801 Effects of starch infusion on body condition, lactation performance, and fecal content in lactating cows. Y. Zou*, Y. Guo, Z. Yang, Y. Du, S. Li, and Z. Cao, *State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing, China.*

The effect of ruminal or abomasal starch infusion on body condition, lactation performance, and fecal content of lactating cows was measured. Six Holstein cows (3 multiparous and 3 primiparous) fitted with permanent ruminal cannulas were arranged into 2 complete 3 × 3 Latin squares, infused in the rumen or abomasums with starch solution (800 g/d) or not infused (control) for 15 d. The abomasal infusion was through a plastic tube (6 mm i.d.) inserted into the abomasums through the rumen and held in place with a flexible rubber disk (18 cm i.d.). Extra energy supplementation was balanced with the decreased DMI (0.77 kg/d, $P = 0.26$), thereby milk yield was decreased (0.63 kg/d for abomasal treatment). The decrease ($P = 0.32$) of starch percentage in feces (0.44 vs. 0.51% of DM; starch infusion vs. control) indicated a higher intestinal absorption efficiency, which was in consistent with the data concerning starch digestibility, starch digestibility of cows receiving starch infusion abomasally (93.04%) was greater ($P = 0.39$) compared with ruminally (88.86%). An increase of backfat thickness (BFT) by 1.83 mm (ruminally) and 2.37 mm (abomasally) when starch was infused indicated a decrease in mobilization of adipose reserves and stimulation in lipid anabolism. The results indicated that supplementation of starch at a concentration of 800 g/d in the abomasums could stimulate the body lipid metabolism and storage other than transport to the mammary gland.

Table 1. Body condition, lactation performance, and fecal content of lactating cows infused starch with 800 g/d in the rumen, or the abomasum

Item	Control	Rumen	Abomasum	SEM
DMI, kg/d	18.58	17.96	17.67	0.30
DM digestibility, %	59.01	59.48	60.39	3.34
Starch digestibility, %	88.50	88.86	93.04	1.89
BW, kg	584.5	590.5	600.7	8.35
BCS	2.71	2.75	2.79	0.06
BFT, mm	17.50	19.33	19.87	0.61
Ruminal propionate, mmol/L	17.32	18.28	17.27	0.95
Feces DM, %	16.72	16.84	17.75	0.27
Feces starch, % of DM	0.51	0.44	0.43	0.02
Milk yield, kg/d	20.38	20.35	19.75	0.30
Milk fat, %	3.43	3.42	3.35	0.03
Milk protein, %	2.89	2.91	2.88	0.02
Milk lactose, %	4.94	4.98	4.94	0.03

Key Words: backfat thickness, lactating cow, lactation performance

802 Benefits of using milk fat to true protein ratio to evaluate on farm transition dairy cow lipid metabolism and effect of transition cow success on milk production. Z. Sawall* and N. B. Litherland, *University of Minnesota, St. Paul.*

Three early lactation studies using multiparous cows (n = 176) were evaluated to determine the efficacy of utilizing fat to true protein ratio (FPR) as a determinant of success of transition cow management. To evaluate FPR cut point for risk of lipid related disorders, cows were divided into 2 groups post hoc, < or >1.4 FPR during the first month postpartum. Analysis was conducted using PROC MIXED in SAS with model including, year, diet × year and treatments of < or >1.4 FPR. Cows with a FPR >1.4 vs. < 1.4 had greater serum BHBA mmol/L and NEFA μEq/L on d 1, 7 and 14 postpartum indicating cows >1.4 FPR had subclinical ketosis. Cows with FPR > 1.4 vs. < 1.4 had greater liver triacylglycerol % (TAG) on d 7 and 14. Cows with FPR > 1.4 lost more kg body weight (BW) through the first 4 weeks of lactation. Yield of ME 305d milk yield, kg tended to be greater for cows >1.4 FPR. Utilizing FPR > 1.4 as a minimum cut point is an adequate diagnostic tool sensitive to detecting cows with a mean BHBA > 1.2 mmol/L, which is the lower value for determining subclinical ketosis. Detecting and managing the negative effects of elevated serum BHBA, NEFA and liver triglycerides as indicated by FPR >1.4 has potential to increase ME 305d milk yield. First month FPR is a low cost indicator of transition cow lipid metabolism.

