

Effects of feeding reduced dietary CP with supplementation of synthetic AA on N and C
excretion, energy utilization, and fecal VFA concentrations.

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Diet Tables for Metabolism Study

Table 1. Ingredient and nutrient composition of nursery phase 3 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	36.944	40.449	44.062	48.096
SBM	16.000	16.000	16.000	16.000
DDGS	15.000	15.000	15.000	15.000
Choice White Grease	2.581	2.637	2.668	2.628
Limestone	1.043	1.048	1.062	1.079
Monocal. Phosphate	-	0.064	0.109	0.160
Vitamin premix ²	0.250	0.250	0.250	0.250
TM premix ³	0.180	0.180	0.180	0.180
Salt	0.350	0.350	0.350	0.350
Soy concentrate	12.732	8.859	4.780	0.145
Fish meal	4.000	4.000	4.000	4.000
Dried whey	10.000	10.000	10.000	10.000
Lysine-HCL	-	0.185	0.382	0.607
DL-Met	-	0.059	0.121	0.191
L-Thr	-	-	0.100	0.213
L-Trp	-	-	0.015	0.053
L-Val	-	-	-	0.081
L-Ile	-	-	-	0.053
Phytase ⁴	0.100	0.100	0.100	0.100
Carbadox ⁵	0.250	0.250	0.250	0.250
Zinc oxide	0.370	0.370	0.370	0.370
Cr premix	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	26.63	24.65	22.65	20.45
DE, kcal/kg	3,661	3,643	3,624	3,600
ME, kcal/kg	3,429	3,429	3,429	3,429
SID Amino acids, %				
Arg	0.91	0.75	0.60	0.44
His	0.42	0.37	0.31	0.26
Ile	0.61	0.52	0.43	0.36
Leu	1.62	1.50	1.38	1.25
Lys	1.35	1.35	1.35	1.35
Met	0.29	0.26	0.24	0.21
Met + Cys	0.54	0.49	0.44	0.39
Phe	0.77	0.68	0.58	0.48
Phe + Tyr	1.35	1.18	1.02	0.84
Trp	0.15	0.12	0.10	0.10
Thr	0.54	0.47	0.42	0.42
Val	0.73	0.64	0.56	0.47

Table 1. Cont. Ingredient and nutrient composition of nursery phase 3 diets.

Diet	C	1X	2X	3X
Ca, %	0.53	0.53	0.53	0.53
Avail. P, %	0.21	0.21	0.21	0.21
<u>Analyzed Composition</u>				
Dry matter, %	90.17	89.87	89.99	89.40
CP, %	25.88	23.38	21.31	18.94
Carbon, %	40.66	40.97	41.40	41.29
Gross Energy, kcal/g	4.17	4.17	4.13	4.10

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 6615 IU; vitamin D₃, 662; vitamin E, 44.1 IU; vitamin K, 2.21 mg; vitamin B₁₂, 38.59 µg; riboflavin, 8.82 mg; pantothenic acid, 22.05 mg; niacin, 33.08 mg.

³TM premix supplies the following per kg of diet: iron, 126.1 mg; zinc, 126.1 mg; manganese, 15.63 mg; copper, 11.75 mg; iodine, 0.48 mg; selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Nutrition – Dupont).

⁵Mecadox[®] 10 (Carbadox-Phibro Animal Health, Ridgefield Park, NJ) provided at 55 ppm.

Table 2. Ingredient and nutrient composition of nursery phase 4 diets.

