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Lipidomic membrane as a molecular basis for precision nutrition in childhood obesity

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Obesity is a metabolic chronic disease of high complexity and multifactorial origin. Diet and life style are the main causes of the disease but the effect of food in the organism is not easy to measure. The use of mature erythrocyte membranes as representative site for all other body tissues, is an established protocol for membrane-based molecular diagnostics [1–3]. The aim of this study was to compare the fatty acid (FA) composition of erythrocyte membranes from obese children compared with normal weight controls together with the evaluation of the nutritional and behavioral profile.

A prospective observational study was carried out on a cohort of 161 children (104 normal weight and 57 obese), from 6 to 16 years old, recruited at AZTI and Biocruces Bizkaia Health Research Institute. FA composition of mature erythrocyte membrane phospholipids was determined by gas chromatography-mass spectrometry. Nutritional data and life style were also obtained through validated questionnaires.

Obese children showed a mid-quality diet (7.8 points, measured with KIDMED index) characterized by a lower intake of fish, vegetables and nuts and higher intake of sugars and processed meat compared with optimal quality diet observed in normal weight children. Fatty acid profile of obese children showed an inflammatory profile, evidenced by the excess of omega 6 FA (mainly arachidonic acid), as well as a prevalence of saturated and trans FA (Fig. 1).

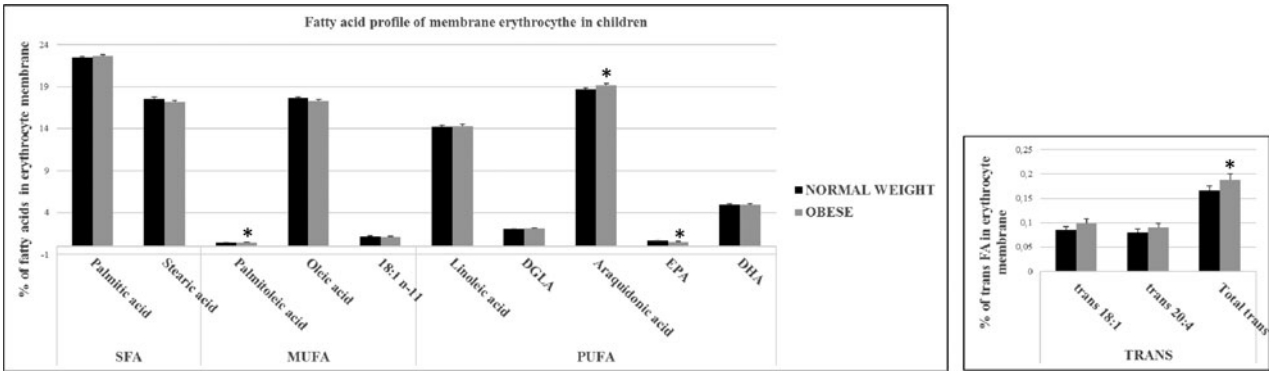

Fig. 1. Erythrocyte membrane fatty acids in obese and normal weight children. Data are expressed whit means ± standard error. SFA: saturated FA; MUFA: monounsaturated FA; PUFA: polyunsaturated FA. *$p < 0.05$ Data was compared with Analysis of Covariance test (ANCOVA) adjusting model by age, gender and food intake.

This study reveals an altered lipid profile of erythrocyte membranes of obese subjects evidencing the effect of diet, lifestyle and metabolism on the disease. A comprehensive membrane lipidomic profile of obesity will allow us to design customized food solutions to improve health status, which may include specific food products and supplements to prevent and control obesity.

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