“Where to Turn for Heartburn” – Evaluating the Effectiveness of Antacids

Materials
Antacid medications (2 types)
Self-sealing plastic sandwich bag
Beakers (50 ml x 2)
Marker
Masking tape
50 ml graduated cylinder
Distilled water
Plastic spoons
Transfer pipette
pH meter
Weak acid (vinegar)

Procedure

Part A: Opening LoggerPro

1. Check to make sure that the LabPro is plugged in to a surge protector or power strip and that the pH meter is plugged into CH1 on the LabPro.
2. Log on to the computer using your username and password.
3. Select LoggerPro from the list of applications that is presented to you.
4. Go to File → Experiment → Biology with Computers and open the file for Lab #3 – Acids and Bases.

Part B: Preparing Antacid Solutions

1. Label one beaker “Antacid 1” and add the name of the product that you are testing.
2. Place one dose of the antacid into the beaker.
3. Use a graduated cylinder to measure 50 mL of distilled water. Add 50 ml of distilled water to the labeled beaker. Mix each solution with a plastic spoon until the antacid is dissolved in the water.
4. Remove the pH electrode from the storage solution, hold it over the waste beaker, and rinse it with distilled water.
5. Carefully lower the pH electrode into the beaker containing the antacid solution. Record the initial pH of the antacid solution in Data Table 1.

Part C: Adding Acid to Antacid Solutions

1. Add 0.5 mL of vinegar to the beaker and stir carefully with a plastic spoon. Try not to bump the pH electrode while stirring. Record the pH of the solution in Data Table 1 after the addition of 0.5 mL of acid.
2. Continue adding 0.5 mL of acid to the antacid solution, stirring each time, and recording the pH in Data Table 1. Keep going until the antacid solution has reached pH 4.0. If you have added 5.0 mL of acid and the solution has not reached pH 4, begin adding 1 mL of acid at a time.

3. If you finish testing one antacid sample, pour out the contents of the beaker into the sink, rinse out the beaker, and repeat the experiment with a different antacid sample.

**Data Table 1:** Total Amount of Acid Added to Antacid Solution

<table>
<thead>
<tr>
<th>Initial pH</th>
<th>0.5 mL</th>
<th>1.0 mL</th>
<th>1.5 mL</th>
<th>2.0 mL</th>
<th>2.5 mL</th>
<th>3.0 mL</th>
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<td>7.0 mL</td>
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</table>

**Analysis and Conclusions**

1. On a piece of graph paper, make a line graph showing the data you collected for each antacid sample that you tested. The x-axis of your graph should show the independent variable (the variable that you changed or manipulated during the experiment). The y-axis of your graph should show the dependent variable (the variable that you measured during the experiment). Use a different color for each antacid that you test. Be sure to label both axes and include a title at the top of the graph.

*Answer the following questions on a separate piece of paper. Attach your answers to the back of your graph.*

1. Which of the three antacids that were tested was more effective at neutralizing acid? Explain how your results support this conclusion.

2. Acids add H\(^+\) to a solution. Antacids contain bases and/or buffers. Write in your own words how antacids neutralize acid. If you’re having trouble, think about the pre-lab activity or return to Online Activity 4.4 on the CD-ROM to review acid-base chemistry.

3. Some antacids worked better than others but all of them eventually lost their effectiveness and allowed the solution to become acidic. What do you think was happening in the antacid solution when the pH started to become acidic? Be as descriptive as possible. Draw a picture of what you think was happening inside of the solution.

4. Suggest a reason why some antacids might be more effective than others.