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RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Oestrus synchronization and reproductive performance under different protocols in anoestrus dairy goats

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Abstract

The aim of the study was to evaluate the effects of different progestagens on oestrus synchronization and the effects of vitamin mix (A, D_3 and E) and GnRH singly or in combination on the fertility parameters in anoestrus dairy goats. The animals (n=186) were divided into three groups. One group was injected with 20 mg fluorogeston acetate, second received 60 mg medroxyprogesterone acetate and third was treated with 3 mg Norgestomet. The goats which showed oestrus with these applications were further mated naturally. For this purpose, the goats were divided into four subgroups. The control goats received 2 ml NaCl, second group was treated with vitamins (150,000 IU D3, 1,000,000 IU A and 100 mg E) immediately after mating, third group was treated with GnRH on the 12th day after mating and the fourth group received the combination of vitamins and GnRH. The oestrus rate and the interval to oestrus were found to be higher ($P<0.05$) in experimental goats treated with Norgestomet. There were no statistically significant differences between the subgroups in terms of the pregnancy rate, abortion rate, gestation length, twins rate and litter size ($P>0.05$). In conclusion, the short term applications of FGA, MAP and Norgestomet successfully induced oestrus in anoestrus dairy goats successfully. However, the vitamins and GnRH administrations post-mating did not improve the fertility parameters.

Keywords: Estrus; vitamin; GnRH; fertility; goat

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Introduction

Goats are amongst the most fertile of the domestic species, with conception rates in the range of 90%. Much of the world's goat population is found in the less industrialized parts of the world, predominantly in the rural areas of the tropical and subtropical zones with nutritionally unfavourable conditions (Holtz, 2005). The goat stock in Turkey in 2012 is around 7,277,953 heads (FAO, 2012). In Turkey where goat rearing is common in the highlands and forestland, goat breeding is done in about 500 farm business and this contributes to the income of nearly 3 million people (Dellal and Dellal, 2005; Akar, 2013). Diverse strategies of breeding management have been developed to meet the supply needs and expectations of consumers, since both meat and milk industries are subjected to growing demands for year-round production (Fatet et al., 2011).

Goats are spontaneously ovulating and seasonal polyoestrous animals. The onset and length of the breeding season is dependent on various factors such as latitude, climate, breed, light, physiological stage, presence of the male, breeding system and the specific photoperiod (Du Preez et al., 2001; Delgadillo et al., 2002; Fatet et al., 2011). Oestrus cycle control in goats serves the purpose of synchronizing oestrus in groups of animals to be bred or inseminated at a particular time or inducing out-of-season oestrus (Holtz, 2005). The stimulation of oestrus in non-breeding season can be achieved with hormonal treatments, manipulation of the photoperiod or by the male effect (Whitley and Jackson, 2004; Fatet et al., 2011; Abecia et al., 2012).

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For the control of the oestrus cycle, progesterone or one of its synthetic analogues is preferred. The most widely used method utilizes fluorogestone acetate (FGA) or medroxyprogesterone acetate (MAP) or Y-shaped silicone-coated devices (CIDR). Vaginal sponges are combined with injections of eCG (equine chorionic gonadotrophin) and an analogue of prostaglandin (cloprostenol) is performed at the end or 48 h before sponge removal. As an alternative progestagen, the highly potent synthetic progestagen norgestomet may be inserted under the skin on the upper side of the ear (Fatet et al., 2011). Oestrus response and fertility vary greatly when intravaginal sponges are applied, dependent on species, breed, co-treatment, management, and mating system (Wildeus, 1999).

Two researchers groups (Uslu and Gülyüz, 2009; Serin et al., 2010) have investigated the effects of GnRH injection after intravaginal sponge, CIDR-G and ear implant application in coloured Mohair and Saanen goats during early anoestrus and breeding season and concluded that GnRH injection had no effect on fertility. Prosperi et al. (2006) reported that the administration of hCG (250 IU) on the third day after oestrus did not affect the pregnancy rate in dairy goats. However, Cam and Kuran (2004) showed that application of GnRH on the 12th day post-mating in goats during the breeding season increased kidding and twin birth rates. Sönmez et al. (2009) reported that vitamin E injection was important in terms of increasing the number of multiple births and the prolificacy rate.

