



# **LACTATE SAMPLING MANUAL**

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**SPECIALISTS INTEGRATING SCIENCE WITH EXERCISE**  
**PEAK CENTRE**  
**For Human Performance**



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## Medical Note:

- Thoroughly read, complete, sign, and fax the Client Information, PAR-Q, and Consent and Waiver forms found in the attached "Client Pre-Assessment Package" before completing the assessment.
- Consult with your physician before conducting the following PEAK Centre exercise evaluation, training, or starting any exercise program.
- Thoroughly read through the entire lactate sampling manual before beginning the assessment. If you have questions contact the PEAK Centre directly.

## Blood Lactate Sampling

### Introduction- Blood Lactate Sampling

The Lactate Kit from the PEAK Centre for Human Performance has been developed to offer cutting edge fitness training tools and assessments to individuals who do not have convenient access to qualified facilities or exercise specialists in their region.

Blood lactate sampling is quite simple. It is precisely the same procedures to that of glucose monitoring. Small samples of blood are collected via a small finger prick using a lancet device and a medical blood collection cup where they are then stored prior to analysis at the Peak Centre laboratory. By strictly following the simple step-by-step procedures, you will be on your way to ensuring that every training session you do is specific to you and your current level of fitness. Although you have the option of collecting the blood samples yourself, it is strongly recommended that you enlist the help of another person to collect the blood samples (latex sampling gloves are included as part of the kit).

All blood samples are analyzed using the most reliable, up-to-date, and medically based analyzers available; having quality equipment eliminates sampling errors that are prevalent among smaller more portable analyzers. With the assistance of precision equipment, you will receive valid and reliable data that accurately reflects your current level of aerobic fitness. By implementing this important quality control, PEAK Centre Exercise Physiologists can help you ensure that each training session you do is performed precisely according to your individual aerobic fitness profile. With this data, training plans can be designed to reflect the key areas each individual needs to develop.

In order to offer laboratory quality assessments and analysis to clients outside of the laboratory setting, it is very important that all clients thoroughly read each section within the lactate sampling manual before beginning the testing process. Each step within the manual is written to ensure that all samples taken, accurately represent the individuals' response to a particular exercise intensity. Any step missed, skipped, or ignored will affect the quality and therefore representation of the sample being taken.

**BE SURE TO READ AND FOLLOW ALL PROCEDURES AS OUTLINED.**

**If any section of the lactate sampling procedure is not entirely clear, please contact a PEAK Centre Exercise Physiologist for a detailed explanation.**

## Assessment Protocol for Intermediate Individuals using 80 rpm

Stage	Women(<140lbs)	Women(>140lbs)	Men(<190lbs)	Men(>190lbs)
1	60 watts	90 watts	130 watts	160 watts
2	80 watts	110 watts	160 watts	190 watts
3	100 watts	130 watts	190 watts	220 watts
4	120 watts	150 watts	220 watts	250 watts
5	140 watts	170 watts	250 watts	280 watts

## Assessment Protocol for Advanced Individuals using 90 rpm

Stage	Women(<140lbs)	Women(>140lbs)	Men(<190lbs)	Men(>190lbs)
1	80 watts	110 watts	150 watts	180 watts
2	100 watts	130 watts	180 watts	210 watts
3	120 watts	150 watts	210 watts	240 watts
4	140 watts	170 watts	240 watts	270 watts
5	160 watts	190 watts	270 watts	300 watts

### Definition of Categories- Running

- Beginner:** Sedentary individual, not currently involved in activity.
- Intermediate:** Leads an active lifestyle (walking, gardening, swimming). May have a health club membership
- Advanced:** Regular member at health club. Also leading an active lifestyle. Views oneself as a "fit person". May be active in various sports (i.e. Cyclist, triathlon age grouper, 10k runner etc.)
- Special Note:** If you are an elite runner (i.e. > 40 min 10K, > 18 min 5km, sub 3:20 marathon, sub 1:30 ½ marathon, contact the Peak Centre for further directions on Starting stage).

