(p<.05). One abortion in the H group was detected 19 days following the first dose. Assay results from piperidinic alkaloid tests are pending.

**Key Words:** MRLS, Conium maculatum

**288 Effects of feeding endophyte-infected tall fescue diets on embryo survival in mares during early gestation.** R. C. Youngblood*[1], B. J. Rude[1], D. L. Christiansen[1], N. M. Filipov[1], R. Hopper[1], N. S. Hill[2], B. P. Fitzgerald[3], and P. L. Ryan, [1]*Mississippi State University, Mississippi State, MS,* [2]*University of Georgia, Athens, GA,* [3]*University of Kentucky, Lexington, KY.*

A high incidence of early embryonic death and spontaneous late-term abortions occurred in Kentucky and neighboring states in spring 2001 and 2002. The objective of this study was to evaluate the embryotoxic potential of feeding endophyte-infected tall fescue seed and hay to mares during early gestation. Mares (n = 12) were matched by stage of gestation (d 60-100) and assigned to diets (6/diet) that were fed for 10 days. Diets consisted of endophyte-free (E-) or endophyte-infected (E+; 271 ppb ergot alkaloid content equivalent to 1.36 $\mu$g/kg BW/day) tall fescue seed (0.5% BW) mixed with sweet feed (10% CP) as well as ad libitum access to E+ tall fescue or ryegrass hay, for E+ and E- treatments, respectively. Rectal temperatures (RT), blood samples and urine was collected daily. Blood and serum was analyzed for clinical chemistry, progesterone (P4), prolactin (PRL), and 3-4-dihydroxyphenylacetic acid (DOPAC, a catecholamine metabolite) analyses, whereas urine was analyzed for ergot alkaloids. Also, fetal heartbeat and presence of echogenic material in fetal fluids was monitored daily by ultrasonography (US). RT (E+ 37.76  0.03; E- 37.84  0.03 C) and PRL (E+ 14.06  0.76; E- 12.11  0.76 ng/ml) serum concentrations were not different between groups. Measuring the change in concentration from d 0 over time, P4 concentrations were not different (E+ -0.64  1.49; E- -0.55  1.47 ng/ml). There was no negative pregnancy outcome and US showed no increase in echogenic material in fetal fluids. There was a rapid and persistent (p<0.05) decline in DOPAC concentrations in E+ compared with E- mares (2.1  0.14 and 4.4  0.43 ng/ml, respectively). Urinary ergot alkaloid concentration was greater (p < 0.01) in E+ compared with E- mares (532.12  52.51 and 13.36  2.67 ng/mg creatinine, respectively). Although no embryo loss was observed during the current study, the elevated concentrations of urinary ergot alkaloids and the depressed endogenous catecholamine activity indicate that prolonged exposure to E+ tall fescue could be detrimental to embryonic development and survival in horses.

**Key Words:** Equine, Ergot alkaloids, Catecholamine

## Meat Science & Muscle Biology: Muscle proteinases and meat quality

**289 The Calpain system and animal agriculture.** D. E. Goll*, *Muscle Biology Group,University of Arizona,Tucson, Arizona 85721.*

Even before purification of calpain was first described (Dayton et al., 1976), calpain activity had been linked to postmortem tenderization (Goll et al., 1974). Studies have since established that nearly all (up to 90 % or more) of the tenderization that occurs during postmortem storage at 2-4°C is the result of calpain activity. Most convincing are the studies showing that there is nearly no degradation of actin and myosin during storage at 2–4°C even for periods as long at 2–3 weeks postmortem. The major cathepsins in skeletal muscle, cathepsins B, D, and L, all rapidly degrade myosin and actin, whereas the calpains are unique among the known proteolytic enzymes in that they do not degrade either actin or myosin.

There presently are three well-characterized members of the calpain family: $\mu$-calpain, a protease that requires 3-50 $\mu$M $Ca2^+$ for half-maximal activity; $\mu$-calpain, a protease that requires 400–800 $\mu$M $Ca2^+$ for half-maximal activity; and calpastatin, a protein that inhibits proteolytic activity of the calpains but of no other protease with which it has been tested.

