

Effect of Calcium Level in the Feed on Plasma Calcium of Chickens

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THREE equal groups of Fayoumi and R.I.R. hens at 4 months of age were fed diets supplemented with 0%, 2% and 6% calcium carbonate.

Before sexual maturity the 6% calcium carbonate group showed the highest level of plasma calcium concentration. The unsupplemented diet showed the lowest level in both breeds.

Plasma calcium averages increased after sexual maturity in all groups in spite of the reproductive activity. The increase was higher in the active than that in the inactive hens. Active hens with eggs in the oviduct showed lower calcium increase especially those having eggs in uteri after laying either for 1 or for 6 months. The significant fall in total plasma calcium in hens «having eggs in uteri» is associated with shell calcification.

Hens having eggs in uteri in groups fed 6% calcium carbonate supplemented diet showed higher plasma calcium than the other groups in the two laying stages. In all laying stages, Fayoumi hens having uterine eggs had higher plasma calcium concentration than their similars in R.I.R. hens.

Plasma calcium in hens is affected by breed, calcium level in food, and physiological state. Snapir and Perek (1970) found breed differences in both the total plasma calcium as well as the bound fraction. They were significantly higher in white leghorn than those of the white Plymouth Rock.

The dietary calcium depletion resulted in progressive decrease in blood calcium (Hurwitz and Bar, 1966). Although the hen has some control over her serum calcium levels, the control is not as instantaneous as might be anticipated.

The hens inability to maintain serum calcium levels when the birds were starved for 16 hr, indicates that this dietary stimulation for bone resorption is not instantaneous (Roland *et al.*, 1972).

Most investigators agreed that the total calcium increases in plasma as birds begin laying (Fleishmann and Fried, 1945, Common *et al.*, 1948). Poul and Snetsinger (1969) reported that the

highest plasma calcium levels were observed at 1hr post oviposition falling slowly towards the later part of shell calcification.

Material and Methods

The work was carried out in the Experimental Farm, Faculty of Agriculture, Giza, Egypt. Thirty-six hens of each Fayoumi and Rhode Island Red (RIR) hens at 4 months of age were available. Hens of each breed were divided into three equal groups. All the birds were fed *ad lib*. On a ration composed of 50% white corn, 20% rice bran, 10% wheat bran, 20% dicorticated cotton seed cake, 0.5% salt and fresh blood was added. Supplementary calcium carbonate was added to the above mentioned ration at three levels, at the rate of 0%, 2% and 6%. Each of these diets were allotted to a group from each breed. The determinations were carried out at three stages. The first stage was one month from the beginning of feeding supplementary calcium and before egg laying, i.e. at 5 months of age, the second, one month from the beginning of laying and the third 6 months from the beginning of laying. At each stage, four hens from each group were weighed and slaughtered. The blood of each hen was drained in a beaker and kept calm for clotting and the blood plasma was kept in a freezer. Calcium was measured by the atomic absorption spectrometer. The ovary and the oviduct of each hen were weighed and noticed for detecting its activity.

Results and Discussion

Hens before sexual maturity showed slight individual difference in concentration of plasma calcium within groups of the two breeds under different levels of supplemented calcium carbonate (Table 1). This result was expected due to inactivity of the uterus in forming the shell.

Hens having diet with 6% calcium carbonate showed the highest level of plasma calcium concentration while those fed the un-supplemented one showed the lowest in both breeds. Chan *et al.* (1968) reported that mild hypercalcemia occurred in chickens fed a high calcium diet, and Hurwitz and Bar (1966) reported that the dietary calcium depletion resulted in progressive decrease in blood calcium.

The plasma calcium averages of hens before sexual maturity were lower than those of active and inactive hens after laying in the two breeds and under the three feeding treatments.

After sexual maturity, wide individual differences occurred in the two breeds and in the three groups (Table 1). This difference was mainly due to the activity and to the egg laying cycle.

The active hens showed plasma calcium concentration more than double it was in hens before sexual maturity in all cases in the three groups of both breeds after laying for 1 and 6 months. Most investigators found that the total calcium increases in plasma as birds start laying (Fleischmann and Fried, 1945, and Common *et al.*, 1948).

Moreover, the inactive hens showed higher calcium concentration than hens before sexual maturity in all groups of both breeds, but the increase was substantially lower than it was in the active hens.