## Dry Run Assessment

Before you complete the blood sampling protocol, the Peak Centre Exercise Physiologists highly recommend that you complete a 'dry run assessment'. This assessment assists with determining what stage of the protocol is going to be most suitable for you.

**Step 1: Before beginning the assessment, select your ability level from the descriptions below.**

### Definition of Categories- Cycling

- Beginner:** Sedentary individual, not currently involved in activity.
- Intermediate:** Leads an active lifestyle (walking, gardening, swimming). May have a health club membership.
- Advanced:** Regular member at health club and/or cycle club. Also leading an active lifestyle. Views oneself as a "fit person". May be active in various sports (i.e. competitive recreational cyclist, triathlon age grouper, etc.)
- Special Note:** If you are an elite cyclist (i.e. cyclist, triathlete, mountain biker, cyclocross, contact the Peak Centre for further directions on starting stage).

**Step 2: Select the appropriate Assessment Protocol level.**

### Categories

#### **Assessment Protocol for Beginner Individuals - using 70 rpm**

Stage	Women(<140lbs)	Women(>140lbs)	Men(<190lbs)	Men(>190lbs)
1	50 watts	80 watts	100 watts	130 watts
2	70 watts	100 watts	130 watts	160 watts
3	90 watts	120 watts	160 watts	190 watts
4	110 watts	140 watts	190 watts	220 watts
5	130 watts	160 watts	220 watts	250 watts

## Categories

### Assessment Protocol for Beginner Individuals

Stage	Grade (%)	Speed (km/h)	Speed (mph)
1	2	5	3.1
2	2	6	3.8
3	2	7	4.4
4	2	8	5.0
5	2	9	5.6

### Assessment Protocol for Intermediate Individuals

Stage	Grade (%)	Speed (km/h)	Speed (mph)
1	2	8	5.0
2	2	9	5.6
3	2	10	6.2
4	2	11	6.8
5	2	12	7.5

### Assessment Protocol for Advanced Individuals

Stage	Grade (%)	Speed (km/h)	Speed (mph)
1	2	11	6.8
2	2	12	7.5
3	2	13	8.1
4	2	14	8.7
5	2	15	9.3

### Important:

For elite level athletes, contact the PEAK Centre directly. An assessment protocol will be developed specific to your performances within your Sport discipline (rowing, running, cycling).

*Dry Run Assessment cont:*

## **Step 3:**

1. Set aside a day where you are well rested to complete the dry run assessment and determine what stage you will be starting the assessment on.
2. Spend at least 5-10 mins warming up at an intensity that is slightly lower than that of your first stage (i.e. if stage 1 = 6.8 mph on the treadmill, progress the speed up to no higher than 6.5mph in the warm-up).
3. Following the warm-up, begin the first 3-minute stage of the protocol.
4. Pay close attention to your **average HR** at the 2:30-3:00 min mark of each stage.
5. At the end of each 3 minute interval, take a 1 min rest break and **record the average HR** response that you saw for the 2:30-3:00 min mark of that stage.
6. Provided you feel ok, keep increasing the speed and/or watts up to the designated number every 3 mins until you reach muscular fatigue\*.
7. At the end of the assessment, record the **total time** of the assessment (only add up the 3 min stages and not the time of the rest intervals) and the **maximum heart rate** that you saw throughout the duration of the assessment. **Please note** that your max HR may be seen **before** the end of the final stage so pay close attention to your HR monitor in the final stages of the assessment.
8. Email one of the Peak Centre Exercise Physiologists at: [info@peakcentre.ca](mailto:info@peakcentre.ca) to record your dry run results. **Please include stage speeds/watts, total time, and heart rate values for each stage.** Following the receipt of this information you will be contacted with the stage information for your lactate analysis assessment.

### **\* Special note:**

When cycling, fatigue is determined when you cannot maintain the desired cadence consistently (i.e. rpms drop from 90 to 85 which indicates loss of power).

When running, fatigue is determined what you cannot continue running at the speed of the final stage.

