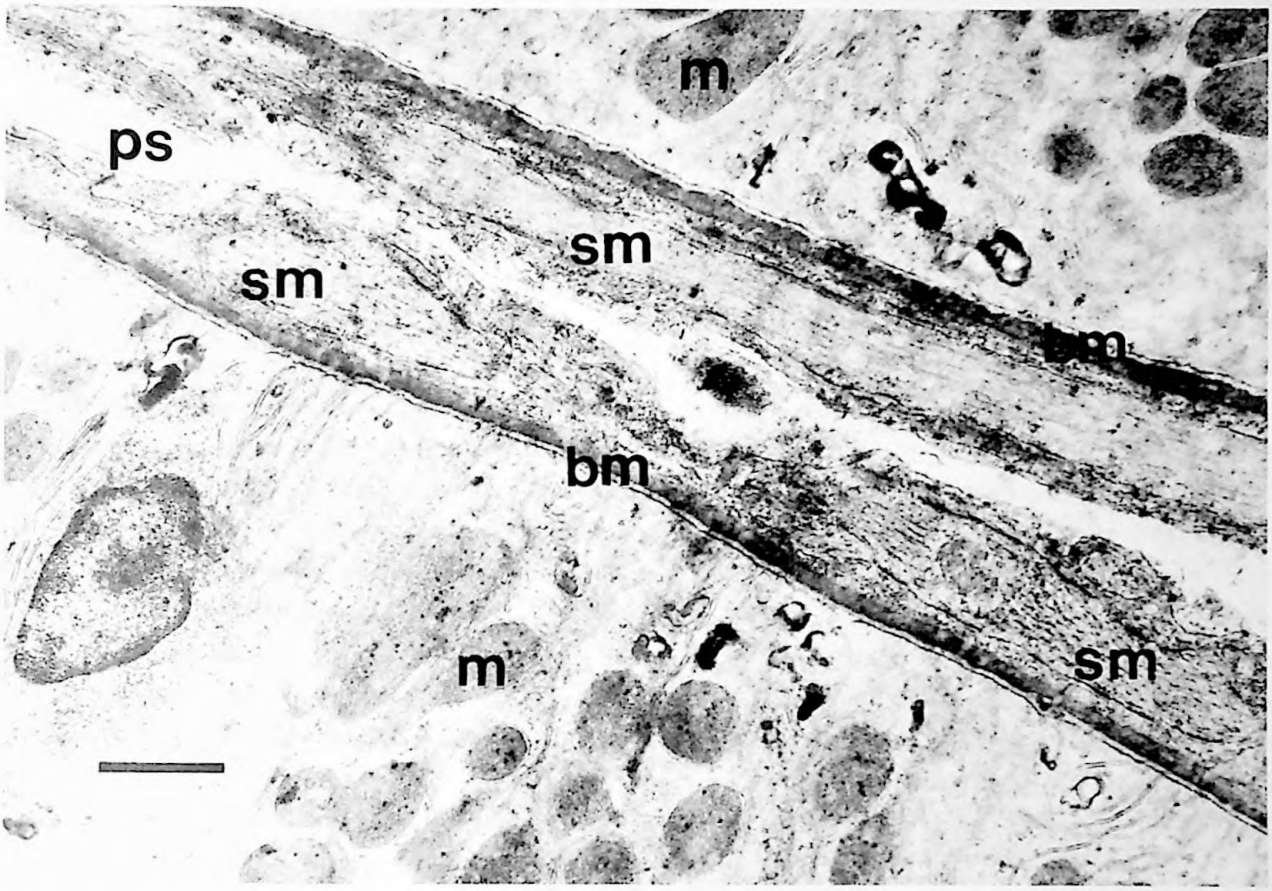

Figure 1.--Electron micrograph of adjacent proximal segments of flounder renal nephrons with numerous mitochondria (m). Smooth muscle cells (sm) are situated between the peritubular space (ps) and the basement membrane (bm) of the tubules. Mag. = 16,600 x, scale bar = 1.0 μm.

