DOI:10.22059/IJVM.2023.359138.1005391 Iranian Journal of Veterinary Medicine Original Article

Online ISSN: 2252-0554

Comparison of Reproductive Performance Using Progesterone Vaginal Implant and eCG in Out of Breeding Season in Cyclic and Anestrus Dairy Ewes

Jahan Rooshan, Navid[1]. Talebkhan Garoussi, Massoud[1*]. Akbarinejad, Vahid[1]. Azarmi, Sareh[2].

1-Department of Theriogenology, Faculty of Veterinary Medicine, University of Tehran. Tehran-Iran.

2-Ph.D of Reproduction Biotechnology, Faculty of Veterinary Medicine, University of Tehran. Tehran-Iran.

*

ABSTRACT

BACKGROUND: Estrus synchronization is widely used in induction of ovulation in dairy ewes in out of breeding season.

OBJECTIVE: The aims of this study were to investigate the differences in reproductive performance between cyclic and anestrus Lacaune dairy ewes in synchronization protocol using vaginal implant of progesterone (CIDR) and eCG in out of breeding season programming.

METHODS: Eighty-four Lacaune ewes were chosen that ranging in 15 to 20 month old and they had one delivery, which at least 90 days had passed. Two blood samples were taken for progesterone (P4) evaluation apart from10 days. Plasma P4 concentrations were determined using an ELISA. Ewes with <1 ng/ml P4 in two blood sample were considered acyclic and compared with cyclic ewes in estrus expression, Pregnancy rate, Lambing rate, Litter size, Fecundity, Birth weight and sex of lambs. The ewes were kept in separated place about 5 km far away from the rams for more than 2 months.

RESULTE: Out of 84 ewes, 31 ewes were cyclic (36.90 %) and 53 ewes were anestrous (63.10 %). In anestrous ewes, P4 concentration was 0.43 ± 0.4 ng/ml and 0.45 ± 0.04 ng/ml in the first and second blood sampling, respectively. In cyclic ewes, P4 concentration was 2.46 ± 0.39 ng/ml and 2.77 ± 0.34 ng/ml in in the first and second blood sampling, respectively. Expression of behavioral estrus did not differ between anestrous and cyclic ewes ($P > 0.10$). Pregnancy rate and lambing rate tended to be greater in cyclic ewes as compared with anestrous ewes (Odds ratio = 3.35, 95 % confidence interval = 0.88-12.77, $P = 0.08$). Litter size, fecundity, birth weight of lambs and sex ratio of offspring were not different between anestrous and cyclic ewes ($P > 0.10$).

CONCLUSION: The cyclic ewe when using synchronization protocols outside the breeding season could cause high pregnancy and lambing rates in comparison with anestrus ewe.

Key words: Dairy ewe, eCG, Out of breeding season, P4, Reproductive indices.

Introduction

Sheep and goats are seasonal polyestrous animals. The ovarian activity decreases in the seasons when the day length is longer, and they are so-called out of the breeding season. Outside the breeding season, ewes enter the anestrous phase. Anestrous in ewes is characterized by the absence of estrus and ovulation due to a decrease in LH pulse frequency in response to increased sensitivity of the hypothalamus to the negative feedback effect of estradiol (Bedenbaugh *et al*., 2018). Various studies have shown that seasonal estrus in sheep is a result of changes in the response of the hypothalamus-pituitary axis to the ovarian estradiol hormone (Legan *et al*., 1977). In order to resume ovarian activity outside of the breeding season, brain control centers must be re-sensitized (Grattan, 2015). For this purpose, progesterone P4 priming is used. The source of P4 that is provided to the animal actually captures this artificial induction that has a P4 producing corpus luteum. Before creating an active corpus luteum on the ovary, the dominant follicle or follicles must grow from the follicular wave and reach the dominance stage, and then ovulation occurs and then become a P4-producing corpus luteum. Using an external P4 source, artificial induction occurs to re-sensitize brain centers to restart ovarian activity (Kuru *et al*., 2020). There are various methods to induce ovarian activity outside the breeding season of ewe, such as: changing the amount of light exposure (Gómez *et al*., 2008), using melatonin implants (Mura *et al*., 2017), using hormones such as natural and artificial P4. Each of these techniques has a percentage of success and failure. The presence of male animals among female animals can play a significant role in the release of LH and FSH and lead to increased ovulation and subsequent fertility and pregnancy (Ferdowsi *et al*., 2020). The use of natural or artificial P4 in ewes to synchronize estrus has different forms (sponge and CIDR and oral and injectable forms). Each of these P4 sources release a different amount of this hormone into the blood (Gonzalez *et al*., 2020). When there is an intention to use P4 outside of the reproductive season, eCG hormone