## Blood Lactate Sampling Setup

### 1. Included Supplies:

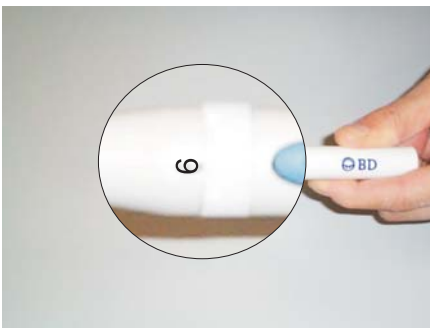
- BD Lancet Device (1)
- Lancets (15-30)
- Blood collection vials (15-30)
- Alcohol swabs (15-30)
- Latex gloves (3-6 for helper)

### Needed Supplies

- Tissues
- Small table/counter (for supplies)

### 2. Preparing the Lancet Device:

1. Unscrew the cap from the BD Lancet Device by holding the device at both ends, **NOT** at the ridged section.
2. Select penetration (6) by turning the ridged section of the cap (deepest setting).
3. Insert a lancet firmly into the lancet device holder. Remove the round lancet cover. Screw the cap back on the lancet device while holding the narrow end of the cap, not the ridged section.
4. Pull out the arming device as far as it will go (back end of the lancet device) and then let go of the arm. It will return to its original position.



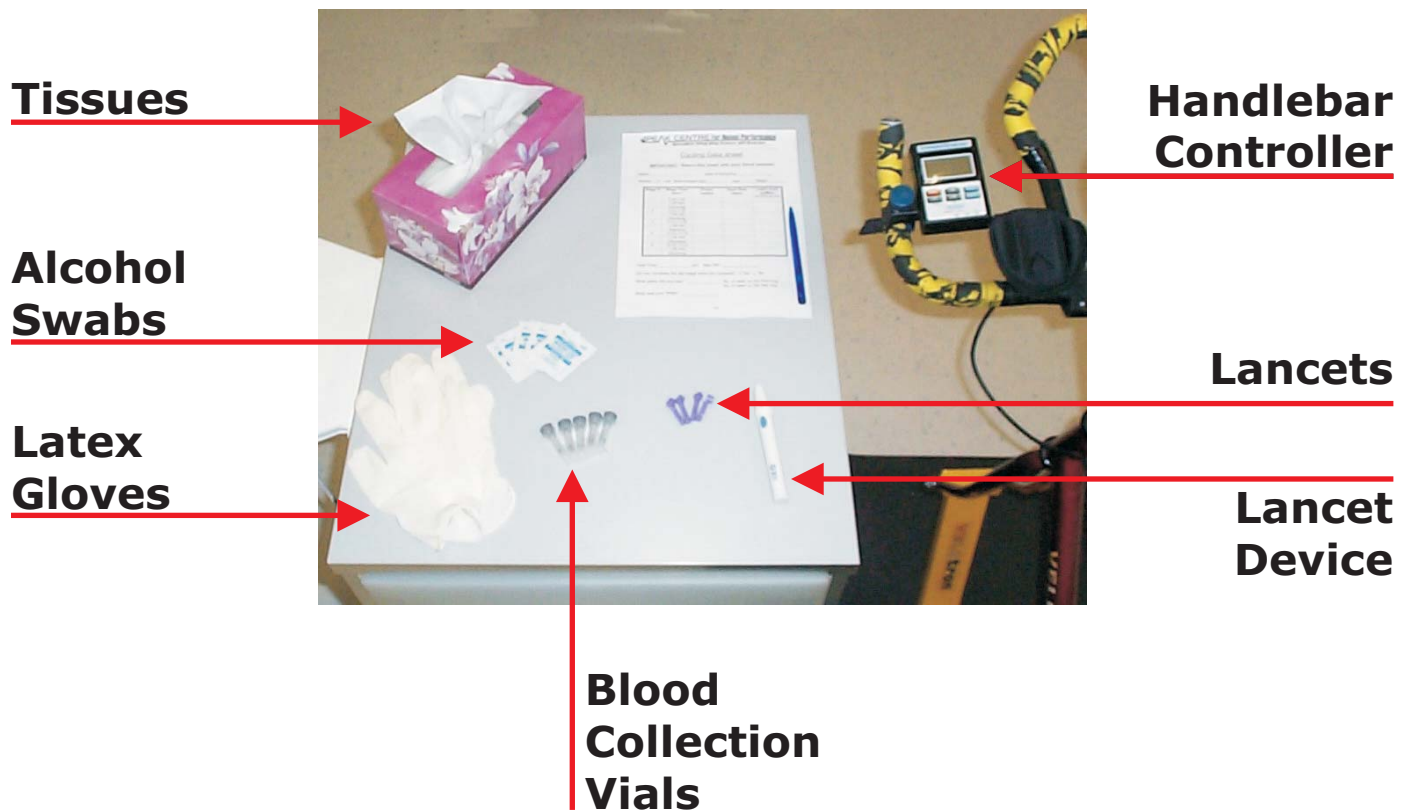
### 3. Practicing Using the Lancet:

1. Holding the lancet device away from the body, practice "firing" the device (once then lancet device is loaded, as in step 4 above). Hold the lancet device in the dominant hand, and using the thumb to push the blue firing button. Reload (step #4 above) And repeat 2-3 times.

## 4. Assessment Area Setup and Supplies:

Set-up all of the required supplies included in your Lactate Kit within easy access of your bicycle or treadmill (**See Figure 3**).

### Figure 3



### **IMPORTANT- Before Beginning the Assessment**

- Remove all of the grey caps from the blood collection vials, and **then lightly place the caps back over** the tops of the vials. This is to ensure easy access to the vials during the test.
- Ensure you have the loaded lancet device, 4 lancets, 5 collections vials, 5 alcohol swabs, and tissues set within easy access of the testing area (a table or small flat surface is required).

## 5. Key Points (Do not skip this section):

1. Always change the lancet after each blood sample. Never use the same lancet twice, and never use the same lancet on different people.
2. Have all blood sampling supplies and data sheets easily assessible and ready to use.
3. Record the heart rate at the end of each 3-minute stage and before taking the blood sample.
4. Stop pedaling/running while taking the blood sample (for all protocols).
5. Before taking all samples, clean the sampling fingertip with an alcohol swab and dry with a tissue.
6. Be careful not to smear the blood drop with your finger(s).
7. **Ensure to fill blood into cup to a minimum 1/3rd of 250µL line (2-3 big drops).**
8. After taking all samples, replace the grey cup lid on the blood collection vial. Gently tap, and then **flick the bottom of each cup after sampling.**
9. Ensure that the blood sample is obtained within the 1-minute sampling window.
  - If you go beyond 1 minute, complete the sample and put an "X" beside the stage on the data sheet and continue to the next stage for the time indicated.
  - If you do go beyond 1 minute, stick with the times outlined on the data sheet. Ex: First sample takes 1 min 15 seconds; the second stage would still end at 7:00 min.

## 6. Pre-test Warm-Up:

### CYCLING - COMPUTRAINER ASSESSMENT

1. Perform an initial rolling resistance calibration with the CompuTrainer; ensuring the rolling resistance is set between **1.95 and 2.05lbs** on the handlebar controller (see CompuTrainer™ manual).
2. Warm-up for at least **10 minutes** prior to starting the testing process. The warm-up must be slightly lower than the starting power as determined in your 'dry run' assessment) and must be at the same cadence (**70, 80, or 90 rpms**) as that to be used during the assessment.

**E.g. Starting power 150 watts  
Warm-up progressively to 140 watts**

3. Recalibrate the rolling resistance calibration on the CompuTrainer; ensuring the rolling resistance is set between **1.95 and 2.05lbs** on the handlebar controller (see CompuTrainer™ manual) before getting off the bike.
4. Get off the CompuTrainer™ and stretch prior to beginning the assessment. **(No more than 5 minutes)**
5. When you are ready to begin, increase the power on the handlebar controller (+ button) to the starting wattage and cadence (**as prescribed by a PEAK Centre Exercise Physiologist**) and begin the assessment.

