قسم : الانتاج الحيوانى ـ كلية الزراعة ـ جامعة القاهرة.
رئيس القسم : أ. د. / محمد جمال الدين قمر .

تأثير اضافة كربونات الكالسيوم الى عليقة الدجاج الفيومى والرود ايلاند الاحمر على قناة المبيض ونشاط وضع البيض

محمد جمال الدين قمر ، محمد الشافعى ، محمد النادى* ، محمد سامى**

استهدف هذا البحث دراسة التركيب التشريحى لقناة المبيض مع التركيز على غدة افراز قشرة البيضة (الرحم) تحت تأثير نوع الدجاج ومستوى الكالسيوم المضاف للغذاء وكذلك تحت تأثير النشاط الناشىء عن وضع البيضة. وقد اظهرت النتائج ان الدجاج الفيومى يحتاج لكمية من الكالسيوم لاعطاء النمو الملائم للجهاز التناسلى اكثر مما يحتاجه الدجاج الروداىلاند الاحمر وذلك قبل الوصول للنضج الجنسى ، كما ادى الكالسيوم المضاف للعليقة المتزنة الى نمو أكبر فى الجهاز التناسلى بعد النضج الجنسى فى كلا النوعين فى الدجاج البياض (النشط) . بصفة عامة وجدت علاقة طردية بين وزن قناة المبيض ووزن البيضة. اظهر الدجاج الرود ايلاند الاحمر زيادة أكبر فى نمو الرحم بعد النضج الجنسى عما أظهره الدجاج الفيومى سواء فى الوزن المطلق أو الوزن النسبى وذلك بعد وضع البيض لمدة ٦ شهور تحت تأثير جميع مستويات كربونات الكالسيوم المضافة . زاد وزن الرحم الذى كان يحتوى على بيضة وقت الذبح زيادة نسبية طفيفة عنه فى الافراد الأخرى ،وكانت هذه الزيادة بسبب نقص وزن منطقة افراز الزلال (الماجنم) ومنطقة افراز غشية القشرة (الاسمث) فى هذه المرحلة بعد افراز المواد التى كانت مختزنة فى انسجتها وليس لزيادة فعلية فى وزن الرحم لعدم تخزينه لمواد افرازية.

* : قسم الانتاج الحيوانى ـ كلية الزراعة جامعة المنوفية.
** : قسم الانتاج الحيوانى ـ المركز القومى للبحوث.

Dept. of Animal Production,
Faculty of Agric. Cairo University,
Head of Dept. Prof. Dr. G.A.R. Kamar.

WEIGHT CHANGES IN THE REPRODUCTIVE ORGANS OF THE FAYOUMI AND RHODE ISLAND RED HES AND ITS RELATION TO DIETARY SUPPLEMENTED CALCIUM LEVELS

(WITH 5 TABLES)

BY

G.A.R., KMAR, M.M.H. EL-SHAFIE, M.M. EL-NADI and M.S. SAMY.

(Received at 16/2/1981)

SUMMARY

The Fayoumi hens needed more calcium than the RIR hens for the growth of the reproductive system before sexual maturity. Calcium supplemented diet caused more growth in active reproductive system than ration devoid in clacium carbonate in both breeds. In general there was a positive relationship between oviduct weight and egg weight. The RIR hens showed higher absolute and relative increase in uterine weight both after sexual maturity and after laying for six months than the Fayoumi hens. Uterus having egg showed slight increase than others in any other periods of laying cycle. Moreover it showed higher relative weight mainly due to the decrease in magnum and isthmus weight, after secreting their materials, and not due to uterine storage materials.

INTRODUCTION

Calcium is very important for laying hens because it represents an important part of egg, that is, the egg shell.

The deficiency of calcium in diet brings about a progressive thinning of shell followed by a complete cessation of laying (TAYLOR ET AL., 1962). NEVALAINEN (1969) reported that calcium deficient diet caused egg shell weight to decrease progressively from the control level of 5.51 to 1.56 gm on the 9th egg. Dietary calcium depletion resulted in a progressive decrease in blood and egg shell calcium weight.

In general, the reproductive organs and their component parts exhibited cyclic changes during egg formation. In most instances, these changes are associated with functional activity (SMITH ET AL., 1957). The size of the chicken oviduct varies also according to body size (STURKIE, 1965). BRAGG ET AL. (1971) reported that high temperatures appeared to decrease both shell quality and the amount of ^{45}Ca activity secreted into the egg shell. SCOTT ET AL. (1976) indicated that particles of calcium carbonate must be sufficiently large and hard to allow fragments to remain in the gizzard throughout the night, they must be sufficiently soft and of large surface to allow the gastric acidity to dissolve them at a rate that will release approximately 75 mg of calcium ion per hr to blood stream.

