

Effects of a supplementation of polyphenols on the early steps of weight gain in healthy volunteers submitted to one month of overfeeding: focus on the subcutaneous adipose tissue.

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Background: Overweight and obesity have dramatically increased worldwide. Because of their association with several deadly diseases (diabetes, cancer, cardiovascular diseases...), obesity and overweight became a serious public health topic. Many strategies are proposed to help counteract obesity and associated diseases development and among them, polyphenols are found to be a promising approach. Therefore, we decided to investigate the effects of a polyphenol supplementation during the early steps of weight gain in humans.

Material and methods: 42 healthy male subjects were submitted to 31 days of overfeeding, supplemented with either 2 g of polyphenols or a placebo. At the beginning and at the end of the intervention, blood and feces samples were collected, body composition was explored, euglycemic hyperinsulinemic clamp and indirect calorimetry were performed and tissue biopsies were realized. With a focus on adipose tissue biopsies, RNA-sequencing and RT-qPCR were performed in order to measure gene expression; immunohistochemistry was made to confirm the changes at the protein level.

Results: Overfeeding increased fat mass and body weight similarly in both groups. RNA-sequencing confirmed the effect of overfeeding on lipid storage and adipose tissue development and revealed a protective effect of polyphenols on the angiogenic response in the subcutaneous fat. RT-qPCR confirmed the sequencing data on the expression of genes related to lipid metabolism and angiogenesis. Immunohistochemistry using anti-CD31 antibodies reinforced these observations and showed that a supplementation of polyphenols during 31 days of overfeeding did inhibit angiogenesis in the subcutaneous adipose tissue of the subjects.

Conclusion: Polyphenol supplementation cannot protect against weight gain during overfeeding, however, it inhibits angiogenesis in the subcutaneous adipose tissue. The next step will be to find the genes, proteins or pathways involved in the inhibition of angiogenesis in the subcutaneous adipose tissue.