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Clinical Applications of Cloprostenol Sodium in Treating Several Reproductive Disorders in Iraqi Cows

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Abstract:

Background: Cloprostenol sodium is a synthetic analogue of prostaglandin F2α (PGF2α). It is a potent luteolytic agent; that within hours of administration, it causes the corpus luteum to stop production of progesterone, and to reduce in size over several days. The uterus is composed of layers of smooth muscle, and systemic administration of PGF2α appears to aid in uterine expulsion of fluid and contaminants, helping to improve the uterine environment, thus leading to increases in subsequent pregnancy rates.

This study explores the efficacy of cloprostenol sodium in treating many reproductive disorders in cattle. A total twenty five multiparous cows and in second to fifth parturition with diverse reproductive disorders allocated into three groups, first group consisting of five cows suffering luteal cyst, the second group consisting of sixteen cows suffering retained placenta and third group consisting of four cows had pyometra. All these groups received cloprostenol sodium by intramuscular injection, and the animals are recovered and came to estrus and inseminated artificially after variable times of treatment and according to specific reproductive disorder.

Aims: : the aims of the study were to assess the efficacy of cloprostenol sodium (synthetic analogue of PGF2α) in treating several reproductive disorders in Iraqi cows.

Results: the number of cows experiencing ovarian luteal cyst and treated by cloprostenol sodium were five. All of them recovered and showed signs of estrus and insemination between 32–36 days, with a range of 34±0.37 days. Cows experienced retained placenta in this table was 16 and have

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received cloprostenol sodium. Ten cows recovered after 72-96 hours and came to estrus and inseminated within a range 54-63 (58.50±2.19) days after treatment. Six animals did not respond to cloprostenol sodium treatment, manual removal of retained fetal membranes, intrauterine oxytetracycline tablet insertion, and intramuscular injection of 20% oxytetracycline. These cows displayed signs of estrus, fully recovered, and became inseminated 72 days after treatment. 4 cows had pyometra were treated with cloprostenol sodium and three times within seven days of each other with intrauterine oxytetracycline. After receiving therapy, these cows recovered well from estrus and inseminated in 54–58 (56±0.32) days.

Conclusions: It can be concluded that the cloprostenol sodium was very effective and had potential efficacy in treating the reproductive disorders involved in the study if it is employed in high dose or concentration.

Keyword: Cloprostenol sodium, Reproductive Disorders, cows

Introduction :

Cloprostenol sodium is a synthetic analogue of prostaglandin F2α (PGF2α). It is a potent luteolytic agent; that within hours of administration, it causes the corpus luteum to stop production of progesterone, and to reduce in size over several days. Cloprostenol sodium and other synthetic analogues of prostaglandin F2α (PGF2α), are lipid compound derived from the arachidonic acid, participates in numerous body functions including smooth muscle contraction. The uterus is composed of layers of smooth muscle, and systemic administration of PGF2α at 5–7 days postpartum appears to aid in uterine expulsion of fluid and contaminants, helping to improve the postpartum uterine environment, thus leading to increases in subsequent pregnancy rates (Leblanc, 2008; Hendricks, et.al, 2006). PGF2α also causes luteolysis of a responsive CL. Lysis of the CL leads to decreased concentrations of blood progesterone, inducing estrus 2-5 days following its administration. The subsequent estrus cycle is characterized by increased estrogen and myometrium contraction (Paisley, et.al, 1986; Heuwieser, et.al, 2000; Steffan, et.al, 1984). The benefits of PGF2α are due to induction of estrus caused by the lysis of a functional CL on the ovary (Kasimanickam, et.al, 2005). The ensuing estrus promotes uterine contractions that physically expel uterine bacterial contamination and improves the estrogen-mediated uterine defense mechanisms (Kasimanickam, et.al, 2005). PGF2α has been used to treat many reproductive disorders like retained of placenta, ovarian luteal cyst and pyometra due its role in regression of corpus luteum, and its ability in induce contractions of myometrium (Tucho, 2017; Szenci, 2009; Stevens, et.al, 1995).

