1452 Estimation of Net Present Value of Beef Females of Various Ages and The Economic Sensitivity of Net Present Value of Changes in Production. M. S. Meek*, J. C. Whittier, and N. L. Dalsted, *Colorado State University, Fort Collins*.

The objective of this study is to economically evaluate the value of future production and the economic sensitivity to changes in production throughout the life of the beef female. Production and cost data were obtained from an existing operation during the 1996 production year. Net Present Value (NPV) analysis was used to determine the value of future production. Values for yearlings, two, three, four, five, six, and seven-year-olds were $786, $1027, $1146, $1210, $1171, $1088, and $1068 respectively with the highest residual value occurring in four-year-old cows. The economic sensitivity of NPV to changes in production was measured in the yearling and bred heifer analysis. This was obtained by determining the change in NPV resulting from a one-percent change in a production parameter. The change in the NPV is called a shadow price and represents the breakeven cost of changing the production parameter. The shadow prices for the yearling analysis were: $4.30 for yearling pregnancy (YP); $2.68, two-year-old pregnancy (2P); $3.55, spring cull sales in two-year-old heifers (2SC); $2.79, calf death loss in two-year-old dams (2CD); and $2.50, weaning weight in two-year-old dams (2WW). Shadow prices in the bred heifer analysis were: $5.67 (2P); $6.51 (2SC); $3.75 (2CD) and $3.36 (2WW). This information, and the process developed to determine NPV of replacement heifers, provides a basis for better decision making relative to heifer development practices.

Key Words: Net Present Value, Heifer Development, Beef Cattle

1453 Effect of ruminal glucose infusion on dry matter intake, urinary nitrogen composition, and serum chemistry profiles in sheep. M. S. Brown*[1], D. M. Hallford[1], M. L. Galyean[2], C. R. Krehbiel[1], and G. C. Duff[1], [1]*New Mexico State Univ., Las Cruces and* [2]*Texas Tech Univ., Lubbock*.

Twelve, 18-mo-old ewes were used to determine the effect of ruminal glucose infusion on DMI, urinary ammonium (NH^+_4) and urea N (UUN) concentration, and serum profiles. Ewes were limit-fed a 90% concentrate diet for 30 d, stratified by BW into three groups (avg. BW=82.6±1.1 kg), and assigned randomly to receive 0, 5, or 10 g of glucose/kg of BW via esophageal intubation. Urine was collected hourly for 12 h, and blood (jugular venipuncture) at 0, 3, 6, 9, and 12 h. After 12 h, animals were housed individually, allowed free access to the diet, and DMI was recorded for 5 d. Blood pH was 7.49, 7.48, and 7.48 at 0 h, and decreased (linear, L, P<.01) at 12 h (7.41, 7.36, and 7.26) with increasing glucose infusion. Serum glucose increased (L, P<.06) at 3 and 6 h. Serum L(+)-lactate increased (L, P<.08) at 3, 6, and 9 h, whereas serum D(-)-lactate increased (L, P<.09) at 6 and 12 h, and quadratically at 9 h (P<.06). After the glucose challenge, DMI decreased (L, P<.05). Urinary pH and NH^+_4) were not influenced by glucose infusion; however, UUN increased at 3 (quadratic, Q, P<.05), 4, 5, 6 (L, P<.03), and 7 h (Q, P<.05), and decreased at 11 and 12 h (L, P<.09). As ruminal glucose infusion increased, serum creatinine increased at 9 (L, P<.03) and 12 h (Q, P<.02). Blood urea N:creatinine decreased at 9 and 12 h (L, P<.07). Serum Na increased (L, P<.005) at 3 and 9 h, whereas Cl increased (L, P<.05) at 3 h then decreased (Q, P<.09) at 12 h. Serum K decreased quadratically (P<.04) at 3 and 9 h, and linearly at 6 and 12 h (P<.05). Serum P increased at 3, 9 (L, P<.02), and 12 h (Q, P<.06). Serum lactate dehydrogenase (LDH) increased (Q, P<.10) at 3, 6, 9, and 12 h. Increasing glucose infusion increased serum globulin (Q, P<.06), albumin, and total protein (L, P<.08). Results suggest that UUN and several serum constituents may serve as markers indicative of organic acid load.

