Egyptian J. Anim. Prod. (2022) 59(3):97-109

IMPACT OF OXYTETRACYCLINE AND PROSTAGLANDIN F2α DURING PUERPERIUM PERIOD ON UTERINE RECOVERY AND POST-PARTURIENT REPRODUCTIVE CHARACTERISTICS IN BALADI COWS

A.I. Damarany

Department of Animal and Poultry Production, Faculty of Agriculture and Natural Resources, Aswan University, Egypt

Submitted: 9/8/2022; Accepted: 3/10/2022; Published:14/11/2022

SUMMARY

This study aims to determine the influence of oxytetracycline and prostaglandin F2α during the puerperium period, on uterine recovery and post-parturient reproductive characteristics in Baladi cows. Twenty Baladi cows were used immediately after birth and were divided into two groups of 10 cows per group. The first group (n= 10 cows) was treated with 20 ml intrauterine infusion of oxytetracycline hydrochloride solution for three consecutive days during the puerperium period and 5ml intramuscular prostaglandin F2α injection once after three hours from calving, while the second group (n= 10 cows) was used as a control group. The present findings demonstrated the interval from parturition to uterine involution in Baladi cows was significantly (P <0.05) lower, (28.4 ± 4.5, days) in treated cows compared to 45.7 ± 3.5, days in control group cows. However, the period from calving to the resumption of estrus activity postpartum was significantly (P <0.05) below, 45.2±9.1, days in treated cows compared to 68.2±6.2, days in control cows. Meanwhile, the time from calving to conceived was significantly (P <0.05) less (96.5±12.3, days) in treated cows than (155.3 ±15.2, days) in controlled cows. In addition, the conception rate from first mating was significantly (P <0.05) higher, 60% in treated cows compared to 30% in control cows. In conclusion, the current study demonstrated improvement in post-partum reproductive performance in cows which treated with oxytetracycline and prostaglandinF2αduring the puerperium period. So, the study recommends that small breeders should treat their cows during the puerperium period.

Keywords: Oxytetracycline, prostaglandinF2α, uterine recovery, reproductive characteristics, Baladi cows

INTRODUCTION

The puerperium period in cows is one of one of the most harmfulperiods in the life of the animal, as cows are exposed to infection by some pathogenic microbes inside the uterus that affect their reproductive performance after calving. Most the cow breeders under the traditional and, bind, stalls system, especially in Upper Egypt, villages, would intervene to help their cows during parturition, thus exposing the cows to microbial pollution infection. Management factors and complications at parturition such as calving assistance can increase the incidence of uterine disease and have been identified as risk factors for clinical and subclinical endometritis (Wagener *et al*., 2014). The calving environment, dystocia, retention of the placenta, twins, and diet are considered the plausible risk factors for uterine infection (Sheldon *et al*., 2008). We must understand that there is an interactive relationship between the environment and uterine infection, immunity, and reproduction so that we can make strategies to counteract the fertility decline in cattle (Sheldon *et al*., 2008). Bacterial contamination of the uterine lumen is common in cattle during calving which leads to infection and uterine disease (Sheldon *et al*., 2008). One of the costliest issues facing the dairy industry is a uterine disease. Eicosanoids have the potential to directly affect uterine immunity, and exogenous PGF2α is possibly an effective treatment for uterine diseases (Lewis and Wulster-Radcliffe, 2006). Infertility conjugated with the uterine diseases causes harm to the endometrium and disruption of ovarian activity. Bacteria causes fluctuation in endometrial prostaglandin secretion and perturb ovarian follicle growth and function (Sheldon *et al*.,2008). Subclinical endometritis declines conception rates (Kasimanickam *et al*., 2004 and Gilbert *et al*., 2005). The primary goal of postpartum reproductive health in cows is the full involution of the uterus, the defense against infection, and the resumption of normal estrous cycle activity (LeBlanc *et al*., 2002 and Gautam *et al*., 2009). The uterine size declines during the puerperal cycle as the endometrium regenerates, a bacterial infection is removed and ovarian cyclicity in a phase known as uterine involution resumes, a condition for effective reproduction afterward (Heppelmann *et al.*, 2013). A uterine bacterial infection occurs shortly after calving in many cows (Sheldon *et al*., 2009a and Molina-Coto and Lucy, 2018). Prunner *et al*. (2014) showed that the rate of uterine bacterial growth increased during the 15 days post- partum. Sheldon *et al*. (2006) and Földi *et al*. (2006) observed that uterine infections at or after calving are considered common, with 80-100% of animals possessing uterine lumen bacteria in the first 2 weeks, after birth. Subclinical endometritis is characterized as endometrial inflammation without systemic symptoms (Madoz *et al*., 2014 and Mariño *et al*., 2017). Subclinical endometritis is characterized as endometrial inflammation with a lack of purulent vaginal discharge, (Sheldon *et al*., 2019 and Tobolski *et al*., 2021). Subclinical endometritis is a uterine disease with no clinical symptoms that cannot be reliably identified at a farm site (Ricci *et al*., 2015). Cows with uterine inflammation have poor reproductive efficiency, resulting in lower conception rates, more open days, and more losses in pregnancy (Galvão *et al*., 2009 and Vieira-Neto *et al*., 2014). Changes in the immune and endocrine systems are associated with increased sensitivity of cows to infections during the periparturient period (Cai *et al.*, 1994). Pothmann *et al*. (2015) found that more than 90% of the subclinical endometritis diagnosed have been found in multiparous cows. Alterations of a prostaglandin E2 and F2α synthesis pattern were associated with infected cows with subclinical endometritis (Gabler *et al*., 2009 and Baranski *et al*., 2013). Estradiol and progesterone impair the production of PGE and PGF in response to lipopolysaccharides (LPS), indicating the role of steroid hormones in interaction with bacterial contamination (Herath *et al*., 2006). The production of dairy cows is adversely affected by clinical, and subclinical endometritis, and economic losses are attributed to delays in resumption of ovarian activity, increased number of services per conception, and reduced milk yield (LeBlanc, 2008 and Cheong *et al*., 2011). The percentage of incidence rate of subclinical endometritis in normal parturition was 36.47% compared with 85.5% in abnormal parturition (Moges, 2015). Reduced activity of the dominant ovarian follicle was correlated with bacterial infection of the endometrium (Sheldon *et al*., 2002 and Williams *et al*., 2007). One of the best protocols for the treatment of postpartum endometritis in dairy cows is an intrauterine antibiotic infusion (Drillich *et al.*, 2005). Intrauterine administration is helpful, especially in cows' treatment and prophylaxis of postpartum endometritis (Malinowsk *et al*., 2004). Kasimanickam *et al.* (2005) and Denis-Robichaud and Dubuc (2015) reported the importance of using antimicrobials and prostaglandin F2α in treatments of dairy cows with subclinical endometritis. Oxytetracycline is one of the broad-spectrum antibiotics used to treat postpartum endometritis in dairy cows (Sheldon *et al*., 2004). Noakes and England (2009) reported that oxytetracycline administration can be used as a prophylactic intrauterine antibiotic post-assisted parturition. For the treatment and prevention of endometritis, two major methods are commonly used: the use of antibiotics (intrauterine or systemic) or prostaglandins (PGF2α) (Lefebvre and Stock, 2012). PGF2α seems to be beneficial for clinical endometritis therapy (Salasel and Mokhtary, 2011). Intrauterine treatment with chlortetracycline was better than no treatment in dairy cows (Goshen and Shpigel, 2006). This study aims to determine the influence of oxytetracycline and prostaglandin F2α during the puerperium period in Baladi cows, which need simple assistance in parturition on uterine recovery and post-parturient reproductive characteristics.