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Materials and Methods:

This study was conducted in the college of Veterinary Medicine in Diyala province in the period extends from 1/1/2024 until 1/1/2025 and included twenty five multiparous and in second to fifth parturition cows with diverse reproductive disorders that came to the College of Veterinary Medicine's farm and numerous veterinary clinics for treatment. In order to determine the type of reproductive illness, a rectal palpation was performed on and then after, these cows were allocated into three groups: first group (n= 5) cows were suffered luteal cyst and treated with 600 micrograms (µg) of Alfaglandin (solution contains 250 micrograms cloprostenol sodium (alfasan WOERDEN-HOLLAND) by intramuscular injection for one time.

The second group, which includes 16 cows with retained placentas, were treated with 600 µg of Alfaglandin once. Ten of the cows responded to the treatment, while the other six cows did not. They were treated by manually removing the retained placenta and injecting five oxytetracycline tablets (each tablet contains 500 miligrams of oxytetracycline HCL, ALSHARK Veterinary Products, Syria) intrauterine, as well as Vetasterol (an injectable oily solution, each ml contains 2 miligrams of Oestradiol Benzoate (Base) Aburaihan Pharma Co., Iran), was injected by intramuscular with a dose 4miligrams, and oxytetracycline (20%) (4grams) (Imoly 20% (solution, each ml containing 200 mg oxytetracyclin, Intracin Co. LTD, India) (20 ml) intramuscularly for one time. A single intramuscular injection of 600 µg of Alfaglandin and an intrauterine therapy of 10% oxytetracycline (100 mg/ml Oxytetracycline (clorihidrate)) were administered to the third group (n=4) of cows that had pyometra. LABORATORIES MICROSULES URUGUAY S.A. Three times, separated by seven days, two grams (20 ml) of solution containing oxytetracycline were diluted by thirty milliliters of normal saline (sodium chloride 0.9% w/v, each 100 milliliters includes sodium chloride USP 0.9 gm, PIONEER for pharmaceuticals industries, Iraq).

Statistical Analysis

SAS (2018), the Statistical Analysis System, is a tool that indicates how different factors affect study parameters. To indicate the comparison between the treated groups in the study, the chi-square test was employed (10).

Results:

Table (1) shows the number of cows experiencing ovarian luteal cyst, which were five cows (20%)(Group 1). Out of all the instances that were part of the study, all of them recovered and showed signs of estrus and insemination between 32–36 days, with a range of 34±0.37 days, after receiving a dose of 600 mcg of cloprostenol sodium. The cows experienced retained placenta in this table was 16(64%) (Group 2) and have received cloprostenol sodium for one time. Ten cows recovered after 72-96 hours and came to estrus and inseminated within a range 54-63(58.50±2.19) days after treatment. Six animals did not respond to cloprostenol sodium treatment, manual removal of retained fetal membranes, intrauterine oxytetracycline tablet insertion, or intramuscular injection of 20% oxytetracycline. These cows displayed signs of estrus, fully recovered, and became inseminated 72 days after treatment.

Table (1) shows that 4 (16%) cows with pyometra (Group 3) were treated once with cloprostenol sodium and three times within seven days of each other with 2 grams of intrauterine oxytetracycline

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Pages: 68-75

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(10%). After receiving therapy, these cows recovered well from estrus and inseminated in 54–58 (56±0.32) days.

Table 1: Comparison among difference groups in terms of Time of onset of estrus

Groups	NO.	Treatment (no.)	Time of onset of estrus(days)
Group 1	5 (20.00%) b	Cloprostenol Sodium	32-36 (34.00 ±0.37) c
Group 2	16 (64.00%) a	Cloprostenol Sodium(10)	54-63 (58.50 ±2.19) b
		Manual remove+ Oxytetracycline + estradiol (6)	72 (72.00 ±0.00) a
Group 3	4 (16.00%) b	Cloprostenol Sodium + Oxytetracycline	54- 58 (56.00 ±0.32) b
P-value	0. 0001 **	---	0.0001 **
Means having with the different letters in same column differed significantly. ** (P≤0.01).			

Discussion:

A synthetic prostaglandin analogue that shares structural similarities with prostaglandin F2α (PGF2α) is cloprostenol. With a dosage of just 500 micrograms, this powerful luteolytic agent causes the corpus luteum to morphologically and functionally regress (luteolysis), which is followed by a return to estrus and regular ovulation (Wanamaker and Massey,2004; Brick, 2011). Therefore, it is used to treat reproductive disorders associated with persistent luteal tissue in cows like pyometra and ovarian luteal cyst (Andrews, et.al, 2004; Hafez and Hafez, 2000). These characteristics enables the theriogenologists to employ it as a hormonal drug to treat the former cases.

