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The Effect of Body Condition Score on Hormonal and Vaginal Histological Changes During Estrus of Synchronized Etawah Cross Bred Does

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***Abstract*—**Eight Etawah cross bred does were divided into two groups based on *body condition score* (BCS). Group I (BSC 2, body weight 25-30 kg; n = 4), and Group II (BSC 3, body weight, 35-40 kg, n=4). All does received intravaginal controlled internal drug release devices (CIDR) for 10 days, and a prostaglandin F2α at 48 h before CIDR removal. Estrus detection was carried out using vasectomized buck. Vaginal epithelium was taken to determine estrus cycle. Blood samples were taken every 3-6 hours, started from moment of CIDR removal until the end of estrus. The results showed vaginal histological indicated estrus occurred at the hours of 25 to 60 and 30 to 70 post CIDR removal in BCS 2 and 3, respectively. Progesterone peak of BCS 2 and BCS 3 were 0.18±0.31 and 0.48±0.31 ng/mL on the hour 0 post CIDR removal. Estradiol -17ß peak of each group was 53.25±35.08 and 89.91±92.84 pg/mL at 48 post CIDR removal. LH surge only occurred on BCS 3 groups, the LH concentrations were 9.9± 9.1; 4.5± 4.0; and 18.2± 9.1 ng/mL at 45, 48 and 51 hours post CIDR removal, respectively. It was concluded that the BCS had effects on vaginal histological changes and LH surge.

***Keywords*—**Estrus synchronization, Vaginal histological changes, Progesterone, Estradiol -17ß , LH

I. Introduction

In Indonesia, goats play an important role in an income of farmer. Moreover, production of these animals as a source of animal protein to support the national program on meat self-sufficient. Etawah cross bred goat is one of potential livestocks to be developed. However, their reproduction performance is not good. Therefore, application of reproductive technologies is possible to improve their reproduction performance. High reproduction performances are essential for profit in meat goat production [1], and are determined by the number of progeny delivered in a given period of time. The reproduction performance close correlated the profile of gonadotrophine hormone. The cycle changes of these hormone is effected by body condition score. The fertility of BCS 3 does was better than BCS 2[2]. A progesterone-releasing controlled internal drug release (CIDR-B for cattle and CIDR-G for sheep and goats) treatment has been found to be effective in controlling the estrus cycle in domestic ruminant species. A routine synchronization treatment using intravaginal CIDR device for 10 days, together with a prostaglandin injection, 2 days before CIDR removal, efficiently induces and synchronizes estrus and ovulation during the breeding as well as during the non-breeding seasons in goats [3]. In the present study, The Etawah cross bred does were synchronized using CIDR implants for 10 days combined with PGF2α injection. The profile of hormone (Progesterone, Estradiol -17ß and LH) and vaginal histology during estrus were examined.

II. Material and Methods

Animals and location of research

Eight Etawah cross bred does were divided into two groups based on *body condition score* (BCS). Group I (BSC 2, body weight 25-30 kg; n = 10), and Group II (BSC 3, body weight, 35-40 kg, n=10) [4]. Before conducting the study, each doe was dewormed and submitted to a general physical examination and vaginal inspection. They were individually fed with fresh grass cubes twice daily. The concentrate consumed per doe per day varied between 500 and 800 g. Drinking water was available ad libitum. The studies were carried out at Balai Pembibitan Ternak dan Hijauan makanan Ternak (BPT-HMT) Singosari Malang, East Java and Faculty of Animal Science, University of Gadjah Mada, Yogyakarta.

Estrus synchronization

Estrus synchronization was conducted by implanting intravaginal CIDR (CIDR-SHEEP and Goat Device, 0.3 g progesterone, Pharmacia & Upjohn Pty Limited, Rydalmere NSW) during 10 days. Intramuscularly injection of 125 g (0.5 cc) dose PGF2 α (Juramet®, Jurox, Australian) was given on day 8. On day 10 the CIDR was removed.

Estrus detection and vaginal histology

The estrus responds of were detected every 4 hours for 60 hours since CIDR removal. Does were also exposed individually to the vasectomized buck, and were considered to be in estrus when allowing to be mounted by the buck. The duration of estrus was recorded at the time from when the doe showed a sign of estrus to the time when the doe rejected mounting of the buck. Vaginal epithelium smears were taken

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to determine estrus cycle of the does. The smears were stained by using Giemsa, and observed under light microscope.