Ingredient, %	Diet ¹			
	C	1X	2X	3X
Corn	35.840	43.400	51.141	59.198
SBM, 48% CP	38.646	30.758	22.560	13.908
DDGS	20.000	20.000	20.000	20.000
Choice White Grease	2.548	2.474	2.357	2.110
Limestone	0.874	0.919	0.965	1.013
Monocal. Phosphate	0.662	0.707	0.755	0.805
Vitamin premix ²	0.250	0.250	0.250	0.250
TM premix ³	0.180	0.180	0.180	0.180
Salt	0.350	0.350	0.350	0.350
Lycine-HCL	-	0.250	0.515	0.793
DL-Met	-	0.036	0.115	0.199
L-Thr	-	0.024	0.139	0.260
L-Trp	-	-	0.025	0.072
L-Val	-	-	-	0.108
L-Ile	-	-	-	0.104
Phytase ⁴	0.100	0.100	0.100	0.100
Carbadox ⁵	0.250	0.250	0.250	0.250
Cr premix	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	26.82	23.98	21.13	18.28
DE, kcal/kg	3,634	3,618	3,603	3,588
ME, kcal/kg	3,429	3,429	3,429	3,429
SID Amino acids, %				
Arg	1.57	1.34	1.09	0.84
His	0.63	0.55	0.47	0.39
Ile	0.99	0.85	0.71	0.67
Leu	2.14	1.95	1.75	1.54
Lys	1.22	1.22	1.22	1.22
Met	0.39	0.38	0.42	0.47
Met + Cys	0.75	0.71	0.71	0.71
Phe	1.17	1.02	0.88	0.72
Phe + Tyr	2.07	1.81	1.55	1.27
Trp	0.27	0.23	0.21	0.21
Thr	0.85	0.76	0.76	0.76
Val	1.10	0.97	0.83	0.79
Ca, %	0.60	0.60	0.60	0.60
Avail. P, %	0.32	0.32	0.32	0.32

Table 2. Cont. Ingredient and nutrient composition of nursery phase 4 diets.

Diet	C	1X	2X	3X
<u>Analyzed Composition</u>				
Dry matter, %	88.94	88.58	88.81	88.30
CP, %	26.69	22.94	19.08	17.75
Carbon, %	46.14	43.90	46.79	45.58
Gross Energy, kcal/g	4.17	4.15	4.11	4.22

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 6615 IU; vitamin D₃, 662; vitamin E, 44.1 IU; vitamin K, 2.21 mg; vitamin B₁₂, 38.59 µg; riboflavin, 8.82 mg; pantothenic acid, 22.05 mg; niacin, 33.08 mg.

³TM premix supplies the following per kg of diet: iron, 126.1 mg; zinc, 126.1 mg; manganese, 15.63 mg; copper, 11.75 mg; iodine, 0.48 mg; selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Health – Dupont)

⁵Mecadox[®] 10 (Carbadox-Phibro Animal Health, Ridgefield Park, NJ) provided at 55 ppm.

Table 3. Ingredient and nutrient composition of grower phase 1 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	46.707	53.524	60.688	68.359
SBM, 48% CP	30.126	22.794	15.221	7.192
DDGS	20.000	20.000	20.000	20.000
Choice White Grease	0.850	0.896	0.801	0.500
Limestone	0.960	1.133	1.176	1.118
Monocal. phosphate	0.327	0.369	0.413	0.459
Vitamin premix ²	0.150	0.150	0.150	0.150
TM premix ³	0.140	0.140	0.140	0.140
Salt	0.350	0.350	0.350	0.350
Lysine-HCL	-	0.235	0.478	0.735
DL-Met	-	-	0.056	0.134
L-Thr	-	0.008	0.114	0.226
L-Trp	-	-	0.013	0.056
L-Val	-	-	-	0.080
L-Ile	-	-	-	0.101
Phytase ⁴	0.100	0.100	0.100	0.100
CTC-50 ⁵	0.100	0.100	0.100	0.100
Cr premix	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	23.66	20.98	18.33	15.69
DE, kcal/kg	3,558	3,544	3,530	3,516
ME, kcal/kg	3,374	3,374	3,374	3,374
SID Amino acids, %				
Arg	1.33	1.11	0.89	0.65
His	0.55	0.48	0.41	0.33
Ile	0.85	0.72	0.60	0.56
Leu	1.96	1.78	1.60	1.41
Lys	1.01	1.01	1.01	1.01
Met	0.35	0.32	0.34	0.38
Met + Cys	0.68	0.61	0.59	0.59
Phe	1.02	0.89	0.75	0.61
Phe + Tyr	1.81	1.57	1.33	1.07
Trp	0.23	0.19	0.16	0.16
Thr	0.73	0.64	0.64	0.64
Val	0.97	0.84	0.72	0.66
Ca, %	0.66	0.66	0.66	0.66
Avail. P, %	0.26	0.26	0.26	0.26

Table 3. Cont. Ingredient and nutrient composition of grower phase 1 diets.

