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EFFECT OF METHERGIN AND OXYTOCIN AS ECBOLIC AGENTS ON UTERINE INVOLUTION AND FERTILITY OF EGYPTIAN BUFFALO COWS

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ABSTRACT

This study was carried out at Mehallet Mousa Experimental Stations, belonging to Animal Production Research Institute to evaluate the effects of methergin or oxytocin administration at 0 or 24 hours after calving on uterine involution and the pregnancy rate of buffalo cows. About 20 multiparous Egyptian buffalo cows with normal parturition having (400-650 kg) live body weight, (2-7) parities and (2.5-3.5) body condition score were used in this study. Animals were divided into five groups (n=4/each). Animals in the 1st group were i.m. injected with saline solution at calving and 24 h post-calving (control). Each animal in the 2nd and 3rd groups (G2 and G3) received an i.m. injection of 3 mg methergin (MET) at 0 and 24 h post-calving, respectively. While, each animal in the 4th and 5th groups received an i.m. injection of 100 IU oxytocin (OXY) at 0 and 24 h post-calving, respectively. Throughout post-partum period, all buffaloes were hand milked twice daily. Routine examination of the genitalia per rectum was conducted twice weekly to judge the uterine involution manually by fingers. Ultrasonography was used immediately after rectal palpation to determine gravid and non-gravid uterine horns and cervical diameter. Uterine involution was considered complete when both horns were nearly symmetrical. Pregnancy was diagnosed by rectal palpation on day 45 post-insemination and conception rate was recorded. Results revealed that the duration of symmetric horns was shorter ($P<0.05$) for MET at 0 or 24 h post-calving than that in the controls. The same duration tended to reduce in OXY at 0 or 24 h post-calving as compared to the controls, but the differences were not significant. The duration of cervical closure was insignificantly lower in treatment groups, being the shortest in MET at 0 h. The significant reduction in gravid horn diameter stopped on day 17, 17, 24 and 24 of post-partum period in MET 24 h, MET 0 h, OXY 0 h and OXY 24 h versus on day 27 of post-partum in the control ones. The significant reduction in non-gravid horn diameter stopped earlier in MET 0 h (day 7) than in other treated and control groups (day 14). The significant reduction in cervical diameter stopped earlier in MET 0 h (day 14) than in other treatments and control (day 17). Animals treated with OXY at 0 h showed the best results regard to conception rate, number of services per conception and days open.

In conclusion, it was found that the oxytocin treatment at 0 h of calving performed on buffalo cows with the purpose of stimulating involution had pronounced effect on the duration of days open, number of services per conception and conception rate, without marked effects on the shrinkage of the uterine horns diameter and closure of the cervix during post-partum period compared with that seen in the control.

Keywords: *Buffalo cows, uterine involution , methergin, oxytocin, reproduction.*

INTRODUCTION

To realize the optimum economic return of brood buffaloes, the number of calves produced per dam life time must be maximized. As pregnancy in the buffalo cow lasts an average of 315 days, the goal of producing one calf/buffalo cow/year is achievable only if brood buffaloes conceive by 45-55 days postpartum. First post-partum conception rates are lower and embryonic losses are higher at this time compared to buffalo cows bred during subsequent cycles due to failure of the uterus, being completely involuted (Loy, 1980; Ginther, 1992; Ball, 1993; Alaçam, 1997).

Several procedures have been investigated in an attempt to alter involution. These include uterine wash (Blanchard *et al.*, 1989; McCue and Hughes, 1990), administration of ecbolic agents (Blanchard *et al.*, 1991) and the delaying of the first ovulation by using ovarian steroids (Loy *et al.*, 1982; Bruemmer *et al.*, 2002). Oxytocin and PGF2α analogs are the most frequently used ecbolics agents (Yılmaz, 1999). In mare, administration of 20 IU oxytocin (IV) for 10 days did not alter uterine involution (Blanchard *et al.*, 1991). In buffalo cows, oxytocin was not administered immediately after parturition for promoting uterine involution, but methergin was used to accelerate the uterine involution in buffalo cows (Abou El-Ghait, 2004).

This study aimed to evaluate the effects of methergin or oxytocin administration at 0 or 24 hours after parturition on uterine involution and the pregnancy rate of buffalo cows.

MATERIALS AND METHODS

This study was carried out at El-Nattaf El-Geded branch related to Mehallet Mousa Experimental Stations, belonging to Animal Production Research Institute, Agricultural Research Center, Ministry of Agriculture, Egypt, during the period from November 2010 to September 2011.

