Variations in the Digestible Lysine Requirement of Broiler Chickens Due to Sex, Performance Parameters, Rearing Environment, and Processing Yield Characteristics

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ABSTRACT Four experiments were conducted to evaluate variations in the digestible lysine (DLYS) requirement estimates of broilers due to rearing environment, sex, or growth performance during the starter period (7 to 21 d) and due to sex, growth, and carcass yield characteristics during the grower period (21 to 38 d). In the first 3 experiments, chicks were allocated to either battery or floor pens. The fourth experiment was conducted during the grower period with birds reared in floor pens only. All the studies used a lysine-deficient corn-soybean meal-corn gluten meal basal diet formulated to be isonitrogenous and isocaloric. Treatments consisted of 5 graded levels of DLYS varying from 0.70 to 1.21% in the first 3 experiments and from 0.73 to 1.13% in the fourth experiment. The DLYS requirement was estimated by broken-line methodology based on body weight gain (BWG) and gain:feed ratio (G:F) for the starter period, and the same variables plus breast meat yield for the grower period. During the starter period, the average DLYS requirement of males based on BWG was slightly higher than that of females reared in battery (0.96 vs. 0.94%) or floor pens (0.98 vs. 0.93%). However, based on G:F, the average DLYS requirement of females was slightly higher than that of males reared in both battery (0.99 vs. 0.96%) and floor pens (1.01 vs. 0.99). The DLYS requirement based on G:F was higher than that based on BWG only for females in both rearing environments. Rearing environment did not affect the DLYS requirement of broilers during the starter period. In the grower period, the DLYS requirement of males was higher than that of females based on BWG (0.97 vs. 0.93%), but for G:F it was similar for both sexes (0.96%). The DLYS requirement for females based on G:F was higher than that based on BWG. The DLYS requirement for maximum breast meat yield of males (0.98%) or females (0.90%) was similar to the estimate for maximal growth performance.

Key words: digestible lysine requirement, broiler, sex, rearing environment, growth performance

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INTRODUCTION

Lysine is the second limiting amino acid (**AA**) for poultry fed corn-soybean meal diets, and because it is only used for protein synthesis, it has been chosen to express all other essential AA as a percentage of Lys, under the ideal protein concept (Baker and Han, 1994; Emmert and Baker, 1997; Baker et al., 2002). Therefore, it is crucial to obtain an accurate Lys requirement if that system is to be used. However, many factors must be considered in estimating AA requirements, such as the strain of the birds, type of diets, levels of other nutrients, age, sex, and rearing environment (Baker et al., 2002). To date, possible differences in the requirement of not only Lys, but all the essential AA due to sex, performance parameters such as body weight gain (**BWG**), gain to feed ratio (**G:F**), or processing yield are not very well documented. Some research has shown that the Lys requirement is higher for males than it is for females during the starter (Han and Baker, 1993) and the grower periods (Baker and Han, 1994). However, studies evaluating how the Lys requirement varies because of sex have not been conducted recently with modern strains of birds. On the other hand, based on BWG, G:F, or breast meat yield (**BMY**), the Lys requirement has been found to differ. Baker and Han (1994), Mack et al. (1999), and Baker et al. (2002) reported that the Lys requirement was higher for optimum feed efficiency than it was for BWG, whereas Labadan et al. (2001) reported that the Lys requirement during the first 2 wk posthatching was higher for BWG than it was for feed conversion, and it changed minimally based on BWG, feed conversion, or BMY from 3 to 6 wk of age. Thus, it is not clear how all these variables may affect the estimated Lys requirement. Moreover, most of the studies conducted to estimate the AA requirements during the starter period (1 to 21 d of age) have used battery brooders as a rearing environment, which are different from the

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rearing systems used under commercial conditions and thus could make it more difficult to extrapolate experimental results to commercial production systems. A multitude of factors makes it difficult to draw conclusions, because different experimental conditions have been present in all the studies.

A full evaluation of the Lys requirement and how it varies according to sex, rearing conditions, or performance characteristics should be addressed using the same basal diet, strain of birds, and experimental conditions. Thus, the objective of our studies was to evaluate how the digestible lysine (**DLYS**) requirement might change according to sex, rearing environment, and processing yield characteristics in broiler chickens during the starter and grower periods.

