

966 cows from nine randomized complete block design trials conducted in the US and Canada in which 4 doses of monensin (0, 7, 15, 22 g/ton of dry matter intake (DMI)) were fed for a complete lactation. The PROC MIXED and PROC NLIN procedures in SAS were used to analyze data. DMI and milk yield data were analyzed with monensin dose as fixed effect and location as a random variable. Location and cows were used as random factors and week in milk (WIM) as repeated measure in the model. Increased production efficiency (Milk/DMI) (1.51, 1.52, 1.56 and  $1.59 \pm 0.03$ ;  $P < 0.0001$ ) was a result of a linear reduction in DMI (20.4, 20.4, 19.8 and  $19.6 \pm 0.17$  kg/d;  $P = 0.003$ ) and similar milk yield ( $31.6 \pm 0.4$ ). When weekly DMI data for the first 12 WIM was analyzed using an exponential model ( $DMI(t) = a - b \times \exp(-c \times t)$ ; where  $DMI(t)$  = weekly DMI for corresponding WIM,  $a$  = asymptotic maximum DMI,  $b$  = potential increase in DMI,  $c$  = fractional rate of increase of DMI with WIM, and  $t$  = WIM) the rate of change in DMI was linearly increased as monensin dose increased (0.036, 0.047, 0.045, and  $0.051 + 0.004$  % per d;  $P = 0.007$ ). This also resulted in a linear increase in production efficiency (1.89, 1.92, 1.96, and  $2.01 \pm 0.04$ ;  $P < 0.0001$ ). These results may indicate that monensin may have a different effect on DMI depending on rumen dynamics or energy status of the cow. A faster intake recovery was associated with a reduction in the incidence of ketosis (12.7 % for control versus 6.2, 7.0 and 4.2 % for monensin treated,  $P = 0.03$ , 0.06 and 0.04, respectively), but there was no effect on reproductive efficiency (services per conception, days open, days to first service, calving interval and days open) except lower first service conception rate (37.5%) at 22 g/ton compared to the control group (49.6%). Feeding monensin to transition cows may help improve energy balance through a higher rate of DMI increase during early lactation.

**Key Words:** Monensin Concentration, Exponential Model, DMI

**W224 Effect of malic acid on rumen fermentation *in vitro* with DHA diet.** L. Liu, J. Q. Wang\*, D. P. Bu, S. J. Liu, K. L. Liu, H. Y. Wei, and L. Y. Zhou, *Chinese Academy of Agricultural Sciences, Beijing, China*.

The objective of this study was to evaluate changes in rumen fermentation when different levels of malic acid were added in a DHA-enriched diet. The rumen-simulation technique (RUSITEC) apparatus containing eight vessels was employed in this experiment. Treatments were as follows: (1) base diet rich in DHA (CON); (2) base diet with 10 mM malic acid (Trt1) and (3) base diet with 20mM malic acid. This study was repeated at two-week intervals. Experimental period was 7 d including 6 d for adaptation and 1 d for sampling. Culture fluid was collected every 3 h over a 12 h period on the last day of each experimental period. The concentration of VFA was analyzed by gas chromatography (model 6890, Series II; Hewlett Packard Co., Avondale, PA). Data were analyzed with PROC MIXED procedure of SAS for a completely randomized design with repeated measures. The results showed that with the addition of malic acid, culture fluid pH numerically decreased ( $P > 0.05$ ) from 6.17 to 6.14 and 6.09 for CON, Trt1 and Trt2, respectively. However, addition of malic acid in a DHA diet had no effect on acetate concentration in culture fluid ( $P > 0.05$ ). Contrarily, propionate and butyrate concentration in culture fluid increased when malic acid was added. Compared to CON, concentration of propionate in Trt1 and Trt2 increased by 30.37% and 62.37%, respectively. Butyrate concentration increased by 21.76% and 24.85% for Trt1 and Trt2. The proportion of acetate to propionate decreased significantly ( $P < 0.01$ ). Results suggest that malic acid supplementation in a DHA diet changes the rumen fermentation process.