In addition to its role in postmortem tenderization, evidence indicates that the calpain system is responsible for initiating turnover of the myofibrillar proteins in skeletal muscle. Hence, the calpain system has an important role in muscle protein turnover and the rate and efficiency of skeletal muscle growth. Existing evidence indicates that changes in calpastatin activity are more closely related to postmortem tenderization and rate of muscle growth than changes in calpain activity are. Because skeletal muscle contains sufficient calpain activity to destroy all myofibrillar proteins in the muscle in less than 5 min, future studies should focus on how activity of the calpains is regulated (e.g., via calpastatin, phosphorylation, other?) in postmortem and growing muscle.

Dayton, W.R., Goll, D.E., Zeece, M.G., Robson, R.M., and Reville, W.J. (1976) A $Ca2^+$-activated protease possibly involved in myofibrillar protein turnover. Purification from porcine muscle. Biochemistry 15, 2150–2158.

Goll, D.E., Stromer, M.H., Olson, D.G., Dayton, W.R., Suzuki, A., and Robson, R.M. (1974) The role of myofibrillar proteins in meat tenderness. Proc. Meat Industry Res. Conf., American Meat Institute Foundation, Arlington, VA. pp. 75–98.

**290 The influence of calcium metabolism on beef tenderness.** T. A. Walsh*, R. H. Pritchard, D. M. Wulf, and K. W. Bruns, *South Dakota State University, Brookings, SD/USA.*

Calpain and calpastatin activity are thought to be the determining factors for meat tenderness, and Ca plays a role in calpain activity. The present theory is to manipulate beef cattle diets to change muscle Ca levels and consequently calpain activity and shear force. To test whether dietary Ca manipulations affect tenderness, Angus steers (n=20), from a single source, were assigned to pairs based on an allotment weight. One steer from each pair was assigned to the control treatment (CO) and the other to the low dietary Ca (LC) treatment. All cattle were fed a typical high grain finishing (0.65% Ca) diet starting at 343 kg BW; dietary restrictions were imposed 113 d later at 561 kg BW. The LC received a 0.24% Ca diet for 14, 21 or 28 d prior to harvest and was returned to the CO diet for one feeding 16 h prior to harvest. Individual performance and carcass data were collected. Post mortem muscle temperature and pH were determined for the *Longissimus dorsi*, *Triceps brachii*, and *Semimembranosus* muscles from each carcass at 1, 3, 6, 24, and 48 h post mortem. Warner-Bratzler shear force was determined on three steaks from each muscle from each carcass, on d 5, 10 and 15 post mortem. There appeared to be no adverse affect on DMI or ADG when fed a LC diet. Serum Ca levels at exsanguination were higher (P<0.01) for LC cattle than CO (11.9 v. 9.3 mg/dL). Muscle pH was higher (P<0.05) for LC at 1 h (6.47 v. 6.25), 3 h (6.16 v. 5.97), 48 h (5.61 v. 5.57) post mortem. Warner-Bratzler shear force values did not differ (P>0.2) between treatments on d 5, 10, and 15 for the *Longissimus dorsi* (3.0 kg ± 0.18) and *Triceps brachii* (3.1 kg ± 0.15). Shear force was lower (P<0.05) for LC on d 5 for the *Semimembranosus* (3.6 v. 4.2 kg). Muscle Ca concentration was numerically higher in the LC than CO (38.6 v. 37.3 $\mu$g/g). The depletion of Ca from finishing diets did not appear to have adverse affects on performance, but did increase serum Ca levels and altered muscle pH and shear force values of the *Semimembranosus*.