MATERIAL AND METHODS

Thirty six hens of each of the Fayoumi and Rhode Island Red (RIR) were used. Hens of each breed were divided into three equal groups. All groups were fed ad-libitum on a diet composed of 50% white corn, 20% rice bran, 10% wheat bran, 20% decroticated cottonseed meal, 0.5% salt, fresh blood was added at alevel where its protein content represented 10% of the total protein in the rations. Mineral and vitamin mixtures were added to the rations at levels of 0.4 & 0.1% respectively. The composition of the mentioned mixtures were as follows:

Mineral Mixture (gm/100 Kilogram corn):

220 dipotassium phosphate, 120 magnesium sulfate, 300 manganese sulfate, 30 iron sulfate, 0.80 copper sulfate and 0.18 potassium iodate.

Vitamin Mixture (gm/100 Kilogram corn):

0.4 riboflavin, 1.0 calcium pantothenate, 0.09 menadione, 130 choline chloride, 1000 U.S.P. units vitamin A and 100 I.C.U. vitamin D3. The hens groups were differed in calcium carbonate supplemented level as follows: the first group did not receive, the second and third groups obtained 2 and 6% calcium carbonate, respectively.

Fac. of Agric. Monofia Univ., National Research Cenre of Egypt.
Prof. Dr. M.S. Danasouri & Prof. Dr. H.M. Ali.

Three studies on the development of the ovary and oviduct were done on each group as follows. The first one month from the beginning of feeding supplementary calcium source, i.e. at 5 months of age, the second after one month from the beginning of laying and the thrid after 6 months from the beginning of laying. Four of each Fayoumi and RIR hens from each group at each stage were weighed and slaughtered. Ovary and oviduct were separated directly from the hen, weighed and the length of the oviduct was recorded. Then, the latter was divided into its regions, funnel, magnum, isthums, uterus and vagina. The weight, the length and width of each segment were recorded.

Eggs were collected daily, weighed, broken, then yolk was separated and weighed. The shell with membranes were washed caerfully to get rid of albumen, dried under room temperature for one day, then shell weight and thickness with membranes were recorded. The shell was treated with dilute hydrochloric acid to obtain shell membrane free, then separated, washed, dired under room temperature and their weights and thickness were recorded. Albumen weight was calculated by difference.

RESULTS

Table (1) shows ovary, oviduct and uterus average weights before and after sexual maturity as affected by calcium carbonate supplemented level. Table (2) shows effect of calcium carbonate supplementation on the weights of ovary, oviduct and uterus of the Fayoumi and RIR hens after laying for 6 months. Table (3) indicates the effect of calcium carbonate supplementation on the weights of oviduct regions of the Fayoumi and RIR hens before sexual maturity. Table (4) shows the effect of calcium carbonate addition to the ration on the weights of oviduct regions of Fayoumi and RIR hens after laying for 1 month. Table (5) indicates the effect of calcium carbonate supplementation on the weights of oviduct regions of the Fayoumi and RIR hens after laying for 6 months.

DISCUSSION

The heaviest ovaries and oviducts were recorded at 2% & 6% level in the RIR and Fayoumi hens, respectively (Table 1). These results suggest that Fayoumi hens need more dietary calcium level than RIR hens for the growth of the reproductive system.

After one month of first-egg laid, there was an increase in the weight of resting post laying organs than before sexual maturity.

Within each group,it was noticed that hens having eggs in the uteri showed a positive relationship between oviduct weight and egg weight laid from the same hen after 6 months of laying except with the Fayoumi hens which were supplemented with 2% calcium carbonate (Table 2).

The Ovary:

Laying hens in active periods showed a great increase in ovary weight as compared with those before sexual maturity in the two breeds. STURKIE (1965) reported that the increase of ovary weight at sexual maturity is mainly due to the growth of ova.

The increase differend due to the level of calcium carbonate in diet, the period of laying cycle, age and breed. In this connection, NEVALAINEN (1969) reported that the ovary weight of calcium deficient birds were significantly lower.

High individual difference appeared in ovary weight within active hens, mainly due to egg laying cycle, in the two breeds and the three treatments. SMITH ET AL. (1957) reported that an abrupt decrease in ovary weight accompanies ovulation. This decrease approximately is equal to the yolk ovulated.

