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## Occurrence of Atypical Glomeruli in the Kidney of Opossum (Didelphys Virginiana)*

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The histological structure of the glomerulus in the dog, cat, rabbit, and guinea pig, used in various studies of renal function, is, in general, similar. The glomeruli vary in size and number in such animals, and the degree of lobulation of the capillary tufts shows some difference in the various species, yet the finer structure of these bodies remains constant. The epithelium which lines Bowman's capsule consists of a single layer of flattened, non-specialized cells and the reflection of these cells over and between the capillary loops of the glomeruli is made up of an even flatter type of cell.

In 1924 a study was commenced of the histology of the kidney in certain older animals to ascertain if there was any difference in structure in the vascular and tubular units in such ancestral species which might be indicative of a difference in the function of these structures as compared with similar units in more recent species, now used for experimental purposes. The first animal studied was the marsupial, *Didelphys virginiana.*

Twenty-seven opossum have been used in this study. The animals were placed in large types of rabbit cages and the urine collected. The urine from all of the animals was normal. It was free from albumin, glucose and diacetic acid. The microscopic studies showed an absence of casts. Various types of epithelial cells with occasional red and white blood cells were present. After such initial observations the animals were killed by a stroke behind the head, and the kidneys immediately removed for fixation. The kidneys were sectioned through their long axes, and tissue for fixation removed from each lateral half. The fixatives employed were 95% alcohol, Zenker's fluid, 10% formalin, and a solution of corrosive-acetic. Both paraffin and celloidin sections were made and stained with eosin and haematoxylin and with eosin and methylene blue.

The histological study of the kidneys of 19 of the 27 opossum showed glomerular structures similar to those in higher laboratory animals and man. The tubular epithelium and especially that of the convoluted tubules appears to be less specialized than epithelium in the same location in more recent species. Very frequently the convo-

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luted tubule cells fail to show a clear-cut differentiation. In such areas the nuclei have not a regular arrangement, so that a syncytial-like appearance is produced. The cell cytoplasm is not striated. The epithelium of the loops of Henle and the straight tubules have the usual histological structure. The cell boundaries are definite and the nuclei have a regular arrangement.

In 8 of the 27 opossum kidneys, in addition to the occurrence of a predominance of normal glomeruli, an atypical type of glomerulus was found. These atypical structures vary in size, as is the case with the normal glomeruli. The capillary endothelium and the lobulation of the tufts show no departure from the normal. The structure in these glomeruli which makes them atypical and of interest, is the epithelium which lines Bowman's capsule. In this location in place of the usual flattened, non-specialized type of cell, there are high columnar cells showing a definite demarcation one from the other and containing large, regularly arranged, hyperchromatic nuclei. This atypical epithelium has the cytological appearance of marked specialization. The height of the cells was found to vary in the different glomeruli, and in the same structures these cells showed some evidence of a transition from the high columnar type to a more flattened variety of cell. In such transition there was found no approach to the usual flattened epithelium which lines Bowman's membrane in the normal glomerulus.

To ascertain the numerical relationship of the atypical glomeruli to the normal glomeruli, the total number of both types of glomeruli were counted in 50 sections. Each section represents a cross-section taken from tissue obtained at the mid-portion of the lateral half of the kidney. The average for both types of glomeruli in such sections is 243. Of this number 84 are atypical and 159 are normal glomeruli. The tubular epithelium in the kidneys of the 7 opossum with atypical glomeruli has in general the same cytological appearance as the 19 normal animals. The convoluted tubule epithelium in many of the tubules has a syncytial appearance with no systematic arrangement of the nuclei. There is a lack of cell differentiation. (See Fig. 1.)

Insufficient data have been accumulated and no functional studies have been made which at the present time will permit a discussion of the origin or meaning of the atypical glomeruli in the kidney of the opossum. The question arises whether or not in the kidney of some of the marsupials and in species of animals of an even more remote biological position, the glomerulus had a more specialized structure, and a more specialized function than it now has in the higher laboratory animals and in man.

FIG. 1.

Photograph without enlargement of camera lucida drawing, Leitz, Oc. 2, Obj. 6, from the kidney of Opossum 4. In the center is large glomerulus. Capillary tuft shows a definite lobulation. The epithelial layer of cells reflected over the capillaries is of the usual flattened type. The epithelium lining Bowman's membrane is made up of a high columnar type of cell atypical for this location. The cells are clear-cut in their differentiation. The nuclei of these cells show a regular arrangement and are hyperchromatic. The convoluted tubule epithelium shows a lack of specialization in structure. In certain of the tubules a syncytial appearance is obtained. The epithelium of the loops of Henle is normal.

Similar investigations are now in progress with the kidneys of the Duck-Bill, *Ornithorhynchus anatinus* (*Paradoxus* Blumenb.), the Spiny Ant-eater, *Echidna aculeata*, and an Australian lizzard, *Sphenodon* or *Hatteria punctatum*.

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