

ORIGINAL RESEARCH COMMUNICATION

# Mechanisms for the acute effect of fructose on postprandial lipemia<sup>1, 2, 3</sup>

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**Background:** A high fructose intake can lead to postprandial hypertriacylglycerolemia. The underlying mechanism is unclear.

**Objective:** The objective of the study was to investigate the mechanisms involved in fructose-induced hypertriacylglycerolemia and the contribution of de novo lipogenesis in an acute setting.

**Design:** In a randomized, crossover study, 14 subjects were given a fructose or glucose test meal after an overnight fast. [<sup>2</sup>H<sub>2</sub>]Palmitate and [U<sup>13</sup>C]<sub>D</sub>-fructose or [U<sup>13</sup>C]<sub>D</sub>-glucose were added to trace the handling of dietary fats and the fate of dietary sugars in the body. Blood samples were taken before and after the meal. Respiratory exchange ratio was measured by using indirect calorimetry, and breath samples were collected.

**Results:** Plasma triacylglycerol and VLDL-triacylglycerol concentrations were significantly higher ( $P = 0.001$  for both), whereas the concentrations of insulin and [<sup>2</sup>H<sub>2</sub>]palmitate in nonesterified fatty acids were significantly lower after fructose than after glucose ( $P = 0.002$  and  $0.03$ , respectively). The respiratory exchange ratio was higher after fructose ( $P = 0.04$ ); significantly ( $P = 0.003$ ) more carbon from sugars was recovered in breath carbon dioxide over 6 h after fructose (30.5%) than after glucose (24.5%). At 240 min, newly synthesized fatty acids from fructose made up  $\approx 0.4\%$  of circulating VLDL-triacylglycerol, whereas newly synthesized triacylglycerol-glycerol made up 38%. Newly synthesized fatty acids and triacylglycerol-glycerol from glucose contributed almost none of VLDL-triacylglycerol ( $P = 0.002$  and  $0.007$  for glucose and fructose, respectively).

**Conclusions:** The lower insulin excursion after fructose may result in less activation of adipose tissue lipoprotein lipase, which led to impaired triacylglycerol clearance. The contribution of de novo lipogenesis to fructose-induced hypertriacylglycerolemia is small, but its effect on altering the partitioning of fatty acids toward esterification may be considerable.

**Key Words:** Fructose • hypertriglyceridemia • de novo lipogenesis • mechanisms • high-carbohydrate diets • stable isotopes • lipoprotein lipase • carbohydrate oxidation

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Am. J. Clinical Nutrition, November 1, 2008; 88(5): 1419 - 1437.

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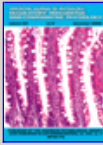


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