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THE APPLICATION OF EQUINE CHORIONIC GONADOTROPIN (*e*CG) AND PROSTAGLANDIN F2α TO INCREASE THE RATE OF PREGNANCY IN BALI CATTLE AT BULELENG, BALI

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Abstract

This research objective was to increase the rate of pregnancy in Bali cattle using *e*CG and PGF2 at Buleleng, Bali. The experimental animal used in this study comprised of 18 female Bali cattles, with normal estrus cycle and 18 months old of age. The Bali cattles are all healthy with a body score of at least 2. The Control Group was injected with PGF2α 25 mg intramuscular twice on day 0 and day 11. Treatment Group 1 was injected with PGF2α 25 mg and *e*CG dosage of 400 IU intramuscular. Treatment Group 2 was injected with PGF2α 25 mg and *e*CG dosage of 600 IU intramuscular. On day 14, the female Bali cattle both Treatment Group 1 and 2 respectively showed signs of estrus. Few hours' later artificial insemination was performed on the same day. On Day 30, all 18 female Bali cattle were checked for pregnancy using Ultrasonography (USG). The female Bali cattle were assumed to be pregnant because there were signs of enlargement in cornua uteri unilaterally. Therefore, this indicates that there was no significant difference between Treatment Group 1 and Treatment Group 2 in pregnancy rate. The results from Control Group showed 4 pregnant and 2 not-pregnant; Treatment Group 1 showed 6 pregnant; Treatment Group 2 showed 6 pregnant. Based on the results, Control Group showed 88% of the Bali cattle were pregnant. Meanwhile, Treatment Group 1 and Treatment Group 2 showed 100% pregnant from the total 18 Bali cattle. Therefore, this research showed a positive feedback consistent with the objective.

Keywords: Bali Cattle, *e*CG, PGF2 and The Rate of Pregnancy.

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1. Introduction

The reproductive potential of a species has long been identify as the most important source of commercial beef production. Large animal study has been a major engine of discovery in reproductive biology. In the early days of gonadotropin study it was prove that transplantation of anterior pituitary tissue from domestic species into laboratory animals stimulate indicative of early development puberty and other reproductive consequences [1].

Bali cattle have primarily been used for meat various purposes in small scale village farming and are considered to be among the most important livestock in these highly populated regions of Indonesia. A total of 232 cows from 32 farmers in Buleleng, Bali provience have a highly fertility quality, being resistant to many disease and having a very good appetite in food consumption. It is thus, of crucial importance to maintain efficient breeding of healthy and productive Bali cattle. Increased knowledge of the hormone combination *e*CG and PGF2α is thus importance also for understanding the rate of pregnancy using ultrasonography (usg).

Equine Chorionic Gonadotropin the gonadotropic hormone produced in the chorion of pregnant mares is known as *e*CG. Previously referred as pregnant mare's serum gonadotropin (PMSG), the hormone is commonly used in concert with progestogen to induce ovulation in livestock prior to artificial insemination. Pregnant mares secrete the gonadotropin hormone from their endometrial cups between 40 and 130 days into their pregnancy, and once collected, it has been used to artificially induce estrus in female swine, cattle, goats, and sheep. Despite being less pure than pituitary extracts from sheep, goats or swine, *e*CG tends to be used because of its longer circulatory half-life. In equids, *e*CG has only LH like activity, but in ruminants it has activity like both follicle-stimulating hormone (FSH) and luteinizing hormone (LH) [2, 3].

However, the productivity capability of beef cattle in the country has not given good results. One of the ways to overcome the problems that hinder the growth in livestock population is increase estrus, fertilization techniques and artificial insemination with the aim to improve productivity [4].

Hormone prostaglandin F2-alfa is injected intramuscularly to prompt estrus in cattle as an alternative technique. Moreover, hormone PGF2α regress corpus luteum. Therefore, the level of progesterone hormone reduces causing the hypothalamus to secrete *Gonadotropin Releasing Hormone* (GnRH) to revitalizing the anterior pituitary. GnRH impacting on rising FSH and LH which will stimulates the follicle growth and estrogen production. Lastly, administration of the hormone causes symptoms of estrus [5].

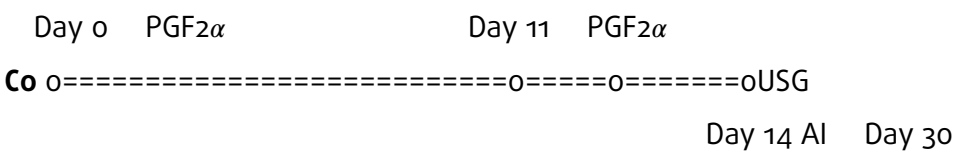
Pregnant Mare Serum Gonadotropin (PMSG) supports the development of follicle in ovarium, such as FSH [6]. A few follicles for ovulation have luteinizing because PMSG also function as LH like activity. The life expectancy of the *e*CG producing cells appears firm, as ectopically erected chorionic girdle cells pre-revolutionary to non-pregnant mares endure and sustain *e*CG secretion for 75-100 days, similar to their persistence in the uterus [7]. From the background above, therefore a study will be carry out entitled the application on equine chorionic gonadotropin (*e*CG) freeze dry and prostaglandin F2α to increase the rate of pregnancy in Bali cattle.

