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الحالة الغذائية للدجاج تحت تأثير التحصين والعدوى  
١- التغذية ومرض النيوكاسل

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استخدم لاجراء هذه التجربة ١٠٠ كتكوت عمز يوم من سلالة دقى - ٤ وذلك لدراسة تأثير التحصين بالعدوى بالنيوكاسل على نسبة البروتين الكلى ، الكالسيوم ، الفسفور غير العضوى ، البوتاسيوم ، الصوديوم ، الكلوريد ، فيتامين أ والكاروتينات فى سيريوم الدم وكبد الكتاكيت . وقد تبين الآتى :-

( ١ ) لم يحدث تغيير معنوى فى نسبة المكونات السابق ذكرها نتيجة للتحصين فيما عدا نسبة البوتاسيوم والكاروتينات فى السيريوم التى نقصت معنويا بعد أربعة أيام من التحصين .

( ٢ ) ونتيجة للعدوى نقصت نسبة البروتين الكلى نقصا معنويا فى الكتاكيت غير المحصنة بعد ٤ أيام من العدوى بينما ارتفعت نسبة الكالسيوم فى السيريوم فى المجموعات الممحصنة وغير المحصنة بعد ٤ أيام وأسبوعين من العدوى وأيضاً ارتفعت نسبة البوتاسيوم فى السيريوم ارتفاعا معنويا فى الكتاكيت غير المحصنة بعد ٤ أيام من العدوى .

( ٣ ) وقد أدت العدوى بالنيوكاسل فى الكتاكيت الممحصنة الى زيادة نسبية فيتامين " أ " فى السيريوم زيادة معنويا بينما نقصت نسبة الكاروتينات نقصا حادا بعد أسبوعين من العدوى وفى الكبد ارتفعت محتوى الكبد من فيتامين " أ " ارتفاعا معنويا بعد ٤ أيام من العدوى فى الكتاكيت الغير محصنة .

THE NUTRITIONAL STATUS OF CHICKENS UNDER THE INFLUENCE OF VACCINATION  
AND CHALLENGE INFECTION

I- NUTRITION - NEWCASTLE DISEASE INTERRELATIONSHIPS  
(WITH 3 TABLES)

BY

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SUMMARY

One hundred one day-old Dikki-4 chicks, were used to study the effect of vaccination and challenge with Newcastle disease virus on the level of total protein, calcium, inorganic phosphorus, potassium, sodium and chloride in serum and vitamin A and total carotenoids in serum and liver.

1. The vaccinated birds showed no significant differences in the levels of total protein, inorganic phosphorus, calcium, sodium, chloride, and vitamin A in serum and vitamin A and total carotenoids in liver.
2. The potassium and total carotenoid levels in serum were significantly reduced 4 days postvaccination.
3. The total serum protein level was significantly reduced in the unvaccinated challenged birds 4 days postinoculation.
4. The serum calcium level was significantly elevated 4 days and 2 weeks in vaccinated and unvaccinated birds as a result of challenge with NDV.
5. Four days postinoculation serum potassium level was significantly increased in unvaccinated challenged birds.
6. Vitamin A level in serum increased significantly in vaccinated birds postinoculation while the total carotenoid level was sharply decreased in vaccinated group 2 weeks postinoculation. The vitamin A content in the liver of unvaccinated birds was significantly increased 4 days postinoculation.

INTRODUCTION

Studies in the field of animal nutrition has been mainly concerned with determining the nutritive requirement for different purposes, while a little attention has been given to the role that nutrition may have in the cause, control, or prevention of diseases.

In recent years, a number of studies have been carried out to investigate the metabolic consequences and biochemical changes induced by infections and the mechanism by which infection affects nutritional status.

KRAEZKOWSKI (1964) demonstrated that the total serum protein was not affected in chickens immunized against ND, but there was a decrease in serum albumin and increase in globulin fraction. Similar results were obtained by CLARK and FOSTER (1968), while TRUDY and NAUCHNO (1974) reported an increase in total blood protein in 5 months old fowls immunized by the airborne route with a mixture of live, avirulent pasteurized vaccine and the B strain of NDV.

Total serum proteins were found to be significantly reduced in chickens of different ages and sexes infected with Newcastle disease (ND) (SQUIBB ET AL., 1955), as well as in experimental and spontaneous ND infection carried out by KRAEZKOWSKI (1964), CLARK and FOSTER (1968) and TRUDY and NAUCHNO (1974). RIVETZ ET AL. (1977) described the biochemical changes in fowl serum protein during infection with strains of Newcastle disease virus (NDV) of different virulence. They found that the total protein and albumin fraction decreased in velogenic infection.

