



Effect of progesterone supplementation on conception rate following single and double insemination in repeat breeder cows

PRAVESH KUMAR¹, MADHUMEET SINGH², NAVNEET KUMAR³ and AMIT KUMAR⁴

Himachal Pradesh Krishi Vishwavidhyalya, Palampur, Himachal Pradesh 176 062 India

Received: 9 December 2011; Accepted: 13 April 2012

Key words: Artificial insemination, Conception, Progesterone, Repeat breeder cows

Establishment and maintenance of pregnancy and embryo growth in cattle are related to the ability of the corpus luteum (CL) to secrete progesterone (Estergreen *et al.* 1968). Variability in progesterone synthesis may lead to asynchrony between the embryo and uterus (Pope 1988). Thus, the time and pattern of rise in plasma progesterone concentrations may be an important factor in determining the likelihood of an embryo remaining viable. A deficiency in the steroid secretion of the CL, especially during early period of gestation could contribute to embryo losses (Thatcher *et al.* 1994).

Repeat breeder (Jersey/crossbred) cows (141) heifers as well as pleuriparous aged between 2 to 12 years having milk yield between 2–10 kg/day presented for insemination in livestock farm of the University, Veterinary clinical complex, and nearby field veterinary institutions were included in the study. Only those animals that were free from any apparent reproductive disorder and were not conceiving in spite of 3 or more than three conceptions were selected. These animals were divided into treatment (106) and control (35) groups. All the animals were inseminated with frozen semen of different Jersey and crossbred bulls.

The animals included in progesterone treatment group were further divided into 3 groups, viz. the progesterone administration simultaneous to AI (group 1; 30). In group 1, 11 cows were inseminated with single insemination and 19 cows were inseminated with double insemination, insemination and exogenous administration of progesterone on third day post AI (group 2; 32). In group 2, cows inseminated with single insemination were 13 and inseminated with double insemination were 19. In group 3, administration of progesterone on fifth day post AI, 11 and 33 cows were inseminated with single and double insemination, respectively. Hydroxyprogesterone caproate

(500 mg/cow; 2 ml) was injected intramuscularly in all the animals. Overall, 35 repeat breeder cows presented for routine insemination acted as control (group 4) in which the insemination was done with single (16) and double (19) insemination without any treatment. The insemination in the entire double insemination subgroups was done at an interval of 24 h of first insemination (Sharma *et al.* 2006). Pregnancy diagnosis was carried out 60 days post AI by rectal examination method in cows not returning to estrus.

Overall effect of exogenous administration of progesterone on conception rate (CR) following single and double insemination in repeat breeder cows is shown in Table 1.

Among the repeat breeder cows, administered hydroxyprogesterone caproate intramuscularly simultaneous to AI, the overall CR was 18.18% with single insemination and 21.05% with double insemination. Similarly, among cows injected progesterone third day post AI, conception rates were 46.05 and 47.36% with single and double insemination, respectively, and in cows in which progesterone was administered day fifth post AI the conception rates were 45.45 and 48.48% with single and double insemination respectively. In control group cows the overall conception rates were 18.75

Table 1. Effect of progesterone supplementation on conception rate following single and double insemination in repeat breeder cows

Day of progesterone administration	Insemination	Cows inseminated	Pregnant	CR (%)
0(30)	Single	11	2	18.18
	Double	19	4	21.05
3(32)	Single	13	6	46.05
	Double	19	9	47.36
5(44)	Single	11	5	45.45
	Double	33	16	48.48
Control(35)	Single	16	3	18.75
	Double	19	6	31.57

Present address: ^{1,4}Assistant Professor (¹pk9919@rediffmail.com; ⁴vet50amy@gmail.com), ²Professor (madhumeet2004@rediffmail.com), ³Professor and Head (navneetplp@gmail.com).

and 31.57% with single and double insemination, respectively. Supplementation of progesterone on day 3 and 5 improved the conception rate in repeat breeder cows in comparison to day 0 and control group. However the difference between the groups was statistically non-significant ($P < 0.05$).

Rosen and Struman (1989) observed that parenteral administration of progesterone after 5–10 days of estrus had improved the conception rate significantly in repeat breeder cows. Devanathan *et al.* (1999) used 500 mg progesterone fifth day post AI and achieved the conception rate of 53.84% in repeat breeder cows. Similarly, 65.21% cows conceived when 250 mg progesterone was administered on day 5, 12 and 19 after AI in repeat breeder cows (Srivastava and Kharche 2001). In another study, the conception rate in repeat breeding cows was 45–60% after administering progesterone on day 3 or 5 post AI (Singh *et al.* 2002, Kumar *et al.* 2011). Awasthi *et al.* (2002) also reported 70% conception rate by using progesterone 6–8 days post insemination. Progesterone supplementation during the early stages of intrauterine embryonic development may induce a uterine environment more conducive to embryonic survival in such cows, and thereby rescue some of the delayed embryos. It is possible that a significant portion of reduced fertility in the cow population is attributable to inadequate maternal luteal function and consequent inadequacies in the progesterone dependent uterine environment (Arndt *et al.* 2009). Early embryonic loss could occur through inadequate uterine environment. The higher conception rate in animals by using progesterone may be due to improved uterine environment for embryo survival and development (Balakrishnan *et al.* 1994). Exogenous administration of progesterone brings about certain favorable changes in the uterine luminal fluid (Devanathan and Pattabiraman 1997). Endometrial secretions, essential for stimulating and mediating changes in conceptus growth and differentiation throughout early pregnancy was directed by the steroid environment generated by the ovary (Wilmut *et al.* 1986). Higher progesterone concentration and a lower ratio of estradiol to progesterone on days 3 and 6 were very conducive for the growth of embryo (Maurer and Echternkamp 1982). Progesterone could be the mediator of embryonic survival (Jindal *et al.* 1996). Plasma progesterone concentration during early pregnancy can modify oviductal (Murray 1993) and endometrial (Roberts *et al.* 1993) development and secretory activity.