Key Words: Acidosis, Serum Constituents, Urea Nitrogen

1454 Marrow content of bovine cervical vertebrae. R. A. Gebault*, R. A. Field, W. J. Means, and W. C. Russell, *University of Wyoming, Laramie*.

Marrow content of bovine cervical vertebrae was quantified so that a method to monitor the amount of marrow in meat from advanced meat recovery (AMR) systems could be developed. Cervical vertebrae from choice and select grade carcasses (294 to 343 kg) were cleaned of soft tissues (lean, fat, periosteum, spinal root ganglia), but cartilage was left attached. Three procedures for determining marrow content were used: 1) Sawed vertebral pieces were centrifuged (15,700 × g, 20 min, 21°C) to remove marrow, 2) Marrow was pressed from spongy bone pieces (.8 × 2.0 × 2.5 cm) with all cortex removed (Carver Press, 2 s, 2.8×10^7 Pa), and 3) Vertebrae cleaned of all soft tissue were ashed (72 h, 600°C) and an equation for estimating marrow developed. Mean percentages of marrow obtained via centrifugation, Carver Press and ashing were 10.8, 22.9 and 33.9, respectively. Because some marrow remained in the spongy bone after centrifugation or pressing, these methods were not useful for marrow determination. Means and SE were derived for percentage of cartilage (9.50±.82). Percentage of ash in fresh bone cortex (58.51±.84), marrow (.57±.05), and cartilage (2.14±.11) were also determined. Because large differences exist between ash content of bone and marrow, and because cartilage content of cervical vertebrae is relatively constant, the following equation could be developed:

$$\text{Marrow wt} = \frac{\text{cartilage wt}(\text{cartilage A} - \text{bone A}) + \text{bone A}(\text{bone wt}) - \text{total ash}}{(\text{bone A} - \text{marrow A})}$$

A = percentage of ash

Fresh cervical bone weight (bone wt) and total ash weight of cervical vertebrae (total ash) were also used in the equation to calculate marrow content. Marrow content of whole cervical vertebrae minus the amount left in pressed cervical vertebrae should equal marrow in meat from AMR systems. Our ashing method for determining amount of marrow in intact cervical vertebrae may be applied to cleaned bone from AMR systems. It will be useful in validating proposed methods for determining marrow content in meat.

Key Words: Marrow, Bovine, Bone

1455 Antiluteolytic effect of alpha tocopherol in ewes. J. E. Vierk*, W. J. Murdoch, K. J. Austin, E. A. Van Kirk, and T. R. Hansen, *University of Wyoming, Laramie*.

Alpha-tocopherol (TOC; vitamin E) is a biological antioxidant that protects cells from the effects of reactive oxygen on DNA damage and nuclear/ cytoplasmic condensation that dictate apoptosis. Accumulation of toxic oxidants is a prelude to apoptotic cell death during regression of the corpus luteum. The present experiments were designed to evaluate antiluteolytic effects of TOC. In the first experiment, western-range ewes were challenged with a luteolytic dose of prostaglandin F2-alpha (PGF) on Day 10 of the estrous cycle. Ewes (n = 5 per group) were injected (i.m.) with vehicle (V) or TOC (2100 IU) at −12, −2, 10, 24 and 48 h respective to injection of PGF. PGF induced an immediate decline in serum progesterone in V and TOC ewes. After 24 h, serum progesterone rebounded in four-of-five TOC ewes, and remained elevated over the next two days (corpus luteum rescue). In the second experiment, ewes received no PGF (CON), PGF (0 h), or TOC (−12, −2, 10 h) and PGF (TP) on Day 10. Luteal glands were collected 24 h after PGF and evaluated for progesterone, DNA laddering, and morphology. Serum progesterone was sustained in CON ewes, while an acute decrease was observed following PGF regardless of exposure to TOC. Luteal gland concentrations of progesterone were highest, intermediate, and lowest in CON, TP, and PGF groups, respectively. Degradation of DNA was circumvented in four-of-five TP ewes when compared with no degradation in CON, and distinctive laddering of DNA in PGF ewes. PGF caused shrinkage of large (PGF-sensitive) luteal cells, pyknosis, and vascular collapse; a similar morphology was observed in the sole case of luteal gland DNA laddering despite treatment with TOC. All treatment differences were P<.05. Large luteal cells of CON and the majority of TOC ewes appeared healthy. The antioxidant TOC, while not altering the induction of functional luteolysis, did protect corpora lutea from apoptosis. Perhaps treatment with an antioxidant to coincide with the period of maternal recognition of pregnancy will enhance fertility in ruminants.

