



In vitro effect of growth hormone on progesterone production by large preovulatory follicles depends on the hen age and follicular layers interaction



A. Smekalova, E. Montvila, O. Konovalova, O. Mityashova, I. Lebedeva
L.K. Ernst Federal Science Center for Animal Husbandry, Podolsk, Russia

Introduction

Growth hormone (GH) is an endocrine and paracrine/autocrine regulator of the hen ovarian function, with the GH receptor concentration in the granulosa layer (GL) being maximum in the largest preovulatory follicle (Lebedeva et al. 2004, Biol.Reprod. 71:1174-1181).

The aim of the present work was to investigate GH effects on in vitro production of progesterone by GL from the two largest yellow follicles (F1 and F2) due to the hen age and the presence of the theca layer (TL).

Methods

The following groups of hens were selected for experiments:

- young hens with long clutch (YLC, 32-33 week-old, >10 eggs per clutch)
- old hens with short clutch (OSC, 74-76 week-old, 3-6 eggs per clutch).

Two largest preovulatory follicles, F1 and F2 (Fig. 1), were obtained at 7 h after ovulation (n=8-9); theca and granulosa layers were isolated (Fig. 2). GL was cultured separately or jointly with the respective TL for 18 h in the presence or absence of chicken GH (25 ng/ml).

