

podia. However, after a sufficient length of time (6 days or more) the changes seem to become irreversible. Typical fibroblasts appear and in numerous cultures, especially those growing in bottles, instead of slides, large colonies of typical fibroblasts develop, which cannot be distinguished from cultures of fibroblasts, obtained from regular connective tissue.

Thus, the possibility of the transformation of a small lymphocyte into a macrophage (polyblast) and further into a fibroblast seems to be demonstrated.

This is a preliminary report.

¹ Maximow, A., *Beitr. z. path. An. u. z. allg. Path.*, 1902, Suppl. v, 1.

² Maximow, A., *Arch. f. mikr. Anat.*, 1909, lxxiii, 444.

³ Awrorow, P., and Timofejewsky, A., *Virch. Arch.*, 1914, ccxvi, 184.

⁴ Carrel, A., and Ebeling, H., *J. Exp. Med.*, 1922, xxxvi, 365.

⁵ Maximow, A., *Klin. Wochenschr.*, 1925, iv, 1486.

⁶ Lewis, M., *Am. J. Path.*, 1925, i, 91.

⁷ Fischer, A., *Compt. rend. soc. biol.*, 1925, xciii, 109.

⁸ Timofejewsky, A., and Benewolenskaja, S., *Arch. f. exp. Zellforsch., bes. Gewebezüchtung (Explantation)*, 1925, ii, 31.

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Experimental Obstruction of the Mesonephric Ducts.

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In a previous paper¹ the writer showed that destruction of the growing ends of the Wolffian ducts in young chick embryos resulted in the failure of these ducts to establish connection with the cloaca. Under these circumstances, the Wolffian bodies became hydronephrotic, the cloaca failed to differentiate a urodaeal sinus, the allantois remained rudimentary, and the chicks died not later than the end of the sixth day from either lack of oxygen or a possible retention of urine. Since up to that time the allantoic fluid of normal embryos had never been analyzed by modern microchemical methods, the latter possibility could not at first be determined. But investigations begun in 1924¹ have shown that the end product of nitrogen metabolism in chick embryos is uric acid; that measurable amounts of it appear in the allantoic fluid as early as the fifth day of incubation; that it is eliminated in rapidly increasing amounts up to at least the 15th day²; and that during all this time, from the 5th

to the 15th day) the mesonephric tubules undergo rapid increase in both length and volume.³

The present article deals with the effect of experimental obstruction of the Wolffian ducts upon the nephrogenic tissue of the embryo. In this connection it should be recalled that the rudimentary pronephros gives rise to the Wolffian ducts; that from the 20th to the 30th somites these ducts are joined by the definitive mesonephric tubules; and that after the lower end of each duct has given rise to the metanephric diverticulum the latter is joined by metanephric tubules derived from the nephrogenic tissue of somites 31 to 33 (Lillie).

In all cases in which the writer has prevented one or both Wolffian ducts from reaching the cloaca, the ureter on that side has never formed, and no metanephric tubules have developed. There is, however, a concentration of nephrogenic tissue medial to the posterior cardinal vein (*Bl.*, Fig. 3). But this blastema never differentiates nor becomes as dense as nephrogenic tissue, which is in contact with the pelvis of the ureter (*cf. Bl.*, and *Met*, Fig. 2, from a unilateral case of hydronephrosis).

Similarly, the mesonephric portion of the nephrogenic tissue never differentiates into tubules in the absence of the Wolffian duct from a given region. This is especially easy to demonstrate when the original lesion which destroys the growing ends of the Wolffian ducts is below the level of the vitelline veins (22nd somite). Above this level the operation is much more difficult, but I have three such cases. The first is shown in Fig. 3, from a chick operated upon at 39 hours and then reincubated four days longer, the downgrowth of the Wolffian ducts having been stopped at the level of the wingbud (17 to 19 somites) just above the somites which give rise to the definitive Wolffian body. In this photomicrograph, which is taken at the level of the caeca, neither right nor left Wolffian (*W.b.*) contains any tubules below the lesion. In all other respects the embryo appears to be normal. A second case is shown in Fig. 1, a chick of 66 hours incubation, fixed 28 hours after the operation. This shows a section taken at the level of the 23rd somite, 4 somits below the lesion (*cf. Lillie*, 1908, Fig. 111). In this earlier stage a slight concentration of the nephrogenic tissue (*Nph.*) can be seen medial to the posterior cardinal veins (*P.v.*) but this apparently disappears long before the sixth day (Fig. 3). From these observations it thus appears that neither the mesonephric nor the metanephric tubules develop in the absence of the Wolffian duct from territory adjacent to the appropriate nephrogenic tissue. The rudimentary pronephros

must therefore be considered a vital organ, for without the Wolffian ducts to which it normally gives rise, neither the embryonic nor the adult kidney is formed.