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**Key Words:** DHA Diet, Malic Acid, Rumen Fermentation

**W225 Effect of physical particle size on ruminal and post-ruminal disappearance of nutrients of a mixed concentrate in Holstein steers.** H. Jahani-Azizabadi<sup>1</sup>, M. Danesh Mesgaran\*<sup>1</sup>, and A. Rahmatimanesh<sup>2</sup>, <sup>1</sup>*Ferdowsi University of Mashhad, Mashhad, Mashhad, Iran*, <sup>2</sup>*Heram Talaei Shargh Feed Mill Company, Nishabour, Iran*.

In situ ruminal and post-ruminal disappearance [dry matter (DM), crude protein (CP) and ether extract (EE)] of a mixed concentrate prepared as fine mesh (fm), fine pellets (fp) and coarse pellets (cp) were studied. All pellets were provided in a condition of 70°C with pressure of 3 bars in 7 seconds. Concentrate was composited of cereal grain, soybean meal, canola meal, fish meal, urea, wheat bran, beet pulp, bagasse, salt, sodium bicarbonate, mineral and vitamin premix, anionic salt, molasses, sugar, protected fatty acid and Mg oxide (318, 60, 150, 15, 3.6, 250, 33, 40, 6.7, 8.6, 8, 15, 55, 30, 5 and 2.1 g/kg DM, respectively). Four Holstein steers ( $430 \pm 50$  kg, BW) fitted with ruminal fistulae and T-shaped intestinal cannulae were used. Steers fed (DM basis) 2.5 kg of alfalfa hay, 2.1 kg of corn silage, 1.5 kg of straw and 2.5 kg of concentrate (170 g CP/kg of DM). Approximately 5 g of sample (DM) was placed in polyester bag (12x19 cm, pore size of 48  $\mu$ m, n=8), then incubated in the rumen for 12 h. After removal from the rumen, bags were washed and dried. Then, 1 g DM of un-ruminal disappeared sample was weighed into a mobile bag (3x6 cm, pore size of 48  $\mu$ m, n=8) and inserted in small intestine, then removed from the voided feces and rinsed in cold tap water. DM, EE and CP of intact and incubated samples were determined. Data were analyzed using completely randomized design. Ruminal DM, CP and EE disappearance of fm was significantly ( $P < 0.01$ ) lower than fp and cp. Ruminal DM, CP and EE disappearance of fp was significantly ( $P < 0.01$ ) higher than cp (0.71, 0.61 and 0.65 vs. 0.67, 0.58 and 0.59, respectively). Post-ruminal DM, CP and EE disappearance of fm concentrate (0.45, 0.50 and 0.80, respectively) was significantly ( $P < 0.01$ ) higher compared with fp (0.35, 0.38 and 0.68, respectively) and cp (0.39, 0.38 and 0.57, respectively). Results of the present study indicated that the physical particle size of a mixed concentrate might impact on ruminal and post-ruminal disappearance of DM, CP and EE.

**Key Words:** Physical Processing, Disappearance, Mobil Nylon Bag

**W226 Influence of an  $\alpha$ -amylase on *in vitro* ruminal fermentation and starch degradation.** W. Hu\*<sup>1</sup>, M. E. Persia<sup>2</sup>, and L. Kung, Jr.<sup>1</sup>, <sup>1</sup>*University of Delaware, Newark*, <sup>2</sup>*Syngenta Animal Nutrition, Research Triangle Park, NC*.

A thermostable  $\alpha$ -amylase was isolated and then expressed in corn grain. Although this amylase was specifically developed for use in ethanol production, because it has completed the FDA consultation process for food and feed, the utility of this amylase as a feed enzyme on rumen fermentation and starch degradation *in vitro* was explored. In experiment 1, pure corn grains were fermented individually with inoculums of rumen fluid and artificial saliva for 6 h at 40°C. Four corns were evaluated: flint, opaque and two corns with near identical nutrient profiles: one containing amylase (CA) and the other the isogenic control (IC).