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The effects of topiramate on liver and NPY levels in female obese rats: Stereological and histopathological study

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Statement of the Problem: Obesity, defined as one of the 10 most risky diseases by the World Health Organization, affects almost all the system and organs in the body. Topiramate (TOP) is an antiepileptic drug which has also been proved to alleviate body weight. Neuropeptide Y (NPY) is a 36 amino-acid neuropeptide that is involved in various physiological and homeostatic processes in both the central and peripheral nervous systems (Figure 1).In this study, we aimed to develop an obesity model on adult rats with a high fat diet and to investigate the possible effect of TOP on liver in the high-fat-diet (HFD)-induced obese female rats and whether these possible effects are related to NPY levels by histological and morphometric methods.

Methodology & Theoretical Orientation: For this aim, 24 female Wistar albino rats were randomly divided in four equal groups, viz. control (CONT), obese (OBES), TOP, and OBES+TOP. Following processing and cutting the liver tissue, sections were used for histopathological examination and stereological analyses. Also immunohistochemical analyses were made by NPY marker.

Findings: Given the stereological outcomes, total number of hepatocytes was reduced in the OBES+TOP group compared to those of the TOP group. In terms of the mean sinusoid volume, no meaningful difference was distinguished among the groups. Likewise, histopathological findings exhibited mild to severe alterations in the manifestation of liver architectures in experimental rats (OBES, OBES+TOP, TOP). While NPY positivity increased in obese rats, it decreased in TOP administrated groups.

Conclusion & Significance: In conclusion, our findings presented that TOP administration associated with obesity decreases body weight by setting the NPY level. For all that, it may have deleterious influence on the liver tissue in the subjects and hepatocyte loss might be derived from the possible side effect of TOP in combination with obesity. Hence, the both are risk factors enhancing hepatotoxicity.

Figure 1: Homeostatic mechanism induced by NPY.

Recent Publications

1. Lee J S, Jun D W, Kim E K, et al. (2015) Histologic and metabolic derangement in high-fat, high-fructose, and combination diet animal models. Scientific world Journal 306326.
2. Alkan I, Altunkaynak BZ, Altun G and Erener E (2017) The investigation of the effects of topiramate on the hypothalamic levels of fat mass/obesity-associated protein and neuropeptide Y in obese female rats. Nutr Neurosci. 15:1-10.
3. Tüfek NH, Altunkaynak ME, Altunkaynak BZ and Kaplan S (2015) Effects of thymoquinone on testicular structure and sperm production in male obese rats. Syst Biol Reprod Med. 61(4):194-204.

4. Masarone M, Federico A, Abenavoli L, et al. (2014). Nonalcoholic fatty liver: epidemiology and natural history. Rev Recent Clin Trials 9:126-133.
5. Bekar E, Altunkaynak BZ, Balcı K, Aslan G, Ayyıldız M and Kaplan S (2014) Effects of high fat diet induced obesity on peripheral nerve regeneration and levels of GAP 43 and TGF-β in rats. Biotech Histochem. 89(6):446-56.

Biography

B Zuhal Altunkaynak is a Professor in Histology and Embryology. She has expertise in studies about pathophysiology and neural pathways of obesity and their treatment in the animal models. She uses light and electron microscopy and also histochemical and molecular technics for these studies.

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