The results showed in table (1) related to the cases of cows experiencing ovarian luteal cyst and treated by cloprostenol sodium revealed and confirmed a fact that the prostaglandinF2α and its analogues like cloprostenol sodium are effective in treating this reproductive disorder in cows (Andrews, et.al, 2004;Noakes, et.al, 2009; Youngquist and Threlfall, 2007). The recommended dose of cloprostinol sodium in many previous studies was five hundred micrograms; while the dose of the drug in the present study was six hundred micrograms, which may lead to this high recovery of the ovarian luteal cyst cases. Many studies showed that the higher dose of hormone might enhance the response to the hormonal treatment, in comparison with low dose of the specific hormone (Brick,

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Pages: 68-75

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2011; Kasimanickam, et.al, 2005; Jeengar, et.al, 2014). The return to estrus of treated cows that suffered ovarian luteal cyst was 34 days post treatment and this assists the effectiveness of cloprostinol sodium as a drug of choice in treating of ovarian luteal cyst.

The findings in the table (1) associated with treatment of cows suffered retained placenta by cloprostenol sodium confirmed the efficacy of cloprostenol sodium as a hormonal therapy for retained placenta in account of uterine inertia, and its function in facilitating the expulsion of retained fetal membranes and uterine contractions was identified (Tucho, 2017). Six cows did not respond to cloprostenol sodium treatment, and after the retained placenta manually removed using intrauterine oxytetracycline tablets and an intramuscular injection of 20% oxytetracycline, these cows displayed signs of estrus, fully recovered, and became inseminated 72 days after treatment. The treatment of retained placentas by manual removal is contentious; many theriogenologists did not like this approach because of the negative effects of manual removal on uterine tissue and the weakened uterine defense mechanism (Noakes, et.al, 2009; Jeengar, et.al, 2014). However, it is uncomfortable to see the fetal membranes hanging from the vulva, and it is better to remove them by hand (Andrews, et.al, 2004; Bolinder, et.al, 1988; Drillich, et.al, 2005). The type of treatment of retained placenta by manual removal in comparison with the hormonal therapy by cloprostenol may lead to the delayed return of estrus in the treated cows and this may belong to the detrimental effect of the case on the genitalia which may the genitalia need a long time until the genital tissue recovered and being capable to resume its functional activity (Ali, et.al, 2024).

The results related to cows have pyometra and treated with cloprostenol sodium are in agreement with many previous studies indicated that the synthetic analogue of PGF2α (cloprostenol sodium) has a good efficacy as a hormonal therapy in treating pyometra, and its action related to the effectivness of this drug hormone in luteolyzing a corpus luteum accompanied pyometra and expel of purulent discharge present in the uterine lumen (Szenci, 2009; Stevens, et.al, 1995).

The intrauterine infusion of oxytetracycline is effective against the causative agent of the pyometra, which indicated that this type of treatment method has higher efficacy in treating this disorder (Drillich, et.al, 2006b; Kacar and Kaya, 2014). Return to estrus in this group of cows which recovered from pyometra appears to be long and lasts nearly two months, and this may attributed to the noticeable effect of the uterine inflammation on the uterine tissue and ovaries that leading to the relative long time being elapsed to the genital tissue being recovered and resume normal reproductive effectiveness (Tucho, 2017; Youngquist and Threlfall, 2007;Mohammed, 2024).

Conclusions:

It can be concluded that the cloprostenol sodium was very effective and had potential efficacy in treating the reproductive disorders involved in the study if it is employed in high dose or concentration.

Recommendations:

We recommend employing cloprostenol sodium as synthetic analogue of PGF2α in highly dose or concentration to treat many reproductive disorders in cows.

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Conflict of interest

The authors declare no conflict of interest.

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Authors contribution

All authors contributed effectively in this research, *Kudhair N.Y.*designed and achieved experiments and wrote the paper; *Abdulameer S.J. analysed* the data; *Talib N.T. and Ibrahim A.K.* supervised the project and revised the manuscript.

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https://djvs.uodiyala.edu.iq
Pages: 68-75

Diyala Journal for Veterinary Sciences
Vol. 3 No.2 June (2025)
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