The Oviduct:

The oviduct weight in hens after sexual maturity and egg laving in active period exhibited great increase than that before sexual maturity in the two breeds. WILKENS (1915), HALL (1926) & CHAIKOFF ET AL.(1941) reported

that oviduct weight increased from 22 grams on five months of age before sexual maturity to 78 grams after sexual maturity in laying Leghorn hens.

Hens fed rations without calcium carbonate and having eggs in uteri showed the lowest increase in oviduct weight in the two breeds. NEVALAINEN (1969) reported that the oviduct weight of White Leghorn hens fed on calcium deficient diet were significantly lower than those of laying controls. RIR hens having uteral egg showed more increase in oviduct weight than Fayoumi hens in each group especially in the group fed 6% calcium carbonate. This difference may be due to body size, since RIR hens have heavier body than Fayoumi hens. This result agrees with that reported by STURKIE (1965).

The Magnum:

In active hens, when the oviduct weight was great, magnum composed the greatest portion of it than in inactive hens in all stages. This result suggests that magnum grows more than any other region of the oviduct when activated. SMITH ET AL. (1957) reported that magnum is the most active segment and exhibts the highest cyclic weight changes during egg formation. Magnum weight increased in a greater rate after sexual maturity and laying by 1 month in active hens than before sexual maturity in the two breeds, but diminished after that at 6 months of laying in many cases.

The Isthmus:

After sexual maturity, isthmus weight in active hens increased than before sexual maturity (Tables 4&5) and a great indicidual differences occured due to activity and calcium supplement level. SMITH ET AL. (1957) reported that in active oviduct, a loss in weight of isthmus is associated with the passage of an egg through this segment. RICHARDSON (1955) added that the isthmus is similar to magnum in that the epithelial cells of both are observed to accumulate secretory granules in gland cells during interovulatory period. Loss in the weight of isthmus was noticed to be much greater than the weight of deposited membrane (ROMANOFF and ROMANOFF, 1949).

The Uterus:

Comparing uteri of hens at different periods of egg cycle, it was found that uterus having an egg showed the greatest weight than that at any other period of egg formation in the two breeds under all feeding treatments. The difference in the weight of uterus in active hens was slight indicating that uterine tissue do not store secretory materials in contrast to the case of magnum and isthmus. SMITH ET AL. (1957) reported that no cellular material accumulates in the pre-secretory stages of the uterus. Microinciniration studies (RICHARDSON, 1955) have shown a marked increase of mineral material in uterus mucosa during active shell formation, and perhaps this material, with associated water, accounts for the observed slight increase in weight.

REFERENCES

Bragg, D.B., Floyd, J; and Stephenson, E.L. (1971): Factors affecting the transfer of calcium 45_{Ca} from the hen's diet to the egg shell. Poultry Sci., Vol. L, No. 1.

Chaikoff, I.L., Lorinz, F.W. and Enterman, C. (1941): The avian egg. Endocrinology, 28: 597.

Hall, G.O. (1926): The relation of the internal anatomy of fowls to intensity, cycle and annual egg production. Inaug. Diss., Cornell Univ., Ithaca, New York, 76: 180.

Nevalainen, T.J. (1969): The effect of calcium deficient diet on the reproductive organs of the hen. Poultry Sci., 48: 653.

Richardson, K.C. (1955): The secretory phenomena in the oviduct of the fowl including the process of shell formation examined by microinciniration technique. Phil. Trans. Rey. Sci., London, B. 225: 149.

Romanoff, A.L. and Romanoff, A.J. (1949): The avian egg. John Wiley and Sons, Inc., New York.

Scott, M.L., Nesheim, M.C. and Young, R.J. (1976): Nutrition of the Chicken, 2nd Ed. M.L. Scot and Associates Publishers, Ithaca, NY.

Smith, A.H., Hoover, G.N., Nordstrom, J.O. and Winget, C.M. (1957): Quanitative changes in the hens oviduct associated with egg formation. Poultry Sci., 36: 353.

Sturkie, P.D. (1965): Reproduction in the female and egg formation. Avian Physiology. Cornel University Press, New York.

Taylor, T.G., Morris, T.R. and Hertelendy, F. (1962): The effect of pituitary hormones on ovulation in calcium deficient pullets. Vet. Rec. 74: 123.

Wilkins, R.H. (1915): A study of the reproductive system of the female domestic fowl., Cornell Univ., Ithaca, New York, 64: 180.