Table 1. Effects of fat to true protein ratio on early lactation lipid metabolism and milk production

	FPR <1.4	FPR >1.4	SEM	*P*-value
BHBA d 1, mmol/L	0.96	1.22	0.08	0.01
BHBA d 7, mmol/L	0.86	1.34	0.12	<0.01
BHBA d 14, mmol/L	0.77	1.25	0.13	<0.01
NEFA d 1, μEq/L	442.14	603.57	45.24	<0.01
NEFA d 7, μEq/L	575.29	857.44	51.23	<0.001
NEFA d 14, μEq/L	513.31	715.50	42.96	<0.001
Liver TAG 7, %	3.80	9.53	0.99	<0.001
Liver TAG 14, %	4.11	7.70	0.73	<0.001
BW change, kg	−33.58	−59.62	5.80	<0.001
ME 305d milk, kg	10,593.00	11,544.00	418.31	0.08

Key Words: fat:protein ratio, lipid metabolism, transition cow

803 Effects of three levels of energy intake during the close-up period on blood metabolites of dairy cows. A. Pineda*, F. C. Cardoso, and J. K. Drackley, *University of Illinois, Urbana.*

Dairy cows start facing negative energy balance few wk before calving leading to blood metabolites imbalance, predisposition to metabolic disorders, and compromised cow performance. The objective of this study was to evaluate the effects of controlled energy intake prepartum on blood metabolites in the peripartum period. Twenty-seven multiparous Holstein cows dried-off 50d before expected calving date were blocked by lactation, body weight, body condition score, and randomly assigned to one of 3 dry period diets. Cows were individually fed throughout the experiment. Dietary treatments were: controlled-energy group (CE; n = 11), fed a high-fiber diet to supply 100% of NRC requirements for energy and all nutrients ad libitum; high-energy group (HE; n = 7), fed a diet formulated to supply 160–180% of energy (NEL) requirements at ad libitum intake; and restricted-energy group (RE; n = 8), fed to 80% of their calculated NEL requirements by controlled intake of the high-energy ration. After calving a single lactation diet to supply 100% NRC requirements was fed to all cows. Blood samples were obtained 3× per wk from 21d until calving, daily 5 d after calving, and then 3× per wk until 21d after calving. Plasma samples were analyzed for concentrations of BHBA, calcium (Ca), and magnesium (Mg). Cows remained in the experiment until 28d after calving. Data were analyzed using the MIXED procedure of SAS. There were no differences ($P >$ 0.30) among treatments for Ca, Mg, and BHBA concentrations. How-

ever, differences ($P < 0.01$) were observed by d in Ca, Mg, and BHA concentrations during the transition period. BHBA concentration began to increase from 0.74 ± 0.17 mg/dL 1 wk before 1.56 ± 0.30 mg/dL 1wk after calving. Calcium concentration dropped from 9.40 ± 0.20 mg/dL to 7.89 ± 0.43 mg/dL 2 d before calving and increased to 9.01 ± 0.44 mg/dL at d 5 after calving. In conclusion, blood metabolites measured in this study were greatly affected by days relative to calving but not by treatment.

Key Words: dairy cow, dry period, transition period

804 Grain processing methods for Nellore bulls fed high grain finishing diets. C. Sitta, M. A. P. Meschiatti, P. R. B. Campanili, L. T. C. Mello, W. F. Angolini, J. de Souza, F. Batistel, V. N. Gouvêa, M. Lovaglio, A. H. F. Melo, J. R. R. Dórea, D. F. A. Costa, and F. A. P. Santos*, *University of São Paulo, Piracicaba, São Paulo, Brazil.*

Feedlot cattle fed high grain diets usually have high energy intake. Grain processing methods can increase energy availability by disrupting the protein matrix encapsulating starch granules and by increasing the surface area allowing more starch to be digested. One positive outcome of grain processing methods, such as flaking or grinding may be a higher animal performance. The objective of this trial was to evaluate the use of 2 processing methods of corn grain (fine ground and flaked corn) on animal performance. Two hundred thirty-nine Nellore bulls (350 kg BW ± 1.42) fed diets containing 5% sugarcane bagasse; 50% corn; 28.9% citrus pulp; 10% cottonseed; 4% soybean meal; 1.1% urea; 1% mineral and vitamin premix, were blocked by initial body weight and randomly allocated to 40 pens in groups of 6 animals. The parameters evaluated were dry matter intake (DMI), average daily gain (ADG) and feed efficiency (FE = ADG.kg DMI^{-1}).The experiment lasted 117 d and the data was analyzed using Mixed procedure of SAS package. Animals fed flaked corn were heavier by the end of the experiment and had higher ADG and FE. It was concluded that corn flaking is an efficient way to improve performance of feedlot Nellore cattle in comparison with fine ground corn.

