between Control and LAC10 ($P < 0.05$) for ruminal fluid samples collected on d 80. However, molar ratio of butyrate was not affected by treatment. These results indicate that inclusion of lactose in calf starter affects ruminal VFA profile, but its effects on rumen pH warrants further investigation.

Key Words: calf, lactose, rumen

1298 Methionine:lysine ratio for crossbred suckling calves fed milk replacer and an amino acid complex. J. C. Chagas[1], M. A. Ferreira[1], M. R. Entjes[2], F. S. Machado[3], L. F. Costa e Silva[4], and M. I. Marcondes*[5], [1]*Universidade Federal Rural de Pernambuco, Recife, Brazil,* [2]*VHL University of Applied Sciences, Leeuwarden, Netherlands,* [3]*EMBRAPA, Juiz de Fora, Brazil,* [4]*Universidade Federal de Vicosa, Vicosa, Brazil,* [5]*Departamento de Zootecnia, Universidade Federal de Viçosa, Viçosa, Brazil.*

Knowledge about the amino acid (AA) requirements of dairy cattle is rare, and information regarding limiting AAs for suckling calves does not exist. Due to the difficulties in studying the AA requirements for ruminants, research is necessary to evaluate and determine optimal levels when including these AAs in the diet. Based on studies demonstrating lysine (Lys) and methionine (Met) as limiting AAs for neonates, we hypothesized that it is possible to determine the Met:Lys ratio that maximizes the performance of suckling dairy calves. This study evaluated the effect of increasing dietary Met:Lys ratios (DMLR) on performance and body composition of crossbred suckling calves of two different ages. Thirty-six male calves (Holstein-Gyr) were introduced in the experiment on the eighth day of age and randomly distributed among two slaughter ages (16 animals slaughtered at 30 d of age, and 20 animals slaughtered at 60 d of age) and four DMLR (44, 48, 52, and 56%), which were provided in the form of an AA complex (18.93 g) added to 905 g of milk replacer. The experimental diets were provided without permission of refusals, so the intake of dry matter and nutrients were the same for all animals, regardless of DMLR. Average daily gain (ADG), gain composition and body composition were evaluated separately for the two age groups for the linear and quadratic effects of DMLR. When necessary, the linear-plateau model was adjusted. Calves from 0 to 30 d of age did not show an improved performance due to increased DMLR; it is possible that animals up to 30 d of age had other metabolic priorities over body growth and protein deposition. For calves from 30 to 60 d of age, a linear-plateau response was observed for ADG and crude protein gain (CP); the greatest ADG observed was 590 g/d for a DMLR of 52.56% ($P = 0.001$), and the greatest CP deposition observed was 89 g/d for a DMLR of 52.33% ($P = 0.027$). Total body CP presented a quadratic behavior, with a maximum of 11.72 kg of CP for a DMLR of 53.91% ($P = 0.040$). The increased DMLR did not influence performance of calves from 0 to 30 d, and the optimal DMLR that ensured the best performance of calves from 30 to 60 d of age was situated between 52 and 54%.

Key Words: bovine, body composition, crude protein

1299 Effects of organic or inorganic Co, Cu, Mn, and Zn supplementation to weaned calves during preconditioning on their productive and health responses. K. Lippolis*[1], R. F. Cooke[1], L. G. T. da Silva[2], K. M. Schubach[1], A. P. Brandao[1,2], R. Marques[1], C. K. Larson[3], T. DelCurto[4], and D. W. Bohnert[1], [1]*Oregon State University- EOARC Burns, Burns,* [2]*UNESP- FMVZ, Botucatu, Brazil,* [3]*Zinpro Corporation, Eden Prairie, MN,* [4]*Oregon State University- EOARC Union, Union.*

This experiment compared productive and health parameters of weaned calves receiving or not supplemental Co, Cu, Mn, and Zn from an organic or inorganic source during a 45-d preconditioning program. Ninety Angus × Hereford calves were weaned on d −1 and immediately allocated according to weaning BW and age (BW = 261 ± 2 kg, age = 224 ± 2) to a18-pen drylot with 5 calves per pen (steers, $n = 4$; heifers, $n = 1$). Pens were randomly assigned to receive: 1) supplementation with inorganic sulfate sources of Cu, Co, Mn, and Zn (INR), 2) supplementation with an organic source of Cu, Mn, Co, and Zn (ORG; Availa®4; Zinpro Corporation, Eden Prairie, MN), and 3) no supplementation of Cu, Co, Mn, and Zn (CON). During the preconditioning phase (d 0 to 45), calves received mineral treatments while offered free-choice hay and 2.7 kg/d of corn-soybean meal concentrate. The INR and ORG were included into the concentrate, and formulated to provide the same daily amount of Cu, Co, Mn, and Zn. Calf ADG during preconditioning was calculated based on average initial BW (d −1 and 0) and final BW (d 44 and 45). Liver samples were collected via needle biopsy on d 0, 22, and 45. Calves received vaccination on d 15 and 29. Blood samples were collected on d 15, 29, and 45, and analyzed for plasma concentrations of antibodies against *Mannheimia haemolytica*. No differences were detected ($P \geq 0.15$) among CON, INR, and ORG calves for initial (d 0) liver Co, Cu, Mn, and Zn concentrations. On d 22 and 45, liver Cu and Co concentrations were greater ($P < 0.01$) for INR and ORG calves compared with CON. Moreover, ORG calves had greater ($P = 0.05$) liver Co concentrations on d 45, but similar ($P = 0.35$) liver Co on d 22 and similar ($P \geq 0.63$) liver Cu on d 22 and 45 compared with INR calves. Liver Zn and Mn concentrations were similar ($P \geq 0.14$) among CON, INR, and ORG calves on d 22 and 45. No differences ($P \geq 0.17$) were detected among treatments for feed intake, BW gain, health variables, or antibodies against *M. haemolytica*. Therefore, supplementation with inorganic or organic Co, Cu, Mn, and Zn during a 45-d preconditioning period

2016 JAM

Joint Annual Meeting

July 19–23, 2016
Salt Lake City, UT

American Society of Animal Science
Journal of Animal Science
Volume 94, E-Supplement 5

American Dairy Science Association®
Journal of Dairy Science®
Volume 99, E-Supplement 1