65 can be used as a source of gonadotropins along with it to increase the percentage of success in inducing ovarian activity and also the number of lambs with the presence of a ram in each birth (Martinez *et al*., 2018). The method of using CIDR or sponge along with eCG hormone outside the breeding season is a common and well-known method all over the world and has a high pregnancy rate (Pugh and Baird, 2012). The success rate of synchronization in sheep without 70 eCG administration outside the breeding season is low (Boscos *et al*., 2002). Increasing the dose of eCG improves the ovulation rate (Khan *et al*., 2022). The administration of eCG in sheep increases the ovulation rate by mobilizing small ovarian follicles, increasing the growth rate of dominant follicles and changing the proportions of follicle size classes in estrus (Martemucci and Alessandro, 2011). eCG does not seem to rescue follicles from atresia in sheep (Barrett *et al*., 75 2004). eCG causes early oocyte activation (Hameed *et al*., 2021). Follicles that are exposed to eCG synthesize more P4 (Şen, 2020). There are various methods to detect some degree of acyclicity of sheep. Laparoscopy method, ultrasound method, estrus monitoring and plasma progesterone measurement, which are considered the easiest and most accurate methods for detecting anestrous ewe. According to the amount of P4, it is possible to find out if the animal is 80 non-cyclical. According to previous studies, the value of this number has been reported differently. From 0.2 ng/ml (Husein and Ababneh, 2008), 0.5 ng/ml (Talebkhan *et al*., 2012) and 1 ng/ml (Mirzaei *et al.*, 2017) in two occasions and 9 to 10 days apart, they are considered as the basic amount of progesterone, if the amount of progesterone is lower than this number it is considered as acyclic. We considered the highest value mentioned in the articles as the basic P4 85 level so that we can argue that if the P4 level of an ewe is higher than 1 ng/ml, it is definitely a cyclic ewe.

The aims of this study were to investigate the difference between cyclic and non-cyclic dairy Lacuane ewes in the synchronization program outside the breeding season and to compare the

differences using P4 among the ewes regarding the reproductive performance such as: estrus expression, pregnancy rate, lambing rate, litters size, fecundity, birth weight and gender.

Materials & Methods:

Study location

This study was carried out in an industrial dairy sheep farm in Qazvin province-Iran (longitude 50°18′, and altitude 121 m). This study started in April, 2022. The average temperature recorded at this time was 14°C.

Animals

In total, 84 Lacuane dairy ewes, based on plasma P4 levels were divided into cyclic and non-cyclic groups. These two groups were compared based on reproductive indices. The animals were kept in dense conditions. In short, these dairy ewes received 1 kg of corn silage, 420 gr of corn flour, 420 gr of barley flour and 750 gr of alfalfa.

For prevention of ram effects (sight, smell and sound), the ewes were kept in separated pens about 5 km far away from the rams for more than 2 months. All rams had at least one mating season experience. The animals were fed with a mix of alfalfa hay, barley, concentrate with trace elements, and wheat straw in the zone. They were treated by antihelmantic for external and internal parasites. The management of the ewes did not change throughout the entire period. All rams and ewes were fed properly for flushing 20 days before the start of this study. In the flushing, they got higher amount of corn silage and flour with higher amount of barley flour.

Progesterone assay

Two blood samples were taken from the jugular vein before the start of the synchronizing program and subsequent mating, at an interval of 9 days, to evaluate the amount of progesterone in the ewes. To obtain plasma in order to determine progesterone concentration, centrifugation was performed at 1000 rpm for 10 minutes. ELISA method and Monobind kit belonging to USA were used to determine plasma concentration of progesterone. If the amount of P_4 in the plasma was less than 1 ng/ml, it was considered as anestrus.

Protocol for synchronization of estrus

CIDR® (Eazi-Breed™ Zoetis. Pfizer. New York. USA) contains 0.3 gram was used for 14 days. In addition, 400 IU of eCG (Gonaser, Hipra, Spain) was injected intramuscularly on the day of CIDR removal.

Estrus detection

Estrus detection was performed by ram. The rams were introduced to the flock after implant removal. They were within the flock for 40 days. Sheep marking crayon or Ewe Harness Crayon (Carmel®) was used. The back of the ewes was checked for coloring and the effect(s) of ram jumping that were recorded.

Management of mating and pregnancy diagnosis

Rams were introduced to ewes for natural mating in a ratio of one to ten. The rams were in the groups until 25 days after the start of the program. Transabdominal B-mode ultrasonography by WED 3100 (Well. D Schenzhen, China) with a 5 MHz convex array transabdominal transducer was performed for pregnancy diagnosis almost between days 30 and 45 of gestation. The second ultrasonic test was performed to confirm pregnancy in 80-90 days.