MATERIALS AND METHODS

Farm and environment conditions:

The study was performed on a traditional farm in the Kom Ombou region (32^o ,31' 23" east and 22^o , 28' 09" north), in the Aswan governorate. In traditional farm conditions, the cows were raised and housed in semi-shaded sheds and tied. Table (1) illustrates ambient temperature (^{o}C), relative humidity (RH %), and temperature humidity index (THI) during the study. Table (2) clarifies the classification of zones based on THI values in cattle with THI model proposed by (Samal, 2013). The study extended from November to April. Estimated temperature humidity index (THI) according to the formula suggested by Mader *et al.* (2006):

THI= (0.8×Tmax db) + [(RH/100) × (T max db −14.4)] +46.4

Temperature-humidity index (THI) = 0.8 x ambient temperature + [(% relative humidity) 100) x (ambient temperature -14.4)] + 46.4

Table 1. Ambient temperature (^{o}C), relative humidity (RH %), and temperature humidity index (THI) during the experimental period

Months of calving	Average Ambient Temperature (^{o} C)		Average Relative humidity (RH %)	THI
	Min.	*Max.*		
November	20.4	30.2	19	73.56
December	16.1	29.5	20	73.02
January	13.2	20.5	23	64.20
February	14.3	23.4	22	67.10
March	19.3	31.3	19	74.65
April	21.4	35.0	17	77.90

Table 2. Classification of zones based on THI values in cattle with THI model according to (Samal, 2013)

THI	Stress level	Response of cattle
<72	None	Non-noticeable
72-79	Mild	Dairy cows will adjust by seeking shade, increasing respiration rate and dilation of the blood vessels. The effect on milk production will be minimal.
80-89	Moderate	Both salivaproduction andrespiration rate will increase. Feed intake may be depressed and water consumption will increase. There will be an increase in bodytemperature. Milk production and reproduction will be decreased.
90-98	Severe	Cows will become very much uncomfortable due to high body temperature, rapid respiration (panting) and excessive saliva production. Milk production and reproduction willbemarkedlydecreased.
>98	Danger	Potential cow death scan occur.

Trial animals and feeding:

Twenty Baladi cows were included in the current study. The cow parity ranged from 3rd to 6th and the live body weight varied from 330 to 350 kg at calving. During the experiment, bran, wheat hay and concentrate feed mixture (16% protein) alongside Barseem Higazee (*Alfa- alfa*) as a green fodder was given to animals. Both cows were kept in the same environmental and administrative conditions according to a work routine.

Designing the trial:

Cows number was divided into two equal groups (n= 10 cows per group). The first group was treated with oxytetracycline and prostaglandin F2α, while the second group was served as a control. As recommended by the producer, the cows were treated with a 20ml intrauterine infusion of oxytetracycline sterile solution (Pan-Terramycin oxytetracycline hydrochloride solution 3g. *Pfizer*, Egypt) for three consecutive days during the puerperium period and 5ml equivalent 25 mg Dinoprost Tromethamine (Lutalyse™, *Zoetis,* 5mg/ml) intramuscular prostaglandin F2α injection once after three hours from calving.

Postpartum reproductive parameters evaluation:

The uterine condition score (UCS) was measured and categorized as proposed by (Okawa *et al*., 2017):

UCS1 = the uterus was completely palpable, with uterine horn symmetry and evidence of typical uterine conditions.

UCS2 = the uterus was completely noticeable, but with uterine horn asymmetry and incomplete involution.

UCS3 = the uterus was not completely palpable and was located outside the pelvic cavity

Uterine involution: When both uterine horns return to their normal position and sit in the pelvic region at the same or almost equal non-gravid scale, their regular tone and quality are called full according to the uterine involution in accordance with Elmetwally *et al*. (2016) and Gohar *et al*. (2018).

Assisted calving: Those cows that need little help just pull the front legs during the delivery of the fetus.

Conception rate: The percentage of cows that are pregnant from the first postpartum mating, and calculated as:

$$\frac{\text{Number pregnant cows x 100}}{\text{Number served cows}}$$

Identification of estrus and the diagnosis of pregnancy:

Daily regular visual monitoring of cows was performed. Cows were considered in the estrus period once one of the estrus symptoms was exhibited like, mucus discharge and standing behavior. Post-sixty days (without any estrus symptoms) after service, the pregnancy was diagnosed by rectal palpation method**.**

Analysis of hormones:

Blood samples (10 ml) were collected from cows at estrus, 7th, 15th and 21th days post-service from the jugular vein in heparinized tubes. For plasma processing, samples were centrifuged for 20 minutes at 3000 rpm, plasma was separated, and stored at -18 ^{o}C until assay time. The Immunotech (France) radioimmunoassay package was used to test the hormones progesterone (P4) and estradiol-17β (E2). The susceptibility values of progesterone and estradiol-17β were 0.03ng/ml and 4.0pg/ml, respectively, according to the manufacturer's information. For progesterone (P4) and estradiol-17β (E2), the intra-assay variance coefficient was 6.4% and 12.1%, respectively.

Statistical analysis:

One factor (treatment effect) on uterine involution and postpartum reproductive characteristics was included in the statistical design. Chi Squire was done to test the significance of percentage values. The statistical analysis was carried out using software (SAS, 2002). The following statistical model was used:

$$\mathbf{Y_{ij} = \mu + T_i + e_{ij}}$$

Where:

$\mathbf{Y_{ij}}$= the observation trait,

$\boldsymbol{\mu}$ = overall mean,

$\mathbf{T_i}$ = the fixed effect of i^{th} treatment (i=1,2 where 1=treated and 2=untreated)

e_{ij} = experimental error

The Multiple Range Test of Duncan (Duncan, 1955) was used to verify the importance of the variations between means.

RESULTS AND DISCUSSION

Effect of treatment with oxytetracycline and prostaglandinF2α during the puerperium period on uterine involution in Baladi cows:

Table (3) shows that the period from parturition to uterine involution in Baladi cows was significantly (P<0.05) lower, 28.4±4.5 days in treated cows compared to 45.7±3.5 days in the control group cows. The return of the uterus to its normal non-pregnant size and postpartum role is called uterine involution, which relies on the rate of myometrial contractions, bacterial infection clearance, and endometrium histological regeneration (Elmetwally *et al*., 2016 and Elmetwally and Bollwein, 2017). During the normal uterine involution process after parturition, a variety of aerobic and anaerobic bacteria grow in the uterine lumen (Sheldon *et al*., 2008). Epithelial regeneration occurs approximately 25 days after parturition, while full histological regression occurs approximately 6-8 weeks postpartum (Sheldon *et al.,* 2008**).** The time taken for complete uterine involution was recorded to range from 26 to 52 days in dairy cattle (Noakes*et al*. 2001). The present findings agreed with those reported by Swelum (2013) who proposed that the intrauterine treatment of dairy cows and camels with oxytetracycline in the puerperium period contributes to uterine tissue regeneration. Sheldon *et al*. (2004) stated that oxytetracycline is a broad-spectrum antibiotic used to reduce developing uterine bacteria. Beagley *et al.* (2010) found that intrauterine antibiotics in cattle have an adverse effect on local bacterial development**.** Malinowsk *et al*. (2004) reported that intrauterine therapy has been found effective in the prevention and prophylaxis of postpartum uterine diseases in cows. In the current research, the beneficial impact of PGF2α therapy on the shortened time from calving to uterine involution was shown to indicate these results in line with those reported by Tobolski *et al*. (2021). Procedures involving uterine involution involve contractions and peristalsis, so conditions that lower blood calcium content or uterine production of PGF2α can decrease uterine involution and prolong intrauterine infection (Roberts, 1986). There is a positive association between the concentration of PGF2α in puerperal circulation and the uterine horn diameter (Sheldon *et al*., 2003). Hanzen *et al.* (2003) reported that repeated administration of PGF2α, 3-13 days after calving accelerates uterine involution by facilitating the removal of the contents of the uterus. To help the uterus overcome infections, exogenous PGF2α can improve immune functions or boost uterine motility (Hirsbrunner *et al*., 2003). Elsheikh and Ahmed (2005) observed that PGF2α injection within the first week resulted in rapid involution of the uterus in dairy cows. Melendez *et al*. (2004) reported that at 8 d postpartum, two doses of PGF2α 8 h apart in primiparous Holstein cows diminished the diameter of the uterine horns. Masoumi *et al*. (2018) observed that 25mg PGF2α injection led to uterotonic effects, which may aid accelerate uterine involution in puerperal dairy cows**.** PGF2α is commonly used during early postpartum to facilitate uterine involution in dairy cows (Salasal and Mokhtari, 2011 and Jeremejeva *et al*., 2012). A certain amount of PGF2α is assumed to be a prerequisite for the uterine involution process, primarily to induce uterine smooth muscle shrinkage to enhance lochia discharge and uterine morphological and functional recovery (Williams, 2013). Ingawale and Bakshi (2016) suggested that injection of PGF2α on day 14 post-calving led to lowering the time needed for involution of the uterus from 31.5 days to 27.4 days in control and treated buffaloes groups respectively. During 30 days postpartum, dairy cows that received an injection of PGF2α on the day of calving, nearly 60% of cows had their uterus involution, compared to 30% of control dairy cows (Zidane *et al*., 2011). In cows with subclinical endometritis, PGF concentrations are lower than PGE in the fourth week postpartum, and the ratio of PGE to PGF production may be one of the causes of delayed involution or endometrial regeneration (Baranski *et al*. 2013).