Table 1. Performance of Nellore bulls receiving finishing diets with two corn grain processing methods (fine ground and flaked)

	Fine ground	Flaked
Initial BW, kg	350	351
Final BW, kg	498[b]	512[a]
DMI, kg	8.51	8.47
Average daily gain, kg	1.26[b]	1.36[a]
Feed efficiency (ADG/DMI)	0.148[b]	0.160[a]

[a,b]Different superscripts across the rows indicate significant differences between treatments ($P < 0.05$).

Key Words: Nellore, feedlot, grain processing

805 Effects of wet distillers grains and condensed distillers solubles on growth performance and carcass characteristics of finishing steers. H. D. Hughes*, M. S. Brown, R. Butler, K. J. Kraich, J. Simroth-Rodriguez, and J. O. Wallace, *West Texas A&M University, Canyon.*

Few data exist describing the feeding value of condensed distillers solubles (CDS) in diets typical of the southern High Plains. Crossbred steers (n = 384) were adapted to a common finishing diet, blocked by BW, and assigned to treatments of CDS concentration (0, 7.5, or 15% of diet DM) in diets containing 15% wet distillers grains with solubles (WDGS; represented by 0/15, 7.5/15, and 15/15, respectively) or to a control treatment containing 0% CDS and 0% WDGS. Cattle were housed in 36 soil-surfaced pens (9 pens/treatment). Diets contained equal fat and crude protein content across treatments. The WDGS and CDS replaced portions of steam-flaked corn, cottonseed meal, yellow grease, and urea. Cattle were fed twice daily for 167 d (initial BW = 360 ± 11 kg). Dry matter intake tended to increase ($P = 0.12$) with increasing CDS concentration (9.05, 9.10, and 9.27 ± 0.18 kg/d for 0/15, 7.5/15, and 15/15, respectively), but DMI was not different between the control (8.97 kg/d) and the average of remaining treatments ($P = 0.58$). Steer ADG on a live basis was 7.3% greater in cattle fed WDGS and CDS diets (1.53, 1.50, and 1.52 ± 0.03 kg/d for 0/15, 7.5/15, and 15/15, respectively) compared with cattle fed the control diet (1.42 kg/d; $P = 0.007$), but ADG was not different among CDS concentrations ($P > 0.43$). Cattle fed the control were 4.2% less efficient on either a live or carcass basis than the average of those fed CDS ($P = 0.005$), and gain efficiency decreased linearly on a live basis only ($P = 0.09$; $P = 0.25$ on a carcass basis) as more CDS was fed. Hot carcass weight ($P = 0.02$) and 12th rib fat thickness ($P = 0.09$) were both greater for cattle fed WDGS and CDS compared with the control. Based on cattle performance, the NEg of WDGS and CDS were 100 and 85%, respectively, of the NEg of steam-flaked corn. Results suggest that including up to 15% of ration DM as CDS, in combination with WDGS, may negatively affect gain efficiency.

Key Words: feedlot cattle, wet distillers grains with solubles, condensed distillers solubles

806 Individual limitation of total daily concentrate consumption reduces between-day variation of concentrate consumption and carcass weight in Holstein bulls fed high-concentrate rations during the finishing period. M. Verdu*[1], A. Bach[2,1], and M. Devant[1], *[1]Department of Ruminant Production-IRTA, Torre Marimon, Caldes de Montbui, Barcelona, Spain, [2]ICREA, Barcelona, Spain.*

A total of 116 bulls (321 ± 2.9 kg BW, 234 ± 7.4 d of age) were divided into 2 treatments: (1) concentrate consumption fed ad libitum (AD) and (2) daily individual concentrate consumption limited to 7.5 kg/d (DCL) to evaluate their effects on performance, eating pattern, and carcass of Holstein bulls. Individual concentrate intake and eating pattern were recorded daily with a computerized concentrate feeder, and BW every 28 d. Animals were slaughtered after 107 d and HCW, and carcass quality were registered. Data were analyzed using a mixed-effects model with repeated measures. As concentrate consumption of AD bulls (6.5, 6.9, and 7.2 ± 0.17 kg/d, 1st, 2nd, 3rd mo, respectively) increased ($P < 0.05$) throughout the study, concentrate consumption of DCL bulls increased ($P < 0.05$) from the 1st to the 2nd mo (6.2 to 6.5 ± 0.17 kg/d, respectively), but no increase was observed in the 3rd mo (6.6 ± 0.17 kg/d). The CV of concentrate intake in DCL was less and constant throughout the study (12 ± 0.85%) compared with AD bulls which increased ($P < 0.01$) in the 3rd mo (18, 17, 19 ± 0.85%). In the 3rd mo, the number of daily meals in the 3rd mo increased ($P < 0.01$) in the DCL (9.0 ± 0.45) compared with the AD bulls (8.6 ± 0.45). Limiting daily total concentrate intake did not affect ADG, but tended ($P = 0.09$) to improve efficiency in the 3rd mo (0.20 and 0.18 ± 0.007 kg/kg for DCL and AD, respectively). However, HCW ($P < 0.05$) was less in DCL compared with AD bulls (245 and 250 ± 1.6 kg, respectively). Limiting daily individual total concentrate consumption is effective reducing the CV of concentrate consumption, concentrate consumption and efficiency, but reduces carcass weight, compared with bulls fed ad libitum.