TABLE (1)

Ovary, Oviduct and Uterus Average Weights Before and After Sexual Maturity As Affected by Calcium Carbonate Supplement. (in grams)

Ca Carbonate supplement (%)	Stage	Fayoumi hens			RIR hens		
		Ovary	Oviduct	Uterus	Ovary	Oviduct	Uterus
0%	Before S.M	1.6	2.4	0.3	1.4	2.0	0.6
	1 month after	2.7	2.9	0.7	1.8	4.8	1.3
2%	Before S.M	1.7	2.3	0.5	1.9	2.7	0.6
	1 month after	2.0	3.5	0.9	1.0	4.3	0.8
6%	Before S.M	2.3	3.0	0.7	1.5	1.3	0.3
	1 month	3.5	4.6	1.4	3.0	5.3	1.2

TABLE (2)

Effect of Calcium Carbonate Supplementation On The Weights of Ovary, Oviduct and Uterus of The Fayoumi and RIR Hens After Laying For 6 Months.

Carbonate supplement (%)	Hen	Oviduct activity	Body wt.g.	Ovary wt.g.	Oviduct wt.g.	Uterus wt.g.	Egg wt.g.	Egg Shell wt.g.	Egg Shell Thick (m.m)
					FAYOUMI				
	1	Egg in uterus	998	28.2	25.0	7.2	47.9	4.02	0.39
	2	Egg in uterus	1148	8.0	19.0	5.8	43.0	4.00	0.36
0%	3	Active	1168	32.0	31.0	8.0	41.8	4.08	0.33
	4	Inactive	726	4.6	10.0	3.0	40.6	4.17	0.40
	5	Egg in uterus	1158	33.0	32.0	10.3	39.0	4.08	0.41
2%	6	Egg in uterus	865	32.0	31.0	9.5	42.1	4.11	0.43
	7	Active	974	8.0	18.0	5.6	42.2	4.39	0.45
	8	Inactive	1075	7.0	11.0	3.4	43.6	4.73	0.43
6%	9	Egg in uterus	998	21.0	30.0	9.3	39.4	4.22	0.41
	10	Egg in uterus	1066	20.0	30.2	10.3	40.0	4.04	0.42
	11	Active	1062	29.0	30.0	9.6	44.3	4.85	0.47
	12	Active	1048	19.0	36.0	10.4	41.2	4.61	0.46
					RIR				
	1	Active	1514	5.4	14.0	6.0	49.0	4.78	0.41
	2	Active	1252	7.0	17.0	4.3	47.9	5.45	0.35
0%	3	Inactive	1311	4.0	12.0	4.1	41.7	3.40	0.23
	4	Inactive	1252	4.0	8.0	3.0	51.5	5.09	0.32
	5	In M and U	1592	23.0	40.0	12.0	45.0	3.54	0.31
2%	6	Egg in uterus	1408	10.0	42.0	18.8	47.0	4.80	0.36
	7	Active	1160	39.0	38.0	13.6	46.2	4.63	0.38
	8	Active	1360	7.0	22.0	9.3	39.7	3.41	0.33
	9	Egg in uterus	1350	36.5	48.0	15.0	55.4	6.04	0.35
	10	Egg in uterus	1340	37.5	38.6	16.8	47.3	4.77	0.32
6%	11	Active	1374	8.0	16.0	5.9	48.7	5.80	0.35
	12	Active	1590	9.0	18.0	6.0	42.9	4.15	0.38

TABLE (3)

Effect of Calcium Carbonate Supplementation On The Weights of Oviduct Regions of The Fayoumi and RIR Hens Before Sexual Maturity.

Ca Carbonate supplement (%)	Weights (gram)					
	Oviduct	Funnel	Magnum	Isthmus	Uterus	Vagina
			FAYOUMI			
0%	2.4	0.3	0.6	0.6	0.3	0.6
2%	2.3	0.3	0.6	0.6	0.5	0.4
6%	3.2	0.4	0.7	0.8	0.7	0.6
			RIR			
0%	2.0	0.2	0.4	0.5	0.6	0.4
2%	2.8	0.3	0.7	0.6	0.6	0.5
6%	1.3	0.2	0.4	0.3	0.3	0.1

TABLE (4)

Effect Of Calcium Carbonate Addition To The Ration On The Weights OF Oviduct Regions Of The Fayoumi And RIR Hens After Laying For 1 Month.

