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Hormone Profile in Bali Cattle During Follicular Phase

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Abstract: The objective of this research was to determine of LH, FSH and Estradiol 17 β hormone concentrations in serum of Bali cattle during estrous cycles with a special reference to follicular phase. The estrous cycle of each animal was synchronized with two injections of 25 mg of PGF2α. Transrectal ultrasound examination of ovaries was performed daily and blood samples were collected after the ultrasound examination on days 17, 18, 19, 20 of the estrous cycle. The results showed that, there are significant increase in mean serum LH and Estradiol 17β from the day 17 until the appearance of estrous sign. However, no changes were observed in the mean of FSH until day 20. The concentration of serum FSH remained constant from day 17 until day 20 and then decrease during estrous phases of estrous cycles. In conclusion, estradiol-17-ß LH concentrations of blood serum increased from the day 17 until the appearance sign of estrous. The concentration of serum FSH remained constant from day 17 until day 20 and then decrease during estrous phases of estrous cycle.

Key words: LH · FSH · Estradiol 17 Β · Bali Cattle · Follicular Phase

INTRODUCTION

Reproductive performance of the cow herd is one of the factors affecting efficiency of cow-calf systems. The major objective of cattle breeding is to produce one calf per cow every year. Therefore reproductive performance of the cowherd highly determines the efficiency of cowcalf systems. The reproductive function of cows is based on estrous cycles, a serial process regulated by the hypotalhamic-pituitary-gonadal axis, which produces hormones that dictate reproductive event. Understanding the mechanisms that control reproduction function will provide important information to enahnce reproductive performance.

It has been known, most estrous cycles in cows consist of 2 or 3 waves of follicular activity. Waves of ovarian follicular development comprise the growth of dominant follicles some of which become ovulatory and the others are remainder regressed [1].

The dominant follicle continues to grow at an accelerated rate. There was a progressive increase in follicular size and estradiol production during growth phase of each wave and if its development coincides with corpus luteum lysis and the decrease of progesterone, it may ovulate[2]. Each follicular growth wave in estrous cycle is associated with transient rise of FSH. FSH surge reaches peak concentrations, on average, when the largest follicle is about 5 mm. The mean concentration then decrease, with about a 3-day interval between peak concentrations. Increased levels of FSH in the early follicular phase cause the continued growth and development of follicles [3]. FSH stimulates the production of estradiol in cattle. Increased levels of FSH occurs due to an increase in the frequency and amplitude of LH [4]. During the follicular phase, elevated estrogen concentrations trigger estrus behavior in cows and lead to the LH surge and consequent ovulation.

The Bali cattle is considered to have several advantageous characteristics and to be well adapted to the country's harsh environmental tropical conditions with drought and rain. However, some of the problems were found associated with the less optimal reproductive in Bali cattle. The Bali cattle have problem with low performance due to hormonal disturbances such as a high incidence of *silent heat*, low yields of insemination and the high number of early embryonic death [5].The study on hormonal profile in follicular phase, provide a useful information and resources to enhance the reproductive

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performance of Bali cattle.Therefore, the aim of this study was to evaluate the concentrations of reproductive hormones in blood serum in Bali cattle

MATERIALS AND METHODS

Animal: Four cows from Teaching Farm Bali cattle, Sobangan, Badung Regency, Bali were used in this study. During the experimental period, all animals were kept on pen. They were fed consisting of rice straw and commercial feed suplemented with mutivitamin and minerals and had free access of water.

Detection of Estrus: Estrus was synchronized with two injections of PGF2 α (Dinoprost) administered intramuscularly. Cows were observed for signs of estrus following PGF2 α treatment three times daily and ultrasonographic examinations were made to confirm follicular phase.

Collection of Blood Sample: Blood samples were collected by vacuum through the jugular vein puncture. The blood samples were placed in a vacutainer containing ethylene diamine tetra acid (EDTA) as an anticoagulantand were placed in plastic bags and transported to the laboratory in an ice box. In the laboratory, blood tubes were centrifuged at 3,000 rpm for 15 minutes then the serum was separated and stored at -20 °C for further analysis

Hormone Analysis: Blood serum concentrations of LH, FSH and Estradiol 17 β, were measured by ELISA technique by using commercial kits (General Biological corp).

Statistical Analysis: The mean values±SEM for concentrations of LH, FSH and Estradiol 17 β hormones in serum were computed and the hormone profile during follicular phase was tested by general lineal model procedures of SPSS. Ver 18.0.for windows.

RESULTS

The concentrations of LH, FSH and Estradiol 17 β during follicular phase are presented in Table 1 and the pattern of elevated levels of LH, FSH and estradiol on Bali Cattle shown in Figure 1.