2. Materials and Methods

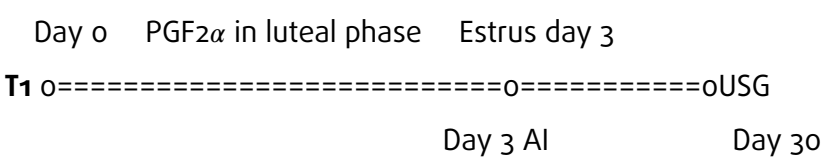
The experimental animal use in the study is 18 female Bali cattles. The Bali cattle use in this study has normal estrus cycle and they are 18 months old. Moreover, the Bali cattles use in this study is healthy with body score of at least 2. Materials used in the study are equine chorionic gonadotropin (*e*CG) hormone form Intervet Holland IM named as Folligon with different dose and PGF2α 25 mg. In the other hand, equipment that used in this research is obstetric rubbers gloves, plastics gloves, syringe, cotton, tissue, vaseline, alcohol, IB gun, local made artificial vagina, and ultrasonography (USG).

2.1. Injecting implementation table

The table of *e*CG freeze dry and PGF2α injecting in Bali cattle:



T1 and T2 detected in luteal phase by usg:



Day 0 *e*CG folligon 400 IU

Day 0 PGF2α in luteal phase Estrus day 3

T2 0==========0==========0USG

Day 3 AI Day 30

Day 0 *e*CG folligon 600 IU

2.2. Artificial insemination and detection of pregnancy

Firstly, management farming animals is carrying out including handling and arranging into their treatment groups. Control group is injected PGF2α 25 mg twice, day 0 and again day 11. Besides, treatment group 1 on day 0 is injected *e*CG 400 IU and PGF2α 25 mg intramuscularly. Whereas, treatment group 2 is injected *e*CG 600 IU and PGF2α 25 mg intramuscularly. Later, on day three estrus will occur. Sign of estrus on Bali cattle are vulva turns red, slightly swallowed labia and there is some slimy fluid discharge from vagina.

A month after artificial insemination, all the cattle is examined for pregnancy test using ultrasonography. Before proceeding, for pregnancy test prepares all things. The Bali cattle are arranged according to their treatment groups handled caution. Their standing position while now inserts transducer from ultrasonography in rectum slowly into uterus. Meanwhile, observe the ultrasonography screen for any different, move transducer carefully. If pregnancy occurs, amnion fluid is seen in black color and inside the amnion fluid there is fetus. It is hard to detect clearly because the images will pass in few seconds.

3. Results

The result of pregnancy detection via ultrasonography is shown on the table below:

Treatment	Pregnant	Not-pregnant	Total
Control Group (CG): PGF2α 25 mg 2 times	4	2	6
Treatment Group 1 (TG 1): PGF2α 25 mg + eCG 400 IU	6	-	6
Treatment Group 2 (TG 2): PGF2α 25 mg + eCG 600 IU	6	-	6

4. Discussion

Use of *e*CG manifest advantageous in increasing the pregnancy rate for fixed time embryo transfer, independent of the cases employed for synchronization. Perhaps the most widespread use of *e*CG has been exploitation of its FSH activity in induction of estrus in immature animals and luteinizing hormone. In addition, *e*CG may induce supplementary ovulations as well as support the second wave of corpora lutea [8].

Prostaglandins have been used successfully to synchronize oestrus in groups of heifers and cattle. This technique has application in heifers, beef cows and dairy cattle where oestrus detection is frequently difficult, thus enabling the routine use of artificial insemination at a predetermined time. The availability of artificial insemination in such situations allows the use of semen form genetically superior sires and nonetheless can result in the improved genetic potential of the offspring [9].

The result of pregnancy in Bali cattle from this research using ultrasound control group with injection PGF2α 25 mg twice shows 4 pregnant and 2 not-pregnant Bali cattle while treatment group 1 PGF2α 25 mg and *e*CG dosage of 400 IU reveal 6 pregnant Bali cattle. However, the treatment group 1 and treatment group 2 indicates not significant differences because treatment group 2 PGF2α 25 mg and *e*CG dosage of 600 IU shows 6 pregnant Bali cattle too. Variations in the incidence of estrus is most likely a reflection of differences in the ovarian follicles growth phase so that when luteolysis after injection PGF2α ovulatory follicles that are not uniform maturity, ultimately could lead to ovulation at different timing according to, [4] stated about 48-72 hours.