Reproductive performance

The reproductive performance indices were calculated such as Estrus expression (EE), lambing rate (LR), pregnancy rate (PR), fecundity rate (FR), prolificacy rate (PR), or little size rate (in the Table). Lamb genus and the average birth weight are shown in the Table.

Statistical analysis

Continuous data (i.e., litter size, fecundity and birth weight of lambs) were analyzed by GLM procedure. Binary data (i.e., estrus expression, pregnancy rate, lambing rate and sex ratio of offspring) were analyzed using GENMOD procedure including function link logit in the model. Multiple comparisons were performed using LSMEANS statement. All analyses were conducted in SAS version 9.4 (Statistical Analysis Systems, Cary, NC, USA). Differences at $P < 0.05$ and $0.05 \leq P < 0.10$ were considered significant and tended to be significant, respectively.

Results

Progesterone concentration

Out of 84 ewes that were evaluated for concentration of progesterone by two consecutive blood sampling 10 days apart, 31 ewes were cyclic (36.90 %) and 53 ewes were anestrous (63.10 %). In anestrous ewes, progesterone concentration was 0.43 ± 0.4 ng/ml and 0.45 ± 0.04 ng/ml in the first and second blood sampling, respectively (in the Figure). In cyclic ewes, progesterone concentration was 2.46 ± 0.39 ng/ml and 2.77 ± 0.34 ng/ml in in the first and second blood sampling, respectively (in the Figure).

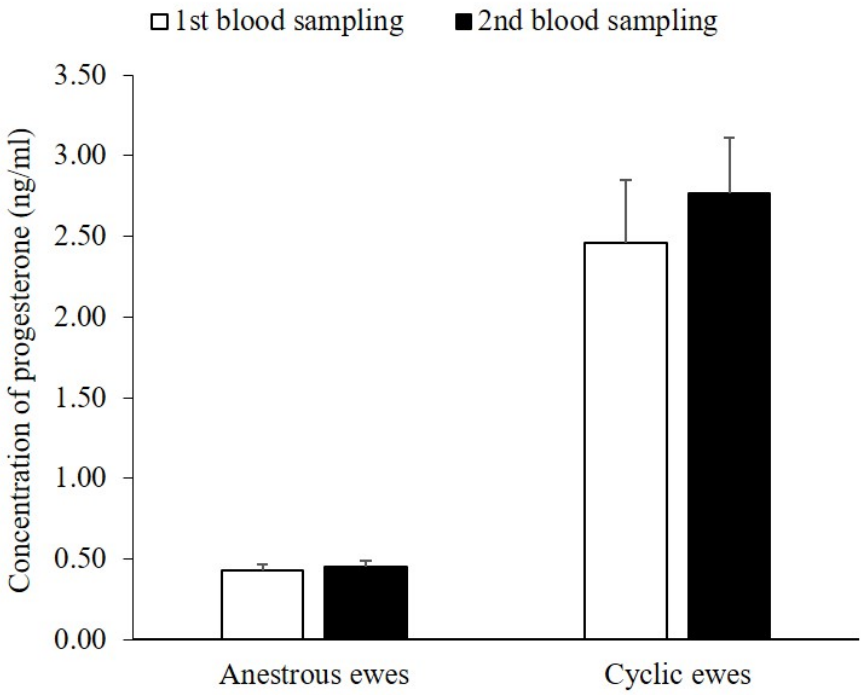

Figure. Concentration of P4 in anestrus and cyclic ewes in the first and the second blood sampling in out of breeding season programming.

Expression of behavioral estrus did not differ between anestrous and cyclic ewes ($P > 0.10$; in the Table). Pregnancy rate and lambing rate tended to be greater in cyclic ewes as compared with anestrous ewes (Odds ratio = 3.35, 95 % confidence interval = 0.88-12.77, $P = 0.08$; in the Table). Litter size, fecundity, birth weight of lambs and sex ratio of offspring were not different between anestrous and cyclic ewes ($P > 0.10$; in the Table).

Variable	Anestrous ewes (n = 53)	Cyclic ewes (n = 31)
Estrus expression (%)	75.47 (40/53)	90.32 (28/31)
Pregnancy rate (%)	73.58 (39/53)[a]	90.32 (28/31)[b]
Lambing rate (%)	73.58 (39/53)[a]	90.32 (28/31)[b]
Litter size	1.44 ± 0.09	1.39 ± 0.11
Fecundity (%)	105.66 ± 10.37	125.81 ± 13.56
Birth weight of lambs (kg)	3.86 ± 0.12	3.96 ± 0.14
Sex ratio of offspring (%)	57.14 (32/56)	64.10 (25/39)

[ab]Various small letters indicate tendency to statistical difference between two categories of ewes ($0.05 < P < 0.10$).