### RUNNING- TREADMILL ASSESSMENT

1. Warm-up for at least 10 minutes prior to starting the assessment process. The warm-up must be slightly lower than the assessment starting speed (as prescribed by a PEAK Centre Exercise Physiologist) and must be at the same grade (2%) as that to be used during the test.

**E.g. Starting speed 12 km/h (7.5 mph)  
Warm-up progressively to 11.7 km/h (7.3 mph)**

2. Get off the treadmill and stretch prior to beginning the assessment.
3. Get back onto the treadmill and ensure the treadmill is reset to 2% grade. Set the treadmill to the initial starting speed (as prescribed by a PEAK Centre Exercise Physiologist) and begin the assessment.

## 7(a). The Sampling Process- Partner Assisted:

### **IMPORTANT:**

**IF YOU ARE CONDUCTING THE PARTNER ASSISTED METHOD, ENSURE THAT THE PERSON CONDUCTING THE SAMPLING WEARS THE PROVIDED LATEX GLOVES AT ALL TIMES DURING THE SETUP AND SAMPLING PROCESS.**

1. Immediately at the end of the 3-minute stage record the individuals' heart rate, and then have them stop cycling/running. Have the individual remain on the bike or treadmill.

### **Preparing to Sample**

2. Have the individual place their hand on either the brake hoods of the right handlebar (cycling testing) or the treadmill side rails (running testing). Choose to sample from either the middle or ring fingertips of the right hand.
3. Ensure that the individuals' finger and hand are relaxed, and ensure their hand remains on the handlebars throughout the procedure

### **Blood Sampling- 1 Minute Procedure**

4. Wipe the underside surface of the fingertip thoroughly with an alcohol swab.
5. Wipe the fingertip well with a tissue.
6. Keeping the palm of the individuals' right hand facing toward the floor, squeeze down the underside of the individuals' finger so it turns slightly red. (Start the squeeze from the last knuckle on the underside of the individuals' finger, and stop approximately 1/2 inch from the rider's fingertip.



7. Keeping your fingers in the squeezed position on the individuals' finger, press the lancet device firmly against the tip of the prepared finger.



8. Using the thumb of the hand holding lancet device press the blue firing button. Be sure to keep the lancet device and finger pressure applied to the individuals' finger.

9. Slightly release the tension on the individuals' fingertip to allow blood flow. **(Do not totally release the finger)**

10. Grab one of the blood collection vials and remove the grey cap.



11. Keeping the client's palm facing down, squeeze the tip of the finger as to form a big drop of blood. (Start from the underside of the last knuckle and slide your finger down the riders finger, stopping 1/2 inch from the individuals' fingertip.)

## **IMPORTANT:**

**Do not smear the blood drop with your finger(s). If this happens, clean the finger again with the alcohol swab and wipe with a tissue, then firmly resqueeze.**

12. Once a big blood drop has formed, use raised edge of cup to tap and draw blood into cup.



13. Briefly release the tension on the finger, and then resqueeze the finger again to get a second drop, and a third drop.

14. Place a clean tissue in the individuals' hand and have them hold on to it until the next sample.

15. Replace the grey lid tightly on the cup. Tap the cup on a counter, then "flick" the bottom of the cup 5-10 times.



**IMPORTANT:**

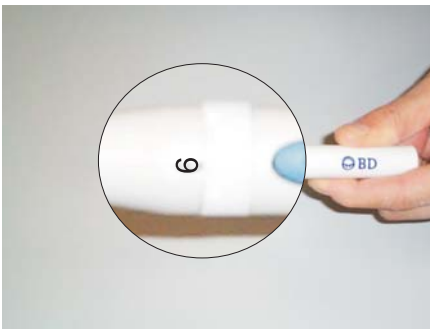
Fill blood into cup to a minimum 1/3rd of 250µL line (2-3 big drops). The necessary sample size is clearly marked on each cup.

16. Have the individual increase to the same rpm's (cycling) or grade (2% always for running) as the previous stage, then increase to the next power/speed level until the desired watts/speed are reached (Refer to your Assessment Category).