**Key Words:** Beef, Muscle, Calcium

**291 Influence of early postmortem protein oxidation on beef quality.** L. J. Rowe, K. R. Maddock, A. Asmus, S. M. Lonergan, and E. Huff-Lonergan, *Iowa State University.*

The objective of this study was to examine the impact of early postmortem protein oxidation on the color and tenderness of beef steaks. To obtain a range of oxidation levels, both longissimus dorsi et lumborum (LDL) muscles from each of ten beef steers fed a finishing diet with vitamin E (1000 IU per head per day, minimum of 126 d [VITE], n = 20 muscles) and from another ten beef steers fed the same finishing diet without vitamin E (CON diet, n = 20 muscles) were used. Within 24 h after harvest, LDL muscles from each animal were cut into 2.54 cm thick steaks and individually vacuum packaged. Steaks from each animal were assigned to a control group (not irradiated) and an irradiated group (average dose = 6.4 kGy). Steaks were irradiated within 26 h postmortem and were aged at 4°C for 0, 1, 3, 7, and 14 d after irradiation. Steaks from each diet/irradiation/aging time treatment were used to determine color, shear force, and degree of protein oxidation (carbonyl content and sulfhydryl content). Steaks from animals fed VITE diet had significantly higher $\alpha$-tocopherol contents than steaks from animals fed the CON diet. At 0 d post-irradiation, within diet,

steaks that had been irradiated had lower L* values ($P < 0.05$). At all aging times irradiated steaks, regardless of diet, had significantly lower a* and b* values than non-irradiated steaks. Carbonyl concentrations were significantly higher in irradiated steaks compared to non-irradiated steaks at 0, 1, 3, and 7 d post-irradiation ($P < 0.05$). Protein carbonyl content was significantly and positively correlated to Warner-Bratzler shear force values. Immunoblot analysis for carbonyls showed that Vitamin E supplementation decreased the number and extent of oxidized sarcoplasmic proteins. At d 0 post-irradiation, sulfhydryl content of purified myofibrils from irradiated steaks was significantly lower compared to myofibrils from non-irradiated steaks ($P < 0.03$). These results indicate that increased oxidation of muscle proteins early postmortem could have negative impacts on fresh meat quality.

**Key Words:** Protein oxidation, Irradiation, Beef quality

**292 Effects of oxidation on beef tenderness and mu-calpain activity.** L. J. Rowe*, K. R. Maddock, A. Trenkle, S. M. Lonergan, and E. Huff-Lonergan, *Iowa State University*.

The objective of this study was to examine the role of early postmortem tissue oxidation in regulating postmortem mu-calpain activity and subsequent meat tenderness. It was hypothesized that oxidative conditions in postmortem (PM) tissue would decrease mu-calpain activity and minimize the extent of tenderization. To achieve different levels of oxidation two treatments were used, supplementing beef animals with vitamin E the last 126 days on feed and irradiating products early PM. Ten beef steers were fed a finishing diet that included vitamin E at 1000 IU per head per day. Another ten beef steers were fed the same finishing diet without vitamin E. At 24 h PM, both strip loins from each animal were cut into 2.54 cm thick steaks, and individually vacuum packaged. Steaks from each animal were irradiated within 26 h PM at 0 kGy (n = 20 loins) or 6.4 kGy (n = 20 loins). Steaks were aged at 4°C for 0, 1, 3, 7, and 14 d post-irradiation. Steaks from each diet/irradiation/aging group were used to determine Warner-Bratzler shear force (WBS), calpain activity, autolysis, and degradation of myofibrillar proteins. At 1, 3, 7, and 14 d post-irradiation, WBS values of irradiated steaks were significantly higher compared to non-irradiated steaks. Western blots of troponin-T and desmin showed decreased proteolysis in irradiated samples compared to non-irradiated samples. Casein zymography predicted that mu-calpain from irradiated meat had less activity in the tissue than did mu-calpain from non-irradiated meat. Western blotting showed mu-calpain from irradiated meat was less autolyzed compared to mu-calpain from non-irradiated meat. These observations suggest that oxidation in early postmortem meat may be an important inhibitor of mu-calpain activity and should be considered more closely in early PM studies. This study also suggests that irradiation of whole muscle meat products before tenderization is complete will arrest tenderization and potentially compromise the palatibility of the product.