Fig. 1. Follicular hierarchy

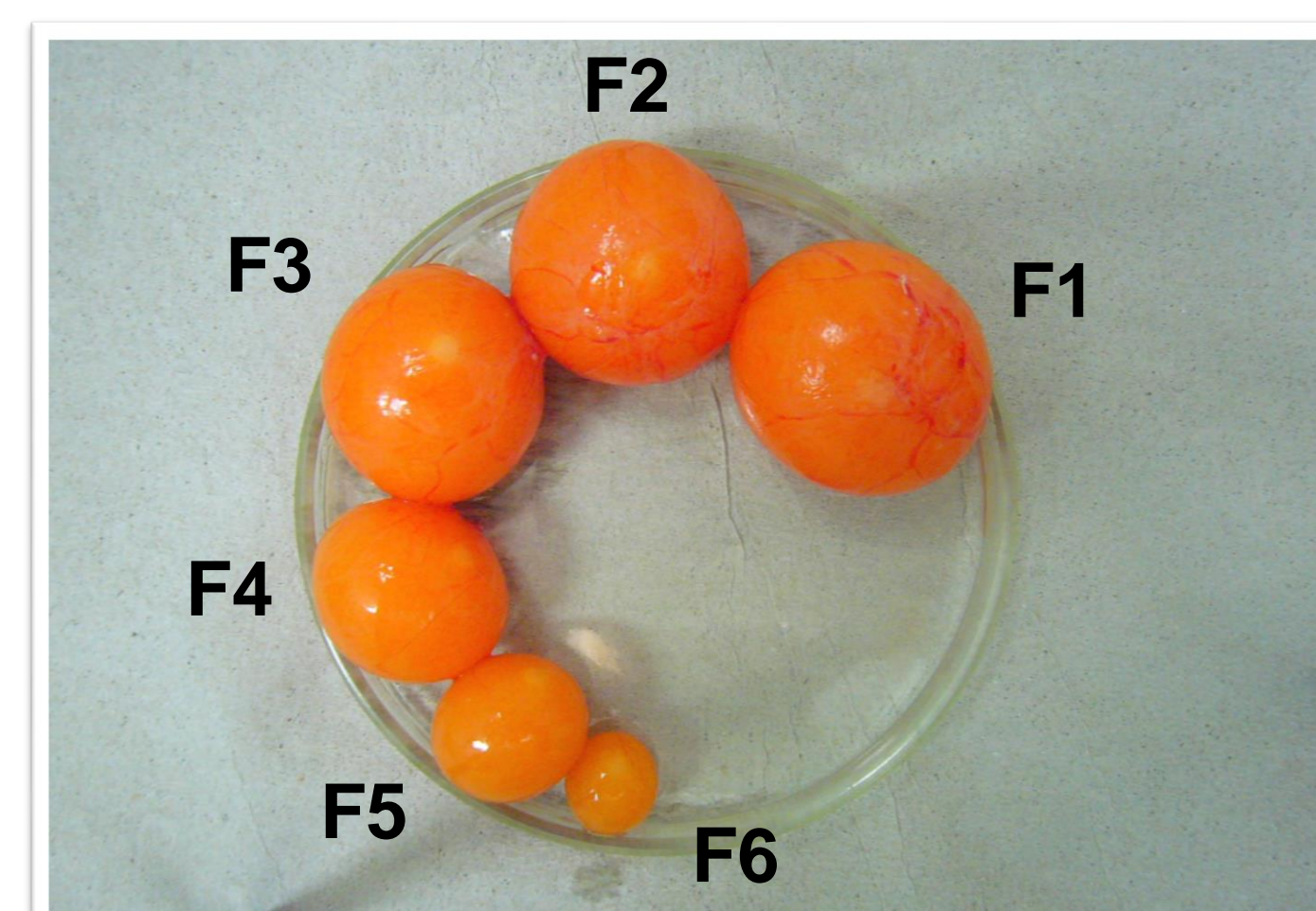
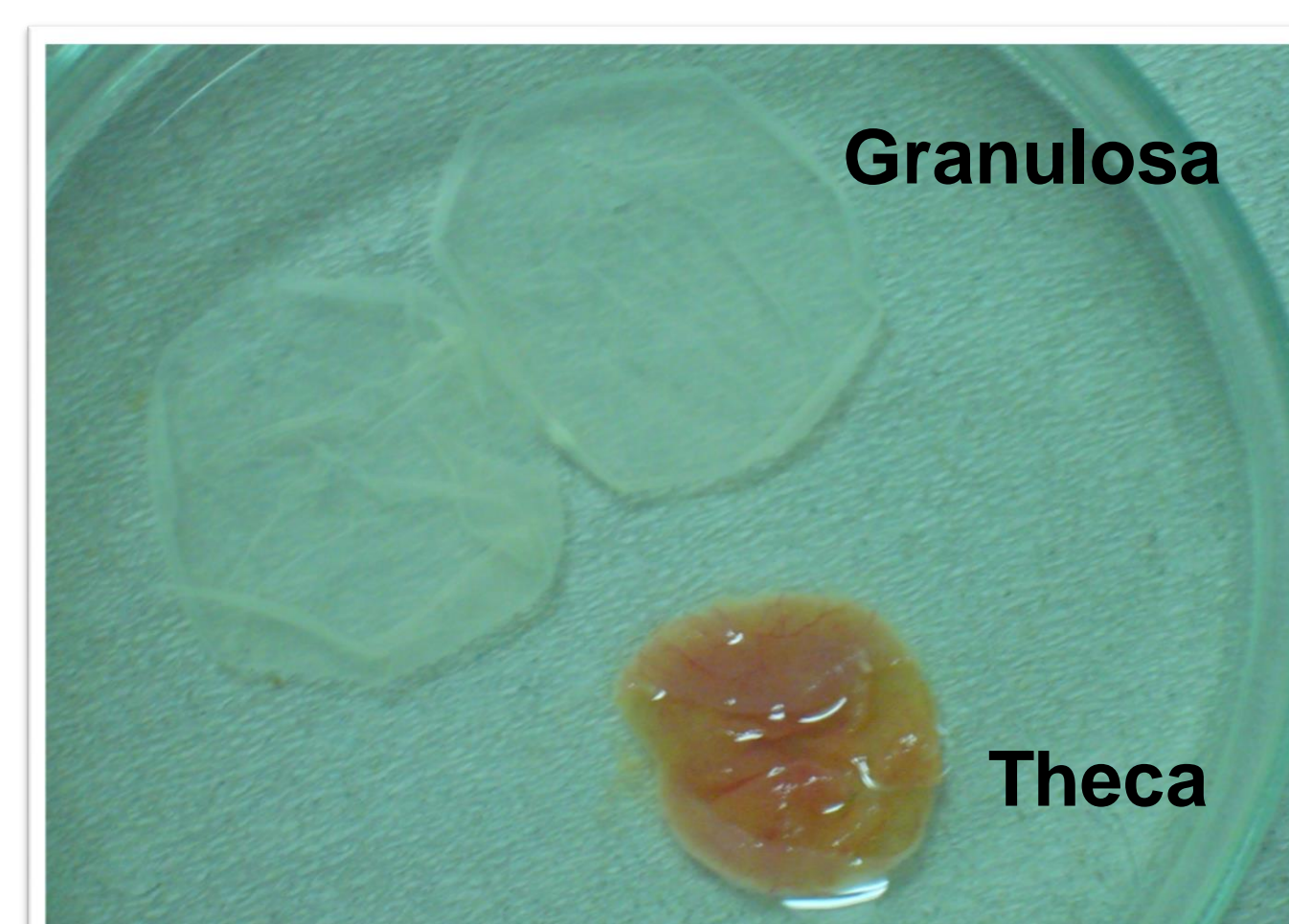


Fig. 2. Hen follicular layers



Concentrations of progesterone in culture media were measured by ELISA. The data were analyzed by repeated measures ANOVA.

