The Measurement of CO_2 Production from Yeast Respiration

Yeast use cellular respiration just as we do to convert the energy in glucose and other fuels to ATP. The waste product is carbon dioxide. The carbon dioxide produced can be collected and used as an indicator of the rate of cellular respiration. By graphing its production over time we can visualize the activity rate of the cells.

Procedure

1. Partially fill a small beaker (no larger than 250 ml) with warm water between 35-40ºC.
2. Obtain a 15ml test tube and a cap with three very small holes in it. Add 8 ml of 5% sucrose solution to the tube.
3. Keeping the tube upright, place it in your beaker of warm water for 5 minutes.
4. Now fill the test tube with 10% yeast solution until the tube is filled to the rim. Screw on the cap securely. A few drops of yeast solution will likely escape through the small holes.
5. Mix the contents by inverting the tube several times, keeping your finger over the holes to prevent any loss of fluid. It is important that the tube does not contain any large air bubbles.
6. Now invert the tube in your beaker of warm water and start timing. Keep the beaker between 35- 40ºC for the duration of the lab. Don't worry that the tube begins to leak yeast solution from the holes - this is normal.
7. At the end of the first three minutes, use a grease pencil to mark the point where there are carbon dioxide bubbles, including any foam. Continue to mark the position of the CO_2 every 3 minutes for 30 minutes. Invert the tube once to remix the contents every third reading. Make sure to plug the holes with your finger.
8. After your last reading, empty your tubes and fill it with water. Use a 2 mL pipet to reduce the amount of water in the tube to the first mark. Records the volume of water removed. Do the same for each mark.
9. Pool your data with the class.

Questions

1. a) Why was the tube placed in the beaker for 5 minutes before the experiment was started?
b) Why was the water in the beaker held between 35-40ºC?
2. Why did liquid in the tube leak from the holes in the cap throughout the experiment?
3. Why was it important to invert the tube before the experiment began?
4. Construct a graph of the volume of CO_2 collected over time. On the same graph, plot the class data. Account for any differences between the two data sets.
5. Predict what would have happened to the reaction rate had we continued the experiment.