"Bean Juice Lab: Teachers' Notes and Preparation"

Before the Lab:

The night before the lab, soak one pound of pinto or red beans in water to a total volume of one gallon (this makes it easy to transport in a one gallon water container). Pour off and save the juice, discard the softened beans. The juice contains beta-galactosidase, which is the enzyme in question for this lab.

You should also assemble the following materials, think about mixing up the starch solution the night before. 1% solution (10 grams starch per liter), mixed on a stirring hot plate until dissolved, will work fine. Bring to room temperature before using.

You will need about 60 3-5 oz plastic cups or test tubes and racks; water, 0.1M HCL, vinegar, or lemon juice; ammonia, Drano solution, or $0.1M \ H_2SO_4$; dilute I_2KI ; starch solution; standard droppers; pH meters or paper; one thermometer per working group; and a hot plate and ice bucket per table (working groups can share if necessary).

Introduction/Invitation:

"It says here on this bag of beans to soak the beans and then change the water before cooking. Why?" (students will volunteer that it's to clean the beans, keep asking and prodding until a student remembers that this way you won't get gas from eating beans).

"It turns out that the bean contains a self-digesting enzyme. Remember that the bean has two parts; the embryo for the plant, and a built in food source. The amylase helps digest the starch into lactose, then another enzyme digests the lactose into galactose and glucose.

"In this lab, we'll quantify the rate of reaction of starch digestion by titration. This means we'll drip the enzyme solution into the substrate until the starch/iodine solution is cleared. Then you'll manipulate variables of temperature, pH, and concentration to find the optimal condition for this reaction."

PART 1:

- 1) Take 10 ml of starch solution.
- 2) Drop in one or two drops of iodine until the solution turns dark.

Lab Teachers Guide

CL Gary



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