

BLOOD LACTATE TESTING



Discover Your Personalized Training Zones: Optimize Your Workouts, Prevent Overtraining, and Reach New Levels

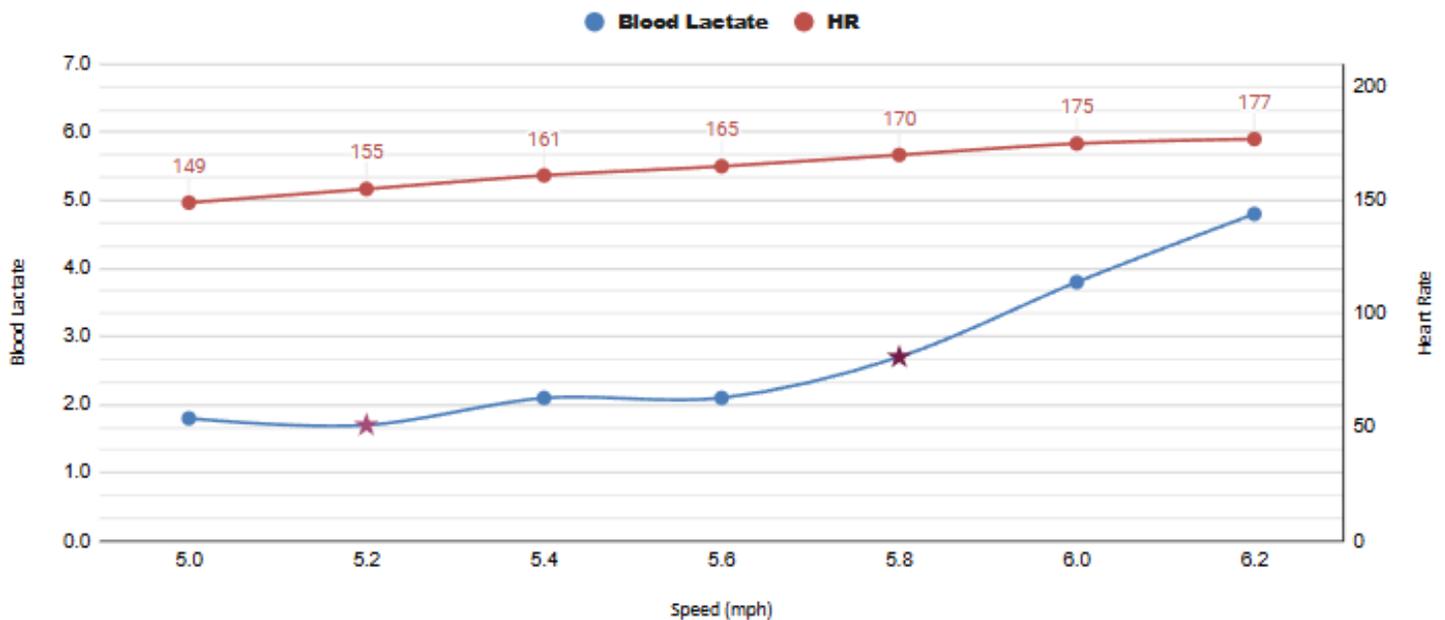
What is Lactate and Lactate Threshold?

Lactate is a key molecule in human metabolism, produced during glycolysis—the process where the body breaks down glucose or glycogen for energy. Blood lactate concentration is often measured in endurance athletes to assess performance. During gradual increases in exercise intensity, blood lactate levels rise slowly at first and then spike more rapidly as the workout intensifies. The point at which lactate begins to accumulate faster than it can be cleared, known as the lactate threshold (LT), is a **more reliable predictor of performance**

than VO2max and offers a better measure of exercise intensity than traditional heart rate zone calculations. LT helps in tailoring exercise prescriptions to be more specific and individualized.

