Effect of Dietary Conjugated Linoleic Acid Isomers on Water and Glycerol Permeability of Kidney Membranes

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Conjugated linoleic acid (CLA) refers to a group of positional and geometrical isomers of linoleic acid (18:2ω-6) in which the double bonds are conjugated. Dietary CLA has been associated with various health benefits although details of its molecular mode of action remain elusive. The effect of CLA supplemented to palm oil-based diets in Wistar rats, as a mixture of both or isolated cis9,trans11 and trans10,cis12 isomers, was examined on water and glycerol membrane permeability of kidney proximal tubule. A control group without CLA was included for comparative purposes. Purified kidney brush-border membrane vesicles were obtained providing an excellent model to study transport processes independently of other cellular events. The membrane permeability was assessed by stopped-flow light scatter and the activation energy calculated for water and glycerol transport. Additionally, the fatty acid profile of membrane vesicles was determined in order to assess CLA isomers incorporation into total membrane lipids. Even though water permeability was unaltered, an increase in glycerol permeability was obtained for the group supplemented with CLA mixture, possibly by means of an increase in lipid bilayer fluidity since the activation energy for glycerol permeation remained high. This effect was correlated with an increased CLA isomeric membrane incorporation for the same dietary group. Conversely, our data indicate that CLA isomers, combined or isolated, do not affect aquaporin-mediated water transport. Taken together, these results suggest that diet supplementation with CLA mixture, in contrast to its individual isomers, may enhance membrane fluidity subsequently raising kidney glycerol reabsorption. This fact may be of biological relevance since in the kidney, glycerol can be either metabolized in situ or converted to glucose in the liver.

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