The function of tubular constrictions in the glomerular kidney of the winter flounder is not known. Trump and Bulger (1967) speculated that tubular constrictions may contribute to fluid propulsion along the flounder nephron. On the basis of single nephron glomerular filtration rates (gfr) of 350-650 pl min^{-1} (Beyenbach, 1982) and Poiseuilles equation, the pressure needed to drive fluid along the lumen of the renal tubule is negligible (less than .1 mm Hg) when compared to the arterial perfusion pressure of the kidney, 24 mm Hg (Cech et al., In: Respiration of Marine Organisms. Ed., Cech et al., TRIGOM, 155-162, 1975). Thus under normal glomerular filtration rates, filtration pressure should provide sufficient force to drive fluid flow along the nephron without the assitance of tubular constrictions. However, previous studies in our laboratory have shown that proximal tubules of the winter flounder secrete fluid at rates that may exceed the single nephron glomerular filtration rate if gfr is low or zero (glomerular intermittency). This leads us to speculate that in the absence of glomerular filtration (Hickman, Can. J. Zool. 46:427-437, 1968) and in the presence of tubular fluid secretion (Beyenbach, 1982), tubular constrictions may play an important role in the propulsion of luminal fluid along the proximal tubule and more distal segments of the nephron. Supported by Wiegand Fellowship (to WHC) and in part by NIH AM 26633 (to KWB).

CATION SELECTIVITY OF FLOUNDER PROXIMAL TUBLES

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Proximal tubules of the winter flounder Pseudopleuronectes americanus secrete fluid into the tubule lumen

across, what appears to be, an electrically leaky epithelium (Beyenbach, Nature 299:54-56, 1982). The low transepithelial voltages and resistances that are measured (Beyenbach, et al., Bull. MDIBL 20:78-82, 1982) presumably result from transepithelial low resistance pathways between epithelial cells. Since the role of this pathway in fluid secretion is unknown it was of interest to evaluate its permselectivity with respect to the two principal ions found in secreted fluid, Na and Cl.

Flounder proximal tubules were isolated and perfused in vitro as described previously (Bull. MDIBL 20:78-82, 1982). The transepithelial voltage (V_T) was measured continuously. The ionic selectivity of the tubule wall was assessed by examination of dilution potentials that result when the NaCl concentration in the bath or tubule lumen was reduced (145 mM →14.5 mM) and isosmotically replaced with mannitol (Boulpaep and Seely, AJP 221:1084-1096, 1971; Greger, Pflügers Arch. 390:30-37, 1981; Warnock and Gee, AJP 242:F395-F405, 1982). The measured transepithelial voltage changes were corrected for liquid junction potentials at the agar bridges, using a free flowing saturated KCl electrode as reference. Under control conditions, i.e., with identical Ringer's (145 mM NaCl) in lumen and bath, the transepithelial voltage was -1.6 ± 0.6 mV (9), $\bar{x} \pm$ S.E. (number of tubules). When the NaCl concentration in the bath was lowered the transepithelial voltage became more lumen-negative, changing by -24.9 ± 1.8 mV (13). Subsequent reduction of the lumen NaCl concentration, which eliminated transepithelial diffusion gradients for NaCl, abolished this dilution potential and returned V_T to control values, -2.6 ± 1.4 mV (4). When the bath NaCl concentration was increased to control values again (producing lumen-directed diffusion gradients for NaCl) the lumen became electropositive to the bath changing by 22.2 ± 3.0 mV (7). This dilution potential disappeared when control Ringer was also present in the tubule lumen. The data summarized above for 13 tubules are represented graphically in Figure 1 for a single tubule experiment.

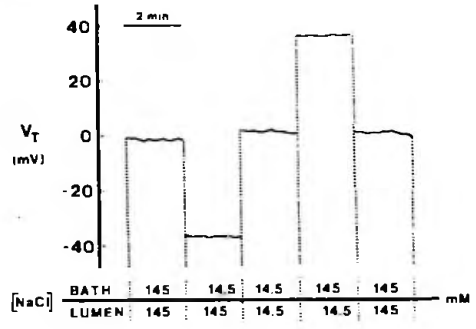

Figure 1.--Transepithelial voltages induced by transepithelial diffusion gradients for NaCl in the tubule which elicited the largest voltage responses. The figure lists the NaCl concentrations under each experimental condition. Voltage is measured with respect to ground in the bath.

The results clearly showed that transepithelial diffusion gradients for NaCl give rise to transepithelial voltages. When the gradient drives diffusion from bath to lumen, the lumen becomes electropositive. The similar magnitude of the voltage changes, differing in polarity only, supports the assumption that the changes in the transepithelial voltage took place across a single barrier, presumably located in the paracellular pathway. The polarities of the voltage changes indicate the permselectivity of this pathway for Na. However, since the full Nernst potential for Na was not observed the data are also consistent with the paracellular permeation of Cl. Supported in part by NIH AM 26633.

HIGH AFFINITY ESTROGEN BINDING IN CYTOSOL OF WINTER FLOUNDER LIVER.

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Many aspects of liver function are responsive to steroidal estrogens and researchers have demonstrated that