

The level of selected indices of oxidative stress after 5-week supplementation with an innovative pro-health snack among a group of athletes

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Introduction: In previous research, the authors developed a technology for the production of a gelatin hydrolysate from carp (*Cyprinus carpio*) skins having strong antioxidant properties (Tkaczewska et al., 2020). As a result, it was found that the high solubility of the obtained hydrolysate in a wide pH range does not limit its use in the food industry, and moreover, it can be used with food products subjected to heat treatment at temperatures up to 100°C without adversely affecting its antioxidant properties (Tkaczewska, Jamróz, Kulawik, Morawska, & Szczurowska, 2019). Trials among laboratory animals allowed to show that the obtained hydrolysate affected neither liver or kidney function, nor the blood counts of healthy Wistar rats. Therefore, it was concluded that this preparation is safe to be used in living organisms. A statistically significant increase in glutathione reductase activity and the total oxidative status of blood serum in healthy animals fed with the addition of the hydrolysate is a promising indicator of its antioxidant properties in vivo (Tkaczewska, Borczak, et al., 2019; Tkaczewska, Jamróz, Piątkowska, et al., 2019). Thus, it seemed justified to develop a product that could be used in pre-workout nutrition as a source of energy (derived in appropriate proportions from individual nutrients) and supporting the reduction of oxidative stress. This product will include carp meat and a gelatin hydrolysate from carp skin with antioxidant properties.

Purpose: The study aim was to assess the effect of 5-week snack supplementation with enzymatic carp (*Cyprinus carpio*) skin hydrolysate additives indices of exercise-induced oxidative stress with the advantage of eccentric contractions among a group of physically active people.

Method: The study included 49 males, aged 18-40, practicing sports disciplines of endurance or strength-endurance nature. The participants were randomly divided into 3 groups: experimental (E)- n= 17, control (C)- n= 16 and placebo (P)- n=16. For 5 weeks, the experimental group consumed snacks with the addition of enzymatic hydrolysates once a day, the placebo group - snacks without the hydrolysate, the control did not consume any snacks. Research was approved by the Bioethics Committee. The subjects were characterised by similar body mass and structure, and did not take supplements that could improve physical performance or biochemical indicator levels. Before the study, participants underwent nutritional consultations for diet standardization. Physiological examinations included 2 series: in the 1st, VO₂max was assessed to provide similar loads for all subjects during the eccentric test, the intensity maintained at 60% VO₂max; 2nd series, only the eccentric test was performed with adherence to guidelines from the 1st series. Venous blood was collected 1h before each eccentric test, and then 1h, 24h and 48h after its completion. The serum concentration of thiobarbituric acid reactive substances (TBARS) and glutathione reductase (GR) activity were determined.

Results: The highest TBARS concentration was equally observed 1h after eccentric exercise in both the 1st and 2nd series. The difference in concentration of this index before the test vs. 1h after completion in group E was significantly lower ($p < 0.05$) after the 5-week supplementation. A similar tendency was observed in the remaining groups, but these differences were not significant ($p > 0.05$). The highest GR activity in group E was found after the supplementation period and was statistically significant ($p < 0.05$) in relation to the results from the 1st series. In groups P and C, no significant differences ($p > 0.05$) in GR activity between the 1st and 2nd testing series were observed.

Conclusion: Consuming snacks with the addition of enzymatic hydrolysates having antioxidant properties for 5 weeks reduces oxidative stress in a group of athletes following eccentric exercise.

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