Effect of treatment with oxytetracycline and prostaglandinF2α during the puerperium period on resuming estrus cyclicity in Baladi cows:

Table (3) illustrates that the time from parturition to 1st postpartum estrus was significantly (P<0.05) below 45.2±9.1, days in treated cows compared to 68.2±6.2, days in control cows. The current results agreed with those reported by Schofield *et al*. (1999) who found that treatment of dairy cows with prostaglandin F2α, 21 days after calving shortened the first estrus period by around 10 days. Etherington *et al*. (1985) and Young *et al*. (1986) suggested that the use of PGF2α between 14 and 28 days postpartum resulted in reduced the period to the postpartum first estrus in dairy cows. Ingawaleand Bakshi (2016) stated that on day 14 postpartum, PGF2α injection resulted in a short interval from calving to the first postpartum estrus of 47.6 days relative to 67.1 days in control buffaloes. Intrauterine treatment with oxytetracycline twice weekly for 2 weeks prevented the negative effects of uterine disease on fertility in multiparous dairy cows (Goshen and Shpigel, 2006). Intrauterine therapy is a helpful medication, especially for the treatment and prophylaxis of postpartum uterine diseases in cows (Malinowsk *et al*. 2004). Beagley *et al*. (2010) reported that intrauterine antibiotics have a detrimental and effective impact on local bacterial growth in cattle. Usage of uterine oxytetracycline infusion provided better reproductive performance than the intramuscular method in the first 21st postpartum in cows diagnosed with uterine diseases (Armengol and Fraile, 2015). Intrauterine oxytetracycline can cause inflammatory responses and uterine defense reactions and stimulate uterine leukocyte cells. It can also contribute to uterine tissue regeneration (Noakes and England (2009) and Swelum, 2013). The interval between parturition and the incidence of first ovulation was positively associated with the time needed to complete uterine involution (Madej *et al*., 1984). Gundling *et al*. (2012) found that treatment with PGF2α in cattle shows a positive effect on uterine involution. Uterine inflammation prevents the release of PGF2α by the endometrium and extends the luteal phase of the estrous cycle (Pepper and Dobson, 1987 and Bondurant, 1999). A single administration of PGF2α accelerates uterine involution and hastens a return to fertile estrous cyclicity in the early post-partum period (Lindell and Kindahl, 1983 and Kindahl *et al*., 1984). Archbald *et al*. (1993) suggested that during the early postpartum period, the use of PGF2α led to increasing fertility in dairy cattle**.** Cows with subclinical endometritis recorded a delayed return to postpartum calving ovarian activity (Salehi *et al*., 2017). In healthy cows, the number of ovarian follicles has been found to be higher and less incidence of cystic follicles than in cows with uterine disease (Maquivar*et al*., 2015). Anovulation is associated in Holstein Friesian cows with subclinical endometritis (Tsousis*et al.* (2009). Galvao*et al*. (2010) suggested that cows that started to cycle by 21 days postpartum had fewer incidences of subclinical endometritis postpartum and a greater pregnancy rate than an anovulatory cow. Dubuc*et al.* (2012) observed that cows with subclinical endometritis had a delayed restart of ovarian activity postpartum. Opsomer *et al.* (2000) stated that the first postpartum ovulation is deferred in cows with uterine infections. Kudlac (1991) increased the duration of uterine involution resulting in an extended period of resumption of ovarian activity in the postpartum period in cows. Infected cows with subclinical endometritis early postpartum were less likely to ovulate than healthy cows (Burke *et al*., 2010). Bacteria modulate the secretion of endometrial prostaglandin and disrupt the development and activity of ovarian follicles (Sheldon *et al*., 2008). Uterine disease is associated with an increased incidence of anestrus and ovarian cystic (Peter, 2004). McDougall *et al.* (2007) and Senosy *et al*. (2009) showed a delayed resumption of dairy cattle to normal postpartum cycles in cows with uterine inflammation.

***Effect of treatment with oxytetracycline and prostaglandinF2α during the puerperium period on days open in Baladi cows*:**

Table (3) indicates that the interval from calving to conceived (Days open) was significantly ($P<0.05$) less, 96.5±12.3, days in treated cows compared with 155.3±15.2, days in controlled cows. The present findings align with those reported by Kasimanickam *et al*. (2005), who observed that in dairy cows treated with a single PGF2α and antibiotics dose, the period from calving to conception was less than 101, 103 days compared to 119 days in control cows, respectively. Similar findings reported by Risco*et al*. (1994) showed that routine postpartum application of PGF2α decreases the time from calving to pregnancy in dairy cows. Goshen and Shpigel (2006) suggested that usage of intrauterine antibiotics in normal, treated, and untreated dairy cows with clinical metritis resulted in 140.5, 136.2, and 165.5 days of open days, respectively. Mcclary *et al*. (1989) treatment of dairy cows with PGF2α during early postpartum resulted in a decline in days open 98.6 days compared to 118.8, days for untreated cows. There were fewer days open for dairy cows treated with prostaglandin F2α (Folman *et al*., 1990). The dairy cows treated with PGF2α on day 8 postpartum recorded lower days open (White and Dobson 1990). Lopez-Gatius (2003) observed a drop in days open after administration of PGF2α during the early postpartum phase relative to the control group in dairy cattle. Cows with uterine disease (endometritis) recorded a longer interval (151 days) from calving to conception than unaffected dairy cows (119 days) (LeBlanc *et al*., 2002). Galvao *et al*. (2009) showed that PGF2α treatment in dairy cows with subclinical endometritis declines the time from parturition to conception. Bicalho*et al.* (2016) reported that cows with subclinical endometritis had longer 42 days open compared to healthy cows. Kasimanickam *et al*. (2004) stated that in cows with subclinical endometritis the time from calving to pregnancy was longer 141 days compared to 112 days in healthy cows. Similar findings were reported by Gilbert *et al*. (2005) who found that in cows with subclinical endometritis the days open was longer 206 days compared to 118 days in healthy cows. Madoz *et al*. (2013) observed that cows with subclinical endometritis had an increase in the interval from parturition to conception compared with normal cows 133 and 93, days respectively. Galvao *et al.* (2009) reported that treatment with PGF2α in dairy cows with subclinical endometritis led to a decrease in the time from calving to pregnancy. Ricci *et al*. (2015) proposed that there was a 40-day delay to conception in beef cows with subclinical endometritis relative to normal cows. Vieira-Neto *et al*. (2014) proposed that cows with subclinical endometritis recorded a longer number of days open compared to healthy cows. Uterine disease results in an increase in the time from calving to pregnancy in multiparous cows (Toni *et al*., 2015). The time from calving to pregnancy (DO) extended in cows with postpartum uterine disorders such as subclinical endometritis (Barański *et al*., 2012). Barrio *et al*. (2015) found that the time from calving to conception (DO) was longer 154 days in cows suffering from subclinical endometritis compared with 119 days in healthy cows.

Table 3. Effect of treatment with oxytetracycline and prostaglandinF2α during puerperium period on uterine involution and post-parturient reproductive aspects in Baladi cows

Items	Treated cows (10 cows)	Untreated cows (10 cows)
Uterine involution period (days)	$28.4^{a} \pm 4.5$	$45.7^{b} \pm 3.5$
The interval from parturition to 1st postpartum estrus (days)	$45.2^{a} \pm 9.1$	$68.2^{b} \pm 6.2$
The interval from parturition to conceived (days open)	$96.5^{a} \pm 12.3$	$155.3^{b} \pm 15.2$

a, b: values within the same row having different superscripts are significantly different at P <0.05.

