

Gary E. Shull, PhD

Professor

Department of Molecular Genetics, Biochemistry and Microbiology

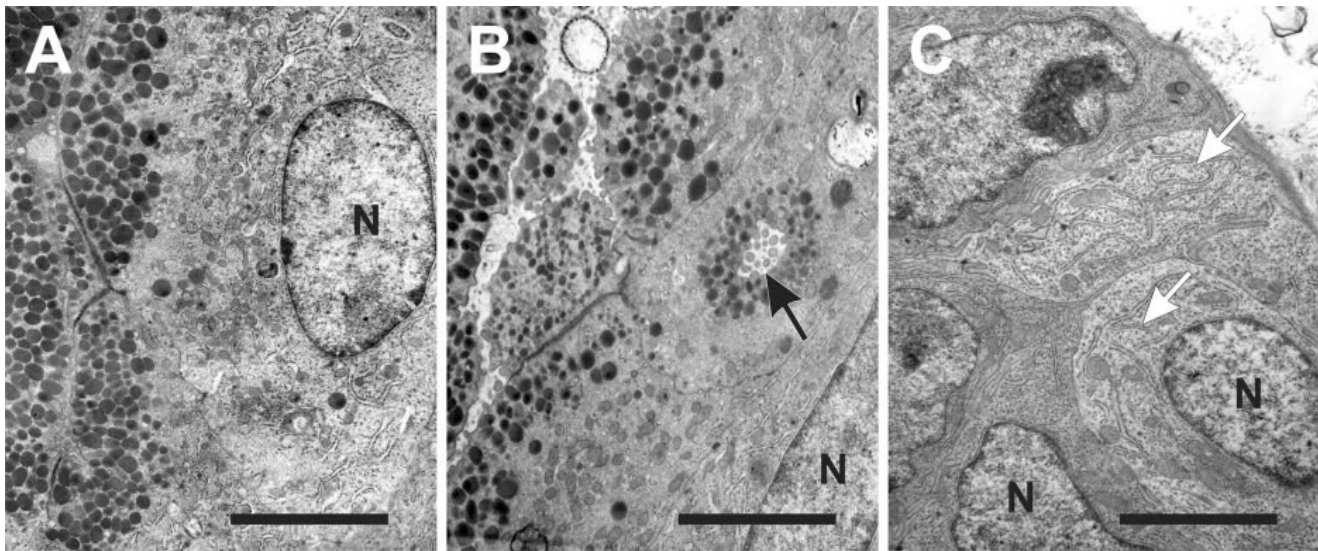
Description of Research:

Ion transport proteins are important in homeostatic processes that are disturbed in a number of human diseases, including those of the gastrointestinal tract, heart, kidney, and skin. To understand the physiological functions of these ion transporters, Dr. Shull is developing mouse models in which their genes have been disrupted, and analyzing them using molecular, physiological, and bioinformatics techniques. This work has revealed a diversity of phenotypes, including systemic acid-base disorders of the gastrointestinal tract, mouse models of congenital diarrheal disease, impaired cardiac performance, reduced blood pressure, profound hearing loss, male infertility, systemic acid-base disorders, and perturbations of transepithelial ion transport in the kidney. Many of the ion transporters for which they have developed knockout mouse models are known to be involved in human diseases. These studies have provided important insights about the physiological functions of these ion transporters *in vivo*.

Collaborations:

Dr. Shull collaborates with Dr. Lorenz on the analysis of mouse models in which ion transport processes have been disrupted in epithelial tissues. Additionally, Dr. Shull works with Drs. Cohen, Cuppoletti, Matthews, Montrose, Warner, and Witte investigating mouse models in which absorption or secretion has been altered in the intestinal tract and has used the **Bioinformatics Core** to analyze microarray data from his mouse models.

Representative Figure:



Electron micrographs of mucous and undifferentiated cells from 9-week-old NHE4^{+/+} or NHE4^{-/-} mice. (A) wild-type mucous pit cell showing mucus granules. (B) NHE4^{+/+} mucous pit cells had mucus granules and small cystic structures (arrow) were often observed as well. (C) In NHE4^{-/-} gastric glands, one of the most common cell types observed by electron microscopy was a relatively undifferentiated cell with numerous polysomes and none of the ultrastructural features indicative of a specific lineage. The cytoplasm of some of these cells (arrows) appeared lighter than others (see the adjacent cells). Abbreviation: N, nucleus. For all panels, bars = 5 μ m. Fig. 10 from *J Biol Chem*, 2005; 280: 12781-12789.