Diet	C	1X	2X	3X
<u>Analyzed Composition</u>				
Dry matter, %	88.25	88.17	88.30	87.77
CP, %	22.63	20.00	18.14	14.78
Carbon, %	43.23	41.95	42.14	42.58
Gross Energy, kcal/g	4.09	4.10	4.17	3.94

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 3969 IU; vitamin D₃, 397; vitamin E, 26.46 IU; vitamin K, 1.32 mg; vitamin B₁₂, 23.15 µg; riboflavin, 5.29 mg; pantothenic acid, 13.23 mg; niacin, 19.85 mg.

³TM premix supplies the following per kg of diet: iron, 87.3 mg; zinc, 87.3 mg; manganese, 10.82 mg; copper, 8.14 g; iodine, 0.33 mg, selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Health – Dupont).

⁵Chlortetracycline (CTC) provided at 110 ppm (Aureomycin 50, Alpharma Inc., Bridgewater, NJ).

Table 4. Ingredient and nutrient composition of grower phase 2 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	52.752	59.543	66.479	73.669
SBM, 48% CP	24.146	17.101	9.786	2.085
DDGS	20.000	20.000	20.000	20.000
Choice White Grease	0.786	0.735	0.650	0.443
Limestone	0.963	1.002	1.043	1.087
Monocal. phosphate	0.313	0.354	0.396	0.440
Vitamin premix ²	0.150	0.150	0.150	0.150
TM premix ³	0.140	0.140	0.140	0.140
Salt	0.350	0.350	0.350	0.350
Lysine-HCL	-	0.226	0.460	0.707
DL-Met	-	-	0.026	0.100
L-Thr	-	-	0.098	0.206
L-Trp	-	-	0.022	0.064
L-Val	-	-	-	0.064
L-Ile	-	-	--	0.096
Phytase ⁴	0.100	0.100	0.100	0.100
CTC-50 ⁵	0.100	0.100	0.100	0.100
Cr premix	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	21.33	18.76	16.19	13.63
DE, kcal/kg	3546	3533	3519	3505
ME, kcal/kg	3374	3374	3374	3374
SID Amino acids, %				
Arg	1.15	0.94	0.73	0.50
His	0.50	0.43	0.36	0.28
Ile	0.75	0.63	0.51	0.47
Leu	1.82	1.65	1.48	1.29
Lys	0.86	0.86	0.86	0.86
Met	0.32	0.29	0.28	0.32
Met + Cys	0.62	0.55	0.51	0.51
Phe	0.92	0.79	0.66	0.52
Phe + Tyr	1.62	1.39	1.15	0.91
Trp	0.20	0.16	0.14	0.14
Thr	0.65	0.55	0.55	0.55
Val	0.87	0.75	0.63	0.56
Ca, %	0.53	0.53	0.53	0.53
Avail. P	0.23	0.23	0.23	0.23

Table 4. Cont. Ingredient and nutrient composition of grower phase 2 diets.

Diet	C	1X	2X	3X
<u>Analyzed Composition</u>				
Dry matter, %	87.53	87.91	87.51	87.0
CP, %	20.79	17.56	15.73	13.27
Carbon, %	41.07	41.49	39.84	40.21
Gross Energy, kcal/g	4.36	4.02	4.05	3.82

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 3969 IU; vitamin D₃, 397; vitamin E, 26.46 IU; vitamin K, 1.32 mg; vitamin B₁₂, 23.15 µg; riboflavin, 5.29 mg; pantothenic acid, 13.23 mg; niacin, 19.85 mg.

³TM premix supplies the following per kg of diet: iron, 87.3 mg; zinc, 87.3 mg; manganese, 10.82 mg; copper, 8.14 mg; iodine, 0.33 mg, selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Health – Dupont)

⁵Chlortetracycline (CTC) provided at 110 ppm (Aureomycin 50, Alpharma Inc., Bridgewater, NJ).

