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Progesterone concentration in EWES synchronized with Controlled Internal Drug Releasing (CIDR) device

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Abstract

The present study was aimed to determine the progesterone profiles in ewes synchronization with CIDR. The ewes were synchronized with Controlled Internal Drug Releasing (CIDR) device containing 300 mg of progesterone. A total of 120 postpartum, parous, healthy ewes aged about 2 to 5 years were divided into 5 groups and each group consists of 24 animals. Each group was further subdivided into 2 groups consists of 12 animals and were studied during breeding and nonbreeding seasons. Group I ewes were considered as untreated control. Ewes in Group II were treated with CIDR and were left in place for 12 days followed by intramuscular injection of 400 IU of PMSG at the time of device removal. Ewes in Group III were treated with CIDR and 600 IU of PMSG was given intramuscularly at the time of removal of CIDR. Ewes in Group IV were treated as in Group II and additionally supplementation 200 IU of hCG injection at the time of mating. Ewes in Group V were treated as in Group III and additional injection of 200 IU of hCG at the time of mating. Plasma progesterone concentrations of experimental ewes were measured by enzyme-linked immunosorbant assay (ELISA). The progesterone levels before insertion were 1.44 ± 0.13 ng/ml and 2.46 ± 0.11 , 3.63 ± 0.10 and 5.11 ± 0.16 ng/ml on day 3, 6 and 9 of treatment, respectively in breeding season. In nonbreeding season, the progesterone levels were 0.84 ± 0.11 ng/ml before insertion of CIDR. During treatment, the progesterone levels were 1.84 ± 0.14 ng/ml on day 3, 2.33 ± 0.15 ng/ml on day 6, 3.01 ± 0.18 ng/ml on day 9 and 2.55 ± 0.10 ng/ml on day 12 of treatment (at the time of removal). The progesterone levels were significantly ($P < 0.01$) increased from day 0 to day 9 of treatment and thereafter it was significantly ($P < 0.01$) decreased on day 12 of treatment. Significantly, higher progesterone levels were recorded in all groups of ewes inserted with CIDR (3.62 ± 0.21 to 2.99 ± 0.10 ng/ml) compared to control group of ewes (1.43 ± 0.07 ng/ml).

Keywords: Progesterone concentration, EWS synchronized, controlled internal drug releasing

1. Introduction

Estrus synchronization in sheep is achieved by control of the luteal phase of estrous cycle, either by providing exogenous progesterone or by inducing premature luteolysis. The latter approach is not applicable during seasonal anestrus, whereas exogenous progesterone in combination with gonadotropin can be used to induce and synchronize estrus in anovular ewes and does. Exogenous hormonal regimen used to induce fertility in anestrus ewes consists of 12–16 day progesterone treatment followed by injection of gonadotropin.

Intravaginal devices such as sponges and CIDR have been extensively used for estrus synchronization in small ruminants, during the breeding and anoestrus seasons. They are impregnated with progestagens that are effective at lower dose levels than natural progesterone. Intravaginal devices are usually inserted over periods of 9 to 19 day and used in conjunction with PMSG. Intravaginal devices have retention rates of more than 90 per cent and females usually exhibited estrus within 24 to 48 h after removal of device (Wildevus, 2000) [9].

A large number of sheep remain unsettled in the farmer's field due to one or other reproductive problems and are slaughtered every year. The economically important and most commonly occurring reproductive disorder of sheep is anestrus, which causes huge economic loss to the farmers due to low fecundity and longer inter lambing period (< 1 lamb/year). Majority of the indigenous sheep breeds are mono-ovulator, which is major limitation in increase their productivity. Increasing the percentage of lamb crop and number of lambs marked are the primary two goals of sheep producers.

2. Materials and Methods

A total of 120 non-pregnant, healthy and parous ewes aged about 2 to 5 years (60 days postpartum) belonging to different flocks were selected.

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The selected ewes were studied during breeding (September to October) and non-breeding (January to February) seasons. The selected ewes were divided into five groups in such a manner that each major group consisting of 24 ewes. Each group of 24 ewes was divided into 2 sub-groups so that each sub group consisted of 12 ewes each. In each group 12 ewes were subjected to synchronization of estrus during the breeding season and 12 ewes in nonbreeding season.

Group 1 (n=24) served as controls & received no treatment. In group 2 (n=24) the ewes were inserted with CIDR for 12 days and 400 IU of PMSG was injected intramuscularly at the time of removal of CIDR.

In group 3 (n=24) the ewes were inserted with CIDR for 12 days and 600 IU of PMSG was administered intramuscularly at the time of removal of CIDR.

In group 4 (n=24) The ewes were treated with CIDR for 12 days, 400 IU of PMSG was injected intramuscularly at the time of removal of CIDR and injected 200 IU of hCG intramuscularly at the time of mating.

In group 5 (n=24) ewes were inserted with CIDR for 12 days and 600 IU of PMSG at the time of removal of CIDR and 200 IU of hCG at the time of mating was given.

Ewes of all groups were monitored for the symptoms of estrus by using a teaser ram daily 4 times with an interval of 6 hours for the duration of 30 minutes for five days after withdrawal of CIDR. The plasma progesterone profiles were studied on day 0, 3, 6, 9 and 12 of treatment. The Plasma progesterone concentrations of experimental ewes were measured by enzyme-linked immunosorbant assay (ELISA).