Key Words: Apoptosis, Corpus Luteum, Tocopherol

1456 Estrous and ovarian response to the Select Synch protocol. E. R. Downing*, D. G. LeFever, J. C. Whittier, J. E. Bruemmer, and T. W. Geary, *Colorado State University, Fort Collins*.

The objectives of this study were to evaluate the ovarian and estrous responses among cows synchronized with the Select Synch protocol by d of the estrous cycle at the initiation of treatment (d −7). Multiparous Angus and crossbred cows (n = 56) were fitted with HeatWatch^{TM} monitors 22 d prior to the synchronization treatment. All cows received the Select Synch protocol, which consists of an injection of GnRH (100 μg) on d −7 and an injection of $PGF_{2\alpha}$ (25 mg) on d 0, followed by 5 d of estrous detection and AI. Ovaries on cows were scanned transrectally daily beginning 5 d prior to GnRH and ending upon insemination. Cows were visually detected twice daily for 2 h to compare visual with electronic detection of estrus. There was no difference (P > .5) between visual (85.7%) and electronic (89.3%) detection of estrus. Ovarian response to the Select Synch protocol was dependent on the stage of the estrous cycle when the protocol was initiated (see table below). Among cows that were not detected in estrus prior to the treatment, 100% responded to $PGF_{2\alpha}$, whereas only 77.8% responded to GnRH. Cows that were between d 15–17 of their estrous cycle responded poorly to both GnRH and $PGF_{2\alpha}$. However, these cows exhibited estrus 11 ± 19 h prior to the injection of $PGF_{2\alpha}$. These data demonstrate that the Select Synch protocol is capable of synchronizing estrous among the majority of cows in a herd, and emphasizes the importance of accurate estrous detection beginning 24 h before the $PGF_{2\alpha}$ injection.

% Response	d 0–3[1]	d 4–6	d 7–9	d 10–14	d 15–17	d 18–20	d unknown[2]
GnRH[3]	80.0	66.7	80.0	20.0	14.3	100.0	77.8
$PGF_{2\alpha}$[4]	100.0	100.0	100.0	100.0	14.3	100.0	100.0

[1]Day of the estrous cycle at the initiation of treatment; [2]Estrous activity was not detected one estrous cycle prior to treatment; [3]Follicle ovulated, follicular wave initiated, and corpus luteum (CL) formation; [4]CL regression.

Key Words: Select Synch Protocol, Beef Cows, Electronic Estrous Detection

1457 The effects of degradable and metabolizable protein supply on performance of first calf heifers. L.P. Anderson[1]*, J.A. Paterson[1], R.P. Ansotegui[1], M. Cecava[2], and W. Schmutz[2], [1]*Montana State University-Bozeman and* [2]*Consolidated Nutrition, L.C., Omaha, NE*.

The effects of protein supplementation on changes of cow and calf weight gain, body condition score (BCS) and protein degradation were evaluated when supplements contained varying amounts of degradable (DIP) and undegradable (UIP) intake protein. Thirty-two individually fed first calf heifers (avg. 395 kg) were allotted to a 2x2 factorial arrangement of treatments [main effects of DIP and metabolizable protein (MP)] one day after calving, based on cow weight and sex of calf. Cows were fed a basal ration of chopped, crested wheat hay (5% CP, 55% TDN) ad libitum for 60 d by use of Calan-Broadbent gates. DIP and MP were supplied using differing ratios of soybean and protected soybean meals. All diets were formulated to provide equal amounts of energy. Cows were weighed and BCS measured on d 0, 30, 60. Milk production was determined by weigh-suckle-weigh at d 45 of the experiment. Calf weight was measured on d 0, 45, 60. Blood urea nitrogen (BUN) levels were determined for the cows at d 60. N degradabilities for the soybean meal and protected soybean meal were 75 and 30%, respectively. Hay N degradability was estimated to be 67%; determined by a Streptomyces griseus protease degradation procedure. Cow weight gain was greater for DIP vs MP at both 30 and 60 d. BCS was improved due to DIP supplementation. BUN levels were higher in cows given supplemental DIP vs MP (avg. 16.5 vs. 6.6 mg/dL). Milk production and calf daily gains were not changed due to supplement. OM, NDF and ADF intakes decreased due to supplemental DIP. ADF intake was also decreased due to supplemental MP treatments. These data suggest providing DIP in early lactation resulted in faster weight gains, increased BCS, decreased OM and NDF intakes and increased N digestibility than providing UIP.

