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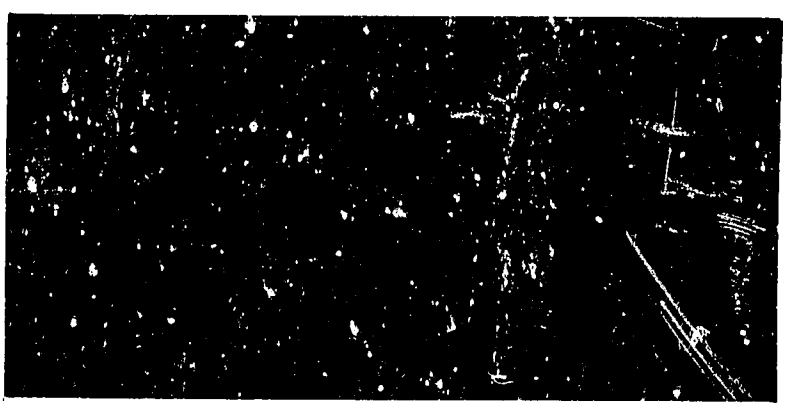

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ENDOCRINE CONTROL OF THE ESTROUS CYCLE IN SHEEP IN THE SOUTHERN ALTIPLANO OF PERU

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ENDOCRINE CONTROL OF THE ESTROUS CYCLE IN SHEEP IN THE SOUTHERN ALTIPLANO OF PERU

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SUMMARY

This study was carried out at the La Raya Experiment Station, IVITA, Cusco, Peru (15° South latitude, 71° West longitude, 4,200 m elevation). A group of 88 ewes (46 Corriedale and 42 Criollo) was bred in June, and 95 ewes (46 Corriedale and 49 Criollo) was bred in November. Approximately half of the ewes served as control and the other half were synchronized using intravaginal sponges containing 40 mg of FGA (14 days) and 500 IU of PMSG. All animals were grazed on native pasture. The mean incidence of estrus and ovulation, fertility at lambing and the fertilization failure and/or embryo-fetal loss did not differ statistically ($P > 0.05$) among age groups, breeds and breeding periods. Yearling ewes showed a lower ($P < 0.05$) incidence of ovulation (75.6%) and tended to show higher ($P < 0.05$) ovulation rate (1.50) and similar ($P > 0.05$) lambing rates (1.25) than older ewes (90.6-92.7%, 1.29-1.37 and 1.13-1.19, respectively). The fertilization failure and/or embryo-fetal loss was higher ($P < 0.05$) in hormone treated (34.8%) than control ewes (17.7%).

The ovulation and lambing rates in ewes receiving hormones (1.68, 1.37) were statistically higher ($P < 0.01$) than in control ewes (1.03, 1.02). The ovulation rate in ewes bred in June (1.55) was statistically higher ($P < 0.01$) than ewes bred in November (1.20). The lambing rate from ewes bred in June (1.26) was numerically higher ($P > 0.05$) compared to November (1.14).

CONTROL ENDOCRINO DEL CICLO ESTRUAL EN OVINOS DEL ALTIPLANO SUR DEL PERU

RESUMEN

Este estudio fue conducido en la Estación Experimental La Raya, IVITA, Cusco, Perú (15° Latitud sur, 71° Longitud oeste, 4,200 m de elevación). Un grupo de 88 ovejas (46 Corriedale y 42 Criolla) fueron empadradas en Junio y 95 ovejas (46 Corriedale y 49 Criolla) en Noviembre. Aproximadamente la mitad sirvieron como ovejas testigo y la otra mitad fueron sincronizadas con 40 mg de FGA en esponja intravaginal y 500 UI de PMSG inyectable al momento de retirar las esponjas (dia 14). Todas las ovejas fueron mantenidas en pradera nativa. La incidencia de estros y ovulaciones, la fertilidad al parto, y la falla de fertilización y/o pérdida embrionaria o fetal no difirieron estadísticamente ($P > 0.05$) entre edades, razas y épocas de monta. Las ovejas de un año (primerizas) mostraron baja ($P < 0.05$) incidencia de ovulaciones (75.6%), alta ($P < 0.05$) tasa de ovulaciones (1.50) y una similar ($P > 0.05$) prolificidad (1.25) que ovejas adultas (90.6 - 92.7%, 1.29-1.37 y 1.13-1.19, respectivamente). La falla

de fertilización y/o pérdida embrionaria o fetal fue alta ($P < 0.05$) en ovejas hormonalmente tratadas (34.8%) comparadas con ovejas testigo (17.7%). La tasa de ovulación y la prolificidad (1.68, 1.37) en ovejas tratadas fue estadísticamente superior ($P < 0.01$) que en ovejas testigo (1.03, 1.02). La tasa de ovulación en ovejas servidas en Junio (1.55) superó estadísticamente ($P < 0.01$) a ovejas servidas en Noviembre (1.20). La prolificidad fue del 1.26 y 1.14 para ovejas reproducidas en Junio y Noviembre respectivamente ($P > 0.05$).