Table. Reproductive performance of anestrous and cyclic ewes in estrous synchronization in out of breeding season. Data are presented as mean ± SEM and percentages. Values in parenthesis are actual numbers.

Discussion

The findings of this study showed that the rate of pregnancy and lambing in cyclic ewes was higher compared to anestrous ewes in the synchronization program out of the breeding season using a synchronization protocol consisting of CIDR and eCG (in the Table). The lack of comparison between cyclic and non-cyclic ewes in synchronization protocols out of the breeding season and the only citation being the off-season at this period, it is clear that the percentage of ewes in the off-season are also cyclic, it has been tried to study the response difference between

these two groups of ewes in the common synchronization protocol of using CIDR and eCG hormone. Naturally, if the amount of P4 before the synchronization program extracted, the proper program for each group of ewes can be presented separately. Reyna *et al*., (2007) showed that the synchronization and response to eCG hormone is better in outside of the breeding season than inside. Within the breeding season, ewes are cyclic and this study showed that the pregnancy rate was reduced in cyclic ewes in out of breeding season in dairy ewes. The main reason for this topic is the insemination method. In the study of Reyna and his colleagues, the insemination was done at a fixed time and laparoscopically, which indicates that it is more suitable to create synchronization with CIDR and then inject eCG hormone in off-season (Reyna *et al*., 2007). In cyclic ewes, the response to CIDR may be completely different. From luteinizing follicles to preventing ovulation and etc. In the case of anestrous ewes, the only purpose of using CIDR is progesterone priming. It is important to mention that the results of our study were obtained by natural mating and artificial insemination was not performed in these groups. This suggests that cyclic ewes may only affect the timing of estrus symptoms. The results of this study also showed that the estrus expression is not lower in cyclic ewes compare in non-cyclic ones, whereas in terms of percentage, 15% more than in estrus expression shown in cyclic ewes. Another important issue is the difference in ovulation time. In cyclic ewes and in the breeding season, if the synchronization program is used, the time of ovulation in these groups is very different from each other, and this also causes the low pregnancy rate in insemination at a fixed time (Santos *et al*., 2020). This does not mean that the response to the synchronization program is low in these groups, however, in cyclic animals, the response to the hormone should be stronger than in non-cyclic animals (Barrett *et al*., 2004). Cyclic cows can be easily induced with two injections of prostaglandin and there is no need to use CIDR and inject hormones. But, sheep are very different from cows. If P4 is measured outside the breeding season, usually 50% of the herd is non-cyclic based on P4 levels, and it is expected that in case of natural mating without

any intervention, approximately 50% of the herd should become pregnant. Whereas only 10 to 15 percent of the cyclic animals became pregnant and remnant need to performed the synchronization program (Arjmandi *et al*., 2021). This is the reason why it is not recommended to inject prostaglandin in any herd of sheep and goat. In another study, a transient peak of FSH was observed in both reproductive and non-reproductive seasons in ewes before the appearance of follicular waves. Thus, eCG administration is expected to affect follicular wave dynamics (Barrett *et al*., 2004; Viñoles *et al*., 2001). Synchronization success rate in sheep without eCG administration outside the breeding season is low (Martinez *et al*., 2015). The administration of eCG in sheep increases the ovulation rate by mobilizing small ovarian follicles, increasing the growth rate of dominant follicles and changing the proportions of follicle classes in estrus (Uslu *et al*., 2012). eCG does not appear to rescue follicles from atresia in ewes (Martemucci *et al*., 2011). eCG induces early oocyte activation (Dogan *et al*., 2018). Follicles exposed to eCG can produce more P4 (Garoussi *et al*., 2019. Ghasemzadeh-nava *et al.*, 2017). It was expected that in cyclic ewes, Litter size & fecundity increased in the flock and higher versus anestrous ewes. In our study, no significant difference was observed between the two groups (in the Table). This possibility was given because the response to the hormone in cyclic ewes should have shown itself better. In the studies, it was shown that outside the breeding season, the ratio of multiple ovulation in the first ovulation is higher than the second ovulation (MK, 2013). Perhaps the most likely reason is that the ovulation rate in non-cyclic animals is high during the first ovulation. Another possible reason is due to the effect of the ram effect in increasing the amount of secreted LH, and this has caused an increase in ovulation and subsequent multiple births in non-cyclic ewes. In the studies carried out, it has been shown that the mating of a male animal and the direct contact of the ewe with a ram lead to an increase in the secretion of LH, and an increase in the growth of follicles and the production of estradiol, and subsequently, estrus, LH surge and ovulation (Scaramuzzi and Downing, 1997; Berean *et al*., 2019; Mirzaei *et al*., 2017; Ayaseh *et*

