SUGAR SUBSTITUTE COMPOUNDS AS ENVIRONMENTAL EXPOSURES – ASPECTS FROM NEUROENDOCRINE FUNCTIONS

Zsolt Molnár[1], Péter Hausinger[2], Krisztián Sepp[3], Mózes Miklós[1,3], Marianna Radács[1] and Márta Gálfi[1]

[1]Institute of Applied Natural Science, Faculty of Education, University of Szeged Hungary Department of Environmental Biology and Education, Juhász Gyula Faculty of Education, University of Szeged, Szeged H-6725, Hungary
[2]Invasive Cardiology Department, Southern Site of Internal Medicine, Albert Szent-Györgyi Medical School, University of Szeged, Szeged H-6725, Hungary
[3]Department of Internal Medicine, Albert Szent-Györgyi Medical School, University of Szeged, Szeged H-6725, Hungary
e-mail: molnar.zsolt.02@szte.hu

Abstract
It is an extremely interesting question to what extent elements of psychic activity (e.g. cognition) in social existence can change by mediating neuroendocrine communication when it is necessarily altered by chemical environmental influences (e.g. nutritional biological agents) through real technosphere exposures. In the processes of learning and memory, biological mechanisms regulated by the neuro-endocrine system appear predominantly, showing a network relationship with essential local system properties. Exposures (dietary supplements) are tested on in vitro models by monitoring the events of neuro-endocrinological communication (hormone secretions, monoamine /adrenaline and serotonine/) and their changes in exposure.

Introduction
The quality of nutrients is of particular importance in the elements of the environmental system. In normal human homeostasis, the carbohydrate, lipid, protein and mineral as well as vitamin content of nutritional ingredients is determinant in maintaining health. When some systemic human disorder, e.g. sugar metabolism occurs, the quality and quantity of these otherwise simple intakes also change [1]. It is important to declare that sugar is an inseparable part of the human nutrition, but because of the health some people choose to limit their food intake by replacing sugar with e.g. saccharin and stevia. The neuroendocrine system is of key importance in the regulation of metabolism, the elements of which can consequently regulate higher-order behavioural processes [2]. Modification of regulatory processes, e.g. through sugar replacement agents, can modify established equilibrium regulatory processes. Due to its anti-diuretic role, arginine vasopressin (AVP) is essential in osmoregulation, volume regulation, and is a carrier of information in behaviour, learning and memory functions [3]. This endocrine hormone is involved in neuronal processes via the monoamine signalling, which is confirmed by the mechanisms of e.g. serotonine (5-HT), adrenaline (E) [4, 5]. It is a very interesting question to what extent the psychic activity elements of social life (e.g. learning) can change by mediating neuroendocrine communication when it is necessarily altered by energy recovery routes (nutritional biological agents such as sugar substitutes). Energy generation mechanisms provide chemical energy transfers from the breakdown of raw materials (carbohydrates, lipases, nucleic acids, proteins) that are necessary to maintain healthy life phenomena. Regulatory systems with neuro-endocrino-immune functions control this large metabolic cascade. If the wrong material enters the metabolic pathway in a healthy organism, the regulatory cycles try to compensate for

its disturbance [6]. All this can lead to a decrease in the complex homeostatic capacity, which in turn is accompanied by a loss of necessary adaptation possibilities.

