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Estrous synchronization of Pelibuey ewes, using CIDR and different doses of eCG

Sincronización de estros en ovejas Pelibuey utilizando CIDR y diferentes dosis de eCG

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Abstract

In the Pelibuey breed, the dose of equine chorionic gonadotropin (eCG) used in the estrous synchronization is not fully established. The objective of this study was to analyze the effect of two different doses of eCG included in progestagens-based estrous synchronization protocols, on the reproductive response of Pelibuey ewes. For this reason, 28 and 24 ewes during two consecutive years were submitted to a synchronization protocol. The first group (LOW) considered the use of a CIDR for a 7-day period, followed by an i.m. administration of 0.125 mg of Cloprostenol and a dose of 300 U of eCG. The second group (HIGH) received the same protocol with a modification, the use of a 400 U of eCG. To evaluate the response variables, were Fisher exact test and analysis of variance considered. There was no difference (P>0.05) between groups for the percentage of estrous ewes (92.31%), total conception rate (82.69%) and the conception rate of ewes with synchronized estrous (87.5%). Additionally, the estrous beginning (47.75±1.43 h) and prolificacy (1.86 lambs/partum) was similar between groups. In conclusion, the estrous synchronization protocols for Pelibuey ewes using CIDR for a 7-day period can use eCG in a dose of 300 U without effects on their associated reproductive performance.

Keywords: ovine, equine chorionic gonadotropin, conception rate.

Resumen

En la raza ovina Pelibuey, no está establecida completamente la dosis de gonadotropina coriónica equina (eCG) a emplear en protocolos de sincronización de estros. El objetivo del estudio fue analizar el efecto de dos diferentes dosis de eCG, incluidas en protocolos de sincronización de estros basados en progestágenos, sobre la respuesta reproductiva de ovejas Pelibuey. Para ello, 28 y 24 ovejas durante dos años consecutivos, fueron sometidas a un protocolo de sincronización; el primer grupo (BAJA) recibió un CIDR durante siete días y a su retiro se administró 0.125 mg de Cloprostenol y eCG a una dosis i.m. de 300 U. El segundo grupo (ALTA) recibió el mismo protocolo con una modificación, el empleo de una dosis de 400 U de eCG. Para evaluar las variables obtenidas, se realizó la prueba exacta de Fisher (datos en porcentaje) o análisis de varianza. No existieron diferencias (P>0.05) entre grupos para el porcentaje de ovejas en estro (92.31%), la tasa de concepción total (82.69%) y de las ovejas con estro sincronizado (87.50%). Adicionalmente, el inicio del estro (47.75±1.43 h) y la prolificidad (1.86 crías/parto) fue similar (P>0.05) entre grupos. En conclusión, los protocolos de sincronización de estros para ovejas Pelibuey que utilizan CIDR por siete días, pueden emplear eCG a una dosis de al menos 300 U, sin afectar sus indicadores reproductivos asociados.

Palabras clave: ovinos, gonadotropina coriónica equina, tasa de concepción.

INTRODUCTION

In different domestic species, for several decades a reproductive technology that is the synchronization of estrus has been as a routine practice in some production units used. Its use in sheep allows to improve reproductive efficiency; although factors such as the wide variety of synchronization protocols (Hashemi *et al*., 2006) and the hormonal products used, including progestogens (Fleish *et al*., 2012; Hashemi *et al*., 2006), can affect the response reproductive to these protocols and thereby increase production costs. A hormone included in a complementary way in the protocols is equine chorionic gonadotropin (eCG), favoring the conception rate and ovulatory rate. Although a risk associated with the use of this hormone is an increase in the ovulatory rate, which leads to multiple births and the possibility of having low-weight offspring; which compromises their survival (Lozano-González *et al*., 2012). Various studies consider the use of eCG, in doses ranging from 0 to 500 U (Arroyo-Ledezma *et al*., 2013; Fleish *et al*., 2012; Garoussi *et al*., 2019; Iida *et al*., 2004); however, there are practically no studies that justify the use of these different doses in Pelibuey sheep. A breed considered low seasonality (Arroyo *et al*., 2007); so the use of high doses might not be justified. A reduction in the dose used would reduce the cost of the synchronization protocol, continue the transition to protocols with less use of hormones and reduce the risks associated with the presence of multiple births.

Therefore, the objective of the present work was to analyze the effect of two different doses of eCG, included in estrous synchronization protocols, based on progestogens on the reproductive response of Pelibuey sheep.