Active hens without eggs in the oviduct showed higher blood calcium concentration than those having eggs in both breeds at the two laying stages. Hens having eggs in uteri had lower plasma calcium than those having eggs in magnum or isthmus in the same group (Table 1). Hertelendy and Taylor (1961) showed that there were very large differences between individual birds in the changes in blood calcium which occurred during the egg cycle.

When mean values were considered, it was found that there was significant fall in total plasma calcium associated with shell calcification. Paul and Snetsinger (1969) reported that the highest plasma calcium levels were observed at 1 hr post oviposition falling slowly towards the later part of shell calcification.

In hens having eggs in uteri it was found that those fed on 6% calcium carbonate diet showed higher plasma calcium concentration than those on the other two rations in both breeds and at the two laying stages.

In all laying stages, Fayoumi hens having uterine eggs had higher plasma calcium concentration than their similars in RIR hens in all groups at all stages.

TABLE 1. Effect of calcium carbonate supplement in ration on plasma calcium concentration in Fayoumi and R.I.R. hens before sexual maturity, one month and 6 months after laying

% of carbonate supplement	No. of hen	Fayoumi hens				R.I.R. hens			
		before sexual maturity	one month after laying	6 months after laying	before sexual maturity	one month after laying	6 months after laying		
		mg/100 ml	uterus activity	uterus activity	mg/100 ml	uterus activity	uterus activity	mg/100 ml	uterus activity
0 %	1	9.8	egg in M.	egg in U.	23.6	egg in U.	egg in U.	21.8	Active
	2	10.4	inactive	egg in U.	22.8	egg in U.	inactive	14.2	active
	3	10.3	inactive	inactive	26.2	active	inactive	13.4	inactive
	4	10.4	inactive	inactive	16.2	inactive	inactive	16.0	inactive
	Ave.	10.2							
2 %	5	11.2	egg in U.	egg in U.	24.2	egg in U.	egg in U.	23.6	egg in M&U
	6	11.0	egg in M.	egg in U.	23.8	egg in U.	egg in I.	23.8	egg in U.
	7	10.6	inactive	inactive	13.8	inactive	active	24.2	active
	8	10.4	inactive	inactive	14.0	inactive	inactive	14.2	active
	Ave.	10.8							
6 %	9	10.2	egg in U.	egg in U.	24.0	egg in U.	egg in U.	22.6	egg in U.
	10	11.2	egg in M.	egg in U.	25.2	egg in U.	egg in U.	23.4	egg in U.
	11	12.0	inactive	inactive	26.6	active	inactive	16.2	active
	12	12.2	inactive	inactive	27.2	active	inactive	14.4	active
	Ave.	11.4							

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تأثير مستوى الكالسيوم في العليقة على كالسيوم بلازما الدم في الدجاج

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استخدم في هذه الدراسة ٣٦ دجاجة من كل من الفيومي والرود ايلندرد عند عمر ٤ شهور وقد قسمت الى ثلاثة مجاميع متساوية في كل نوع . وكانت العليقة في المجموعة الاولى في كل نوع خالية من الكالسيوم الاضافى ، بينما احتوت الثانية على ٢٪ والثالثة على ٦٪ كربونات كالسيوم اضافى .

وقد اظهرت النتائج أنه قبل النضج الجنسى سببت العليقة المحتوية على ٦٪ كربونات كالسيوم اضافى أعلى معدل في تركيز كالسيوم الدم بينما سببت العليقة الخالية من الكالسيوم الاضافى أقل مستوى في كالسيوم الدم في كل من النوعين .

وقد ارتفعت معدلات كالسيوم الدم بعد النضج الجنسى بغض النظر عن النشاط التناسلى في الثلاثة مجموعات في كل نوع . وكانت الزيادة اكبر من الدجاجات النشطة عنها في الدجاجات غير النشطة . وقد اظهرت الدجاجات المحتوية على بيضة في فئاة المبيض زيادة اقل وخاصة في حالة وجود البيضة في الرحم وذلك بعد شهر وستة شهور من بدء وضع البيض . ويتعلق ذلك بعملية ترسيب الكالسيوم في قشرة البيضة . وقد اظهرت الدجاجات المحتوية على بيضة في الرحم التى تتناول عليه بها ٦٪ كربونات كالسيوم اضافى اعلى معدلات في الزيادة في الكالسيوم الدم عنها في مثيلاتها في المجموعات الاخرى وذلك في مرحلة وضع البيض . والدجاج الفيومي المحتوى على بيضه في الرحم اظهر ارتفاعا في معدل كالسيوم الدم عنه في الرود ايلند في كل مراحل الانتاج وفي كل المجموعات المتماثلة .