Table 5. Ingredient and nutrient composition of grower phase 3 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	57.663	62.970	68.387	74.028
SBM, 48% CP	19.365	13.820	8.085	2.025
DDGS	20.000	20.000	20.000	20.000
Choice White Grease	0.705	0.662	0.578	0.396
Limestone	1.032	1.063	1.095	1.139
Monocal. phosphate	0.245	0.277	0.345	0.345
Vitamin premix ²	0.150	0.150	0.150	0.150
TM premix ³	0.140	0.140	0.140	0.140
Salt	0.350	0.350	0.350	0.350
Lysine-HCL	-	0.178	0.361	0.556
DL-Met	-	-	0.041	0.100
L-Thr	-	0.040	0.178	0.206
L-Trp	-	-	0.031	0.064
L-Val	-	-	-	0.064
L-Ile	-	-	-	0.097
Phytase ⁴	0.100	0.100	0.100	0.100
CTC-50 ⁵	0.050	0.050	0.050	0.050
Cr premix ⁶	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	19.46	17.47	15.48	13.49
DE, kcal/kg	3537	3526	3516	3505
ME, kcal/kg	3374	3374	3374	3374
<u>SID Amino acids, %</u>				
Arg	1.01	0.85	0.68	0.50
His	0.45	0.40	0.34	0.28
Ile	0.67	0.58	0.48	0.47
Leu	1.71	1.57	1.44	1.29
Lys	0.74	0.74	0.74	0.74
Met	0.30	0.28	0.29	0.32
Met + Cys	0.58	0.52	0.51	0.51
Phe	0.83	0.73	0.63	0.52
Phe + Tyr	1.46	1.29	1.10	0.91
Trp	0.17	0.14	0.14	0.14
Thr	0.59	0.55	0.55	0.55
Val	0.79	0.70	0.60	0.56
Ca, %	0.53	0.53	0.53	0.53
Avail. P, %	0.21	0.21	0.21	0.21

Table 5. Cont. Ingredient and nutrient composition of grower phase 3 diets.

Diet	C	1X	2X	3X
<u>Analyzed Composition</u>				
Dry matter, %	87.52	87.66	87.72	87.29
Crude protein, %	18.97	15.44	13.69	12.13
Carbon, %	40.88	40.59	41.12	41.48
Gross Energy, kcal/g	4.06	4.02	4.08	3.91

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 3969 IU; vitamin D₃, 397; vitamin E, 26.46 IU; vitamin K, 1.32 mg; vitamin B₁₂, 23.15 µg; riboflavin, 5.29 mg; pantothenic acid, 13.23 mg; niacin, 19.85 mg.

³TM premix supplies the following per kg of diet: iron, 87.3 mg; zinc, 87.3 mg; manganese, 10.82 mg; copper, 8.14 mg; iodine, 0.33 mg, selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Health – Dupont)

⁵Chlortetracycline (CTC) provided at 55 ppm (Aureomycin 50, Alpharma Inc., Bridgewater, NJ).

Table 6. Ingredient and nutrient composition of finisher phase 1 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	61.200	66.197	71.199	76.302
SBM, 48% CP	15.790	10.605	5.388	0.000
DDGS	20.000	20.000	20.000	20.000
Choice White Grease	0.703	0.665	0.623	0.547
Limestone	1.052	1.081	1.110	1.141
Monocal. phosphate	0.266	0.295	0.325	0.356
Vitamin premix ²	0.150	0.150	0.150	0.150
TM premix ³	0.140	0.140	0.140	0.140
Salt	0.350	0.350	0.350	0.350
Lysine-HCL	-	0.166	0.325	0.506
DL-Met	-	-	-	-
L-Thr	-	-	0.026	0.102
L-Trp	-	-	0.005	0.034
L-Val	-	-	-	0.004
L-Ile	-	-	-	0.018
Phytase ⁴	0.100	0.100	0.100	0.100
CTC-50 ⁵	0.050	0.050	0.050	0.050
Cr premix ⁶	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	18.06	16.17	14.29	12.41
DE, kcal/kg	3,661	3,643	3,624	3,600
ME, kcal/kg	3,429	3,429	3,429	3,429
SID Amino acids, %				
Arg	0.91	0.75	0.60	0.44
His	0.42	0.37	0.31	0.26
Ile	0.61	0.52	0.43	0.36
Leu	1.62	1.50	1.38	1.25
Lys	0.65	0.65	0.65	0.65
Met	0.29	0.26	0.24	0.21
Met + Cys	0.54	0.49	0.44	0.39
Phe	0.77	0.68	0.58	0.48
Phe + Tyr	1.35	1.18	1.02	0.84
Trp	0.15	0.12	0.10	0.10
Thr	0.54	0.47	0.42	0.42
Val	0.73	0.64	0.56	0.47
Ca, %	0.53	0.53	0.53	0.53
Avail. P, %	0.21	0.21	0.21	0.21

Table 6. Cont. Ingredient and nutrient composition of finisher phase 1 diets.