Key Words: Beef Cattle, Protein, Lactation

1458 Effects of supplemental soybean oil on productivity and blood metabolites of developing beef heifers. M. B. Whitney*, B. W. Hess, L. A. Burgwald-Balstad, and C. M. Tsopito, *University of Wyoming, Laramie*.

Two experiments were conducted to determine the efficacy of soybean oil as a supplemental energy source for developing heifers consuming a bromegrass hay-based diet. In Exp. 1, 36 Angus × Gelbvieh heifers (259.7 ± 20.5 kg initial BW) were individually fed one of three total mixed rations twice daily for 104 d. Experimental treatments included 0% added soybean oil (0), 3% added soybean oil (3), or 6% added soybean oil (6). Diets were formulated to be isonitrogenous and provide gains of .91 kg/d. Soybean oil replaced corn on a TDN basis in diets 3 and 6. Weights were taken every two weeks, blood samples for serum and plasma were taken on d 0, 27, 55, 83, 97 and 104. Daily rations were adjusted for respective changes in BW. Hip heights, percentage of mature BW, and days pregnant were taken at the conclusion of the study. Percentage of mature BW was estimated using average mature BW of the dams of heifers used in Exp. 1 and Exp. 2. Data were analyzed as a split-plot, and orthogonal contrasts included 0 vs. 3 and 6, and 3 vs. 6. Dietary treatments did not affect ($P > .80$) final weight, percentage of mature BW, or days pregnant. Serum glucose, cholesterol, and NEFA concentrations were greater ($P < .003$) in fat−supplemented heifers. Plasma proportions of C18:1 and C18:2 were greater ($P < .001$) in heifers fed rations with added fat. In Exp. 2, 42 Angus × Gelbveih heifers (288.4 ± 24.3 kg initial BW) were divided into six pens (two pens/treatment) in a randomized complete block designed experiment. Each pen was fed one of the same rations as in Exp. 1, and production measures were determined as previously described. Heifers fed 3% added soybean oil conceived 10 d earlier ($P = .06$) than heifers fed the other treatments. Other production estimates did not differ ($P > .10$). Addition of soybean oil to a forage-based diet increased blood metabolites and decreased the time to conception. Therefore, soybean oil appears to be an acceptable energy source when provided as a supplement to a forage-based diet.

Key Words: Heifer Development, Blood Metabolites, Supplementation

1459 Effects of intraluteal infusion of putrescine into day 10 bovine CL. A. M. Encinias*, K. K. Kane, K. W. Creighton, H. B. Melloy, R. Steiner, T. Ross, D. E. Hawkins, and D. M. Hallford, *New Mexico State Univ., Las Cruces*.

Objectives were to determine influence of putrescine (PUT) infused into CL. Estrus (d 0) in Angus x Hereford and Brangus heifers (n=6) was synchronized with 25 mg (im) $PGF_{2\alpha}$ (Lutalyse). Midluteal (d 10) CL (n=21) were randomly assigned to treatments of PBS, 2.5 mg $PGF_{2\alpha}$, 1.0 mM PUT and 1.0 μM PUT. Treatments (500 μl) were infused directly into CL via needle guided 7.5 MgHz ultrasound transducer. Blood was collected via caudal venapuncture to quantify progesterone (P_4) secretion. Corpus luteum area was measured via ultrasonography at 0, 360, 720, and 1440 min. No differences (P>.10) were detected for P_4 secretion among treatments from 0 to 90 min. At 120 through 1440 min post infusion, differences in P_4 secretion (P<.10) existed among treatments (Table). Area of CL infused with $PGF_{2\alpha}$ were less (P<.05) at 720 min when compared to PBS, 1.0 mM PUT, and 1.0 μM PUT (5.0, 8.4, 7.4, 8.6 mm2±.98, respectively). These differences (P<.05) were also observed at 1440 min in area of CL infused with $PGF_{2\alpha}$ compared to PBS, 1.0 mM PUT, and 1.0 μM PUT (3.58, 8.0, 7.7, 8.0±.84 mm^2, respectively). Progesterone secretion in CL infused with $PGF_{2\alpha}$ decreased while P_4 secretion in 1.0 mM PUT groups peaked at 360 min then declined. Putrescine, given in-vivo, altered P_4 secretion without changing CL area.