al., 2021). Ewes that are constantly accompanied by rams become accustomed to their presence and have the same level of estrus as ewes without rams. 65% of Romney ewes ovulate within 65 hours after the ram enters (Nakafeero *et al*., 2020) and 50% of Merino ewes ovulate within 41 hours after the ram enters. When the ram enters at the same time as the sponge is removed, ovulation occurs along with estrus symptoms (Ungerfeld *et al*., 2020). If the ram enters with a delay of 48 to 52 hours, ovulation occurs, but the ewes do not show signs of estrus (Mahmoud *et al*., 2019). Lambing rate in our study was higher as pregnancy rate in cyclic ewes than non-cyclic ewes and that was due to the absence of abortion in the studied ewes. Many studies have been done to replace GnRH with eCG (Reyna *et al*., 2007; Santos *et al*., 2020). The main reason for these studies is to lower the price and comply with the ethical principles of animal treatment, because the eCG hormone is extracted from pregnant horses. But in most studies, GnRH in outside the breeding season and in non-cyclic ewes showed a much lower pregnancy percentage than eCG, and it is not recommended at all. But GnRH has shown a very appropriate and similar response to eCG within the reproductive season or in cyclic ewes (Reyna *et al*., 2007). In addition, use of eCG with GnRH on the day of insemination increased reproductive performance (Hosseinzadeh *et al*., 2016). In another study showed that injection of 300 IU of hCG hormone after insemination improves pregnancy rate in ewes (Didarkhah and vatandoost, 2022). So, if you know that the ewe is cyclical outside the breeding season, it can be suggested that instead of eCG hormone, GnRH can be used instead. Perhaps the importance of this study lies in the fact that until now, outside of the reproductive season, a comparison between cyclic and non-cyclic ewes included in the synchronization protocol had not been done in terms of reproductive indices.

Conclusion

The cyclic ewe when using synchronization protocols outside the breeding season can cause high pregnancy and lambing rates compared to anestrus ewe.

Acknowledgment

The authors would like to acknowledge the financial support of Faculty of Veterinary Medicine, University of Tehran for this research.

Authors' declaration of interests

No competing interests have been declared.

References:

Arjmandi, R., Vodjgani, M., Niasari Naslaji, A., Gharagozlou, F., Akbarinejad, V. (2021). 'Efficacy of Pre-Synchronization and CIDR on the Outcome of Short-TermSynchronization Program in Zandi Ewes During the Breeding Season', Iranian Journal of Veterinary Medicine, 15(1), pp. 46-55. doi: 10.22059/ijvm.2020.298598.1005064.

Ayaseh, M., Mirzaei, A., Boostani, A., & Mehrvarz, M. (2021). The effect of prostaglandin and gonadotrophins (GnRH and hCG) injection combined with the ram effect on progesterone concentrations and reproductive performance of Karakul ewes during the non-breeding season. Veterinary Medicine and Science, 7(1), 148-155. doi: 10.1002/vms3.353 PMID: 32951343.

Barrett, D. M. W., Bartlewski, P. M., Batista-Arteaga, M., Symington, A., & Rawlings, N. C. (2004). Ultrasound and endocrine evaluation of the ovarian response to a single dose of 500 IU of eCG following a 12-day treatment with progestogen-releasing intravaginal sponges in

the breeding and nonbreeding seasons in ewes. Theriogenology, 61(2-3), 311-327. doi: 10.1016/S0093-691X(03)00215-2 PMID: 14662131.

Bedenbaugh, M. N., D'Oliveira, M., Cardoso, R. C., Hileman, S. M., Williams, G. L., & Amstalden, M. (2018). Pubertal escape from estradiol negative feedback in ewe lambs is not accounted for by decreased ESR1 mRNA or protein in kisspeptin neurons. *Endocrinology*, *159*(1), 426-438. doi: 10.1210/en.2017-00593 PMID: 29145598.

Berean, D., Bogdan, L. M., Blaga Petrean, A., Nadăș, G., Cenariu, M., Andrei, S., ... & Bogdan, S. (2019). Estrous synchronisation and artificial insemination in out of breeding season at lacaune sheep. URI: repository.uaiasi.ro/xmlui/handle/20.500.12811/679.

Boscos, C. M., Samartzi, F. C., Dellis, S., Rogge, A., Stefanakis, A., & Krambovitis, E. (2002). Use of progestagen–gonadotrophin treatments in estrus synchronization of sheep. Theriogenology, 58(7), 1261-1272. doi: 10.1016/s0093-691x(02)01040-3 PMID: 12387340.

Didarkhah, M., & Vatandoost, M. (2022). Comparison of the effect of Gonadotropin-Releasing Hormone and Human Chorionic Gonadotropin on Reproductive Performance of Romanov Ewes During the Natural Breeding Season. Archives of Razi Institute, 77(3), 991-998. doi: 10.22092/ari.2021.354332.1633. doi: 10.22092/ARI.2021.354332.1633 PMID: 36618323.