Animals and management:

This study was conducted on 20 multiparous Egyptian buffalo cows with normal parturition having 400-650 kg live body weight (LBW), 2-7 parities and 2.5-3.5 body condition score (BCS). Also, all experimental animals had normal placental drop (within 12 hours) and did not develop any reproductive disorders after calving.

During the experimental period, animals were submitted to the ordinary system applied at the station. The experimental animals were kept indoors all over the year and fed on diet that met both maintenance and production requirements. The type of offered feed differed according to the season, being concentrate feed mixture (CFM) plus fresh Egyptian berseem (*Trifolium alixandrinum,* 2^{nd}-4^{th} cut) and rice straw during green season, while they were fed on CFM plus corn silage, berseem hay and rice straw during dry season. All animals were vaccinated against various infectious diseases and were free from any parasitic diseases.

Experimental groups and treatments:

The experimental animals (n=20) were divided into five similar groups (n=4/each) according to their live body weight (LBW) and milk production. Animals in the 1^{st} group were i.m. injected with saline solution (0.9% NaCl) at calving and 24 hours after calving and served as a control group (G1). Each animal in the 2^{nd} and 3^{rd} groups (G2 and G3) received an intramuscular (i.m.)

injection of 3 mg Methylergometrine hydrogen maleate (Methergin, MET) at calving and 24 h after calving, respectively. While, each animal in the 4th and 5th groups (G4 and G5) received an i.m. injection of 100 IU Oxytocin (OXY) at calving and 24 h after calving, respectively.

Methylergometrine hydrogen maleate (Methergin):

It is supplied in ampoules, each one (1 ml) containing 0.2 mg methylergometrine hydrogen maleate. It produced by Novartis Pharma, S. A. E. Cairo, under licence from Novartis Pharma, AG., Basle, Switzerland.

Oxytocin:

It presented in vials contains 100 ml (each ml contained 10 IU of Oxytocin. It manufactured by ADWIA Co. S. A. E. 10th of Ramadan City, Egypt.

Milking and suckling system:

Throughout the lactation period all buffaloes were hand milked twice daily at about 7:00 h and 17:00 h. Milk yield of each animal was recorded on one day every month. The animals were used essentially for milk production. During the suckling period, the calf remains with the dam for three to four days to receive the colostrums, and then it was artificial suckled until weaning. During the lactation period, milk yield was recorded as daily or total milk yield

Judgment of uterine involution:

Routine examination of the genitalia per rectum was conducted twice weekly to judge the uterine involution manually by fingers. Previous pregnant uterine horn (PPH) was determined as the longer horn with the greater diameter compared with the previously non-pregnant uterine horn (PNPH).

Real time ultrasonography equipment with a 5.0 MHz linear rectal transducer was used to determine cervical diameter immediately after manual examination. Cervical diameter was measured by placing the transducer in a transversal position in relation to the cervix at its middle section; distance between the outer surfaces was obtained as previously described.

Uterine involution was considered complete when both horns were nearly symmetrical and no further change took place between two consecutive examinations (Miettinen, 1990 and Hussain-Shah *et al.*, 1990).

The time needed for complete uterine involution was calculated by subtracting the date of calving from the date of the examination conducted previous to the latest one.

Breeding and pregnancy diagnosis:

Natural service was used as a method of breeding in the farm under the current study where one bull is placed with 20-30 buffalo cows. For each buffalo cow, the date of service was recorded and thereafter followed up for oestrus return 21 days later. The non-return animals were rectally examined 50 to 60 days after the first breeding for pregnancy diagnosis and in any doubtful case, the examination was repeated 2 weeks later.

Overall conception rate:

It is determined by dividing the total number of conceived buffalo cows by the number of served ones without considering the number services required for each cow to conceive. It is less valuable than FSCR in evaluation of breeding success but if coupled with the determination of the number of services per conception, it can be a valuable indicator (Schultz, 1987).

Statistical analysis:
Results were statistically analyzed according to Snedecor and Cochran (1982) using computer programme of SAS system (2004).

For summetric horns and cervical closure, the completely randomized design was used and the statistical model was:

$$Y_{ij} = U + A_i + e_{ij}.$$

Where: Y_{ij} = observed values, U = overall mean, A_i = experimental groups and e_{ij} = Random error.

For uterine involution parameters, a factorial design (5 experimental groups x 7 times) was used and the model was:

$$Y_{ijk} = U + A_i + B_j + AB_{ij} + e_{ijk}.$$

Where: Y_{ijk} = observed values, U = overall mean, A_i = experimental group, B_j = time, AB_{ij} = Interaction due to experimental group x time and e_{ijk} = Random error.

