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Targeted and untargeted lipidomics reveal unique lipid profile in "Omega-3" transgenic mice

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Essential fats, such as omega-3 and omega-6 fatty acids, must be obtained through the diet and cannot be synthesized de novo in mammals. In 2004, the fat-1 transgenic mouse model was developed, enabling the mouse to endogenously convert omega-6 to omega-3 fatty acids. Research has demonstrated that the fat-1 mouse is protected against a wide variety of diseases and conditions related to inflammation including colitis, pancreatitis, asthma, hepatitis, liver disease, atherosclerosis, insulin resistance, and several types of cancer (breast, colon, pancreatic, liver).

Although a large number of studies have demonstrated reduced disease risk and health benefits in fat-1 mice, a comprehensive comparison of lipids profiles in fat-1 and wild-type mice has not been previously feasible due to lack of a sensitive and comprehensive analytical technique capable of simultaneously quantifying high-abundance (e.g., phospholipids) and low abundance lipids (e.g., oxylipins).

In this study, we used a state-of-the-art, high-throughput assays for the analysis of bioactive lipid species in plasma and liver samples from fat-1 and wild-type mice, providing new clues to the pathways and mechanisms that may be involved in health benefits associated with alterations of the omega-6/omega-3 fatty acids ratio.

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