Egypt. J. Anim. Prod., 14, No. 2, pp. 255–263 (1974).

The Effect of Balancing Amino Acids in the Ration on Glands and Endocrines of Chickens

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60 BIRDS. 5 males and 5 females, divided into 6 equal groups were slaughtered at 14 weeks of age. The sexual organs, offals and endocrines were studied. Six rations were used, two of them served as control having 19% crude protein. The other 4 groups received rations with balanced amino acids in different levels and sources of animal protein. The balance of amino acids was done on the light of the balance of the essential amino acids in meat and egg of chickens.

The reproductive organs of both sexes in the groups that received rations containing balanced amino acids either in high or low levels were absolutly and relatively larger than the control groups. The thymus and bursa of fabricious glands weights and relative weights were larger for the groups that received rations containing balanced amino acids either in high or low levels. There were no trends in adrenal or thyroid glands in this respect. The spleen, liver and at absolute and relativefweights were heavier in the groups that received rations containing balanced levels of amino acids. The adding of fish meal encouraged the deposition of more fat than fwhen skim milk was added. The kidneys and ceca showed no trend in this respect.

The literature in the role of amino acids with respect to endocrines and reproductive organs is very rare. Only the relation between animal protein and reproduction was studied, as it was found that there is a relation between fish meal and the increase in hatchability and reproductivity of birds (Arscott and Combs, 1953 and Bethke *et al.*, 1956).

Material and Methods

Six groups of chicks were fed rations differing in the balance of amino acids (Table 1). The two control groups were not balanced, while the other 4 treated groups were balanced to contain amino acids simulating the ratio of that is chickens meat. At 14 weeks of age, 5 males and 5 females of each of the six groups were slaughtered. Offals weight, endocrine glands and gonads weights were available.

TABLE 1. The composition and ingredients used in the different treatments.

Ingredients % and composition		Control			Treatments		
		1	2	3	4	5	6
Corn		12	12	38	38	16	16
Rice pollishings		12	12	0	0	17.5	17.5
Wheat bran		12	12	1	1	15	15
Horse beans		16	16	4	4	16	16
Cotton seed cake		20	20	0	0	22	22
Seasam cake		0	0	16	16	0	0
Barley mault		25	25	30	30	10	10
Bone meal		1	1	1	1	1	1
Salt		0.5	0.5	0.5	0.5	0.5	0.5
Liquid skim milk kg		32.4	0	180	0	32.4	0
Fish meal		0	2	0	11	0	2
Crude protein		19.22	19.22	18.71	18.71	19.30	19.30
Starch equivalent		57.34	37.34	49.40	49.40	63.70	63.70
Methionine	1	0.23	0.23	0.38	0.43	0.24	0.25
	2	1.21	1.19	2.05	2.32	1.30	1.31
Arginine	1	1.16	1.17	1.03	1.09	1.35	1.36
	2	6.28	6.11	5.51	5.83	7.00	7.50
Histidine	1	0.43	0.42	0.51	0.49	0.48	0.48
	2	2.23	2.18	2.71	2.60	2.50	2.50
Leucine	1	1.12	1.07	1.55	1.44	1.32	1.29
	2	5.83	5.59	8.27	7.70	6.80	6.70
Isoleucine	1	0.84	1.01	0.89	0.84	0.84	0.82
	2	4.57	4.35	5.37	4.44	4.30	4.20
Lysine	1	0.83	0.81	0.85	0.94	0.86	0.87
	2	4.34	4.21	4.52	5.07	4.40	4.50
Cystine	1	0.30	0.29	0.37	0.40	0.33	0.33
	2	1.56	1.50	1.96	2.13	1.70	1.70
Phenylalanine	1	0.76	0.73	0.86	0.76	0.82	0.80
	2	3.98	3.79	4.60	4.06	4.20	4.10
Threonine	1	0.57	0.47	0.65	0.64	0.55	0.55
	2	2.97	2.47	3.44	3.44	2.80	2.80
Valine	1	0.99	0.93	0.89	0.90	0.95	0.95
	2	5.13	4.84	4.73	4.81	4.90	4.90

1. % of amino acids to the total ration.
2. % of amino acids to the protein in the ration.

Result and Discussion

Ovary and oviduct

Ovaries and oviducts of the groups which received rations containing high balanced levels of amino acids were more developed and heavier that received balanced amino acids but in low levels, weight more than the control groups. When the percentages of ovaries and oviducts were concerned, only groups 3 and 4 that received high balanced level of amino acids showed the highest percentage. Meanwhile, groups 5 and 6 showed lower percentages than the control groups (Table 2).

