89 **Quantification of multicatalytic proteinase complex activity by ion-exchange chromatography.** J. R. Arbona* and M. Koohmaraie, USDA, ARS, Roman L. Hruska U.S. Meat Animal Research Center, Clay Center, NE 68933.

Two methods were compared to optimize measurement of Multicatalytic Proteinase Complex (MCP) activity in bovine skeletal muscle. Within 1 h after slaughter, two 10-g samples of longissimus muscle were obtained from each of four crossbred animals. Samples were homogenized in either 6 volumes of extraction solution (50 mM Tris base, 10 mM EDTA and 10 mM 2-mercaptoethanol [MCE], pH 8.3) for method A or in 3 volumes for method B. After centrifugation, the supernatant for method A was loaded onto a DEAE-Sephacel column (1.5 x 20 cm) and eluted with a continuous gradient of NaCl from 25 to 350 mM (250 ml of each). The supernatant for method B was fractionated by addition of solid $(NH_4)_2SO_4$. Ammonium sulfate (40-65%) fractions were dialyzed and then loaded onto a DEAE-Sephacel column (1.5 x 20 cm) and eluted with a continuous gradient of NaCl from 100 to 400 mM (125 ml of each). Total activity eluted from the column was determined using the synthetic peptide N-CBZ-Gly-Gly-Leu-p-nitroanilide. Method A yielded greater MCP activities (102.55 $\pm$ 14.02 vs. 79.67 $\pm$ 11.53 μmole pNA released $\cdot h^{-1} \cdot g^{-1}$ $\pm$ SD; $P < .05$). Enzyme activity was linearly related with incubation time (up to 45 min) and protein in the assay (up to 5 μg). Also, studies indicated that the optimum temperature is in the range of 50 to 60°C and the optimum pH is in the range of 7.5 to 8.5. Determination of MCP following ion-exchange chromatography of a crude muscle extract was more efficient than method B and allowed for the quantification of calpain/calpastatin activities with the fractions eluted.

Key Words: Multicatalytic Proteinase, Bovine, Skeletal Muscle

NONRUMINANT NUTRITION

90 Interrelationship of vitamin E and cardiomyopathy in the young growing pig. J. M. Hoffman*, G. M. Hill, J. R. Turk, J. E. Link, and C. A. Kerr, University of Missouri, Columbia.

Previously we reported a nutritionally induced cardiomyopathy in young growing pigs fed a casein-glucose diet. This cardiomyopathy occurring in pigs fed 50% sole source carbohydrate resembled that of oxidative damage. Since cardiac and serum vitamin E concentrations were depressed in this study, it was hypothesized that vitamin E might be protective; therefore, our objectives were to reproduce this nutritionally induced cardiomyopathy and to determine if vitamin E supplementation could serve a prophylactic role. Twenty, three-week old barrows were blocked by litter to one of three diets with vitamin E provided at either 1 IU/kg (LO), 16 IU/kg (NRC) or 110 IU/kg (HI). All other nutritional needs were met according to the NRC requirements. Blood samples were obtained at 0 and 4 weeks and at termination of the study (8 weeks) when gross pathology, histology and enzyme and trace element assays were performed on selected tissues. There were no significant differences in the erythrocytic, hepatic, and cardiac superoxide dismutase and glutathione peroxidase activity; erythrocytic catalase activity; serum ceruloplasmin; hematocrit or hemoglobin. Hepatic (33 vs 13, 6 ug/g), cardiac (91 vs 32, 18 ug/g) and serum (3 vs 1, 0.7 ug/ml) vitamin E concentrations were significantly ($p<0.05$) higher for the HI pigs than for pigs fed the other diets. Hepatic Fe was significantly ($p<0.05$) higher for pigs fed the NRC than those fed the HI diet (58 vs 38 ug/g). Interactions were observed for several of the parameters. Gross examination of affected animals revealed ascites and fibrin overlying the spleen and liver, pulmonary edema, ventral hydrothorax and multifocal cardiac hemorrhages. Cardiac histological findings were increased vacuolization and lysosomes, decreased cross striations, increased nuclear density in early necrosis, and marked loss of myofibrils being replaced by spindle cells as a sign of early fibroplasia. The incidence of cardiomyopathy were 71% LO, 67% NRC and 71% HI and of death were 29% LO, 17% NRC and 29% HI. Hence, vitamin E did not prevent the onset nor premature death due to cardiomyopathic complications. In conclusion, NRC recommended vitamin E concentrations did not result in greater tissue concentrations and protection than the unsupplemented diet.

Key Words: Cardiomyopathy, Vitamin E, Pig

91 **Influence of high levels of individual B vitamins on starter pig performance.** M. E. Wilson[1]*, M. D. Tokach[2], R. W. Walker[2], J. L. Nelssen[2], R. D. Goodband[2], and J. E. Pettigrew[1], University of Minnesota[1], Waseca and St. Paul and Kansas State University[2], Manhattan.

Previous research at the University of Minnesota has reported a 12 to 20% improvement in growth performance from adding high levels (10 vs 1.4 x NRC) of B vitamins to starter diets. As further investigation, two identical trials were conducted to answer the following objectives: 1) to determine if high levels (10 x NRC) of B vitamins will elicit a growth response over levels standard in the feed industry (1.9 to 3.3 x NRC); and 2) to determine which B vitamin is important to elicit the response. At weaning, pigs were blocked by weight to one of six dietary treatments based on B vitamin level. The negative control diet contained added vitamin B_{12} at 1.9 x NRC (33 μg/kg), riboflavin at 2.4 x NRC (8.3 mg/kg), pantothenic acid at 2.9 x NRC (28.7 mg/kg), and niacin at 3.3 x NRC (49.6 mg/kg). The next four diets contained each of these vitamins added at 10 x the level recommended by NRC (1988). The positive control diet (All) contained all four vitamins at 10 x the levels suggested by NRC. Trial 1 was a 25-d growth trial utilizing 318 pigs with an average initial weight of 5.5 kg at 16 d of age. Trial 2 was a 28-d growth trial utilizing 360 pigs with an average initial weight of 7.5 kg at 25 d of age. Diets fed from d 0 to 14 contained 7.5% porcine plasma, 1.75% spray-dried blood meal, and 20% dried whey and were formulated to 1.5% lysine. Corn-soybean meal diets formulated to 1.25% lysine and containing 10% dried whey and 2.5% blood meal were fed from d 14 to 25 (trial 1) or d 14 to 28 (trial 2). B vitamin inclusion did not influence ($P > .19$) ADG or ADFI in either trial (Table). High levels of riboflavin resulted in an improvement ($P < .07$) in feed efficiency (G/F) in trial 1, but not in trial 2. These results do not support including B vitamins in the starter diet at levels higher than in the negative control diet.

Item	Control	B_{12}	Riboflavin	Pant. Acid	Niacin	All	CV
Trial 1							
ADG, g	377	383	391	379	376	384	6.3
G/F	.73	.73	.76	.72	.74	.73	3.4
Trial 2							
ADG, g	429	440	424	412	428	416	7.2
G/F	.65	.65	.65	.63	.65	.64	4.0

Key Words: B vitamins, Pigs, Growth.