PubMed

Display Settings: Abstract





PLoS One. 2013 May 14;8(5):e62864. doi: 10.1371/journal.pone.0062864. Print 2013.

Identification of functionally distinct Na-HCO3 co-transporters in colon.

Barmeyer C, Ye JH, Soroka C, Geibel P, Hingsammer LM, Weitgasser L, Atway D, Geibel JP, Binder HJ, Rajendran VM.

Department of Internal Medicine, Yale University, New Haven, Connecticut, USA.

Abstract

Na-HCO3 cotransport (NBC) regulates intracellular pH (pHi) and HCO3 secretion in rat colon. NBC has been characterized as a 5,5'-diisothiocyanato-2-2'-stilbene (DIDS)-sensitive transporter in several tissues, while the colonic NBC is sensitive to both amiloride and DIDS. In addition, the colonic NBC has been identified as critical for pHi regulation as it is activated by intravesicular acid pH. Molecular studies have identified several characteristically distinct NBC isoforms [i.e. electrogenic (NBCe) and electroneutral (NBCn)] that exhibit tissue specific expression. This study was initiated to establish the molecular identity and specific function of NBC isoforms in rat colon. Northern blot and reverse transcriptase PCR (RT-PCR) analyses revealed that electrogenic NBCe1B or NBCe1C (NBCe1B/C) isoform is predominantly expressed in proximal colon, while electroneutral NBCn1C or NBCn1D (NBCn1C/D) is expressed in both proximal and distal colon. Functional analyses revealed that amiloride-insensitive, electrogenic, pH gradient-dependent NBC activity is present only in basolateral membranes of proximal colon. In contrast, amiloride-sensitive, electroneutral, [H(+)]-dependent NBC activity is present in both proximal and distal colon. Both electrogenic and electroneutral NBC activities are saturable processes with an apparent Km for Na of 7.3 and 4.3 mM, respectively; and are DIDS-sensitive with apparent Ki of 8.9 and 263.8 µM, respectively. In addition to Na-H exchanger isoform-1 (NHE1), pHi acidification is regulated by a HCO3-dependent mechanism that is HOE694-insensitive in colonic crypt glands. We conclude from these data that electroneutral, amiloride-sensitive NBC is encoded by NBCn1C/D and is present in both proximal and distal colon, while NBCe1B/C encodes electrogenic, amiloride-insensitive Na-HCO3 cotransport in proximal colon. We also conclude that NBCn1C/D regulates HCO3-dependent HOE694-insensitive Na-HCO3 cotransport and plays a critical role in pHi regulation in colonic epithelial cells.

PMID: 23690961 [PubMed - in process] PMCID: PMC3653958 Free PMC Article

Images from this publication. See all images (12) Free text









