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In vivo magnetic resonance spectroscopy of lipid handling in steatotic rat liver

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Objective: Examine lipid handling in liver of rats fed with different high-fat diets using ^1H - ^{13}C magnetic resonance spectroscopy (MRS) together with oral administration of ^{13}C labeled lipids.

Methods: 6 male Wistar rats (11 weeks old; $348 \pm 8\text{g}$) were divided into three diet groups: low-fat (10% fat, CON), high-fat lard (45% fat, HFL), and high-fat palm oil (45%, HFP). After 10 weeks of diet, MRS experiments were performed at baseline, and 4 and 24 h after oral administration of 1.5 g [$\text{U-}^{13}\text{C}$] Algal lipid mixture per kg body weight.

Results: At 4 h after administration of the ^{13}C labeled lipids, ^{13}C enrichment of intracellular liver lipids was similarly increased in all three groups compared to baseline (CON: $0.031 \pm 0.017\%$; HFL: $0.045 \pm 0.022\%$; HFP: $0.033 \pm 0.013\%$), demonstrating that lipid uptake was not affected by the diet regimen. At 24 h, on the other hand, ^{13}C enrichment of liver lipids decreased in CON, whereas in both high-fat diet groups the ^{13}C enrichment did not change compared to 4 h, indicating a lower turnover of the stored liver lipids.

Conclusion: High-fat diet feeding did not alter liver lipid uptake in rats, but resulted in a decreased turnover of the lipids stored in the liver. *This research was funded by the Netherlands Consortium for Systems Biology (NCSB) which is part of the Netherlands Genomics Initiative/Netherlands Organisation for Scientific Research.*