MEDWELL PUBLISHING
Journal of Animal and Veterinary Advances 8 (1): 108-110, 2009
ISSN: 1680-5593

Influence of Caecectomy on Endogenous Amino Acid Losses in Adult Cockerels

[1]A. Nouri-Emamzadeh, [2]A. Yaghobfar, [3]A.A. Sadeghi, [2]A. Mirhadi and [3]M. Chamani
[1]Department of Animal Science, Faculty of Agriculture, Islamic Azad University,
Garmsar Branch, P.O. Box 3581631167, Garmsar, Iran
[2]Animal Science Research Institute, Karaj-I.R., Iran
[3]Department of Animal Science, Faculty of Agriculture, Islamic Azad University,
Science and Research Branch, Tehran, Iran

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).

Corresponding Author: Dr. A. Nouri-Emamzadeh, Department of Animal Science, Faculty of Agriculture, Islamic Azad University, Garmsar Branch, P.O. Box 3581631167, Garmsar, Iran

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

	Bird		
Amino acid	Intact	Caecectomized	[1]SEM
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 ($p<0.5$), [1]Standard error of mean

RESULTS

Table 1, present the influence of caecectomy on quantities of endogenous amino acid losses in adult cockerels. The caecectomy had various effects on the quantities of EAAL for adult cockerels. The caecectomy 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 caececctomy 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, caecectomized 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, phenyalnine and serine are numerically more than other amino acids in endogenous excreta for adult intact and caecectomized 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 caecectomized 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 caecectomy increased endogenous excretion of threonine more than other amino acids. Kessler *et al*. (1981) and Parsons (1985) reported that caecectomized 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 caecectomy 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 caecectomized 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 (caecectomized 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 caecectomized 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 caecectomy 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 caecectomy 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.

REFERENCES

Angkanaporn, K., V. Ravindran and W.L. Bryden, 1997. Influence of caecectomy and dietary protein concentration on apparent excreta amino acid digestibility in adult cockerels. Br. Poult. Sci., 38: 270-276.

Green, S., L. Bertrand, J.C. Duron and R. Maillard, 1987. Digestibilities of amino acids in maize, wheat and barley meals, determined with caecectomized cockerels. Br. Poult. Sci., 28: 631-641.

Kessler, J.W., T.H. Nguyen and O.P. Thomas, 1981. The amino acid excretion values in intact and caecectomized negative control roosters used for determining metabolic plus endogenous urinary losses. Poult. Sci., 60: 1576-1577.

Moore, J., 2004. Amino acid analysis of hydrolysates (feed, fecal, etc). Nathalie Trottier's Laboratory, Department of Animal Science, Michigan State University, 2209 Anthony Hall, East Lansing, MI 48824.

Moreto, M. and J.M. Planas, 1989. Sugar and amino acid transport Properties of the chicken ceca. J. Nutr., 19: 249-268.

Parsons, C.M., 1984. Influence of caecectomy and source of dietary fiber or starch on excretion of endogenous amino acids by laying hens. Br. J. Nutr., 51: 541-548.

Parsons, C.M., 1985. Influence of caecectomy on digestibility of amino acids by roosters fed distillers dried grains with solubles. J. Agric. Sci., 104: 469-472.

Parsons, C.M., L.M. Potter and R.D. Brown, 1982a. Effects of Protein and intestinal microflora on excretion of amino acids in poultry. Poult. Sci., 61: 939-946.

Parsons, C.M., L.M. Potter and R.D. Brown, 1982b. Microbial contribution to dry matter and amino acid content of poultry excreta. Poult. Sci., 61: 925-932.

Parsons, C.M., L.M. Potter and R.D. Brown, 1983. Effects of dietary carbohydrate and intestinal microflora on excretion of endogenous amino acids by poultry. Poult. Sci., 62: 483-489.

Ragland, D., C.R. Thomas, R.G. Elkin, D.J. Shafer and O. Adeola, 1999. The influence of Cecetomy on Metabolizable energy and Amino Acid Digestibility of Feedstuffs for White Pekin Ducks. Br. Poult. Sci., 78: 707-713.

Salter, D.N. and M.E. Coates and D. Hewitt, 1974. The utilization of protein and excretion of uric acid in germ-free and conventional chicks. Br. J. Nutr., 31: 307-318.

Simon, O., T. Zebrowska, R. Munchmeyer, H. Bergner and H. Rohrmann, 1986. Studies on the secretion of amino acids and of urea into the gastrointestinal tract of pigs. 1. Secretion of leucine into the stomach and upper part of the duodenum during continious intravenous influsion of ^{14}C-leucine. Arch. Anim. Nutr., 36: 5-16.

Siriwan, P., W.L. Bryden, Y. Mollah and E.F. Annison, 1993. Measurement of endogenous amino acid losses in poultry. Br. Poult. Sci., 34: 939-949.