EFFECT OF DIETARY LYSINE: ARGININE RATIO ON DE NOVO SYNTHESIS OF HOMOARGININE IN CHICKENS

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Under normal conditions, trace amounts of the non-protein amino acid, homoarginine have been found in the plasma of several species of mammals (Marescau et al. 1992) but not reported in avian species. It has been proposed that homoarginine may be synthesised in the kidney and liver from lysine and arginine (Kato et al. 1988). It will be, therefore, of interest to study the effect of varying dietary levels of lysine and arginine on the de novo synthesis of homoarginine. It is possible that the de novo synthesis of homoarginine may be responsible to the reduced performance of birds fed on diets imbalanced in these amino acids (Allen et al. 1972) and may partly explain the mechanism involved in the lysine-arginine antagonism in chickens. A recent study has demonstrated the negative effect of homoarginine per se on the feed intake in chickens (Angkanaporn et al. 1995). The influence of dietary lysine/arginine ratio on de novo synthesis of homoarginine was investigated in the present study.

Three hundred and twenty day-old male broilers were weighed and allotted into 40 pens on the basis of body weight. Ten maize-soyabean meal based diets were formulated to contain different lysine (lys)/arginine (arg) ratios. The first five diets had similar arginine levels but varied in lysine (lys/arg ratios were 0.8, 1.0, 1.2, 1.4 and 1.6 for diets one to five, respectively). The basal diet (diet one) contained 11 g lys and 14 g arg/kg diet. The other five diets had similar lysine concentrations but varied in arginine (lys/arg ratios were 0.84, 0.74, 0.64, 0.54 and 0.46 for diets six to 10, respectively). The diets were fed from day eight to 18 post-hatching. Feed intake and weight gain were recorded and blood was collected from jugular vein on day 19 post-hatching. Plasma samples were analysed for basic amino acid concentrations including homoarginine.

There were no significant ($P>0.05$) differences in feed intake and weight gain of birds fed on diets varying in lysine (diets one to five). Birds fed on diets containing the highest concentration of arginine (24 g/kg, diet 10) had significantly lower ($P<0.05$) feed intake and weight gain. Plasma homoarginine concentrations were significantly ($P<0.05$) increased from two to 20 (mole/L with decreasing levels of dietary arginine). Plasma homoarginine concentrations in birds fed on diets varying in lysine (diets one to five) were similar ($P>0.05$) but were higher (22 to 68 (mole/L) than those fed on diets six to 10. The correlation between plasma homoarginine concentrations and plasma lys/arg ratio was diphasic. High correlations ($r = 0.82$) were noted at plasma lys/arg ratios lower than 4.5, whereas homoarginine concentrations were unaffected ($r = 0.19$) when the ratios were above 4.5.

Studies utilising semi-purified diets have consistently demonstrated the adverse effects of lys/arg antagonism on the feed intake in chickens (Allen et al. 1972). In the present study, however, high lys/arg ratios had no adverse effects on the feed intake and weight gain of chickens fed on practical maize-soyabean meal diets. The results also indicate that the extent of de novo synthesis of homoarginine in chickens is higher in diets with high lys/arg ratio than those with low lys/arg ratio. However, the levels of homoarginine synthesised are too low to cause any depression in feed intake in chickens.

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