

## Abstract

### **Consumption of low-medium dairy products protects against non-alcoholic fatty liver disease, while high-fat milk and fat from different sources are equally deleterious**

**Background:** Non-alcoholic fatty liver disease (NAFLD) is strongly related with nutrition. Only a few cross-sectional studies and animal studies comparing milk fat to other different fat sources regarding metabolic effects, liver fibrosis or liver damage were conducted. The association of dairy products with a low and high fat to the NAFLD spectrum not fully elucidated.

**Research Hypothesis:** The described studies clarify if milk fat consumption accelerates or ameliorates fatty liver disease by affecting metabolic processes and if it contributes or not to oxidative stress and liver damage.

**Aims:** We aimed to assess the association between dairy product consumption with incidence and remission of NAFLD and presumed significant fibrosis.

**Methods:** Animal study: C57BL/j6 mice 6 weeks old were fed for 10 weeks with high-fat diets based on lard, soybean oil and milk fat (60 percent of total calories). Metabolic impairment and liver damage were evaluated at the end of the experiment. Human study: prospective cohort study among subjects 40-70 years old, participating in two surveys, at least five years apart. NAFLD was determined by ultrasonography or controlled attenuation parameter (CAP), and liver fibrosis by Fibroscan. Meat consumption was assessed by a food frequency questionnaire (FFQ).

**Results:** In mice supplemented with different high-fat diets, all diets induced similar weight gain which was significantly higher compared to control low-fat diet. Surprisingly, high-fat lard-based diet that contains a lot of oleic acid was better in controlling blood glucose than milk fat which was better than soybean oil. Milk fat increased serum cholesterol levels more than lard or soybean oil. In all other parameters of liver damage, there was no significant difference between the fat sources. In the human study, a total of 316 subjects completed the two surveys. In multivariable, high consumption of low-medium fat dairy products (g/d above the baseline gender-specific median) was associated with a lower risk for NAFLD incidence (OR=0.42, 0.18-0.95, P=0.037) or incidence/persistence at follow-up (OR=0.58, 0.34-0.97, P=0.039). High-fat dairy consumption was not related to NAFLD. Neither low-medium nor high-fat dairy consumption was related to presumed significant fibrosis evaluated by liver stiffness. Constantly high consumption of low-medium fat dairy products (p/d above the baseline gender-specific median in both evaluations) was associated with a lower odd for incidence/persistence

NAFLD at follow-up, compared to constantly low consumption (OR=0.51, 0.26-0.99, P=0.046).

**Conclusion:** High-fat diet from different fat sources with a wide spectrum of fatty acids saturation content were found to be equally deleterious. Low-medium fat dairy products may be protective against NAFLD. Low-medium fat dairy products may be preferred over high-fat products to prevent NAFLD.