MATERIALS AND METHODS

Experiments 1, 2, and 3

All procedures were approved by the University of Georgia committee on Laboratory Animal Care. The objective of these experiments was to evaluate the possible differences in the DLYS requirement based on BWG and G:F due to sex or rearing environment during the period from 8 to 21 d of age. For each Experiment, 1,200 1-d-old Cobb 500 broiler chicks were vent-sexed and allocated by sex. Two hundred and forty birds were placed in battery brooders (Petersime Incubator Co., Gettysburg, OH) with raised wire floors, and 960 birds were placed in floor pens with wood shavings in environmentally controlled rooms. All birds received a conventional broiler starter diet (23% CP and 3,200 Kcal of ME/kg) and water ad libitum until d 7. After an overnight fast the birds were sorted by sex, weighed, and randomly assigned to the dietary treatments so that each pen had a similar initial weight and weight distribution. Body weights ranged from 162 to 200 g in males and from 145 to 182 g in females. From 8 to 21 d of age, the birds received the experimental diets, consisting of 5 graded levels of DLYS. Every dietary treatment had 5 replicate pens of each sex (10 replicate pens for each dietary treatment), with the exception of Experiment 1, where due to space limitations of floor pens there were only 4 replicate pens per treatment. There were 5 birds per pen in the battery studies and 20 birds per pen in the floor studies. Body weight and feed intake were recorded throughout the experiments, and BWG and G:F from 8 to 21 d of age were calculated per pen.

Experiment 4

The objective of this experiment was to evaluate the differences in the DLYS requirement for males and females during the grower period, based on growth performance and processing yield parameters. One thousand eight hundred 1-d-old broiler chicks were vent-sexed and allocated by sex in floor pens in an environmentally controlled room, and fed a conventional starter diet with 23% CP and 3,200 Kcal of ME/kg from 0 to 20 d of age. After an overnight fast, at d 21, the birds were sorted by sex and weighed, so that every pen had a similar initial weight and weight distribution. Body weight ranged from 766 to 790 g in females and from 810 to 870 g in males. The birds were randomly assigned to 5 dietary treatments consisting of 5 graded levels of DLYS. In every treatment there were 5 replicates of each sex (totaling 10 replications per dietary treatment) containing 25 birds in each pen. Body weight and feed intake were recorded, and BWG and G:F were calculated per pen at d 38, when the experiment was terminated. For processing yield evaluation, 10 birds per pen were randomly selected and wing-banded. After an overnight fast, the birds were weighed individually at the processing plant, slaughtered, and eviscerated, after which carcasses were chilled for 12 h. The yield was obtained for the entire carcass, BMY, wings, and front and back halves. The carcass was weighed, and the back half yield, consisting of the leg quarters attached to the lower back, was removed and weighed, leaving the white meat front half. The wings and the breast meat (pectoralis major and minor) were removed from the front half and weighed.

Diets

For all experiments, a corn-soybean meal-corn gluten meal basal diet was formulated to meet or exceed the NRC (1994) recommendations from 0 to 21 d of age (Experiments 1, 2, and 3) and from 21 to 38 d of age (Experiment 4) for all nutrients except Lys (Table 1). The levels of DLYS (total lysine) in the basal diet were 0.70 (0.79), 0.80 (0.86), 0.89 (0.93), and 0.73 (0.78)% for Experiments 1, 2, 3, and 4, respectively. Graded levels of L-Lysine•HCl were added to the basal diet at the expense of glutamic acid and dextrose to keep the diets isonitrogenous and isocaloric. Levels of DLYS for each experiment were as follows: 0.70, 0.80, 0.90, 1.00, and 1.10% for Experiment 1; 0.80, 0.88, 0.96, 1.04, and 1.12% for Experiment 2; 0.89, 0.97, 1.05, 1.13, and 1.21% for Experiment 3, and 0.73, 0.83, 0.93, 1.03, and 1.13% for Experiment 4. The true AA digestibilities of the basal diets were determined using the total fecal collection precision-fed rooster assay in adult, cecectomized, Single-Comb White Leghorn roosters (Han and Parsons, 1990). Five roosters were given a 30-g sample of each basal diet via crop intubation, and 5 additional roosters were feed-deprived to estimate endogenous losses. After 48 h, the excreta were collected and freeze-dried, and the samples were sent to a commercial laboratory (University of Missouri-Columbia) for AA quantification in both the feed and excreta.

