

Lab– Analyzing Muscle Fatigue

Background: Muscle cells rely on aerobic respiration for their energy needs. When muscles are deprived of their customary oxygen, they are capable of functioning but for only a short period of time. During intense or prolonged activity, oxygen is often being used by the body 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 anaerobic respiration (lactic acid fermentation). In anaerobic respiration, 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 supplies once again. Following a period of the rest the muscle cells regain their normal condition and can function normally once again.

Objectives: Students will be able to determine their level of muscle fatigue by performing the “tennis ball exercise” and evaluating their data to determine any change in muscle performance during sustained exercise. They will also compare performance among their group and class members

Hypothesis: Predict using an if...then...because statement what you believe will happen.

Materials: Tennis ball, stopwatch or second hand on wall clock, graph paper, colored pencils, ruler

Procedure:

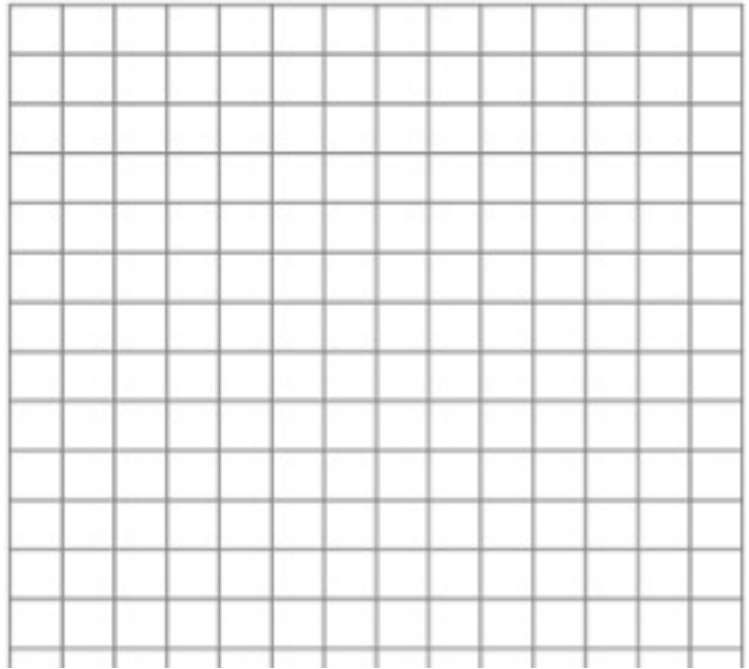
1. Count the number of times you can squeeze a tennis ball in 10 second intervals over 100 seconds. Try to do so as many as you can in each interval. ***A legal squeeze causes a dent in the ball made by using the heel of the hand.*** Your partner should record the data as you squeeze the tennis ball in a table similar to the one below. Also be sure to use the same technique throughout the exercise.
2. **DO NOT STOP TO REST** between 10 second intervals. Your goal is to build up lactic acid in the muscles that you are using.

CAUTION: To prevent injury the procedure should stop when the activity can no longer be completed. (i.e. when the hand cannot dent the ball).

3. Record visual observations of the test subject. Note any changes that occur during or after the exercise. i.e. Color changes, body positional changes, noticeable blood vessels, etc...
4. By interview determine the point where the test subject(s) started to feel fatigue (signs of fatigue may not be noticeable in the data.)
5. Note the time it took for signs of fatigue to disappear.
6. Construct a ***line graph*** of your results.

Data:

Trial # (10 second intervals)	Number of contractions Total	Number of Contraction Interval
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Total:		
Average:		



Questions:

1. Compare the number of contractions between all ten trials. Explain any differences that you observe.
2. What do the lines on the graph tell you about the functioning of the muscle during intense, repeated exercise?
3. Add up the number of contractions over the ten trials and record the total in the data table. Then calculate the average number of contractions and record the average in the data table. Compare the total and average numbers with your group and the class.
4. Explain why the body must use anaerobic respiration (fermentation) instead of cellular respiration during intense physical activity.
5. What is muscle fatigue and what causes it?
6. Explain why the body requires a period of rest after intense or prolonged physical activity.

Conclusion: Summarize your findings and re-visit your hypothesis.