

## SUMMARY

### **The influence of near-infrared radiation on blood cells during hemodialysis in an animal model.**

Hemodialysis is a routine method of blood purification from metabolic products and toxins using extracorporeal circulation. This procedure is associated with numerous effects, such as destruction of blood cells, activation of the coagulation system and the development of inflammation. Disorders of this type lead to further complications, often costly diagnostics and treatment, worsening therapy outcome and patient prognosis.

The scientific goal of my doctoral thesis was to investigate the influence of near-infrared radiation (NIR) on the morphotic blood elements during extracorporeal circulation in hemodialysis. I started the implementation of the presented dissertation by choosing an appropriate animal model for this procedure, analyzing various species of animals. Then I conducted a series of HD treatments in normal sheep and animals subjected to a bilateral nephrectomy to create a model of uremia. During hemodialysis, in half of the animals in each group, I used extracorporeal blood irradiation with NIR light. I performed 120 hemodialysis of healthy sheep and 100 treatments of nephrectomised sheep, which allowed me to perform statistical analyzes of the results obtained for individual parameters.

My research has shown that NIR irradiation leads to the reduction of protein adsorption on the surface of the dialyzer membrane. It also affects the reduction of leukocyte and thrombocyte activity. Near-infrared radiation caused a reduction of oxidative stress, and thus a reduction in the development of inflammation. This therapy increases the resistance of erythrocytes to the effects of extracorporeal circulation, improving the osmotic properties of these cells and may reduce the likelihood of anemia occurring during the HD cycle. I also observed a smaller amount of LDH released from cells in the NIR group. This may indicate a reduction in erythrocyte damage. The radiation from the near-infrared range significantly prevents thrombus formation on the surface of the dialyzer membrane, which corresponds to maintaining the efficiency of dialysis.

The results obtained during the experiments confirmed the hypothesis presented in this dissertation that the radiation in the near-infrared range has a protective effect on the blood cells during extracorporeal circulation in hemodialysis.