The aim of the study was to evaluate the effects of fluorogeston acetate (FGA), medroxyprogesterone acetate (MAP) and Norgestomet on the oestrus induction and interval to oestrus in anoestrus dairy goats. The second goal of the study was to determine the effects of vitamins mixture (A, D_3 and E) and buserelin acetate on fertility parameters of the oestrus goats.

Materials and Methods

Location and animals

This study was carried out using 186 anoestrus dairy goats (Kilis and Damascus breed) with an average age of 3.11 years and average of live weight 42.76 kg in a commercial farm at Kahramanmaras city in Turkey. The goats on the farm were kept in a free sheepfold with adequate space and shelter. The animals were reared freely on pasture for approximately 6 h daily both in the morning and in the afternoon. Additionally, goats were fed a balanced commercial concentrate (200 g/head/day). Water and mineral salts were provided *ad libitum*. Kahramanmaras is located at latitude of 27º 11□N and 38º 36□N, and longitude of 36º 15□E and 37º 42□E, at an altitude of 568 m. It has a mild climate, with cold and rainy winters and hot and dry summers. The ice cream from goat's milk is intensively produced in Kahramanmaras, Turkey.

Experimental design

All goats were divided into three main experimental groups. In first group, all goats (n:62) received intravaginal sponges with 20 mg fluorogeston acetate (Chronogest CR, Intervet, Istanbul) for 7 days, plus 500 IU equine chorionic gonadotrophin (Gonaser 5,000 IU, Intervet, Istanbul) i.m and 75 µg d-cloprostenol (Gestavet Prost, Hipra, Istanbul) i.m at the time of sponge removal. In second group, all goats (n:62) received intravaginal sponges with 60 mg medroxyprogesterone acetate (Esponjavet, Hipra, Istanbul) for 7 days, plus 500 IU eCG (i.m) and 75 µg d-cloprostenol (i.m) at the time of sponge removal. In third group, all goats (n:62) received ear implant with 3 mg Norgestomet (Crestar SO, Intervet, Istanbul) on the upper side of the left ear for 7 days, plus 500 IU eCG (i.m) and 75 µg d-cloprostenol (i.m) at the time of implant removal.

All bucks (n:10) were separated from the flock before the start of the study. Later, the bucks were again introduced back to the flock immediately after sponge and implant removal. The animals were monitored four times daily (05:00, 10:00, 15.00 and 20:00 h for 30 min) for oestrus signs. The oestrus signs observed were searching for the male, restlessness, vocalization, frequent urination, tailing, contraction, hyperaemia and oedema of the vulva, vaginal mucous discharge, and immobility on mounting, which is a characteristic considered as the onset of oestrus. Oestrus detection was carried out using mature bucks at 5 h intervals. Goats in oestrus were allowed to be mated by the bucks and the dates of mating were recorded.

All goats expressed oestrus in the three experiments were again divided into four subgroups (control, vitamin, GnRH and vitamin+GnRH). The control group received 2 ml NaCl (i.m) immediately post mating; the vitamin group received 150,000 IU D_3, 1,000,000 IU A and 100 mg E vitamin (Hipravit AD_3E, Hipra, Istanbul) mixture (i.m) immediately post mating; the GnRH group received 4 µg buserelin acetate (Receptal, Intervet, Istanbul) i.m on the 12th day post mating; the Vitamin+GnRH group combined the vitamin and GnRH applications with the same dose and timing. Pregnancy diagnosis was performed by B-Mode Real Time transrectal ultrasonography with a 5-7.5 MHz probe, 35 days after mating. Termination of pregnancy before 130 days was described as abortion. After parturition, the number of foetuses and gestation length were recorded.

Fertility parameters

The following parameters were recorded:

Oestrus response: number of females in oestrus/number of total female ×100;

Interval to oestrus: time from sponge removal and first mounting acceptance;
Pregnancy rate: number of pregnant females/number of mated female ×100;
Abortion rate: number of aborted females/number of pregnant female ×100;
Gestation length: interval (days) from mating to parturition;
Twin birth rate: number of twin parturition females/all parturition female ×100;
Litter size: average number of foetus born per female.

Statistical analysis

Oestrus response, pregnancy rate, abortion rate, twin birth rate and litter size were analyzed using the Chi-square test. Interval to oestrus and gestation length were statistically analyzed with analysis of variance (ANOVA) using SPSS 14.00 package program (SPSS Inc., Chicago, IL.).