Key Words: beef, concentrate limitation, eating pattern

807 Fattening Holstein heifers feeding high-moisture corn (whole or ground) separately from concentrate and straw ad libitum: Effects on behavior, rumen fermentation, digestibility, and nitrogen balance. M. Devant*[1], B. Quintana[1], and A. Bach[2,1], *[1]Department of Ruminant Production-IRTA, Torre Marimon, Caldes de Montbui, Barcelona, Spain, [2]ICREA, Barcelona, Spain.*

Twenty-four Holstein heifers (199 ± 5.5 kg BW and 157 ± 9 d age) housed in individual pens were assigned to 3 treatments where high-moisture corn (HMC), either whole or ground, concentrate (25% CP, 3.5 ME Mcal/kg), and straw were fed separately and ad libitum. Treatments were (1) whole HMC, concentrate (25% CP, 3.5 ME Mcal/kg), straw (WHMC), (2) ground HMC, concentrate (17% CP, 3.3 ME Mcal/kg), straw (GHMC), and (3) concentrate and straw (Control). Concentrate, HMC, and straw consumption was recorded daily, and BW weekly. At the beginning, middle, and end of the study rumen fluid was collected through rumenocentesis to determine rumen pH and VFA concentrations, and apparent nutrient digestibility and N balance were determined. Feeding behavior was monitored throughout the study. Animals were slaughtered after 134 d, HCW, rumen wall and cecum lesions, and liver abscesses were recorded. Data were analyzed using a mixed-effects model with repeated measures. Treatment did not affect total DMI, feed efficiency, ADG, final BW, carcass weight or classification. Concentrate consumption of Control heifers (6.6 ± 0.35 kg/d) was greater ($P < 0.001$) than that of GHMC (4.1 ± 0.35 kg/d) and WHMC (2.8 ± 0.35 kg/d) heifers, and GHMC heifers consumed less ($P < 0.001$) HMC than did the WHMC heifers (2.3 ± 0.31 and 4.2 ± 0.31 kg/d, respectively). Straw intake was greater ($P < 0.05$) in Control (0.84 ± 0.063 kg/d) and GHMC (0.75 ± 0.063 kg/d) compared with WHMC heifers (0.59 ± 0.063 kg/d). Treatments did not affect rumination, self-grooming, non-nutritive oral behaviors, and rumen pH. However, rumen acetate to propionate ratio decreased ($P < 0.01$) when heifers received HMC (2.82 ± 0.276) compared with Control (1.77 ± 0.276). Total-tract starch apparent digestibility was greater ($P < 0.001$) in Control (97.7 ± 0.47%) and GHMC (99.4 ± 0.47%) than in WHMC (95.2 ± 0.47%) heifers. Treatments did not affect N retention. Feeding HMC, either whole or ground, separately from concentrate and straw results in similar performance and behavioral patterns than feeding only concentrate and straw.

Key Words: beef, digestibility, feed consumption

808 Effect of increased dietary grain inclusion on growth performance of prepubertal dairy heifers. T. S. Dennis*, J. E. Tower, H. Schmitz, A. Mosiman, and T. D. Nennich, *Purdue University, West Lafayette, IN.*