The **lactate threshold (LT)** is a critical concept in exercise physiology, representing the exercise intensity at which lactate begins to accumulate in the blood faster than it can be cleared. This threshold is a marker of the shift from primarily aerobic (oxygen-dependent) energy production to anaerobic (less oxygen-dependent) energy production.

Imagine filling a cup with water faster than it can drain. Eventually, the cup overflows. Similarly, as exercise intensity increases, lactate production surpasses the body's ability to clear it, leading to an accumulation that signifies the lactate threshold. Crossing this threshold means your muscles are increasingly relying on anaerobic metabolism, which is less efficient and can lead to fatigue.

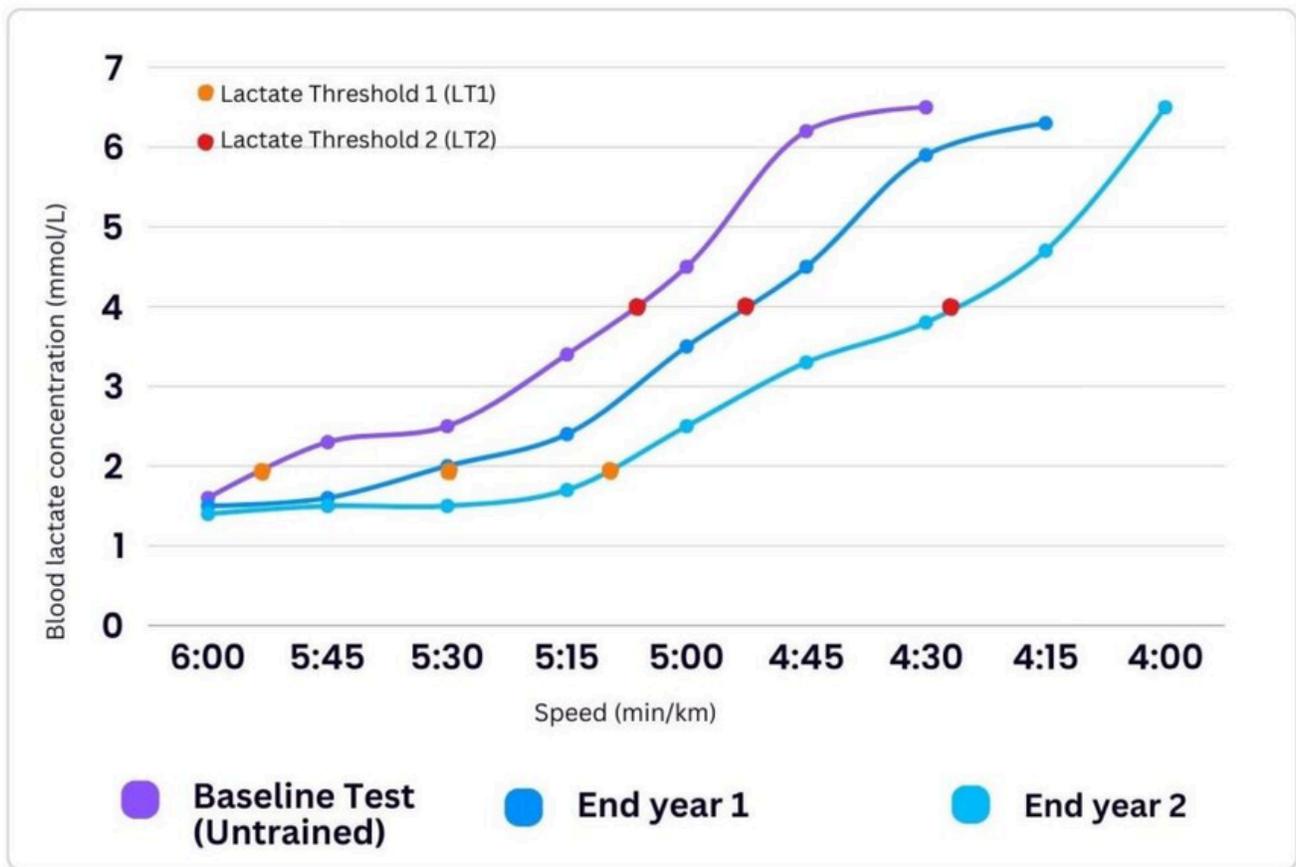


The lactate threshold is a valuable marker for athletes because it reflects the balance between lactate production and clearance. Knowing your lactate threshold allows for more accurate training prescriptions, enabling you to push the limits of your endurance without tipping into the "red zone" of unsustainable effort.