Table 1: Oestrus rate and interval to oestrus in goats in the three experimental groups

Groups	N	Oestrus rate		Oestrus interval	
		n	%	N	Hour
Group I	62	55	88.7[b]	55	26.01[b]
Group II	62	62	100.0[a]	62	32.35[a]
Group III	62	59	95.2[a]	59	32.32[a]
Average	186	176	94.7	176	30.20

The values within the same column with different superscripts are significantly different (P<0.05)
Group1: 20 mg Fluorogeston acetate
Group2: 60 mg Medroxyprogesterone acetate
Group3: 3 mg Norgestomet

Results and Discussion

In the present study, oestrus syncronization with FGA, MAP and norgostomet in anoestrus dairy goats was successfully induced. The results revealed that oestrus rate was 88.7, 100.0 and 95.2% in the FGA, MAP and norgestomet treatments, respectively (Table 1). There were significant differences (P<0.05) between groups, and the average was 95%. These results are in agreement with other authors (Romano, 2004; Fonseca et al., 2005; Husein et al., 2005; Bitaraf et al., 2007; Dogan et al., 2008; Özer and Doğruer, 2011). The response obtained in our experiments was higher than the 83% reported by Fonseca and Torres (2005) and the 80% reported by Karaca et al. (2009).

In this study, the interval to oestrus following progestagen withdrawal was 26.01, 32.35 and 32.32 h in the FGA, MAP and norgestomet syncronization, respectively. These values showed significant differences (P<0.05) compared to the experimental groups, and the average was 30.20 h. These are similar to the findings of Fonseca and Torres (2005) and Husein et al. (2005). However, this interval is longer than the reported value of Bitaraf et al. (2007), Dogan et al. (2008) and Özer and Doğruer (2011). The interval is shorter than reported by Romano (2004) and Fonseca et al. (2005). These contradictions may be due to breed, nutrition and seasonal differences.

Pregnancy rates are generally lower following synchronization than natural oestrus (Fonseca and Torres, 2005; Fernandez-Moro et al., 2008). The reduction in pregnancy rate in induced oestrus may be the result of deficient synthesis and secretion of progesterone (Fonseca and Torres, 2005). In this study, the pregnancy rate was similar and the average was 32.95% among the subgroups. These results are in agreement with that of Dogan et al. (2008). However, they were generally lower than reported elsewhere (Romano, 2004; Husein et al., 2005; Bitaraf et al., 2007; Karaca et al., 2009; Özer and Doğruer, 2011).

The incidence of abortions was 3.5% for dairy goats in the study of Mellado et al. (2006). Mellado et al. (2004) reported that the abortion rate in goats under extensive conditions was 15.2%. Goats with the thinnest, sub-nutritional levels, primiparaous, polled, low blood serum Ca and high blood serum urea levels under extensive conditions had a high abortion rate (Mellado et al., 2004). In this study, the abortion rate was higher and the average was 52.63% among the subgroups. It was higher than that of reported by Mellado et al., (2004) and Mellado et al., (2006). The high rate of abortion in the present study was unclear.

In the present study, gestation length was almost similar between the subgroups. These parameters are similar to the reported values of Fonseca and Torres (2005), Husein et al. (2005) and Bitaraf et al. (2007). This interval in the present study was within the normal range.

Table 2: Reproductive parameters in the control, vitamins, GnRH and Vit.+GnRH subgroups

Groups	Pregnancy rate		Abortion rate		Gestation length		Twin birth rate		Litter size	
	N	%	N	%	N	Day	N	%	N	%
Control	43	37.21	16	37.50	10	148.20	10	50.00	10	1.50
Vitamins	45	40.00	18	50.00	9	148.00	9	44.44	9	1.44
GnRH	45	28.89	13	61.54	5	148.60	5	40.00	5	1.40
Vit.+GnRH	43	25.58	10	70.00	3	147.67	3	33.33	3	1.33
Total/average	176	32.95	57	52.63	27	148.15	27	44.44	27	1.44

The values in the all groups are not significantly different (P>0.05).

The rate of single and multiples births in goats varies depending on breed parity number, season, and environmental conditions (Holtz, 2005; Mellado et al., 2006). The twin birth rate was no different (P>0.05) and the average was 44.44% among the subgroups in this study. It was lower than reported by Husein et al., (2005).