INTRODUCTION

Approximately 56.1 percent of the 15.3 million sheep in Peru is located in the southern altiplano. The majority of these sheep are the Criollo type and belong to the small producers in the communities.

The fertility level in the sheep industry in Peru is low and is influenced by a reduced proportion of ewes showing estrus, low ovulation rate and low fertilization and/or high embryo-fetal loss (Vivanco et al., 1986a; 1986b).

Although there is less than two hours difference in day length throughout the year, a higher incidence of breeding coincides with the shorter days (February to August). However, ewes and rams run together throughout the year, and some lambing does occur at other periods of the year.

Earlier investigators have found methods to control the estrous cycles of ewes by using hormones (Rhind, et al., 1976;

Quirke, 1979) and various levels of light:dark ratios (Vesely, 1975).

Information on the use of hormones to induce estrus and ovulation in sheep in the highlands of Peru is not available. This study is an attempt to measure the effectiveness of progesterone and PMSG on the control of the estrous cycle and fertility of sheep during two periods of the year.

MATERIALS AND METHODS

This study was conducted at the La Raya Experiment Station of IVITA, Cusco, Peru (15° South latitude, 71° West longitude, 4,200 m elevation). A total of 183 ewes were assigned to four age groups, two hormone treatments and to two breeding periods as shown in Table 1. All animals were grazed on native pasture during the total experimental period (June 1984 to July 1985). A group of 88 ewes (46 Corriedale and 42 Criollo) were bred in June, and 95 ewes (46 Corriedale and 49 Criollo) were bred in November. In each breeding period, approximately half of the ewes served as control ewes and the other half were synchronized using intravaginal sponges containing 40 mg of FGA (14 days) and 500 IU of PMSG IM at the time of sponge removal. Fertile painted rams were introduced into the flock of ewes (at a ratio of 1:10) at the time of progestogen withdrawal. The ewes in both the hormone treated and control groups were exposed to fertile rams for a 35 breeding period. The incidence of estrus (ewes

bred/ewes exposed) was recorded. Laparoscopies were performed in all ewes during the post-breeding estrous cycle to obtain the incidence of ovulation (ewes ovulating/ewes observed) and rate of ovulation (number of CL/ewes ovulating). Fertility (ewes lambing/ewes exposed), prolificacy (lambs born/ewes lambing) and fertilization failure and/or embyro-fetal loss (ova shed - lambs born/ova shed) were also determined.

RESULTS AND DISCUSSION

Data on incidence of estrus and ovulation, ovulation and lambing rates, percent fertility and fertilization failure and/or embryo-fetal loss are summarized in Table 2.

The incidence of estrus, fertility and the fertilization failure and/or embryo-fetal loss did not differ statistically ($P > 0.05$) among age groups, breeds, hormone treatment or breeding periods. Yearling ewes had a statistically lower ($P < 0.05$) incidence of ovulations (75.6%) than older ewes (90.6, 92.7 and 92.3 percent, respectively, for 2.5, 3.5 and 4.5 years of age). Nevertheless, yearling ewes tended to show higher ovulation and lambing rates than the older ewes ($P < 0.05$) when expressed as an overall average, which is in contrast to information generally reported that the older ewes have higher ovulation or lambing rates than the ewe lambs (Land, 1970; Scaramuzzi and Radford, 1983).

No statistical differences ($P > 0.05$) were found among breeds (Corriedale vs. Criollo) and breeding periods (June vs.

November) for all observed reproductive traits except for fertilization failure and/or embryo-fetal loss, where values were higher in hormone treated than control ewes (38.4 vs 17.7; $P < 0.05$).

The incidence of estrus for both naturally and hormonally induced ewes (88.8 vs 95.3%; $P > 0.05$) was high and similar to those reported by Quirke (1979) for Finn x Galway ewes and higher than Vivanco et al. (1986a) for Junin and Criollo sheep. The fertility rate did not differ ($P > 0.05$) between the Corriedale (67.4%) and Criollo (75.8%). These levels differ from 40-55 percent for Junin and Criollo sheep during the anestrous season (October - November) and 65 and 84 percent for the same breeds during breeding season (March - April) reported by Vivanco et al. (1986a; 1986c).