Statistical Analysis

Growth performance data at 21 (Experiments 1, 2, and 3) and 38 d of age plus carcass yield results (Experiment 4) were fitted to linear and quadratic response curves (Draper and Smith, 1981) using the GLM procedure of SAS (SAS Institute, 1990). The digestible AA requirements

Table 1. Composition of the lysine-deficient basal diet used for Experiments 1, 2, 3, and 4

Ingredient	Starter period[1]	Grower period[2]
	%	
Corn	65.80	67.89
Soybean meal	10.00	15.00
Corn gluten meal	5.00	7.00
Dextrose[3]	5.45	—
Soybean oil	2.00	—
Poultry fat	—	1.00
Limestone	1.33	1.40
Dicalcium phosphate	2.04	1.20
Salt	0.30	0.30
Vitamin mix[4]	0.25	0.25
Mineral mix[5]	0.08	0.08
L-Lys·HCL[6]	0.42	—
DL-Methionine	0.25	0.10
Glycine	2.00	—
L-Glutamic acid[7]	2.90	0.09
L-Threonine	0.34	0.09
L-Tryptophan	0.06	—
L-Phenylalanine	0.03	—
L-Isoleucine	0.27	—
L-Arginine	0.55	—
L-Valine	0.30	—
L-Histidine	0.08	—
$NaHCO_3$	0.50	0.05
Bacitracin MD[8]	0.05	0.05

[1]Starter period from 8 to 21 d of age. The diet contained (by calculation) 3,370 kcal of ME_N/kg and 20% CP; it also contained 0.70 (0.79), 0.80 (0.86), and 0.89 (0.93)% digestible Lys (total lysine) as determined by analysis of diet and total excreta collection of cecectomized roosters for Experiments 1, 2, and 3, respectively.

[2]Grower period from 21 to 38 d of age. The diet contained (by calculation) 3,230 kcal of ME_N/kg and 20% CP; it also contained 0.73 (0.78)% digestible Lys (total lysine) as determined by analysis of diet and total excreta collection of cecectomized roosters.

[3]Dextrose level varied (6.25, 6.13, and 6.13% in the basal diets for Experiments 1, 2, and 3, respectively), to keep the diets isocaloric for all 3 experiments.

[4]Vitamin mix provided the following (per kg of diet): thiamin·mononitrate, 2.4 mg; nicotinic acid, 44 mg; riboflavin, 4.4 mg; D-Ca pantothenate, 12 mg; vitamin B_{12} (cobalamin),12.0 μg; pyridoxine·HCL, 4.7 mg; D-biotin, 0.11 mg; folic acid, 5.5 mg; menadione sodium bisulfate complex, 3.34 mg; choline chloride, 220 mg; cholecalciferol, 27.5 μg; transretinyl acetate, 1,892 μg; all-rac α tocopheryl acetate, 11 mg; ethoxyquin, 125 mg.

[5]Trace mineral mix provided the following (per kg of diet): manganese ($MnSO_4 \cdot H_2O$), 60 mg; iron ($FeSO_4 \cdot 7H_2O$), 30 mg; zinc (ZnO), 50 mg; copper ($CuSO_4 \cdot 5H_2O$), 5 mg; iodine (ethylene diamine dihydroiodide), 0.15 mg; selenium ($NaSe0_3$), 0.3 mg.

[6]L-Lysine·HCl (78.8% Lys) was added at 0.420, 0.435 and 0.470% of the diet to obtain digestible lysine levels of 0.70, 0.80 and 0.89% for Experiments 1, 2, and 3, respectively. Levels of digestible lysine were determined by total excreta collection of cecectomized roosters.

[7]The supplemental glutamic acid level in the basal diets varied among experiments to keep diets isonitrogenous (2.90, 3.01, and 2.97% for Experiments 1, 2, and 3, respectively).

[8]Contributed 27.5 mg/kg of bacitracin methylene disalicylate.

for BWG, G:F, carcass yield (**CY**), and BMY were estimated by one-slope broken-line methodology (Robbins et al., 1979).

RESULTS

Experiment 1

There was a significant quadratic and broken-line response ($P < 0.05$) to increasing dietary levels of DLYS based on BWG and G:F for males and females reared in either battery or floor pens (Table 2). The DLYS requirement estimates of males reared in batteries was 0.91 and 0.90% based on BWG and G:F, respectively. When reared in floor pens, the DLYS requirement of males based on BWG was 0.93%. Based on G:F, the DLYS requirement estimate was similar to that of males reared in batteries (0.90%). The DLYS requirement of females reared in battery pens was 0.90 and 0.93% based on BWG and G:F, respectively, whereas for females in floor pens the DLYS requirement based on BWG and G:F was 0.82 and 0.90%, respectively. The DLYS requirement of males did not differ because of rearing environment, but females in floor pens had a substantially lower DLYS requirement based on BWG. When comparing sexes, there was little evidence that males and females differed in their DLYS requirement estimates. Overall, DLYS requirements estimated based on BWG and G:F were similar for males and females.

