

Today obesity has become one of the most important health problems in the world. Half of humanity has excessive body mass, and obesity affects as many as 500 million people on our planet. About 25% of Poles is obese. It is estimated that more people die from obesity and its complications such as heart attack, stroke or diabetes than from hunger. High-fat diet is one of the main reasons of obesity. The numerous complications of excessive weight include not only heart diseases and blood vessel diseases, but also incorrect iron metabolism in organism. Recently it has been shown that the abnormal metabolism of this element contributes to chronic inflammation and increases the so-called oxidative stress. Oxidative stress is a series of adverse biochemical changes that can lead to further damage of the heart, brain and other organs, and even to cancer.

In the light of the above data, the treatment of obesity complications, including malabsorption of iron and improper iron metabolism, has become one of the most important challenges of modern medicine. The most common way to complement iron deficiency is to administer it in oral form. A serious disadvantage of this method is the low absorption of iron. On the other hand, iron intake in intramuscular and intravenous form carries the risk of overdose of this element and damage to internal organs, including mainly liver, brain and kidneys. This damage is connected mainly with inflammation and oxidative stress. It is therefore important to develop a safe and effective method of iron supply. Previous research in this area focused primarily on the search for new iron compounds, but none of them fully addresses the needs of obese patients with iron deficiency.

Recent scientific studies show that probiotic organisms favorably affect iron metabolism in the body by increasing its availability and reducing the risk of anemia. Furthermore, some studies suggest that probiotics may counteract chronic inflammation and oxidative stress. This creates the potential possibility for implementing probiotics in the prevention and therapy of obesity complications, including iron deficiency and anemia. So far, not enough researches have been done to dispel all the doubts in this area.

The aim of our project is to evaluate the effect of oral supplementation with *Lactobacillus plantarum* ATCC 14917- one of the *Lactobacillus* probiotic strain, on iron absorption and metabolism, and to investigate the effect of these probiotic bacteria on inflammation and oxidative stress in rats on high fat diet.

Our study will be performed on a population of 96 Wistar rats. These animals are frequently used model of metabolic processes occurring in human organisms. They will be subdivided into subgroups and will consume, depending on the subgroup, the standard diet, high fat diet, high fat diet deficient in iron, probiotic bacteria *Lactobacillus plantarum* ATCC 14917 or *Lactobacillus curvatus* and iron in various combinations. *Lactobacillus curvatus* bacteria will serve as a comparator for the probiotic bacteria *Lactobacillus plantarum* ATCC 14917. Rats will undergo numerous tests. In their blood, feces, intestinal content and tissues a range of parameters of iron metabolism, inflammation and oxidative stress will be determined. In addition, the content of studied probiotic bacteria in the feces of rats will be determined. Moreover, animal body composition will be examined.

The results of this study will help to better understand the influence of oral supplementation with *Lactobacillus plantarum* on iron absorption and metabolism, and the mechanisms of probiotics impact on inflammation and oxidative stress. This is the main reason this topic has been chosen to investigate. Moreover, the results of this animal study would help to project future human trials. Potential results of these future trials on patients would ameliorate the effectiveness and safety of iron supplementation and reduce the costs of healthcare connected with obesity-related iron metabolism disturbances.