

# Reproductive performance of Iraqi Awassi ewes in response to treatment with equine chorionic gonadotropin

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## Summary

Exogenous gonadotropins are widely used to improve ovulation rate, fertility or to reduce embryonic mortality. Therefore, two experiments were performed at Al-Rafedain Company Sheep Farm, Wasit Province during the 2000 mating season. In Expt. 1, 64 ewe lambs (10-11 months of age) were i.m. injected with either 400 IU (n=22; T<sub>1</sub>) or 600 IU (n=22; T<sub>2</sub>) equine chorionic gonadotropin (eCG) after removal of MAP-impregnated sponges or left as control (n=20; C). In Expt. 2, 829 adult ewes (2-4 years old) were treated either with 400 IU (n=86; T<sub>1</sub>) or 600 IU (n=293; T<sub>2</sub>) eCG after the withdrawal of MAP-impregnated sponges or left as control (n=450; C). Lambs of T<sub>1</sub> and T<sub>2</sub>-groups exhibited the highest (18.75%) twinning percentage (P<0.01) and litter size (1.25) (P<0.05). Conception rate was slightly higher (P<0.05) in group C (80%) compared with the treated groups (72.72%). In Expt. 2, administration of 600 IU eCG improved lambing and twinning rates by 27 and 73% respectively (P<0.01), and that . Litter size increased significantly (P<0.05) in T<sub>2</sub> (1.62).

In conclusion, the implementation of 400 and 600 IU of eCG in Awassi sheep warrants improvement of the reproductive efficiency of ewe lambs and adult ewes during the mating season.

**Keywords:** . eCG; Reproduction; ewes.

## Introduction

The effectiveness of an estrus synchronization system is measured by its ability to elicit a fertile, tightly synchronized estrus response in a majority of treated females. (Odde, 1990). The system must be cost-effective, requires minimal labor, entails limited animal handling and be user-friendly to a producer. Intravaginal progestagen sponges in conjunction with equine chorionic gonadotropin (eCG) (previously called PMSG) are the most effective hormonal regimes used frequently in the sheep industry to induce breeding activity (Gordon, 1983), improve productive efficiency and to facilitate the use of artificial insemination (Beck *et al.*, 1993).

An enormous amount of literature concerning the reproductive performances of Iraqi ewes as influenced by different levels of eCG has been substantiated (Al-Jubouri, 1983; Imam and Juma, 1987; Hamra and Jassim, 1988; Al-Haboby *et al.*, 1992; Al-Rawi *et al.*, 1997; Ageel, 1998; Alkass *et al.*, 1999 and Al-Khazraji *et al.*, 2000) and their results are inherently variable due to differences in number of animal used, analogues, breeds or in management practices followed. However, the studies involving large numbers of animals have never been achieved in Iraq. Moreover, very little attempts using such treatments was conducted for Iraqi ewe lambs (ICARDA, 1996; Al-Rawi *et al.*, 1997 and Abdulkareem, 2002). Such observations prompted us to identify the effects of two different levels of eCG (400 and 600 IU) on some of the reproductive aspects of Iraqi Awassi ewes and ewe lambs.

## Materials and Methods

Two experiments were conducted at Al-Rafedain Company Sheep Farm, Al-Dubouni, Wasit Province during the 2000 mating season. Sixty four Awassi lambs (10-11 months of age) (Expt. 1) and 829 adult Awassi ewes (2-4

years old) (Expt. 2) were used. Animals were allowed to graze cereal stubble and barley grains (400 and 500 g for ewe lambs and adult ewes per day, respectively) according to their requirements (NRC, 1975).

### Expt. 1 :

Animals were randomly divided into three groups. The first group (n = 20) was served as control (C), and ewe lambs of group 2 (n=22) and group 3 (n=22) were i.m. injected with 400 (T<sub>1</sub>) and 600 IU ECG\* (T<sub>2</sub>) respectively. The injections were carried out 13 days after the withdrawal of the vaginal sponges impregnated with 60 mg MAP\*\*.

Active fertile rams (1:25) were introduced to ewe lambs 48 hrs. after the removal of sponges. Rams were left with the ewe lambs for 3 estrual cycles (51 days) together with the control group.

