embedded in the smooth muscle of the expansor secundariorum muscle of the chick; the myelinated axons that they gave rise to ran across the muscle and joined the brachial nerve supplying the wing.

It is currently considered that Herbst corpuscles and the similar Pacinian corpuscles of mammals are mechanoreceptors[6]. If this is true for the corpuscles in the expansor secundariorum muscle it seems likely that movements of the secondary wing feathers would be detected by the Herbst corpuscles which could play an important role in flight. Variations in the pitch of the secondary feathers and changes in the air flow over them due to manœuvring or to air currents encountered would be registered as alterations in the vibration frequency of these feathers. This information, relayed via the Herbst corpuscles, spinal cord and autonomic efferent fibres to the expansor secundariorum muscle could reset the pitch of the secondaries to suit their continually changing environment. This system may therefore be an example of the involvement of a lamellate type of receptor in a direct muscle reflex.

The peripheral nature of the expansor secundariorum muscle and the simplicity of the dissection needed to expose it should make it a suitable preparation for the in vivo study of this type of receptor.

Résumé. Les corpuscules de Herbst existent dans le m. expansor secundariorum de l'aile de la poule domestique. Il est possible qu'ils conditionnent l'action réflexe du muscle.

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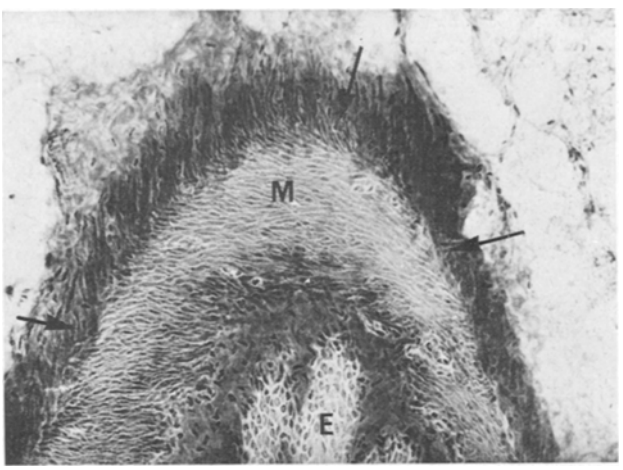
Atypical Muscle Cells in the Wall of the Renal Calix and Pelvis with a Note on their Possible Significance

Atypical muscle cells were first recognized in the wall of the renal calix by the present author and their fine structure has recently been described in the rat renal calix by Dixon and Gosling[1]. Similar cells have now been demonstrated in a number of species and this report is a brief description of their morphology when examined using light microscopy.

In all species examined (monkey, rabbit, guinea-pig and rat) atypical muscle cells are identified in the caliceal wall close to the renal parenchyma. These cells are smaller than the other (typical) smooth muscle cells identified in the wall of the upper urinary tract. Each cell is separated from its neighbours by a small amount of connective tissue; they are not grouped closely into bundles. Using Massons trichrome technique, the cytoplasm of atypical cells stain less well and their nuclei appear smaller than other smooth muscle cells. A continuous layer composed of atypical cells can be identified around the renal caliceal and pelvic wall lying on the external aspect of the muscle coat. The cells run at right-angles to the subjacent muscle to which they are closely related. They are arranged obliquely so that their long axes run towards the lumen (Figure). These cells extend across the renal pelvis as far as the pelvi-ureteric junction where they appear to end; similar cells could not be detected in the ureteric wall proper.

Using formalin fixed paraffin embedded tissues, atypical muscle cells are difficult to detect. Employing these techniques, the present author failed to describe these cells in a recent report on the musculature of the upper urinary tract[2]. This difficulty might explain why the cells have remained undetected in spite of many investigations on the region. The present study was based on cryostat sections cut from fresh tissues quenched in isopentane (previously cooled in liquid nitrogen).

The frequent association between nervous tissue and atypical muscle cells has been noted in the calix. Preliminary studies on the distribution of catecholamine containing nerves in the renal calix and pelvis of other species



An oblique section through the renal pelvis of the guinea-pig showing the epithelium (E) and pelvic muscle (M). The position of atypical muscle cells is indicated by the arrows. × 200.