In conclusion, I wish to record the probable occurrence of compensatory hypertrophy of the excretory gland of the embryo, following unilateral hydronephrosis. Such a case is shown in Fig. 2.

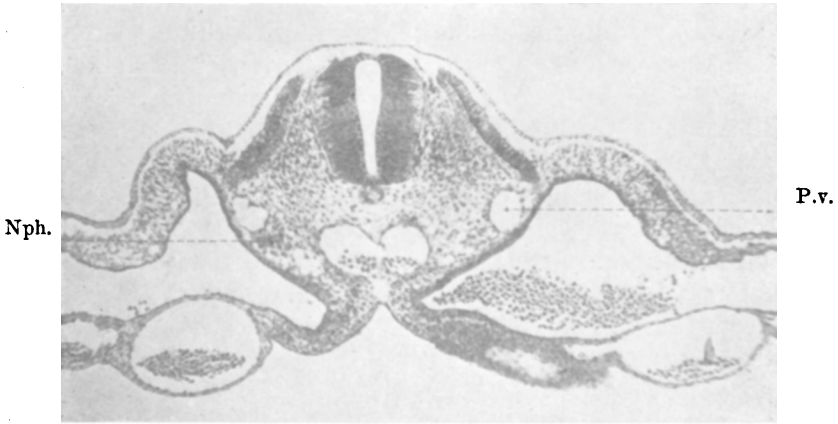


FIG. 1.

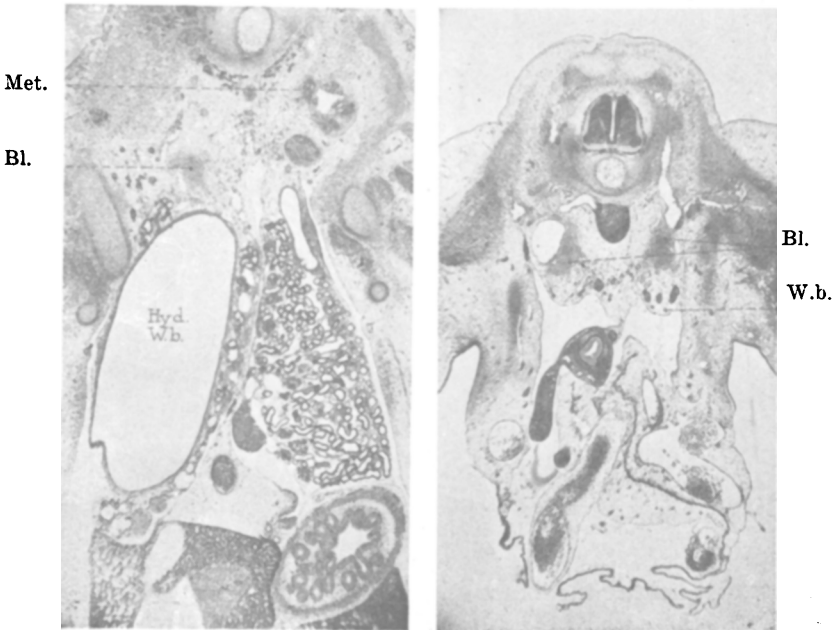


FIG. 2.

FIG. 3.

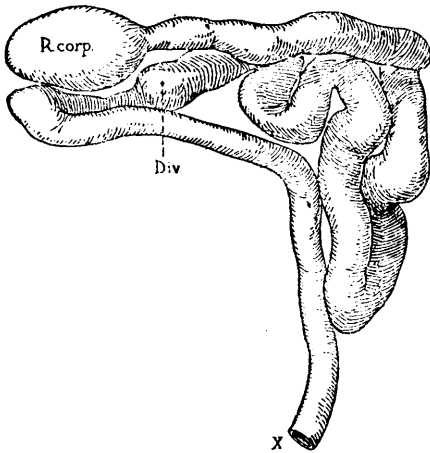


FIG. 4.