Determination of hormone

Blood samples were taken every 3-6 hours, started from moment of CIDR removal until the end of estrus. The blood samples were analyzed by Elisa method using 17-α-OH Progesteron ELISA, Estradiol ELISA kit (DRG Intruments GmbH, Germany) and LH DETECT (INRA centre de tours Nouzilly, France) to determine the progesterone, estradiol -17ß and LH, respectively [5].

Statistical analysis

Data of progesteron, estradiol -17ß, LH and histology of vagina were analyzed descriptively.

III. Results

The results showed progesterone peak of BCS 2 and BCS 3 were 0.18±0.31 and 0.48±0.31 ng/mL on the hour 0 post CIDR removal. The lowest progesterone concentration was 0.07 ± 0.07 ng/mL occurred at the 51 hour post CIDR removal. Statistical analyzed showed significant differences ($P < 0.05$) on progesterone concentration between the hour of 0 and hours of 6 through 66 post CIDR removals (Figure 1).Estradiol -17ß peak of each group were 53.25±35.08 and 89.91±92.84 pg/mL occurred at 48 hours post CIDR removal or 16 hours after onset of estrus. Statistical analyzes indicated significant differences ($P< 0.05$) on estradiol at 0 hours with at 42, 54 and 66 hours after CIDR removal (Figure 2).

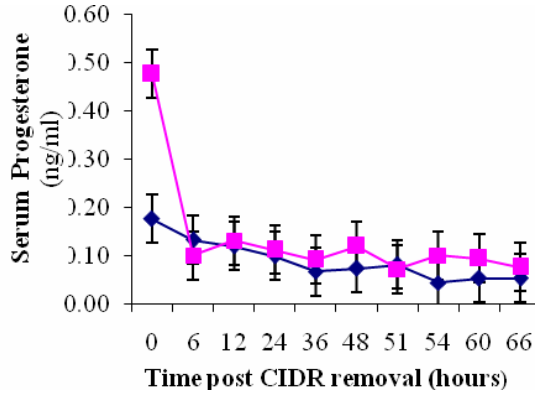

Fig. 1 Serum progesteron of synchronized Ettawah cross bred does (∀ = BCS 1 group, ■ = BCS 2 group)

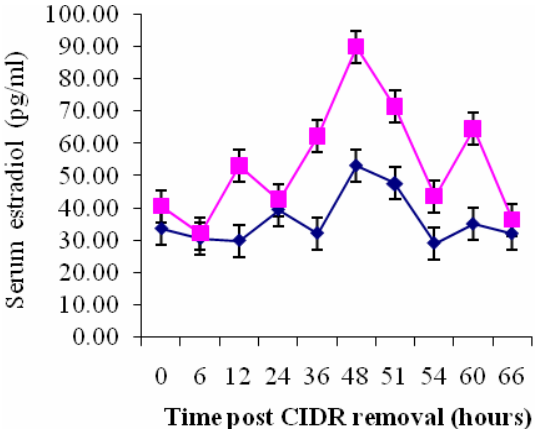

Fig. 2 Serum estradiol of synchronized Ettawah cross bred does (∀ = BCS 1 group, ■ = BCS 2 group)

LH concentrations were 9.9± 9.1; 4.5± 4.0; and 18.2± 9.1 ng/mL at the hours of 45, 48 and 51 post CIDR removal, respectively. LH surge only occurred on BCS 3 groups. the LH concentrations were 9.9± 9.1; 4.5± 4.0; and 18.2± 9.1 ng/mL at 45, 48 and 51 hours post CIDR removal, respectively (Figure 3). There were significant differences ($P< 0.05$) on concentration of LH at hours 0, 6, 27, 42, 48, 54, 60 with at 51 hout after CIDR removed.

Vaginal histological indicated estrus occurred at the hours of 25 to 60 and 30 to 70 post CIDR removals in both BCS 2 and 3 groups. Vaginal smear during estrus is characterized by superficial cells that are keratinized, largely anucleate, and have angular, folded cell margins (Figure 4).