### Expt. 2 :

Adult Awassi ewes (2-4 years old) were divided randomly into three groups, a non-treated control group (n=450; C) and two eCG-treated groups. Ewes in group 2 (T<sub>2</sub>; n=86) and group 3 (T<sub>3</sub>; n=293) were treated with progestagen (60 mg MAP\*\*) impregnated sponges for 13 days and either treated with 400 or 600 IU eCG, respectively. Active fertile rams (1:25) were introduced to ewes, 48 hrs. after the withdrawal of the sponges. Rams were left with the ewes for 3 estrual cycles (51 days). Fertile rams (1:25) were also left with the control group for 3 estrual cycles.

For both experiments, fertility (%), litter size and the rates of conception, lambing and twinning together with barrenness were calculated according to Al-Saigh and Alkass (1992).

Data were analyzed by using GLM procedures (SAS, 1996). Chi-Square test was performed to test the significance of the differences.

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**Results**

**Expt. 1 :**

Fertility rate was not affected significantly by eCG treatment. Though it tended to be higher in C-ewe lambs (75%) in comparison with the treated groups (72.7%) (Table 1). Conception rate, on the other hand, was higher ( $P<0.05$ ) in C group (80%) compared with eCG-treated groups (72.7%) (Table 1).

Lambing rate tended to be higher (+7%) in the treated than in C group. T1 and T2 groups exhibited the highest ( $P<0.05$ , + 65%) twinning rates in relation with C group (Table 1).

Treatment with eCG caused significant ( $P<0.05$ ) increase in litter size of treated ewe lambs (1.25, vs. 1.13). The percentages of barren ewes were not affected by eCG administration, which were 25, 27.3 and 27.3% for C , T1 and T2 groups, respectively (Table 1).

**Table 1.** Effect of eCG on the reproductive performance of Awassi ewe lambs.

Traits	Treatments			Level of significance
	C	T1	T2	
No. of ewe lambs	20	22	22	
No. of ewes lambed	15	16	16	
No. of ewes aborted	1	0.00	0.00	
(1) Fertility (%)	75	72.7	72.7	N.S
(2) Conception rate (%)	80	72.7	72.7	*
No. of lambs born	17	20	20	
No. of twins born	1	3	3	
(3) Lambing rate (%)	85	90.90	90.90	N.S
(4)Twinning rate (%)	6.66	18.75	18.75	**
(5)Littersize	1.13	1.25	1.25	*
(6)Barrenness (%)	25	27.28	27.28	

**Expt. 2 :**

Fertility rate and barrenness did not vary among groups. Though it tended to be higher and lower respectively in C-ewes compared with eCG-treated groups (Table 2).

T1-ewes exhibited the lowest ( $P<0.05$ ) rate of conception (76.7%); the rates of C and T2- groups were 84.4 and 84.3% respectively (Table 2). Litter size of T2-ewes (1.62), on the other hand, exceeded ( $P<0.05$ ) that of C (1.14) and T1 group (1.11) (Table 2).

Lambing and twinning rates were overwhelmingly higher ( $P<0.01$ ) in T1 and T2 ewes by 27 and 38% (lambing rate) and 62 and 73% (twinning rate) than in the C-ewes (Table 2).

**Discussion**

Results of the present experiments revealed a high rate of fertility (72-83%) compared with those previously reported by Al-Haboby *et al.*, (1992) (60-74%), Ageel (1998) (68%) and Al-Khazraji *et al.*, (2000) (45-70%)

**Table 2.** Effect of eCG on the reproductive performance of Awassi ewes.

Traits	Treatments			Level of significance
	C	T1	T2	
No. of ewe lambs	450	86	293	
No. of ewes lambed	375	62	235	
No. of ewes aborted	5	4	12	
(1) Fertility (%)	83.33	72.09	80.20	
(2) Conception rate (%)	84.44	76.74	84.30	*
No. of lambs born	428	69	383	*
No. of twins born	27	12	63	
(3) Lambing rate (%)	95.33	80.23	130.71	**
(4)Twinning rate (%)	7.13	19.35	26.80	**
(5)Littersize	1.14	1.11	1.62	*
(6)Barrenness (%)	16.7	27.9	19.8	**

\* =  $P<0.05$

\*\* =  $P<0.01$

N.S. = Non significant.