Experiment 2

Performance of both males and females followed a significant ($P < 0.05$) quadratic and broken-line response to increasing dietary levels of DLYS for BWG and G:F under both rearing environments (Table 3). The estimated DLYS requirement of males reared in batteries was 1.01% based on both BWG and G:F, whereas for males in floor pens, the DLYS requirement was 0.97 and 0.99% for BWG and G:F, respectively. The DLYS requirement for females in battery and floor pens was 0.97% based on BWG, whereas based on G:F the estimates were 1.04% and 1.02% in battery and floor pens, respectively. From the results of this experiment, there appeared to be little effect of either sex or rearing environment on the DLYS requirement during the period of 8 to 21 d of age.

Experiment 3

Due to the high variation observed in the battery studies, the growth performance data could not be fitted either to a quadratic or broken-line response curve. Therefore, an estimation of the DLYS requirement was obtained only for the floor studies (Table 4). The DLYS requirement estimates based on BWG and G:F were 1.03 and 1.08% for males and 0.99 and 1.10% for females, respectively. Males had higher DLYS requirement estimates than females based on BWG, although based on G:F, the DLYS requirement estimates of females were slightly higher than that of males. Regardless of the sex, the DLYS requirement based on G:F was consistently higher than that based on BWG.

Experiment 4

Growth performance, CY, and BMY of both males and females during the grower period (i.e., 21 to 38 d of age) followed a significant ($P < 0.05$) quadratic and broken-line response to increasing levels of dietary DLYS (Tables

Table 2. Growth performance and digestible lysine requirement estimates of male and female broiler chicks fed graded levels of digestible lysine from 7 to 21 d of age reared in either battery or floor pens, Experiment 1

	Male				Female			
	Battery[1]		Floor[2]		Battery[1]		Floor[2]	
% Digestible Lys	Gain[3] (g)	Gain:feed[4] (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain[3] (g)	Gain:feed[5] (g:kg)
0.70	423	571	421	515	463	574	450	528
0.80	498	608	546	573	588	642	559	579
0.90	631	675	622	614	586	673	592	608
1.00	662	644	625	624	656	730	578	616
1.10	602	653	—	—	558	663	—	—
SEM	24.8	11.4	22.5	12.9	18.6	13.4	15.7	10.2
Dig. Req. Est.[6]	0.91	0.90	0.93	0.90	0.90	0.93	0.82	0.90

[1]Means represent 5 pens of 6 birds each.
[2]Means represent 4 pens of 20 birds each.
[3]Quadratic and broken-line response ($P < 0.05$).
[4]Quadratic and broken-line response ($P = 0.055$).
[5]Quadratic and broken-line response ($P = 0.066$).
[6]Digestible Lys requirement estimate (%) obtained through broken-line methodology.

Table 3. Growth performance and digestible lysine requirement estimates of male and female broiler chicks fed graded levels of digestible lysine from 7 to 21 d of age reared in either battery or floor pens, Experiment 2

	Male				Female			
	Battery[1]		Floor[2]		Battery[1]		Floor[2]	
% Digestible Lys	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)
0.80	446	542	344	577	422	556	386	592
0.88	569	607	465	624	521	604	498	644
0.96	599	660	582	672	542	608	536	665
1.04	663	675	572	695	599	686	569	694
1.12	653	715	587	671	567	670	517	681
SEM	29.6	16.4	18.3	14.6	22.8	17.1	14.8	12.8
Dig. Req. Est.[4]	1.01	1.01	0.97	0.99	0.97	1.04	0.97	1.02

[1]Means represent 5 pens of 6 birds each.
[2]Means represent 4 pens of 20 birds each.
[3]Quadratic and broken-line response ($P < 0.05$).
[4]Digestible Lys requirement estimate (%) obtained through broken-line methodology.