**Key Words:** Calpain, Protein oxidation, Beef tenderness

**293 Effects of oxidation on inactivation of calpastatin in beef .** K. R. Maddock, L. J. Rowe, E. Huff-Lonergan, and S. M. Lonergan*, *Iowa State University*.

The objective of this study was to examine the role of early postmortem (PM) tissue oxidation in postmortem inactivation of calpastatin and subsequent protein degradation. It was hypothesized that conditions that influence protein oxidation have the potential to alter inactivation of calpastatin and degradation of troponin-T. To achieve different levels of oxidation two treatments were used, supplementing cattle with vitamin E the last 126 days on feed and irradiating products early PM. Ten beef steers were fed a diet that included vitamin E at 1000 IU per head/per day (VITE). Ten beef steers were fed the same diet without vitamin E (CON). At 24 h PM, both strip loins from each carcass were cut into 2.54 cm thick steaks, and individually vacuum packaged. Steaks from each carcass were irradiated within 26 h PM at 0 kGy (n = 20 loins) or 6.4 kGy (n = 20 loins). Steaks were aged at 4*C for 0, 1, 3, and 14 d post-irradiation. Calpastatin activity (units/g tissue) and specific activity (units/g extracted protein) were determined on steaks aged 0, 3 and 14 d post-irradiation. Western blots were used to determine the predominance of intact calpastatin in paired steaks and to detect proteolysis of troponin-T. VITE treatment resulted in steaks with lower calpastatin activity and specific activity at 0 d post-irradiation than steaks from the CON diet ($P < 0.05$). At d 1 post-irradiation, troponin-T was more degraded in non-irradiated steaks from VITE steers than non-irradiated steaks from the CON steers ($P < 0.05$). Diet did not affect calpastatin activity at 3 or 14 d. Irradiation did not result in consistent differences in calpastatin activity at 0 d post-irradiation. Calpastatin activity and specific activity in steaks receiving 6.4 kGy were higher at 3 and 14 d postmortem than companion (0 kGy) steaks ($P < 0.01$). Immunoblots for calpastatin demonstrate that intact calpastatin was detected more frequently in irradiated samples than non-irradiated samples at 0 and 1 d post irradiation. The results demonstrate increased oxidation of muscle in the early PM period has the potential to decrease the rate of inactivation of calpastatin and may influence proteolysis of other meat proteins.

**Key Words:** Calpastatin, Protein oxidation, Proteolysis

**294 Effect of pH and ionic strength on calpastatin inhibition of $\mu$- and m-calpain.** K. R. Maddock*, E. Huff-Lonergan, L. J. Rowe, and S. M. Lonergan, *Iowa State University, Ames, IA*.