Effect of treatment with oxytetracycline and prostaglandinF2α during the puerperium period on conception rate in Baladi cows:

Figure (1) shows that the conception rate from the first service was significantly (P<0.05) higher, 60% in treated cows compared with 30% in control cows. One of the safest and most effective protocols for the treatment of postpartum endometritis in dairy cows is an intrauterine infusion of antibiotics (Drillich *et al*., 2005). The present findings correspond with those stated by Armengol and Fraile (2015) reported that intrauterine infusion of oxytetracycline produce improve reproductive performance in cows during the first 21 days postpartum and increases conception rate from the first service. Ahmadi *et al*. (2005) found that the pregnancy rate of oxytetracycline-treated cows was 66.7%, compared with 33% of cows receiving only PGF2α. McDougall (2002) stated that intrauterine antibiotic therapy has increased the reproductive efficiency of dairy cattle. Sheldon and Noakes (1998) reported that the pregnancy rate from the first service was 48.7% when treating the cows with tetracycline intrauterine infusion but was 52.5% when PGF2α was used. Goshen and Shpigel (2006) in normal, treated, and untreated clinical metritis (CM) cows after intrauterine antibiotics, conception rates after the first insemination were 38.3%, 42.5%, and 18%, respectively. A lower conception rate from the first service was recorded in dairy cows with uterine infection (endometritis) (29.8%) than in unaffected (37.9%) (LeBlanc *et al*., 2002). A single dose of antibiotics or PGF2α increases the reproductive efficiency of dairy cows with subclinical endometritis (Kasimanickam *et al*. 2005). Ribeiro *et al*. (2015) recorded that the occurrence of disease in dairy cows is 42%, from calving to service and these diseases are responsible for the decline in fertilization and conceptus development. Bicalho *et al*. (2016) found that pregnancy rates were 27% lower in cows with subclinical endometritis than in healthy cows. Barlund *et al*. (2008) reported that cows with subclinical endometritis had a significantly lower first-service conception rate than healthy cows. Embryonic viability is likely to be impaired in a contaminated uterus owing to a decline in uterine milk quantity and the harmful effects of bacterial compounds (McDougall, 2001). The postpartum uterine disease may affect sperm transfer, embryonic attachment failure, and poor placental development (Sheldon *et al*., 2009a). Early postpartum subclinical endometritis in dairy cows reduces the pregnancy rate by 29%, relative to 45%, in normal cows **(**Madoz *et al*. 2013). Vieira-Neto *et al*. (2014) suggested that cows with subclinical endometritis have a lower conception rate compared to healthy cows. Salasel *et al*. (2010) and Janowski *et al*. (2013) reported that 50% of repeat breeder dairy cows suffer from subclinical endometritis. Kasimanickam *et al*. (2004) suggested that during the postpartum period, the first service pregnancy rate in dairy cows with subclinical endometritis was 18% compared to 32% in healthy cows. Gilbert *et al*. (2005) showed that the pregnancy rate from the first service was 11% in cows with the uterine disease compared to 36% for healthy cows. Treatment of dairy cows in early postpartum with two doses PGF2α 8 h apart led to an increased first service conception rate (47.1%) in treated cows compared to (27.6%) in the control group (Salasel and Mokhtari, 2011). After the first artificial insemination, the pregnancy rate was zero percent in control cows, but 25.0% in dairy cows who administered PGF2α (Okawa *et al*., 2021). Melendez *et al*. (2004) demonstrated that when Holstein cows were administered two doses of PGF2α 8 h apart at 8 d postpartum, the treatment led to an improved pregnancy rate at first service by 17%. Jeremejeva *et al*. (2012) showed that injections of prostaglandin F2α plus anti-inflammatory drug at periods of 8 h after 8 days postpartum led to a rise in the pregnancy rate by 50% in treated cows compared to 37% in the control group in dairy cows after the first services. Herath *et al*. (2009) observed that in cows with *E. coli* infection evidence for raising production of PGE relative to PGF2α. Single PGF2α administration 14 to 28 days post-partum resulted in a 68% increase in first-service conception rate compared to 43% in control cows (Young *et al*. 1984). Mcclary *et al*. (1989) reported that treatment of the dairy cow in early postpartum with prostaglandin F2α led to an improvement of first service pregnancy rates (41.3%) in the treated cows and (35.7%) in the control group). PGF2α has a local influence on the hypothalamic-pituitary axis and an elevated frequency of LH pulses (Peters *et al*., 1989). Guilbault *et al*. (1987) stated that higher concentrations of PGF2α early in the postpartum period are associated with the early resumption of ovarian activity. Ingawale and Bakshi (2016) suggested that PGF2α injection resulted in an improvement in the rate of first-service pregnancy (33.33%) in treated buffaloes on day 14 postpartum, compared to (16%) in untreated buffaloes. Galvao *et al*. (2009) stated that PGF2α treatment in cows with subclinical endometritis improves the first-service conception rate.

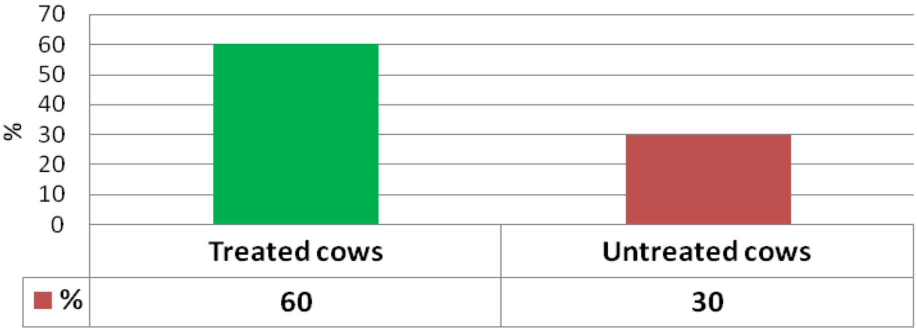

Figure 1. Conception rate in treated and untreated Baladi cows.

Concentrations of progesterone (ng/ml) and estradiol-17β (pg/ml) during the estrous cycle in treated and untreated Baladi cows

As shown in table (4), concentrations of progesterone and estradiol-17β at estrus were significantly ($P < 0.05$) higher in pregnant cows than in non-pregnant cows. Atypical progesterone profiles that indicate delayed ovulation, cystic ovarian disease, or prolonged luteal phases are frequently caused by uterine diseases, such as retained placenta and uterine infection (Opsomer *et al*., 2000; Royal *et al.*, 2000). *E. coli* or LPS led to fluctuations in the secretion of these hormones PGF2α and PGE2 (Herath *et al*., 2006). The current results agree with those reported by Waldman *et al.* (2001) who found that there was a strong inverse association between the likelihood of non-return and the concentration of progesterone in cows at mating time. Conceived cows had a higher frequency of d 10 post-service progesterone concentration compared to non-conceived cows (Busch *et al*., 2008). Table (4) shows that 21-day post-service progesterone concentrations were higher in treated cows than in untreated cows, perhaps responsible for and/or promoting higher pregnancy rates in treated cows than in untreated cows. The results obtained agree with those stated by Lemley *et al*. (2010) who recorded that the rise in progesterone after mating was associated with improved retention in pregnancy and growth in embryonic development. Rivera *et al*. (2011) stated that less development and quality of cow embryos are attributed to lower levels of progesterone in lactating dairy cows during follicle formation. Cerri *et al.* (2011) found that higher progesterone concentrations before and after service were associated with increased fertility. Progesterone affects ovarian and uterine functions during conception by direct or indirect methods and also in the early stages of embryo development. During follicular growth, a drop in plasma progesterone levels is associated with lower fertility rates and impedes embryo survival during early pregnancy periods (Inskeep, 2004 and Pursley and Martins, 2011). A high level of progesterone affects pregnancy by causing synchrony between the uterus and embryos. However, a low uterine system level of progesterone does not induce important changes in dairy cows to host and retain embryos (Kenyon *et al*., 2013 and Randi *et al*., 2016). The present findings showed, that during the estrous cycle, progesterone concentrations reached a lower level at estrus but, in estradiol, they had higher concentrations of these fluctuations or modifications which had a positive effect on conception. Progesterone is immunosuppressive, while estradiol has been used to treat uterine disease and can support immunity (Lewis, 2003). In cows with subclinical endometritis, estradiol concentrations were lower compared to healthy cows 21 days postpartum (Green *et al*. 2011). Kasimanickam *et al*. (2005) suggested an increase in the uterine defenses when progesterone concentrations were low in dairy cows. Cows with uterine diseases are less likely to ovulate the first primary follicle than normal cows (8% vs. 40%) and are more likely to have abnormal progesterone concentrations (58% vs. 39%) (Sheldon *et al*., 2008). Dairy cows with uterine infections have slower development of the first postpartum dominant follicle from 7 to 16 days after calving, have less plasma estradiol concentrations, and are less susceptible to ovulation (Sheldon *et al*., 2002). Williams *et al*. (2007) found decreased follicle development and estradiol secretion in cows with uterine infections besides a decline in progesterone concentrations after the first post-calving corpus luteum formation. Sheldon *et al*. (2009b) showed that a drop in follicular size and estradiol concentrations is caused by uterine disease. In cows with greater uterine pathogen load, the diameter of the corpus luteum was smaller and progesterone concentrations declined (Williams, 2013). Changes in liver transcription for genes linked to steroid hormone production and inflammation were correlated with subclinical endometritis in dairy cows. These modifications resulted in impairments in fertility (Akbar *et al*., 2014).

