Abstract citation ID: bvac150.078

Adipose Tissue, Appetite, & Obesity

RF36 | PSUN101

Liver and Adipose Tissue Effects of Triiodothyronine Treatment in an Animal Model of Metabolic Syndrome

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Introduction: Metabolic syndrome (MS) associates to obesity and non-alcoholic fatty liver disease (NAFLD). Besides its high and rising prevalence, the therapeutical options are scarce. Studies show that thyroid hormones (TH) may ameliorate hepatic function and hepatic and extra-hepatic lipid deposition.

Aim: To evaluate the effects of triiodothyronine (T3) treatment in high and low dose on the liver and adipose tissue of an animal model of metabolic syndrome (ZSF1 rats).

Material and methods: Four groups of animals were evaluated: 1) ZSF1 lean rats (Ln, used as controls; n=8); 2) untreated ZSF1 obese rats (Ob; animal model of MS; n=10); 3) ZSF1 obese rats treated with high dose T3 (hT3; initially 0.04mg/mL and 0.06mg/mL after 4 weeks; n=5); 4) ZSF1 obese rats treated with low dose T3 (lT3; 0.03mg/mL; n=5). We performed anthropometric and oral glucose tolerance testing (OGTT). Tissues and blood were collected at the 24th week of age for histological evaluation and assessing the levels of thyroid hormones.

Results: The animals from hT3 and lT3 groups had similar weights and both were significantly heavier (tibial length/weight ratio of 14.7±0.6 and 14.1±0.7g/mm respectively) than Ln (10.7±0.6g/mm, p<0.01). The rats from lT3 group were also significantly lighter than Ob (15.3±1.0g/mm, p=0.042). Fasting glucose of hT3 (118.6±36.0mg/dL) was lower comparing to Ob (228.1±58.6mg/dL, p<0.01) and to lT3 (207.2±69.8mg/dL, p=0.048) and similar to Ln (82.1 ±9.1mg/dL, p=1.00). The evaluation of the area under the curve (AUC) of OGTT is in agreement with these results.

The histological evaluation of the liver showed a ratio between lipids and surrounding tissue significantly lower in the treated groups (hT3 0.35±0.1 and lT3 0.34±0.1) compared to Ob (0.89±0.2, p<0.01) and similar to Ln (0.14±0.1, p=0.106 and p=0.124, respectively). The ratio between glycogen and surrounding tissue was not different between treated animals and either Ob or Ln.

Concerning the adipose tissue, adipocyte area was similar between treated animals (hT3 7435±1031mm^2 and lT3 6899 ±554mm^2, p=1.00) and was significantly lower compared to Ob (9037±789mm^2, p<0.01) and higher compared to Ln (2771±754mm^2, p<0.01). The area of fibrosis was similar between hT3 and lT3 (7.7±1.1mm and 6.6±0. 5mm, respectively, p=1. 00), higher when comparing both groups with Ln (2.4±1.3mm, p<0.01) and lower when comparing both groups with Ob (13.5±2.2mm, p<0.01). **Conclusion:** Treatment of obese ZSF1 animals with T3 improved the glycemic profile, and lipid and fibrous deposition in the liver and adipose tissue. The usage of low dose T3 does not seem different from high dose concerning these effects and might be associated with fewer adverse events. TH may, in the future, become an option when treating patients with MS and NAFLD.

Presentation: Sunday, June 12, 2022 12:30 p.m. - 2:30 p.m., Monday, June 13, 2022 12:42 p.m. - 12:47 p.m.