Concerning the effect of infection on vitamin status SQUIBB ET AL. (1955) and SQUIBB ET AL. (1971) reported a decrease in total carotenoids of blood serum as a result of NDV infection. However, these observations have not been confirmed by other workers (PEREIRA and BEGUM, 1968). GARTNER and RYLEY (1956) and SQUIBB (1961) observed no correlation between vitamin A reserves in the liver and specific diseases, during their studies on vitamin A reserves in fowl and its relation to disease.

As to the effect of infection on mineral status, it was generally found that the hemolytic action of NDV results in release of large amounts of potassium with subsequent elevation of serum potassium level in chickens (KLEMPERER, 1960; EL-SHAIR, 1972). On the other hand, RIVETZ ET AL. (1977) reported reduced potassium levels in serum of chickens infected with NDV, while there was no effect on the level of calcium, magnesium and sodium after infection.

The present work was planned to study the effect of vaccination and challenge with NDV on the level of some nutrients (Proteins, calcium, phosphorus, sodium, potassium, chlorides, vitamin A and total carotenoids) in the blood sera of chickens and vitamin A and total carotenoid content in the liver. Newcastle disease was chosen as representative of viral disease.

#### MATERIALS AND METHODS

One hundred, day-old, Dokki-4 chicks were used in this experiment. On the third day of age, all chicks were vaccinated against Newcastle disease with eye-drop vaccine.

Both feed and water were supplied ad-lib. throughout the experiment. The chicks were feed on a commercial diet contained the following composition:

TABLE (1)

The average composition\* of the commercial diet offered to the chickens

	%
Moisture	11.67
Dry matter	88.33
Crude protein	20.26
Ether extract	6.27
Crude fiber	2.93
Nitrogen free extract	51.99
Ash	6.54
Calcium	1.18
Phosphorus	1.02
Metabolizable Energy Mc 1/Kg.	3.1

\* Calculated according to McDONALD ET AL. (1973).

At 9 weeks of age 40 Dokki-4 chicks were isolated as control group while the other 60 birds were vaccinated intramuscularly with Kowmorov vaccinal strain (1.0 ml for each chick). At 11 weeks of age, 20 birds from the unvaccinated and 30 birds from the vaccinated group were inoculated with velogenic viscerotropic NDV (0.5 ml = about 50,000 virus particles in the suspension/ bird).

Blood samples were collected from the birds pre - and one week post - vaccination (10 weeks of age), as well as before inoculation, one and two weeks after inoculation for chemical analysis.

Random birds were slaughtered and their livers were removed for determination of vitamin A content.

#### Chemical analysis:

For determining the levels of the various nutrients in serum the following methods were used: the biuret method after WOLFSON (1948) for determination of total serum proteins; BAUER ET AL. method (1962) for inorganic phosphorus; WHITEHORN method (1921) for chlorides; and the method of BARON and BELL (1957) for the determination of serum calcium. Sodium and potassium levels were determined by flamephotometer. The estimation of carotenoids and vitamin A in blood was carried out according to the method of KIMBLE (1939) modified by YUDKIN (1941).

The method of PETT and LEPAGE (1940) was used for determining the vitamin A content in the liver.

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## RESULTS

Results are presented in Tables 2 & 3.

## DISCUSSION

From the results obtained in Table 2 one may notice that the total serum protein level was not affected by vaccination. Similar results were obtained by KRAEZKOWSKI (1964) and CLARK and FOSTER (1969), while TRUDY and NAUCHNO (1974) reported an increase in the total blood protein. At the same time, the challenged unvaccinated birds showed a significant decrease in total serum protein (Table 3), a result which is similar to that recorded by SQUIBB ET AL. (1955), KRAEZKOWSKI (1964), and RIVETZ ET AL. (1977).

While the vaccination with NDV had no significant effect on the calcium and inorganic phosphorus serum levels, the serum calcium was significantly increased 4 days after inoculation. However, RIVETZ ET AL. (1977) found no effect on serum calcium level in chickens inoculated with NDV.

Regarding the serum potassium level, a decrease in serum potassium was found 4 days postvaccination (Table 2). Inoculation of unvaccinated birds with NDV was consistently associated with a rise in serum potassium levels. Our findings confirm earlier work by KLEMPERER (1960) and EL-SHAIR (1972) showing an elevation of serum potassium level in infected chickens as a result of the haemolytic action of NDV.