However, conception rate was statistically analyzed using Student's Chi-square test. Duncan multiple range test was used to test the differences among means (Duncan, 1955).

RESULTS

Uterine involution:

Results presented in Table (1) revealed that the period elapsed from parturition to detectable symmetric uterine horns was affected significantly (P<0.05) by treatment, being significantly (P<0.05) shorter for buffalo cows treated with MET at 0 or 24 h post-calving than that in the controls. However, this period tended to reduce in buffalo cows treated with OXY at 0 or 24 h post-calving as compared to the control, but the differences were not significant.

Table (1): Effect of treatment on duration (day) of uterine involution in postpartum buffalo cows.

Item	Control	MET 0 time	MET 24 h	OXY 0 time	OXY 24 h
Duration (day) of					
Symmetric horns	28.5±1.19[a]	24.3±0.25[c]	24.5±1.26[bc]	27.3±0.75[ab]	25.8±0.48[abc]
Cervical closure	25.0±1.15	21.8±1.80	22.8±0.89	24.8±0.25	25.0±0.82

a, b and c: Means denoted within the same column with different superscripts are significantly different at P<0.05.

On the other hand, period elapsed from parturition to complete cervical closure was not affected significantly by treatment, but tended to reduce in treatment groups, being the shortest in buffalo cows treated with MET at 0 h of parturition.

Post-partum changes in diameter of gravid uterine horns:

Throughout post-partum period, diameter of gravid horns showed significant (P<0.05) reduction in all groups, with different trends in each treatment group as compared to the control group. In this respect, the significant reduction in gravid horn diameter stopped on day 17, 17, 24 and 24 of post-partum period in MET 24 h, MET 0 time, OXY 0 time and OXY 24 h groups versus on day 27 of post-partum in the control one (Table 2).

Such findings may indicate earlier uterine involution of gravid horns when buffalo cows were treated with MET at 0 time or 24 h post-calving as compared to OXY at 0 time or 24 h post-calving.

Table (2): Effect of treatment on mean diameters (cm) of gravid horn in postpartum buffalo cows.

Post-partum day	Control	Treatment group			
		MET 0 time	MET 24 h	OXY 0 time	OXY 24 h
3	7.00 ± 0.00^{a}	7.00 ± 0.00^{a}	7.00 ± 0.00^{a}	7.00 ± 0.00^{a}	7.00 ± 0.00^{a}
7	5.25 ± 0.25^{b}	5.00 ± 0.41^{b}	5.00 ± 0.58^{b}	5.50 ± 0.65^{b}	5.25 ± 0.25^{b}
10	3.75 ± 0.32^{c}	3.50 ± 0.29^{c}	4.75 ± 0.75^{b}	4.25 ± 0.32^{bc}	4.38 ± 0.25^{b}
14	3.25 ± 0.32^{c}	3.25 ± 0.32^{c}	4.13 ± 0.52^{b}	3.63 ± 0.43^{cd}	3.50 ± 0.29^{bc}
17	2.50 ± 0.35^{cd}	2.50 ± 0.41^{cd}	3.13 ± 0.24^{c}	3.00 ± 0.35^{d}	2.75 ± 0.14^{c}
21	2.13 ± 0.31^{d}	1.75 ± 0.41^{d}	2.13 ± 0.24^{d}	2.63 ± 0.24^{d}	2.25 ± 0.14^{cd}
24	2.13 ± 0.47^{d}	1.50 ± 0.29^{d}	1.63 ± 0.38^{d}	$1.88\pm0.13d^{e}$	1.63 ± 0.24^{d}
27	1.38 ± 0.35^{e}	1.50 ± 0.28^{d}	1.50 ± 0.25^{d}	1.34 ± 0.20^{e}	1.34 ± 0.21^{d}
31	1.00 ± 0.41^{e}	1.50 ± 0.32^{d}	1.50 ± 0.31^{d}	1.34 ± 0.23^{e}	1.34 ± 0.19^{d}

a, b ....f: Means denoted within the same column with different superscripts are significantly different at P<0.05.

It is of interest to note that gravid horn diameter in all groups showed pronounced reduction between day 3 and 7 of post-partum period, while the least changes were observed between 17 and 21 days.

Post-partum changes in non-gravid uterine horns:

Throughout post-partum period, diameter of non-gravid horns also showed significant (P<0.05) reduction in all groups, with different trends in each treatment group as compared to the control group. The significant reduction in gravid horn diameter stopped earlier in buffalo cows treated with MET 0 time, (day 7) than in other treated and control group (day 14, Table 3).