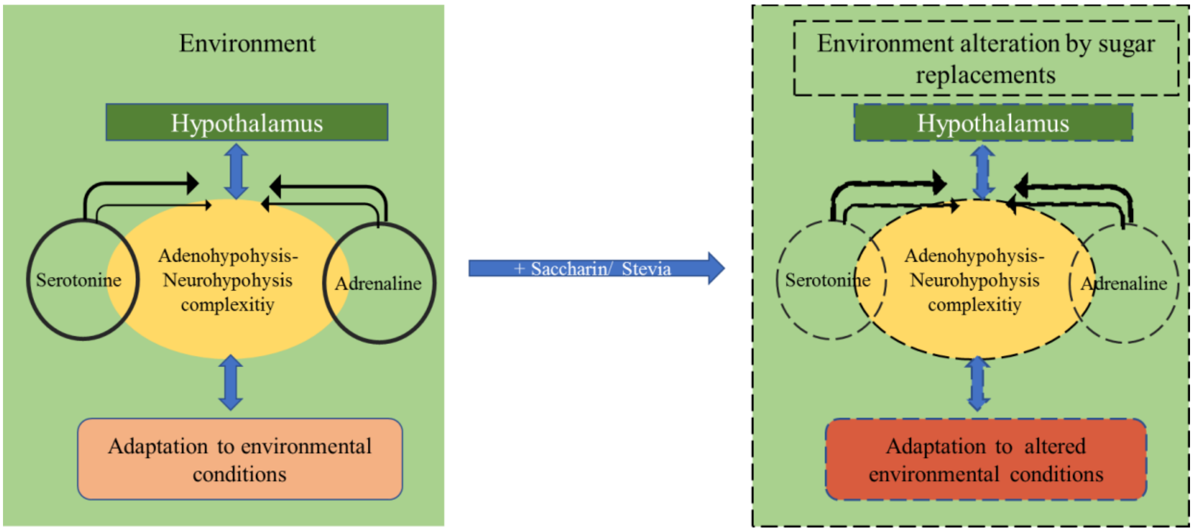

Figure 1 Neuroendocrine regulation and possible endocrine disturbance by sugar replacement

Aims

In our research, we wanted to investigate this issue in relation to monoamine activated (neural transmitter functions) hormone regulations (AVP). We wanted to study the effects of sugar replacement on monoamine-mediated hormone release functions in an *in vivo and in vitro* animal model using a cellular research design.

Methods

In the experiment Wistar ♂ rats were treated *in vivo* with, saccharin: 0.2 mg/ bw.kg/day, and stevia: 40 mg/ bw.kg/day for 16 weeks (n=6/groups). After treatment, from the Wistar rats neurohypophysis were prepared for *in vitro* primer, monolayer cell culture model (NH). The tissues were digested enzymatically (trypsin: 0.2 % /Sigma, Germany/ for 30 min; collagenase /Sigma, Germany/: 30 μg/cm^3 for 40 min; dispase /Sigma, Germany/: 50 μg/cm^3 for 40 min in phosphate-buffered saline; temperature: 37°C). Mechanical dissociation was achieved with nylon blutex sieves (Ø: 83 and 48 μm). Cultures were controlled for viability (>95%) by trypan blue tests, after than for function for AVP release (in aspecific and specific regulation). In the research protocol was investigation in NH models: untreated as control, treated with 10^{-6}M of 5-HT, 10^{-6}M of E and then exposed to saccharin and stevia, during 120 min. The AVP releases of NH model were measured by radioimmunoassay. The protein content was detected by modified Lowry method. The data were analysed by ANOVA (n=5).

Results and discussion

In our results showed mild modified AVP release activity by different treatments of sugar substitutes.

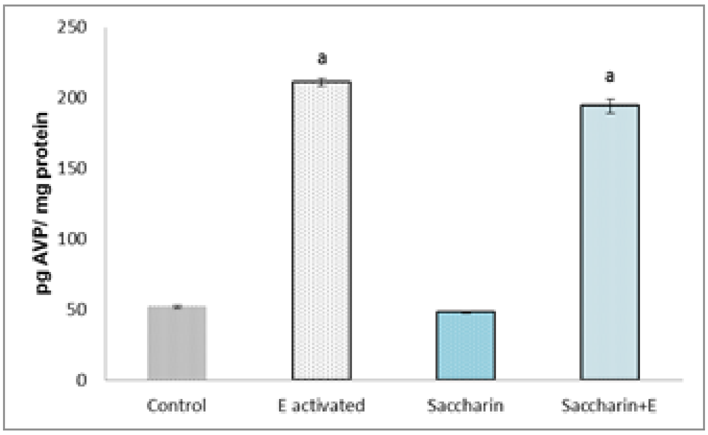

Figure 2. The effects of in vivo Saccharin treatment on E activated AVP release in NH cultures from Wistar rats (n=5, means±S.E.M., a: p<0.05)