3. Results and Discussion

3.1 Progesterone Profiles

The progesterone levels in ewes synchronized with CIDR were presented in Table 1. During breeding season, the progesterone levels were 1.01±0.10, 1.19±0.07, 1.83±0.23, 2.41±0.28 and 2.91±0.33 ng/ml on day 0, 3, 6, 9 and 12, respectively in untreated control group of ewes in CIDR treatment. While in nonbreeding season, the progesterone levels were 0.87±0.06, 0.95±0.09, 1.03±0.10, 1.15±0.15 and 0.99±0.08 ng/ml on day 0, 3, 6, 9 and 12, respectively in untreated control group of ewes of CIDR treatment.

Overall progesterone levels in ewes inserted with CIDR was 1.44±0.13 ng/ml prior to insertion, 2.64±0.11, 3.63±0.10 and 5.11±0.16 ng/ml on day 3, 6 and 9 of insertion and 3.34±0.12 ng/ml at the time of removal of CIDR during breeding season. While in nonbreeding season, the same was 0.84±0.11, 1.84±0.14, 2.33±0.15, 3.01±0.18 and 2.55±0.10 ng/ml, respectively. But Van Cleeff *et al.* (1998) [7] recorded higher levels of progesterone than the present study. However, the progesterone levels of present study were almost nearer to the levels reported by Vinales *et al.* (2001) [8] and Gungor *et al.* (2007).

Overall mean progesterone levels in ewes synchronized with CIDR were 1.43±0.07, 3.04±0.09, 2.93±0.06, and 2.99±0.10 and 2.96±0.08 ng/ml in control, CIDR4, CIDR6, CIDR4h and CIDR6h groups, respectively. The progesterone levels were significantly ($P<0.01$) at higher levels in CIDR inserted ewes than noninserted control group of ewes.

Similar studies were also carried out by Moakhar *et al.* (2012) [4] in Chall breed and Naderipour *et al.* (2012) [5] in Kalkuhi breed of ewes who reported higher progesterone levels during treatment.

The progesterone levels were significantly ($P<0.01$) and progressively increased upto day 9 of insertion in both seasons but subsequently decreased at the time of removal of CIDR in breeding season and maintained higher levels in nonbreeding season at the time of removal. Similar increasing trend of progesterone levels with CIDR treatment was also reported by Hamra *et al.* (1986) [2] where the progesterone concentration increased within 24 (Vinales *et al.*, 2001) [8] or 72 h (Turk *et al.*, 2008) [6] of insertion of CIDR, reached peak level on day 4 and gradually decreased on day 13. Similar increasing progesterone levels during treatment and decreasing progesterone levels after removal of CIDR were also reported by Moakhar *et al.* (2012) [4] and Naderipour *et al.* (2012) [5].

Variation in progesterone levels might be attributed to the time of insertion of CIDR and phase of estrous cycle as reported by Husein *et al.* (2007) [3] who recorded progesterone levels in ewes treated with CIDR during different durations (5 to 9, 10 to 14 and 5 to 14 days) and progesterone levels were differed significantly among the groups.

Table 1: Progesterone profile (ng/ml) in ewes synchronized with CIDR during breeding and nonbreeding season

Sl. No	Group	Season										Overall Mean
		Breeding					Non breeding					
		Day of treatment					Day of treatment					
		0	3	6	9	12	0	3	6	9	12	
Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	Mean ± S.E.	
1.	Control	1.01 ±0.10	1.19 ±0.07	1.83 ±0.23	2.41 ±0.28	2.91 ±0.33	0.87 ±0.06	0.95 ±0.09	1.03 ±0.10	1.15 ±0.15	0.99 ±0.08	1.43 ^b ±0.07
2.	CIDR 4	1.42 ±0.13	3.33 ±0.23	4.43 ±0.28	5.62 ±2.77	3.19 ±0.36	0.81 ±0.08	2.20 ±0.15	2.67 ±0.20	3.92 ±0.20	2.80 ±0.24	3.04 ^a ±0.09
3.	CIDR 6	1.56 ±0.17	2.76 ±0.10	3.88 ±0.22	5.87 ±0.30	3.48 ±0.27	0.82 ±0.07	1.99 ±0.20	2.73 ±0.19	3.28 ±0.23	2.96 ±0.16	2.93 ^a ±0.06
4.	CIDR 4h	1.58 ±0.20	2.99 ±0.26	3.85 ±0.24	5.74 ±0.30	3.62 ±0.21	0.89 ±0.04	2.03 ±0.14	2.75 ±0.18	3.49 ±0.19	2.94 ±0.17	2.99 ^a ±0.10
5.	CIDR 6h	1.64 ±0.18	2.92 ±0.14	4.14 ±0.28	5.91 ±0.30	3.54 ±0.25	0.81 ±0.07	2.02 ±0.19	2.47 ±0.19	3.32 ±0.11	2.88 ±0.10	2.96 ^a ±0.08
	Overall Mean	1.44 ^h ±0.13	2.64 ^e ±0.11	3.63 ^b ±0.10	5.11 ^a ±0.16	3.34 ^c ±0.12	0.84 ⁱ ±0.11	1.84 ^g ±0.14	2.33 ^f ±0.15	3.01 ^d ±0.18	2.55 ^{ef} ±0.10	2.67 ±0.08

Means bearing different superscripts differed significantly

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