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Effects of Progesterone on some fertility performances in cattle

A Thesis Presented By

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List of Abbreviation

CL	corpus luteum
FSH	Follicle stimulating hormone
LH	Luteinizing hormone
GnRH	gonadotropin releasing hormone
$PGF_{2\alpha}$	Prostaglandin $F_{2\alpha}$
P4	Progesterone
CIDR	**C**ontrolled **I**nternal **D**rug **R**elease
PRID	Progesterone-Releasing Intravaginal Device
BW	Body weight
COD	cystic ovarian disease
COFs	Cystic ovarian follicles
CSF	Cerebrospinal fluid
hCG	Human chorionic gonadotropin
AI	Artificial insemination
Synch	Synchronization
MGA	Melganosterol Acetate
IM	Intramuscular injection
IV	Intravenous injection
USA	United States of America
ES	Estrus Synchronization
AIP	Acute intermittent porphyria
mg/kg	Milligram per kilogram
g	Gram
µg	microgram
ng	nanogram
ml	Milliliter
SMB	Synchro-mate-B
d	Day
IVF	In vitro fertilization
PR	progesterone receptor
FDA	Food Safety Modernization Act

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Summary

Reproductive failure is a major source of economic loss in the beef industry. The majority of this loss occurs because cows do not become pregnant during a defined breeding season. Therefore, the goal of any breeding program is to maximize the number of females that become pregnant. This means that fertility plays a major role in the success of any breeding program. There are several methods by which fertility can be measured: 1) conception rates (number of animals pregnant/number of animals inseminated), 2) pregnancy rates (number of animals pregnant/number of animals available for breeding), and 3) calving rates (number of animals calved/number of animals available for breeding)**.**

Our study conducted on 40 dairy cattle at Dakahlia Governorate (3.5-5 years old) to study the effect of progesterone device insertion in dairy cattle and its effect in fertility.

Results of this study were in line with our expectations and paralleled the findings of other researchers. As expected, the insertion of a progesterone device increased circulating serum progesterone levels to a level higher than mean progesterone concentrations during the pre-treatment cycle.

The effect of progesterone device insertion on serum progesterone:

The present study mirrored a significant increase in progesterone level after treatment with progesterone device compared to control group in 3rd, 7th, and 9th day respectively, a significant increase in progesterone concentration in implanted cow's progesterone device might be due to

exogenous progesterone and uniform and sustained release of hormone to the vascular system. Hence, the rise of progesterone on the 7th day is obvious due to the effect of progesterone device.

The effect of progesterone device insertion on serum FSH & LH:

There is significant increase in FSH level after treatment with progesterone device in 3rd and 7th day respectively compared to control group.

Also our study showed a significant increase in LH level after treatment with progesterone device in 9th day compared to control group**.**

After progesterone device insertion there is an increased circulatory concentration of progesterone exerted negative feedback on hypothalamus and anterior pituitary. Hence, favoring GnRH, FSH and LH storage. Following termination of progesterone therapy (after CIDR withdrawal by the day 7 after insertion), the rapid drop in circulatory concentration of Progesterone promotes the release of GnRH as the negative feedback of Progesterone was abolished, followed by FSH an LH release with subsequent resumption of ovarian cyclicity. Also, the increased circulatory concentration of progesterone has sensitized the hypothalamic-pituitary system. Likewise, progesterone increased hypothalamus sensitivity to estrogen with subsequent increase in the intensity of heat**.**

The effect of progesterone device insertion on conception rate:

The present study showed that the conception rate after treatment with progesterone device was 85.71 %for cystic ovary treated group , 58.3 % for smooth inactive ovary treated group , 75% for persist corpus luteum treated group and total conception rate was 73.3%.

In present study 15 dairy cows reported to have cystic ovary when examined by ultrasonography**.** Animals were received progesterone for 7 days and injected with prostaglandin on the 7th day, at the end of treatment 14 of 15 cows show estrus and only 12 of 14 cows become pregnant with conception rate 85.7%**.**

Positive ovarian response, estrus and pregnancy occurrence with this high conception rate proved that the treatment with progesterone device is an effective treatment and the mechanism by which the cows recovers from COD after treatment can be explained by the following use of progesterone device leads to increase the circulating progesterone to levels comparable to those observed during the normal luteal phase this lead to decrease LH by negative feedback mechanism on hypothalamus and pituitary , thus LH is insufficient to maintain cyst lead to atresia of cystic follicles. Removing the inhibitory effects of the cystic follicles results in the emergence of a new follicular wave . Moreover, progesterone device is able to restore the ability of the hypothalamo-pituitary axis to generate an LH surge in response to an increase in circulating estradiol and release of the ovum by the newly developed dominant follicle which induced by removal of progesterone device.

In present study 15 dairy cows reported to have smooth inactive ovary when examined by ultrasonography. Animals were received progesterone for 7 days with prostaglandin injection at the 6th day, at the end of treatment 12 of 15 cows show estrus and only 7of 12 cows become pregnant with conception rate 58.3%**.**

These results can be explained by increase progesterone level after progesterone device insertion intravaginal as it absorbed from vagina to the circulation and as a result progesterone level is increased enough and exerts negative feedback effect on the secretion of GnRH from the hypothalamus and releasing FSH and LH from the anterior pituitary. Thus, FSH and LH secretion is stopped and these hormones are reserved in the anterior pituitary. With the removal of CIDR vaginal hormone progesterone is reduced within 6 hours and reaches to the concentration of the base and as a consequence the negative feedback effect is removed, Therefore GnRH is secreted and release of LH and FSH begins that leads to follicular growth and formation of dominant follicles.

In the present study 10 dairy cows reported to have persist corpus luteum when examined by ultrasonography**.** Animals were received progesterone for 7 days with prostaglandin injection at the 6^{th} day, at the end of treatment 4of 10 cows showed estrus and only 3 of 4 cows become pregnant with conception rate 75%**.**

The pathogenesis of retained CL is complicated and not yet fully understood but it was believed that the final pathway involves an altered uterine environment that results in diminished secretion of luteolytic prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$). This condition is characterized by the presence of a large CL on the ovary, failure to return to heat, a persistently high level of progesterone in blood .Treatment of persistent CL requires the injection of $PGF_{2\alpha}$ alone or in combination with GnRH 48 to 56 hours later to kick start the oestrus cycle,

It was obvious that the conception rate of cystic ovary group was higher than that of smooth inactive group and persist corpus luteum group and conception rate of persist corps luteum group was higher than that of smooth inactive group**.** This difference may be attributed to difference in number of treated animals and its body condition score**.**