Table 4. Concentrations of progesterone (ng/ml) at estrus, 7th, 15th and 21th days post-service and estradiol-17β (pg/ml) in treated and untreated Baladi cows

Items	Treated cows (10 cows)		Untreated cows (10 cows)	
	Pregnant	Non-pregnant	Pregnant	Non-pregnant
Progesterone (ng/ml)				
At estrus	0.38^a±0.09	0.22^b±0.04	0.24^a±0.02	0.18^b±0.04
7^{th} days post-service	3.22^a±0.03	2.21^b±0.01	2.94^a±0.02	2.11^b±0.03
15^{th}days post-service	5.81^a±0.06	3.32^b±0.04	4.34^a±0.06	2.32^b±0.02
21^{th}days post-service	8.23^a±0.12	0.20^b±0.01	5.45^a±0.12	0.23^b±0.01
Estradiol-17β (pg/ml)				
At estrus	32.3^a±0.32	18.3^b±0.22	24.2^a±0.31	17.2^b±0.32

a, b: values within the same row having different superscripts are significantly different at $P < 0.05$.
1-Conception rate calculated from the first service.

CONCLUSION

The current study demonstrated improvement in post-partum reproductive performance in cows which treated with oxytetracycline and prostaglandinF2α during the puerperium period. So, the study recommends that small breeders should treat their cows during the puerperium period.

REFERENCES

Ahmadi, M.R., S. Nazifi and H.R. Ghaisari, 2005. The effect of intrauterine Cephapirin on treatment of endometritis in commercial dairy cattle. Archives Razi Institute, 59 : 35-45.

Akbar, H., F.C. Cardoso, S. Meier, C. Burke, S. McDougall, M. Mitchell, C. Walker, S.L. Rodriguez-Zas, R.E. Everts, H.A. Lewin, J.R. Roche and J.J. Loor, 2014. Postpartal subclinical endometritis alters transcriptome profiles in liver and adipose tissue of dairy cows. Bioinformatics Biology Insights, 8: 45-63.

Archbald, L. F., C. Risco, P. Chavatte, S. Constant, T.Tran, E. Klapstein and J.Elliot, 1993. Estrus and pregnancy rate of dairy cows given one or two doses of prostaglandin F2 alpha 8 or 24 hours apart. Theriogenology, 40:873-884.

Armengol, R. and L. Fraile, 2015. Comparison of two treatment strategies for cows with metritis in high-risk lactating dairy cows. Theriogenology, 83:1344-1351.

Baranski, W., K. Lukasik, D. Skarzynski, M. Sztachanska, S. Zdunczyk and T. Janowski, 2013. Secretion of prostaglandins and leukotrienes by endometrial cells in cows with subclinical and clinical endometritis. Theriogenology, 80: 766-772.

Barański, W., M. Podhalicz-Dzięgielewska, S. Zduńczyk and T. Janowski, 2012. The diagnosis and prevalence of subclinical endometritis in cows evaluated by different cytologic thresholds. Theriogenology, 78: 1939-1947.

Barlund, C. S., T. D. Carruthers, C. L. Waldner and C. W. Palmer, 2008. A comparison of diagnostic techniques for postpartum endometritis in dairy cattle. Theriogenology, 69:714-723.

Barrio, M., M.Vigo, A. Quintela, J. J. Becerra, P. J. García-Herradón, D. Martínez-Bello, F. I. Fernandez-Sanchez, A. Prieto, J. Cainzos and A. I. Peña, 2015. Short communication: Influence of subclinical endometritis on the reproductive performance of dairy cows. Spanish Journal of Agricultural Research,13(4): e05SC02, 6 pages.

Beagley, J.C., K.J. Whitman, K.E. Baptiste and J. Scherzer, 2010. Physiology and treatment of retained fetal membranes in cattle. Journal Veterinary Internal Medicine, 24:261-268.

Bicalho, M.L., F.S. Lima, V.S. Machado, E.B. MeiraJr, E.K. Ganda, C. Foditsch, R.C. Bicalho and R. O. Gilbert, 2016. Associations among Trueperellapyogenes, endometritis diagnosis, and pregnancy outcomes in dairy cows. Theriogenology, 85:267-274.

Bondurant, R.H., 1999. Inflammation in the bovine female reproductive tract. Journal of Animal Science, 77 (Suppl. 2): 101-110.

Burke, C.R., S. Meier, S. McDougall, C. Compton, M. Mitchell and J.R. Roche, 2010. Relationships between endometritis and metabolic state during the transition period in pasture-grazed dairy cows. Journal Dairy Science, 93:5363-5373.

Busch, D. C., J. A. Atkins, J. F. Bader, D. J. Schafer, D. J. Patterson, T. W. Geary and M. F. Smith, 2008. Effect of ovulatory follicle size and expression of estrus on progesterone secretion in beef cows. Journal Animal Science, 86: 553-563.

Cai, T.Q., P.G. Weston, L.A. Lund, B. Brodie, D.J McKenna and W.C. Wagner, 1994. Association between neutrophil function and periparturient disorders in cows. American Journal Veterinary Research, 55:934-943.

Cerri, R. L., R. C. Chebel, F. Rivera, C. D. Narciso, R. A. Oliveira, W. W. Thatcher and J. E. P. Santos, 2011. Concentration of progesterone during the development of the ovulatory follicle: I. Ovarian and embryonic responses. Journal Dairy Science, 94:3342-3351

Cheong, S. H., D. V. Nydam, K. N. Galvão, B. M. Crosier and R. O. Gilbert, 2011. Cow-level and herd-level risk factors for subclinical endometritis in lactating Holstein cows. Journal Dairy Science, 94:762-770.

Denis-Robichaud, J. and J. Dubuc, 2015. Randomized clinical trial of intrauterine cephapirin infusion in dairy cows for the treatment of purulent vaginal discharge and cytological endometritis. Journal Dairy Science ,98: 6856-6864.

Drillich, M., D. Raab, M. Wittke and W. Heuwieser, 2005. Treatment of chronic endometritis in dairy cows with an intrauterine application of enzymes: A field trial. Theriogenology, 63: 1811-1823.

Dubuc, J., T.F. Duffield, K.E. Leslie, J.S. Walton and S.J. LeBlanc, 2012. Risk factors and effects of postpartum anovulation in dairy cows. Journal Dairy Science, 95:1845-1854.

Duncan, D. B., 1955. Multiple range and Multiple F-test. Biometrics, 11:1.

Elmetwally M. and H. Bollwein, 2017. Uterine blood flow in sheep and goats during the peri-parturient period assessed by transrectal Doppler sonography. Animal Reproduction Science,176:32-39.

El-metwally, M.A., A. Montaser, N. Elsadany, W. Bedir, M. Hussein and S. Zaabel, 2016. Effects of parity on postpartum fertility parameters in Holstein dairy cows. IOSR Journal of Agriculture and Veterinary Science, 9: 91-99.

Elsheikh, A.S. and F.O. Ahmed 2005. Backing up postpartum dairy cows with PGF2 alpha. Journal of Animal and Veterinary Advances,4:506-509.

Etherington, W.G., S.W. Martin, I.R. Dohoo and W.T. Bosu, 1985. Interrelationship between postpartum events, hormonal therapy, reproductive abnormalities and reproductive performance in dairy cows. A path analysis. Canadian Journal. Comparative. Medicine, 49: 261-267.

Földi, J., M. Kulcsar, A. Pecsi, B. Huyghe, C. De Sa, J. Lohuis, P. Cox and G. Huszenicza, 2006.Bacterial complications of postpartum uterine involution in cattle. Animal Reproduction Science, 96: 265-281.

Folman, Y., M. Kaim and M. Rosenberg, 1990. Comparison of methods of synchronization of estrus cycles in dairy cows. I. Effect on plasma progesterone and manifestation of estrus. Journal Dairy Science,73: 2807-2816.

Gabler, C., M. Drillich, C. Fischer, C. Holder, W. Heuwieser and R. Einspanier, 2009. Endometrial expression of selected transcripts involved in prostaglandin synthesis in cows with endometritis. Theriogenology, 71:993-1004.

