Localization of the high affinity glutamate transporter EAAC1 in rat kidney.

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Abstract

Most amino acids filtered by the glomerulus are reabsorbed in the kidney via specialized transport systems. Recently, the cDNA encoding a high-affinity glutamate transporter, EAAC1, has been isolated and shown to be expressed at high levels in the kidney. To determine the potential role of EAAC1 in renal acidic amino acid reabsorption, the distribution of EAAC1 mRNA and protein in rat kidney was examined. In situ hybridization revealed that EAAC1 mRNA is expressed predominantly in S2 and S3 segments of the proximal tubules and at low levels in the inner stripe of outer medulla and inner medulla. Polyclonal antibodies raised against the carboxy terminus of EAAC1 recognized a single band of ~70 kDa on Western blots of membrane protein from kidney cortex and medulla. Immunofluorescence microscopy revealed intense signals in the luminal membrane of S2 and S3 segments and weaker signals in S1 segments, descending thin limbs of long-loop nephrons, medullary thick ascending limbs, and distal convoluted tubules. These results are consistent with EAAC1 encoding the previously described apical high-affinity glutamate transporter in the kidney that mediates reabsorption of acidic amino acids in tubules beyond early proximal tubule S1 segments. Potential additional roles of EAAC1 in acid/base balance, cell volume regulation, and amino acid metabolism are discussed.

acidic amino acid; proximal tubule; loop of Henle; distal tubule; metabolic acidosis; glutamine; ammonia; volume regulation