There are significant increase (P<0.05) in mean serum LH and Estradiol 17β from the day 17 until the appearance sign of estrous. However, no changes were observed in the mean of FSH until day 20. The concentration of serum FSH remained constant from day 17 until day 20 and then decrease during estrous phases of estrous cycle. The results of this study showed that the highest concentrations of LH and Estradiol 17 β during estrous were 0.15±7.62 ng / ml and 67.75±2.06. respectively. While the maximum FSH concentrations showed on day 19 of estrous cycle with concentration were 15.73±0.21 and decreased to 7.62±0.15 ng / ml when estrus.

Table 1: Levels of LH, FSH and Estradiol 17 β on follicular phase

Estrus Cycle (Day)	Hormone concentration (ng/ml) LH	FSH	Estradiol 17β
17	5.37±0.28	14.75±0,29	51.25±2.25
18	5.95±0.19	15.50±0.41	57.00±1.42
19	6.63±0.15	15.73±0.21	62.50±2.08
20	7.07±1.15	15.08±0.15	64.00±3.37
Estrus	7.62±0.15	8.98±0.46	67.75±2.06

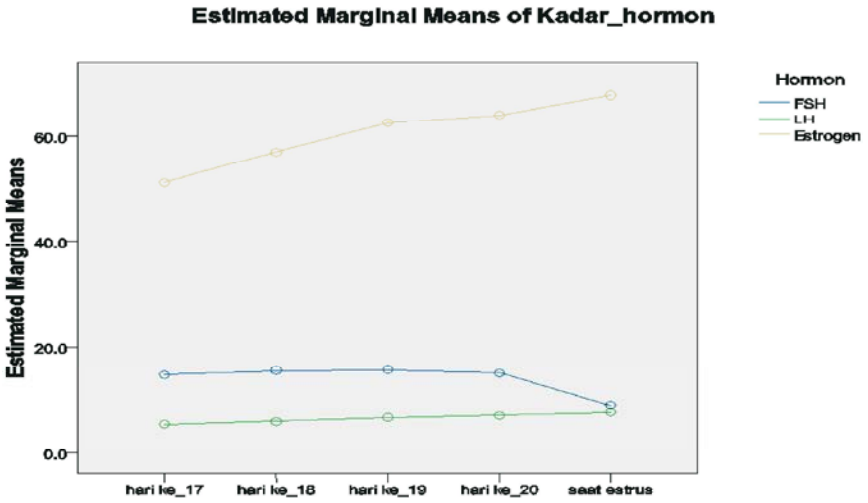

Fig. 1: LH, FSH and Estradiol 17 β Concentration

DISCUSSION

To better understand the reproductive system of cattle, the first need to recognize the main hormones produced by the cow's body to control reproduction. The reproductive system of cattle is characterized by a series of physiological events that occur in a definite order over a specific period of time, which are classified as estrous cycles.

Estrous is controlled by multiple hormones which are produced by endocrine glands.The estrus cycle in cows, divided into luteal phases and follicular phase. The luteal phase characterized when progesterone production by the corpus luteum is elevated. The follicular phase, when the corpus luteum is regressed, follicular growth, estrogen and LH production in enahnced.

In this study, mean concentration of LH and Estradiol 17 β increased during the follicular phase. The increasing concentrations of LH and Estradiol 17 β in this study were similar to the report by Peters [6]. The rise in Estradiol 17 β concentrations between days 17 and 20 of the cycle,agreement with the report by Tabatabaei *et al.* [7].

It is generally accepted that the mechanism of negative feedback due to decreasing progesterone concentrations following luteolysis, is followed by an increase in tonic LH release by pituitary, occurring as a result of increasing LH pulse frequency [8]. The pattern of elevated concentrations of LH are also reported by Kaneko *et al.* [9]. LH concentrations begin to rise at the beginning of estrous or the onset of estrous behaviour. Also, the same result was reported in Buffalo, maximum LH concentrations occurred when estrous [10].

The follicular synthesis of estradiol requires the coordinated activities of LH [11]. According to Chasombat *et al.* [12] and Evans [13], the concentrations of estradiol depending on the number of developing follicles. Increasing LH concentrations are considered to stimulate follicular oestradiol secretion. The maximum concentrations of LH and estradiol 17 β in this research is higher than in dairy cattle [14] and is lower than with Holstein cattle [7]. The pattern of elevated concentrations of LH is that LH concentrations begin to rise at the beginning of estrous or the onset of estrous behavior reached 12.2±2.8 ng / ml [9] the same was reported in Buffalo, maximum LH concentrations occurred at estrous [10].

The level of FSH during folicular phase were slight constant and decrease in estrus phase. In Thai cattle, the level of FSH concentrations fluctuated throughout the estrous cycle [15]. Contrary to this study, FSH level in Holstein cattle showed a significant increased in estrous phase [7]. Increased levels of FSH from day 15 to 19 of the estrous cycle associated with the occurrence of follicular development [10].

CONCLUSION

It is concluded that the concentration of serum LH and Estradiol 17β increased from the day 17 until the appearance sign of estrous. The concentration of serum FSH remained constant from day 17 until day 20 and then decrease during estrous phases of estrous cycle**.**

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