Table (3): Effect of treatment on mean diameters (mm) of non-gravid horn in postpartum buffalo cows.

Post-partum day	Control	Treatment group			
		MET 0 time	MET 24 h	OXY 0 time	OXY 24 h
3	2.50 ± 0.20^{a}	2.75 ± 0.25^{a}	2.63 ± 0.38^{a}	3.00 ± 0.00^{a}	3.38 ± 0.24^{a}
7	2.13 ± 0.13^{a}	2.25 ± 0.32^{ab}	2.63 ± 0.38^{a}	2.38 ± 0.13^{b}	2.63 ± 0.24^{b}
10	2.13 ± 0.00^{a}	1.75 ± 0.14^{b}	2.38 ± 0.52^{ab}	2.00 ± 0.20^{b}	2.25 ± 0.32^{bc}
14	1.38 ± 0.13^{b}	1.50 ± 0.00^{b}	1.75 ± 0.29^{bc}	1.75 ± 0.14^{bc}	1.88 ± 0.13^{cd}
17	1.00 ± 0.00^{b}	1.38 ± 0.13^{b}	1.63 ± 0.13^{c}	1.63 ± 0.24^{c}	1.50 ± 0.20^{d}
21	1.00 ± 0.00^{b}	1.38 ± 0.13^{b}	1.38 ± 0.13^{c}	1.50 ± 0.20^{c}	1.50 ± 0.20^{d}
24	1.00 ± 0.00^{b}	1.13 ± 0.13^{b}	1.13 ± 0.13^{c}	1.38 ± 0.13^{c}	1.38 ± 0.24^{d}
27	1.00 ± 0.00^{b}	1.13 ± 0.13^{b}	1.13 ± 0.13^{c}	1.34 ± 0.13^{c}	1.25 ± 0.24^{d}
31	1.00 ± 0.00^{b}	1.13 ± 0.13^{b}	1.13 ± 0.13^{c}	1.34 ± 0.13^{c}	1.25 ± 0.24^{d}

a, b ....f: Means denoted within the same column or row with different superscripts are significantly different at P<0.05.

It is worthy noting that the morphological changes in non-gravid horns of pregnant animals caused by changes in all uterine compartments during pregnancy as a result of presence of the embryo in the gravid horn. Therefore, the involution of non-gravid horns was detected to be faster during early post-partum period as compared to the gravid horns, which required longer interval to be involuted. Such trend of changes in diameter of gravid and non-gravid horns during post-partum period are illustrated in Fig. (1).

Cervical involution:

Results in Table (4) revealed that cervical diameter showed significant (P<0.05) reduction to be closed during post-partum period in all groups, with different trends in each treatment group as compared to the control group. The significant reduction in cervical diameter stopped earlier in MET 0 time group (day 14) than in other treatment and control groups (day 17).

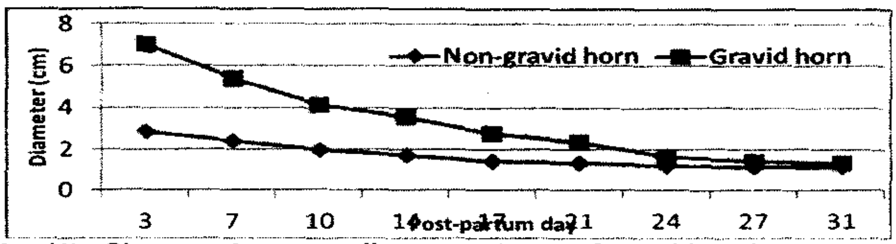

Fig. (1): Changes in mean diameters (mm) of gravid and non-gravid horns in postpartum buffalo cows.

The present results may indicate earlier cervical closure of buffalo cows treated with MET at 0 h post-calving. Such trend was associated with earlier involution of non-gravid horns in the same group (Table 3).

Based on the results of uterine horn involution and cervical closure, treatment of buffalo cows treated with MET at 0 time showed the best results of uterine involution as compared to other treatment and control group.

Table (4): Effect of treatment on cervical diameters (mm) of postpartum buffalo cows.

