**Possible correlations between thyroid hormone and depressive and anxious behavior in obese rats**

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**Introduction:** The thyroid hormone (TH) modulates the development and functioning of the central nervous system by regulating the expression of genes related to brain plasticity. There is a well described relationship between the thyroid hormone and mood changes such as depression and anxiety that may generally be reversed by treatment with T3. Obesity is related to depressive and anxious behavior and the very same genes regulated by T3 are changed in obesity. Thus, our working hypothesis is based on the possibility that obesity leads to changes in T3 signaling in the brain of rats that may be involved in the depression and anxiety observed in these animals.

**Methods:** To test our hypothesis we treated male Wistar rats with high fat diet (40%) for 32 weeks. At the end of this time the animals were subjected to behavioral testing to assess their memory acquisition, anxious and depressive behavior. We also evaluated changes in the expression of genes involved in depression, genes regulated by T3 and genes related to inflammation in pre-frontal cortex and hippocampus of the obese rats.

**Results:** Through behavioral tests we found that obesity induces a depressive and anxious behavior, but does not lead to memory impairment. The gene expression analysis showed that obesity leads to increase in mRNa for TH transporters (OATP1), for TH receptors (TRα, TRβ, PPARG and PPARbeta) and a decrease in two genes positively regulated by T3 (Aldh1a1 and RBM3) and an increase in Halpln1, a gene negatively regulated. We also found an increase in expression of genes related to inflammation (NFKB and MMP9).

**Discussion:** It is possible that obese individuals show a lower availability of T3 in the brain, which induces a local moderate hypothyroidism with a decrease in the T3 signaling pathway. The mild hypothyroidism could be underlying the depression observed in obese rats. The increase in transporters and receptors for T3 could be a compensatory mechanism to counteract this hypothyroidism. Furthermore, we observed a significant increase in the expression of genes related to inflammation, which may also be associated with the phenotype found in these animals.

**Conclusion:** Our results suggest that there is a change in TH signaling in the rat brains that may be involved in the development of a depressed and anxious phenotype induced by obesity.

**References:**

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