

Stress, high-fat diet, and high physical inactivity promote poor health outcomes, which include too high cholesterol levels. This problem applies to a large group of people from modern society. Many of them need medications to overcome their health problems and prevent severe health consequences like heart attack or stroke, which may be a result of increased cholesterol. Statins are the drugs, which help to control cholesterol levels. In general, they are well tolerated by patients, which probably is a reason for their popularity. This group of medications is the best-selling prescription drugs worldwide. Unfortunately, there is a group of people, who suffer from side effect of statin-based therapy. The main problem is myalgia, which except muscle pain, is described as muscle weakness, tenderness, cramps, or stiffness. Often, when myalgia appears, patients give up statin therapy.

It is known that statins block cholesterol production in the liver. But the mechanism of their interaction with skeletal muscle is not entirely clear. In the literature, we can find a few theories, which try to explain this phenomenon. One of them tells about the reduction of cholesterol production in the muscle (when a too high dose of statin was used). Other theories focus on mitochondrial malfunctions, oxidative stress, or statin-induced cell death. These theories suggest different mechanisms of statin's action, but one does not exclude the others. Therefore, a combination of several routes of statin influence on skeletal muscle may be responsible for observed side effects.

To study the mechanism of the statin action on the skeletal muscle we propose to use a novel scientific discipline – metabolomics. It allows to measure thousands of metabolites in biological sample and obtain a metabolic profile or fingerprint. We will use metabolomics to indicate which metabolic pathways are affected by statin use. Additionally, a correlation between statin concentration and plasma metabolites will be performed. Obtained results will allow us to have a global overview on statin's action. It is probable that observed side effects are caused by the combined action of statins through different mechanisms. By performing such comprehensive analyses we will indicate which metabolic pathways are affected by statins. Obtained results can be used to select patients that are more prone to myalgia or to find metabolic alterations responsible for these side effects. This last information can be used to propose novel therapeutic strategies that can prevent myalgia in patients with side effects.