Post-partum day	Control	MET 0 time	MET 24 h	OXY 0 time	OXY 24 h
3	6.25±0.48^{a}	5.50±0.29^{a}	6.50±0.50^{a}	6.75±0.25^{a}	6.25±0.48^{a}
7	4.25±0.25^{b}	4.38±0.24^{b}	5.75±0.75^{a}	4.63±0.38^{b}	4.63±0.24^{b}
10	3.50±0.29^{bc}	3.13±0.13^{c}	4.25±0.48^{b}	4.00±0.41^{bc}	3.75±0.25^{c}
14	2.88±0.24^{c}	2.75±0.14^{d}	3.50±0.35^{b}	3.25±0.29^{c}	3.25±0.14^{c}
17	2.38±0.24^{cd}	2.50±0.20^{d}	2.50±0.20^{c}	2.88±0.13^{cd}	2.63±0.13^{d}
21	2.00±0.35^{d}	2.25±0.32^{d}	2.13±0.24^{c}	2.38±0.13^{d}	2.38±0.13^{d}
24	1.88±0.24^{d}	1.88±0.24^{d}	1.88±0.24^{c}	2.00±0.00^{d}	1.88±0.13^{e}
27	1.63±0.27^{d}	1.88±0.24^{d}	1.88±0.24^{c}	2.00±0.00^{d}	1.88±0.13^{e}
31	1.63±0.27^{d}	1.88±0.24^{d}	1.88±0.24^{c}	2.00±0.00^{d}	1.88±0.13^{e}

a, b ....f: Means denoted within the same column or row with different superscripts are significantly different at P<0.05.

Conception rate:

The examination of the conception rates after 1st service revealed that 50% of animals treated with MET at 0 or 24 h post-calving and 75% of those treated with OXY at 0 or 24 h post-calving became pregnant versus 50% of the controls. The differences between groups were statistically significant ($P<0.05$). The conception rate at the second estrous cycle after parturition was 25% for animals treated with MET at 24 h post-calving, while none of animals treated with MET at 0 time or OXY at 0 or 24 h post-calving were conceived. The conception rate at the third estrous cycle after parturition was significantly ($P<0.05$) higher in animals treated with MET at 0 time (50%) than those treated with OXY at 0 or 24 h post-calving (25%) and controls (25%), while the conception rate of animals treated with MET at 24 h post-calving was 0%. However, only one animal in the control group and another treated with MET at 24 h post-calving required more than three services to conceive (25%, Table 5).

It is of interest to note that animals treated with MET at 0 h post-calving and those treated with OXY at 0 or 24 h post-calving showed higher conception rates (100%) after the 3rd service, but was associated with the least number of services per conception (1.5 services) only in animals treated with OXY at 0 or 24 h post-calving as compared to those treated with MET at 0or 24 h post-calving (2 services) and control animals (2.5 services). Interestingly to note that animals treated with OXY at 0 time showed the best results regard to conception rate, number of services per conception and days open (Table 5).

Table (5): Effect of treatment on cumulative conception rate (%) in postpartum buffalo cows.

Conception rate (%)					Item
OXY 24 h	OXY 0 time	MET 24 h	MET 0 time	Control	
75^{a}	75^{a}	50^{b}	50^{b}	50^{b}	1st service
0.0^{c}	0.0^{c}	25^{a}	0.0^{c}	0.0^{c}	2nd service
25^{b}	25^{b}	0.0^{c}	50^{a}	25^{b}	3rd service
-	-	25**	-	25*	> 3 services
1.50 ± 0.50^{b}	1.50 ± 0.50^{b}	2.00 ± 0.71^{ab}	2.00 ± 0.58^{ab}	2.50 ± 0.96^{a}	NSC
112±37.77	95±30.73	109±44.64	138±40.52	154±46.42	Days open

a and c: Means denoted within the same row with different superscripts are significantly different at $P<0.05$. NSC: Number of services per conception.

* Five services. ** Four services.

Based on the present results of uterine involution (Table 1) and reproductive performance (Table 5), animals treated with MET at 0 or 24 h post-calving showed higher impact on uterine involution, however, those treated with OXY at 0 or 24 h post-calving showed no effect on uterine involution with the best reproductive performance, in particular those treated with OXY at 0 h.

DISCUSSION

The aim of this study was to rapidly reduce the large postparturient uterus to its pre-gravid state, to clear the uterus, to decrease the rate of uterine infection arising out of the delay in involution and to increase the conception rates by inducing uterine contractions by administering methergin or oxytocin at 0 or 24 h post-calving.