The objective of the study was to determine the extent to which pH and ionic strength influence the inhibition of $\mu$- and m-calpain. Calpastatin, $\mu$-calpain, and m-calpain were purified from porcine semimembranosus. $\mu$- or m-Calpain (0.45 units) were incubated with fluorogenic peptide Suc-Leu-Leu-Val-Tyr-AMC (170 M) in the presence of calpastatin (0, 0.15, or 0.30 units) under the following pH and NaCl concentration conditions: pH 7.5, 165 mM NaCl; pH 6.5, 165 mM NaCl; pH 6.0, 165 mM NaCl; pH 7.5, 295 mM NaCl; pH 6.5, 295 mM NaCl; pH 6.0, 295 mM NaCl in a total volume of 1 ml. The reactions were initiated with addition of 100 $\mu$M $CaCl_2$ for $\mu$-calpain and 1 mM $CaCl_2$ for m-calpain. Calpain activity was measured at 30 and 60 min in a fluorometer using an excitation wavelength of 380 nm and emission wavelength of 460 nm. Percent inhibition with 0.15 or 0.3 units calpastatin was standardized against activity of calpain alone at each each pH and ionic strength combination. Activity of $\mu$-calpain was affected by pH ($P < 0.01$). Immunoblotting of $\mu$-calpain demonstrated more autolysis of the 80 kDa subunit in pH 7.5 incubations compared to pH 6.5. This may explain the observation that within each ionic strength, $\mu$-calpain exhibited the greatest activity at pH 6.5. High ionic strength reduced $\mu$-calpain activity ($P < 0.01$). Inhibition of $\mu$-calpain by calpastatin was not affected by pH, but was affected by ionic strength. Percent inhibition of $\mu$-calpain was significantly higher in 295 mM than 165 mM NaCl at 30 min and 60 min when 0.3 units of calpastatin was included in the assay. Activity of m-calpain was greater at pH 7.5 than 6.5 ($P < 0.01$). m-Calpain activity was not detected at pH 6.0. Percent inhibition of m-calpain by calpastatin was greater at pH 6.5 than 7.5 at 165 mM NaCl ($P< 0.01$). Percent inhibition of m-calpain was greater at 295 mM than 165 mM NaCl ($P<0.01$). These observations indicate that activity of calpain and inhibition of $\mu$- and m-calpain by calpastatin can be affected by pH and ionic strength and merits further investigation.

**Key Words:** Calpastatin, Calpain, Proteolysis

**295 Degradation of calcium regulating and intermediate filament proteins is related to fresh pork quality.** A. E. Asmus*[1], E. P. Berg[2], J. L. Melody[1], S. M. Lonergan[1], and E. Huff-Lonergan[1], [1]*Iowa State University Ames, IA,* [2]*University of Missouri Columbia, MO*.

Proteins that regulate calcium in muscle may influence pork tenderness and water-holding capacity. These proteins include the sarcoplasmic reticulum Ca2+-ATPase pump-1 (SERCA-1) and ryanodine receptor (RYR). Proteolysis of the intermediate filament protein desmin has also been related to increased tenderness in meat. We hypothesized that degradation of these proteins (SERCA-1, RYR, and desmin) may be related to tenderness. Commercial hybrid pigs (n=54) were harvested and pH measurements were taken in the longissimus dorsi (LD) and the semimembranosus (SM) at 1 h and 24 h postmortem. Warner-Bratzler (WBS) shear force measurements were made on LD samples at 1 d and 21 d postmortem. LD and SM samples were analyzed by immunoblotting with antibodies for SERCA-1, RYR and desmin. Immunoreactive bands were quantified using densitometry. WBS at 1 d was significantly correlated to intact SERCA-1 at 7 d in the LD (r=0.358), indicating products with lower WBS may have less intact SERCA-1. WBS at 1 d was significantly correlated to the amount of intact RYR in the LD at 24 h (r=0.423), indicating that samples with less intact RYR may have lower WBS. Significant correlations were observed between WBS at 21 d and desmin degradation in the LD at 96 h and 7 d (r=0.527 and

r=0.331 respectively) , indicating that samples with less intact desmin may have lower WBS values. The pH at 24 h and intact SERCA-1 at 96 h and 7 d in the LD were significantly correlated (r=0.276 and r=0.306 respectively) and in the SM at 96 h and 7 d (r=0.326 and r=0.382 respectively) indicating that samples with low 24 h pH had less intact SERCA-1 at later aging times. These results indicate increased proteolysis of SERCA-1, RYR, and desmin may be associated with increased tenderness. These results also indicate that SERCA-1 degradation may be associated with differences in pH decline.

**Key Words:** Tenderness, Pork, Proteolysis

## Nonruminant Nutrition: Feed ingredients

**296 Influence of variation in particle size on the flow characteristics of ground corn.** C. N. Groesbeck*, R. D. Goodband, M. D. Tokach, J. L. Nelssen, S. S. Dritz, C. W. Hastad, and K. R. Lawrence, *Kansas State University, Manhattan*.

