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Glutathione Concentration of White Leghorn and Barred Plymouth Rock Embryos After Fourteen Days of Incubation.*

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Rhode Island Red embryos, destined to develop into adults of comparatively large size, proliferate cells at a faster rate than White Leghorn embryos, destined to develop into adults of comparatively small size.[1] It is known that glutathione (sulphydryl) stimulates cell proliferation, and that rapidly growing rats and rabbits have a greater concentration of glutathione in their body tissues than less rapidly growing controls.[2-3] Furthermore, fasted new-born rabbits which are destined to develop into large adults have a greater concentration of glutathione than those destined to develop into small adults.[4]

The following experiment was performed in order to determine the glutathione concentration of White Leghorn and Barred Plymouth Rock embryos, and to ascertain whether or not a difference in concentration exists between the two breeds. Most of the Leghorns, and all of the Barred Plymouth Rocks used in the experiment were descendants of the stocks used by Asmundson and Lerner in studies on the inheritance of adult body size. It was definitely known that the Rocks had a significantly greater post-hatching growth rate than the Leghorns.[5]

The range of adult weights of the Leghorn hens used for the production of eggs in the first experiment was from 1418 to 2250 gm., with a mean weight of 1814, and of the Barred Plymouth Rocks, 2481 to 3143 gm., with a mean weight of 2881. There was a considerable variation in the weight of the Leghorn sires, the range extending from 1940 to 2915 gm. with a mean of 2385. The only Rock male used weighed 3669 gm.

In the second experiment the Leghorns used for the production of eggs were more carefully selected for uniformity of adult size.

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1 Blunn, C. T., and Gregory, P. W., *J. Exp. Zool.* (in press).

2 Gregory, P. W., and Goss, Harold, *J. Exp. Zool.*, 1934, **69**, 13.

3 Goss, Harold, and Gregory, P. W., *J. Exp. Zool.* (in press).

4 Gregory, P. W., and Goss, Harold, *J. Exp. Zool.*, 1933, **66**, 155.

5 Asmundson, V. S., and Lerner, I. Michael, *Poultry Science*, 1934, **13**, 348.

The weight of the females ranged from 1480 to 2130 gm., with a mean of 1703. The Leghorn males varied from 1550 to 1860 gm., with a mean of 1725. The Rock females varied from 2340 to 3220 gm., with a mean of 2698, while the Rock males varied from 3500 to 4150 gm., with a mean of 3841.

The eggs from which the embryos were obtained were selected in pairs on the basis of weight, one Leghorn and one Rock constituted a pair. Most of the eggs were paired within 0.2 gm. However, in a few cases the difference between the weights of the eggs paired was slightly greater. The paired eggs were incubated in the same incubator at the same time, and the glutathione determination of the embryo was made after 14 days of incubation. The general method of analysis has been described.[2, 6] The data were analyzed by Fisher's method of pairing. Table I contains the summarized results.

TABLE I.
Summary of Glutathione Concentration of Barred Plymouth Rock and White Leghorn Embryos Analyzed after 14 Days of Incubation.

Exp. No.		Pairs	Mean GSH mg./100 gm. Rocks	Mean GSH mg./100 gm. Leghorns	Value of t	t value necessary to be highly significant
1	Spring, 1934	40	48.7	46.4	2.594	2.576
2	Fall and winter 1934-35	25	44.7	40.0	3.265	2.787
1 and 2 combined		65	47.2	43.9	4.055	2.576

The Leghorns used in Experiment 1 were rather variable so far as adult size is concerned, but the mean GSH concentration of the Rock embryos was significantly greater than that of the Leghorns. The Leghorns of Experiment 2 had been inbred with selection for weight. As a result the adult size of the females and especially of the males was less than that of the Leghorns used in the first experiment. The Rocks used in the second experiment were descendants of the birds used in Experiment 1. The results of Experiment 2 emphatically confirm the observations of the first experiment, that the embryos of the larger breed have a greater concentration of GSH than those of the smaller. When the data of Experiments 1 and 2 are combined, the results are most significant.

The glutathione values are positively correlated with the rate of cell proliferation at 14 days of incubation. It is also correlated with the post-hatching growth rates and adult weights.

[6] Goss, Harold, and Gregory, P. W., PROC. SOC. EXP. BIOL. AND MED., 1935, **32**, 681.