Studies of the distribution of virus in cortisone-injected and control eggs are now in progress. Preliminary experiments have disclosed increased viral concentration in embryo tissue from eggs injected with cortisone. It is therefore unlikely that the increased amount of virus in the allantoic fluid is the result merely of a localization or re-distribution of virus in the altered host.

Discussion. The data presented indicate that under the experimental conditions employed the concentration of influenza or mumps viruses attained in developing hens' eggs injected with cortisone may exceed that in similarly infected control eggs by a significant amount. If the concentration of mumps virus in cortisone-injected eggs is multiplied by a factor expressing the increased allantoic fluid volume of such eggs, it is found that the increased yield of virus per egg may be as high as 688% of controls.

Coincident with the observed increases in the amount of virus formed, profound changes in the host occur which are attributable to the effects of cortisone(1). Because the mechanism of cortisone effects upon the host is obscure, speculation concerning the basis for increased viral concentration is not warranted at present. It should be recalled, however, that the chick embryo is not known to possess immunologic mechanisms so that the suppression of antibody formation observed with cortisone(3) cannot be invoked in explanation of the present phenomenon.

Recent studies by Kalter, *et al.*(4) on the effect of growth hormone and testosterone on influenza virus multiplication in mice revealed increases in the "rate of virus proliferation and . . . the amount of virus present" in lungs of hormone-injected animals. These increases were related by the authors to increased host protein anabolism induced by hormone administration. In contrast, cortisone injection depresses chick embryo growth and may produce weight loss and negative nitrogen balance in the rat(5), but nonetheless results in increased viral concentration in the infected host in which anabolic function is apparently depressed. These findings constitute a paradox only if the dual assumption is made that: (1) viral concentration is directly related to host protein anabolism, and (2) cortisone actually causes depressed anabolism of the developing egg. Present evidence is insufficient to justify either assumption.

Summary. The concentration of Lee, PR8, or mumps virus in the allantoic fluid of eggs injected with cortisone acetate is significantly greater than the concentration of these agents in the allantoic fluid of control eggs.

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Non-effect of a Growth Hormone Preparation in the Regenerating Feather.* (18407)

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An acceleration of feather growth normally occurs in the fowl during the juvenile molts when the bird is in the phase of rapid development. Such accelerations occur in association with the appearance of new pigment—and structural traits, as may be seen when the measured axial increments of successively regenerating feathers from given follicles are compared in relation to the respective pat-

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terns displayed(1). The converse situation, a slowing down of feather growth is obtained by feeding the anti-thyroid drug thiouracil. In hybrid fowl this experimental retardation has as a clear sequel an alteration of the plumage phenotype, bringing further evidence of participation by the growth properties of the system in the development of its pattern(2).

There are certain indications which suggest that the action of estrogens in determining female feathering may proceed *via* a primary alteration imposed upon the zone of growth of the feather germ by the hormone (3). This supposition could be verified were it possible to approximate regional feather growth in the male of a sexually dimorphic breed to that of the female by some substance free of estrogenic properties and having no intrinsic action on feather structure or color. Growth hormone preparations could be expected to yield accelerated feather growth and seemed entirely suitable on such other grounds. Admirable test fowl are Brown Leghorn males, where the dorsal feathers grow more slowly, the ventral feathers more rapidly, than do the corresponding ones of the hen. Induced growth accelerations of the male feather hence might cause simultaneous female patterns. Similar morphological alterations should however, not accompany artificially increased rates of growth in the male breast plumage.

Experimental methods. The growth hormone preparation (Lot 22KRI) used was most kindly furnished by Dr. I. M. Bunding, Armour and Company, Chicago, Illinois. It was stated to cause an increase of 20 gram body weight in 15 days in the hypophysectomized rat; the daily dose being 50 gamma per 50 gram body weight. Portions of this powder were dissolved in 0.9 per cent saline in distilled water, 10 or 20 gamma per ml. Amounts sufficient for one day's treatment were stored frozen in vials and thawed only just prior to intradermal injection. The birds treated with the growth hormone preparation were adult Brown Leghorns, three cocks, one slip, and two capons weighing 1548, 1570, 1905, 2025, 2130 and 2323 grams, respectively. The times of emergence of new feather germs and the later feather growth rates normal to each of the 6 separate birds were first established as a basis for comparison. Feathers were plucked May 25, 1949, on the right side of the body and the birds were examined at intervals thereafter for the first appearance of the feather germs beyond the mouth of the follicle. Records were then made thrice weekly of the axial increments of eight regenerates in the saddle and nine in the breast of each fowl. The original feathers of these rows were filed individually for later pattern reference. Plumage patches at some little distance were denuded simultaneously to provide regenerating material for split feather germs. These preparations permit an inspection at any desired interval of currently induced modifications(4).

