Name _____ Period ____

Muscle Fatigue

Problem: What happens when lactic acid builds up in muscles?

Background: In order to contract, your muscles require energy in the form of ATP. Muscles normally produce ATP by using oxygen (aerobic respiration.) When the muscle cells do not receive enough oxygen, anaerobic respiration produces lactic acid. When muscles do a lot of work quickly, the build up of lactic acid greatly reduces their ability to contract, until eventually exhaustion sets in and contraction stops altogether. This is called *muscle fatigue.*

Materials: clothespin, timer

Procedure

1. Hold a clothespin between the thumb and index finger on your dominant hand (the one you use the most.)

2. Count the number of times you can open and close the clothespin in a 20-second period while holding the other fingers of the hand straight out. Make sure to squeeze quickly and completely to get the maximum number of squeezes for each trial.

3. Repeat the process for nine more 20-second periods, recording the result for each trial in the data table. Do NOT rest between trials.

4. Repeat steps 1, 2, and 3 for the nondominant hand.

5. Make a line graph of your results for both hands.

Data Table – Number of Clothespin Squeezes

Hand	1	2	3	4	5	6	7	8	9	10
dominant										
nondominant										

Analysis

1. What happened to your strength as you progressed through each trial?

As students go through the trial, they should find that it gets harder to do and they start to slow down

2. Describe how your hand and fingers felt near the end of your trials.

Their hands should start to hurt and burn due to the build up of Lactic Acid

3. Were your results different for the dominant and the nondominant hand? If yes, explain why. The nondominant hand (the one you don't use) will tire faster than the dominant (the hand you write with) will

4. Your muscles will likely recover after about 10 minutes of rest. Explain why. The body has time to break down the lactic acid and allows the muscles to begin to function as normal.

5. Compare the anaerobic process which produces muscle fatigue with the normal process of aerobic respiration which would occur in an unstressed hand use situation. Student should define the steps of Aerobic respiration (glycolysis, Kreb cycle, Electron Transport chain) and Anaerobic Respiration (glycolysis and fermentation)

Adapted from "How Do Your Muscles Work?" from Troy High School, Troy, NY