Acylcarnitines Accumulating in Medium-chain Acyl-CoA Dehydrogenase Deficiency Impairs Redox Homeostasis in Rat Cerebral Cortex


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Medium-chain acyl-CoA dehydrogenase deficiency (MCADD) is the most frequent fatty acid oxidation disorders, clinically characterized by episodic crises with vomiting, seizures and coma. Considering that the pathophysiology of the neurological symptoms observed in MCADD is poorly known, the objective of the present study was to investigate the in vitro effects of hexanoylcarnitine (HC), octanoylcarnitine, decanoylcarnitine (DC) and cis-4-decenoylcarnitine (cDC) on important oxidative stress parameters in cerebral cortex of young rats. HC, DC and cDC significantly induced lipid peroxidation, as determined by increased thiobarbituric acid-reactive substances (TBA-RS) values. In addition, carbonyl formation was significantly augmented and sulphydryl content diminished by DC, reflecting induction of protein oxidative damage. HC, DC and cDC also decreased reduced glutathione (GSH) levels, the most important brain antioxidant defense. Furthermore, DC-induced elevation of TBA-RS values and decrease of GSH levels were prevented by the free radical scavengers melatonin and α-tocopherol, indicating the involvement of reactive oxygen species in these effects. Our present data show that the major medium-chain acylcarnitines accumulating in MCADD elicit oxidative stress in rat brain. It is therefore presumed that these compounds may be involved to a certain extent in the pathogenesis of the neurologic dysfunction of MCADD.

Key words: oxidative stress; acylcarnitines; cerebral cortex

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