The present results for the mean diameter of the gravid or non-gravid horns were different among the experimental groups, but we studied the morphological changes in mean diameters to indicate the interval to be involuted (constant measures at successive days. The detected higher measurements of gravid uterine horns and cervix at 3 days post-partum was mainly due to the gravid uterus is a large flabby sac lying in the abdominal cavity during the first 24–48 h after calving (Chauhan *et al.*, 1977) and the uterus was considered completely involuted in buffaloes when it returns to its pre-conception size, tone and location in the pelvic cavity (Hussain-Shah *et al.*, 1990). In post-partum cows, Morrow (1969) found during involution that, the size of the uterus markedly decreases. This reduction in size was relatively slow during the first 10 days, but was followed by a period of markedly increased uterine tone and reduction in its size during the next 10-14 days postpartum. According to the present results in this study, buffalo cows showed an opposite trend to bovine in this respect (Table 2). In accordance with the present results, Agrawal *et al.* (1978) found that the average weight of the uterus of buffalo cows including the cervix is markedly decreased from about 6 kg just after parturition to about 3 kg on day 7. On day 15 when the caruncles are completely degenerated the average weight is 0.7 kg then it decreases to 0.3 kg on day 45. The gravid horn becomes located on the pelvic brim by day 14 (Usmani and Lewis, 1984), then in the pelvic cavity by days 21–25 (Roy and Luktuke, 1962). Also, Aboul-Fadle (2000) reported that the diameter of the uterus is halved by day 5 postpartum and its length is halved by day 15 postpartum and the uterus regains its normal size on day 19 to 21 if there is no pathological affections.

Based on anatomical features used in this study, the complete uterine involution occurred at an interval averaging 28.5 day post-partum in the control group. Suthar *et al.*, (2004) found that uterine and cervical involution was completed at an average of 26.4 ± 0.70 days postpartum in Mehsani buffaloes, which is in nearly similarity to the present results. However, the uterus of the buffalo cows was completely involuted later by the 45th day postpartum (Agrawal *et al.*, 1978), 40.7 days (El-Sheikh and Mohamed, 1977) or 35.4 days (Tejram, Shanikar and pant, 1979). The ideal length for complete uterine involution period was between 31 and 40 days (El-Shafie *et al.*, 1983). However, El-Azab *et al.* (1984) recorded that the mean intervals necessary for complete cervical and uterine involution were 35.3±5.3; 27.8±3.2 and 26.1±3.3 days for post-gravid, non-gravid horns and cervix, respectively. In addition, the duration to complete uterine involution in Egyptian buffaloes averaged 26 to 45 days (Essawy, 1987), 30 days (Abdo, 1988), 40.3±1.2 days (Aboul-Ela *et al.*, 1988) and 24-44 days (El-Sabbagh, 1993). The uterine involution was completed 34.30±1.3 days in dairy buffaloes (Qureshi *et al.*, 1998), and by the day 45 postpartum in Murrah buffalo cows (Lohan*et al.*, 2000). Such results suggested marked variation in uterine involution according to breed, age, parity of buffaloes (Harbac, 2006).

Uterine muscle activity is important in the process of involution. A contractile uterus is advantageous in removing excessive fluid and debris from the uterine lumen early postpartum. Previous observations on cows without fetal membrane retention showed that while there was a high variability among individual animals, uterine contractions generally diminished rapidly, with a major decline between 12 and 24 h after calving, and with very little spontaneous contractility left at 48 h (Bajcsy *et al.*, 2005). Uterine contractility is necessary for the clearance of intrauterine fluid after bacterial infusion in the buffalo cows.

Treatment protocols, in which uterotonic drugs are administered during the puerperal phase in cows to evacuate the uterus by increasing its contractility, aimed to accelerate the process of involution (Bajcsy *et al.*, 2006). Methergin is a medication that has been associated with myocardial infarction in women. Methergin is a semi-synthetic ergot alkaloid used for both the prevention and control of uterine hemorrhage during the postpartum period. This drug directly contracts smooth muscle cells, which results in rapid and prolonged contraction of the uterus. The mean half-life is 3.4 hours but may be as long as 12.7 hours (Nall and Feldman, 1998; Gowri and Al Haini, 2003). In the present study a pronounced positive effects were detected for animals treated with methergin at 0 or 24 h post-calving. Similarly, Abou El-Ghait (2004) reported that injection of methergin within the first 24 hours postpartum may be efficient as much as GnRH-PGF2-GnRH regime in reducing days required for complete uterine involution and days to first estrus in Egyptian buffalo cows.

Numerous attempts have been made to achieve a longer uterotonic effect by using oxytocin. A continuous, slow-rate intravenous drip infusion, as is often used in humans, is difficult to perform with animals under farm conditions (Kündig *et al.*, 1990). The use of oxytocin seems to be preferred during the puerperal phase. However, only a few studies (Eiler *et al.*, 1984; Burton *et al.*, 1990) have quantified the uterotonic effects of oxytocin if administered shortly (within 12 h) after calving (Giama *et al.*, 1976; Burton *et al.*, 1990).