It is generally recognized that the majority of breeds in the world have natural ovulation rates of between 1 and 2. Variable responses to hormone treatment in sheep have been reported and relate mainly to the level of PMSG administered in a particular season of the year. Treatment with 500 IU PMSG significantly increased ($P < 0.05$) the ovulation rate (1.68 vs. 1.03) and lambing rate (1.37 vs. 1.02) over the controls.

There was no difference ($P > 0.01$) in fertility of control and synchronized ewes, which indicates that the ewes were still cycling naturally during both breeding seasons. Ewes receiving hormones had a significantly higher ($P < 0.05$) proportion of

fertilization failure and/or prenatal mortality (34.8%) than control ewes (17.7%). Quirke (1979), Casida et al. (1966) and Lahlou-Kassi and Marie (1981) have reported that ewes with a high ovulation rate lost a higher proportion of ova compared to ewes with a low ovulation rate. This might have happened to ewes of this study where twice as much ova loss occurred in hormone treated ewes compared to a low ova loss in control ewes. Fertilization failure and/or embryo-fetal loss (30.3%) did not differ ($P > 0.05$) for the Corriedale and Criollo ewes (27.0%). These results are in agreement with Foote et al. (1959) who reported no difference in loss of early embryos Columbia and Hampshire breeds.

No differences occurred in reproductive performance of ewes during June compared to November ($P > 0.05$). However, the ovulation rate (1.55) and lambing rate (1.26) tended to be higher in relation to the June breeding period compared to the November period (1.20 and 1.14, respectively). The fertilization failure and embryo-fetal loss in ewes bred in both breeding periods was similar (34.9 and 34.5%; $P > 0.05$). Hulet et al. (1956) reported different embryo mortality from early compared to late matings in the season. However, Watson and Radford (1966) detected no differences in embryonic mortality with natural matings at four different times of the year, and Quirke (1979) reported no differences in hormone synchronized ewes.

The results of this study demonstrate that a moderate level of PMSG can be effective in increasing ovulation and lambing

rates in breeds of sheep in the highlands of Peru where these traits are normally very low. Loss due to fertilization failure and/or embryonic mortality is doubled in hormone treated ewes.

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Table 1. Number of animals assigned and experimental design.

Treatment/ Age (years)	Corriedale		Criolla		Total
	Jun	Nov	Jun	Nov	
Control					
1.5	8	4	5	3	20
2.5	4	6	3	3	16
3.5	2	3	5	8	18
4.5	7	8	6	10	31
Hormone treated					
1.5	9	5	8	3	25
2.5	4	6	3	3	16
3.5	2	5	6	10	23
4.5	10	9	6	9	34
Total	46	46	42	49	183

Factorial 4 x 2 x 2 x 2

4 = Ages (2 T, 4 T, 6 T and 8 T; approximately 1.5, 2.5, 3.5 and 4.5 years of age).
2 = Breeds (Corriedale vs. Criolla).
2 = Treatments (control vs. hormone).
2 = Breeding periods (June vs. November).

Table 2. Observed reproductive traits of sheep by age, breed, treatment and breeding period (La Raya, Cusco, Peru).

Variables	Incid. of estrus %	Incid. of ovul. %	Ovul. rate	Fertility %	Lambing rate	Failure[1] %
Overall	91.8	87.9	1.37	71.6	1.20	28.6
Breed						
Corriedale	90.2a	84.8a	1.40a	67.4a	1.23a	30.3a
Criolla	93.4a	91.2a	1.34a	75.8a	1.17a	27.0[a]
Treatment						
Hormone	95.3a	90.6a	1.68b	75.3a	1.37b	34.8b
Control	88.8a	85.7a	1.03a	68.4a	1.02a	17.7[a]
Breeding Period						
June	92.1a	86.4a	1.55b	75.0a	1.26a	34.9a
November	91.6a	89.5a	1.20a	68.4a	1.14a	34.5[a]
Age						
2 T(1.5 yr)	86.7a	75.6a	1.50a	62.2a	1.25a	2[1].6a
4 T(2.5 yr)	90.6a	90.6b	1.31b	75.0a	1.13a	29.0[a]
6 T(3.5 yr)	95.1a	92.7b	1.29b	78.1a	1.22a	20.4a
8 T(4.5 yr)	93.9a	92.3b	1.37b	72.3a	1.19a	31.7[a]

$P < 0.01$ for means with different superscript letters by columns within main effects.

[1]Fertilization failure and/or embryo fetal losses.