

Thymus Extirpation in the Laying Hen.

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In an endeavor to test the claims of Soli¹ that extirpation of the thymus gland of the laying fowl leads to the total temporary suppression of shells on eggs laid subsequently, this gland was removed from 3 one-year-old, actively laying, pure-bred Brown Leghorn hens which had been carefully trap-nested since the onset of the laying period. All 3 birds laid in the morning of the day their thymus glands were removed. Recovery was uneventful but the immediate effect was a temporary cessation of egg laying. One bird (No. 29) recommenced laying 10 days later while the other 2 (Nos. 39 and 94) started again 15 days after the operation. All laid regularly thereafter until killed 8 to 9 weeks later.

The eggs laid in the postoperative period were, with one exception, normal in respect to size and shell thickness. The one exception was provided by No. 29 which laid a small egg 61 days after the date of operation. Since this bird produced 2 small eggs within a few weeks immediately preceding the removal of the thymus the small egg subsequently laid is not definitely attributable to the effect of the removal of the gland.

Soli reported that 15 or 20 days following this operation the fowl's calcium metabolism becomes deranged, and that this was indicated by the production of eggs in which the shell was either totally or partially suppressed; after another short period (at about 40 days) there was a return to a normal calcium metabolism and the production of eggs with normal shells.

Determination of blood calcium of experimental and control females was made by Professor F. B. Hutt* to whom our thanks are due for the data of Table I. Fourteen control females upon which determinations of blood calcium were made during the same period showed an average calcium content of 18.65 mg. per 100 cc. of serum. In spite of the fact that these measurements were made at a time when (on the basis of Soli's experiments) the greatest effect following deprivation of the thymus was to be expected, the

¹ Soli, U., *Pathologica, Rev. quindic. (Genova)*, 1911 **3**, 118.

* Professor Hutt, now of the University of Minnesota, was at the time of this experiment, in the Animal Breeding Research Department of the University of Edinburgh.

TABLE I.

Number of Bird	Days Postoperative	Amount of calcium in mg. per 100 cc. serum
29	17	25.70
	28	22.45
39	18	29.55
	29	28.40
94	15	24.85
	26	26.60

operated birds in this period showed a somewhat higher blood calcium content than did the normal laying hens.

The thymectomized birds were killed at the conclusion of the experiment and the neck region carefully examined for persistent nodules of thymus tissue. In No. 94 the operation was apparently successful in that no persistent tissue was present. In 2 birds (Nos. 29 and 39) a tiny fragment of thymus was found anterior to the thyroid; additional fragments of tissue from the post-thyroid region also proved, on histological examination, to be thymus. At the time of killing these 2 birds possessed a total of 0.095 and 0.030 gm. of thymus tissue, respectively; an average of 0.592 gm. of thymus was obtained from a series of 12 normal females of the same age group.

The frequent occurrence of thymus tissue near and posterior to the thyroid was further indicated by a careful study of the 12 control birds, all but 2 of which showed definite amounts of typical tissue in this region. The distribution of this tissue is somewhat variable; besides being present within the capsule of either one or both thyroid lobes (and penetrating into the substance of the gland) in 3 cases it was found closely apposed but external to the capsule—extending around the posterior end of the thyroid and coming to lie between it and the parathyroid gland. Terni^{2, 3} has reported “thymus-like tissue” within the 2 post-branchial bodies of the fowl. The results obtained from both the experimental and the normal birds indicate that removal of the thymus lobes as far down as the thyroid gland would result in a completely thymectomized bird only in isolated cases.

The data recorded here show that removal of the thymus gland in the hen led neither to the lowering of the calcium content of the blood nor to the production of eggs deficient in shell or egg membranes. Since the operation could be said to be completely success-

² Terni, T., *Arch. Ital. di Anat. e di Embriol.*, 1927, **24**.

³ Terni, T., *Atti Reale Ist Ven. di Sci., let. ed arti*, 1928, **87**, 197.

ful in only one of the birds it might be argued that the evidence presented here is not sufficiently strong to counterbalance Soli's positive results. For the 4 comparable cases quoted by Soli a post-mortem examination was made on only one bird; complete removal was reported. It is perhaps significant that this operated bird again began to produce eggs with normal shells when calcium salts were added to the diet.

We have also thymectomized 9 immature fowls, which subsequently produced eggs with wholly normal shells. This same result has been previously reported for such fowls by Ackert and Morris⁴ and more fully by Morgan and Grierson.⁵ Riddle and Krizenecky⁶ have reported a similar result from thymectomized and bursectomized immature pigeons; they advance the view that even if all of the true thymus is extirpated there still remains in the body much lymphoid tissue possessing thymus function.

It has been shown that in our stock of birds, owing to the occurrence of post-thyroid fragments of thymus tissue in the majority of cases, an operation for the removal of the gland could only be partially successful. Since, as far as we are aware, such a distribution of the thymus has not been previously described it is considered possible that some of the previously recorded cases of complete thymectomy might have possessed residual thymus tissue posterior to the thyroid. If an attempt were made to remove these fragments it is conceivable that, owing to their proximity to the parathyroid gland, a temporary faulty calcium metabolism leading to the production of shelled eggs might be attributable to an interference with the parathyroid.

⁴ Ackert, J. E., and Morris, M. G., *Anat. Rec.*, 1929, **44**, 209.

⁵ Morgan, A. H., and Grierson, M. C., *Anat. Rec.*, 1930, **47**, 101.

⁶ Riddle, O., and Krizenecky, J., *Am. J. Physiol.*, 1931, **97**, 343.