In this study, litter size was similar and the average was 1.44 among the subgroups. It was close to the values reported by Bitaraf et al. (2007). However, it was lower than the values of 1.9 reported by Husein et al. (2005). It was higher than the values of 1.2 reported by Fonseca and Torres (2005).

Two research groups (Uslu and Gülyüz, 2009; Serin et al., 2010) reported that GnRH injection after syncronization had no significant effect on fertility. Prosperi et al. (2006) reported that the administration of hCG on the third day after oestrus did not affect the pregnancy rate in dairy goats. However, Cam and Kuran (2004) showed that kidding and twin birth rates in goats treated with GnRH on day 12 post-mating was higher than control. Ceylan et al. (2007) reported that the low concentrations of vitamins E, A and beta-carotene may have some effects on reproductive problems such as repeat breeding and anoestrus. Sönmez et al. (2009) investigated the effect of vitamin E treatment (200 mg) in goats and found that this vitamin is important in increasing the number of multiple births and prolificacy rate. In the current study, the application of vitamins alone or in combination with GnRH did not improve the fertility parameters in the current study. These results are in agreement with those of Prosperi et al. (2006), Uslu and Gülyüz (2009) and Serin et al. (2010). However, the results are in disagreement with those of Cam and Kuran (2004) and Sönmez et al. (2009).

Conclusion

According to the results of the current study, the short term applications of different progestagens in anoestrus dairy goats successfully induced them to estrus. The oestrus rate was 100% and 95% in the MAP and Norgestomet syncronization, respectively. The interval to onset of estrus in the FGA (26.01 h) syncronization was shorter than in MAP and Norgestomet. Pregnancy rate in the subgroups were low and it was on average 33%. The abortion rate was high and it was on average 53% among the subgroups. The gestation lengths in the subgroups were similar and it was 148 days on average. Additionally, GnRH and vitamin administrations post-mating did not improve the fertility parameters.

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References

Abecia, J.A., Forcada, F. and González-Bulnes, A. 2012. Hormonal control of reproduction in small ruminants. *Animal Reproduction Science*, 130: 173-179.

Akar, Y. 2013. Reproductive performance of Saanen goats under rural or intensive management systems in Elazığ region, Turkey. *Pakistan Veterinary Journal*, 33: 45-47.

Bitaraf, A., Zamiri, M.J., Kafi, M. and Izadifard, J. 2007. Efficacy of CIDR, fluogestone acetate sponges and cloprostenol for estrous synchronization Nadooshani goats during the breeding season. *Iran Journal Veterinary Research,* 8: 218-224.

Cam, M.A. and Kuran, M. 2004. GnRH agonist treatment on day 12 post-mating to improve reproductive performance in goats. *Small Ruminant Research*, 52: 169-172.

Ceylan, A., Serin, İ., Akşit, H., Seyrek, K. and Gökbulut, C. 2007. Investigation of vitamins A, E, beta-carotene, cholesterol and triglyceride concentrations in dairy cows with repeat breeder and anestrus. *Kafkas Universitesi Veteriner Fakultesi Dergisi,* 13: 143-147.

Delgadillo, J.A., Flores, J.A., Véliz, F.G., Hernández, H.F., Duarte, G., Vielma, J., Poindron, P., Chemineau, P. and Malpaux, B. 2002. Induction of sexual activity in lactating anovulatory female goats using male goats treated only with artificially long days. *Journal Animal Science,* 80: 2780-2786.

Dellal, İ. and Dellal, G. 2005. The economy of Turkish Goat Breeding. 'National Congress of Dairy Goat' İzmir, Turkey, May 26-27, pp: 15.

Dogan, I., Konyalı, A., Tolu, C. and Yurdabak, S. 2008. Different estrous induction protocols during the transition period in lactating Turkish Saanen does followıng AI. *Acta Veterinaria (Beograd),* 58: 259-266.

Du Preez, E.R., Donkin, E.F., Boyazoglu, P.A., Rautenbach, G.H., Barry, D.M. and Schoeman, H.S. 2001. Out-of-season breeding of milk goats-the effect of light treatment, melatonin and breed. *Journal South African Veterinary Associaton,* 72: 228-231.

