

## **AIM OF THE PROJECT**

The study aims to investigate how cardiac rehabilitation affects myokine gene function and myokine blood level in subjects with heart damage. It is supposed that cardiac rehabilitation improves myokine gene function and increases myokine level in the blood in subjects with heart damage.

## **REASONS WHY THIS RESEARCH TOPIC WILL BE INVESTIGATED**

Currently, about 126 million people worldwide suffer from heart hypoxia causing heart damage. Ischemic heart disease is nowadays the leading cause of death. Cardiac rehabilitation in patients after heart attack reduces mortality and improves patients' health state. However, mechanisms in which cardiac rehabilitation favorably affects the function of heart still remain not well investigated.

Myokines are a group of substances secreted by muscle cells. Some studies have shown that myokines may be one of the causes of positive effect of cardiac rehabilitation on the function of the heart. Myokine is one of myokines secreted during exercises. Very recently high myokine production in hypoxic skeletal muscles has been shown. As heart muscle shares numerous characteristics with skeletal muscles, it is supposed that also hypoxic heart muscle may produce myokine in increased amounts. Some animal studies have proven, that intravenously administered myokine favorably influences the heart after heart attack. However, myokine level in the heart and myokine blood level in patients after heart attack have never been investigated, especially in relation to cardiac rehabilitation. Myokine production depends from calcium.

## **RESEARCH DESCRIPTION**

The study will consist of human and animal experiment.

The two-stage **animal experiment** will be performed on Spontaneously Hypertensive Rats (SHR) and on Wistar rats. Before and after each stage of the experiment: the rats will undergo exercise test on a treadmill; will be weighed and measured; blood pressure will be checked; and feces samples will be collected. **In the first stage** lasting 8 weeks SHR rats will be divided into two equal groups: SHR-AIN and SHR-HF and similarly Wistar rats will be divided into two equal groups: W-AIN and W-HF. Rats in SHR-AIN and W-AIN groups will receive standard AIN diet and rats from SHR-HF and W-HF groups- high fat (HF) diet. **In the second stage** lasting 8 weeks, rats from all groups will be divided into eight equal subgroups. Rats from group SHR-AIN will be divided into subgroups SHR-AIN-T and SHR-AIN-NT; from group SHR-HF into subgroups SHR-HF-T and SHR-HF-NT; from group W-AIN into subgroups W-AIN-T and W-AIN-NT; from group W-HF into subgroups W-HF-T and W-HF-NT. Rats in SHR-AIN-T and W-AIN-T subgroups will receive standard AIN diet and will perform training; in SHR-AIN-NT and W-AIN-NT subgroups will be fed standard AIN diet and will not perform training; in SHR-HF-T and W-HF-T subgroups will be fed HF diet and will perform training; in SHR-HF-NT and W-HF-NT subgroups will be fed HF diet and will not perform training. **After the second stage of the experiment** the rats will be euthanized and the blood, hair and internal organs will be collected. The following parameters will be checked: in **serum**: concentration of myokine, lipids, markers of heart muscle function, and calcium; in **feces, organs and hair**: calcium level; in **heart and aorta**: myokine level and myokine gene content.

In the **human experiment** patients will be divided into two equal groups: group A and group B. Into group A patients who underwent heart attack several weeks prior enrolment and underwent phase I of cardiac rehabilitation prior the study will be included and will undergo 2-weeks long phase II of cardiac rehabilitation. Into group B patients who underwent heart attack and phase I of cardiac rehabilitation before the study but have not yet undergone phase II of cardiac rehabilitation, will be included. In patients from group A at beginning of the experiment and after 2 weeks of rehabilitation: body mass and body composition will be checked; blood pressure will be measured; the analysis of cardiovascular system function will be done; blood, urine and hair samples will be collected. In patients from group B the same measurements and blood, urine and hair samples collection, as in patients from group A, will be performed once. In patients' **serum** concentration of: myokine, lipids, markers of heart muscle function, and calcium will be checked. In **urine and hair** calcium content will be measured.

## **THE MOST IMPORTANT EXPECTED EFFECTS**

The results of the study would help to gain knowledge on mechanisms involved in heart repair after heart attack in patients undergoing cardiac rehabilitation. The project results would help to plan future studies investigating the physiology of exercise in patients with damaged heart. Moreover, the study results would allow to plan clinical experiments investigating the role of myokines in the therapy of patients after heart attack.