Wax model of mesonephric tubule taken from widest portion of left Wolffian body of hydronephrotic embryo shown in Fig. 2, (6 days, 9 hrs. 17.3 mm.) X 85

R. Corp., renal corpuscle; *Div.*, diverticulum separating secretory tubule from mesonephric ureter; *X*, junction of ureter with Wolffian duct.

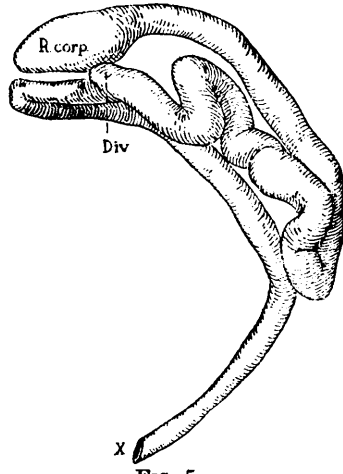


FIG. 5.

Mesonephric tubule from widest portion of left Wolffian body of a normal embryo (H. E. C., 2076) incubated 6 days and 7 hrs., 17.3 mm. X 85.

The growing end of the right Wolffian duct of this embryo was destroyed at the level of the 30th somite (50 hours), the duct on the left side being untouched. After 4¼ days of incubation the embryo was fixed. The sections showed an enormous distention of the right mesonephros (*Hyd. W.b.*, Fig. 2). The one on the left side, however, appeared to be normal. But when it was modelled in wax and its volume obtained by displacement, it was found to be just twice as large as the left mesonephros of a normal embryo of the same age and length in the Harvard collection. When the tubules from these embryos were modelled, the corpuscle and secreting portion of the operated embryo were found to be 1.86 times the volume of the corresponding parts of a normal embryo (Figs. 4 and 5). Since, however, the operated embryo seemed older than the other, despite its similar length and age, the relative size of the two embryos was tested by modelling the livers of the two specimens. The volumes of these organs were found to be in the ratio of 1.6 to 1, proving that the operated embryo had grown faster than the other, but also showing that the left Wolffian body of the operated embryo had grown faster than the liver. As an additional check the glomeruli (inner capsules) of 6 mesonephric tubules were modelled

and compared with 6 glomeruli from a normal 11-day chick which had already been modelled for another purpose. Those from the operated embryo (6 days and 9 hours, 17.3 mm.) were found to be larger than those from the 11-day chick, which measured 31 mm., the average volumes of the glomeruli being in the proportion of 1.2 to 1. It seems reasonable to assume, therefore, that we are dealing with a compensatory hypertrophy of the embryonic kidney which is not unlike that of the adult organ. Also, it is believed that this similarity of reaction to pathological conditions, coupled with the similarity of end products of nitrogen metabolism found in embryo and adult (namely uric acid), demonstrates a greater homogeneity of these serial excretory organs than has been recognized hitherto.

¹ Boyden, E. A., *J. Exp. Zool.*, 1924, xl, 437-472.

² Fiske, C. H., and Boyden, E. A., *J. Biol. Chem.*, 1926, lxx, 535-556.

³ Boyden, E. A., and Fiske, C. H., *Anat. Rec.*, xxxiv, No. 6, in press.

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Relations between pH, Agglutination and P. D. with *Bacterium Phaseoli Sojense*.

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In the course of a series of studies on a group of bacteria pathogenic for plants, it was found that a strain of *Bacterium phaseoli sojense*, when plated on agar, gave colonies that were distinctly "Rough" and "Smooth". The cultural characteristics, virulence for plants and the serological reactions of these organisms have been described elsewhere.¹ We were interested in studying the agglutination reactions of these cultures, particularly because the "Rough" organisms, although more agglutinable than the "Smooth", as is generally the case, had also been found to be spontaneously agglutinated even in distilled water suspensions and after repeated washings with water.

In Table I we present the results of agglutination and P. D. (electrophoretic potential difference) measurements on suspensions prepared in distilled water after three washings with water.² Adjustments of pH were made by appropriate additions of aqueous HCl or NaOH solutions to the specified pH values.