TABLE 2. **Weights and percentages of gonads to body weight in the different treatments***

Items	Treatments					
	1	2	3	4	5	6
weight (g)						
Ovary	2.19	2.29	2.76	2.41	1.89	2.04
Oviduct	1.13	1.19	1.19	1.15	0.92	0.80
Testes	2.10	2.52	3.87	3.85	3.00	3.88
% to body weight						
Ovary	0.55	0.60	0.64	0.58	0.45	0.52
Oviduct	0.28	0.31	0.27	0.28	0.21	0.20
Testes	0.49	0.53	0.80	0.75	0.68	0.78

* The chicks were slaughtered at 13 — 14 weeks of age.

Testes

Testes weights were heavier in the groups that received balanced amino acid rations either in high or low levels than the controls. This trend still holds true with respect to testes percentage of the body weight. However, it seems that the supplementation of the ration with the animal protein source in a fish meal form, improved testes weights more than when supplement with the skim milk. This may suggest a clone relationship between reproduction in male and the type of protein and amino acids prevailing in the fish meal. It is a well known fact that supplementing the ration with animal protein is essential for good hatchability (Bethke, *et al.*, 1956). Also, unknown factor in condensed fish meal, as an animal protein source, caused the increase in hatchability over the controls, although both fed normal balanced ration containing all the known required nutrients (Arscott and Combs, 1953). Also, Kammar (1964) found that the balancing of amino acids in the rations of the

cocks either in a high or low level increased the fertility and hatchability of their eggs and caused them to produce better quality and quantities of semen. This improvement was more obvious when the animal protein source was fish-meal rather than the skim milk.

Thyroid gland

There were no trend with respect to thyroid gland, either for the absolute or relative weights of the different treatments or between sexes (Tables 3 and 4). However, the thyroid of males tended to be somewhat larger than that of the females.

TABLE 3. **Weights of different endocrines of the different treatments (Weights in g).**

Groups	Sex	Thyroid	Thymus	Adrenals	Bursa
	Male	0.058	1.076	0.107	0.774
1	Female	0.051	1.043	0.087	0.929
	Average	0.054	1.061	0.097	0.851
	Male	0.070	0.762	0.950	0.769
2	Female	0.066	0.835	0.960	0.727
	Average	0.068	0.798	0.950	0.748
	Male	0.100	0.758	0.156	2.135
3	Female	0.062	0.832	0.107	0.665
	Average	0.081	1.795	0.131	1.399
	Male	0.065	0.999	0.095	1.513
4	Female	0.051	0.946	0.083	0.917
	Average	0.058	0.975	0.089	1.215
	Male	0.083	1.667	0.112	1.401
5	Female	0.045	1.077	0.063	0.951
	Average	0.062	1.339	0.076	0.951
	Male	0.068	1.907	0.118	1.088
6	Female	0.040	0.436	0.067	0.806
	Average	0.054	1.172	0.091	0.947

TABLE 4. Percentage of different endocrines to body weight of different treatments.

Groups	Sex	Thyroid	Thymus	Adrenals	Bursa
1	Males	0.0134	0.250	0.0248	0.180
	Females	0.0128	0.264	0.0221	0.235
	Average	0.0131	0.257	0.0234	0.266
2	Males	0.0149	0.162	0.0202	0.164
	Females	0.0173	0.210	0.0252	0.191
	Average	0.0160	0.188	0.0224	0.176
3	Males	0.0155	0.426	0.0241	0.330
	Females	0.0144	0.192	0.0248	0.145
	Average	0.0150	0.333	0.0242	0.260
4	Males	0.0126	0.193	0.0293	0.292
	Females	0.0129	0.238	0.0208	0.230
	Average	0.0127	0.213	0.0251	0.265
5	Males	0.0182	0.369	0.0247	0.311
	Females	0.0107	0.256	0.0150	0.139
	Average	0.0141	0.307	0.0197	0.218
6	Males	0.0138	0.385	0.0256	0.220
	Females	0.0102	0.111	0.0164	0.250
	Average	0.0122	0.264	0.0204	0.213

Thymus gland

Thymus absolute or relative weights were larger for the groups that received balanced amino acids either in high or low leves (Table 3 and 4). This trend was the same observed for body weigh (Kamar *et al.*, 1971). This may be due to that the thymus is related to growth and its size is normally related to body size and the advance of the age (Sturkie, 1965).

Adrenal glands

There were no trend with respect to adrenal glands, either for the absolute or relative weights of the different treatments or between sexes (Tables 3 and 4). However, the adrenals of the males tended to be somewhat larger than of the females.

Bursa of fabricious gland

The bursa absolute and relative weights were larger for the groups received balnced amino acids either in high or low levels (Table 3 and 4). This trend was the same observed for growth and body weight (Kamar *et al.*,1971). This may be due to that the bursa is related to growth and its size is normally related to body size and the advancement of age (Sturkie. 1965).

Liver

The spleen absolute and relative weights were heavier in the groups that received rations containing balanced amino acid ration either in high or low levels. The livers of the groups that received low levels of balanced amino acids were larger than those that received high levels (Tables 5 and 6).

