Role of endogenous endotoxin absorption and LPS receptors in metabolic inflammation related to excessive lipid intake

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Low-grade inflammation is recognized as a major metabolic feature in obesity, leading to increased risks of insulin resistance and cardiovascular disease. Among possible causes triggering such inflammation, the role of the absorption of gut endotoxins (lipopolysaccharides, LPS) during the digestion of lipids in a meal has recently been revealed. However, the impact of increased lipid intake and of lipid composition on endotoxin-related metabolism remained to be elucidated.

Healthy normal weight to obese humans were characterized regarding endotoxemia. Non-obese volunteers were then subjected to a dietary overfeeding intervention with a 70 g-increase of daily lipid intake. Moreover, mice were fed diets enriched with 20 wt% of rapeseed oil, sunflower oil, palm oil or milk fat. We measured endotoxemia, LPS receptors LBP and sCD14, IL-6 and MCP-1. Gene expression of TLR4, CD14 and cytokines was analysed by PCR in white adipose tissue.

In humans, markers of endotoxemia increased with BMI. Moreover, in part of the cohort, increased lipid intake resulted in altered markers of endotoxemia and increased postprandial absorption of endotoxins associated with increased inflammation. In mice, palm oil-diet provoked the greatest inflammatory outcomes, high plasma LBP, low sCD14 and increased expression of TLR4 and CD14 in adipose tissue. In contrast, rapeseed oil-diet resulted in an LPS metabolism driven towards less inflammatory pathways.

Mechanisms involving endotoxin metabolism appear to contribute to the development of low-grade inflammation during excessive fat intake. Moreover, lipid composition can contribute to modulate the onset of inflammation through the quality of LPS receptors.