MATERIAL AND METHODS

The study was carried out in the months of February and March (late winter) for two consecutive years, in Colón municipality, in Querétaro state, Mexico (20º42 'North Latitude and 100º01' West Longitude). In this region, a semi-dry temperate climate prevails, with an average annual temperature of 17.4 ºC. Pelibuey sheep (n=28 in year 1 and 24 in year 2) were used, which at the beginning of the study had an average weight of 50.1 ± 1.36 kg and an average body condition of 3.41 ± 0.07, measured on a scale from 1 to 5 (Romero, 2015). Sheep were randomly assigned to two estrus synchronization protocols; the first group (LOW) received the insertion of an intravaginal device, containing progesterone (CIDR) on day 0; same that was withdrawn on day 6, in conjunction with the application of an i.m. of 300 U of eCG and a dose of 0.125 mg of a prostaglandin F2 alpha analog (Cloprostenol). The second group (HIGH) received the CIDR on day 0, withdrawing on day 6, in conjunction with the application of a higher dose of eCG (400 U) and a dose of 0.125 mg of Cloprostenol.

The sheep were subjected to estrus detection 24 h after the devices had been removed. The detection was carried out twice a day (09:00 and 18:00), using a stallion of the same

breed, until reaching 72 hours. Natural service was using, ensuring a male-female ratio no greater than 1:10.

Subsequently, the ewes were subjected to pregnancy diagnoses 35 days after their service, to determine the conception rate. For this, an Aloka brand ultrasound was used, with a 5 MHz transrectal transducer (Mod. SSD500). At birth, the number of offspring born for each of the females was to determine their prolificacy recorded.

For statistical analysis, Fisher's exact test was to establish possible differences in the percentages of sheep in estrus and pregnant sheep performed. Additionally, analysis of variance was performed to determine differences between groups for the variables live weight, body condition, the onset of estrus and prolificacy; considering a randomized complete block (year) design. Previously, the data of some variables were by their natural logarithm transformed; however, their untransformed values are for ease of reading shown.

The onset of estrus was considered taking into account the time elapsed between the withdrawal of the CIDR and the first frank estrous behavior (the sheep allowed it to mount, without moving). Data were analyzed using the SAS statistical package (SAS Institute Inc., Cary, NC), considering in all analyzes a value of $P < 0.05$, as statistical significance (Chavalarias *et al*., 2016).

RESULTS AND DISCUSSION

In this study, body condition can affect reproductive indicators (De La Isla *et al*., 2010) and the weight of the sheep. At the beginning of the study, it was similar ($P > 0.05$) between the synchronization groups (Table 1), which makes it possible to ensure that any possible, difference between the studied treatments. They would not be associated with these indicators, and that both groups entered the study with equal terms. Recorded body condition is within desirable for ewes entering reproductive service period. Only for this variable, the inclusion of the year as a block was significant ($P < 0.05$).

Table 1. Average reproductive variables of Pelibuey ewes subjected to two estrus synchronization protocols, using CIDR for seven days and a low or high dose of eCG

Variable	Low	High	Total
n	27	25	52
Live weight, kg	49.75±1.78	50.40±2.10	50.06±1.36
Body condition	3.43±0.10	3.39±0.11	3.41±0.07
Start of estrus, h	48.36±1.77	47.09±2.33	47.75±1.43
Prolificity (lambs /delivery)	1.95±0.15	1.76±0.12	1.86±0.1

Although no differences ($P > 0.05$) were observed between the treatments for the percentage of estrus (Figure 1), the response achieved for this indicator was good, taking into account what has been described for sheep with similar synchronization protocols (Ali

et al., 2009), and better than those who have used intravaginal sponges (Alavez *et al*., 2014). On the other hand, a perhaps more important indicator, such as the conception rate, was not affected (P> 0.05) by the dose of eCG used.

The results are slightly higher than studies with sheep using sponges (Garoussi *et al*., 20199). This allows us to affirm that the use of a dose of only 300 U of eCG can be as efficient in promoting the expression of estrus and the conception of ewes, as a higher dose (400 U). In the estrous synchronization protocols used, eCG is the second-highest cost, so a decrease in its dose can represent considerable savings. However, it remains to be established whether this dose can be even lower for the breed used.