Galvão, K.N., M. T. Frajbla, S.B. Brittin, W.R. Butler, C.L. Guard and R.O. Gilbert, 2009. Effect of prostaglandin F2alpha on subclinical endometritis and fertility in dairy cows. Journal Dairy Science, 92:4906-4913.

Galvão, K.N., M. Frajblat, W.R. Butler, S.B. Brittin, C.L. Guard, and R.O. Gilbert, 2010. Effect of early postpartum ovulation on fertility in dairy cows. Reproduction Domestic Animal, 45: e207-211.

Gautam, G., T. Nakao, M. Yusuf and K. Koike, 2009. Prevalence of endometritis during postpartum period and its impact on subsequent reproductive performance in two Japanese dairy herds. Animal Reproduction Science, 116:175-87.

Gilbert, R.O., S.T. Shin, C.L. Guard, H.N. Erb and M. Frajblat, 2005. Prevalence of endometritis and its effects on reproductive performance of dairy cows. Theriogenology, 64: 1879-1888.

Gohar, M.A., M. A. Elmetwally, A. Montaser and S. M. Zaabel, 2018. Effect of oxytetracycline treatment on postpartum reproductive performance in dairy buffalo-cows with retained placenta in Egypt. Journal veterinary healthcare, 1; 45-53.

Goshen, T. and N. Y. Shpigel, 2006. Evaluation of intrauterine antibiotic treatment of clinical metritis and retained fetal membranes in dairy cows. Theriogenology, 66:2210-2218.

Green, M.P., A.M. Ledgard, S.E. Beaumont, M.C. Berg, K.P. McNatty, A. J. Peterson and P. J. Back, 2011 Long-term alteration of follicular steroid concentrations in relation to subclinical endometritis in postpartum dairy cows. Journal Animal Science, 89:3551-3560.

Guilbault, L.A, W.W. Thatcher and C.J. Wilcox, 1987. Influence of physiological infusion of prostaglandin F2α into postpartum cows with partially suppressed endogenous production of prostaglandins. 2. Interrelationships of hormonal, ovarian and uterine responses. Theriogenology, 27:947-957.

Gundling, N., M. Feldmann and M. Hoedemaker 2012. Hormonal treatments for fertility disorders in cattle. Tierarztl PraxAusg G Grosstiere Nutztiere, 4084:255-263.

Hanzen, C., B. Boudry and P. Drion, 2003. Induction and synchronization of estrus by PGF2α. Point Veterinary, 236:22-23.

Heppelmann, M., A. Brömmling, M. Weinert, M. Piechotta, C. Wrenzycki and H. Bollwein, 2013. Effect of postpartum suppression of ovulation on uterine involution in dairy cows. Theriogenology, 80:519-25.

Herath, S., D.P. Fischer, D. Werling, E.J. Williams, S.T. Lilly, H. Dobson, C.E. Bryant and I.M. Sheldon, 2006. Expression and function of Toll-like receptor 4 in the endometrial cells of the uterus. Endocrinology, 147: 562-570.

Herath, S., S.T. Lilly, D.P. Fischer, E.J. Williams, H. Dobson, C.E. Bryant and I.M. Sheldon, 2009. Bacterial lipopolysaccharide induces an endocrine switch from prostaglandin F2alpha to prostaglandin E2 in bovine endometrium. Endocrinology, 150:1912-1920.

Hirsbrunner, G., B. Knutti, U. Kupfer, H. Burkhardt and A. Steiner, 2003. Effect of prostaglandin E2, DL-cloprostenol, and prostaglandin E2 in combination with D-cloprostenol on uterine motility during diestrus in experimental cow. Animal Reproduction Science, 79:17-32.

Ingawale, M. V. and S. A. Bakshi, 2016. Effect of GnRH and PGF2α administration in early post-partum period on fertility in retained placenta buffaloes. Buffalo Bulletin, 35 (4):629-634.

Inskeep, E.K., 2004. Preovulatory, and postmaternal recognition effects of concentrations of progesterone on embryonic survival in the cow. Journal Animal Science, 82: 24-39.

Janowski, T., W. Barański, K. Łukasik, D. Skarżyński, M. Rudowska and S. Zduńczyk, 2013. Prevalence of subclinical endometritis in repeat breeding cows and mRNA expression of tumor necrosis factor α and inducible nitric oxide synthase in the endometrium of repeat breeding cows with and without subclinical endometritis. Polish Journal of Veterinary Sciences, 16:693-699.

Jeremejeva, J., T. Orro, A. Waldmann and K. Kask, 2012. Treatment of dairy cows with PGF2α or NSAID, in combination with antibiotics, in cases of postpartum uterine inflammation. ActaVeterinariaScandinavica, 54:45.

Kasimanickam, R., T.F. Duffield, R.A. Foster, C.J. Gartley, K.E. Leslie, J.S. Walton and W.H. Johnson, 2004. Endometrial cytology and ultrasonography for the detection of subclinical endometritis in postpartum dairy cows. Theriogenology, 62: 9-23.

Kasimanickam, R., T.F. Duffield, R.A. Foster, C.J. Gartley, K.E. Leslie, J.S. Walton and W.H. Johnson, 2005. The effect of a single administration of cephapirin or cloprostenol on the reproductive performance of dairy cows with subclinical endometritis. Theriogenology, 63:818-830.

Kenyon, A.G., L.G. Mendonça, G. Jr Lopes, J.R. Lima, J.E. Santos and R.C. Chebel, 2013. Minimal progesterone concentration required for embryo survival after embryo transfer in lactating Holstein cows. Animal Reproduction Science, 136:223-230.

Kindahl, H., G. Frederickson, A. Madej and L.E. Edqvist, 1984. Role of prostaglandins in uterine involution. Proceedings of the Xth Int. Cong. Animal Reproduction and AI; Urbana-Champaign, 4:9-24.

Kudlac, E., 1991. Notes on the treatment and prevention of retained placenta in cows with respect to their subsequent fertility. TierarztlicheUmschau, 46: 407-410

LeBlanc, S. J., 2008. Postpartum uterine disease and dairy herd reproductive performance: A review. The Veterinary Journal, 176:102-114.

LeBlanc, S.J., T.F. Duffield, K.E. Leslie, K.G. Bateman, G.P. Keefe, J.S. Walton and W.H. Johnson, 2002. Defining and diagnosing postpartum clinical endometritis and its impact on reproductive performance in dairy cows. Journal of Dairy Science, 85: 2223- 2236.

Lefebvre, R.C. and A.E. Stock, 2012. Therapeutic efficiency of antibiotics and prostaglandin F2α in postpartum dairy cows with clinical endometritis: An evidence-based evaluation Veterinary Clinics of North America. Food Animal Practice, 28:79-96.

Lemley, C. O., K. A. Vonnahme, L. R. Tager, K. M. Krause and M. E. Wilson, 2010. Diet-induced alterations in hepatic progesterone (P4) catabolic enzyme activity and P4 clearance rate in lactating dairy cows. Journal of Endocrinology, 205: 233-241.

Lewis, G.S., 2003. Steroidal regulation of uterine resistance to bacterial infection in livestock. Reproductive Biology Endocrinology, 1,117.

Lewis, G.S. and M.C. Wulster-Radcliffe, 2006. Prostaglandin F2alpha upregulates uterine immune defenses in the presence of the immunosuppressive steroid progesterone. American Journal of Reproductive Immunology, 56:102-111.

Lindell, J.O. and H. Kindahl, 1983. Exogenous prostaglandin F2α promotes uterine involution in the cow. ActaVeterinariaStandinavica, 24: 269-274.

Lopez-Gatius, F., 2003. Is fertility declining in dairy cattle? A retrospective study in northeastern Spain. Theriogenology, 60: 89-99.

Madej, A., H. Kindahl, W. Woyrro, L.E. Edqvist and R. Stupnicki, 1984. Blood levels of 15-keto13,14-dihydroprostaglandin F2α during the postpartum period in primiparous cows. Theriogenology, 21:279-287.

Mader, T. L., M.S. Davis and T. Brown-Brandl, 2006. Environmental factors influencing heat stress in feedlot cattle. Journal Animal Science, 84: 712-719.

Madoz, L.V., M.J. Giuliodori, M. Jaureguiberry, J. Plontzke, M. Drillich and R.L. De-la-Sota, 2013. The relationship between endometrial cytology during estrous cycle and cutoff points for the diagnosis of subclinical endometritis in grazing dairy cows. Journal Dairy Science, 96:4333-4339.

