San Juan Basin Research Center
18683 Hwy 140
Hesperus, CO 81326
Phone: 970-385-4574
Fax: 970-385-4892
Email: sjbaes@coop.ext.colostate.edu

2002-C5

June 2002

Feeding supplemental safflower seeds to increased fertility in heifers with the addition of human Chorionic Gonadotropin (hCG) post breeding to stimulate maternal recognition

R. W. Walker[1], D. D. Zalesky, P. D. Burns, J. C. Whittier, G. Sides[2]

Objective. To determine the effect of feeding safflower seeds as a source of fat to increase conception rate and reduce the onset to estrus in premiparus beef heifers, and the use of a glycoprotein (hCG) to stimulate maternal recognition.

Introduction. Replacement heifer development offers many producers challenges in their efforts for breeding season preparations. Meeting heifer nutrient requirements is of critical importance in assuring optimum reproductive performance (Bellows, 1999). In heifer management, it is crucial for heifers to reach their targeted weight at the right time in order to achieve optimum reproductive performance during the breeding season. Resent research has indicated that adequate fat may be an additional nutrient that needs to be present in the diet (Bellows, 1999). Oil fats are much higher in energy (TDN = 180%) than grain, such as corn or barley.

Studies with feeding supplemental fat to beef heifers have resulted in positive, negative, and no effects on reproductive performance. Bellows, (1999) compared pregnancy rates on prepuberal F1 heifers supplemented with a low fat (LF-1.9%) or a high fat (HF-4.4%) dietary fat supplement (commercially available rumen escape fat (Megalac)) for a 162 day feeding period, and found no significant difference on the low fat (76%) versus high fat supplemented heifers (73%). He proposed feeding 60 days pre-breeding could show more favorable results.

Evidence suggests that the consumption of fat by cattle, particularly polyunsaturated plant oils, can positively influence ovarian follicular growth, luteal function, and postpartum reproductive performance independent of caloric effects (Williams, 1999). Fat supplementation affects follicular growth dynamics in cattle by increasing the number of follicles in the medium-sized classification by 1.5 to 5-fold within 3 to 7 weeks (Wehrman et al., 1991; Ryan et al., 1992; Thomas et al., 1997).

Bellows showed that a 162 day feeding period may be too long; therefore, suggestions may favor more positive responses with shorter feeding periods. If heifers are exposed to the diet for just enough time and not overly exposed, feeding a fat supplement could be economically feasible in developing heifers for replacements. Other studies ended supplement feeding at the start of breeding which may induce stress to that heifer at time of fertilization of the egg, therefore possibly resulting in lower conception rates. Carrying the supplemental feeding period 15-20 days post-breeding may show an increase in conception rates due to an increased interference in prostaglandin synthesis.

---

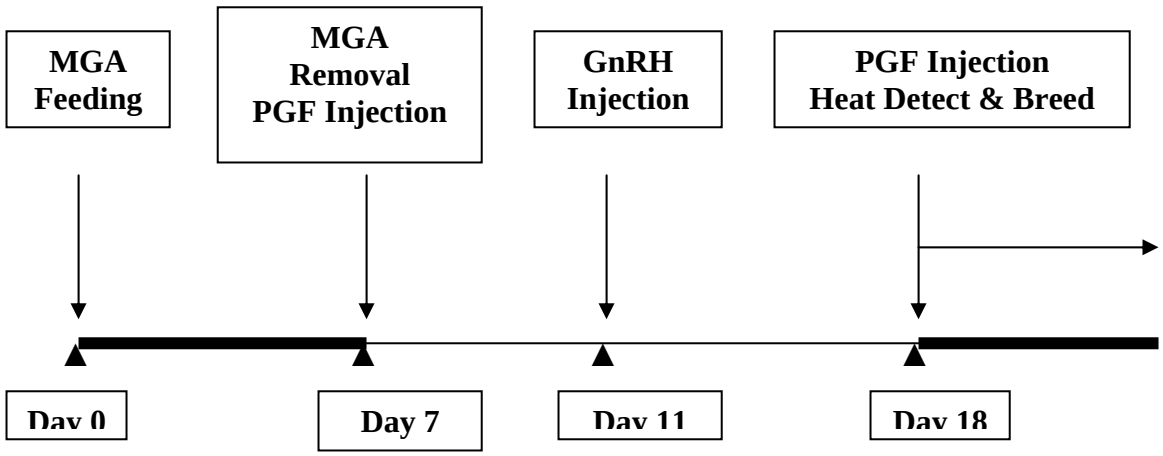
[1] Graduate Student, CSU Animal Sciences and San Juan Basin Research Center
[2] Intervet, Inc., Millsboro, DE

Human Chorionic Gonadotropin (hCG), given exogenous, will increase progesterone synthesis. Post-breeding injection of hCG has been reported to increase (Brown et al., 1973) or have no effect (Hansel et al., 1976; Echternkamp and Mauren, 1983) on pregnancy rate. In 1988, Breuel et al., showed increased pregnancy rates with hCG before and after breeding.

Fat supplementation increases cholesterol levels in blood circulation. With the increase of a progesterone precursor, cholesterol, the ability for hCG to increase levels of progesterone during pregnancy for maternal recognition should improve. As of lately, there has been no work done on incorporating an hCG injection on fat supplemented heifers for an increase in pregnancy rates.

