Nonruminant Nutrition: Energy

T196 Energy requirement of broiler breeder hens: Egg weight, egg composition and progeny. C. Salas*, R. D. Ekmay, J. England, S. Cerrate, and C. N. Coon, *University of Arkansas*, *Fayetteville*.

Under or overfeeding dietary energy to broiler breeders (BB) can lead to a reduction in hatching egg production. The objective of this study was to evaluate the effects of energy intake (EI) on egg composition, hatchability, fertility and progeny performance. Cobb 500 BB pullets were reared in 3 groups as follows: a control group (SBW), a group 20% heavier (HBW) and a group 20% lighter (LBW). At 21 wks, pullets of each group were moved to cages and fed 1 of 6 diets (each diet had 2860 kcal ME and 20.8-14.3% CP). The EI for each diet was adjusted to provide 330, 360, 390, 420, 450 and 480 kcal ME/hen/d and 24 g of ideal protein/d at peak production. Birds fed 390 kcal ME/d produced 177.1 hatching eggs, 14 and 16.4 more eggs than the BB fed 330 and 480 kcal ME/d, respectively ($P < 0.0001$). The same BBs produce .4g to 1.5g heavier eggs than the other groups ($P < 0.0001$). BBs were inseminated every 5 wks to monitor egg fertility, hatchability and chick weight. At hatch, chicks from LBW hens were always lighter; this translated into BW*EI interactions. The LBW and SBW hens fed 330 and 360 kcal ME/d produced lighter chicks. Chicks from breeders fed 390 to 480 kcal ME/d weighed ≥42g in all hatches. Egg fertility and hatchability were ≥90% and 85%, respectively; for all groups.
Egg composition was determined every 5 wks for each BB group during the production period. In wks 30 and 35 BB fed 480 kcal ME/d produced eggs with the highest % yolk ($P < 0.01$). BB fed 480 kcal ME/d produced eggs with a higher yolk:albumen ratio (0.46 to 0.65)($P < 0.05$), but this had no effect on progeny performance. All progeny from the 50 wk hatch was reared in floor pens until 42d and 5 birds/pen were further processed. There were no differences between the progeny groups in BW gain, feed:gain ratio or processing yields. This study shows that BBs in cages perform well with an EI of 390 kcal ME/d throughout the production period.

Key Words: broiler breeders, energy intake, eggs

T197 Determination of metabolizable energy content of meat and bone meal for broilers using regression method. O. A. Bolarinwa*[1], O. A. Olukosi[1], R. A. Hamzat[2], and O. Adeola[1], [1]*Purdue University*, *West Lafayette, IN,* [2]*South Suburban College*, *Chicago, IL*.

An experiment was conducted to determine the ME content of 2 meat and bone meal (MBM) samples by the regression method. Gross energy of MBM1 and MBM2 were 4.383 and 4.857 kcal/g DM, respectively. The CP, ash, and crude fat contents for MBM1 or MBM2 were 585 or 614, 272 or 218, and 109 or 120 g/kg DM. A standard corn-soybean meal diet with GE and ME of 4.601 and 3.310 kcal/g DM, respectively, and 6 test diets were used for the study. In the standard diet, corn, soybean meal, corn starch and soy oil were used as the sources of energy. In the test diets, each of the 2 MBM samples were added at the rate of 30, 60 or 90 g/kg diet to partly replace corn, soybean meal, corn starch and soy oil such that the ratio of all energy-yielding feedstuffs to one another was the same in all the assay diets. Each of the 7 dietary treatments had 8 replicates with 6 birds per replicate. Birds received a starter diet from d 1 to d 15 post-hatch. Birds with an average BW of 397 g at d 15 post-hatch were assigned to 7 diets in a randomized complete block design. Experimental diets were fed for 7 d and excreta were collected twice daily on d 20 and 21. Average weight gain and feed efficiency were between 391 to 424 g and 700 to 757 g/kg, respectively. The ME content of each MBM sample was determined from the slope of the regression of MBM contribution to apparent ME intake in kilocalories against amount of MBM intake in grams. Metabolizable energy values for meat and bone meal samples derived from the regression analyses were 3.364 and 3.691 kcal/g DM, for MBM1 and MBM2, respectively. It is likely that the difference in energy value is due to greater GE and fat and lower ash in MBM2 compared with MBM1.

Key Words: broiler, meat and bone meal, metabolizable energy

T198 Determination of the chemical composition and true metabolizable energy of high oil poultry by-product meal. M. G. Olyayee*, H. Janmohammadi, A. Taghizadeh, A. Rafat, and S. Ostan, *University of Tabriz*, *Tabriz, Iran.*