June 15, 1949, this same procedure was repeated at identical levels of the body but on the left side. Commencing June 25, to July 8, incl., each bird received 40 gamma of the growth hormone daily. 20 gamma were given in the morning and 20 in the evening. Half of this dosage was injected very slowly each time immediately anterior of the regenerating row of feathers in the left saddle and of the row in the left breast. This method of administration was retained but the daily amounts injected were increased to 160 gamma daily from July 9, to July 18, and to 320 gamma daily from July 19, to July 27. A second plucking in the left saddle and breast was made immediately forward of the sites of injection of the growth hormone July 8, 1949.

Results and discussion. The breast feathers grown in the test periods deviated in no manner from the normal; they are omitted from further discussion.

The saddle feathers plucked May 25 had laid down about the first third to one-half of their length at the time the injections of the growth hormone were commenced on the

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2. Juhn, M., *J. Heredity*, 1945, v36, 354.

3. Juhn, M., *J. Exp. Zool.*, 1949, v112. 109.

4. Juhn, M., and Gustavson, R. G., PROC. SOC. EXP. BIOL. AND MED., 1930, v27, 747.

opposite side of the body. The feathers of the left saddle plucked June 15 were emerging beyond the mouth of the follicle at this time and they achieved about half their growth during treatment. The regenerates of the July 8 plucking completed all the phases of reconstitution and their first growth took place in the presence of the growth preparation.

Comparisons of the course of regeneration under these three separate conditions were made between derivatives of follicles of substantially identical position in the body. There proved to be no detectable effect on the part of the growth hormone (in the concentrations employed) either in acceleration of axial growth of the feather or in reduction of the time occupied by the restitutory processes. Serial split preparations showed, however, that during injection of the growth hormone a stimulation of thyroid activity occurred. Black pigment granules were found deposited in the zone of growth; this is an effect characteristic of excess thyroxine in the Brown Leghorn(5). Tests for traces of thyrotrophin in the growth preparation were therefore made following the method of Smelser(6).

Four groups of ten each male and female New Hampshire chicks, four weeks of age, were selected from the University of Maryland stock for a similar distribution by body weight. Ten, 40, and 160 gamma respectively were given daily to one group each, the dose divided between morning and evening. The fourth untreated group served as control. Half the number was sacrificed the day after completion of five days of treatment; the remainder upon the eleventh day after 10 days of injection. The thyroids were dissected free of surrounding tissue and weighed on a Roller-Smith balance. Treated and control glands were not found to differ in either series. However, Smelser has pointed out(5) that the thyroid of the 6-day-old thyrotrophin treated chick may show signs of activity at dosages less than those causing a weight increase. The saddle feather germ of the Brown Leghorn accordingly seems a more sensitive indicator than thyroid weight.

Early negative results often are later found due to inadequate concentrations. Consequently the daily dosage of the growth hormone was increased about 30-fold. One Brown Leghorn cock weighing 2005 grams was given 10 mg daily for 5 successive days. The effect on feather growth was again negative but the thyroid was more markedly stimulated as judged by the intensified reaction recorded in the feather germ. Failure to obtain growth acceleration could still result from dosage insufficiency but it also may be that the traces of thyrotrophin in the preparation interfered in some manner with a possible response.

Summary. An attempt was made to cause acceleration of feather growth in fowl by injections of growth hormone in the vicinity of regenerates. The preparation used gave a 20-gram body weight increase in 15 days in the hypophysectomized rat in dosage of 50 gamma per 50 grams body weight. Six Brown Leghorn males each received 40, 160, and 320 gamma over a period of weeks. One fowl was given 10 mg daily for 5 days. All tests were negative in feather growth but induced pattern changes indicated the presence of traces of thyrotrophin in the preparation.

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