Diet	C	1X	2X	3X
<u>Composition analyzed</u>				
Dry matter, %	87.60	87.57	87.41	87.07
CP, %	16.72	14.52	13.48	12.13
Carbon, %	42.44	43.41	41.09	41.11
Gross Energy, kcal/g	3.91	3.90	3.86	3.81

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 3969 IU; vitamin D₃, 397; vitamin E, 26.46 IU; vitamin K, 1.32 mg; vitamin B₁₂, 23.15 µg; riboflavin, 5.29 mg; pantothenic acid, 13.23 mg; niacin, 19.85 mg.

³TM premix supplies the following per kg of diet: iron, 87.3 mg; zinc, 87.3 mg; manganese, 10.82 mg; copper, 8.14 mg; iodine, 0.33 mg, selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme, Danisco Animal Health – Dupont)

⁵Chlortetracycline (CTC) provided at 55 ppm (Aureomycin 50, Alpharma Inc., Bridgewater, NJ).

Table 7. Ingredient and nutrient composition of finisher phase 2 diets.

	Diet ¹			
	C	1X	2X	3X
<u>Ingredient, %</u>				
Corn	68.723	73.800	78.937	84.278
SBM, 48% CP	27.985	22.656	17.221	11.480
Choice White Grease	0.871	0.819	0.749	0.579
Limestone	0.793	0.823	0.854	0.886
Monocal. phosphate	0.657	0.688	0.719	0.752
Vitamin premix ²	0.150	0.150	0.150	0.150
TM premix ³	0.140	0.140	0.140	0.140
Salt	0.350	0.350	0.350	0.350
Lysine-HCL	-	0.171	0.345	0.529
DL-Met	-	0.023	0.075	0.131
L-Thr	-	0.050	0.126	0.207
L-Trp	-	-	0.004	0.035
L-Val	-	-	-	0.077
L-Ile	-	-	-	0.076
Phytase ⁴	0.100	0.100	0.100	0.100
Ractopamine ⁵	0.030	0.030	0.030	0.030
Cr premix	0.200	0.200	0.200	0.200
<u>Calculated Composition</u>				
Crude protein, %	19.57	17.69	15.82	13.95
DE, kcal/kg	3578	3570	3562	3553
ME, kcal/kg	3417	3419	3421	3422
SID Amino acids, %				
Arg	1.14	0.98	0.82	0.65
His	0.46	0.41	0.36	0.30
Ile	0.71	0.62	0.52	0.50
Leu	1.54	1.41	1.28	1.14
Lys	0.90	0.90	0.90	0.90
Met	0.28	0.27	0.30	0.33
Met + Cys	0.57	0.54	0.54	0.54
Phe	0.84	0.74	0.64	0.54
Phe + Tyr	1.45	1.28	1.10	0.92
Trp	0.20	0.17	0.14	0.14
Thr	0.61	0.59	0.59	0.59
Val	1.56	1.50	1.44	1.45
Ca, %	0.52	0.52	0.52	0.52
Avail. P, %	0.32	0.32	0.32	0.32

Table 7. Cont. Ingredient and nutrient composition of finisher phase 2 diets.

Diet	C	1X	2X	3X
<u>Analyzed Composition</u>				
Dry matter, %	86.44	86.70	86.81	86.68
CP, %	19.71	16.02	14.79	13.51
Carbon, %	40.41	40.87	41.95	40.13
Gross Energy, kcal/g	4.08	4.03	3.99	3.98

¹Diet: Control (C), 1X CP reduction (1X), 2X CP reduction (2X), and 3X CP reduction (3X).

²Vitamin premix provided per kilogram of the diet: vitamin A, 3969 IU; vitamin D₃, 397; vitamin E, 26.46 IU; vitamin K, 1.32 mg; vitamin B₁₂, 23.15 µg; riboflavin, 5.29 mg; pantothenic acid, 13.23 mg; niacin, 19.85 mg.

³TM premix supplies the following per kg of diet: iron, 87.3 mg; zinc, 87.3 mg; manganese, 10.82 mg; copper, 8.14 mg; iodine, 0.33 mg, selenium, 0.30 mg.

⁴Phytase activity level 600.1 PU/kg (Phyzyme Danisco, Animal Health – Dupont).

⁵Ractopamine HCl – Paylean-9® (Elanco Animal Health, Greenfield, IN) provided at 6.0 ppm in the diets.