LUTEAR CELLS AND HEN-FEATHERING.

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In nearly all breeds of poultry the dorsal plumage of the male differs from that of the female in length of certain feathers, in structural features, and in most breeds in color also. In the race of Sebrights, on the other hand, the male is feathered like the female. He is said to be hen-feathered. There are other breeds, such as the Campines and Hamburghs, in which both cock-feathered and hen-feathered adult males are known.

It has recently been shown by Boring and Pearl[1] that there are groups of cells in the ovary of the hen (Fig. 1) that collect in the follicles after the egg is set free, and produce there a yellow pigment that reacts chemically in the same way as does the lutear pigment of the corpus luteum of the mammal. They call these cells lutear cells.

Boring and Pearl have also shown that the lutear cells are absent in the testes of adult male fowls.

It has been convincingly demonstrated by Goodale,[2] both for ducks and fowls, that extirpation of the ovary leads to the assumption of the full male plumage by the female. Whether the germinal material, or the connective tissue of the stroma of the ovary, or the lutear cells are responsible for the condition of the plumage of the female could not be determined by ovariotomy alone. If, however, any element should be found in the testes of the hen-feathered Sebright that was absent from other cock-feathered breeds, and like any elements peculiar to the female, then it would appear highly probable that these elements

[1] Boring, A. M., and Pearl, R., *Anat. Rec.*, 1917, xiii, 253; Pearl and Boring, *Am. J. Anat.*, 1918, xxiii, 1.

[2] Goodale, H. D., *Biol. Bull.*, 1910–11, xx, 35; *Am. Nat.*, 1913, xlvii, 159; *J. Exp. Zool.*, 1916, xx, 421.

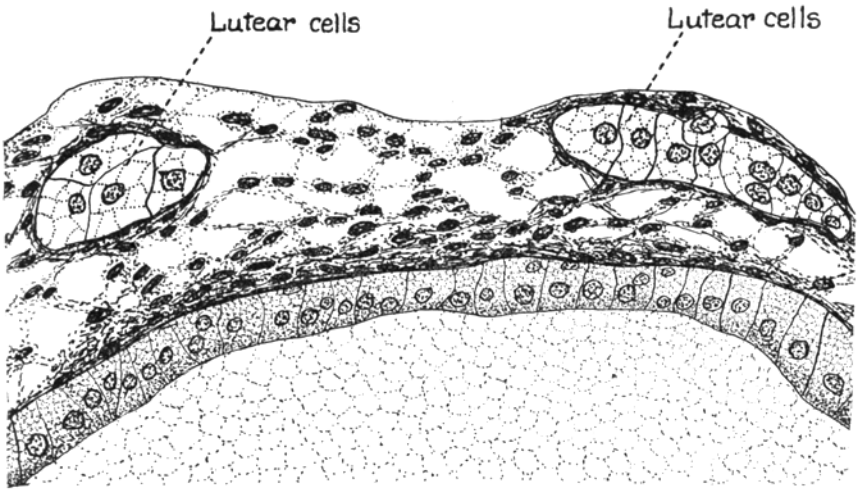

FIG. 1. Two groups of lutear cells in the theca of the follicle of the hen.

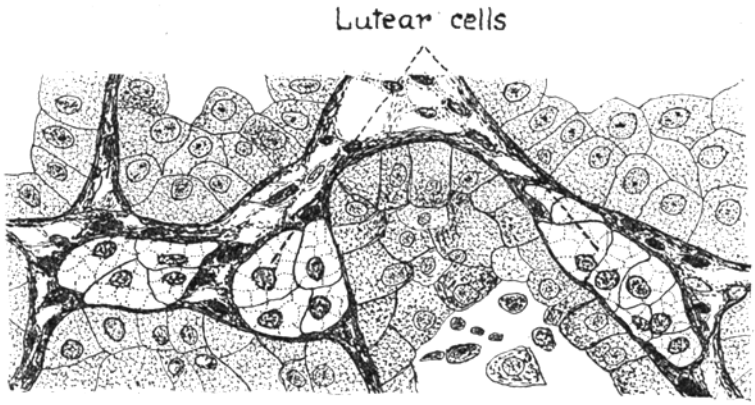

FIG. 2. Three groups of lutear cells in the connective tissue between the seminal tubules of the Sebright male.

are responsible for hen-feathering in the female as well as in the male Sebright.

A histological examination of the testis of a Sebright has shown that it contains groups of lutear cells (Fig. 2) identical in appearance with those in the ovary of the hen. It seems practically certain that these

are the cells whose secretion suppresses in the hen and in the Sebright male the characteristic cock-feathering.

