protein retention in growing chicks as any of the other numerous protein combinations studied. It has also been shown that by supplementing heat-treated cereals with casein the biological value of the combination is equal to that of the unheated cereals plus casein.[5]

Conclusions. It is evident from these results and also from the known character of the ration fed that a factor is required for growth and reproduction in the domestic fowl other than vitamins A, B, B_4, B_6, D, E, K, riboflavin, the chick antidermatosis vitamin, nicotinic acid, factor W, the antiencephalomalacia factor and the essential fatty acids. It appears improbable that this factor is the grass juice factor,[6] since corn and wheat are reported to be poor sources of the latter factor. It also is improbable that the factor is protein in nature. The factor is destroyed by heating in a dry atmosphere for 36 hours at 120°C. It is present in cereals, yeast and milk.

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Development of the Mesonephros in Amblystoma after Early Extirpation of the Duct.

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The mesonephros in Amblystoma develops from the 9th (or 10th) embryonic somite to the twentieth, at the level of the cloaca. The anterior region, corresponding approximately to segments 10-15, bears the usual relation to the gonad and is the so-called "sexual kidney." The posterior region, more massive and anatomically more complex (due to the presence of secondary, tertiary units, etc.) is the "secretory kidney." Both regions develop from a continuous band of nephrogenic tissue, the "mesonephric blastema" dorso-medial to and contiguous with the primitive kidney duct or pronephric duct. Very early in differentiation the mesonephric units of both regions establish connections with this duct, which thus becomes the mesonephric duct. There is, however, a marked delay in the development of the posterior region, during which the units of the sexual kidney are well developed and functional; and it is to

[5] Morgan, A. G., *J. Biol. Chem.*, 1931, **90**, 771.

[6] Kohler, G. O., Elvehjem, C. A., and Hart, E. B., *Wisc. Agr. Exp. Sta. Bul.* 439, 1937, 2.

this region of delayed development that secondary, tertiary, etc., tubules are confined. These statements rest largely on the early work of Hall.[1] Such differences in morphology, chronology and functional relations raise interesting problems of homology.

In view of the early association between the rudimentary mesonephric units of both regions and the duct, it was decided to investigate the result of elimination of the latter upon the origin and differentiation of the former. In Amblystoma the primitive duct (pronephric duct) arises at the level of somites 3 and 4, and gradually grows posteriorly along the ventral border of the row of somites until it reaches the cloaca at the level of somite 20. At stages 26-27, Harrison's Series, the growing end of the duct reaches only to the 8th or the beginning of the 9th somite, and at or prior to this time may be removed without disturbing the mesonephric region. The blastema is untouched, but will never establish relations with a duct. Embryos subjected unilaterally to this operation were studied at several larval stages, comparing operated and unoperated sides. Earlier results, chiefly on *A. tigrinum,* have been reported;[2] further experiments on *A. punctatum* confirm and enlarge these findings. Thus far, because of a special interest in the gonad, the region of the "sexual kidney" has been studied more fully.

The results, based on a study of 22 cases, may be summarized as follows: (1) Gross dissection shows the duct entirely lacking on the operated side. In about one-third of all cases only a slender, beaded strand of tissue marks the position of the mesonephros. In the remaining cases nodular masses occur irregularly at one or more loci, denoting the development of tubules, singly or in clumps.

(2) Histologically, all units on the operated side are found to be capable of developing to a vesicular form in the absence of the duct. This is short of the stage at which connection to the duct would occur.

(3) About 15% of all units continue development to the stage of simple sigmoid tubules (stage of connection) or beyond. Many approximate normal tubules, but others are atypical or degenerate.

(4) Independently developing units occur at all levels of the kidney. However, when the data for the whole group are plotted according to spinal segments, tubule development occurs most frequently in the middle segments of the sexual region.

(5) Single isolated tubules may develop but there is a tendency to differentiate in clumps of 2 or more, and for rudimentary units adjacent to differentiated tubules to be more advanced in development.

1 Hall, R. W., *Bull. Mus. Comp. Zool. Harvard College,* 1904, **45.**

2 Burns, R. K., Jr., *Anat. Rec.,* 1934, **58** (Suppl., p. 7).

(6) Although the average number of units exhibiting independent differentiation might suggest that only Hall's "units of the first order" possess this capacity, nevertheless the irregular distribution in individual cases, the tendency to occur in aggregations, and complete failure of all units to develop in many cases, do not favor this hypothesis.

(7) Posterior to the sexual region differences between operated and unoperated sides are less extreme, due to the more recent development of these units. The percentage of tubules capable of independent differentiation is, however, about the same as for the "sexual kidney." A study of older larvae will be necessary before final statements can be made regarding this region.

(8) The fundamental distinction between units capable of independent differentiation and those whose development is arrested at the vesicle stage, remains to be determined.

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Susceptibility of the "Gopher," *Citellus richardsonii* (Sabine), to *Leptospira icterohemorrhagiæ*.

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Rats *(Rattus norvegicus* and *Rattus rattus)* are responsible for the world-wide dissemination of bubonic plague and Weil's disease (infectious spirochetal jaundice or spirochetosis icterohemorrhagica) and for the presence of plague in the extensive rodent population that is native to the United States. Plague was originally introduced among the native rodents through the association of infected rats from the wharves of San Francisco with members of the ground-squirrel genus *Citellus*. The disease is continuing to spread in the ground-squirrel host. Today, it is present throughout an extensive area and constitutes a public health problem of major importance. Might ground-squirrels play a similar rôle in Weil's disease? An investigation was undertaken to throw light on this point. In the present communication, evidence is summarized which shows that the "gopher," *Citellus richardsonii* (Sabine), a rodent closely related to the California ground-squirrel, is sus-