In buffaloes, Unar *et al.* (1988) reported that administration of oxytocin following parturition decreased the mean interval to complete uterine involution to 34 days. They added that treatment with antibiotics (systemic and intrauterine) decreased the interval to complete uterine involution to 31 days. The interval to complete uterine involution in non-treated buffalo cows was 35 days. Bajcsy *et al.* (2006) indicated that administration of either 50 IU oxytocin or 0.35 mg carbetocin (Oxytocin analogue) intramuscularly elicited similar uterotonic effects in healthy, early postpartum cows (Between 14 and 16 h after parturition). Because by the fourth hour after treatment, the levels of contractility in the two treated groups have effectively dropped to that of the control group, no further effect on the contractility of the uterus could be expected from the drugs beyond this time. The normal effect of oxytocin on uterine involution of buffalo cows in this study may be attributed to that the biological effect of oxytocin depends on two factors: on how quickly it is removed from the circulation by excretion and through metabolism, and on whether there are enough specific receptors available, which are capable of binding the drug. It can therefore be anticipated that this effect would be short lasting, as the half-life of oxytocin has been reported to be short in cows (Wachs *et al.*, 1984). Also, the decreased plasma estrogen levels in the cow around calving could impair the effect of oxytocin in a very early postpartum uterus, because estrogen may stimulate the synthesis of endometrial oxytocin receptors (Eulenberger *et al.*, 1986; Kündig *et al.*, 1990).

In mare, oxytocin can be used for promoting uterine involution (Brinsko *et al.*, 1993; Alaçam, 1997) and the effect of oxytocin level on the uterine response (5 vs. 40 IU oxytocin was studied by several authors (Gutjahr *et al.*, 2000; Madill *et al.*, 2002), showing that contractile activity and duration of response were greater by increasing oxytocin level. The failure of the oxytocin administration to reduce uterine size has been due to: (1) the failure to induce sustained uterine contractions and (2) the failure of induced contractions to reduce uterine size (Blanchard *et al.*, 1991).

Regarding the reproductive performance (Table 5), Schirar and Martinet (1982) recorded that re-initiation of normal cyclic activity postpartum depends on the return of the uterus to non-gravid size and function, for that, the uterus plays an important role in the resumption of ovarian functions during the postpartum period. Also, Chauhan *et al.* (1977) reported that involution of the uterus has an important role in a cow to becoming pregnant again. Moreover, Van De Plassch (1981) reported that among the factors limiting restoration of ovarian function after calving is uterine involution that has to be grossly completed between 30 and 40 days postpartum in dairy cows. Although, oxytocin treatment had no effects on uterine involution of buffalo cows as proven in this study, it showed beneficial effects on reproductive performance of buffalo cows. In this respect,

Blanchard *et al.* (1991) reported that the mean day of first postpartum ovulation in the control group was longer than those of the oxytocin group. In agreement with the present results, the 1st conception rate was 55.8% in Egyptian buffaloes (El-Shafie *et al.*, 1983) or 47% in Murrah-Nili Ravi buffaloes (Singh *et al.* (1979). However, it was lower (36.38%) as reported by Oloufa (1955). On the other hand, Singh *et al.* (1979) observed the higher 1st conception rate (63.6%) when buffaloes were bred between 46-60 days postpartum. The reason of decreasing reproductive performance of animals treated with methergin, despite of the earliest uterine involution may indicate a negative relationship between duration of uterine involution and resumption of ovarian activity, although Paisley *et al.* (1986) concluded that the interval from parturition to conception is often longer as a result of delayed involution of the uterus, delayed resumption of estrous cycles or both.

CONCLUSION

In conclusion, it was found that the oxytocin treatment at 0 h of calving performed on buffalo cows with the purpose of stimulating involution had pronounced effect on the duration of days open, number of services per conception and conception rate, without marked effects on the shrinkage of the uterine horn diameter and closure of the cervix during post-partum period compared with that seen in the controls.

