

Plasma Iron and Copper in Laying Hens

J. L. Latorre, J. M.* Recio and J. Planas *

Departamento de Biología
Facultad de Ciencias
Universidad de Valladolid
Valladolid (España)

(Received on December 9, 1971)

J. L. LATORRE, J. M.* RECIO and J. PLANAS. *Plasma Iron and Copper in Laying Hens*. R. esp. Fisiol., 28, 65-68. 1972.

Plasma iron and copper has been determined by atomic absorption in 50 laying hens of different percentage of eggs production.

These values are increased during the laying period but their levels are independent from the egg laying frequency.

The concentration in these metals in the eggs (yolk and white) has been also determined and a significant correlation between them has been shown. A clear decrease of iron in yolk has been observed in the group of hens with the highest laying activity.

A significative correlation has been found between plasma iron and copper in different mammals and birds (3). In a first report one of us (1) has observed how the increased values during the laying period conserved the same correlation.

In the present paper we analized the plasma iron and copper in hens with a controlled egg production to study if these values present any relation to the frequency of laying.

Materials and Methods

A group of 50 hens (Hy-line race) two and half years old and which have been

laying for two years has been studied. The hens were occupying individual cages and during 28 days the eggs were controlled daily. Then, the hens were grouped according to the percentage of egg production.

Blood extraction from alar vein were obtained with heparinized syringe after 10-12 hours fasting.

The plasma iron and copper values were determined by atomic absorption with an acetilen/air flame Evans electro-selenium apparatus Mod. 240 as an adaptation of the SPRAGUE and SLAVIAN (9) method. The standard solutions were prepared from the Titrisol* (Merck).

The plasma determination appeared to be more exact by a direct plasma assay.

Iron and copper contents in eggs have been determined after the digestion with acids (2).

* Departamento de Fisiología Animal. Facultad de Ciencias. Universidad. Barcelona (7).

Table 1. *Plasma iron and copper in laying hens.*
Mean \pm σ .

Egg production %	N.º	$\mu\text{g Fe } \%$	$\mu\text{g Cu } \%$	Correlations Fe/Cu
0	6	418 \pm 192	56.5 \pm 7	r=0.91 t=7.893 p<0.01
10-15	4	642 \pm 154	44.5 \pm 8	r=0.99 t=11.621 p<0.01
30-35	3	482 \pm 131	50 \pm 4	r=0.98 t=6.2335 p<0.02
35-40	5	580 \pm 69	51.6 \pm 9	r=0.54 t=1.119 p<0.30
40-45	3	651 \pm 164	53 \pm 9	r=0.54 t=0.638 p<0.50
45-50	4	670 \pm 105	56.5 \pm 14	r=0.62 t=1.117 p<0.30
50-55	9	627 \pm 102	48 \pm 8	r=0.46 t=1.346 p<0.30
55-60	5	744 \pm 144	61 \pm 26	r=0.82 t=2.429 p<0.10
60-65	8	563 \pm 109	55 \pm 8	r=0.46 t=1.260 p<0.30
65-70	3	715 \pm 101	51 \pm 2	r=0.99 t=7.651 p<0.10
Mean	50	626 \pm 127	52 \pm 14	r=0.53 t=3.989 p<0.001

Table II. Iron and copper content in eggs (yolk and with egg) from hens separated in groups of different egg production (%).

Mean \pm σ .

Hens group Egg production %	N. eggs	YOLK			WHITE		
		mg Fe/100 g	mg Cu/100 g	Correlations	mg Fe/100 g	mg Cu/100 g	Correlations
30-40	5	6.14 \pm 1.8	0.27 \pm 0.048	r=0.775 t=1.943 p<0.20	2.44 \pm 0.6	0.16 \pm 0.03	r=0.54 t=1.92 p<0.20
40-49	4	7.88 \pm 2.5	0.35 \pm 0.052	r=0.92 t=2.322 p<0.20	2.50 \pm 0.5	0.18 \pm 0.03	r=0.77 t=2.984 p<0.10
50-59	3	7.55 \pm 0.69	0.28 \pm 0.03	r=0.99 t=6.432 p<0.10	4.35 \pm 1.5	0.19 \pm 0.01	r=0.98 t=12.831 p<0.05
60-70	4	5.23 \pm 1.8	0.30 \pm 0.07	r=0.97 t=6.322 p<0.05	2.49 \pm 0.4	0.17 \pm 0.02	r=0.99 t=2.954 p<0.10
Mean	17	6.45 \pm 1.7	0.29 \pm 0.06	r=0.75 t=4.05 p<0.001	3.18 \pm 1.1	0.17 \pm 0.02	r=0.31 t=1.349 p<0.20

Results

In Table I and II the iron and copper values in plasma and eggs can be found. The correlation between these elements have been estimated in each group and in total. The yolk and white egg contents in these elements have also been considered and a positive correlation is shown between them.

Discussion

A plasma iron increase was observed in the laying hen by RAMSAY and CAMPBELL (7) and later by us (5). This increase was also observed in other species (6). The same estrogenic effect is also known in mammals on the plasma copper level (8).

The estrogen administration in immature hens produces the double increase in both, plasma iron and copper, as it has been found in the laying period (1). But in the

present paper we have appreciated that the different laying frequency does not produce a significant variation in the plasma levels of these constituents. On the other hand, a decrease in the iron contents in the eggs from the hens with the highest laying frequency is shown (Table II). A significant correlation iron/copper in the yolk is found too.

The plasma iron turnover goes up a 100 % in the laying period (4). With the present results we could suppose that there exists a different turnover according to the supply of the necessary amount of iron for egg production without any variation in the plasma iron level. Further research will follow in this line to know more about the iron metabolism in birds.

References

1. BALASCH, J., BRASÓ, A. and PLANAS, J.: *Actas Soc. Esp. C. Fisiol.* Santiago, 1970, 353-6.

2. DREYFUS, J. and SCHAPIRA, G.: *Le Fer., L'Expantion*, Paris, 1958.
3. PLANAS, J. and BALASCH, J.: *R. esp. Fisiol.*, **26**, 91, 1970.
4. PLANAS, J. and BALASCH, J.: *R. esp. Fisiol.*, **26**, 307, 1970.
5. PLANAS, J. and CASTRO, S.: *R. esp. Fisiol.*, **16**, 197, 1960.
6. PLANAS, J., CASTRO, S. and RECIO, J. M.^a: *Nature* (Lond.), **189**, 668, 1961.
7. RAMSAY, W. N. M. and CAMPBELL, E. A.: *Biochem. J.*, **58**, 313, 1954.
8. RUSS, E. M. and RAYMUNT, J.: *Proc. Soc. Exp. Biol. Med.*, **92**, 456, 1956.
9. SPRAGUE, S. and SLAVIN, W.: *Atomic Absorption Newsletter*, **4**, 228, 1965.