Conclusion

- The steroidogenic response of GL from the two largest preovulatory follicles to GH differs in young and old hens.
- The interaction with TL modifies the GL response and makes it similar in birds regardless the age and reproductive status.

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Results

When GL from F1 follicle cultured alone, GH did not affect progesterone production in YLC hens (Fig. 3) and decreased it from $30,5 \pm 3,4$ to $20,5 \pm 2,9$ ng/mg tissue ($P < 0.01$) in OSC hens (Fig. 4). Conversely, when tested GL from F2 follicle, GH increased progesterone output from $15,8 \pm 2,4$ to $20,4 \pm 2,5$ ng/mg tissue ($P < 0.05$) in YLC birds (Fig. 3) and had no effect on the output in OSC birds (Fig. 4). During co-culture of GL and TL, GH raised 1.4-1.5 times the production of progesterone in the case of F1 follicle and did not change it in the case of F2 follicle in hens of both ages (Fig. 5, 6).

Fig. 3. Progesterone production by the GL of YLC hens in the absence or in the presence of GH

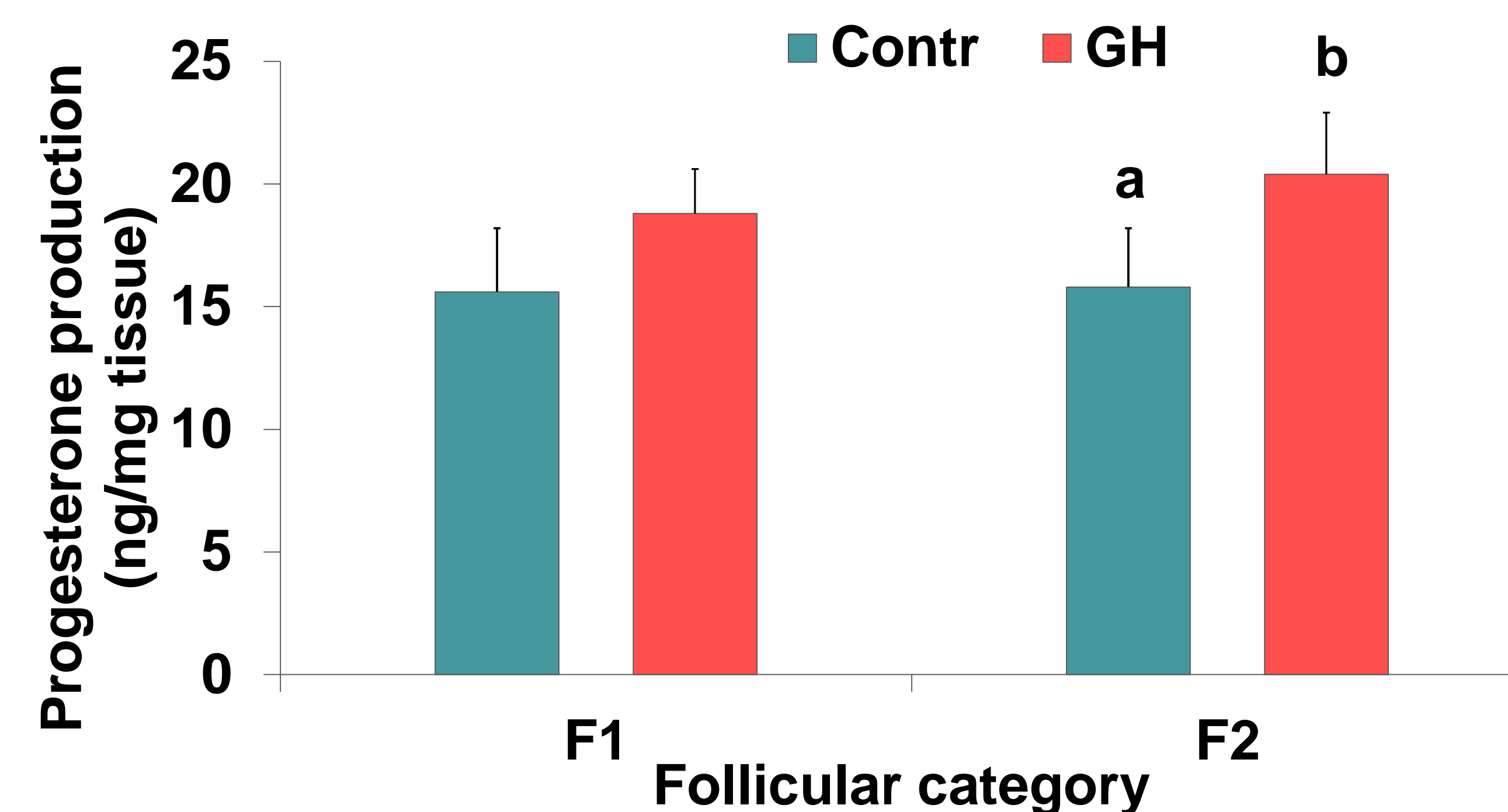


Fig. 4. Progesterone production by the GL of OSC hens in the absence or in the presence of GH