(1) No. of ewes lambed/No. of ram-exposed ewes x100.

(2) No. of ewes lambed and aborted/No. of ram - exposed x100.

(3) No. of lambs born/No. of ram-exposed ewes x100.

(4) No. of lambs born/No. of ewe lambed.

(5) No. of twin born/No. of ewe lambed x100.

(6) 100 - Fertility rate.

and in line with that of Abdulkareem (2002) (75-77.3%) in response to 500-700 IU of eCG. In retrospect, these findings are lower than the previous results on the same farm on adult Awassi ewes injected with 600 IU of eCG (92.2%) (Alkass *et al.*, 1999). One could argue that the main reasons for the reduction of fertility in eCG treated ewes lambs compared with adult ewes in our experiments could be attributed to both uterine and ovarian causes. This may be due in part, to differences in responsiveness of the ovaries to eCG (Mann *et al.*, 1992) reduced sperm transport (Lauderdale and Ericsson, 1970) as well as to alteration in the cleavage rate (Ahmed *et al.*, 1995) or in circulating hormonal milieu (Chow *et al.*, 1982).

Considering the present values of conception rates, the low rates (72-84%) as compared with those reported by Alkass *et al.*, (1999) (90.8-98.7%) experimented on adult ewes using 600 IU eCG. Differences as such may reflect the differences in the potency between analogues as well as in the management practices followed. On the other hand, similar trend was noticed in our previous data on ewe lambs (Abdulkareem, 2002) in which a significant effect of eCG on conception rate was not observed.

Lambing rate of adult ewes was higher ( $P<0.01$ ) in T2 (130.7%) group compared with the other groups (Expt. 2) and tended to be higher (+7%) in eCG treated ewe lambs (Expt. 1). Data of the present work (80.2-130.7%) exceeded those previously obtained by Al-Haboby *et al.*, (1992) (86%) and Al-Khazraji *et al.*, (2000) (45-80%) and on line with the values reported by Ageel (1998) (128.5%) and Alkass *et al.*, (1999) (109-115%) for cross-bred and Awassi adult ewes. Furthermore, the results of

ewe lambs herein (85-90.9%) are slightly less than the values obtained by Abdulkareem (2002) (85-95.54%) for Awassi ewe lambs. An enlightened explanation for this improvement in eCG treated groups must involve the mechanisms controlling embryo survival rather than follicle proliferation. It is noteworthy that eCG can rapidly change growing follicles into antral follicles, stimulate multiplication of granulosa cells and prevent follicular atresia (Mauleon and Mariana, 1977).

Similar improvement in twinning rate was also observed by Ageel (1998) using 500 IU eCG for adult As-saf ewes (34.3%). and Abdulkareem (2002) employing 400 (31.25%) and 600 IU (29.41%) eCG for Awassi ewe lambs. The twinning rate achieved currently by 600 IU eCG (26.8%) (Expt. 2) were overwhelmingly higher than those reported earlier on adult Awassi ewes in response to 500 (23.5%) (Ageel, 1998) or 600 IU eCG (23.9%) (Alkass *et al.*, 1999). Differences between the finding of these studies may be attributed to the differences in the numbers of animals and in their ages.

Collectively, increasing lambing and twinning rates would certainly increase the number of lambs born and consequently increase farmers profits under Iraqi farm conditions.

Treatment with eCG caused a significant increase in litter size among ewe lambs (Expt. 1) and obviously in adult ewes (Expt. 2). These results data are consistent with the findings of Al-Haboby *et al.*, (1992), Alkass *et al.*, (1999) and Abdulkareem (2002).

Excluding data of T2 ewes (1.62), these values are lower than those reported by other workers (1.36-1.87) on different breeds of sheep (Al-Jubouri, 1983; Shrestha *et al.*, 1983 and Hamra and Jassim, (1988). The present low litter size may be associated with ovarian and uterine dysfunction that may be related either to incomplete development of the reproductive tracts of ewe lambs or to thermal and mechanical stress.

