Abstract

An extracellular ATPase (E-type ATPase) clone was isolated from a human brain cDNA library and sequenced. The transcript shows similarity to the previously published chicken smooth muscle and rat brain ecto-ATPase cDNAs, human CD39L1 cDNA (putative human ecto-ATPase), and mammalian CD39 (lymphoid cell activation antigen, ecto-apyrase, ATPDase, ATP-diphosphohydrolase) cDNAs. The full-length human brain cDNA encodes a 529 amino acid glycoprotein with a putative membrane spanning region near each terminus, with the majority of the protein found extracellularly. Expression of this clone in mammalian COS-1 cells yielded NaN₃-sensitive ATPase and ADPase activity detectable both on intact cells and cell membrane preparations. The nucleotide
hydrolysis ratio of the expressed protein is approx. 2.75:1 (ATPase:ADPase activity), classifying it as an ecto-apyrase. However, this hydrolysis ratio is intermediate between that observed for the ecto-ATPases and the CD39 ecto-apyrases (L. Plesner, Int. Rev. Cytol. 158 (1995) 141–214). Quantitative analyses of amino acid identities and similarities between this ecto-apyrase and other vertebrate E-type ATPases suggest that this human brain enzyme is nearly equally related to the ecto-ATPases and the CD39s, and phylogenetic analysis suggests that it could be an ancestral enzyme from which both ecto-ATPases and CD39 ecto-apyrases are derived.

Keywords
Ecto-ATPase; Ecto-apyrase; CD39; Brain; Extracellular nucleotide; E-type ATPase

Abbreviations
ADP, adenosine 5â€²-diphosphate; ATP, adenosine 5â€²-triphosphate; BLAST, basic local alignment search tool; cDNA, complementary DNA; CD39, lymphoid cell activation antigen (ecto-apyrase); ECL, enhanced chemiluminescence; ecto-ATPDase, ecto-ATP diphosphohydrolase (ecto-apyrase); EDTA, ethylenediaminetetraacetic acid; EGTA, ethylene glycolbis(â€²-aminoethyl ether)-N,N,Nâ€²,Nâ€²-tetraacetic acid; HB6, human brain E-type ATPase clone; MOPS, 3-(N-morpholino)propanesulfonic acid

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