Increased Adiposity and Hepatic Steatosis are Prevented in Mice Fed an Amylose-Rich Diet vs. a Diet High in Amylopectin

This study focused on non-alcoholic fatty liver disease (NAFLD), which is associated with obesity, insulin resistance, and type 2 diabetes mellitus, and is becoming recognized as a component of the metabolic syndrome. NAFLD includes hepatic steatosis, inflammation and fibrosis and can ultimately lead to cirrhosis.

The objective of this study was to evaluate the effect of a rapidly absorbed (high glycemic index) versus a slowly absorbed (low glycemic index) carbohydrate on measures of adiposity and hepatic steatosis in a mouse strain not predisposed to obesity or diabetes.

The study design randomized mice to two experimental diets. The macronutrient composition of each diet was constant (19% protein, 13% fat, 68% carbohydrate); the diets differed only in the type of starch used. One group was fed 100% amylopectin as its starch portion (A, high glycemic index), while the other was fed both amylopectin (40%) and amylose (60%) (AA, low glycemic index).

After a one-week run-in period on a high amylose diet, the mice were weight-paired and randomized to an A diet (n=8) or an AA diet (n=9). They were fed either diet for 25 weeks. Body weight and energy intake were the same for each group throughout the study.

Beginning at week 3, the AA-fed mice had a noticeably lower adiposity than the A-fed mice as evidenced by a DEXA scan (17.5±0.64% fat vs. 19.6±0.66% fat, respectively p=0.042). At week 18, AA-fed mice had 25.3±1.04% fat, while the A-fed mice had 30.7±0.87% fat (p=0.0008). At the end of the study, epididymal fat pads weighed less in AA-fed mice compared to A-fed mice. Oil Red O staining of frozen liver sections showed decreased intracellular fat droplet accumulation in AA-fed mice, compared to A-fed mice, with no difference in liver weights between the two groups. Triglycerides were extracted from the liver by the Folch method and quantified.

In addition to greater adiposity, the animals in the A group had higher insulin levels, higher circulating triglycerides and higher hepatic triglycerides compared to the AA group.

The study concluded that a diet high in rapidly absorbed carbohydrates leads to hyperinsulinemia, increased fat deposition and hepatic steatosis possibly due to increased substrate availability (glucose) for de novo lipogenesis. From this study we may speculate that Westernized diets comprised of refined, rapidly-absorbed carbohydrates could contribute to a metabolic milieu that increases the risk for cardiovascular disease.

Highlights from the **American Diabetes Association Annual Meeting 2006**