## Post-Blood Sampling

17. With the client performing the next stage, the individual doing the sampling must then change the lancet. Follow the "Preparing the Lancet Device" section on page 8.



18. On repeat samples see "Repeat Samples section" on the next page.

## Repeat Samples

*On repeat samples:*

1. Record the heart rate for the stage on the Data Sheet and then stop pedaling or running.
2. Thoroughly wipe the underside of the previously pricked finger with the alcohol swab.
3. Wipe the finger well with a tissue.
4. Squeeze the finger. If a blood drop does appear proceed to collect another sample in next sequential sample tube.
5. If a blood drop does not appear, re prick the finger, and then proceed to collect Another sample in an empty sample tube.
6. Change the lancet.
7. Increase to the required rpm's.
8. Increase to the next power/ speed level.
9. Repeat for the time intervals indicated on the Data Sheet

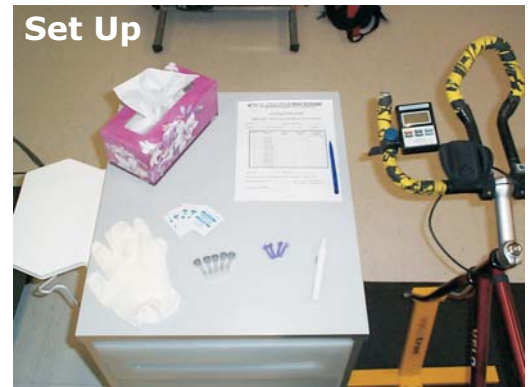
### **IMPORTANT:**

**Ensure to fill blood into cup to a minimum 1/3rd of 250µL line (2-3 big drops).**



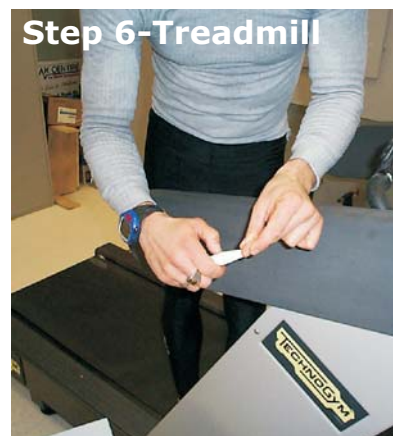
## 7(b). The Sampling Process- Self Administration:

1. Immediately at the end of the 3-minute stage record your heart rate, and then stop cycling/running. Remain on the bike or treadmill.
2. Choose to sample from either the middle or ring fingertips of either hand.
3. With your opposite hand; wipe the underside surface of the fingertip thoroughly with an alcohol swab.
4. With your opposite hand; wipe the fingertip well with a tissue.



## **Blood Sampling- 1 Minute Procedure**

5. Ensure that your finger and hand are relaxed. Using only your non-dominant hand, place your fingers as shown in Step 5 (apply pressure with the thumb on the bottom side of sampling finger, and middle finger on top of the nail of the sampling finger, so the tip turns slightly red).
6. Keep the palm of your sampling hand facing toward the floor, and keeping your fingers in the squeezed position, grab the lancet device your non-sampling hand, and firmly press the lancet device against the tip of the prepared finger.
7. Using the thumb of the hand holding lancet device press the blue firing button. Be sure to keep the lancet device and finger pressure applied to the finger. Do not move your finger away when pressing the button.
8. Slightly release the tension on the sampling finger to allow blood flow.
9. Grab one of the blood collection vials and remove the grey cap with the



10. Keeping the palm of your sampling hand facing toward the floor, resqueeze your finger (Step 5) as to form a drop of blood on your fingertip.

**IMPORTANT:**

**Be careful not to smear the blood drop with your thumb. If this happens, clean the finger again with the alcohol swab and wipe with a tissue, then firmly resqueeze.**



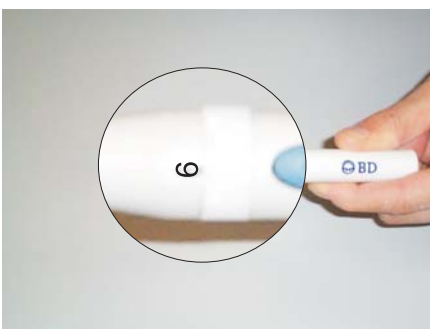
11. Once a big blood drop has formed, use raised edge of vial to catch the drop of blood into the cup.

