

tablets were given alone. There were variations both above and below the average curve obtained in the series which had received the Armour tablets alone, but the majority of the determinations as well as the average curve are somewhat higher in the series in which the KI was administered in combination with the Armour anterior pituitary tablets.

Twelve guinea pigs were used in a series of experiments in which thyroid substance was administered alone in doses of 0.05 grain (Armour thyroid substance) and in combination with KI 0.05 gm. Both drugs were administered daily by mouth. The average curve of the metabolic rates in the set of 6 guinea pigs in which the thyroid substance was given alone is very similar to that obtained when Armour anterior pituitary tablets were administered. There is a fairly sudden rise within the first 8 to 12 days which ranges from 35% to 50% above the normal. This rise is followed by a fall which occurs in all the animals and ranges from 30% to 100%. After this there is a gradual and steady rise so that at the end of the 28 day period in which the animals were observed, the basal metabolic rate reaches a level approximately 50% above the normal rate. The animals which had received KI in combination with the thyroid substance showed in general a similar average curve of the metabolic rate to that obtained in those which had received the thyroid substance alone. There were variations in the determinations in the former series both above and below those in the latter series but the majority of the determinations as well as the average curve in the guinea pigs which had received thyroid substance with KI were slightly higher, especially in the latter periods, than in those which had received the thyroid substance alone.

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Does Castration in Guinea Fowls Produce Sexual Differentiation in Plumage and Changes in Head Furnishings?

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In guinea fowl there are no sex differences in shape, pigmentation and pattern of plumage, and but slight difference in development of head furnishings (comb and wattles are a little larger in cocks). In

comparison with common fowls the guinea fowl feathers are of hen-like type, having short and rounded ends. This fact raises the question whether the sexual uniformity in feathering in guinea fowl is of the same nature as that of the Sebright bantams according to Morgan's findings.¹ Finlay² reported 2 castrations of guinea fowl cocks, with negative results. In the present study both cocks and hens were castrated, and resulting changes in head furnishings and plumage carefully measured.

Five cocks and 5 hens (same stock) were castrated at the age of 5 months on September 19, 1930. One week after castration certain feathers of left neck, back and tail were pulled out; corresponding feathers on the right side served as control, and after 5 months the animals were killed. Complete castration had been obtained in 3 cocks and one hen. In one cock small spherical regenerates on both sides, and in another cock a similar regenerate of testicular tissue on the left side, were found (0.05-0.1 g.). One hen regenerated on the left side an ovarian tissue with 7 macroscopically identifiable follicles (weight 0.0456 gm.); a second hen had a spherical regenerate with typical testicular tissue containing spermatozoa (sex reversion)*; a third hen showed a tissue histologically resembling an embryonic sexually indifferent gonad; the fourth hen had an hypertrophied right ovary (weight 0.0255 gm.), likewise showing the structure of a sexually indifferent gonad.

The removed plumage, regenerated in all cases in 1 month, showed no change in the shape, pigmentation and pattern even in complete castrates. Head furnishings were compared with measurements obtained on 5 normal cocks and 5 normal hens from the same stock and age. Proportions of the comb were not different in normal and castrate cocks. Hens with ovarian regenerates had only slightly smaller combs than the completely castrated female. The comb, therefore, like the plumage, is developmentally independent of the gonads.

The wattles are smaller than in control, but here also there is no pronounced difference between the completely and incompletely castrated animals. Average percentage reductions of the dimensions of the wattles of the castrates were:

	Length %	Breadth %
Cocks	-22.85	-29.94
Hens	-23.46	-21.06

¹ Morgan, T. H., *Carnegie Inst.*, 1919, **285**.

² Finlay, G. F., *Brit. J. Biol.*, 1925, **2**, 439.

* A detailed description of this case will be given separately.

A diminution of wattles occurs in the castrates of both fowls and guinea fowls. We think that the non-influence of castration on comb size in guinea fowls, in contrast with the diminution found in common fowls, is explained by an anatomical difference in the nature of the combs in guinea fowl and in *Gallus*. In the latter the comb consists mainly of connective tissue,³ while in guinea fowl this is mainly a spongy bony tissue which gives no response to gonadal hormones.

The sexual differentiation of the plumage in various poultry can therefore be arranged in 3 types: 1. *Primary sexual uniformity* (guinea fowls, pigeons,⁴ turkeys). Pure "hen-like" plumage, independent of gonads, of genotypical nature. 2. *Sexual dimorphism* (*G. domesticus*, ducks, pheasants, etc.). A richly differentiated, colored "cock-like" plumage, depressed in females by ovarian hormone to a "hen-like" plumage. 3. *Secondary sexual uniformity* (Sebright bantams). Here, as in group 2, genotypically a richly differentiated, colored and "cock-like" plumage which, in both sexes, becomes depressed to a uniform hen-like type by hormones of ovary and testis.

One may also consider these three types of sexual differentiation in fowls as different degrees of phylogenetic evolution.

³ Champy, Ch., and Kritsch, N., *C. R. Soc. Biol.*, 1925, **92**, 683.

⁴ Lipschütz, A., and Wilhelm, O., *C. R. Soc. Biol.*, 1928, **99**, 691.