In previous research, we showed that roller mill (RM) ground corn flows better than corn ground with a hammer mill (HM), and decreasing particle size and increasing fat decreases flow ability. Therefore the objective of these experiments was to determine if the flow differences between HM and RM ground corn were due to the particle size standard deviation (PSSD). In both Exp., RM and HM corn samples were sifted through 13 screens and material from each screen was collected. Samples were dried 12 h to equalize moisture content. Soy oil was then added at 0, 4, and 8 % to samples. Flow ability was then determined by measuring angle of repose (the maximum angle measured in degrees at which a pile of grain retains its slope). A large angle of repose represents a steeper slope and poorer flow ability. In Exp. 1, we created 5 RM samples with mean particle size ranging from 1415 to 343 microns and 5 HM samples from 1382 to 333 microns. All samples were created to have similar PSSD, ranging from 1.1 to 1.3. There was an interaction (P<0.05) between particle size, added fat, and mill type. Increasing fat increased angle of repose; however, the difference was less in fine ground HM samples than in the RM samples. In RM samples, decreasing particle size had less of an impact on flow ability than in HM ground corn. In Exp. 2, we used 4 RM and 4 HM samples that were constructed from the previously collected grain. All samples were similar in mean particle size (641 to 679 microns) with varying PSSD (1.62 to 2.27). There was no (P>0.10) fat x PPSD x mill type interaction observed. Increasing fat (P<0.04) and PSSD (P<0.001) decreased flow ability. These data suggest that the greater flow ability of RM ground corn appears to be a result of less particle size variation. However, with fine particle sizes (<700 microns) other factors, such as particle shape, may also contribute to flow ability.

**Key Words:** Particle size, Hammer mill, Roller mill

**297 Effects of soybean meal source and level on growth performance of weanling pigs.** K. R. Lawrence*, R. D. Goodband, M. D. Tokach, S. S. Dritz, J. L. Nelssen, J. M. DeRouchey, C. W. Hastad, B. W. James, and M. G. Young, *Kansas State University, Manhattan*.

Three experiments were conducted to compare the effects of increasing solvent extracted soybean meal (SBM) and extruded-expelled soybean meal (EESOY) in diets for early-weaned pigs. All pigs (PIC; 5 pigs/pen) were fed a control diet containing no SBM or diets containing 20% or 40% of either SBM or EESOY. In Exp. 1 (n=175, 6.0 kg BW; 7 pens/treatment), diets were formulated using NRC (1998) nutrient values for SBM and previously determined values for EESOY. From d 0 to 14, no differences were observed in ADG or ADFI (P>0.05), but G:F became poorer (linear, P<0.06) with increasing soybean meal source. Soybean meal sources were analyzed for CP after the trial was completed. We speculated numeric differences in performance between sources could have been a result of lower than expected CP in the EESOY. In Exp. 2 (n=350, 5.9 kg BW; 14 pens/treatment), soybean meal sources were analyzed and actual nutrient values were used in diet formulation. From d 0 to 14, increasing SBM decreased ADFI (linear, P<0.02). Increasing EESOY decreased ADG, ADFI, and G:F (linear, P<0.01). Soybean meal sources used in Exp. 1 and 2 were then analyzed for trypsin inhibitor (TI). The EESOY from Exp. 1 and 2 had TI values greater than 6 mg TI/g, suggesting it was underprocessed, while SBM had values less than 2 mg TI/g. In Exp. 3 (n=350, 7.1 kg BW; 14 pens/treatment), different lots of EESOY and SBM were analyzed for TI (EESOY=1.8 mg TI/g; SBM=0.7 mg TI/g) to ensure quality and actual CP values were used in diet formulation. From d 0 to 14, increasing EESOY decreased ADG and ADFI, but improved G:F (linear, P<0.01). Increasing SBM decreased ADFI, but improved G:F (linear, P<0.02). No differences (P>0.05) were found between soybean meal sources. Feeding 40% EESOY or SBM in diets immediately after weaning resulted in poorer growth performance of weanling pigs compared to those fed lower levels (20%). Feeding properly processed EESOY resulted in similar growth performance compared to feeding SBM.