Materials and Methods. Premiparous crossbred beef heifers (n = 110) will be split into two breeding seasons: an early and a late breeding season for other experimental reasons. Heifers will be grouped and fed in feedlot pens during the feeding and breeding period. In the first breeding season, control and treatment heifers (n = 27, n = 28) will be placed on a control diet consisting of a mixed alfalfa-grass hay at a rate of 13 lbs/hd/day and oat grain at a rate of 3.3 lbs/hd/day given 30 days pre-breeding and continue 15 days after the breeding period. Treatment heifers will be given the control diet, changing oat grain feeding to 2.2. lbs/hd/day, plus an added supplement (safflower seeds) at a rate of 2.1 lb/hd/day for 30 days pre-breeding and continue 15 days after the breeding period. Diets will be formulated to be isocaloric and isonitrogenous. During the second breeding season, the control and treatment groups will be fed the same as the first breeding season, but will start 2 months following the first breeding season.

7-11 MGA Select Synch Protocol



1st Breeding Season	Treatments	2nd Breeding Season
April 15	Start supplementation for control & treatment groups Blood samples Body condition score	June 15
April 20	Blood samples	June 20
April 25	Begin MGA Feeding (7-11 Select Synch)	June 25
May 2	MGA Removal $PGF_{2\alpha}$ injection	July 2
May 6	GnRH injection (100 μg: i.m.)	July 6
May 13	$PGF_{2\alpha}$ injection	July 13
May 14 – 20	Heat Detect and Breed	July 14 – 20
May 31	End Fat Supplementation	July 31

** One hCG injection (3,300 IU) will be given to half of the control group and half of the treatment group while an injection of saline (a placebo) will be given to the other half of the control and treatment groups on day 12 post breeding. Blood samples will be taken twice (5 days apart) before the start of the supplemental feeding period to determine cyclicity in heifers. Blood samples will then be taken weekly until 25 days post breeding; and every day beginning on the day before, day of, and 5 days after hCG injection . Body condition scores will be assessed on all heifers at the start of supplementation. Heifers will be diagnosed for pregnancy to AI via rectal ultrasound 35 days after the breeding period. Cleanup bulls will be turned out 14 d after the 6 day heat detection period.

Blood samples will be evaluated to determine cholesterol levels and progesterone concentration during the feeding period. Ultrasound will be used to determine conception rates in response to fat supplementation and administration of hCG.

Overview. Increased consumption of dietary fat affects an array of ovarian and reproductive end points in heifers. Understanding certain relationships with fat supplementation on developing heifers for breeding will allow us to provide an economical method for rancher's to develop their own replacements. Based on the nutritional requirements of developing heifers, fertility, such as conception rate, should increase with supplementation of fat during the pre-breeding period, and onset to estrus interval should shorten. An increased source of linoleic acid, along with hCG, may aid in maternal recognition and increase conception rates in heifers and possibly cows. There maybe a place for supplementing fat if results show an increase in heifers showing cyclicity earlier and quicker due to an added fat source.

Doses:

GnRH: 1st Breeding Season = approximately 55 doses
2nd Breeding Season = approximately 55 doses
Total of = 110 doses

hCG: 1st Breeding Season Only = 27 doses
Total of = 27 doses

REFERENCES:

Bellows, R. A. 1999. Some effects of feeding supplemental fat to beef cattle. Proc. RBC Symposium XVI. p. 81. Greely, Colorado.

Breuel, K. F., J. C. Spitzer, T. Gimenez, D. M. Henricks and S. L. Gray. 1988. Effect of holding time and temperature of bovine whole blood on concentration of progesterone, estradiol-17 and estrone in plasma and serum samples. Theriogenology. 30:613.

Brown, H., J. F. Wagner, R. P. Rathmacher, J. W. McAskill, N. J. Elliston and R. F. Bing. 1973. Effect of human chorionic gonadotropin on pregnancy rate of heifers, when used under field conditions. J. Am. Vet. Med. Assoc. 162:456.

Echternkamp, S. E., and R. R. Maurer. 1983. Conception, embryonic development and corpus luteum function in beef cattle open for two consecutive breeding seasons. Theriogenology. 20:627.

Hansel, W., R. W. Spalding, L. L. Larson, D. B. Laster, J. F. Wagner and R. K. Braun. 1976. Influence of human chorionic gonadotropin on pregnancy rates in lactating dairy and beef cows. J. Dairy Sci. 59:751.

Ryan, D.P., R. A. Spoon, and G. L. Williams. 1992. Ovarian follicular characteristics, embryo recovery, and embryo viability in heifers fed high fat diets and treated with follicle-stimulating hormone. J. Anim. Sci. 70:3505-3513.

Thomas, M. G., B. Bao, and G. L. Williams. 1997. Dietary fats varying in their fatty acid composition differentially influence follicular growth in cows fed isoenergetic diets. J. Anim. Sci. 75:2512-2519.

Wehrman, M. E., T. H. Welsh, Jr, and G. L. Williams. 1991. Diet-induced hyperlipidemia in cattle modifies the intrafollicular cholesterol environment, modulates ovarian follicular dynamics and hastens the onset of postpartum luteal activity. Biol. Reprod: 45:514-523.

Williams, G. L., R. L. Stanko. 1999. Dietary fats as reproductive nutraceuticals in beef cattle. Proc. American Society of Anim. Sci.