Dogan, I., Nur, Z., & Kilinc, B. (2018). Different estrus induction protocols and fixed time artificial insemination during the anoestrous period in non-lactating Kivircik ewes. Journal of the Hellenic Veterinary Medical Society, 69(1), 801-808. doi: 10.12681/jhvms.16429.

Ferdowsi, H. R., Vodjgani, M., Gharagozloo, F., Talebkhan Garoussi, M., Niasari Naslaji, A., Akbarinejad, V. (2020). 'The Effects of eCG Injection Time on the Reproductive Performance in Shal Ewes Treated with Short-Term Synchronization Program During the

Breeding Season', Journal of Veterinary Research, 75(1), pp. 109-117. doi: 10.22059/jvr.2018.264746.2844.

Garoussi, M. T., Mavadati, O., Bahonar, M., & Ragh, M. J. (2019). The effect of medroxyprogesterone acetate with or without eCG on conception rate of fat-tail ewes in out of breeding season. Tropical animal health and production, 1-6. doi: 10.1007/s11250-019-02159-8 PMID: 31838718.

Ghasemzadeh-nava, H., Kaveh Baghbadorani, M., Gharavi, J., Ghahremani, N., & Gharagozloo, F. (2017). Investigation of the effect of progesterone (Cue-MateTM) administration on ovulation induction in photostimulated anestrus mares. Iranian Journal of Veterinary Medicine, 11(2), 183-190. doi: 10.22059/ijvm.2017.61598

Gómez-Brunet, A., Santiago-Moreno, J., Campo, A. D., Malpaux, B., Chemineau, P., Tortonese, D. J., ... & López-Sebastián, A. (2008). Endogenous circannual cycles of ovarian activity and changes in prolactin and melatonin secretion in wild and domestic female sheep maintained under a long-day photoperiod. Biology of Reproduction, 78(3), 552-562. doi: 10.1095/biolreprod.107.064394 PMID: 18032418.

Gonzalez-Bulnes, A., Menchaca, A., Martin, G. B., & Martinez-Ros, P. (2020). Seventy years of progestagen treatments for management of the sheep oestrous cycle: Where we are and where we should go. *Reproduction, Fertility and Development*, *32*(5), 441-452. doi: 10.1071/RD18477 PMID: 31972122.

Grattan, D. R. (2015). 60 years of neuroendocrinology: the hypothalamo-prolactin axis. *The Journal of endocrinology*, *226*(2), T101. doi: 10.1530%2FJOE-15-0213 PMID: 26101377.

Hameed, N., Khan, M. I. U. R., Zubair, M., & Andrabi, S. M. H. (2021). Approaches of estrous synchronization in sheep: developments during the last two decades: a

review. Tropical Animal Health and Production, 53(5), 1-10. doi: 10.1007/s11250-021-02932-8 PMID: 34581865.

Hosseinzadeh Aski, A., Masoudi, R., Zare Shahneh, A., Asadzadeh, S., Dirandeh, E., & Sadeghipanah, H. (2016). The effect of equine chorionic gonadotrophin (eCG) injection combined with prostaglandin F2α (PGF2α) and gonadotrophin releasing hormone (GnRH) treatment on reproductive performance of Zandi ewes during non-breeding season. *Archives of Razi Institute*, *71*(4), 269-279. doi: 10.22034/ARI.2016.107512.

Husein, M. Q., & Ababneh, M. M. (2008). A new strategy for superior reproductive performance of ewes bred out-of-season utilizing progestagen supplement prior to withdrawal of intravaginal pessaries. Theriogenology, 69(3), 376-383. doi: 10.1016/j.theriogenology.2007.10.005 PMID: 18031802.

Khan, S. U., Jamal, M. A., Su, Y., Wei, H. J., Qing, Y., & Cheng, W. (2022). Towards Improving the Outcomes of Multiple Ovulation and Embryo Transfer in Sheep, with Particular Focus on Donor Superovulation. Veterinary Sciences, 9(3), 117. doi: 10.3390/vetsci9030117 PMID: 35324845.

Kuru, M., Kuru, B. B., Sogukpinar, O., Sen, C. C., Oral, H., & Kirmizibayrak, T. (2020). Oestrus synchronisation with progesterone-containing sponge and equine chorionic gonadotropin in Pirlak ewes during the non-breeding season: can Toryum improve fertility parameters?. *Journal of Veterinary Research*, *64*(4), 573-579. doi: 10.2478/jvetres-2020-0074 PMID: 33367147.

Legan, S. J., Karsch, F. J., & Foster, D. L. (1977). The endocrine control of seasonal reproductive function in the ewe: a marked change in response to the negative feedback action of estradiol on luteinizing hormone secretion. *Endocrinology*, *101*(3), 818-824. doi: 10.1210/endo-101-3-818 PMID: 560960.