**Key Words:** Pigs, Soybean meal, Performance

**298 Effect of Poultry by-product meal on pig performance.** J. R. Orozco-Hernandez*, J. J. Uribe, S. G. Bravo, V. O. Fuentes-Hernandez, A. Aguilar, and O. H. Navarro, *Centro Universitario de los Altos, Universidad de Guadalajara, Tepatitlan, Jalisco, Mexico*.

Searching and assessing proteinaceous ingredients to be used in single stomach animals is a constant task. On the other hand, there is a continuous renewal of poultry population which generates a protein source of amino acids that can be used in pig feeding. The objective of the trial was to assess increasing levels of a poultry by-product meal in practical pig feeding, from weaning to market weight. Forty newly weaned hybrid pigs were separated into 5 animal groups to assess the addition of 0, 2.5, 5 y 7.5% (dry matter basis) of a poultry by-product meal (HSA) to a sorghum-soybean meal diet in pigs. The intake was measured daily and the weight gain was calculated using initial and final measurements. The initial weight was used as co-variable for the gain. Most of the production parameters were negatively affected with the addition of HSA (P < 0.05). Carcass yield and fat content were reduced (P < 0.05), however the yield of mexican style cuts varied differently. In conclusion, increasing the addition of HSA affects negatively some of the production parameters and carcass yield in pigs.

**Key Words:** Poultry by-product, Pig, Feeding

**299 Effect of inulin and sugar beet pulp on the growth performance and carcass characteristics of wean to finish pigs.** G. F. He*, S. K. Baidoo, Q. Yang, and R. D. Walker, *Southern Research and Outreach Center, University of Minnesota, Waseca, MN 56093*.

The objective of the present study was to determine the performance and carcass characteristics of wean-to-finish pigs fed diets with different carbohydrate sources (inulin and sugar beet pulp). Six hundred and forty early weaned (17-d old, 5.7 ± 0.11kg body weight) barrows and gilts were housed in an environmentally controlled facility from wean to finish. The duration of the study was divided into five phases: 5.7-10; 10-20; 20-50; 50-90; 90-115kg BW. Pigs were blocked by initial body weight and allotted to four dietary treatments: (1) corn soybean meal basal diet as control; (2) basal diet supplemented with inulin in water, 132g/L in phase 1-2, 66g/L in phase 3-5; (3) Ground sugar beet pulp (5% and 7% in phase 1 and 2, 9% in phase 3-5) replacing partial corn in control diet; (4) basal diet supplemented with 0.25% antibiotics (ASP250, Roche Vitamins Inc., Basel, Switzerland) only in phase 1-3. Pigs in treatment 4 grew faster (P<0.01, 601, 613, 594 and 666 g/day for treatment 1-4, respectively, s.e. =8.10) and had higher feed intake (P<0.01, 1244, 1276, 1273, 1368 g/day for treatment 1-4, respectively, s.e.=18.30) than others in phase 1-3. Gain to Feed was negatively influenced (P<0.01) by sugar beet pulp supplementation in treatment 3 compared to treatments 1, 2 and 4 (0.48, 0.48, 0.46, 0.49 for treatment 1, 2, 3 and 4, respectively, s.e.=0.004) in phase 1-3. In phase 4, increased growth rate was observed in pigs supplemented with inulin in water (P<0.01, 1021, 1054, 1026, 1002 g/day for treatment 1-4, respectively, s.e.=9.79). In phase 5, there was no difference in growth performance among treatment groups. Post-slaughter carcass characteristics, including average fat depth, average loin depth, lean percentage and carcass grade premium, were not influenced by the treatments except dressing percentage, which was lower for treatment 3 group (P=0.02, 74.4%, 74.4%, 73.4% and 74.6% for treatment 1, 2, 3 and 4, respectively, s.e.=0.29). In conclusion, continuous supplementation of inulin