By examining the lactate curve, we can gain valuable insights into an individual's metabolic response to exercise. **This analysis helps in identifying very specific training zones, aerobic and anaerobic thresholds, and customizing workout intensities.** The information derived from the lactate curve is key in designing effective training programs and optimizing athletic performance.

Lactate Threshold Data				Prescribed Training Zones				
	HR	Speed (mph)	Pace (min/km)	Recovery	Zone 1	Heart Rate(bpm)	Speed (mph)	Pace (min/km)
LT1	155	5.2	6:47	Overdistance	Zone 2	≤ 155	≤ 5.2	≥ 7:10
LT2	170	5.8	6:26	Endurance	Zone 3	156-163	5.2 - 5.5	7:10 - 6:47
				Tempo/LT	Zone 4	164-170	5.6 - 5.8	6:39 - 6:26
				VO2 max	Zone 5	170-175	5.8 - 6.0	6:26 - 6:13
						≥ 176	≥ 6.1	≤ 6:07

After months of training using the new heart rate zones based on your lactate threshold, we can always retest to assess your progress. Ideally, we should see a rightward shift in the lactate curve (see below). This shift indicates that both your aerobic and anaerobic lactate thresholds (LT1 & LT2) have improved, meaning you can sustain faster paces before hitting these thresholds. **As a result, your race times and paces at a given intensity should improve (see graph below).**



VO2max Testing vs. Lactate Testing. Which is Better for Runners?

VO2 max testing measures the maximum amount of oxygen your body can utilize during intense exercise. Though it is a great and valuable metric for understanding your aerobic capacity, it doesn't provide the same level of detail about your metabolic processes as lactate testing does, especially for endurance athletes.

- **VO2 max** is often tested through a ramp test, where intensity increases every minute until exhaustion. While a high VO2 max is essential for elite endurance performance, it doesn't tell the whole story.
- **Lactate Testing** goes beyond VO2 max by identifying the specific points at which your body shifts from aerobic to anaerobic metabolism. This information is critical for tailoring your training to your unique physiology, making lactate testing a more precise tool for optimizing performance.

In endurance sports such as running, cycling, or triathlons, a high lactate threshold is a key determinant of performance. Athletes with a high lactate threshold can sustain a higher percentage of their VO2 max for longer periods, allowing them to perform at a high level without hitting the wall.

Lactate testing provides a more nuanced and individualized understanding of your endurance capabilities compared to traditional VO2 max testing. **While VO2 max is an important measure of overall fitness, lactate thresholds offer more actionable insights for training and competition.**

What To Expect On The Day of Your Lactate Test

During the test, I will collect small blood samples using a lancet and a lactate analyzer (similar to taking your blood glucose with a glucometer). The lancet is used to puncture the skin—typically on the finger or earlobe—to obtain a drop of blood. The lactate analyzer then reads the lactate concentration in the blood. Each sample requires a new disposable strip to ensure accuracy. You can expect anywhere from 6-14 samples over the testing period. At the end of each stage of the test, you will be asked to jump to the sides of the treadmill so that you are off the track as I need to take a blood sample while you are standing still.



We may only have to use the lancet once, however if the wound closes too quickly there may be multiple pokes. You will be given a cotton swab to apply gentle pressure to the area while you are running, to stop the bleeding. By the end of the test you will be running at a very high intensity, close to your maximum heart rate. Expect to be sweating and breathing hard!



