

Influence of Caecectomy on Endogenous Amino Acid Losses in Adult Cockerels

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Abstract: The experiment was conducted to determine influence of caecectomy on Endogenous Amino Acid Losses (EAAL) in unfed Rohde Island Red adult cockerels. During the experimental period (48 h), excreta of cockerels were collected and dried, ground and assayed for quantities of amino acids. The caecectomy increased ($p<0.05$) the endogenous quantities of serine, histidine, arginine, cystein and isoleucine and decreased ($p<0.05$) the endogenous quantities of methionine, lysine and leucine, but had no significant influence ($p>0.05$) on the endogenous quantities of aspartic acid, Glutamic acid, glycine, threonine, alanine, tyrosine, valine and phenylalanine. However, the mean quantity of EAAL in caecectomized cockerels was approximately 10% more than it in intact cockerels ($p<0.05$).

Key words: Caecectomy, endogenous amino acid losses, rohde island red, adult cockerels, caecal microflora, amino acid digestibility assays

INTRODUCTION

Amino acid digestibility assays are generally based on the collection of excreta than ileal digesta in adult birds because of the easy of collection of excreta relative to ileal digesta (Kesler *et al.*, 1981; Parsons, 1984). But, a difficulty with measurements of true amino acid digestibility based on the analysis of the collected excreta is activities of microflora in the hind gut especially ceca on Endogenous Amino Acid Losses (EAAL). EAAL may be deaminated by this microflora and also, microbial cells may be contributed to fecal amino acids output (Angkanaporn *et al.*, 1997; Parsons *et al.*, 1982b; Green *et al.*, 1987).

Endogenous amino acid sources entering the small intestine include enzyme secretions, shed intestinal cells, mucus and material refluxed into the small intestine from lower gut (Simon *et al.*, 1986). The amount and nature of endogenous amino acids at the hind gut depend on the amount of digestion and absorption in small intestine and also the intensity and kind of activity of caecal microflora on them (Parsons *et al.*, 1983, 1984). Therefore, the objective of the experiment was to determine influence of caecectomy on Endogenous Amino Acid Losses (EAAL) in adult cockerels.

MATERIALS AND METHODS

The experiment was conducted to determine influence of caecectomy on Endogenous Amino Acid Losses (EAAL) in Rohd Island Red (RIR) adult cockerels. Eight (4 intact and 4 caecectomized) RIR cockerels were placed in individual metabolic cages (0.66×0.66 m) with fixed aluminum trays and plastic bags for separately excreta collection. The adult cockerels were caecectomized as procedure described by Angkanaporn *et al.* (1997). The experiment was carried out on the basis of a completely randomized design with 4 replicates with using starvation method included 24 h pre-collection and 48 h collection period of total endogenous excreta from unfed caecectomized and intact cockerels. The total excreta collected during the 48 h period were weighted and frozen. The frozen samples were removed from the freezer and placed in an oven to be dried at 65°C overnight. Quantities of amino acids in the samples were determined by High-Performance Liquid Chromatography (HPLC). For amino acid analysis, the samples were hydrolyzed with 6 N HCL and then determined by High-Performance Liquid Chromatography (HPLC) according to the procedure described by Moore (2004).

Table 1: The influence of caeectomy on quantities of endogenous amino acid losses in adult cockerels (mg/48 h)

Amino acid	Bird		¹ SEM
	Intact	Caeectomized	
Aspartic acid	9.81	11.90	0.81
Glutamic acid	33.10	38.16	2.35
Serine	25.34 ^b	40.61 ^a	2.52
Glycine	17.38	18.57	1.47
Histidine	2.21 ^b	2.90 ^a	0.17
Arginine	8.03 ^b	9.96 ^a	0.63
Threonine	32.64	39.62	3.62
Alanine	6.18	5.46	0.52
Tyrosine	8.22	7.84	0.62
Valine	12.74	13.43	1.22
Methionie	5.17 ^a	3.84 ^b	0.34
Cysteine	1.76 ^b	3.28 ^a	0.41
Isoleucine	1.15 ^b	9.02 ^a	0.46
Lucine	17.43 ^a	12.19 ^b	1.67
Phenylalanine	38.21	29.70	3.95
Lysine	14.11 ^a	10.57 ^b	1.14
Mean	14.59 ^b	16.07 ^a	0.44