Time	PBS[d]	$PGF_{2\alpha}$[d]	1.0 mM PUT[d]	1.0 μM PUT[d]	SE
120	4.7^{a}	2.9^{b}	3.1^{bc}	4.7^{ac}	.65
180	5.6^{a}	2.9^{b}	3.6^{bc}	5.3^{ac}	.74
240	5.2^{ac}	2.6^{b}	3.9^{ab}	6.0^{c}	.75
360	5.4^{a}	2.1^{b}	4.5^{a}	5.5^{a}	.63
720	5.2^{a}	1.0^{b}	3.4^{c}	5.5^{a}	.67
1080	4.5^{ac}	6^{b}	3.1^{a}	4.7^{ac}	.59
1440	5.4^{a}	$.5^{b}$	3.1^{c}	5.1^{a}	.52

^{abc}Row means with different superscripts differ (P<.10). [d]Progesterone (ng/ml) secretion.

Key Words: Polyamines, Corpus Luteum, Progesterone

1460 Effect of sainfoin supplementation on the *in vitro* digestion of fresh alfalfa and on occurrence of bloat in steers. L. R. McMahon[1,4]*, W. Majak[2], T. A. McAllister[1], J. W. Hall[3], G. A. Jones[4], J. D. Popp[5], and K.-J. Cheng[6], [1,2,3]*Agriculture and Agri-Food Canada Research Centres,* [1]*Lethbridge, AB,* [2]*Kamloops, BC and* [3]*Summerland, BC;* [4]*University of Saskatchewan, Saskatoon, SK,* [5]*Alberta Agriculture, Food and Rural Development, Medicine Hat, AB and* [6]*University of British Columbia, Vancouver, BC.*

Effects of sainfoin (*Onobrychis viciifolia*) on alfalfa digestion were studied in *in vitro* incubations and *in vivo* crossover studies (4 years) with steers. Chopped alfalfa and sainfoin leaves (AL, SL) were incubated (100:0, 95:5 and 90:10 AL:SL) in ruminal fluid with and without tannin-binding polyethylene glycol (PEG). Gas and VFA production were similar ($P < .05$) across treatments but NH_3 concentrations were reduced ($P < .05$) between 8 and 24 h with 90:10 AL:SL (without PEG). Sainfoin tannins apparently reduced forage protein degradation without affecting digestibility of the non-protein fractions. In Rusitec incubations of AL and SL (0, 25, 50, 75 and 100% SL), DMD and TND from SL were only 77% and 65%, respectively, of those from AL. As a result, protease and endoglucanase activities, and NH_3-N were linearly reduced (P .05) by SL. Bacterial incorporation of $^{15}NH_3$-N increased ($P < .05$) with percentage of SL but bacterial numbers did not. Ten cannulated Jersey steers were fed freshly cut alfalfa herbage and fresh early- to full-bloom sainfoin herbage at 0 or 10% of *ad libitum* dry matter intake (DMI) of alfalfa, in years 1, 2, and 3; and at 0 or 20% of DMI in year 4. Alfalfa hay and sainfoin hay supplements (10% of DMI) were also compared in year 1, and sainfoin pellets (15% of DMI) were tested in year 4. Sainfoin supplementation (herbage, hay or pellets) reduced ($P < .001$) incidence of bloat in three of the four years (by up to 93%). Including sainfoin herbage or hay in the diet reduced pre-feeding soluble protein concentrations in ruminal fluid (measured in year 1) by 14 and 10%, respectively. These results demonstrate that co-feeding sainfoin with alfalfa, as a source of condensed tannins, can substantially reduce the incidence of bloat in ruminants.

