# Western Sengineering Outreach

Protect That Pill

Grade K-2

# Meet Today's ENG HERO!



Lauren Briens - Associate Professor with Western Engineering

Lauren is an associate professor with the Departmnet of Chemical and Biochemical Engineering and the Assistant Dean, First Year Studies, in the Faculty of Engineering. Her research focuses on particulate technologies and how they are used in pharmaceutical industries.

To learn more about Dr. Briens visit:

https://www.eng.uwo.ca/chemical/faculty/briens\_l/index.html

# Learning Goal:

- Students will consider their own body systems as they learn about medicine.
- Curriculum Connections: Grade 1 Needs and Characteristics of Living Things; Grade 2 Properties of Liquids and Solids

# Materials Needed:

- Candy with coating (e.g. Skittles, M&M's, Smarties) or Alka-Seltzer tablets
- Bowls
- Spoons
- Plate
- Vegetable oil
- Flour
- Cornstarch
- Sugar
- Water









# Engineering and Science Connections:

Today we will be chemical and biomedical engineers. Chemical engineers help create all different kinds of things that have chemicals in them, including medicine. Biomedical engineers help design things in the medical field, from x-ray machines, to prosthetics, to medicines.

Every living thing needs food and every living thing has a way of breaking down that food so that the body can use it. For humans, we have something called the digestive system. When we eat food, it goes into our mouths, down our throats and into our stomachs. In our stomach there is something called stomach acid that helps break down the food so that our body can absorb it and use it for energy. Anything our stomach has left continues on into our intestines where more absorption occurs, before leaving the body as waste.

Sometimes humans get sick and need medicine to help them feel better. When medicine is in a pill, it is a solid. Our body must dissolve the pill into a liquid so that it can be used by the body. But sometimes, the acid in the stomach acts too quickly and breaks down the medicine before our body has used it. Sometimes, the medicine can make our stomach hurt, so we don't want it to break down in the stomach, but further in the digestive system. To make the medicine work where we want it, sometimes they have protective coatings on them. These coatings can do a lot of different things like protecting the chemicals in the medicine during packaging and handling, protecting the pill from temperature and moisture during storage, protecting parts of the digestive system, or allowing the pill to dissolve slowly so that you can get medicine overtime, rather than all at once. Chemical and biochemical engineers help create these coatings!

Video Recommendation: The Digestive System in the Human Body

https://www.youtube.com/watch?v=9znLCDpjb1o

# Activity:

Before beginning, think about the following questions:

- What are some things that all living things need?
- What kind of engineer might help make medicine?
- Why are there coatings on some medicines?

### Game Time - Simon Says "Digestion"

Play a round of Simon Says with your family. One player is Simon and they give instructions for the rest of the players. Only follow the directions when Simon says "Simon says" before giving the direction. If Simon does not say "Simon says" and a player still follows the direction, they are out. Trying to include actions that are part of digestion, like chewing, swallowing, and breaking down food in the stomach. Get creative with your movements!

### Time to begin

You and your team of chemical and biomedical engineers have been hired by a pharmaceutical company to create a protective coating for their new wonder medicine. The medicine is more helpful when it is absorbed later in the digestive system, but will make people feel nauseous if it dissolves in the stomach.

In your trial runs, your pills will be candy or Alka-Seltzer tablets. Your job is to create a coating so that it does not dissolve in water. For the candy, if it begins to dissolve, you will see colour in the water. If the Alka-Seltzer dissolves, you will see bubbles in the water.

To make your coating, mix vegetable oil with any of the other ingredients (flour, sugar, corn starch). If you have other ingredients you want to try, go ahead! Then use the mixture to cover your "pill." Once covered, pour some water into a cup or bowl and place the pill inside. Set up a control as well. To set up a control, place a "pill" with no mixture on it into a different bowl of water. Time how long it takes for both your mixture and the control to start to dissolve. See if your mixture takes longer than the control.

Create a different mixture and run another trial. Were the results better the first time or the second time? Why do you think so? Do thick or runny mixtures work better? Do smooth or bumpy mixtures work better?

Run the trial with as many different mixtures as you would like, but make sure to keep timing how long the pill takes to dissolve, and make notes about which one you think is best!

### FIGHTING THE WIND

### What Did You Learn?

- All living things need food. What else do all living things need?
- What is a solid?
- What is a liquid?
- Which coating worked best?

## Future Learning



• Turn this activity into an experiment! To do that, we must make predictions before we test. Guess which coating you think will work best before you start mixing and testing. As well, we must be specific in experiments. So we can measure our ingredients more we mix and write down how much we have used. By making small adjustments to measurements, we can be more accurate in our final results about which mixture works best!

# Share your creations!

We would love to see what you made. Email as at <u>discover@uwo.ca</u> or tag us on social media.

Instagram: @westernueng Twitter: @westernueng Facebook: @westernueng

Thanks for discovering with us!