Poultry by-product meal (PBPM) is one of the by-products resulting from poultry meat processing and is produced from slaughter wastes of broilers, spent laying hens and breeders. In Iran, the term PBPM refers only to meals which are produced from viscera, feathers, heads and some feet and blood, and are produced by simple low cost technology. The chemical composition of PBPM can vary greatly depending on the raw material source, storage time of raw material before rendering and processing methods. This product is used mostly in poultry diets but there is not enough data of its chemical composition and True Metabolizable Energy (TMEn) content. The present study was conducted to determine the chemical composition and TMEn content of high oil PBPM from Iran. Three composed samples were obtained from local poultry slaughterhouses. The chemical composition of PBPM such as DM, CP, ether extract (EE) and ash content was determined according to AOAC (1990) methods. Gross energy was measured by Parr adiabatic calorimetric bomb and then TMEn was determined by Sibbald precision fed assay. Twenty 4 12-wk-old Ross 308 broiler roosters with similar body weight (2280 ± 80g) were selected. Each sample was replicated 6 times as well as 6 replications for endogenous energy collection. Descriptive statistical responses of all data were obtained by using proc means of SAS (2003). The results showed that this product in comparison with standard tables of nutrient composition has high EE (23.8 ± 1.6%), low ash (6.53 ± 0.8%) and approximately the same CP (57 ± 2.6%) contents. Dry matter was 91.5 ± 0.57. The TMEn values of 3 studied samples were 2798 ± 80, 3518 ± 114.92 and 3220 ± 108.5 kcal/kg. The results showed that TMEn value of high oil PBPM from Iran poultry rendering plants is relatively variable, therefore should be considered by users in poultry diet formulation.

Key Words: TMEn, high oil poultry by-product meal

T199 Metabolizable energy and nutrient digestibility coefficient determination of ingredients with nutritional adjustment. A. G. Bertechini*, V. A. Costa, S. F. Castro, J. C. C. Carvalho, and C. Meneghetti, *Universidade Federal de Lavras*, *Lavras, MG, Brazil*.

Because of the imbalance of the nutrient supplies to the chickens when using the conventional methodology for metabolizable energy and nutrient digestibility coefficients determination, the results cannot be appropriate, for that reason different methods must be developed. In the present study the effect of nutritional adjustment of basal diets after inclusion of the ingredient test (using enzyme) were evaluated. A total of 640 male Cobb 500 broiler chicks from 14 to 21 (n = 400) and 35 to 42 (n = 240) d of age were placed in metabolic cages and assorted into 10 dietary treatment groups with 5 and 3 birds each to first and second phases, respectively. A 5 × 2 factorial treatment scheme, with 5 dietary

adjustments and 2 protease levels (0 and 200 ppm) in a completely randomized design with 8 replicates each was used. The dietary adjustments were: 1) Corn-soybean meal based diet (C-SBM), 2) C-SBM + vitamin + mineral premix, 3) C-SBM 2 + energy, 4) C-SBM 2+ amino acids and 5) C-SBM 2 + energy + amino acids .The variables analyzed were the apparent metabolizable energy (AME) and N corrected (AMEn), the apparent digestibility of crude protein (CPD), dry matter (DMD) and ether extract (EED). The studied ingredient was meat and bone meal (20% of replacement of C-SBM), using total excreta collection (for 3 consecutive days). Results indicated that from 14 to 21 d of age, higher values of AME and AMEn ($P < 0.05$) were observed on treatment 2, followed by treatments 3 and 4. The CPD, DMD and EED were improved ($P < 0.05$) for all treatments where the dietary adjustment was made. Improvements ($P < 0.05$) on AME, AMEn, CPD, DMD and EED with enzyme supplementation was verified. From 35 to 42 d of age highest values ($P < 0,05$) of AME and digestibility coefficients were observed on treatment 5. It is concluded that conventional methodology (without nutritional adjustments) underestimates the nutritional values assigned to meat and bone meal in broiler diets.
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Key Words: nutrient adjustment, nutrient imbalance, digestibility methodology

T200 True and apparent metabolizable energy values of various wheat screening samples. M. Mazhari and A. Golian*, *Ferdowsi University of Mashhad*, *Mashhad, Khorasan Razavi, Iran*.

Three trials were conducted to determine the available energy of different wheat screening samples collected from different locations of Khorasan in Iran. In experiment 1, chemical composition and the nitrogen corrected true metabolisable energy (TMEn) were evaluated. A precision-fed rooster assay was used, in which, each wheat screening sample was tube fed to adult roosters, and the excreta were collected for 48 h. In exp. 2 and 3, 5 and 2 wheat screening samples-based diet with or without xylanase and phytase were fed to 16 d old battery reared chicks and total consumption and excreta were measured during 3 next days. The variable nature of wheat screening varieties led to significant differences in mean TMEn values ($P < 0.01$). The TMEn values of samples determined with adult roosters varied by ± 5.03% of the mean value (3097.65 ± 49.32 kcal/kg) and ranged from 2734.90 to 3245.12 kcal/kg. There was a significant correlation ($P < 0.05$) between chemical composition (CP, EE, ash and CF) and TMEn. The best equation for TMEn yielded an R2 = 0.86, with crude fiber being the most efficient compound. The average AMEn values of 5 and 2 samples determined with young broiler chickens were 2968.41 ± 25.70 kcal/kg and 2976.38 ± 8.34 kcal/kg in exp2 and exp3 respectively. Addition of xylanase and phytase to wheat screenings resulted in significant ($P < 0.01$) improvement in AMEn (4.21 and 2.92% respectively).

