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Intraluminal Measurement of Papillary Duct Urine pH, *in Vivo*: A Pilot Study in the Swine Kidney

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Abstract:

We describe the *in vivo* use of an optic-chemo microsensor to measure intraluminal papillary duct urine pH in a large mammal. Fiber-optic pH microsensors have a tip diameter of 140- μm that allows insertion into papillary Bellini ducts to measure tubule urine proton concentration. Anesthetized adult pigs underwent percutaneous nephrolithotomy to access the lower pole of the urinary collecting system. A flexible nephroscope was advanced towards an upper pole papilla with the fiber-optic microsensor contained within the working channel. The microsensor was then carefully inserted into Bellini ducts to measure tubule urine pH in real time. We successfully recorded tubule urine pH values in five papillary ducts from three pigs (1 farm pig and 2 metabolic syndrome Ossabaw pigs). Our results demonstrate that optical microsensor technology can be used to measure intraluminal urine pH in real time in a living large mammal. This opens the possibility for application of this optical pH sensing technology in nephrolithiasis.

Keywords: Fiber-optic chemical sensor, hydrogen ion concentration, kidney, shock wave lithotripsy, tubule