

EFFECT OF SODIUM PHOSPHATE SUPPLEMENTATION ON AEROBIC CAPACITY UNDER NORMOBARIC HYPOXIA IN CYCLISTS

Human exercise performance is determined by many factors, among which, one of the key determinants are hematological factors, especially in relation to aerobic capacity. In addition to blood oxygen carrying capacity, a factor that affects the level of oxygen supply to tissues is 2,3-diphosphoglycerate (2,3-DPG) in erythrocytes. 2,3-DPG is bound to hemoglobin and reduces its oxygen affinity. An increase in 2,3-DPG in erythrocytes results in easier oxygen supply to tissues. Previous studies indicated that sodium phosphate supplementation may cause an increase in the level of 2,3-DPG in erythrocytes and lead to an improvement in exercise performance in normoxia. Our previous study showed a significant increase in VO_{2max} by 5% and a shift of ventilation threshold towards higher loads following sodium phosphate intake over 6 days. However, it remains unclear how sodium phosphate supplementation affects exercise capacity during acute exposure to hypoxia.

Hypoxia has been repeatedly proven to reduce exercise capacity, with the direct cause being the reduction of maximal oxygen uptake (VO_{2max}). This raises the question whether sodium phosphate supplementation can lead to a reduction in decrease of VO_{2max} during acute hypoxic exposure. Therefore, the proposed research project will aim to evaluate the effect of short-term (six-day) sodium phosphate supplementation on the aerobic capacity under hypoxia in cyclists.

Trained cyclists will participate in the study. Study participants will be subjected to a 6-day sodium phosphate supplementation with 50 mg/kg of fat-free mass (FFM) per day. Immediately before and after phase of supplementation, test series will be carried out. During each test series, venous and capillary blood will be collected to determine the levels of morphological and biochemical variables (hemoglobin concentration, hematocrit value, red blood cell count, reticulocyte count, level of 2,3-DPG, acid-base balance indices and gas exchange variables, concentration of inorganic phosphates and calcium), and laboratory exercise test to exhaustion on the cycle ergometer will be performed. The aim of the test will be to determine VO_{2max} and anaerobic threshold in hypoxia ($FiO_2=16\%$; $\sim 2,000$ m).

The proposed research is of innovative character while its results will represent an important contribution to the development of exercise physiology and sport sciences, through providing a new and enhancing existing knowledge in the area of altitude adaptation. The results obtained in the research will have practical implications, by e.g. improving the methodology of preparation of athletes for competitions at altitude. However, the practical implications will not be limited only to professional sport. Due to the growing popularity of mountain tourism and mountain forms of sports recreation, the presented research problem also concerns public health issues. The results of the research can be used to develop guidelines to increase the health safety of tourists and recreational mountain sport athletes, and can also be utilized by mountain rescue teams.