SUMMARY

Repeat breeder cows (141) were used to study the effect of progesterone supplementation on conception rate following single and double insemination in repeat breeder cows. In treatment group cows 500 mg hydroxyprogesterone caproate was injected intramuscularly and no treatment was given in control group cows. The animals included in progesterone treatment group were divided into 3 groups,

viz. the progesterone administration simultaneous to AI (group 1, $n=30$), conception was 18.18% with single insemination and 21.05% with double insemination. In group 2, ($n=32$), progesterone was administered day 3 post AI, the conception was 46.05 and 47.36% with single and double insemination respectively. Whereas in group 3 ($n=44$), administration of progesterone on fifth day post AI, the conception was 45.45 and 48.48% with single and double insemination respectively. In control group ($n=35$), when no treatment was given, the conception was 18.75 and 31.57% with single and double insemination, respectively.

REFERENCES

- Arndt W J, Holle A J, Bauer M L, Kirsch J D, Schimek D E, Odde K G and Vonnahme K A. 2009. Effect of post-insemination progesterone supplementation on pregnancy rate in dairy cows. *Canadian Journal of Veterinary Research* **73** (4): 271–74.
- Awasthi M K, Tiwari R P and Mishra O P. 2002. Effect of progesterone supplementation during mid luteal phase on conception in repeat breeder cross bred cows. *Indian Journal of Animal Reproduction* **23**: 67–68.
- Balakrishnan M, Bhaskar B V, Chinnaiya G P, Arora V K, Ramu A and Sharma T A. 1994. Progesterone supplementation and pregnancy rate recipient cross bred cattle. *Indian Journal of Animal Reproduction* **15**: 94–97.
- Devanathan T G and Pattabiraman S R. 1997. Effect of progesterone and LH injection on the constituents of uterine lumen fluid. *Indian Veterinary Journal* **74**: 43–48.
- Devanathan T G, Pattabiraman S R, Asokan S A and Rajasundaram R C. 1999. Study on the efficacy of progesterone substitution therapy in repeat breeding cows. *Indian Journal of Animal Reproduction* **20**: 79–80.
- Estergreen V L, Frost O L, Gomes W R, Erb R E and Bullard J F. 1968. Effect of ovariectomy on pregnancy maintenance and parturition in dairy cows. *Journal of Dairy Sciences* **50**: 1293.
- Jindal R, Cosgrove J R, Aherne F X and Foxcroft G R. 1996. Effect of nutrition on embryonic mortality in gilts: association with progesterone. *Journal of Animal Science* **74**: 620.
- Kumar P, Singh M, Kumar N and Sharma A. 2011. Effect of progesterone supplementation on conception rate following single and double insemination in normal and repeat breeder cows. *Proceedings of XXVII Annual Convention of ISSAR and national symposium on "Reproductive biotechnologies for augmenting fertility and conservation of animal species with special reference to north eastern hill region"* 27–29 September. Pp 66, Aizawl.
- Maurer R R and Echternkamp S E. 1982. Harmonal asynchrony and embryonic development. *Theriogenology* **17**: 11–12.
- Murray M K. 1993. An estrogen dependent glycoprotein is synthesized and released from the oviduct in a temporal and region specific manner during early pregnancy in the ewe. *Biology of Reproduction* **48**: 466.
- Pope W F. 1988. Uterine asynchrony: A cause of embryonic loss. *Biology of Reproduction* **39**: 999–1003.
- Roberts R M, Xie S and Trout W E. 1993. Embryo uterine interaction in pigs during 2 weeks of pregnancy. *Journal of Reproduction and Fertility. Supplementary* **48**: 171–86.
- Rosen S and Struman R. 1989. The effect of progesterone implant

- on the fertility of repeat breeder cows. *Animal Breeding Abstracts* **57**: 902.
- Sharma A, Singh M M and Vasishta N K. 2006. Effect of Gonadotrophin releasing hormone administration on conception rate following artificial insemination in repeat breeder cattle. *Indian Journal of Animal Sciences* **76**(4): 330–32.
- Singh M, Vasishta N K, Sood P and Katoch A. 2002. Effect of progesterone supplementation on conception in normal and repeat breeder cow. *Indian Veterinary Journal* **79**: 92–93.
- Srivastava S K and Kharche S D. 2001 Effect of progesterone supplementation on conception rate in repeat breeder cattle. *Indian Journal of Animal Reproduction* **22**: 35–37.
- Thatcher W W, Staples C R, Danet Desnoyers G, Oldick B and Schmitt E P. 1994. Embryo health and mortality in sheep and cattle. *Journal of Animal Science* **72**: 16.
- Wilmot I, Saleb D E and Ashworth C J. 1986. Maternal and embryonic factors associated with prenatal loss. *Fertility* **75**: 851–54.