Preliminary Instructions:

- Wear loose clothing and running shoes
- No exercise 24 hours prior; you need to be recovered so please do not race close to the test date
- No alcohol 6 hours prior
- No smoking 2 hours prior
- No food 2 hours prior; keep it light
- No caffeine 2 hours prior
- Ideally do this test after 1-2 rest days
- We will also use a **chest strap** to measure your heart rate for the test. If you have one and prefer to use your own, you can bring it, otherwise we will use the one that I'll provide.
- Please bring water for yourself for the test. You cannot use any electrolytes or drink mixes for this test.

If these preliminary instructions are not followed, the test will not be conducted.

Lactate results are sensitive to numerous factors such as fatigue, stress, caffeine intake, time of day, nutrition, and more. We should always consider this when performing a lactate test and do our best to control as many of those parameters as possible. The best thing we can do to control is factors is to follow a standardized procedure in the hours preceding the test to increase our chances of success.

Exercise Protocol:

1. Upon arrival, you will be pre-screened (checking vitals) and sign a consent form
2. You will warm-up on a treadmill for 15-20 minutes at a low to moderate intensity and rest for a few minutes
3. I will take a resting blood lactate sample. Here you must be below or around 1 mmol/L, if not, we will wait and test again.
4. You will begin exercising at a specific workload (starting at a low intensity)
5. This is a multistage test so you can expect a total of 8-12 stages at 4 minutes per stage with small increments in workload. We continue the process until we have all the data.
6. What will I be recording?
 - a. **Heart rate** each minute
 - b. **Rate of Perceived Exertion (RPE)** on a scale of 1-10 at the end of each stage
 - c. **Blood lactate** samples during the last 30 seconds of each stage

Who Can Benefit From Lactate Threshold

Testing?

Runners of all levels are encouraged to do this test, especially if you have race or performance goals in mind. Overuse injuries are very common for runners, and training parameters such as how fast you are running are often to blame (i.e. if you often run too hard on easy run days). The test provides more certainty behind your running, helps you to improve your performance, know what kind of training you need to include more of (i.e. more base building, more speed runs, etc.) and can help you avoid injury. Plus, it helps give you an idea of your current capacity and how to improve it.

What Do I Get After The Test?

After our session, I will take the time to crunch the numbers and graph your results. We will then quickly go through the preliminary results. You will be sent a follow-up email with your test results, new prescribed HR zones, and an explanation. You will learn what the results mean, and how to use them in training. If you would like to re-test, I'd recommend at least 4-6 months with the new zones to allow physiological adaptations to kick in.

Test Risks

For treadmill-based lactate threshold testing, the primary risk is falling. To reduce this risk, we will go over the process thoroughly beforehand, and you'll be required to wear the treadmill safety clip.

If you have a sensitivity to needles or blood, this test may carry a higher risk for you. The test involves multiple finger pricks to collect blood samples while running on a treadmill. If you tend to feel lightheaded or unwell around blood or needles, this test may not be suitable for you.

Before proceeding, you will complete an intake form to assess your readiness for physical activity (this will be sent to you prior to the testing appointment). If you're taking medications or have any concerns about your ability to safely perform aerobic exercise,

please inform me. In some cases, medical clearance may be required before testing, especially since you will be hitting higher intensities.

As with any physical activity, there are inherent risks. We mitigate these risks through thorough pre-test screening (intake form and checking vitals). If any elevated risks are identified, I will refer you to a medical provider before moving forward. If no additional risks are present, we can proceed with scheduling and conducting the test!

Testing Location:

I have partnered with **Optimize Physiotherapy and Sport Injury Clinic** located at 18546 104 Ave NW, Edmonton, AB, T5S 0K3 and all testing will be done in-clinic.

Have More Questions?

Email: info@theintuitiverunner.ca **Text:** 780-842-8520