

The effect of various dietary fatty acids on adaptive thermogenesis

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Summary:

Recently it has been revealed that brown adipose tissue (BAT) is present in adult humans and not, as thought before, only in infants and rodents. BAT, with a main function to generate heat, is also involved in energy metabolism by an adaptive response to eating, referred to as diet-induced thermogenesis (DIT). When activated, BAT has a large capacity to dissipate energy, therefore being an interesting player in counteracting obesity. The aim of this review was to examine whether dietary fatty acids may have effects on BAT. There are at least 20 different dietary fatty acids containing 4 to 22 carbons. Depending on length and amount of double bonds, the fatty acids have different properties and effects on BAT. In summary, dietary short-chain fatty acids and medium-chain fatty acids have the largest effect on BAT, with a substantial anti-obesity impact. Long-chain fatty acids and conjugated fatty acids have weaker effects; however they show browning in WAT and decreased visceral fat pad sizes, but possibly need long-term duration to be effective. Nonetheless, for BAT to stay active, it has to be constantly activated, indicating a continual requirement for adequate fatty acids to be more or less chronic to obtain thermogenic effects.

Enclosed in this thesis are the following papers:

Paper I: Significant diet-induced thermogenesis in wild-type but not in UCP1-ablated mice

Paper II: No obesity protection from cold-recruited brown adipose tissue, when mice are transferred to thermoneutrality

Paper III: Replacing long-chain triglycerides with medium-chain triglycerides abolishes diet-induced obesity