^{a,b}Means within a row with no common superscript differ significantly ($p < 0.5$), ¹Standard error of mean

RESULTS

Table 1, present the influence of caeectomy on quantities of endogenous amino acid losses in adult cockerels. The caeectomy had various effects on the quantities of EAAL for adult cockerels. The caeectomy increased ($p < 0.05$) the endogenous excretion of serine, histidine, arginine, cysteine and isoleucine and decreased ($p < 0.05$) the endogenous excretion of methionine, lysine and leucine in adult cockerels. Although the caeectomy had no significant ($p > 0.05$) effect on the excreted quantities of aspartic acid, glutamic acid, glycine, threonine, alanine, tyrosine, valine and phenylalanine but resulted in a numerically increase in quantities of aspartic acid, glutamic acid, glycine, threonine and valine and a numerically decrease in quantities of alanine, tyrosine and phenylalanine (Table 1). However, caeectomized cockerels excreted mean quantity of EAAL more than intact cockerels that this quantity was approximately 10% ($p < 0.05$).

Also, Table 1 indicated that the quantities of some amino acids such as threonine, glutamic acid, phenylalanine and serine are numerically more than other amino acids in endogenous excreta for adult intact and caeectomized cockerels.

DISCUSSION

The results of this experiment are consistent with the findings of those authors (Angkanaporn *et al.*, 1997; Kessler *et al.*, 1981; Parsons, 1982a, b, 1984; Green *et al.*, 1987) that some endogenous amino acids were excreted in

caeectomized birds more than intact birds. The less EAAL in intact birds could be due to greater microbial degradation and utilization and cecal retention of amino acids or both (Parsons, 1985). Green *et al.* (1987) indicated that the caeectomy increased endogenous excretion of threonine more than other amino acids. Kessler *et al.* (1981) and Parsons (1985) reported that caeectomized birds excreted higher amino acids than intact birds after fasting. Comparative studies on germ-free and normal chicks demonstrated microbial proteolysis and deamination of amino acids in the caeca (Salter *et al.*, 1974). The caeectomy increase excretion of endogenous threonine, serine and isoleucine in hens (Parsons, 1984). Moreto and Planas (1989) indicated that some amino acids such as valine are removed in caeca of birds.

In this experiment, increase of phenylalanine, tyrosine, alanine and significantly leucine, lysine and methionine in endogenous excreta of the intact cockerels indicate bacterial synthesis of these amino acids in caeca of these cockerels. Parsons *et al.* (1985) reported higher contribution of microbial protein in excreta of intact roosters compared to caeectomized roosters. Endogenous excreta of intact birds contain approximately 20-30% microbial amino acids (Parsons *et al.*, 1982b). Also, Parsons *et al.* (1983) reported that endogenous losses of surgically-modified (caeectomized and colostomized) roosters contain lower quantities of alanine, aspartic acid and lysine and higher quantities of glycine, proline, serine and threonine than microbial cells in endogenous excreta. Also, it was reported Ragland *et al.* (1999) that the endogenous excreta of caeectomized ducks contain greater quantities of serine, histidine, arginine, cysteine, isoleucine, leucine, aspartic acid, threonine, valine and phenylalanine and tyrosine and lower quantities of lysine, methionine and alanine. The different effects of caeectomy on EAAL between some above reports could be attributed to various in composition, kind and intensity of activity of caecal bacteria on endogenous excretion in different intact birds used in these studies (Angkanaporn *et al.*, 1997; Kesler *et al.*, 1981; Ragland *et al.*, 1999).

On the other hand, results of this study about the quantities of amino acids in endogenous excreta of adult cockerels are according to the results of those authors (Salter *et al.*, 1974; Siriwan *et al.*, 1993) who reported threonine, serine and glutamic acid are the most amino acids in endogenous excreta of fasted adult cockerels. The high quantity of glycine in endogenous excreta could be due to the formation of glycine from uric acid by acid hydrolysis (Parsons *et al.*, 1983).

CONCLUSION

The bacterial activities in hind gut especially caeca of adult cockerels affect the quantities of EAAL; therefore, the caeectomy could be an effective method in reduction these negative effects of bacteria on the measurements of true amino acid digestibility based on the analysis of the excreta in adult cockerels.

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