**IMPORTANT:**

**Fill blood into cup to a minimum 1/3rd of 250µL line (2-3 big drops). The necessary sample size is clearly marked on each cup.**



12. Briefly release the tension on the finger, and then resqueeze the finger again to get a second drop, and third drop.
13. Grab a clean tissue and place it into your sampling hand. Hold onto the tissue until the next sample.
14. Replace the grey lid tightly on the cup. Tap the cup on a counter, then **"flick"** the bottom of the cup 4-5 times.
15. Change the lancet before beginning the next stage. Follow the "Preparing the Lancet Device" section on page 8.



16. Increase to the same rpm's (cycling) or grade (2% always for running) as the previous stage, and then increase to the next power/speed level until the desired Watts/speed are reached (refer to your Assessment Category).

On repeat samples see "Repeat Samples section" below.

## Repeat Samples

1. Record the heart rate for the stage on the Data Sheet and then stop pedaling or running.
2. Thoroughly wipe the underside of the previously pricked finger with the alcohol swab.
3. Wipe the finger well with a tissue.
4. Squeeze the finger. If a blood drop does appear proceed to collect another sample in next sequential sample tube.
5. If a blood drop does not appear, re prick the finger, and then proceed to collect another sample in an empty sample tube.
6. Change the lancet.
7. Increase to the required rpm's.
8. Increase to the next power/ speed level.
9. Repeat for the time intervals indicated on the Data Sheet

### **IMPORTANT:**

**Ensure to fill blood into cup to a minimum 1/3rd of 250µL line (2-3 big drops).**



## 8. When completed:

1. Ensure that the blood is well mixed in the collection tubes. Hold the tops firmly and flick the bottom of each cup 4-5 times to mix the sample before shipping.
2. Wrap all of the samples in paper towel and seal them in a Ziplock bag.
3. Take the samples to the nearest FedEx (US), or ExpressPost (Canada) shipping depot and place all samples in the FedEx blood specimen plastic envelope or ExpressPost shipping folder provided at FedEx/Canada Post depot.

### Complete the FedEx form with comments:

**“This package includes human blood samples that are non infectious and non hazardous. They are being shipped to Canada for analysis.”**

4. **DO NOT FREEZE OR STORE IN REFRIGERATOR.** Store at room temperature.
5. SEND THE PACKAGE IMMEDIATELY WITH YOUR DATA SHEET, OVERNIGHT via FedEx/ExpressPost.  
*Contact the PEAK Centre for a FedEx shipping number (US clients only).*
6. **Declared value is \$1.00**

## 9. QUICK PRICK GUIDE:

1. Ensure that all the required supplies contained within the Lactate Kit are set-up within easy access of your bicycle or treadmill (See Figure 3).
2. Remove all of the grey caps from the blood collection vials.
3. Calibrate the CompuTrainer to a rolling resistance of 1.95 to 2.05, or ensure the treadmill is set to 2% grade.
4. Set the CompuTrainer/Treadmill to the starting power/speed and begin the test.
5. Before the end of the 3-minute stage record the heart rate.
6. Wipe, clean, and prick the sampling finger.
7. Apply tension, release, and then apply more tension to the sampling finger, obtaining a drop of blood on the fingertip. Tap the blood drops into the blood-sampling vial.
8. Repeat 2-3 times to obtain 2-3 drops of blood. Tapping the blood drops into the blood-sampling vial each time. Fill to the marked line.
9. Replace the grey cap, tap the blood to the bottom on the vial, and flick the bottom of the vial 5-10 times.
10. Increase to the next intensity level at the end of the 1-minute sampling.
11. Continue taking a sample at the end of each stage.  
See Repeat samples section - pg.15 & 18