The objective of this study was to evaluate the effect of increasing dietary grain:forage ratio on growth, dry matter intake (DMI), and feed efficiency of prepubertal dairy heifers. Seventy-eight Holstein heifers (133.1 ± 27.4 kg, 125 ± 22 d of age) were randomly allocated by body weight (BW) to 1 of 15 pens. Pens were randomly assigned to dietary treatments balanced for CP and ME containing grain:forage ratios of 80:20 (80%), 60:40 (60%), or 40:60 (40%) and fed for 56 d. Following the treatment period, all pens were switched to a common diet containing 40% grain and 60% forage and fed for an additional 56 d. Body weights were collected every 2 wk, and hip and withers heights, body condition score (BCS), heart girth, and hip width were measured monthly. Data were analyzed as repeated measures using PROC MIXED of SAS with pen as the experimental unit. Heifers fed 80% were 13.7 and 27.1 kg heavier than 60% and 40%, respectively, at the end of the treatment period ($P < 0.01$). Similarly, ADG, DMI, feed efficiency, and skeletal growth were improved during the treatment period for 80% compared with 60% and 40% ($P < 0.01$). There was a treatment × time interaction for DMI (% of BW), with 80% consuming 3.4 and 3.0% of BW, respectively, compared with 40% consuming 2.8 and 3.3% of BW on d 56 and 112, respectively ($P < 0.01$). Additionally, ADG was increased for heifers fed 40% and 60% compared with 80% on d 70 ($P = 0.02$) and 84 ($P = 0.01$) during the common period. Feed efficiency was improved for heifers fed 60% compared with 80% on d 84 of the common period, with 60% averaging 0.166 compared with 0.125 kg ADG/kg DMI for 80% ($P = 0.04$). Intake of total NDF was greater for 80% during the treatment period ($P < 0.01$), but total NDF intake was greater for 40% on d 84 ($P = 0.04$) and 98 ($P = 0.01$) of the common period. Skeletal growth and BCS were similar between treatments during the common period from d 56 to 112 ($P > 0.10$). Dairy heifers had greater ADG when fed high amounts of grain, but ADG and feed efficiency were reduced compared with heifers fed moderate to low amounts of grain after switching to a high-forage diet.

Key Words: dairy heifer, grain inclusion, intake

809 Effects of varying periparturient dietary starch amount and supplementation with *Propionibacterium* on multiparous dairy cow performance, metabolism, and health. Z. Sawall*[1], W. Weich[1], D. Lobao da Silva[1], T. Parrott[2], and N. B. Litherland[1], *[1]University of Minnesota, St. Paul, [2]Dupont Industrial Biosciences, Waukesha, WI.*

Multiparous dairy cows (n = 17/treatment) were used in a 2 × 2 factorial design to determine if daily supplementation with *Propionibacterium* (P169) direct fed microbial (DFM) altered response to periparturient diets varying in starch concentration. Cows were fed low or high starch diets pre- and postpartum 42 d pre- through 56 d postpartum with or without DFM 21 d pre- to 56 d postpartum. Dietary starch concentration was adjusted by replacing corn silage and soy hulls with ground corn to yield 2 pre- and 2 postpartum diets; low starch (15.5%) pre- and (20.1%) postpartum or high starch (26.7%) pre- and (29.7%) postpartum. Either DFM carrier or DFM (providing approximately 60 billion cfu/head/day *Propionibacterium*) were added to each cows TMR daily. Factors combined to produce 4 treatments; 1) low starch + Control (DFM carrier) (LSC), 2) low starch + DFM (LSM), 3) high starch + Control (HSC), 4) high starch + DFM (HSM). Data were analyzed using PROC MIXED in SAS as a 2 × 2 factorial with model effects of starch, DFM and week. We hypothesized that DFM would increase milk yield in both low and high starch diets. Prepartum DMI for LSC, LSM, HSC and HSM averaged 13.1, 11.2, 13.0 and 12.5 ± 0.5 kg/d and was decreased ($P < 0.05$) by DFM but unaffected by dietary starch concentration ($P = 0.14$). Postpartum DMI averaged 22.1, 18.8, 21.7 and 21.4 ± 1.1 kg/d for LSC, LSM, HSC and HSM and tended ($P = 0.08$) to be lower for DFM vs. Control but unaffected by starch ($P = 0.24$). Milk yield through d 56 averaged 45.5, 43.3, 43.8 and 47.2 ± 1.5 kg/d for LSC, LSM, HSC and HSM and was greatest ($P = 0.04$) for HSM but 3.5% FCM yield was similar among treatments. Feed efficiency (3.5%FCM/DMI) averaged 2.15, 2.46, 2.09 and 2.22 ± 0.12 for LSC, LSM, HSC and HSM and was greater ($P < 0.05$) for DFM vs. Control. Serum NEFA, BHBA and liver concentrations of triacylglycerol and glycogen were similar among treatments. In summary, the combination of high starch and DFM resulted in the greatest milk yield. Feed efficiency was increased by DFM for both low and high concentrations of dietary starch.