Key Words: Alfalfa, Sainfoin, Bloat

1461 Nitrogen utilization in thin cows consuming lovegrass straw supplemented with different amounts of non-protein nitrogen and true protein. J. E. Sawyer*, L. A. Knox, L. A. Richards, M. W. Salisbury, J. Richards, C. Krehbiel, and M. K. Petersen, *New Mexico State University, Las Cruces.*

A primary effect of low protein diets in ruminants is the net excretion of N. Supplemental dietary protein may correct this imbalance and allow the animal to retain more body protein. Some sources of protein may enhance the efficiency of protein N retention. The objective of this experiment was to evaluate the effect of differing protein sources fed at different quantities on the nitrogen retention of thin cows consuming a restricted diet. Twelve ruminally cannulated cows were fed lovegrass hay (4.1% CP) at a rate of 1.3% BW/d over three periods. Periods consisted of a 21 d depletion phase (no supplement) and a 21 d supplementation phase. During the supplementation phase, cows were assigned to one of three sources of protein (urea, UREA; cottonseed meal, CSM; or a 50% blood meal 50% feather meal combination, BFM) fed to supply one of four quantities of additional protein (0, 40, 80, or 160 g/d). Supplement was fed three times per week via ruminal cannulae. After the 21 d supplementation period, fecal bags pre-dosed with 20 ml 6N HCl were used to obtain total feces and urine excretion for 72 h. Daily samples were composited and analyzed for N. Percent N retained was calculated. Source effects were evaluated using linear contrasts in the General Linear Models procedure of SAS. Protein quantity effects were evaluated using linear regression procedures of SAS. supplementation significantly increased % N retained over no supplementation (-7.55 ± 11.62% N/d vs. -34.4 ± 13.25% N/d; P=.09). All supplemental N sources improved N retention similarly (UREA -6.39 ± 11.21% N/d; BFM -4.56 ± 11.45% N/d; CSM -11.69 ± 12.19% N/d; P>.7). A significant linear relationship existed between % N retained and quantity of supplementation (P=.06; r^2=.13). The slope of this model indicates a .17% increase in % N retained for each additional g of CP supplied. Within source, protein quantity had a significant linear relationship with % N retained for CSM and UREA (P<.05) but not with BFM (P=.49). These results indicate that in N deprived animals, protein supplementation at any of the quantities fed improved %N retained, and that increasing degradable protein sources up to 160 g/d linearly increased %N retained.

Key Words: Cows, Protein Supplementation, Nitrogen Retention

1462 The use of melengestrol acetate (MGA) and gonadotropin-releasing hormone (GnRH) for synchronization and early induction of estrus in sheep. C. P. King*, D. C. Cockrell, and R. G. Sasser, *University of Idaho, Moscow.*

Mature Suffolk and Columbia ewes (n=113) were used to evaluate the effectiveness of melengestrol acetate (MGA) and gonadotropin-releasing hormone (GnRH) for estrus synchronization and early induction of estrus early in the natural breeding season. Ewes were randomly assigned to treatment groups in a 2 x 2 factorial design with the effect of breed balanced across groups. Treatment groups were: 1) Control (12 d control diet followed by sham injection on day 14); 2)MGA/GnRH-12 d MGA (.25 mg/head/day) followed by 100 μg injection of GnRH on day 14; 3)MGA-12 d MGA (.25mg/head/day) followed by sham injection on day 14; 4) GnRH-12 d control diet followed by 100 μg GnRH injection on day 14. Fertile, semen-tested rams equipped with marking harnesses were introduced on day 13. Ewes were checked daily for estrous activity and serum progesterone was monitored twice weekly throughout the breeding season. Twenty four hours following ram introduction, 42.9% (MGA/GnRH) and 27.6% (MGA) of the MGA treated ewes were in estrus while only 7.1% (GnRH) and 3.6% (control) of the non-MGA treated ewes showed evidence of an estrous response. Within 72 hours of ram introduction, 75% (MGA/GnRH) and 75.9% (MGA) of the MGA treated ewes had been in estrus while only 10.7% of each of the non-MGA treated groups (GnRH and control) were in estrus. By 6 and 12 days after ram introduction the percent of ewes in groups 1 to 4 respectively that showed heat were 28.6%, 78.6%, 89.7%, 42.9% and 53.6%, 78.6%, 89.7% and 67.9%. Pregnancy was diagnosed by transabdominal ultrasonography as well as serum analysis for pregnancy-specific protein B (PSPB). One hundred ten of the 113 ewes were pregnant when tested 29 days after rams were removed. There were no significant differences in pregnancy rates among the 4 treatment groups. The results of this study show that MGA can be effectively used to synchronize estrus early in the breeding season without having any detrimental effects on pregnancy rate.