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Iron Transport Capacity in the Serum of Fowl

Iron transport in the serum of this species offers a different behavior from mammal serum, since the *in vitro* capacity is higher than theoretical estimate (3). Our working hypothesis, suggested in the first studies (4) is that the presence of conalbumin in the serum of birds would be an auxiliary mechanism of transferrin.

In this present paper we are studying the variation of the transport capacity in one batch of cocks and hens at different times. In each specimen, the serum iron has been determined along with the total iron binding capacity according to RAMSAY'S methods (5, 6), using 0.5 ml of plasma and taking the readings in microcells of a *Spectronic 20* photocolorimeter. Likewise, in each serum, the unsatured iron binding capacity has been determined according to BOTHWELL'S *et al.* method (1) with the use of Fe^{59}, having adjusted the technique to a plasma volume of 0.25 ml.

The *in vitro* studies have been performed by adding to 0.25 ml of plasma increasing amounts of a labeled iron solution (0.05; 0.1; 0.15; 0.2 ml) equivalent to iron additions of 62, 125, 250, 375 and 500 μg/100 ml plasma. The final volumen is filled up with distilled water. The labeled iron mother solution was obtained according to WALLENIUS and WASCHEWSKY (8) in such a way that each 0.2 ml contain 1.25 μg Fe.

The plasma sample and the labeled iron solution are left in contact for 15 minutes. After this period 2 ml of a satured iron free ammonium sulphate solution are added and the proteins are left to precipitate for 24 hours. The mixture is filtered and 1 ml of the filtrate is taken and the radioactivity is measured with a well type scintillation counter. The counts per minute obtained from each specimen are compared daily with the radioactivity of 1 ml of a standard prepared with 0.2 ml radioactive iron solution (equivalent to 500 μg/100 ml) and 2.05 ml of destilled water. The number of counts of the standard has varied in different preparations between 2500 and 4000 c.p.m.

The studies on the variation of serum iron (SI), total iron binding capacity (TIBC), unsaturated iron binding capacity (UIBC) and the *in vitro* transport capacity for iron overloads have been performed on a bath of 5 males and 24 hens of the same age (about 4 months at the beginning of the experiment). Blood samples were taken approximately once a month over a period of 5 months. Within this period the hens had started their laying period and in this way it was possible to follow the changes occurring in the serum iron in the same specimen. One again it has been possible to see how the serum iron in laying hens increases considerably just as the TIBC values also increases, albet more slowly and without bearing any proportion to the serum iron (Table I). With Ramsay's methods, there is a repetition of the incongruency appreciated in other papers in that the serum iron produces higher values than TIBC ones (3, 4). The UIBC values, according to the method of BOTHWELL *et al.* (1) gives positives values in laying hens whilst they are nil according to the data obtained with RAMSAY'S methods (5, 6) or with

TABLE I

Serum iron (SI), total iron binding capacity (TIBC), unsaturated iron binding capacity (UIBC) and data *In vitro* fixation of iron in the serum of laying (L) and non-laying hens (NL) and cocks. The data correspond of media values with the standard deviation. In parenthesis number of specimens.

Lot	SI µg Iron (%)	TIBC µg Iron (%)	UIBC * µg Iron (%)	µg free Iron/100 ml. serum — µg Iron added/100 ml. serum				
				62	125	250	375	500
*Hens***								
I NL (24)	143 ± 53	—	102 ± 24	26 ± 14	71 ± 21	176 ± 28	283 ± 25	377 ± 36
II NL (17)	196 ± 65	221 ± 99	61 ± 18	46 ± 29	101 ± 37	173 ± 35	242 ± 41	327 ± 39
III NL (13)	188 ± 87	201 ± 64	73 ± 18	26 ± 20	70 ± 20	148 ± 17	210 ± 35	274 ± 40
III L (7)	549 ± 155	535 ± 53	62 ± 18	24 ± 12	54 ± 19	129 ± 37	185 ± 57	248 ± 55
IV L (16)	674 ± 136	360 ± 87	39 ± 12	29 ± 9	63 ± 16	104 ± 22	142 ± 24	189 ± 31
V L (15)	601 ± 167	402 ± 68	172 ± 41	9 ± 7	30 ± 6	57 ± 10	90 ± 23	125 ± 15
VI L (7)	532 ± 198	352 ± 71	67 ± 36	2 ± 1	8 ± 5	19 ± 6	38 ± 9	65 ± 13
Cocks								
I (5)	130 ± 20	—	113 ± 35	24 ± 11	60 ± 10	174 ± 37	275 ± 14	375 ± 16
II (4)	271 ± 63	289 ± 39	56 ± 15	29 ± 16	75 ± 18	163 ± 46	256 ± 60	332 ± 65
III (4)	197 ± 33	275 ± 29	21 ± 10	23 ± 9	64 ± 18	119 ± 6	183 ± 23	237 ± 33
IV (4)	266 ± 79	343 ± 54	140 ± 11	16 ± 0	35 ± 2	58 ± 9	84 ± 10	117 ± 14

* Data obtained following Bothwells's method.

** Blood extraction date. Hens: I, 22th March; II, 5th April; III, 25th April; IV, 15th May; V, 6th June; VI, 22th June. Cocks: I, 22th March; II, 25th April; III, 15th May; IV, 6th June.

other photocolorimetric or spectrophotometric direct techniques (7).

The *in vitro* values appear higher in each lot of birds as correspond to its UIBC data. We think that the protein precipitation with ammonium sulphate could split some radioactive iron bound to the protein.

There is an obvious increase in the serum fixation capacity *in vitro* in hens, when on the other hand, the following is observed: a) a slow increase in the TIBC values; b) oscillation of the UIBC values around a low average value or a tendency to give nil values, according to the evaluation method used: and, c) a considerable increase in the serum iron. In cocks some results are observed which are parallel to the hens.

The age seems to be a decesive factor in the variation of the serum fixation capacity, although in terms of age equality, it is always lower in the male birds, as also in hens which are not in laying in comparison with laying birds.

It has been appreciated in this specie (2) that the conalbumin content in the serum increases with the age and in the hens is higher, specially during the laying period.

It is hope that the *in vivo* experiments currently in progress with Fe^{59} will show us the differential physiological characteristics of the iron metabolism between sexes and the laying state.

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