Key Words: direct fed microbial, starch, transition cow

810 Effect of duodenal leucine infusion on pancreatic exocrine function of dairy cow. K. Liu, Y. Liu, and J. Yao*, *College of Animal Science and Technology, Northwest A&F University, Yangling, Shaanxi, China.*

The experiment was conducted to evaluate the effects of duodenal leucine infusion on pancreatic exocrine function of dairy cow. Four intravenously Holstein cows (215 ± 7 kg) with duodenal catheters were used in a 4 × 4 Latin square experiment with 4 levels of leucine infusion (0, 29.1, 59.1 and 88.6 μmol·kg^{-1}·h^{-1}). Concentrations of plasma insulin and cholecystokinin increased with increasing leucine infusion ($P < 0.05$), and pancreatic α-amylase secretion (U/h) responded quadratically ($P < 0.01$), with greatest value observed at 29.1 μmol·kg^{-1}·h^{-1}. Duodenal leucine infusion could also affect concentration (U/mL; α-amylase, $P < 0.001$; U/L; chymotrypsin, $P = 0.014$), specific activity (U/mg; α-amylase, $P < 0.001$; lipase, $P < 0.001$) and secretion (U/h; chymotrypsin, $P = 0.016$) of enzymes. These data indicated that leucine could regulate pancreatic enzyme secretion, and there appeared to be a dose-effect relationship between them. Changes in hormones, such as insulin and cholecystokinin, may be involved in the changes of enzyme secretion.

Key Words: dairy cow, leucine infusion, pancreatic exocrine function

811 Effects of starch infusion on plasma metabolic and gene expression in lactating cows. Y. Zou*, Z. Yang, Y. Guo, S. Li, and Z. Cao, *State Key Laboratory of Animal Nutrition, College of Animal Science and Technology, China Agricultural University, Beijing, China.*

The effect of ruminal or abomasal starch infusion on plasma metabolic, gene expression abundance of gluconeogenesis and lipid metabolism of lactating cows was measured. Six Holstein cows (3 multiparous and 3 primiparous) fitted with permanent ruminal cannulas were arranged into 2 complete 3 × 3 Latin squares, infused in the rumen or abomasums with starch solution (800 g/d) or not infused (control) for 15 d. The abomasal infusion was through a plastic tube (6 mm i.d.) inserted into the abomasums through the rumen and held in place with a flexible rubber disk (18 cm i.d.). Ruminal and abomasal infusion did not affect ($P > 0.05$) plasma metabolism in lactating cows, only a numerical change was detected. The increase in insulin ($P > 0.05$) with starch promote glycogen and lipid synthesis, and all these might have been in response to increased ($P > 0.05$) propionate production and absorption. The decrease ($P > 0.05$) in BHBA and NEFA concentrations indicated a decrease in mobilization of adipose reserves and stimulation in lipid anabolism, which is in agreement with the increased ($P > 0.05$) backfat thickness by 1.83 (ruminally) and 2.37 mm (abomasally) when starch was infused. Messager ribonucleic acid abundance of PPAR-gamma and GLUT-4 in subcutaneous adipose also indicated a lipid accumulation in lactating dairy cows. Starch infusion abomasally can certainly been carried down to the intestine directly to ameliorate energy supplies. The results indicated that supplementation of starch at a concentration of 800 g/d in the abomasums could decrease plasma adipose mobilization and stimulate lipid accumulation mRNA abundance.

Table 1. Plasma concentrations and relative mRNA abundance of cows infused starch with 800 g/d in the rumen, or the abomasum

Item	Control	Rumen	Abomasum	SEM
Glucose, mg/dL	58.6	63.5	71.7	3.73
Insulin, μIU/mL	17.3	18.3	19.4	0.62
BHBA, mmol/L	0.52	0.51	0.49	0.03
NEFA, mmol/L	0.40	0.37	1.35	0.03
Backfat thickness, mm	17.50	19.33	19.87	0.61
Liver				
PC	1.39	0.67	0.92	0.22
PEPCK-C	0.60	0.57	0.47	0.07
PPAR-α	1.25	0.95	1.15	0.10
GLUT-2	1.30	0.94	0.90	0.12
Adipose				
InsR	1.01	1.28	1.36	0.17
PPAR-γ	1.30	1.24	1.04	0.07
GLUT-4	0.84	1.22	0.98	0.29

Key Words: expression abundance, lactating cow, plasma and liver metabolism