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تأثير الميثرجين والأوكسيتوسين كعوامل علاجية علـى عـودة الـرحم لوضـعه الطبيعى وخصوبة الجاموس المصرى

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أجريت هـذه الدراسة بمحطة بحوث الإنتاج الحيوانى بمحلة موسى التابعة لمعهـد بحـوث الإنتاج الحيوانى لتقييم تأثير الميثرجين والأوكسيتوسين كعوامل علاجية على عودة الرحم لوضعه الطبيعى وخصوبة الجاموس المصرى. تم إستخدام ٢٠ بقره جاموسى بعد الـولادة تتـراوح فـى أوزانها من ٤٠٠-٦٥٠ كجم وعدد الولادات من ٢-٧. تم تقسيم الحيوانات إلى خمسة مجموعـات (٤ لكل مجموعة)وكانت المعاملات كالتالى:

المجموعة الأولى: إستخدمت كمجموعة ضابطة (كنترول) وتم حقنها بمحلول فـسيولوجى عنـد الولادة، ثم بعد ٢٤ ساعة من الولادة. المجموعة الثانية: تم حقنها بالميثرجين بمعدل ٣ مجـم/رأس عند الولادة. المجموعة الثالثة: تم حقنها بالميثرجين بمعدل ٣ مجم/رأس بعد ٢٤ ساعة من الولادة. المجموعة الرابعة: تم حقنها بالأوكسيتوسين بمعدل ١٠٠ وحدة دولية/رأس عند الولادة. المجموعة الخامسة: تم حقنها بالأوكسيتوسين بمعدل ١٠٠ وحدة دولية/رأس بعد ٢٤ ساعة من الـولادة. تـم إجراء فحص روتينى للجهاز التناسلى عن طريق الجس الشرجى باليد مرتين أسبوعيا لتتبع عـودة الرحم لوضعه الطبيعى. كما تم إجراء الفحص باستخدام جهاز الموجات فوق الصوتية مباشرة بعد الجس اليدوى لقياس سمك قرنى وعنق الرحم. تم إعتبار الرحم فى وضعه الطبيعى مكـتملا عنـد

تقارب قرنى الرحم فى الحجم. كما تم تشخيص الحمل با ستخدام الجس الشرجى عند اليوم ٤٥ بعد التلقيح، وتم تسجيل معدل الأخصاب.

وقد أوضحت النتائج مايلى:

١- كان معدل رجوع الرحم لوضعه الطبيعى أسرع معنويا فى المجموعة الثانية والثالثة (٢٤.٣ و ٢٤.٥ يوم) عنه فى المجموعة الأولى (٢٨.٥ يوم)، أيضا كان المعدل أسرع فى المجموعة الرابعة والخامسة عن المجموعه الأولى ولكن الفروق كانت غير معنوية. وبالمثل أيضا كان معدل حدوث غلق عنق الرحم أسرع فى المجموعات المعاملة عنها فـــى الكنتـــرول، وكـــان أسرعها فى المجموعة الثانية (٢١.٨ يوم).

٢- التقلص فى حجم قرن الرحم الـــذى كان يحوى الحمل تم توقفه معنويا فى اليوم ١٧، ١٧، ٢٤ و ٢٤ بعد الولادة فى المجموعة الثالثة، الثانية، الرابعة والخامسة مقابل توقفه فى اليـــوم ٢٧ بعد الولادة فى مجموعة الكنترول. من ناحية أخرى فـإن التقلص فى حجم قرن الرحم الخالى من الحمل توقف معنويا مبكرا فى المجموعة الثانية (اليوم ٧) مقارنـــة ببـــاقى المجموعـــات المعاملة والكنترول (اليوم ١٤).

٣- قفل عنق الرحم توقف معنويا مبكرا فى المجموعة الثانية (اليوم ١٤) مقارنة بباقى المجموعات المعاملة والكنترول (اليوم ١٧).

٤- أظهرت لحيوانات المعاملة بالأوكسيتوسين عند الولادة (المجموعة الرابعة) أفضل النتائج فـــى معدل الخصوبه بعد التلقيحه الأولى (٧٥%)، عدد التلقيحـــات اللازمـــة للأخـــصـــاب (١.٥) وعددالأيام المفتوحة من الولاده حتى الأخصاب (٩٥ يوم) مقارنة بباقى المجموعات المعامله والكنترول.

فى ضوء النتائج السابقة يمكن استنتاج أن المعاملة بالأوكسيتوسين عند الولادة فى الجاموس، والتى أجريت بغرض تبكير عودة الرحم لوضعه الطبيعى كان لها تأثير واضح على كل من الأيام المفتوحة، عدد التلقيحات اللازمة للأخصاب ومعدل الخصوبه دون أن يكون لها تأثير ملحوظ على إنكماش حجم قرن الرحم الذى حدث به حمل أوغلق عنق الحم فى فترة مابعد الولادة.

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