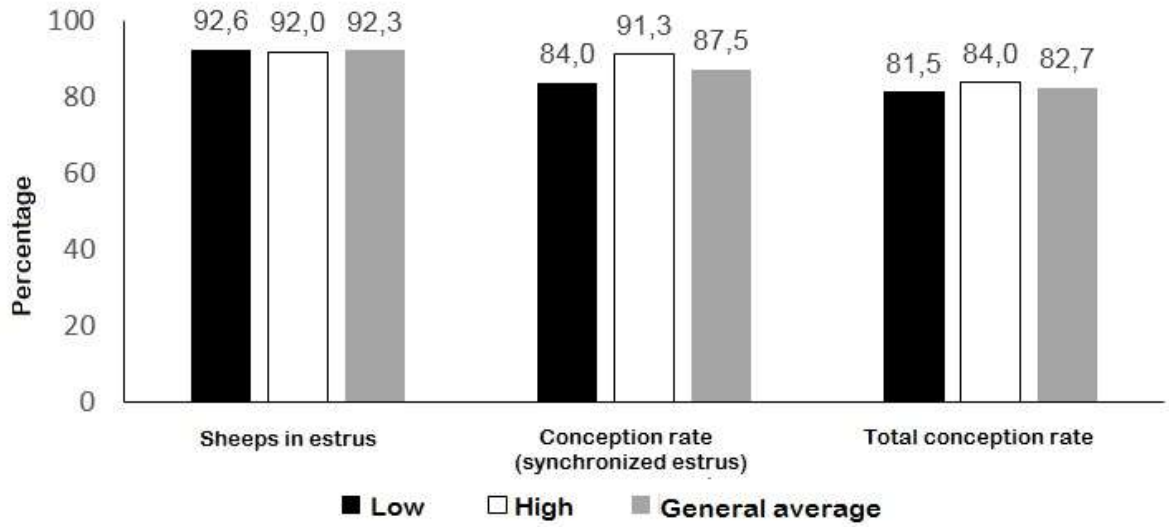

Figure 1. Percentage of sheep in estrus and conception rate of sheep with estrus synchronization protocol that included low or high dose eCG

The percentage of sheep in estrus showed similar results between both groups from 24 to 72 h (Figure 2). The results obtained allow us to suggest that the control of sheep in estrus should be after 33 hours carried out, because at 24 hours, none of the sheep showed estrus.

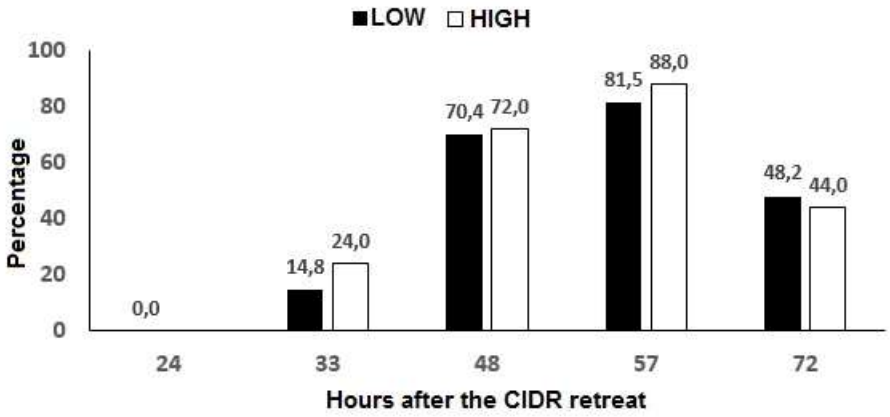

Figure 2. Percentage of sheep in estrus, which were synchronized with CIDR and low or high dose of eCG

The onset of estrus occurred at a similar average (P> 0.05), between synchronization groups (Table 1), with averages that were higher than that observed in other studies using CIDR (Ali *et al*., 2009; Arroyo *et al*., 2013), or intravaginal sponges (Alavez *et al*., 2014). The discrepancy between studies could be due to race; since this onset of estrus was similar to that observed also with hair sheep, using intravaginal sponges (Alavez *et al*., 2014). Unfortunately, the diversity of conditions used in these studies limits a more precise comparison. The eCG can increase the ovulatory rate (Lozano-González *et al*., 2012); however, although less prolificacy was observed with the use of a high dose of eCG, it was not statistically different. Prolificity values are higher than these described for the Pelibuey breed by Galina *et al*. (1996) and Magaña-Monforte *et al*. (2013).

It is likely that the high prolificacy associated with this breed allows for more flexibility regarding the use of eCG, even to use even lower doses than those used in this study, without obviously affecting or impacting the reproductive indicators evaluated. Studies in the future should verify the above.

CONCLUSIONS

The use of a 300 U dose of equine chorionic gonadotropin can be used in protocols for synchronizing the estrus of Pelibuey sheep, based on the use of intravaginal devices for controlled progesterone release. This dose does not modify the reproductive response of the sheep, compared to the use of higher doses of this hormone. Future studies should establish whether it is possible to use even lower doses for this breed, in addition to considering the cost of the protocols used.

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