The sodium and chloride levels in the serum of chickens were nonsignificantly affected as a result of vaccination and challenge (Table 2, 3). Also, RIVETZ ET AL. (1977) found no correlation between sodium level in the serum and NDV infection.

In the present investigation, the vaccination against ND caused a significant decrease in the total carotenoid level in serum. The challenge with NDV caused a nonsignificant decrease in vitamin A and total carotenoid levels in serum of unvaccinated birds. Similar results have been reported by SQUIBB ET AL. (1955) and SQUIBB ET AL. (1971), who attributed the lowered carotenoid level in serum to the reduction in feed intake in unvaccinated birds as a result of infection. However, this result concerning vitamin A has not been proved by PEREIRA and BEGUM (1968).

In the liver, the observation made on the effect of challenge on vitamin A content showed a significant increase (Table 3), however, GARTNER and RYLEY (1956) and SQUIBB (1961) recorded no correlation between vitamin A reserves in the liver and specific diseases in fowls.

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**Table (2) :** The effect of vaccination on the levels of the nutrients in the blood sera and livers of chickens (average values)

Nutrient	Before vaccination	4 days postvaccination.	2 weeks postvaccination.
Total serum protein g protein/100 ml serum	3.79 ± 0.42	3.67 ± 0.062	4.53 ± 1.11
Inorganic phosphorus mg P/100 ml serum	7.37 ± 0.97	6.47 ± 0.419	9.76 ± 1.42
Calcium mg Ca/100 ml serum	9.84 ± 1.481	8.49 ± 0.62	6.93 ± 0.115
Potassium meq K/L serum	4.48 ± 0.73	3.53 ± 0.30	4.43 ± 1.123
Sodium meq Na/L serum	139.14 ± 9.57	143.16 ± 3.88	142.5 ± 19.2
Chloride mg Cl/100 serum	442.77 ± 5.06	442.33 ± 2.516	450 ± 20
Vitamin A I.U. vitamin A/100 ml serum	438.06 ± 112.87	608.9 ± 148.13	512.29 ± 107.45
" " /100 g liver	98.58 ± 44.75		277.25 ± 292.78
µg carotenoids/100 ml serum	286.17 ± 54.84	165.87 ± 37.99	205.32 ± 62.20
" " / g liver	3.05 ± 1.82		2.24 ± 1.30

± Standard deviation

≡ Significant at P 0.05

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Table (3) The effect of challenge on the levels of the nutrients in the blood sera and livers of chickens (average values)

Nutrient	Not vaccinated			Vaccinated		
	Before inoculation	4 days post-inoculation	2 weeks post-inoculation	Before inoculation	4 days post-inoculation	2 weeks post-inoculation
Total serum protein g protein/100 ml serum	5.6 ± 0.61	3.7 ± 0.85	EE	4.53 ± 1.11	4.49 ± 0.73	4.8 ± 1.3
Inorganic phosphorus mg P/100 ml serum	7.37 ± 0.97	5.49 ± 1.63	EE	9.76 ± 1.42	7.22 ± 2.34	6.43 ± 1.32
Calcium mg Ca/100 ml serum	7.73 ± 0.46	10.41 ± 1.53	EE	6.93 ± 0.11	10.33 ± 2.25	9.5 ± 0.38
Potassium meq K/L serum	3.76 ± 0.55	5.54 ± 1.63	EE	4.43 ± 1.12	3.4 ± 0.2	4.48 ± 0.72
Sodium meq Na/L serum	128.0 ± 13.1	155.9 ± 32.4	EE	142.5 ± 19.2	141.0 ± 12.75	153.0 ± 23.46
Chloride mg Cl/100 ml serum	411.66 ± 54.8	303.0 ± 110.46	EE	450.0 ± 20.0	420.0 ± 52.9	474.16 ± 15.30
Vitamin A I.U. vitamin A/100 ml serum	461.94 ± 63.72	346.9 ± 162.59	EE	512.29 ± 107.45	639.85 ± 272.9	944.92 ± 141.88
" " /g liver	121.48 ± 74.59	128.15 ± 456.36	EE	277.25 ± 292.8		903.14 ± 823.16
Carotenoids μg Carotenoids/100 ml serum	261.29 ± 65.84	183.47 ± 51.39	EE	205.32 ± 62.2	323.5 ± 65.8	64.66 ± 41.67
" " /g liver	2.98 ± 2.3	2.59 ± 1.48	EE	2.24 ± 1.3		2.23 ± 0.46

± Standard Deviation

EE Significant at P 0.05

° Significant at P 0.01 and P 0.05

EE The unvaccinated challenged birds died during the first week post-inoculation