Medium-chain dicarboxylic acylcarnitines as markers of n-3 PUFA-induced peroxisomal oxidation of fatty acids.

Omega-3 polyunsaturated fatty acids (n-3 PUFA) found in fish oil activate PPAR-?, stimulate peroxisomal fatty acid (FA) ?-oxidation and prevent impairments on glucose homeostasis. Glucose metabolism and FA oxidation were studied in C57/Bl6 mice fed with diets containing either 3.6 and 31.5% fish oil or lard. To assess the effects of peroxisomal proliferation on FA oxidation independent of n-3 PUFA intake, mice were treated with the PPAR-? agonist WY-14643. n-3 PUFA-fed mice were protected from glucose intolerance and dyslipidemia compared to animals fed a lard-based high-fat diet. Most importantly, mice fed on the hyperlipidic diet based on fish oil as well as the WY-14643 treated mice showed twofold increase of odd, medium-chain, dicarboxylic acylcarnitines in the liver suggesting that not only ?-oxidation, but also ?- and ?-oxidation of FA were increased. Finally, an oxidation assay using liver homogenates and palmitic acid as substrate revealed an over tenfold increased production of similar acylcarnitines, indicating that FA are their precursors. This study shows at the metabolite level that peroxisome proliferation induced either by fish oil or WY-14643 is associated with increased ?- and ?-oxidation of FA producing specific acylcarnitines that...
can be utilized as biomarkers of peroxisomal FA oxidation.