Training with Lactate Basics

The body has two main sources of energy, the anaerobic energy system (without oxygen) and the aerobic energy system (with oxygen). In the simplest terms, lactate is a byproduct of our anaerobic energy system called glycolysis, this system is really good at providing a lot of energy without Oxygen but, has a downside in that it produces lactate and a hydrogen ion as a byproduct. Lactate itself is not what makes your muscles and lungs feel like they are burning but the hydrogen ion that was paired with the lactate does. Even though it is the hydrogen ion that causes the burning sensation, lactate is easier to measure and has a direct correlation with the hydrogen ion concentration in the blood. Luckily, we have an aerobic energy system that can help process and use the byproducts of glycolysis to get our bodies back into equilibrium. The aerobic system uses oxygen and does not produce any negative byproducts but cannot produce energy as fast as the anaerobic system for our muscles to use. Measuring lactate allows us to see what percentage of the aerobic to anaerobic energy systems athletes are using. This is helpful to have our athletes train in the proper zones and train the proper energy systems. In a distance ski race, I would estimate 80-90% of the energy provided to the muscles would be coming from the aerobic system while in a sprint race it could be a little closer to 50/50. This is why roughly 80% of our team’s training is done focusing on the aerobic energy system while the other 20% is focused on the anaerobic system and strength.

Twice a year we try and do a lactate test with our athletes, this test consists of starting at a very slow pace running or skiing, and doing 4-minute stages at that pace. With each stage, the pace and intensity increase until the athlete reaches what they think is their anaerobic threshold pace or the pace at which your muscles and lungs start to burn and can no longer clear the lactate as fast as it is produced. After each stage, we ask the athletes for their heart rate and how hard that stage felt on a stage of 1-10. This helps the athlete tie an objective measure of intensity (lactate) to a subjective measure of intensity (heart rate and feeling). These tests are great for teaching our athletes what easy training should feel like, what threshold training should feel like, and what race pace training should feel like. It also allows coaches to see if the training the athletes are doing is working and making them better athletes.

Written By,

Gerrit Garberich