57±0.36[a]
16	0.00±0.00	18.94±0.74
24	0.00±0.00	18.24±1.02
32	0.00±0.00	20.14±0.43[a]

± Standard error.
a : Significantly different from each other at P/ 0.01.

Table (3)

Pituitary and serum prolactin levels of laying Fayoumi hens during the egg laying cecle

Time after egg laying (hours)	Pituitary PRL (iu/mg)	Serum PRL (ng/ml)
8	2.15±0.10[a]	3.41±0.21
16	2.45±0.15[b]	4.70±0.25[*]
24	1.78±0.12[abc]	2.81±0.10
32	2.54±0.08[c]	3.41±0.21

± Standard error.
* Significantly different from other groups at P/ 0.01.
a Significantly different from each other at P/ 0.05.
b&c Significantly different from each other at P/ 0.01.