Functional expression of the organic cation/carnitine transporter 2 in astrocytes

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L-Carnitine plays an important role in lipid metabolism by facilitating the transport of long-chain fatty acids across the mitochondrial inner membrane followed by fatty acid ß-oxidation. Acetyl-L-carnitine, a naturally occurring endogenous compound, has been shown to improve the cognitive performance of patients with senile dementia Alzheimer's type, and to be involved in cholinergic neurotransmission. We sought to identify the transporters that mediate the uptake of L-carnitine and acetyl-L-carnitine in rat cortical astrocytes. L-carnitine and acetyl-L-carnitine uptake were both saturable, and mediated by a single Na^+-dependent transport system. Uptake of both was inhibited by L-carnitine, D-carnitine, acyl-L-carnitines and various organic cations. A highly significant correlation was found between the potencies of acylcarnitines in the inhibition of L-carnitine and acetyl-L-carnitine uptake and the acyl chain length of acylcarnitines. The expression of mRNA for organic cation/carnitine transporters (OCTNs), carnitine transporter 2 (CT2) and amino acid transporter $B^{0,+}$ ($ATB^{0,+}$) in astrocytes was investigated by reverse transcription (RT)–PCR. OCTN2 mRNA was expressed in astrocytes, whereas the expression of OCTN1, OCTN3 and CT2 mRNA could not be detected. $ATB^{0,+}$ mRNA was expressed at very low levels in astrocytes. Western blotting analysis indicated that anti-OCTN2 polyclonal antibody recognized a band of 70 kDa in both kidney and astrocyte preparations. OCTN2 immunoreactivity was detected in rat astrocytes by immunocytochemical staining. Inhibition of OCTN2 expression by RNA interference significantly inhibited L-carnitine and acetyl-L-carnitine uptake into astrocytes. These results suggest that OCTN2 is functionally expressed in rat astrocytes, and is responsible for L-carnitine and acetyl-L-carnitine uptake in these cells.