Table 4. Growth performance and digestible lysine requirement estimates of male and female broiler chicks fed graded levels of digestible lysine from 7 to 21 d of age reared in either battery or floor pens, Experiment 3

	Male				Female			
	Battery[1]		Floor[2]		Battery[1]		Floor[2]	
% Digestible Lys	Gain (g)	Gain:feed (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)	Gain (g)	Gain:feed (g:kg)	Gain[3] (g)	Gain:feed[3] (g:kg)
0.89	432	497	433	605	431	554	430	624
0.97	453	542	517	652	429	537	521	655
1.05	482	565	576	693	469	569	547	670
1.13	420	531	600	707	412	524	541	689
1.21	473	581	572	716	466	563	531	683
SEM	40.2	34.5	28.6	8.0	35.2	33.6	26.6	7.4
Dig. Req. Est.[4]	—	—	1.03	1.08	—	—	0.99	1.10

[1]Means represent 5 pens of 6 birds each.
[2]Means represent 5 pens of 20 birds each.
[3]Quadratic and broken-line response ($P < 0.05$).
[4]Digestible Lys requirement estimate (%) obtained through broken-line methodology.

Table 5. Growth performance of male and female broiler chicks fed graded levels of digestible lysine in floor pens from 21 to 38 d of age, Experiment 4

	Males[1]		Female[1]	
% Digestible Lys	Gain[2] (kg)	Gain:feed[2] (g:kg)	Gain[2] (kg)	Gain:feed[2] (g:kg)
0.73	1.34	510	1.28	508
0.83	1.54	559	1.31	537
0.93	1.55	578	1.37	551
1.03	1.66	597	1.36	559
1.13	1.59	589	1.35	562
SEM	0.02	4.4	0.03	3.5
Dig. Req. Est.[3]	0.97	0.96	0.93	0.96

[1]Means represent 5 pens of 25 birds each.

[2]Quadratic and broken-line response ($P < 0.05$).

[3]Digestible Lys requirement estimate (%) obtained through broken-line methodology.

5 and 6). The estimated DLYS requirements based on BWG, G:F, CY, and BMY were 0.97, 0.96, 0.94, and 0.98% for males and 0.93, 0.96, 0.88, and 0.90% for females, respectively. Males had a higher DLYS requirement estimate for maximum BWG, CY, and BMY than females. However, based on G:F, the estimates were similar for both sexes. In males, the estimated DLYS requirement for maximum BMY or G:F was not higher than that for maximum BWG. In females, the estimated DLYS requirement based on G:F was higher than that based on BMY. Overall, the DLYS requirement estimate of males based on BWG was higher than that of females; however, there was little difference due to sex in the DLYS requirement estimates based on CY and BMY.

DISCUSSION

Based on 10 broken-line estimates of the requirement during the 7- to 21-d growth period, (i.e., within response criterion, sex, and rearing environment), there was little indication of an effect due to either sex or rearing environment. In regard to performance, the DLYS requirement for G:F averaged 0.99% whereas that for BWG averaged 0.95%. A higher DLYS requirement for G:F than for BWG has been reported by Mack et al. (1999) and Baker et al. (2002), the difference reported being as great as 0.11%. In the present research, however, the difference in the DLYS requirement for BWG and G:F was very subtle (0.04% average) and not observed throughout all experiments. The estimated DLYS requirement of 2-wk-old chickens based on G:F reported by Labadan et al. (2001) was not found to be higher than that based on BWG. Body composition and growth differences in the birds used in those studies could explain the discrepancy in results. To date, it is not clear why these differences may occur with Lys, and there is some evidence indicating that the requirement for maximum G:F is also higher for other AA such as methionine and cystine (Schutte and Pack, 1995; Baker et al., 1996).

To date, most of the research to estimate AA requirements during the first 21 d of age has been conducted in battery brooders. Under commercial conditions, however, broiler chickens face more competition for feed, larger space for motion, and higher disease challenge, among other variables that could affect their DLYS requirement. From the results reported herein, even though growth performance was better in battery cages, the estimated DLYS requirement was not affected by rearing environment, which indicates that requirement estimations obtained in battery studies can be accurately extrapolated to floor-pen conditions. Therefore, the Lys requirement estimates reported in the literature for broilers from 7 to 21 d of age (Baker and Han, 1994; Labadan et al., 2001)

Table 6. Processing yield parameters (%) of male and female broiler chicks fed graded levels of digestible lysine in floor pens from 21 to 38 d of age, Experiment 4

	Male					Female				
% Digestible Lys	Carcass yield[2]	Back half	Front half	Wings	Breast[2]	Carcass yield[2]	Back half	Front half	Wings	Breast[2]
0.73	72.3	47.8	52.2	11.3	20.0	72.7	45.1	54.9	11.2	22.2
0.83	73.3	46.6	53.4	10.9	21.6	73.9	44.5	55.5	11.1	23.4
0.93	74.1	45.3	54.7	10.9	23.1	74.6	44.6	55.4	10.9	24.2
1.03	74.4	44.5	55.5	10.8	23.9	74.4	44.5	55.5	11.0	24.3
1.13	73.9	45.3	54.7	10.8	23.8	74.6	44.0	56.0	10.9	24.2
SEM	0.25	0.31	0.31	0.08	0.24	0.25	0.31	0.31	0.07	0.38
Dig. Req. Est.[3]	0.94	—	—	—	0.98	0.88			—	0.90

[1]Means represent 5 pens of 10 birds each.

