Altitude and hypoxic training is commonly used by endurance athletes due to its benefits during subsequent competition at sea level. The most popular strategies involving exposure to hypoxia include intermittent hypoxic training (IHT), and the live high-train low strategy (LHTL). In the case of IHT, athletes live at or near sea level but train under hypoxic conditions. On the other hand, the LHTL model is characterized by an exposure to hypoxia at rest, while physical training sessions are conducted in normoxia.

Sphingosine-1-phosphate (S1P) is a bioactive lipid that acts via specific plasma membrane receptors. In the plasma S1P is found at high concentration, bound mostly to high-density lipoprotein (HDL) and albumin. The majority of circulating S1P originates from red blood cells and vascular endothelium. Plasma S1P serves important physiological functions including maintenance of the endothelial barrier integrity, regulation of immune cell trafficking, angiogenesis, and arterial blood pressure. In addition, S1P was found to stimulate muscle regeneration, delay development of muscle fatigue, and promote its ability to recover. Our group has previously found that acute exercise increases S1P concentration in plasma and skeletal muscle. In addition, we observed elevation in plasma HDL-bound S1P level following endurance training. The above data suggests that S1P may be a new factor mediating the response to training. Interestingly, it was also reported that hypoxia enhances S1P production in red blood cells.

Altitude and hypoxic training is widely used by athletes, however, there are no studies examining the effect of acute exercise or training under hypoxic conditions on circulating S1P. Therefore, the major aim of the project is to determine whether beneficial effects of hypoxic training on endurance performance are related to alterations in the level of plasma S1P. In order to answer this question we plan to investigate the effects of two most common hypoxic training strategies (LHTL and IHT), and standard training model on S1P metabolism in blood of competitive cyclists.

The results of the project will significantly improve our understanding of the mechanisms underlying the beneficial effects of different models of hypoxic training on endurance performance. They may also shed some light on the factors responsible for considerable variation in the individual response to altitude training. In addition, the results of the project may have clinical implications as HDL-bound S1P was found to possess potent cardioprotective and antiatherogenic properties. Establishing training conditions that induce the greatest increase in HDL-bound S1P may lead to development of new strategies for prevention and treatment of cardiovascular diseases.