Key Words: wheat screening, true and apparent metabolisable energy, xylanase and phytase

T201 Effect of various levels of energy and protein on Humoral immune response in broiler chicks. M. Pilevar, A. Golian*, and M. Aami Azghadi, *Ferdowsi University of Mashhad*, *Khorasan Razavi, Iran*.

A complete randomized design experiment with a 4 × 4 factorial arrangement consisted of 4 levels of energy (2900, 3000, 3100 and 3200 kcal/kg) and 4 levels of protein (17, 20, 23 and 26%) was conducted to assess the effect of dietary energy and protein on humoral immune response of chickens. All birds in each replicate were injected intramuscular with SRBC (15% suspension in PBS, 1 mL/chick) at d 15 and 25. Blood samples were collected at d 5 and 10 of injections. The serum from each sample was analyzed for total anti-SRBC antibody as described previously (Cheema et al., 2003). The data were transformed and then analyzed using the GLM procedures of SAS software (v. 9.1). Total anti-SRBC titers were increased in birds fed low energy diet in both postprimary (PPI) and postsecondary injections (PSI), but dietary protein contents did not influence antibody titers of birds. Increasing the level of energy and protein in broiler diets improved growth rate which may cause a negative effect on humoral immune response. Broiler bursa of Fabricius size decreased gradually with increasing dietary energy level, which could affect on immune response. It seems that, there is a negative phenotypic association between immunocompetence and rapid growth in chickens.

Table 1. Effect of various levels of ME and CP on total anti-SRBC titers in postprimary (PPI) and postsecondary (PSI) injections

		Days PPI		Days PSI	
	Level	5	10	5	10
ME	2900	5.304a	2.424	6.450	4.894a
	3000	4.958b	3.060	6.990	4.559ab
	3100	5.048ab	3.555	7.410	4.389b
	3200	5.132ab	3.630	6.780	4.096
CP	17	5.341	2.968	7.000	4.372
	20	5.233	2.887	6.833	4.508
	23	4.929	2.876	7.037	4.639
	26	5	3.166	6.775	4.383
		Probability			
ME		0.0152	0.95	0.113	<0.001
CP		0.202	0.145	0.831	0.843
ME×CP		0.766	0.397	0.112	0.179

Key Words: humoral immune, energy and protein, broiler chicks

T202 Effect of xylanase supplementation in a pig diet on ileal and postileal energy and fiber fraction digestibility. L. Babinszky*[1], J. Tossenberger[1], D. Ottó[1], and I. Kühn[2], [1]*Kaposvár University*, *Kaposvár, Hungary*, [2]*AB Vista*, *Darmstadt, Germany*.

The trials studied the impact of supplementing high grain/high crude fiber (CF) diets with xylanase (Xyl) on ileal [intake-ileal excretion/intake × 100] and postileal [ileal excretion-fecal excretion/ileal excretion × 100] digestion of GE, NDF, ADF in growing pigs. Each of 4 treatments (Trt) used 5 hybrid barrows (initial live weight 37.3 ± 2.9 kg) in 2 replicates (10 pigs/Trt). Prior to trial pigs were fitted with PVTC-cannulas. Ileal and post-ileal digestibilities (DGY) were determined in same animal using Cr_2O_3 as marker. The wheat, barley, rye, wheat bran, DDGS, soybean hulls based basal diet contained 12.2 MJ MEs, 170.3g CP, 51.1g CF, 223g NDF, 68g ADF, 9.5g LYS, 6.4g M+C / kg. Diets equivalent to 2.6 times maintenance energy requirement (458 KJ MEs/$kg^{0.75}$/d) were fed. TrtI diet had no added Xyl (negative control: NC). Trt2 and 3 diets were supplemented with 8000 BXU/kg and 16000 BXU/kg ECONASE XT (thermostable Xyl from *Trichoderma reesei*). Trt4 was a wheat-barley based positive control diet (PC) with recommended energy level (13.2 MJ MEs). Data were analyzed by ANOVA (SAS, 2004).Trt2 improved ileal DGY over NC from 61.2% to 67.5% (GE), 30.6% to 38.8% (CF), 47.3% to 57.2% (NDF), and 24.0% to 35.3% (ADF); postileal DGY improved from 79.2% to 84.4% (GE), 81.9% to 87.0% (CF), 81.0% to 90.0% (NDF) and 78.0% to 85.5% (ADF) ($P \leq 0.05$). Neither ileal, nor postileal DGY-s increased further in Trt3 ($P \geq 0.05$). DGY-s in Xyl trts

were similar or higher than those in energy balanced Trt4 (PC). Added Xyl also shifted location of energy absorption. While ileal/postileal split of total energy absorption was 74.7% / 25.3% in NC group, Trt2 changed this to 81.2% / 18.8%, supporting that added Xyl improves nutrient DGY in the small intestine. The results show the importance of improved nutrient absorption caused by Xyl supplementation (8000-16000 BXU/kg) to high fiber/NDF grain based diets, if the aim is to provide optimum energy supply for animals.

Key Words: pig, ileal-postileal, digestibility