FAO. 2012. FAOSTAT Agriculture Data, Live Animals, Goats, Turkey. Website: http://faostat.fao.org/site/573/DesktopDefault.aspx?PageID=573#ancor, Accessed on 24.02.2014.

Fatet, A., Pellicer-Rubio, M.T. and Leboeuf, B. 2011. Reproductive cycle of goats. *Animal Reproduction Science*, 124: 211-219.

Fernandez-Moro, D., Veiga-Lopez, A., Ariznavarreta, C., Tresguerres, J.A.F., Encinas, T. and Gonzalez-Bulnes, A. 2008. Preovulatory follicle development in goats following oestrous synchronization with progestagens or prostaglandins. *Reproduction Domestic Animals,* 43: 9-14.

Fonseca, J.F., Bruschi, J.H., Santos, I.C.C., Viana, J.H.M. and Magalhães, A.C.M. 2005. Induction of estrus in non-lactating dairy goats with different estrous synchrony protocols. *Animal Reproduction Science*, 85: 117-124.

Fonseca, J.F. and Torres, C.A.A. 2005. Administration of hCG 5 days after breeding and reproductive performance in nulliparous dairy goats. *Reproduction Domestic Animals,* 40: 495-499.

Holtz, W. 2005. Recent developments in assisted reproduction in goats. *Small Ruminant Research*, 60: 95-110.

Huseın, M.Q., Ababneh, M.M. and Haddad, S.G. 2005. The effects of progesterone priming on reproductive performance of GnRH-PGF2α-treated anestrous goats. *Reproduction Nutrition Development,* 45: 689-698.

Karaca, F., Tasal, I. and Alan, M. 2009. Preliminary report on induction of estrus with multiple eCG injections in Colored Mohair goats during the anestrus season. *Animal Reproduction Science*, 114: 306-310.

Mellado, M., Valdez, R., Garcia, J.E., L´opez, R. and Rodr´ıguez, A. 2006. Factors affecting the reproductive performance of goats under intensive conditions in a hot arid environment. *Small Ruminant Research*, 63: 110-118.

Mellado, M., Valdez, R., Lara, L.M. and Garcia, J.E. 2004. Risk factors involved in conception, abortion, and kidding rates of goats under extensive conditions. *Small Ruminant Research*, 55: 191-198.

Özer, M.Ö. and Doğruer, G. 2011. The effects of long and short term applications of progestogen containing vaginal sponges and subcutaneus ımplants onfertility during breeding season in Damascus goats. *Kafkas Universitesi Veteriner Fakultesi Dergisi,* 17: 47-52.

Prosperi, C.P., Torres, C.A.A., Guimarães, J.D., Bruschi, J.H., Leite, P.A.G. and Maffili, V.V. 2006. Pregnancy rate and progesterone concentration of Alpine and Saanen goats treated with hCG the third day after estrus. *Arquivo Brasileiro Medicina Veterinaria Zootecnia,* 58: 190-195.

Romano, J.E. 2004. Synchronization of estrus using CIDR, FGA or MAP intravaginal pessaries during the breeding season in Nubian goats. *Small Ruminant Research*, 55: 15-19.

Serin, İ., Serin, G., Yılmaz, M., Kıral, F. and Ceylan, A. 2010. The effects of body weight, body condition score, age, lactation serum trygliceridei cholesterol and paraoxonase levels on pregnacy rate of Saanen goats in breeding season. *Journal of Animal and Veteterinary Advances,* 9: 1848-1851.

Sönmez, M., Bozkurt, T., Türk, G., Gür, S., Kızıl, M. and Yüce, A. 2009. The effect of vitamin E treatment during preovulatory period on reproductive performance of goats following estrous synchronization using intravaginal sponges. *Animal Reproduction Science*, 114: 183-192.

Uslu, B.A. and Gülyüz, F. 2009. The effects of GnRH ınjection after ıntravaginal sponge, CIDR-G and ear ımplant application in coloured Mohair goats during early anoestrus season. *Kafkas Universitesi Veteriner Fakultesi Dergisi,* 15: 385-390.

Whitley, N.C. and Jackson, D.J. 2004. An update on estrus synchronization in goats: A minor species. *Journal Animal Science (E Suppl),* 82: E270-E276.

Wildeus, S. 1999. Current concepts in synchronization of estrus: Sheep and goats. *Professional American Society Animal Science,* 39: 1-14.