From the study, control group is injected with PGF2α 25 mg twice on day 0 and day 11 reveals 4 pregnant and 2 not-pregnant. Synchronization process using prostaglandin (PGF2α) preparations will cause regression of CL due to its luteolitic ability. On natural manifestations, prostaglandin (PGF2α) released by uterus of not pregnant animals on day 16^{th} to the 18^{th} of the cycle which serves to destroy the CL. Occurrence of oestrus caused by administration PGF2α result in lysis of CL by mechanism vasoconstriction PGF2α so that blood flow to the CL decreased drastically, as a result, levels of progesterone produced by CL decreased. Later, the level of progesterone decrease will stimulate the pituitary anterior release of FSH and LH, which is responsible for the process of folliculogenesis and ovulation. Lastly, the growth and maturation of follicles which produce estrogen, indicate symptoms of heat. The hormone estrogen system works to improve the sensitivity of female sex organs are characterized by changes in the vulva and transparent discharge [10].

From the research, treatment group 1 is injected with PGF2α 25 mg and eCG 400 IU shows 6 Bali cattle pregnant. On the other hand, treatment group 2 reveals same result too. The injection of eCG was accompanied by an increase in the percentage of oestrus detected. Oestradiol is the hormone responsible for oestrus behaviours with passive mounting activity being positively correlated with increased concentrations. It appears that the injection of eCG is accompanied by greater follicular growth, and hence an increase in the production of oestradiol encouraging better expression of heat [11].

The hypothalamus is responsible for the control of release of gonadotrophins from the anterior pituitary by the action of specific releasing and inhibitory substances. These are secreted by the hypothalamic neurons and are carried from the median eminence of the hypothalamus by the hypothalamic-hypophyseal portal system. In the domestic species the secretion of FSH and LH is controlled by two functionally separate systems. These are the tonic episodic system, which is responsible for the continuous basal secretion of gonadotropin and stimulates the growth of both germinal and endocrine components of the ovary, and the surge system which controls the short-lived massive secretion of gonadotropin, particularly LH, responsible for ovulation [12].

Reproduction of female cattle is one of the biggest factors that affect the efficiency of cow's productivity is determined by the level of fertility, pregnancy and birth (Mwansa *et al.,* . Thus, lower the level of estrus conception ultimately results in lower fertilization. The pregnancy examination was done on day 30 to all the groups; control group 6 female Bali cattle injected with PGF2α 25 mg intramuscular twice on day 0 and day 11 result shown 4 pregnant and 2 not-pregnant; Treatment Group 1 (TG1): 6 female Bali cattle injected with PGF2α 25 mg and *e*CG dosage of 400 IU intramuscular reveals all is pregnant; Treatment Group 2 (TG2): 6 female Bali cattle injected with PGF2α 25 mg and *e*CG dosage of 600 IU intramuscular shows 6 is pregnant. Hence, there is not significant different between treatment group 1 and treatment group 2.

The pregnancy rate in artificial insemination technology is determined by the detection of estrus and the right time for insemination. Lower pregnancy rate in control group is likely due to low progesterone levels during the luteal phase. The possibility of an early death of the embryo, which is a normal process of natural selection, often occur in pigs with the number of piglets in one pregnancy. One of the cause's early embryonic deaths is caused by a deficiency of progesterone. According to, Madyawati, 1994 cattle are experiencing heat 5-10% but not with ovulation, resulting in low levels of pregnancy at first estrus. The low pregnancy rate is likely due to abnormalities of

fertilization, not every ovulation always followed by fertilization and not all fertilization produces by all normal pregnancy.

Lastly, ultrasound examination is the method of diagnosis of pregnancy, which can be done in large livestock for example cows, buffaloes and horses. Procedure, the transducer is inserted into rectum to view the uterus and ovaries. According to, descriptive analysis of the entire data of the study pregnancy detection in Bali cattle via ultrasonography showed 88% pregnant as many as 16 Bali cattle which indicate positive results in USG screen from 18 Bali cattle. Therefore, injection with *e*CG dosage of 400 IU intramuscular has shown the best response toward the rate of pregnancy in Bali cattle compared *e*CG dosage of 600 IU.

5. Conclusion

Based on the results of this research, can be concluded that the *e*CG and PGF2α combination can increase the rate of pregnancy in Bali cattle. Injection of *e*CG dosage of 400 IU and 600 IU intramuscular has shown no significant in cattle. Therefore, using 400 IU dosage of *e*CG is evaluated to increase the rate of pregnancy in Bali cattle.

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