TABLE 5. **Weights of some organs and tissues of the different treatments (Weights in g)**

Groups	Sex	Liver	Kidneys	Spleen	Fat	Ceca
1	Male	12.1	4.8	0.742	0.624	3.1
	Female	10.6	4.4	0.680	0.595	3.0
	Average	11.3	4.6	0.711	0.609	3.05
2	Male	11.8	5.2	0.699	0.578	3.1
	Female	10.9	3.9	0.574	0.591	2.5
	Average	11.3	4.6	0.637	0.584	2.8
3	Male	18.2	6.6	1.280	0.745	4.1
	Female	11.8	4.4	0.836	0.774	3.1
	Average	15.0	5.6	1.060	0.759	3.6
4	Male	14.4	5.2	1.080	1.360	4.0
	Female	11.1	3.9	0.820	0.634	2.7
	Average	12.8	4.6	0.950	0.997	3.4
5	Male	16.6	4.9	1.223	0.721	4.0
	Female	10.7	3.9	0.842	0.551	3.4
	Average	13.3	4.4	1.024	0.626	3.6
6	Male	14.1	4.8	1.090	0.707	3.6
	Female	12.9	4.5	0.704	0.889	3.3
	Average	13.5	4.7	0.891	0.798	3.5

TABLE 6. **Percentage of different organs and tissues to body weight of different treatments.**

Groups	Sex	Liver	Kidneys	Spleen	Fat	Ceca
1	Male	2.88	1.11	0.172	0.145	0.72
	Female	2.70	1.11	0.172	0.150	0.76
	Average	2.74	1.11	0.172	0.147	0.73
2	Male	2 51	1.11	0.149	0.123	0.66
	Female	2.87	1.02	p.151	0.155	0.66
	Average	2.66	1.08	0.150	0.137	0.66
3	Male	2.81	1.02	0.198	1.115	0.63
	Female	2.73	1.02	0.194	0.179	0.72
	Average	2.78	1.02	0.197	0.141	0.67
4	Male	2.78	1.01	0.209	0.263	0.77
	Female	2.79	0.97	0.206	0.159	0.68
	Average	2.79	1.00	0.207	0.218	0.74
5	Male	3.67	1.08	0.270	0.156	0.88
	Female	2.54	0.93	0.200	0.131	0.81
	Average	3.05	1.00	0.234	0.144	0.83
6	Male	2.85	0.97	0.220	0.143	0.73
	Female	3.29	1.15	0.179	0.227	0.84
	Average	3.04	1.06	0.201	0.180	0.69

It seems that this increase in liver size is due to the increased activity which was initiated by the balancing of amino acids.

Kidneys

There were no trend with respect to kidneys absolute or relative weights of the different treatments or between sexes (Tables 5 and 6).

Spleen

Spleen : The spleen absolute and relative weights were heavier in the groups that received either high or low levels of balanced amino acid ratio (Tables 5 and 6). It seems that this increase in the spleen size is due to the increased activity which was initiated by the balancing of amino acids in the diet.

Fat

No clear trend due to treatment difference could be detecter for fat-relative weights, irrespective to the heavier fat weights observed in the groups that received either high or low levels of balanced amino acid ratio (Tables 5 and 6). The later observation was due to that the absolute fat weight is directly related to trends observed in body weight (Kamar *et al.*, 1971). However, there is another trend that showed heavier fat weights, either relative or absolute for the groups that received fish meal as animal protein source rather than the skim milk.

Ceca

There were no trend with respect to cecum absolute or relative weights of the different treatments or between sexes (Tables 5 and 6).

Although the endocrines showed no clear trend in weights, caused by the different treatments, yet it can be detected from the general view of reproductive organs and the endocrines related to growth, that the balancing of amino acids increased the productivity and reproductivity of birds.

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تأثير توازن الأحماض الأمينية فى الغذاء على أعضاء التكـاثر والغدد الصماء والأحشاء

جمال قمر ، سعد السمان و سميره شكرى

قسم الانتاج الحيوانى ، كلية الزراعة ، جامعة القاهرة

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كانت من الاوزان الكلية والنسبية لاعضاء التكاثر فى كلا الجنسين وكذا الغدة النيموسية ، والبرسا بالمجموعات المغذاه على علائق متوازنة الاحماض الامينيـة ـ سواء المرتفعـة أو المنخفضـة المحتوى ـ أكبر منهـا فى المجموعات المقارنة ، بينما لم يظهر أثر واضح على أى من غدد فوق الكلى ولا الدرقية •

وقد كان أثر توازن الأحماض الامينية فى الغذاء واضحا فى كبر حجم الطحال والكبد وترسيب الدهن فى مجموعات التجربة عن مجموعات المقارنة ، ويبدو أن استعمال السمك المجفف كمصدر للبروتين الحيوانى يشجع زيادة ترسيب الدهن عن اللبن الفرز ، كما ظهر تحت ظروف التجربة • ولم يظهر أثر واضح لتوازن الأحماض الامينية فى الغذاء على أى من أوزان الكلى أو الأعود •

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