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Iron Metabolism in Duck and Turkey *

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In 16 ducks and 12 turkeys the plasma iron turnover with Fe^{59} has been determined.

The Fe^{59} globular apparition and its presence in the eggs has also been analyzed.

A great turnover increase in laying females has been observed. These results agreed with our previous studies in the fowl and that would allow to consider it as a comun feature in birds.

The plasma iron clearance and the T 1/2 values in these species are about the same observed in fowl but here a direct take up of iron from the transferrin hy means of reticulocytes has been found.

The reappearance curve of Fe^{59} in blood cells records an inflexion point that could be assigned to the erythrocyte life span. We consider as approximative a mean live span of 25 and 45 days for erythrocytes of turkey and duck respectively.

The egg radioactivity shows a maximum between the 5th and the 10th day and then another one according to the Fe^{59} liberation from blood cell destruction.

Studies of iron metabolism on the hen (3) have shown a clear difference from mammals as for the clearance rate, turnover and the erythrocyte Fe^{59} apparition.

In the present paper we give the results obtained on two other birds species: duck and turkey, with the purpose to appreciate if there exists a similar feature from the one which has been observed in the domestic fowl.

Materials and Methods

We have studied 16 ducks (8 Barberia race, 4 males and 4 females; 8 Khaki-Campbell laying females) and 12 white turkeys (7 males and 5 females).

The turkeys remained 4-6 months in our laboratory and were examined on two different occasions. That allowed us to analyze the females on both a non-laying and a laying state.

The same procedure as described a preceding paper (3) has been followed. Ferric citrate (Fe^{59}) in dosis 1-4 μc/kg body weight has been incorporated to

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1-3 ml homologues plasma known iron binding capacity.

Blood samples at 3, 15, 30, 60, 120 and 180 minutes and at 8, 24 and 48 hours from the radio-iron administration were obtained. During 3-4 months the blood samples were obtained weekly and the radioactivity was analyzed in blood and plasma.

The radioactivity in a same volumen (1 ml) of blood and plasma in a well-type scintillation Philips apparatus (PW 4119 and PW 4038) was measured.

Plasma iron and the total iron binding capacity were determined by RAMSAY's methods (4, 5).

The plasma iron turnover expressed as μg Fe/100 ml blood/24 hours has been calculated according to BOTHWELL and FINCH (1).

The Fe^{59} contents in eggs has been determined in the whole egg with the same Philips apparatus.

Results

In Table I are the results obtained in ducks and turkeys with expresion of the plasma iron, turnover and T 1/2 values in males and females (laying and non-laying hens).

Discussion

In these species the plasma iron turnover is similar as in fowl where we have found (3) values from 2,880 to 2,939 μg Fe/100 ml/24 h in males and non-laying females, against 5,532$\pm$2.167 μg Fe/100 ml/24 h in laying hens. The same we have obtained now in laying state of ducks (6,620$\pm$1,300 μg Fe/100 ml/24 h) and turkeys (4,897$\pm$995 μg Fe/100 ml/24 h) (Table I).

The turnover increase is a consequence of higher plasma iron values, although the clearance rate become slower and the T 1/2 values longer.

In fowl the T 1/2 was in young hens 22$\pm$5 minutes and during the laying period passed to 66$\pm$21 minutes. A variation in this direction has been also onserved in the present study in other birds (Table I).

An inflexion point in the clearance curve near the 60th minutes point could be seen in turkeys and in fowls as well. This could mean a multiexponential rate too. The ducks, on the contrary, show a single clearance line during the whole of the experimental period (180 minutes).

The Fe^{59} blood disappearance is faster in these species (Table II) where in the 8 hours there are practically no radio-

Table I. *Plasma iron and plasma iron turnover values ($m\pm\sigma$) In ducks and turkeys.* In parenthesis are expressed the number of determinations. NL = non laying. L = laying.

Species	N.º specimen	Plasma Iron μg Fe/100 ml	Plasma Iron turnover μg Fe/100 ml blood 24 h.	T 1/2 minutes
Duck				
♂	4 (8)	192$\pm$35	2.177$\pm$680	51$\pm$12
♀ NL	4	187$\pm$14	3.265$\pm$1.180	33$\pm$9
♀ L	8	660$\pm$140	6.620$\pm$1.300	70$\pm$12
Turkey				
♂	7 (12)	175$\pm$39	2.720$\pm$897	40$\pm$15
♀ NL	5	127$\pm$17	2.459$\pm$367	33$\pm$6
♀ L	4	741$\pm$299	4.897$\pm$995	96$\pm$28

Table II. *Blood and plasma radioactivity (% of radioiron injected) (m±σ) at different times from the Fe^{59} administration.*