In support of this conclusion it may be pointed out that one of us has recently shown that complete removal of the testes from the male Sebright causes him to assume the plumage of the ordinary cock.[3] The result is the same as removal of the ovary from the hen (Good-

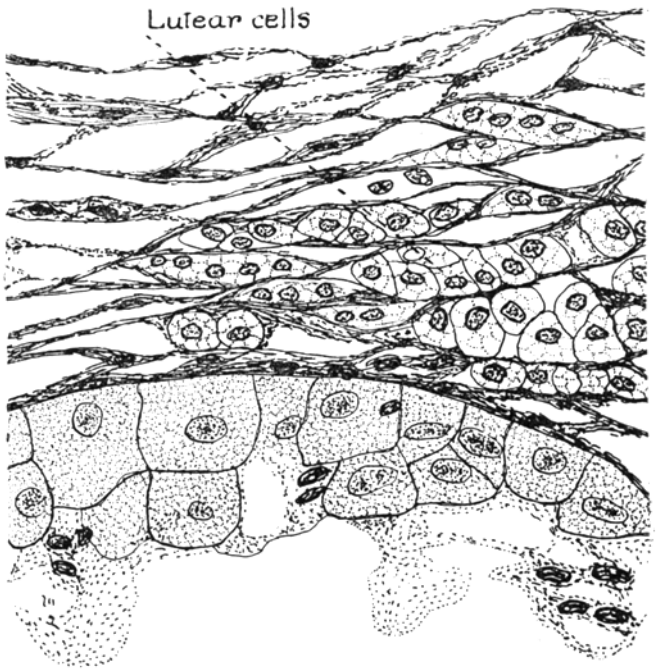

FIG. 3. Several groups of lutear cells in the regenerated testis of a Sebright male.

ale), and theoretically due in both cases to the removal of the lutear cells. The complete demonstration of the above conclusion should be obtained by implanting in an ovariotomized hen pieces of the testes of a Sebright male, producing thereby the same effect as that produced by the presence of her own ovary.

[3] Castration of the ordinary cock does not change the character of his plumage.

In Fig. 1, two groups of lutear cells, in the wall of an egg follicle of a hen, are shown. In Fig. 2 three groups of lutear cells are seen between the tubules of the testis of a male Sebright. In Fig. 3 lutear cells in the regenerated testis of a Sebright male are shown. The bird had been castrated but, since it did not change the character of its plumage, after 6 months it was opened and this piece of testis was found and removed. In Fig. 4 a piece of the testis of a hermaphrodite bird described by Boring and Pearl shows a large group of lutear cells.

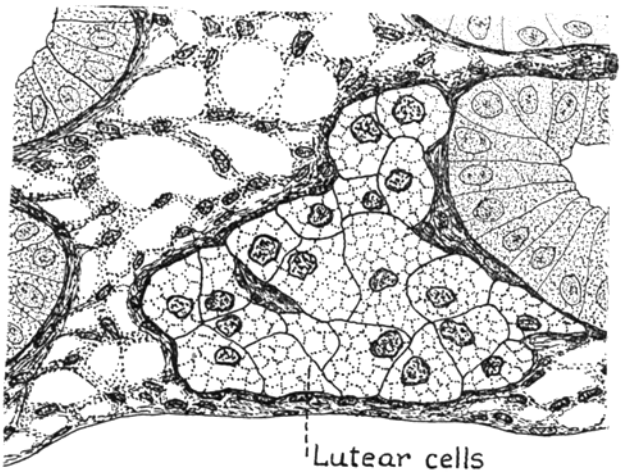

FIG. 4. A group of lutear cells in a hermaphrodite fowl (from Boring and Pearl).

CONCLUSIONS.

The experimental evidence had made clear that some substance is produced in the testis of the male Sebright that suppresses in him the development of the secondary sexual plumage of the cock of his species. The detection in his testis of lutear cells like those in hens makes the conclusion highly probable that it is these cells that cause the suppression of cock-feathering in both the Sebright male and in hens of all fowls. Genetic work by Morgan[4] had shown that one or two Mendelian factor-differences are responsible for hen-feathering

[4] Morgan, T. H., *Am. Nat.*, 1917, li, 513; *Proc. Soc. Exp. Biol. and Med.*, 1915–16, xiii, 31.

in the Sebright. These factor-differences produce their effects through the testes. The presence of these genetic factors, we now see, causes the testes of the Sebright to produce a kind of secretory cell that is ordinarily only produced in the female, or possibly to a slight extent in young males (Boring), or in numbers insufficient to suppress the male plumage in the testes of some ordinary cock birds (Reeves[5]).

[5] Reeves, T. B., *Anat. Rec.*, 1915, ix, 383.