The aim of this project is to compare **the long-term effect of two quite different training modalities – speed-power and endurance training – on changes in plasma free amino acid concentration** at rest, during graded exercise until exhaustion and post-exercise recovery period. In general, our assumption is that structured long-lasting speed-power and endurance training bring about different adaptation changes expressed as amino acids concentration in human blood. We assume that the changes depend on long-term sport specialization and predominant exercise type in a training phase of the one-year cycle, in particular on the contribution of high-intensity exercise to the whole training load, during which energy supply to the skeletal muscle comes from anaerobic metabolism. We hypothesize that:

(1) highly-trained speed-power and endurance athletes will differ in resting, exercise and post-exercise concentrations of free plasma amino acids. We expect a higher level in speed-power athletes;

(2) plasma amino acid concentration will vary according to the changes in training loads in a structured one-year training cycle. Higher plasma amino acid concentrations will be observed in training phases with larger contribution of high-intensity exercise, i.e. in specific preparation and competition periods;

(3) the relative values of plasma amino acid concentrations (per 1 kg muscle mass) at rest, at progressively incrementing exercise intensity (expressed as running velocity and %VO2max) and during recovery will differ between speed-power and endurance athletes.

We will examine 32 adult highly-trained athletes aged 18-32 years with longer competitive sport experience, specialized in sports of different character − speed-power (sprinters) vs endurance (triathletes, distance runners). Body composition and muscle mass will be assessed in each training subphase using densitometry (Lunar Prodigy, GE Healthcare, USA). Laboratory exercise tests will be conducted in consecutive training subphases. Participants will undergo a graded exercise test on a treadmill (h/p/cosmos, Germany). Blood samples will be drawn at rest, during exercise (every 3 min, at each speed change) and after exercise (immediately after the test and 5, 10, 15, 20 and 30 min after exercise completion). The analysis of free amino acid profiles in plasma will be based on the LC-ESI-MS/MS technique and the aTRAQ (Sciex) reagent. This methodology allows to quantify 42 free amino acids in a wide range of physiological fluids and biological matrices, including plasma. Total blood count will be performed using the device Mythic 18 (Orphée, Swiss). Blood gases and electrolytes as well as hemoglobin and hematocrit will be determined using Cobas 121b apparatus (Roche, Germany).

The results of the project will improve the understanding of metabolic adaptation to long-term structured exercise programmes. Possible future practical application of the widening knowledge will be useful in the domains of exercise medicine, sport and public health.

The novelty of our project is that (1) we will compare the effect of two quite different training models that have not been compared so far, (2) We will track the changes in plasma amino acids during a one-year training cycle (so far, periods no longer than a few weeks have occasionally been analyzed), (3) we plan repeated sampling (up to 12 samples) in one exercise session, encompassing resting conditions, consecutive stages of exercise and 30-min recovery period (several hundred samples in total), (4) we introduce skeletal muscle mass as a factor affecting exercise-induced plasma amino acids concentration, (5) we will assay a large number of amino acids (42); usually, a few or maximum 20 proteinogenic amino acids are analyzed, (6) our athletic groups are very homogenous; these are highly-trained individuals with long training history and, thus, adapted to their training modalities and (7) we have a proven state-of-the-art method to determine plasma amino acid concentration.