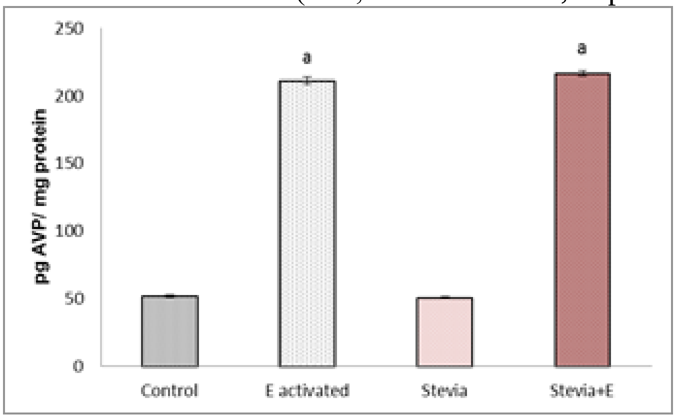

Figure 3. The effects of *in vivo* Stevia treatment on E activated AVP release in NH cultures from Wistar rats (n=5, means± S.E.M., a: p<0.05)

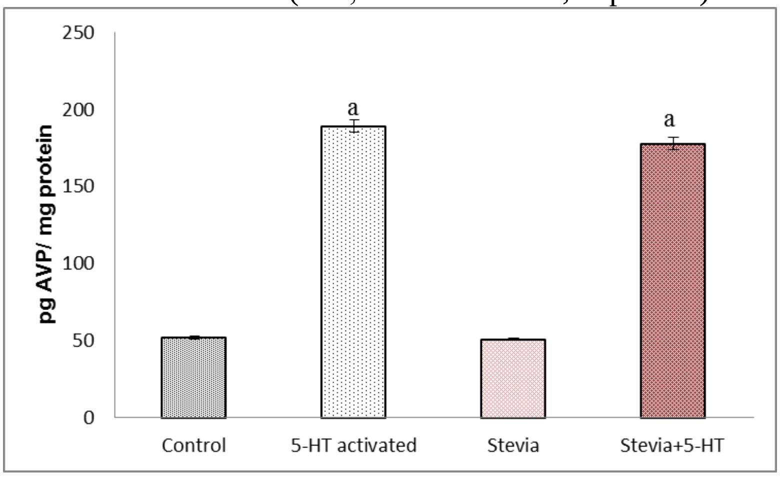

Figure 4. The effects of *in vivo* Stevia treatment on 5-HT activated AVP release in NH cultures from Wistar rats (n=5, means± S.E.M., a: p<0.05)

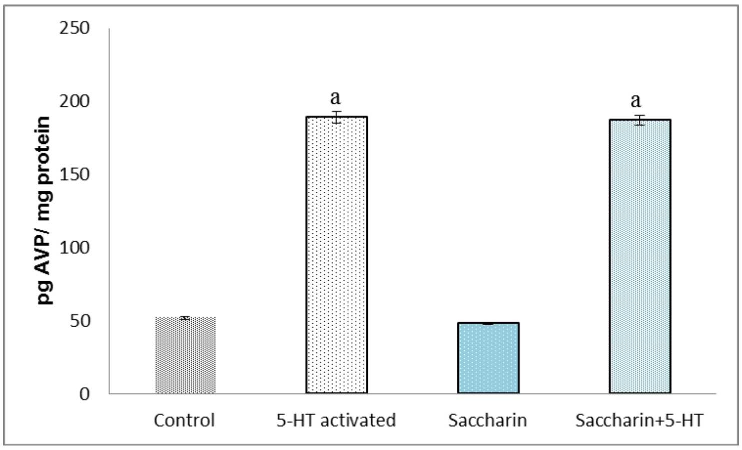

Figure 5. The effects of *in vivo* Saccharin treatment on 5-HT activated AVP release in NH cultures from Wistar rats (n=5, means± S.E.M. a: $p<0.05$)

Conclusion

In conclusion sugar substitutes modulated (not significantly) the E and 5-HT-activated hormone secretion, which is definitely attention-raising. Our results indicate that a strict association exists among certain biophysical properties, especially the sugar substitutes and cellular function, this observation is essential because AVP can affect the learning processes. The potential endocrine modulating effect of fashionable sugar replacement compounds can certainly contribute to the modelling of the endocrine disrupting factor of the model developed by our working group.

Acknowledgements

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