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has shown a similar relationship. The presence of these cells and their relationship to nervous tissue and underlying muscle might reflect a different or additional function from the remainder of upper urinary tract muscle. In this context a number of authors have suggested the possibility of a renal caliceal or pelvic 'pacemaker'[3-5]. More detailed light- and electron-microscopic observations on these atypical muscle cells in normal and hydronephrotic human tissue are to appear elsewhere.

Zusammenfassung. Es werden atypische Muskelzellen beschrieben, welche sich um die Nierenbeckenkelche und die Nierenbecken befinden. Dabei handelt es sich um glatte Muskelfasern, die wahrscheinlich im Nierenbeckenbereich endigen und deren Einfluss auf die Aktivität des Ureters diskutiert wird.

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Electron Microscopic Demonstration of a Particulate Component in the Glycocalyx

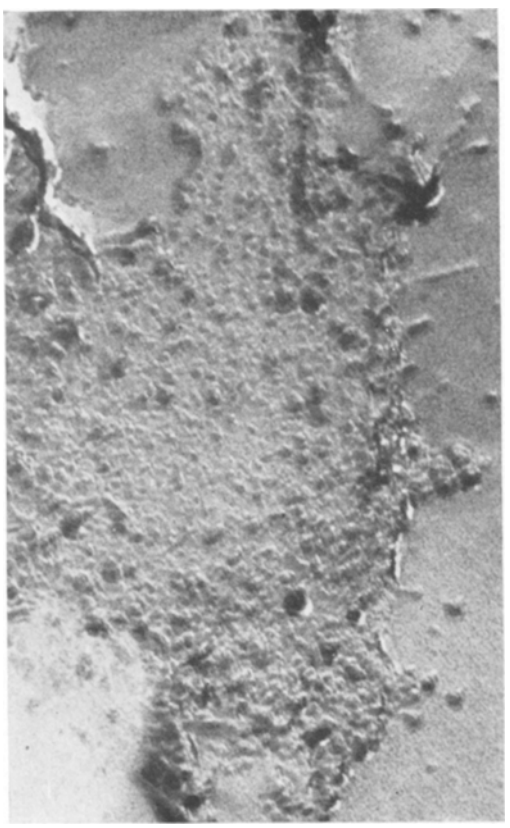
Isolated glomerular basement membranes from the porcine kidney still carry parts of the glycocalyx of neighbouring cells. These remnants could be demonstrated clearly by ultrahistochemical methods[1]. The findings prompted us to study the glycocalyx on the surface of the basement membrane by more direct methods.

Fragments of glomerular basement membrane have been isolated from porcine kidney as described earlier[1,2]. In some experiments these fragments were negatively stained by 1% phosphotungstic acid (containing 0.01% serum albumin), and in other experiments they were prepared by the freeze-etching technique.

After negative staining, circular particles, which were surrounded by an electron-dense rim, have been detected on the surface of the basement membrane. They were not sharply delineated. Their diameters varied between 200–600 Å. The corpuscles were distributed unevenly. In freeze-etched preparations similar corpuscles have been demonstrated (Figure). They measured 200–600 Å in diameter too. Most of them had a diameter of 300–400 Å. The corpuscles were scattered irregularly over the basement membrane.

The findings indicate a particulate structure of the glycocalyx of cells in the porcine glomerulus. We could not decide whether the corpuscles belong to epicytes or endothelial cells, and perhaps both cell types have the same particles in their glycocalyx. Similar corpuscles have been demonstrated within the cell coat of thrombocytes, erythrocytes, and intestinal epithelial cells[3-7]. This seems to indicate a common particulate structure of the glycocalyx. In our preparations of isolated glomerular basement membranes a large quantity of the cell coat was detached. Therefore an irregular distribution of the corpuscles with many gaps between them resulted. The wide variation of the particle size may have been due to the following factors: a) technical sources, b) species or cell type differences, and c) an aggregation of small subunits, which build up the big corpuscles.

The glycocalyx, which consists of corpuscles, behaves like a highly hydrated gel, and it is capable of binding both anions and cations[8,9]. So far other properties of this



Isolated fragment of the porcine glomerular basement membrane. Freeze-etching method. Corpuscles are distributed irregularly over the surface of the basement membrane. Magnification × 64,000.

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