[2]Quadratic and broken-line response ($P < 0.05$).

[3]Digestible Lys requirement estimate (%) obtained through broken-line methodology.

could be applicable to birds grown on floor pens under commercial conditions.

For chicks during the 21 to 38-d growth period, broken-line DLYS requirement estimates were unexpectedly high, differing little from the DLYS requirement estimates for chicks during the 7 to 21-d growth period. Differences in the DLYS requirement for growth performance between males and females were not observed during the growing period (21 to 38 d). As observed during the starter period, the DLYS requirement for G:F was not higher than that for maximum BWG, which is in disagreement with the results reported by Han and Baker (1994) for birds from 3 to 6 wk of age. In agreement with the results reported herein, the estimated DLYS requirements for BWG and G:F reported by Labadan et al. (2001) in chickens of the same age did not differ.

Digestible lysine requirement estimates for males based on CY and BMY (0.94 and 0.98%, respectively) exceeded those of females (0.88 and 0.90%, respectively). Higher BMY was observed without an increase in the requirement for DLYS, suggesting females deposited more breast muscle relative to body weight. This effect was more pronounced in the birds fed low Lys levels. In agreement with these results, Moran and Bilgili (1990) reported that females at 42 d of age had greater yields than males for the chilled carcass and chilled or cooked breast meat, even though males were heavier. Moreover, Han and Baker (1994) reported that although males had larger carcass and breast weights associated with heavier body weight, females had greater yields. Early reports suggested that the Lys requirement for maximum BMY was higher than for BWG (Hickling et al., 1990; Bilgili et al., 1992). Nevertheless, Han and Baker (1994) reported that the Lys need for maximum BMY and G:F was similar in birds from 3 to 6 wk of age. Mack et al. (1999) and Labadan et al. (2001) observed that the Lys requirement of broilers from 3 to 6 wk for maximum BMY and BWG was similar. In addition to that, Si et al. (2001) found that Lys levels up to 3% above the NRC (1994) requirement recommendation did not increase BMY. From the results obtained in the research reported herein, the Lys need for maximum BMY did not differ from that based on growth performance.

In evaluating growth performance criteria from all 4 experiments, clear-cut sex differences in the DLYS requirement based on growth performance characteristics were not observed for the particular type of birds used herein. Protein composition of BWG as well as lean growth could have been similar for both male and female Cobb 500 chickens. The higher DLYS requirement for males than females reported by Han and Baker (1993, 1994) was attributed to more proteinaceous weight gain in their male chicks compared with their female chicks, which could have accounted for the difference observed in the CY and BMY requirements between males and females observed in the grow-out study.

Assuming 0.99% DLYS as an acceptable average estimate of the broken-line requirement, extrapolation of this (statistical) estimate to practical conditions is necessary. Requirements based on plateau intercept of a quadratic fit superimposed on a broken line (Baker et al., 2002) or based on 90% of the upper asymptote of a quadratic fit generally result in an increase of about 0.08% in the DLYS requirements, i.e., relative to broken-line estimates (Baker et al., 2002). Adding 0.08 to 0.99% gives a DLYS requirement estimate of 1.07% for broiler chicks in the second and third wk of life. This equates to 1.20% total Lys for chicks fed a typical corn-soybean meal diet, i.e., assuming Lys digestibility in this diet is 89% (NRC, 1994). This requirement estimate is only slightly higher than that estimated by Baker et al. (2002) of 1.04% but is substantially higher than the NRC (1994) estimate of 1.10% total Lys (0.98% on a digestible basis).

According to the results obtained in the present research, variation in the estimated DLYS requirement due to rearing conditions (i.e., battery brooders vs. floor pens) should not be of great concern. Also the DLYS requirement estimates for maximal breast meat yield were not higher than those for maximal growth performance. However, the actual requirement of DLYS for BWG, G:F, or BMY may depend on the production objectives of a company.

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