The mechanism whereby the overall effect of 600 IU eCG had enhanced lambing and twinning rates as well as litter size of treated ewe lambs with no effect on fertility rate. Apparently, the persistent dominant follicle was regressed during progestagen treatment and new follicle was ovulated at progestagen withdrawal (Anderson and Day, 1994).

The fertility of an ovulated persistent dominant follicle after long - term progestagen treatment (12-16 days) is decreased compared to a normal ovulation. Other proposed mechanism may involve incapability of eCG at this level to decrease intraovarian insulin-like growth factor binding protein-2 (IGFBP-2) activity. The decrease in IGFBP-2 activity is associated with enhanced follicular growth and increased steroidogenesis by granulosa cells (Samaras *et al.*, 1994).

These data indicated that 400 and 600 IU of eCG is a supportive tool in improving some of the reproductive output of Awassi ewe lambs and adult ewes raised extensively of semi-extensively during the breeding season in Iraq.

## Implications

Estrus synchronization in conjunction with eCG is a user-friendly technique to producers, require minimal labor and animal handling. Moreover, eCG is a commercially available gonadotropin in Iraq.

Our results applied successfully in private farm with large flock of ewes raised semi-extensively under Iraqi farm conditions.

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## الأداء التناسلي للنعاج العواسية العراقية استجابةً للمعاملة بهرمون المناسل المشيمي للأفراس (eCG)

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### الخلاصة :

تُستخدم الهرمونات المُنشّطة للمناسل بشكلٍ واسعٍ لتحسين معدل التبويض والخصوبة وتقليل نسبة هلاكات الأجنة. لذلك فقد أُجريت تجربتين في حقل الأغنام التابع لشركة الرافدين للإنتاج الزراعي، في محافظة واسط خلال موسم التناسل 2000. استُخدم في التجربة الأولى 64 من الحملان الأنثوية العواسية بعمر 10-11 شهر فُسمت عشوائياً إلى ثلاثة مجاميع. تُركت المجموعة الأولى (20=n) كمجموعة مقارنة بدون أي معاملة هرمونية في حين تمّ تكتيف الشياح في المجموعتين الثانية (22=n) والثالثة (22=n) باستخدام الاسفنجيات المهبلية الحاوية على 60 ملغم من مركب MAP كبروجستيرون صناعي لمدة ثلاثة عشر يوماً ومن ثم حُقنت بـ 400 (T1) و600 وحدة دولية (T2) على التوالي من هرمون eCG بعد إزالة الاسفنجيات مباشرةً. استُخدم في التجربة الثانية 829 نعجة عواسية بالغة بعمر 2-4 سنوات فُسمت عشوائياً إلى ثلاثة مجاميع أيضاً. حُقنت المجموعتان الثانية (86=n) والثالثة (293=n) بـ 400 (T1) و600 وحدة دولية (T2) من هرمون eCG بعد إزالة الاسفنجيات المُشَبَّعة بـ 60 ملغم من مركب MAP مباشرةً في حين تُركت المجموعة الأولى (450=n) كمجموعة مقارنة بدون أي معاملة هرمونية.

أظهرت الحملان الأنثوية في التجربة الأولى ولدى المجموعتين الثانية والثالثة أعلى (P<0.01) نسبة للتوائم بلغت 18.75% وأعلى (P<0.05) متوسط لعدد المواليد في البطن الواحدة بلغ 1.25. وكانت نسبة الإخصاب أعلى (P<0.05) لدى مجموعة المقارنة (80%) مقارنةً بمجموعتي المعاملة. أدت المعاملة بـ 600 وحدة دولية من هرمون eCG في التجربة الثانية إلى تحسين (P<0.01) نسبة الولادات والتوائم بنسبة 27 و73% على التوالي مقارنةً بمجموعة المقارنة. ازداد عدد المواليد في البطن الواحدة بشكلٍ معنوي (P<0.05) في المجموعة الثالثة (1.62) مقارنةً ببقية المجاميع.

يمكن الاستنتاج أنّ معاملة الحملان الأنثوية العواسية والنعاج البالغة والعواسية بالـ 400 و600 وحدة دولية من هرمون eCG خلال موسم التناسل يؤدي إلى تحسين الكفاءة التناسلية لديها وإمكانية تطبيق هذه النتائج حقلياً وبشكلٍ واسعٍ.

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