

The MODUL Study: Biomarkers before and after intervention in obese children and adolescents

by

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Objectives: The MODUL Study was designed as a 6-month 3-step intervention program for 12-14 year-old children and adolescents with BMI > 97th of age and sex specific percentiles.

Methods: Each module was composed of 2-hour afternoon group sessions 5 times a week for 4 weeks. Module 1 was focused on dietary intervention, using a collection of balanced recipes for breakfast, hot and cold dishes, and snacks, allowing for a free choice of dishes up to a daily maximum of 100 points. This was accompanied by nutritional education, hands-on cooking and eating what the participants had cooked with their peers. Module 2 included 2 hours of sports activities 4 times a week and a nutritional education session on day 4. Module 3 consisted of additional supplementation of 100 mg/d of alpha-tocopherol, because the plasma concentrations had dropped during dietary restriction. Parents were educated during 2-hour evening sessions once a week. Diet diaries were kept throughout the 3 modules and in the intervals between the modules. They were checked daily by the dietitians. A total of 25 children and adolescents were enrolled after informed consent had been obtained.

Results: Dietary fat intake was reduced from 91±25 g/d (37±5 energy%) to 40±13 g/d (29±3 energy%), while energy% derived from protein and carbohydrate was increased. Body weight (-11.6%), body mass index (-13.7%), waist circumference (-9.3%) and subcutaneous adipose tissue mass (-25.3%) decreased significantly. The changes in dietary intake were accompanied not only by significant decreases in plasma concentrations of total and LDL cholesterol, triglycerides and ApoB, but also by those of fasting blood glucose and C-reactive protein, and activities of the liver enzymes ALT, AST and gamma-GT. Due to reduction of vitamin E intake from 11±5 mg/d to 6.6±1.7 mg/d, plasma alpha-tocopherol concentrations decreased significantly to concentrations that were even below the age-specific mean-2SD. They could be restored to normal with low-dose vitamin E supplements, which was associated with a decrease in C-reactive protein concentrations.

Conclusions: Dietary energy and fat restriction are associated with improved glucose and lipid metabolism but also associated with impaired vitamin E status that might become pathophysiologically relevant, given that vitamin E is an antioxidant and as such might also counteract low-grade inflammation in obesity.

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