VIII. SUMMARY

1. Introduction

Homocysteine is an endogenous sulfur amino acid, an intermediate metabolite formed by the methionine transmethylation reaction. Its elevated blood concentration, hyperhomocysteinemia, is in humans a sensitive risk indicator and a risk factor for coagulation disorders, cardiovascular diseases - especially of thrombotic and neurodegenerative etiology and dementia.

In the course of hyperhomocysteinemia in humans, the anticoagulant properties of the endothelium of blood vessels are lost, the synthesis of thromboxane A2 is increased, the coagulation factor V is activated, the synthesis of anticoagulants is inhibited at the DNA level and their effectiveness is reduced, as well as inhibition of the maturation of endothelial matrix cells. The negative influence of homocysteine on myocytes and on disorders of the myocardial contractility has also been discovered. By affecting the nervous system, homocysteine leads to a reduction in the number of dopaminergic neurons, cognitive impairment, depression, and the mechanism of its neurotoxicity is dictated by the promotion of oxidative stress, nerve cell apoptosis, damage to mitochondria and DNA, and functioning as a neurotransmitter that competes with gamma-aminobutyric acid. Homocysteine as an indicator and risk factor has also been recently studied in humans in the course of COVID-19, chronic kidney disease, cancer and infertility.

In veterinary medicine, the role of homocysteine has not been unequivocally elucidated so far. In dogs and cats, it was the subject of studies in the course of heart and kidney diseases as well as in hypothyroidism. Homocysteine has also been studied in farm animals, but has not gained clinical use in them yet. The role of homocysteine in the pathogenesis of horse disease has been poorly understood. It is known that it affects the functions and structure of the cardiovascular system, as it is involved in the proliferation of lymphocytes as well as vascular endothelial cells and vascular smooth muscles. However, no relationship has still been

found between hyperhomocysteinemia and cardiac dysfunction. The role of homocysteine in horses in the course of laminitis is also debatable. However, a relationship was found between hyperhomocysteinemia and early embryo mortality in mares, which results from defects in chorionic angiogenesis. It can be considered that homocysteine is a risk factor for vascular diseases also in horses. All this gives some prospects for the use of homocysteine as a clinically useful marker of certain diseases in horses, but requires further and extensive research, especially since the reference values of this amino acid for horses have not been clearly established yet. According to the literature data, homocysteine is an important inducer of pro-oxidative-antioxidant imbalance with cardiovascular consequences due to endothelial damage. It causes oxidative stress by reducing the activity of glutathione peroxidase and lowering the level of vitamins A, E and C, and by reducing the synthesis of glutathione it leads to the impairment of redox mechanisms. Despite the fact that horses are a species exceptionally well adapted to exercise in the course of evolution, it generates oxidative stress and free radical processes responsible for the formation of numerous metabolic disorders and diseases. The relationship between homocysteine and oxidative stress has already been studied in racehorses, where a high positive correlation was observed between the concentration of this amino acid and hydroxyperoxides. This may indicate that sport horses are at risk of developing certain homocystein-related diseases. The reports on homocysteine and oxidative stress have not been discussed so far in the aspect of jumping horses in terms of training severity and the degree of training.

2. Aim of the study

The aim of the study was to assess the concentration of homocysteine in the blood and to assess the relationship between homocysteine and the indicators of pro-oxidative-antioxidant balance during jumping training of varying intensity in horses. An attempt was also made to use the measurement of blood homocysteine concentration to assess the degree of training of jumping horses.