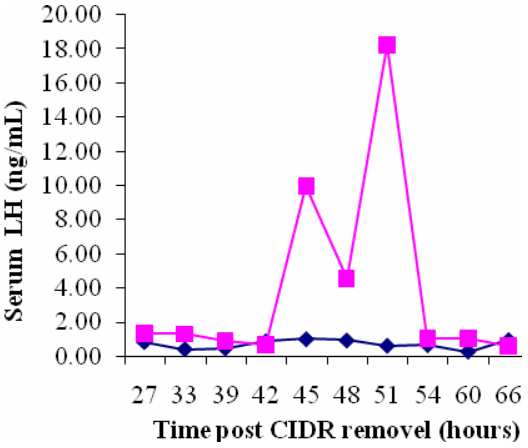

Fig. 3 Serum LH of synchronized Ettawah cross bred does (∀ = BCS 1 group, ■ = BCS 2 group)

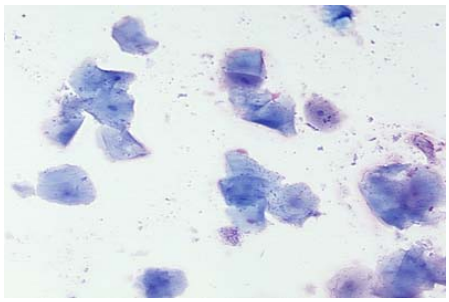

Fig. 4 Vaginal smear of the of synchronized Ettawah cross bred does during estrus (Giemsa stain)

IV. Discussion

The CIDR did not fall off, and there were no does exhibited estrus while being treated with progestagen, indicating that the 0.3 g intravaginal CIDR was adequate to suppress estrus activity and confirming that progestagen has the ability to inhibit estrus in goats [6], via the negative feedback. In the present study PGF2α was used for the elimination of the remnant corpora lutea, influencing the onset of estrus [7].The crucial factor in the continued development of the ovulatory follicle is its ability to synthesize oestradiol [8]. Previous researcher showed a model for steroidogenesis in the bovine, which involves the coordinated actions of FSH and LH. The progestins pregnenolone and progesterone are precursors of synthesis of androstenedione in theca cells. Androgens then cross the basal membrane of the follicle. In the granulosa cells androgens are metabolized to oestradiol 17-β. Stimulated by LH, the granulosa cells secrete pregnenolone which can be converted to androgens by the theca cells [9].Inhibin sets the overall level of negative feedback while oestradiol is responsible for day-today fluctuations in the concentration of FSH which determines the emergence of follicular waves [10]. Three days after emergence the follicle reaches 5 mm in diameter and stops producing oestradiol, which signifies the end of its functional dominance. In the present study the peak of estrogen occurred at the hours 48 post CIDR removal, along with the preceding study that reported estrogen peak close correlated with the maximum size of pre ovulatory follicle [11].The LH surge was recorded at the hours of 41-51 after CIDR removal. In agreement with previous study [12], the interval from CIDR removal to estrus was found to be the most critical and, hence, the factor predicting the occurrence of the LH surge and ovulation. CIDR removal and treatment with PGF2a indirectly initiated the endogenous GnRH peak which resulted in the LH surge. Previous studies reported similar results, although in their study, ovulation occurred between 36 and 48 h Cameron et al. [13]. These results indicate that the estrus synchronization protocols may be useful when precise timing of ovulation is required. By improving the synchrony of the LH surge and ovulation, it will facilitate the implementation of fixed-time breeding and AI in Etawa crossbred goats. It is also useful to consider the effect of AI at a fixed time after CIDR treatment. Between females, a natural variability in the time of ovulation was reported [14].In the present study, CIDR-G treatment plus PGF2α was able to induce estrus behaviour in both groups. However, in the low BCS 2 the estrus behavior does not induce ovulation. The failure of ovulation was clearly associated with absence of a preovulatory surge of gonadotrophins [15].The present results support our hypothesis that in low BCS even though have good estrus response but no LH surge. This result in agreement with previous report in cattle indicate that CIDR-B treatment have no beneficial effect regarding the induction of ovulation in low BCS [16].Histology of vaginal smear showed the characteristics of estrus at the hour hours of 25 to 60 and 30 to 70 post CIDR removal in BCS 2 and 3, respectively. This finding relevance with the appearance of estrus sign during the observation, and reinforced the results of previous studies [17]. Finally, it was concluded that the BCS had an effect on LH surge, and LH surge associated with ovulation and fertility.

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