Madoz, L.V., M.J. Giuliodori, A.L. Migliorisi, M. Jaureguiberry and R.L. De la Sota, 2014. Endometrial cytology, biopsy, and bacteriology for the diagnosis of subclinical endometritis in grazing dairy cows. Journal of Dairy Science, 97:1-7.

Malinowsk, E., K. Kuzma, J. Zietara, M. Nadotry, M. S. Niewitecke, S. Nuliski and M.Kacmarowski, 2004. The use of gynobiotic in therapy and prophylaxis of endometritis in cows. Proceedings 5th Middle-European Buiatrics, CO, Poland, pp. 165-169.

Maquivar, M.G., A.A. Barragan, J.S. Velez, H.Bothe and G.M. Schuenemann, 2015. Effect of intrauterine dextrose on reproductive performance of lactating dairy cows diagnosed with purulent vaginal discharge under certified organic management. Journal Dairy Science, 98:3876-3886.

Mariño, B., L.A. Quintela, J.J. Becerra, L. Barrio, J.E. Mociños, J.LGuillin and et al., 2017. Agreement between postmortem endometrial cytology, biopsy and bacteriology in culled dairy cows. Animal Reproduction,14:1024-1033.

Masoumi, R., A. Badiei, F. Mousakhani, E. Dirandeh, M. Zhandian and M. Stear, 2018. Quantification of the uterine involution and dimensions, hormonal response and reproductive performance of pyometric and healthy dairy cows treated with Dinoprost. South African Journal of Animal Science, 48:222-233.

Mcclary, D.G., M.R. Putnam, J.C. Wright and J.LSartin-Jr, 1989. Effect of early postpartum treatment with prostaglandin F2α on subsequent fertility in the dairy cow. Theriogenology, 31:565-570.

McDougall, S., 2001. Effect of intrauterine antibiotic treatment on reproductive performance of dairy cows following periparturient disease. New Zealand Veterinary Journal, 49: 150-158.

McDougall, S., 2002. Effect of intrauterine infusion of Cephapirin on reproduction and production of cows with peripartum disease. XXII World Buiatrics Congress. 18-23 August, Hanover, Germany.

McDougall, S., R. Macauly and C. Compton, 2007. Association between endometritis diagnoses using a novel intravaginal device and reproductive performance in dairy cattle. Animal Reproduction Science, 99: 9-23.

Melendez, P., J. McHale, J. Bartolome, L.F. Archbald and G.A. Donovan, 2004. Uterine involution and fertility of Holstein cows subsequent to early postpartum PGF2α treatment for acute puerperal metritis. Journal Dairy Science, 87:3238-3246.

Moges, N., 2015. Study on dystocia with history of uterine infections and calving hygiene along with subclinical endometritis in dairy cows in and around Gondar, northwest Ethiopia. Journal of Reproduction and Infertility, 6: 70-73.

Molina-Coto, R.and M.C. Lucy, 2018. Uterine inflammation affects the reproductive performance of dairy cows: A review. AgronomíaMesoamericana, 29:449-468.

Noakes, D.E., T.J. Parkinson and G.C. W. England, 2001. Arthur’s Veterinary and Obstetrics. 8th ed. Baillere and Tindal, London, PP: 189-202.

Noakes, P.T. and G.C.W. England, 2009. Veterinary Reproduction and Obstetrics, Saunders Elsevier, 411-417

Okawa, H., A. Fujikura, M.M.P. Wijayagunawardane, P.L.A.M. Vos, M. Taniguchi and M. Takagi, 2017. Effect of diagnosis and treatment of clinical endometritis based on vaginal discharge score grading system in postpartum Holstein cows. Journal. Veterinary Medical Science, 79: 1545-155.

Okawa, H., M.M.P. Wijayagunawardane, P.L.A.M. Vos, O. Yamato, M.Taniguchi and M. Takagi, 2021. Effects of intrauterine infusion of a chitosan solution on recovery and subsequent reproductive performance of early postpartum dairy cows with endometritis: A Pilot Field Trial. Animals, 11: 197.

Opsomer, G., Y. T. Gröhn, J. Hertl, M. Coryn, H. Deluyker and A. De Kruif, 2000. Risk factors for post-partum ovarian dysfunction in high producing dairy cows in Belgium: a field study. Theriogenology, 53: 841-857.

Pepper, R.T. and H. Dobson, 1987. Preliminary results of treatment and endocrinology of chronic endometritis in the dairy cow. Veterinary Record, 120: 53-56.

Peter, A.T., 2004. An update on cystic ovarian degeneration in cattle. Reproduction Domestic Animal, 39:1-7.

Peter, A.T., W.T.K. Bosu and R.J. DeDecker, 1989. Suppression of preovulatory luteinizing hormone surges in heifers after intrauterine infusions of *Escherichia coli* endotoxin. American Journal Veterinary Research, 50: 368-73.

Pothmann, H., I. Prunner, K. Wagener, M. Jaureguiberry, R.L. De laSota., R. Erber, C. Aurich, M. Ehling-Schulz and M. Drillich, 2015. The prevalence of subclinical endometritis and intrauterine infections in repeat breeder cows. Theriogenology, 83:1249-1253.

Prunner, I., K. Wagener, H. Pothmann, M. Ehling-Schulz and M. Drillich, 2014. Risk factors for uterine diseases on small- and medium-sized dairy farms determined by clinical, bacteriological, and cytological examinations. Theriogenology, 82:857- 865.

Pursley, J.R. and J.P. Martins, 2011. Impact of circulating concentrations of progesterone and antral age of the ovulatory follicle on fertility of high-producing lactating dairy cows. Reproduction Fertility Development, 24:267-271.

Randi, F., B. Fernandez-Fuertes, M. McDonald, N. Forde, A.K. Kelly, H. Bastos-Amorin, E. Muniz de Lima , F. Morotti , M. MarcondesSeneda and P. Lonergan, 2016. Asynchronous embryo transfer as a tool to understand embryo-uterine interaction in cattle: is a large conceptus a good thing? Reproduction Fertility Development, 28:1999-2006.

Ribeiro, E.S., G. Gomes, L.F. Greco, R.L. Cerri, A. Vieira-Neto, P.L. Jr. Monteiro, F.S. Lima, R.S. Bisinotto, W.W. Thatcher and J.E. Santos, 2015. Carryover effect of postpartum inflammatory diseases on developmental biology and fertility in lactating dairy cows. Journal Dairy Science, 99:2201-2220.

Ricci, A., S. Gallo, F. Molinaro, A. Dondo, S. Zoppi and L. Vincenti, 2015. Evaluation of subclinical endometritis and consequences on fertility in piedmontese beef cows. Reproduction Domestic. Animal, 50:142-148.

Risco, C. A., L. F. Archbald, J. Elliott, J.T. Tran and P.Chavatte, 1994. Effect of hormonal treatment on fertility in dairy cows with dystocia or retained fetal membranes at parturition. Journal Dairy Science, 77: 2562-2569.

Rivera, F. A., L. G. D. Mendonc, G. L. Jr, J.E P. Santos, R.V. Perez, M. Amstalden, A. Correa-Calderon and R. C. Chebe, 2011. Reduced progesterone concentration during growth of the first follicular wave affects embryo quality but has no effect on embryo survival post transfer in lactating dairy cows. Reproduction, 141: 333-342.

Roberts, S.J., 1986. Veterinary Obstetrics and Genital Diseases (Theriogenology). Roberts SJ (ed). North Pomfret, Vt., Page 257, Chapter VI.

Royal, M.D., A.O. Darwash, A.P.F. Flint, R.Webb, J.A. Wooliams and G.E. Lamming, 2000. Declining fertility in dairy cattle: changes in traditional and endocrine parameters of fertility. Animal Science, 70: 487-501.

Salasel, B. and A. Mokhtari, 2011. Effect of early postpartum PGF2α treatment on reproductive performance in dairy cows with calving and puerperal traits. Theriogenology, 76:1723-1729.

Salasel, B., A. Mokhtari and T. Taktaz, 2010. Prevalence, risk factors for and impact of subclinical endometritis in repeat breeder dairy cows. Theriogenology, 74:1271-1278.

Salehi, R., M.G. Colazo, M. Gobikrushanth, U. Basu and D.J. Ambrose, 2017. Effects of prepartum oil seed supplements on subclinical endometritis, pro- and anti-inflammatory cytokine transcripts in endometrial cells and postpartum ovarian function in dairy cows. Reproduction Fertility and Development, 24:747-758

Samal, L., 2013. Heat stress in dairy cows reproductive problems and control measures. International Journal of Livestock Research, 13:14-23.

