

Protect that Pill

Client information:

Sarah is a fifth-grade student with an extremely sensitive stomach that is irritated by certain foods and many medications. Sarah recently came down with an illness that caused her to have a high fever, among other symptoms. Her mother wants to help Sarah fight the fever by giving her some aspirin, but she is afraid that the medicine might make Sarah's stomach hurt. Many medicines help our bodies fight sicknesses and diseases, but can also make our stomachs hurt.

Your challenge:

To prevent this stomach pain while still allowing the medication to get into our bodies, engineers and pharmacists have developed pill coatings that do not dissolve until after they have passed through our stomachs. These specially-coated pills are called "enteric-coated" pills or tablets. Your challenge is to design an enteric-coated pill that Sarah can swallow that will not irritate her stomach.

Each team will create and test 2 different recipes for coatings. You will conduct this test by covering skittles in the coating and placing them in a cup of lemon lime soda (stomach acid). You will need to create a recipe with precise measurements and ratios of ingredients.

Materials for pill coating:

- Flour
- Cornstarch
- Sugar
- Vegetable Oil

Directions: You will be following the scientific method for this experiment. You will be testing the following problem:

Problem: What blend of ingredients will hold together best in an acidic substance?

Background Information: *3 paragraphs. 1 summarizing the problem and the clients needs, 1 explaining the functions of the stomach and why it's important to slow down the speed at which a pill breaks down, and 1 about the functions of the different ingredients.*

The client needs a pill coating that will allow the pill to pass through the stomach without very much of it dissolving there. It needs to get to the intestines and dissolve there. The recipe that we wanted was something that would be a thick coat, but able to slide down the throat.

The stomach gets bigger and smaller to crush food and also has a liquid with a Ph of about 2 to dissolve food. We want the pill to resist the acid and get through to the small intestine.

We used our ingredients for a reason. Different foods have different effects when mixed together, and we took that into account when creating our recipes. Cornstarch is a good thickener, we wanted to coat to dissolve to quickly so we used a good amount of cornstarch to make sure that does not happen. The next ingredient we used was vegetable oil. Using oil helps add liquid to make the recipe more of a paste and sticky. We wanted our recipe to stick to the pill so the oil helped. Next flour, flour is similar to corn starch the only difference is that it doesn't bind as well, but still does the job.

Hypothesis: I think that the custardy mixture will work better because it is more sticky

Materials:

- 60 ml (¼ cup) flour
- 30 ml (1/8 cup) cornstarch
- 60 ml (¼ cup) sugar
- 30 ml (1/8 cup) vegetable oil
- 1 paper plate
- 4 small paper or plastic bowls or cups
- 1 clear plastic cup
- 1 cup clear diet (to avoid stickiness) soda
- 3 small plastic spoons
- 2 pieces of color-coated candy per group (Runts or Skittles work well)

Procedure:

1. Mix these two recipes: 2 cornstarch to 1 oil -should look like a custard, and equal parts flour, sugar, oil, and cornstarch -should look like cookie dough
2. Roll a yellow skittle in each mixture. Coat evenly
3. Set up three cups with diet lemon-lime soda to take the place of a stomach.
4. Drop them in soda
5. After 10 minutes, see results

Independent variable: what ingredients we used to coat the skittles

Dependent variable: how long it took the skittle to dissolve in the soda

Constants: soda, skittle, cup, amount of time

Results after 10 minutes: (make a table)

Control	Custard mixture	Dough mixture
Shell was gone, the candy was almost white	The candy was mostly white with yellow speckles where the mixture was thickest	Just like new, no changes made to the shell of the candy

Conclusion:

We were surprised at what happened. We thought that the custard mixture would be stickier and therefore hold together better but actually, the doughy one got thicker. We stumbled a bit along the way. One thing that we did wrong was making our corn starch and oil mix to thin. It didn't work and the skittle shell dissolved. One thing we did well was that we worked very fast. Another thing we did well was coming up with the recipes, we think that overall we did a good job finding recipes. This project was fun and i'm glad that we did it.