Tart Cherry and Fish Oil Effects in Male and Female Diet-induced (C57B6/6J) and Genetically Obese (TALLYHO/Jng) Mice

Maryam Seifishahpar,[1] Jung Han Kim,[2] Kalhara Menikdiwela,[1] Naima Moustaid-Moussa,[1] and Shane Scoggin[1]

[1]Texas Tech University and [2]Marshall University

Objectives: Obesity is a major public health concern that increases the risk of many other chronic diseases. Alteration and remodeling of adipose tissue due to obesity affect adipose functions, leading to chronic low-grade inflammation. Additionally, over accumulation of triglycerides in adipocytes can interfere with the endoplasmic reticulum (ER) functions. These functions include ER stress, as a mechanism to address protein misfolding and other cellular processes including autophagy. Previously, fish oil (FO) and tart cherry (TC) were shown to possess anti-inflammatory properties. We hypothesized that while TC and FO individually decrease inflammation, their combinatorial effects will be greater, either synergistic or additive on regulating inflammation and other adipose tissue functions.

Methods: Four-weeks old, male and female TALLYHO/Jng (TH) and C57BL/6J (B6) mice were fed five different diets including low fat (LF), high fat (HF), and HF supplemented with TC, FO, or TC + FO for 10 weeks. Mice were weighed and adipose tissue was collected and used for gene expression analyses by qRT-PCR.

Results: Both B6 and TH mice were significantly heavier on HF diets compared to LF with greater extent in TH for both sexes. In B6 males, HF group had higher expression levels of inflammatory markers including Mcp1, Il-6, NF-κB and Il-1b compared to LF group ($p < 0.05$). Supplementation with TC and TC + FO decreased mRNA levels of Mcp1 compared to HF in B6 male mice ($p < 0.05$). Furthermore, ER stress markers BIP, CHOP, and SXBP1 were significantly increased in TH males fed HF compared to LF diets ($p < 0.01$). Similarly, autophagy genes ATG12 and Beclin1 were upregulated in TH male HF group compared with LF group ($p < 0.001$). Additionally, supplementation with TC + FO reduced both ER stress (CHOP, sXBP1) and autophagy (ATG12) markers compared to HF in TH male mice ($p < 0.01$). Moreover, Beclin1 mRNA levels were significantly reduced in all supplemented groups compared to HF in B6 male mice ($p < 0.05$).

Conclusions: FO and TC individual and combined effects are in part mediated by changes in expression of genes involved in ER stress, autophagy, and inflammatory pathways in adipose tissue. Further experiments are ongoing to determine whether these changes will be translated at the protein level.

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