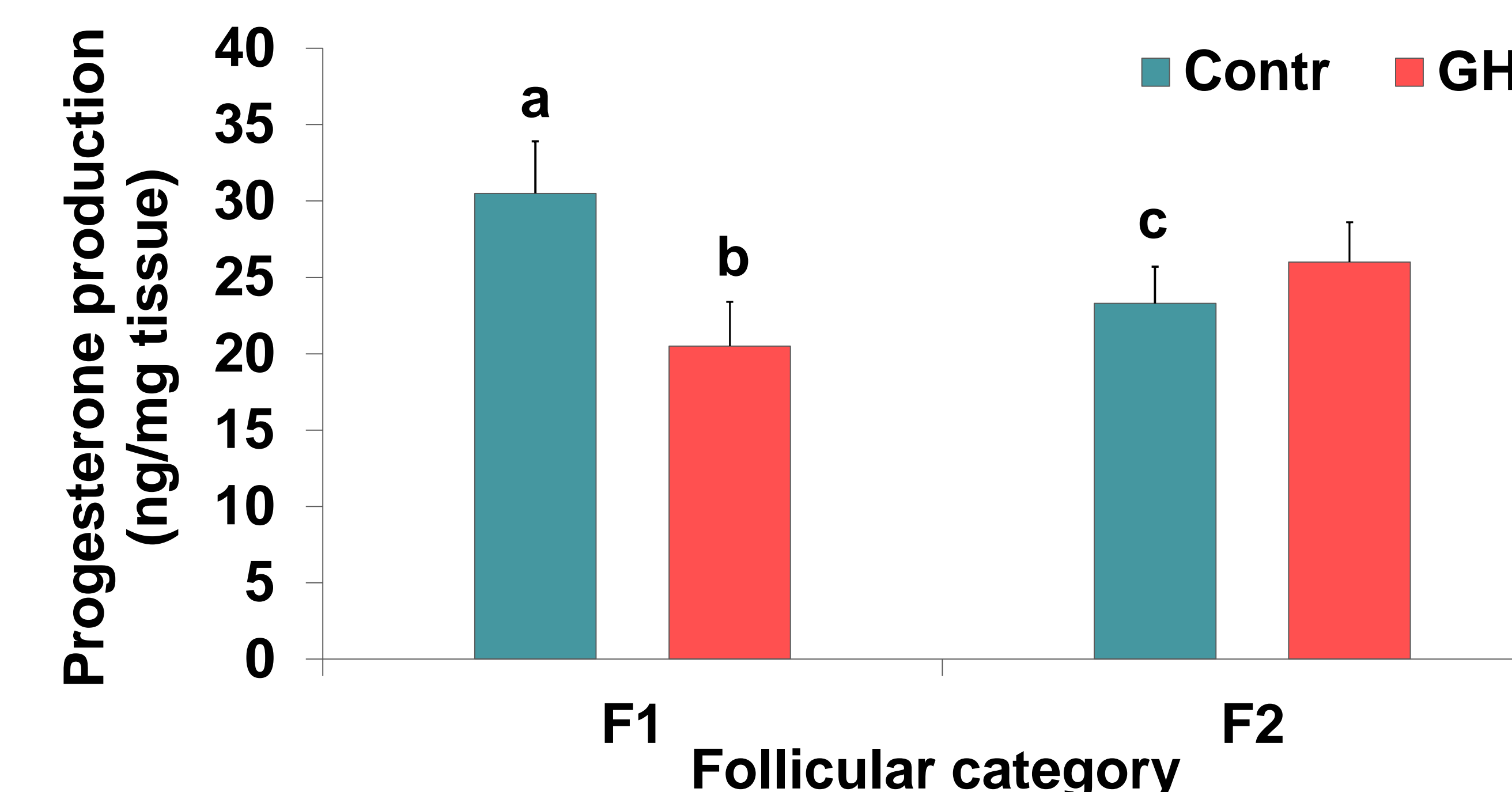


Fig. 5. Progesterone production during co-culture of GL and TL of YLC hens in the absence or in the presence of GH