Mahmoud, G. B., & Hussein, H. A. (2019). Ram effect on estrus behavior, ovarian structureand steroid hormone in Ossimi ewes treated with prostaglandin f2α for estrus synchronization. Egyptian Journal of Animal Production, 56(2), 87-92. doi: 10.21608/ejsgs.2019.33236.

Martemucci, G., & D'Alessandro, A. G. (2011). Induction/synchronization of oestrus and ovulation in dairy goats with different short term treatments and fixed time intrauterine or exocervical insemination system. Animal reproduction science, 126(3-4), 187-194. doi: 10.1016/j.anireprosci.2011.05.011 PMID: 21741783.

Martinez, M. F., McLeod, B., Tattersfield, G., Smaill, B., Quirke, L. D., & Juengel, J. L. (2015). Successful induction of oestrus, ovulation and pregnancy in adult ewes and ewe lambs out of the breeding season using a GnRH+ progesterone oestrus synchronisation protocol. Animal Reproduction Science, 155, 28-35. doi: 10.1016/j.anireprosci.2015.01.010 PMID: 25708125.

Martinez-Ros, P., Rios-Abellan, A., & Gonzalez-Bulnes, A. (2018). Influence of progesterone-treatment length and eCG administration on appearance of estrous behavior, ovulatory success and fertility in sheep. *Animals*, *9*(1), 9. doi: 10.3390/ani9010009 PMID: 30587794.

Mirzaei, A., Mohebbi-Fani, M., Omidi, A., Boostani, A., Nazifi, S., Mahmoodian-Fard, H. R., & Chahardahcherik, M. (2017). Progesterone concentration and lambing rate of Karakul ewes treated with prostaglandin and GnRH combined with the ram effect during breeding and non-breeding seasons. *Theriogenology*, *100*, 120-125. doi: 10.1016/j.theriogenology.2017.06.005 PMID: 28708526.

MK, B. (2013). Effectiveness of different progesterone analogues and GnRH on reproductive parameters in nulliparous Saanen goats at the end of the transition period. Kafkas Üniversitesi Veteriner Fakültesi Dergisi, 19. doi: 10.9775/kvfd.2013.8747.

Mura, M. C., Luridiana, S., Farci, F., Di Stefano, M. V., Daga, C., Pulinas, L., ... & Carcangiu, V. (2017). Melatonin treatment in winter and spring and reproductive recovery in Sarda breed sheep. Animal reproduction science, 185, 104-108. doi: 10.1016/j.anireprosci.2017.08.009 PMID: 28823418.

Nakafeero, A., Hassen, A., & Lehloenya, K. C. (2020). Investigation of ram effect and eCG usage in progesterone based oestrous synchronization protocols on fertility of ewes following fixed time artificial insemination. Small Ruminant Research, 183, 106034. doi: 10.1016/j.smallrumres.2019.106034 .

Pugh, D. G., & Baird, N. N. (2012). *Sheep & Goat medicine-E-book*. Elsevier Health Sciences.

Reyna, J., Thomson, P. C., Evans, G., & Maxwell, W. M. C. (2007). Synchrony of Ovulation and Follicular Dynamics in Merino Ewes Treated with GnRH in the Breeding and Non-breeding Seasons. Reproduction in Domestic Animals, 42(4), 410-417. doi: 10.1111/j.1439-0531.2006.00800.x PMID: 17635779.

Santos-Jimenez, Z., Martinez-Herrero, C., Encinas, T., Martinez-Ros, P., & Gonzalez-Bulnes, A. (2020). Comparative efficiency of oestrus synchronization in sheep with progesterone/eCG and progesterone/GnRH during breeding and non-breeding season. Reproduction in Domestic Animals, 55(7), 882-884. doi: 10.1111/rda.13698 PMID: 32383219.

Scaramuzzi, R. J., & Downing, J. A. (1997). The distribution of ovulations from the ovaries of Merino and Border Leicester× Merino ewes and its effect on the survival of their embryos. Animal Reproduction Science, 47(4), 327-336. doi: 10.1016/S0378-4320(97)00012-2 PMID: 9360771.

Şen, U. (2020). Real-time assessment of the superovulatory effect of FSH and eCG with laparoscopy at different seasons in Akkaraman ewes. Polish Journal of Veterinary Sciences, 291-299. doi: 10.24425/pjvs.2020.133644 PMID: 32627990.

Talebkhan Garoussi, M., Farzaneh, N., Gallehdar, E., & Mohri, M. (2012). Reproductive performance in out-of-breeding season of fatty ewes using implant norgestomet with or without PMSG. *Tropical animal health and production*, *44*, 965-968. doi: 10.1007/s11250-011-9993-z PMID: 22065305.

