"Lactate Threshold Testing – Lab vs. Field"

-The differences between thresholds determined in the lab and in the field

By: Chad Butts, M.S.
Exercise Physiologist, Cadence Cycling & Multisport Centers, NYC

The term "lactate threshold" causes a lot of confusion for athletes trying to determine accurate training zones. An athlete's lactate threshold can be determined by a couple methods but it is important to know the implications of each and how they relate to establishing your individual training zones. Two such methods for determining power and HR training zones are: 1) a graded exercise test in the lab measuring blood lactate samples and 2), a time trial field test. Many athletes have performed one or both of these tests and wonder how they relate to each other. Should they use the lab test data for prescribing training zones or use the average power obtained in the time-trail? First, let's discuss each test and what they actually measure.

In the lab test periodic blood samples are taken from the fingertip or earlobe as an athlete exercises at a gradually increasing intensity. This test measures lactate response to a given workload. The test will start off pretty easy and increase 15-30 watts every 3-4 minutes. At the end of each stage a blood sample is drawn from the fingertip. Assuming your blood is equilibrated, the blood in your legs has reached a steady level even in the blood flowing through your finger. Eventually, your lactate will start to rise very fast and this is typically termed the lactate threshold. Some exercise physiologists determine this point as a rise of more than 1mmol of lactate from resting level. With continued exercise and increasing workload, the slope will be steady until a second breakpoint occurs, commonly known as OBLA, or the Onset of Blood Lactate Accumulation. This is typically around 4 mmol of lactate but can range from 3-6 mmol. This is the point where lactate levels begin to rise very rapidly and the body's clearance system cannot keep up. The workload where this occurs is what Cadence uses to define training zones for our athletes; we define training zones as percentages of lactate threshold workload in terms of watts (for those using power meters) or heart rate (for those using heart rate monitors).

During a field test athletes complete a 10-20 minute time-trial effort. This effort should be equal to as hard as one can sustain for the specified period of time. The average power and heart rate are recorded and training zones are based on a certain percentage of these averages. The single best predictor of endurance cycling performance is the average power one can hold for about 60 minutes. In order to predict what they could do for a 60 minute time trial using a 20 minute test we can estimate what they could do by taking 95% of the power they can average for 20 minutes. Beginner cyclists who do not have much experience pacing for longer time trials typically do better with shorter efforts. In this case you can do shorter 3 mile time trials and take 90% of the average to determine training zones. Although it should be noted that the shorter the test the larger the potential for error due to the larger delta relative percentage anaerobic power plays in determining the result, i.e. 2 minutes of anaerobic power is more than 20% of a 9 min test and less than 10% for a 20+ min test.

Both methods are relevant ways to determine training zones. Average power during time trial efforts lasting about 60 minutes correlate very well with the results found in a lab test. However, many cyclists do not do 60 minute time-trials. It is usual to see that the threshold power determined form a time trial test is higher than that found in the lab. It is important to know that field tests are methods to estimate your individual OBLA, the results you would get from a lab test. The reason these values do not always match up is that your OBLA power is highly correlated to the power you can maintain for 60 minutes, not 20 minutes. The shorter

your field test gets the less reliable it is for estimating your zones and the further these values could differ.