What is it the liver does, the pancreas gone, to produce diabetes? Whatever else it may be we know it permits too much sugar to circulate. We know it loses glycogen under these circumstances. If its power to store glycogen were lost by injury arising from the alimentary organs themselves, would not diabetes result, if the pancreas could not maintain the balance between insulin and sugar? McCann and Hannon have described two types of severe diabetes, one which responds with a lower, the other with a higher respiratory quotient when glucose is given. The former responds to dietary treatment with low protein and balance of keto—and antiketogenic factors; the latter does not. Conceivably the former represents a primary failure of the liver, the latter primary failure of the pancreas.

J. R. MURLIN

UNIVERSITY OF ROCHESTER

OBSERVATIONS ON KIDNEY FUNCTION IN NECTURUS MACULOSUS[1]

IN a recent publication by Wearn and Richards,[2] qualitative analyses of fluid obtained from the glomerular capsules of frogs were reported. Sugar was demonstrated in protein-free glomerular fluid at a time when the bladder urine was sugar-free. Although these observations have been generally accepted as proof of glomerular filtration and tubular reabsorption, certain objections to the finality of this proof may be raised. The evidence presented by Wearn and Richards that the fluid so collected is not merely a tubular secretion backed up into the capsule is not clear. Granting that the fluid does come through the glomerular membrane, proof has yet to be offered that the process is one of filtration.

That the method of micro-manipulation is peculiarly adapted to the study of kidney function is apparent. Technical difficulties present themselves, however, as a result of the minute size of the capsules in the frog. More favorable material would render the method less tedious and more reliable. This has been realized in Necturus maculosus. The capsules in this form are pear-shaped, and while their size varies with functional activity, their average transverse diameter is about one millimeter, their capacity being about three to four cubic millimeters. A longitudinal row of capsules lies just beneath the peritoneal covering near the medial border of the ventral aspect of the kidney.

Detailed description of the technique employed in the work outlined in this report and in further work now in progress is reserved for future publication. In brief, however, the procedure is as follows. The animal is anesthetized by immersion in .15 per cent. solution of urethane, after which the brain is pithed and the ventral surface of the kidney exposed. The animal is fastened to a board and placed on the stage of a binocular dissecting microscope. Illumination is by reflected light from a carbon arc. This arrangement does not necessitate traction on the kidney, as is the case with transillumination. The intensity of this light is ample to permit following the corpuscles through the glomerular capillaries.

The glass pipettes used for collecting glomerular fluid have an inside diameter at the tip of 30 to 50μ, and are manipulated in a microdissector of the type described by Chambers in 1922. After puncturing the capsule the glomerular fluid is withdrawn into the pipette by a mercury system which affords accurate control of the fluid column. Upon emptying the capsule the pipette is withdrawn and the fluid transferred to a capillary tube for analysis. The pipette is in the capsule for a period of from two to five minutes. In every case the bladder is completely emptied before the collection of the glomerular fluid and at the close of the experiment.

The results of the analyses of the glomerular and bladder fluid are briefly as follows: Sugar was demonstrated in the protein-free glomerular fluid at a time when the bladder urine was sugar-free. The chloride content of the glomerular fluid is markedly higher than that of the bladder urine. The blood sugar content, as determined by the Shaffer-Hartmann method, ranges from 60 to 80 milligrams per 100 cubic centimeters.

That the fluid thus obtained had not backed up from the tubules is proved by the following experiments. A minute quantity of trypan blue solution is injected into a capsule and the course of the dye followed as an indication of the direction of fluid flow in the glomerulo-tubule system. The dye is plainly seen to move out of the capsule and down the tubule.

It is evident that the glomerular fluid has entered the capsule through the glomerular membrane. The available data, however, are not adequate to permit a decision as to whether or not the process is one of filtration. Work bearing on this and various other questions of renal function is now in progress on this form. We have demonstrated that catheterization of the tubule is possible. The work has not yet progressed to the stage where a report on the tubular fluid can be made.

H. L. WHITE

FRANCIS O. SCHMITT

[1] From the Physiological Department of Washington University, St. Louis, Missouri.

[2] J. T. Wearn and A. N. Richards, "Observations on the composition of glomerular urine, with particular reference to the problem of reabsorption in the renal tubules," *Amer. Journ. Physiol.*, Vol. 71, p. 209, 1924.