Ungerfeld, R., Rodriguez, M. G. K., & Perez-Clariget, R. (2020). Reproductive response of postpartum spring-lambing ewes: effects of weaning on follicular growth and postpartum interval on response to ram placement with ewes ("ram effect"). Animal Reproduction Science, 223, 106642. doi: 10.1016/j.anireprosci.2020.106642 PMID: 33157361.

Uslu, B. A., Tasal, I., Gulyuz, F., Sendag, S., Ucar, O., Goericke-Pesch, S., & Wehrend, A. (2012). Effects of oestrus synchronisation using melatonin and norgestomet implants followed by eCG injection upon reproductive traits of fat-tailed Morkaraman ewes during suckling, anoestrus season. Small Ruminant Research, 108(1-3), 102-106. doi: 10.1016/j.smallrumres.2012.07.002.

Viñoles, C., Forsberg, M., Banchero, G., & Rubianes, E. (2001). Effect of long-term and short-term progestagen treatment on follicular development and pregnancy rate in cyclic ewes. Theriogenology, 55(4), 993-1004. doi: 10.1016/S0093-691X(01)00460-5 PMID: 11291921.

405

410

مقایسه عملکرد تولیدمثلی با استفاده از کاشت واژینال پروژسترون و eCG در خارج از فصل تولید مثل در میش های شیریسیکلیک و آنستروس

نوید جهان روشن[1]، مسعود طالب خان گروسی[1*]، وحید اکبری نژاد[1]، ساره آذرمی[2].

415 1-گروه آموزشی مامایی و بیماری های تولید مثل دام، دانشکده دامپزشکی، دانشگاه تهران، تهران- ایران.

2-دکترای بیوتکنولوژی تولید مثل، دانشکده دامپزشکی، دانشگاه تهران، تهران- ایران.

چکیده

زمینه مطالعه: همزمان سازی فحلی برای القای تخمک گذاری در خارج از فصل تولید مثلی در گوسفند شیری به صورت گسترده استفاده می شود.

هدف: هدف از این مطالعه بررسی تفاوت عملکرد تولیدمثلی بین میش های شیری سیکلیک و آنستروس نژاد لاکون در برنامه همزمان سازی با استفاده از کاشت واژینال پروژسترون (CIDRو eCG) در خارج از فصل تولید مثل بود.

مواد و روش کار: هشتاد و چهار راس میش لاکون در محدوده سنی 15 تا 20 ماهه انتخاب شدند که یک بار زایمان داشتند و حداقل 90 روز از زمان زایش آنها گذشته بود. دو نمونه خون برای ارزیابی پروژسترون (P4 به فاصله 10 روز) گرفته شد. غلظت P4 پلاسما با استفاده از ELISA تعیین شد. میش هایی با کمتر از ng/ml P4 در دو نمونه خون غیر سیکلیک در نظر گرفته شدند و از نظر فحلی، میزان آبستنی، میزان بره زایی، تعداد بره، باروری، وزن تولد و جنسیت بره ها با میش های سیکلیک مقایسه شدند. میش ها به مدت بیش از 2 ماه در محل جداگانه‌ای با فاصله حدود 5 کیلومتری قوچ ها نگهداری شدند.

نتایج: از 84 راس میش، 31 میش سیکلیک (36/90 درصد) و 53 میش غیر سیکلیک (63/10 درصد) بودند. در میش های غیر سیکلیک، غلظت پروژسترون به ترتیب 0.43 ± 0.4 و 0.04 ± 0.45 در خون گیری اول و دوم بود. در میش های سیکلیک، غلظت پروژسترون در خونگیری اول و دوم به ترتیب 0.39 ± 2.46 و 0/34 ± 2/77 نانوگرم بر میلی لیتر بود. بیان رفتار فحلی بین میش های سیکلیک و غیر سیکلیک تفاوتی نداشت (P> 0/10). نرخ آبستنی و نرخ بره زایی در میش های سیکلیک در مقایسه با میش های غیر سیکلیک بیشتر بود (نسبت شانس= 3.35، ٪95 فاصله اطمینان=0.88-12.77، P=0.08). چندقلوزایی، تزاید گله، وزن تولد بره ها و جنسیت بره ها بین میش های غیر سیکلیک و سیکلیک تفاوتی نداشت (P> 0/10).

نتیجه‌گیری: سیکلیک بودن میش در هنگام استفاده از پروتکل های همزمانی در خارج از فصل تولید مثلی، می تواند سبب بالا بودن نرخ آبستنی و بره زایی نسبت به میش های غیر سیکلیک گردد.

کلمات کلیدی: میش شیری، eCG، خارج فصل تولید مثلی، پروژسترون، شاخص های تولید مثلی.