Species	N.° specimens	Radioactivity (%)					
		8 h.		24 h.		48 h.	
		Blood	Plasma	Blood	Plasma	Blood	Plasma
Turkeys	12	6±3	2±1	15±7	1±1	37±11	0
Ducks	6	14±5	0.5±0.5	26±5	0	57±7	0
Fowl	7	8±5	9±3	7±5	1±0,5	26±10	0

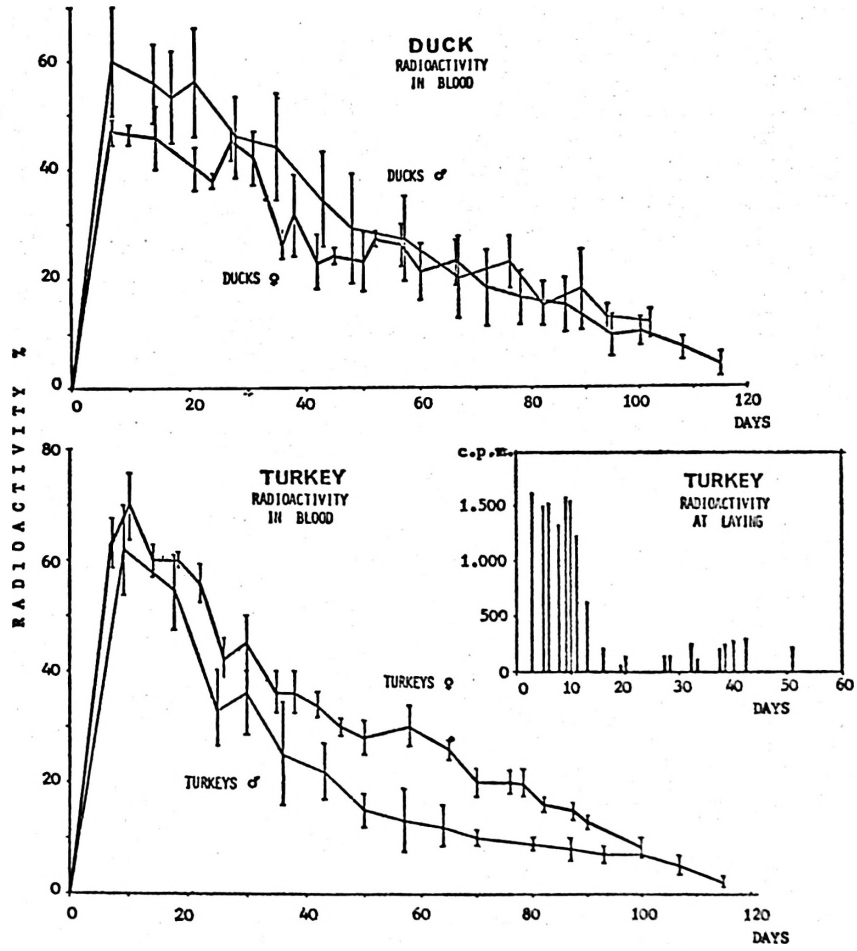

Fig. 1. *Evolution in the radioactivity present in the blood ducks and turkeys after the endovenous injections of ferric citrate (Fe^{59}) previously added to an volume of plasma corresponding to the same animal.*
In turkey is shown, equally, the radioactivity at laying.

iron in plasma. On the other hand, the blood cells, specially in ducks, take up Fe^{59} more quickly, as they where even evident in the 60th and the 120th minutes blood samples.

The Fe^{59} presence in the erythrocytes must be considered as a direct take up from the plasma transferrin-iron by the reticulocytes. This peculiarity has been pointed out in ducks by KLEIN (2) and now we have been able to verify this fact and extent it to the turkey. In the fowl this characteristic is not to be found and 48 hours had to pass before the appearance of Fe^{59} in blood cells but after a period without any plasma radioactivity.

In Fig. 1 the blood cell Fe^{59} appearation showed a maximum on about the 10th day since the injection and then decreased with an inflexion point about the 25th day in the turkey and between 35-45th day in the ducks. These points are the consequence of the erythrocyte life span of two species. KLEIN (2) has determined for the duck erythrocytes a life span of 40 days and we have found in fowl (3) a means of 25-30 days.

The blood radioactivity after 110-120 days was 5-8 %, near to the values observed in fowl.

The egg radioactivity (Fig. 1) shows a maximum on the first days (4-10th days) and then one other maximal value after the blood cell life span. In these species we have observed the same as in hens (3) as for plasma iron level and egg iron concentration, since the oviduct must take up the iron proceeding from the erythrocyte destruction.

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