SAS, 2002. User's Guide: Statistics, Version 9.0 Edition. SAS Institute Inc., Cary, NC, USA.

Schofield, S.A., S.E. Kitwood, C.J.C. Phillips, 1999. The effects of a postpartum injection of prostaglandin F2α on return to oestrus and pregnancy rates in dairy cows. Veterinary Journal, 157:172-177.

Senosy, W. S., M. Uchiza, N. Tameoka, Y. Izaike and T. Osawa, 2009. Association between evaluation of the reproductive tract by various diagnostic tests and restoration of ovarian cyclicity in high producing dairy cows. Theriogenology, 72:1153-1162.

Sheldon, I. M., M. Bushnell, J. Montgomery and A. N. Rycroft, 2004. Minimum inhibitory concentration of some antimicrobial drugs against bacteria causing uterine infections in cattle. Veterinary. Record, 155: 383-387.

Sheldon, I.M., J. Cronin, L. Goetze, G. Donofrio and H.J. Schuberth, 2009a. Defining postpartum uterine disease and the mechanisms of infection and immunity in the female reproductive tract in cattle. Biology of Reproduction, 81:1025-1032.

Sheldon, I.M., J.G. Cronin and J.J. Bromfield, 2019. Tolerance and innate immunity shape the development of postpartum uterine disease and the impact of endometritis in dairy cattle. Annual. Review. Animal. Biosciences, 7: 361-384.

Sheldon, I.M., G.S. Lewis, S. LeBlanc and R.O. Gilbert, 2006. Defining postpartum uterine disease in cattle. Theriogenology, 65:1516-1530.

Sheldon, I.M. and D.E. Noakes, 1998. Comparison of three treatments for bovine endometritis. Veterinary Record, 142: 575- 579.

Sheldon, I.M., D.E. Noakes, A.N. Rycroft and H. Dobson, 2003. The effect of intrauterine administration of estradiol on postpartum uterine involution in cattle. Theriogenology, 59:1357-1371.

Sheldon, I.M., D.E. Noakes, A.N. Rycroft, D.U. Pfeiffer and H. Dobson, 2002. Influence of uterine bacterial contamination after parturition on ovarian dominant follicle selection and follicle growth and function in cattle. Reproduction, 123:837-845.

Sheldon, I.M., S.B. Price, J. Cronin, R.O. Gilbert and J.E. Gadsby, 2009b. Mechanisms of infertility associated with clinical and subclinical endometritis in high producing dairy cattle. Reproduction Domestic Animal, 44:1-9.

Sheldon, M. I., E. J. Williams, A. N.A. Miller, D.M. Nash and S. Herath, 2008. Uterine diseases in cattle after parturition. The Veterinary Journal, 176: 115-121.

Swelum, A.A.A., 2013. Clinical endometritis in the camel (*camelusdromedarius*): A field study. Journal of Animal and Veterinary Advances, 12: 527-532.

Tobolski, D., K. Łukasik, A. Bacławska, D.J. Skarzynski, M. Hostens and W. Baranski, 2021. Prediction of calving to conception interval length using algorithmic analysis of endometrial mRNA expression in bovine. Animals, 11: 236.

Toni, F., L. Vincenti, A. Ricci and Y.H. Schukken, 2015. Postpartum uterine diseases and their impacts on conception and days open in dairy herds in Italy. Theriogenology, 84:1206-1214.

Tsousis, G., R. Sharifi and M. Hoedemaker 2009. Associations between the clinical signs of chronic endometritis with ovarian cysts and body condition loss in German Holstein Friesian cows. Journal Veterinary Science, 10:337-341.

Vieira-Neto, A., R.O. Gilbert, W.R. Butler, J.E. Santos, E.S. Ribeiro, M.M. Vercouteren, R.G. Bruno, J.H. Bittar and K.N. Galvão, 2014. Individual and combined effects of anovulation and cytological endometritis on the reproductive performance of dairy cows Journal Dairy Science, 97:5415-5425.

Wagener, K., T. Grunert, I. Prunner, M. Ehling-Schulz and M. Drillich, 2014. Dynamics of uterine infections with *Escherichia coli*, *Streptococcus uberis* and *Trueperellapyogenes* in post-partum dairy cows and their association with clinical endometritis. Veterinary Journal, 202:527-532.

Waldman, A., O. Reksen, K. Landsverk and E. Ropstad, 2001. Progesterone concentrations in milk fat at first insemination – effects on non-return and repeat- breeding. Journal Animal Reproduction, Science, 65: 33-41.

White, A.J. and H. Dobson 1990. Effect of prostaglandin F2α on the fertility of cows after calving. Veterinary Record, 127: 588-592.

Williams, E.J. 2013. Drivers of post-partum uterine disease in dairy cattle. Reproduction Domestic Animal, 48:53-58.

Williams, E.J., D.P. Fischer, D.E. Noakes, G.C.W. England, A. Rycroft, H. Dobson and et al., 2007. The relationship between uterine pathogen growth density and ovarian function in the postpartum dairy cow. Theriogenology, 68:549-559.

Young, I.M. and D.B. Anderson 1986. Improved reproductive performance from dairy cows treated with dinoprotst-tromethamine soon after calving. Theriogenlogy, 26:199-208

Young, I.M., D.B. Anderson and R.W.J. Plenderleith 1984. Increased conception rate in dairy cows after early post-partum administration of prostaglandin F2α THAM. The Veterinary Record, 115:429-431.

Zidane, K., A. Niar and D. Tainturier 2011. Comparative effect on clinical use of PGF2α and Reprocine in the treatment of retained placenta in dairy cows at Tiaret Region (Algeria). Asian Journal of Animal and Veterinary Advances, 6: 593-598.

تأثير الأوكسي تتراسيكلين والبروستاجلاندين F2α خلال فترة النفاس على عودة الرحم والخصائص التناسلية بعد الولادة في الأبقارالبلدية

أحمد إسماعيل ضمرانى

قسم الإنتاج الحيواني والدواجن، كلية الزراعة والموارد الطبيعية، جامعة أسوان، مصر

تهدف هذه الدراسة الى تقدير تأثير الأوكسي تتراسيكلين والبروستاجلاندين F2α خلال فترة النفاس على تعافي الرحم والخصائص التناسلية بعد الولادة في الأبقار البلدية. تم استخدام عشرين بقرة بلدية بعد الولادة مباشرة وتم تقسيمها إلى مجموعتين من ١٠ أبقار لكل مجموعة. المجموعة الأولى (ن = ١٠ أبقار) عوملت بـ ٢٠ مل من محلول الأوكسي تتراسيكلين هيدروكلوريد بالتسريب داخل الرحم لمدة ثلاثة أيام متتالية خلال فترة النفاس و٥ مل حقنة في العضل بروستاجلاندين F2α مرة واحدة بعد ثلاث ساعات من الولادة، بينما المجموعة الثانية (ن = ١٠ أبقار) كانت ضابطة. أظهرت النتائج الحالية أن الفترة من الولادة إلى ارتداد الرحم في الأبقار البلدية كانت اقل معنويا (P <0.05) (٢٨.٤ ± ٤.٥ يوم) في الأبقار المعاملة مقارنة بـ (٤٥.٧ ± ٣.٥ يوم) في أبقار المجموعة الضابطة. كانت الفترة من الولادة إلى استئناف النشاط الشبقى بعد الولادة اقل معنويا (P <0.05)، (٤٥.٢ ± ٩.١ يوم) في الأبقار المعاملة مقارنة بـ (٦٨.٢ ± ٦.٢ يوما) في أبقار المجموعة الضابطة. بينما كان الوقت من الولادة حتى الحمل أقل معنوياً (٩٦.٥±١٢.٣ يوم) (P<0.05) في الأبقار المعاملة من (١٥٥.٣ ± ١٥.٢ يوم) في مجموعة الأبقار الضابطة. بالإضافة إلى ذلك، كان معدل الحمل من التلقيح الأول أعلى معنويا (P <0.05) ٦٠٪ في الأبقار المعاملة مقارنة بـ ٣٠٪ في مجموعة الابقار الضابطة. في الختام، أظهرت الدراسة الحالية تحسنًا في الأداء التناسلي بعد الولادة في الأبقار التي عوملت بأوكسي تتراسيكلين والبروستاجلاندين F2α خلال فترة النفاس. لذلك، توصي الدراسة بضرورة قيام المربين الصغار بمعاملة أبقارهم خلال فترة النفاس.