«Research Note»

Diurnal Change in the Pituitary Gonadotropic Activity in Immature Cockerels

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HASHIGUCHI *et al.*¹⁾ reported that ribonucleic acid (RNA) contents in testes of cockerels showed a diurnal change. Since the RNA content in the testis of the chicken is responsible to pituitary gonadotropins²⁾, the existence of the diurnal change in the RNA content in the testes of the cockerel suggests an existence of a similar diurnal change in the release of gonadotropins from the anterior lobe of pituitary. The present study was performed to elucidate the diurnal change in the pituitary gonadotropic activity in immature cockerels which were raised under the light regimen of 14-hr light per day.

Experimental

Male White Leghorn chicks were raised from the day of hatch under 14-hr light per day (14L : 10D, light on 05.00-19.00 hr) with a supply of feed and water *ad lib*. At 4, 5 and 7 weeks of age, they were killed at the nine different times during a 24-hr period: 08.00, 11.00, 14.00, 16.00, 18.00, 21.00, 00.00, 02.00 and 05.00 hr. At each time, ten birds were killed and their anterior lobes of pituitary were removed, weighed, frozen immediately on dry ice, and stored in a deep-freezer (-20°C). Within three weeks after the removal, the pituitaries were homogenized in 0.9% NaCl solution and assayed for the gonadotropic activity using the bioassay method, based on ^{32}P -uptake by chick testes, according to the method of KAMIYOSHI *et al.*³⁾. The pituitary homogenate, 0.5 mg pituitary equivalents (4-week-old and 5-week-old cockerels) or 0.3 mg pituitary equivalents (7-week-old cockerels), was injected into each assay chicks (35-45 g body weight). In each assay, two doses (1 and 2 μg per chick) of LH standard (NIH-LH-S-16) were also injected. In all assays, the dose of ^{32}P was 5 μCi per chick. The gonadotropic activity of the pituitary was expressed as cpm (counts per minute) per mg testes. Concentrations of gonadotropins were obtained by a calculation according to the conventional method of 3-point assay using the response to the LH standard, and expressed as μg LH equiv. per mg of the pituitary. Gonadotropin contents per pituitary were obtained by multiplying the concentrations by the mean weight of the pituitary.

Results and Discussion

In the 4-week-old cockerels, no statistically significant difference in the pituitary gonadotropic activity was observed among the groups at various times during the 24-hr

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period. However, a higher activity was found in 5-week-old cockerels at 14.00 hr (Table 1) and also in 7-week-old cockerels at 11.00 hr (Table 2). The results were almost the same when compared the pituitary concentrations or the pituitary contents. These findings indicate that the pituitary gonadotropic activity of the cockerel under the present light regimen (14-hr light per day) shows a diurnal change. Since detectability for the existence of the change in the gonadotropic activity is dependent upon the sensitivity of the method of assay used, a similar diurnal change might be also detectable in the pituitary of the 4-week-old cockerels if a more sensitive method of assay were employed. However, it is likely to consider that the diurnal change in the pituitary gonadotropic activity may become prominent at about 5 weeks of age. Although the

Table 1. Gonadotropic activity of the anterior pituitary (AP) at various times during a 24-hr period in 5-week-old cockerels

Hour of day ¹⁾	Hour after light(L) or dark(D)	³² P-uptake ²⁾ cpm/mg testes	GTH conc. μ g LH/mg AP	GTH content μ g LH/AP
08.00	3L	226 $\pm$ 10*(12)**	ab†	9.7
11.00	6L	240 $\pm$ 9 (12)	ab	12.9
14.00	9L	257 $\pm$ 12 (12)	b	18.1
16.00	11L	232 $\pm$ 12 (11)	ab	11.0
18.00	13L	207 $\pm$ 12 (11)	a	6.7
21.00	2D	207 $\pm$ 11 (11)	a	6.7
00.00	5D	211 $\pm$ 12 (12)	a	7.2
02.00	7D	219 $\pm$ 11 (11)	a	8.5
05.00	10D	230 $\pm$ 9 (11)	ab	10.5

1) Ten birds/group

2) Saline controls were 178 $\pm$ 8(12); 0.5 mg dose per chick.

* Mean $\pm$ S. E.

** No. of assay chicks

† Means followed by the same letter are not significantly different ($P < 0.05$) in Kramer's multiple range test⁴⁾.

Table 2. Gonadotropic activity of the anterior pituitary (AP) at various times during a 24-hr period in 7-week-old cockerels

Hour of day ¹⁾	Hour after light(L) or dark(D)	³² P-uptake ²⁾ cpm/mg testes	GTH conc. μ g LH/mg AP	GTH content μ g LH/AP
08.00	3L	181 $\pm$ 9*(12)**ab†	7.9	51.4
11.00	6L	189 $\pm$ 9 (12)	b	8.8
14.00	9L	180 $\pm$ 8 (12)	ab	7.8
16.00	11L	181 $\pm$ 11 (12)	ab	7.9
18.00	13L	166 $\pm$ 7 (12)	ab	6.3
21.00	2D	167 $\pm$ 6 (12)	ab	6.4
00.00	5D	159 $\pm$ 9 (11)	a	5.7
02.00	7D	171 $\pm$ 9 (11)	ab	6.8
05.00	10D	187 $\pm$ 11 (11)	ab	8.6

1) Ten birds/group

2) Saline controls were 128 $\pm$ 4(12); 0.3 mg dose per chick.

*, **, † Same as in Table 1.

hour at which the peak of the gonadotropic activity appeared was earlier in the 7-week-old cockerels than in the 5-week-old cockerels, whether the hour of the peak becomes earlier with the progress of age needs further investigations.

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未成熟雄鶏における下垂体前葉の性腺 刺激ホルモン力価の日内変動

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白色レグホーン種雄鶏を孵化直後から14時間照明(5時~19時)10時間暗黒の明暗周期下で飼育し、4週齢時、5週齢時および7週齢時において1日のうちのいろいろな時刻に殺して下垂体前葉を採取し、その性腺刺激ホルモン力価を雛精巢³²P取込法によって測定した。

4週齢時においては性腺刺激ホルモン力価の日内変動

は認められなかったが、5週齢時においては14時(照明開始後9時間)に最高値を示す変動が認められ、7週齢時においては11時(照明開始後6時間)に最高値を示す変動が認められた。従って白色レグホーン種雄鶏の下垂体前葉の性腺刺激ホルモン力価の日内変動は本実験条件下では約5週齢時から顕著になるものと思われる。

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