Ca Carbonate Supplement (%)	Hen No.	Weight (gram)						Oviduct Activity
		Oviduct	Funnel	Magnum	Isthmus	Uterus	Vagrina	
				FAYOUMI				
	1	18.8	0.6	5.2	4.0	5.0	4.0	Egg in magnum
0%	2	3.4	0.4	0.6	0.6	1.0	0.8	Inactive
	3	2.6	0.4	0.4	0.6	0.6	0.6	Inactive
	4	2.6	0.4	0.6	0.8	0.4	0.4	Inactive
	5	33.0	1.0	17.0	3.0	10.0	2.0	Egg in uterus
2%	6	43.0	3.0	18.0	5.0	12.0	5.0	Egg in magnum
	7	3.2	0.4	0.6	0.8	0.6	0.8	Inactive
	8	3.8	0.4	0.8	1.0	1.0	0.4	Inactive
	9	33.0	2.0	11.0	5.0	12.0	3.0	Egg in uterus
	10	34.6	2.0	15.4	4.0	10.2	3.0	Egg in magnum
6%	11	5.0	0.4	1.2	1.2	1.4	0.8	Inactive
	12	4.2	0.4	0.8	0.6	1.4	1.0	Inactive
				RIR				
	1	14.0	1.0	4.0	2.0	6.0	1.0	Active
	2	17.0	1.1	7.9	1.9	4.3	1.8	Active
0%	3	12.0	1.0	3.8	1.6	4.1	1.5	Inactive
	4	8.0	0.5	2.9	0.6	3.0	1.0	Inactive
	5	40.0	3.0	17.0	4.0	12.0	4.0	In uterus & magnum
2%	6	42.0	1.4	15.8	3.2	18.8	2.8	Egg in uterus
	7	38.0	1.7	18.0	3.2	13.6	1.5	Active
	8	22.0	1.2	7.5	2.2	9.3	1.8	Active
	9	48.0	1.6	25.0	4.4	15.0	2.0	Egg in uterus
6%	10	38.6	2.0	15.4	2.4	16.8	2.0	Egg in uterus
	11	16.0	1.5	5.7	1.7	5.9	1.2	Active
	12	18.0	1.0	6.2	2.3	6.0	2.5	Active

TABLE (5)

Effect Of Cadcium Carbonate Supplementation On The Weights Of Oviduct Regions Of The Fayoumi And RIR Hens After Laying For 6 Months.

Ca Carbonate Supplement (%)	Hen No.	Weight (gram)						Oviduct Activity
		Oviduct	Funnel	Magnum	Isthmus	Uterus	Vagina	
				FAYOUMI				
0%	1	25.0	3.3	9.7	2.4	7.2	2.4	Egg in uterus
	2	19.0	1.5	7.4	1.6	5.8	2.7	Egg in uterus
	3	31.0	1.7	15.5	3.2	8.0	2.6	Active
	4	10.0	1.4	3.2	1.1	3.0	1.3	Inactive
2%	5	32.0	2.4	12.7	3.3	10.3	3.3	Egg in uterus
	6	31.0	2.0	13.5	3.1	9.5	2.9	Egg in uterus
	7	18.0	1.0	8.3	1.5	5.6	1.6	Active
	8	11.0	1.3	2.8	2.0	3.4	1.5	Inactive
6%	9	30.0	2.8	11.9	2.9	9.3	3.1	Egg in uterus
	10	30.2	2.9	11.5	3.1	10.3	2.4	Egg in uterus
	11	30.2	3.0	11.8	3.3	9.6	2.3	Active
	12	36.0	1.8	14.9	5.0	10.4	3.9	Active
				RIR				
0%	1	14.0	1.0	4.0	2.0	6.0	1.0	Active
	2	17.0	1.1	7.9	1.9	4.3	1.8	Active
	3	12.0	1.0	3.8	1.6	4.1	1.5	Inactive
	4	8.0	0.5	2.9	0.6	3.0	1.0	Inactive
2%	5	40.0	3.0	17.0	4.0	12.0	4.0	In uterus & magnum
	6	42.0	1.4	15.8	3.2	18.8	2.8	Egg in uterus
	7	38.0	1.7	18.0	3.2	13.6	1.5	Active
	8	22.0	1.2	7.5	2.2	9.3	1.8	Active
6%	9	48.0	1.6	25.0	4.4	15.0	2.0	Egg in uterus
	10	38.6	2.0	15.4	2.4	16.8	2.0	Egg in uterus
	11	16.0	1.5	5.7	1.7	5.9	1.2	Active
	12	18.0	1.0	6.2	2.3	6.0	2.5	Active