THE INFLUENCE OF CENTRAL SEROTONINERGIC AND DOPAMINERGIC ACTIVITY ON NUTRITIONAL AND METABOLIC PARAMETERS

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SUMMARY

Introduction: Neuromediators dopamine and serotonin play a significant role in homeostatic and hedonic regulation of food intake, may exert direct metabolic effects and particularly serotonin influences affectivity. Their central activity could be quantified by functional tests. Common regulatory mediators of metabolism and affectivity represent an interesting research goal.

Aims of study: The first aim was to describe the relationship between central serotoninergic activity measured by citalopram challenge test, affectivity, preference of macronutrients in food and metabolic profile in healthy men. The second aim was to confirm the use of sublingual apomorphine test as a functional test for assessment of central dopaminergic activity. The third aim was to reveal the relationship between central dopaminergic activity measured by sublingual apomorphine test, preference of macronutrients and metabolic profile.

Methods: The study was performed on 42 healthy men (average age 43.5 ± 7.4 years and average BMI 27.4 ± 5.7 kg/m²) within 4 days with a week interval in between them. Anthropometric and biochemical examinations were performed on day 0 when the psychological test (self-assessment of anxiety /SAS/ and depression /SDS/) and three-day diet records were filled in. Hyperinsulinemic euglycemic clamp was done on day 7 (for evaluation of insulin resistance measured by e.g. metabolic clearance rate for glucose, MCR). On day 14, citalopram test was performed with intravenous administration of citalopram in the dose 0.3 mg/kg for assessment of central serotoninergic activity. Area under the curve (AUC) for prolactin was calculated from prolactin levels measured throughout the test. On day 21, apomorphine test was performed with sublingual administration of apomorphine (0.033 mg/kg) and subsequent measurement of prolactin (PRL) a growth hormone (GH) concentrations forming AUC for assessment of central dopaminergic activity. Student t-test and Pearson coefficients were used for statistical analyses.

Results: Anxiety and depression were connected with food preference of carbohydrates (correlation between SAS/SDS and percentage of food carbohydrates: $r = 0.455$, $P = 0.003$; resp. $r = 0.402$, $P = 0.009$) and higher insulin resistance (e.g. correlation between SAS/SDS and MCR: $r = -0.34$, $P = 0.034$; resp. $r = -0.373$ $P = 0.019$). Positive association was observed between insulin resistance and preference of carbohydrates and their greater real intake (correlation between MCR and carbohydrate craving questionnaire and mono-/dicarbohydrate food intake, respectively: $r = -0.404$, $P = 0.011$; resp. $r = -0.396$, $P = 0,013$).

Sublingual administration of apomorphine was followed up by similar response of prolactin and growth hormone, respectively, as its parenteral administration (literal data were compared).

Central dopaminergic activity declines with age (correlation with AUC/GH: $r = -0.33$, $P = 0.031$) and BMI (correlation with AUC/GH: $r = -0.41$, $P = 0.007$). Lower central dopaminergic activity is connected to higher total cholesterol (correlation with AUC/PRL: $r = -0.41$, $P = 0.007$), higher food preference of carbohydrates (correlation with AUC/PRL: $r = -0.345$, $P = 0.025$), higher glycated hemoglobin (correlation with AUC/GH: $r = -0.37$, $P = 0.016$) and insulin resistance measured by HOMA index (correlation with AUC/GH: $r = -0.345$, $P = 0.025$).

Conclusion: Anxiety and depression are connected with food preference of carbohydrates and higher insulin resistance in healthy men. Sublingual apomorphine can be used as a good alternative to subcutaneous apomorphine for assessment of central dopaminergic activity during apomorphine test. And finally, central dopaminergic activity declines with age and BMI and correlates negatively with metabolic parameters.

Key words*:* serotonin, dopamine, metabolic parameters, food preference, affectivity