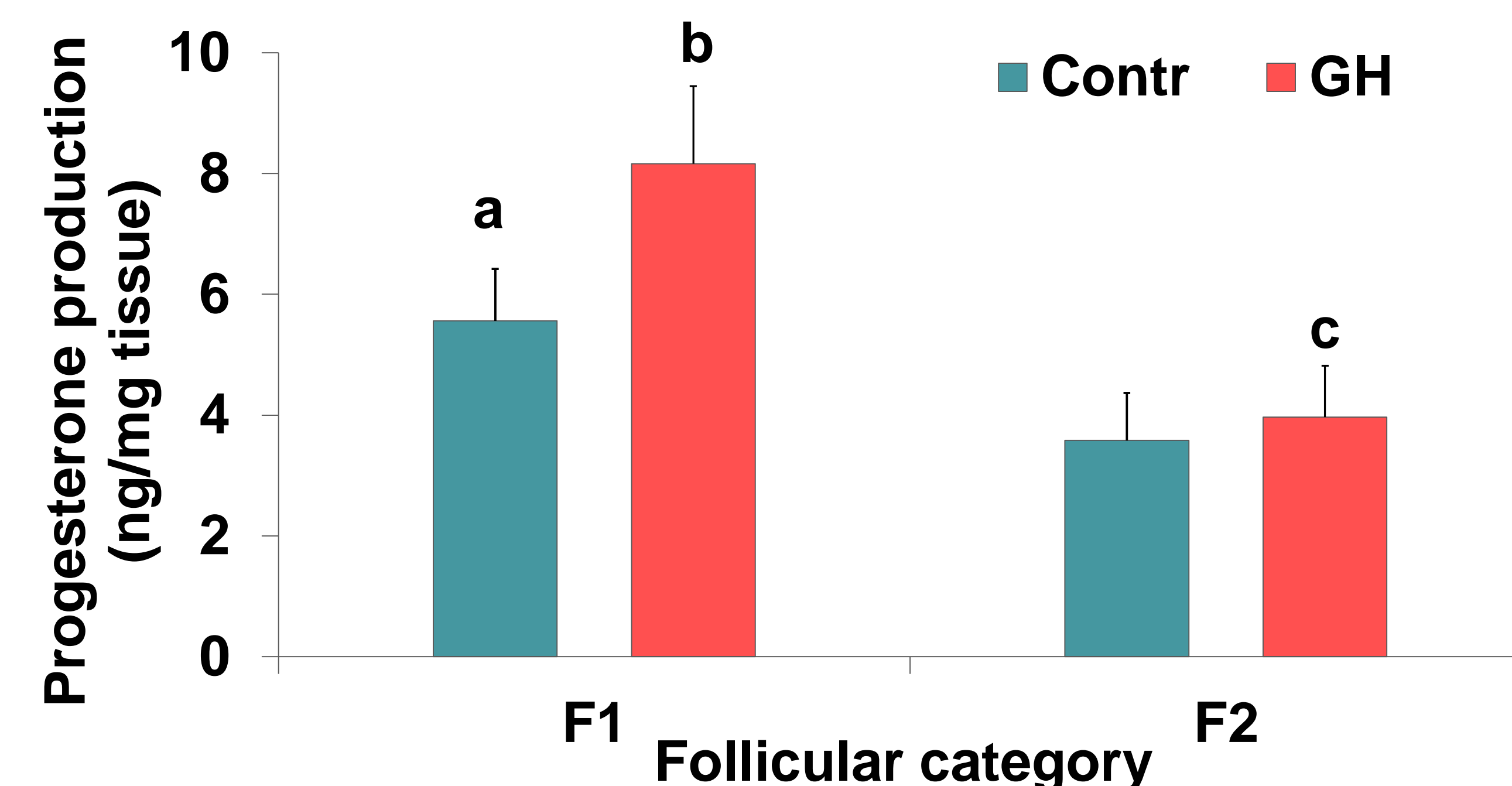
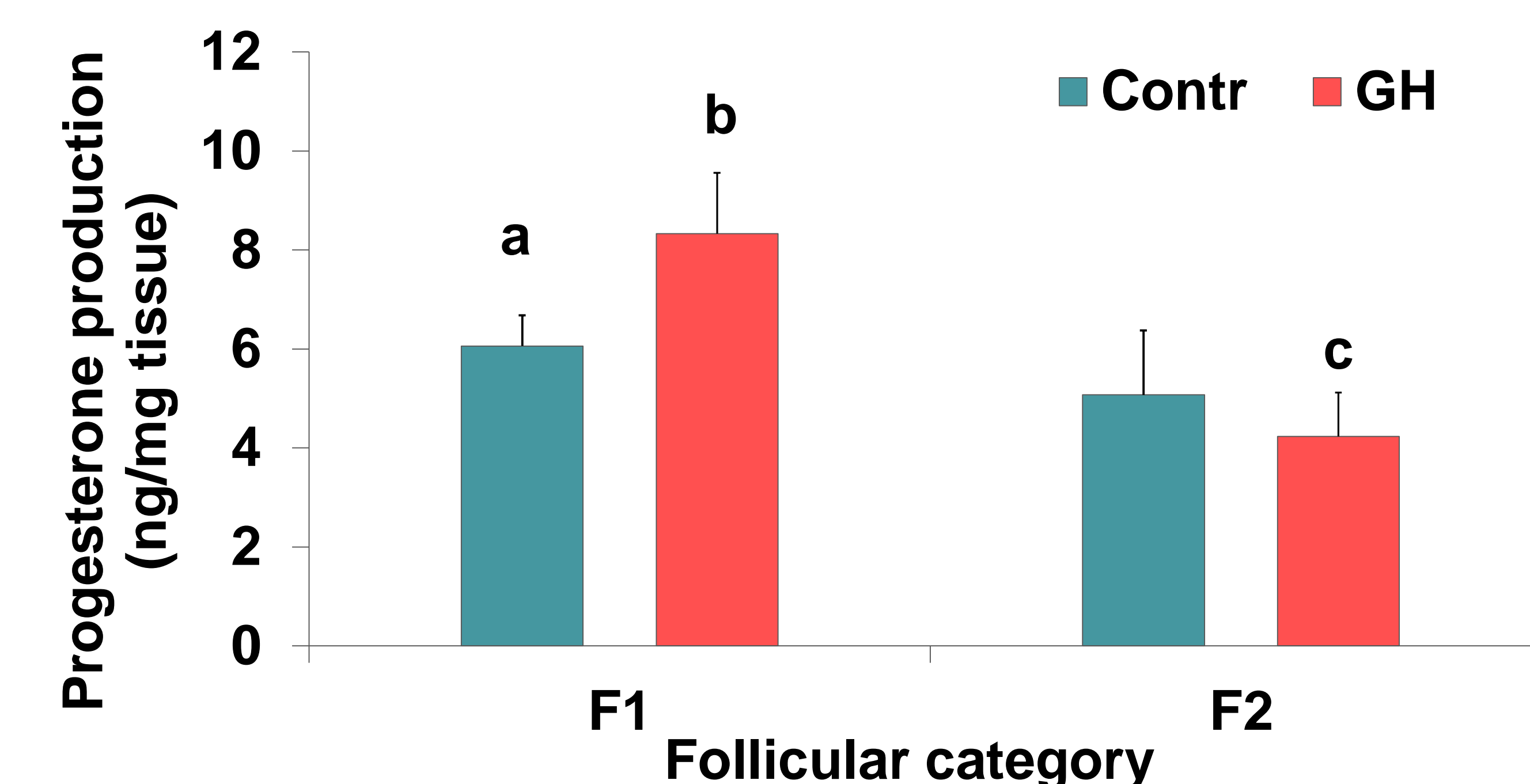


Fig. 6. Progesterone production during co-culture of GL and TL of OSC hens in the absence or in the presence of GH



Means with different letters differ significantly.