

Lab 8 – Analyzing Muscle Fatigue

Background:

Muscle cells rely on cellular respiration for their energy needs. When muscles are deprived of oxygen, they are capable of functioning but only for a short period of time. During intense or prolonged activity, the body is often using oxygen faster than it can be supplied to the muscle. The muscle cells will continue to function. However, they begin to get extra amounts of energy via another type of respiration called lactic acid fermentation. This is where your body builds up lactic acid causing your muscles to experience fatigue. This reduces your muscle's ability to function and your body desires rest to build up its oxygen supply once again. Following a period of the rest, the muscle cells regain their normal condition and can function normally once again.

Objectives:

- Be able to determine level of muscle fatigue by performing the “clothespin exercise”.
- Evaluate data to determine any change in muscle performance during sustained exercise.
- Compare performance between right and left hand muscles.
- Be able to connect results and lab to the process of cellular respiration.

Materials:

Spring-type clothespin, stopwatch or second hand on wall clock, graph paper, colored pencils, ruler

Procedure:

1. Count the number of times you can open and close a clothespin in 30 seconds. Try to do so as many as you can in 30 seconds. Record your data in the following table. **Be sure to open and close the clothespin completely each time.** Also be sure to use the same technique (fingers) throughout the exercise.
2. Repeat the 30 second operation again 9 more times with the same hand and record your data with each successive trial. **DO NOT STOP TO REST** any longer than it takes to record your data. Your goal is to build up lactic acid in the muscles that you are using.
3. Now repeat the procedure for your other hand 10 times and record your data.
4. Construct a **line graph** of your results with the vertical axis being labeled “number of contractions” and the horizontal axis being labeled “number of trials”.

Data:

Left hand trial #	Number of contractions	Right hand trial #	Number of contractions
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	
Total:		Total:	
Average:		Average:	

Questions:

1. Look at the data in the table for your dominant hand. Compare the number of contractions in trial #1 to the number in trial #10. Explain any differences that you observe.
2. Again look at the data in the table for your dominant hand. Compare the number of contractions between all ten trials. Explain any differences that you observe.
3. What do the lines on the graph tell you about the functioning of the muscle during intense, repeated exercise?
4. Add up the number of contractions over the ten trials for each hand and record the total in the data table. Then calculate the average number of contractions for each hand and record the average in the data table. Compare the total and average numbers between your two hands. What is the cause of the difference in contractions between your right and left hand?
5. Explain why the body must use anaerobic respiration (fermentation) instead of cellular respiration during intense physical activity.
6. What is muscle fatigue and what causes it?
7. Explain why the body requires a period of rest after intense or prolonged physical activity.