



Minds in Motion

Casein Creation!

Activity Rundown:

Did you know that back in the 1900's, milk was commonly used to make everyday items such as buttons, hair combs, and even jewellery? In this activity, you'll be conducting your very own chemistry experiment by making casein plastic out of some simple ingredients you may already have at home.

You will need:

- ☐ 1 cup of milk (Tip: Whole milk or heavy cream will make the best plastic)
- ☐ 4 teaspoons of white vinegar
- ☐ Mug or pan to heat milk
- ☐ Mug to hold milk
- ☐ Microwave or stove top (Parent supervision needed!)
- ☐ Paper towels
- ☐ Spoons
- ☐ Optional: Food colouring, glitter, markers, cookie cutters

Let's do it!

1. Using a mug in a microwave or a pan on a stove top, heat the milk until steaming. Remember to occasionally stir!
2. In a different mug, pour in the 4 teaspoons of vinegar.
3. Carefully pour the heated milk into the mug containing the vinegar.

STOP!

Do you notice anything strange once the milk and vinegar begin to mix? Get a piece of paper and write down any observations. Why do you think this change is happening?

4. You should see white clumps forming in the vinegar-milk mixture.
5. SLOWLY mix the mixture together with a spoon for a few seconds.
6. Stack 5 layers of paper towel on a flat surface that you don't mind getting wet.
7. Wait for your mixture to cool down a bit so that it's safe to touch with your hands.
8. Using a spoon, scoop out the white clumps and place them on the layered paper towel. Get as much of the liquid out of the clumps by pressing paper towels firmly on top of the wet clumps.
9. Gather all the little clumps together and form them into a ball. At this point, you can add food colouring or glitter!



Minds in Motion

10. While still wet, roll out the balled-up casein plastic and use a cookie cutter to create a shape! The plastic can also be moulded by hand into a sculpture if you're patient.
11. Leave your casein to dry for at least 48 hours. Once dry, use paint or markers to colour your creation!



Important notes:

- Make sure your area is well ventilated when creating your casein plastic. Hot milk and vinegar do not create the most pleasant of smells.
- To avoid clogging your drain, do not put any of the solid white clumps down the sink. Instead, discard them in the garbage.

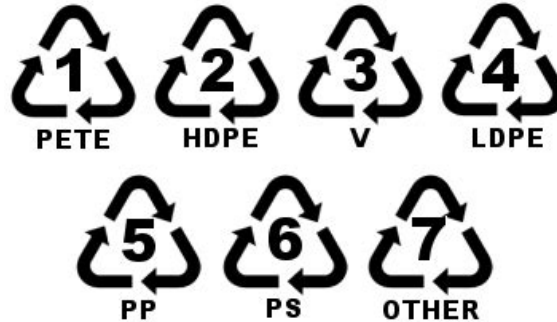
Background:

How does milk make plastic? To answer that we need to think first about what plastic is. The word plastic is used to describe a material that can be moulded into many shapes. There are actually seven different kinds of plastic:

1. Polyethylene Terephthalate (PETE or PET) used in food and drink packaging.
2. High-Density Polyethylene (HDPE) used in grocery bags, shampoo bottles, and medicine containers.
3. Polyvinyl Chloride (PVC) used for toys, clingwrap, and tubing.
4. Low-Density Polyethylene (LDPE) used in liners for milk and juice containers.
5. Polypropylene (PP) used in hot food containers.
6. Polystyrene or Styrofoam (PS) otherwise known as styrofoam!
7. Miscellaneous plastics (includes polycarbonate, polylactide, acrylic, acrylonitrile butadiene, styrene, fiberglass, and nylon). Basically, any plastic not induced or a mix/layered version of the six previously mentioned plastics.

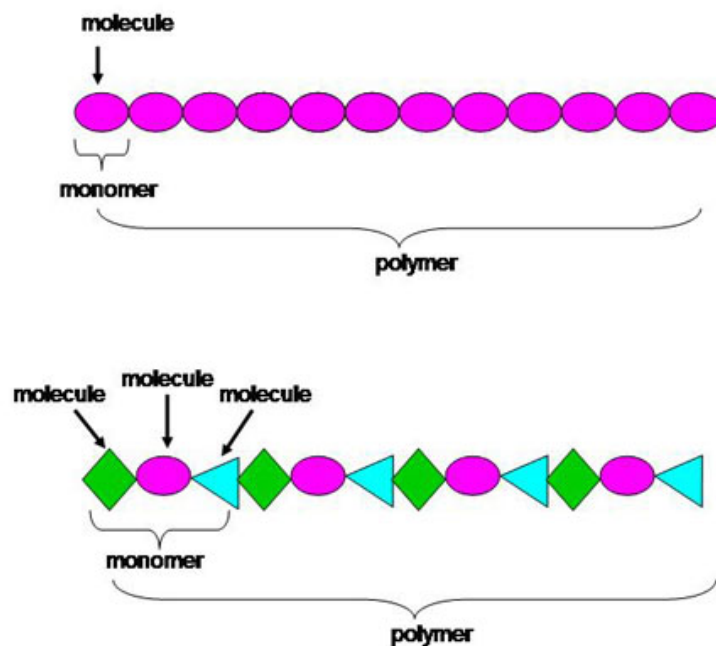


Minds in Motion



Their similarities and differences come from their differences in their molecules. Molecules are the smallest units of any given thing. You, your bed, and the food you eat is all made up of molecules! Unfortunately, molecules are way too small to be seen with just your naked eye.

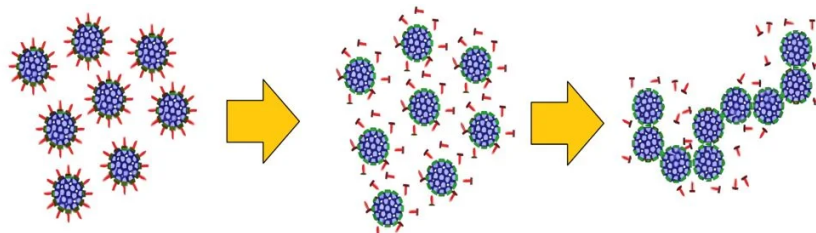
The seven different kinds of plastic are similar because they are all made up of molecules that are repeated over and over again in a chain. These are called polymers, and all plastics are polymers! Sometimes polymers are chains of just one type of molecule and other polymers are chains of different types of molecules that link together in a regular pattern. A single repeat of the pattern of molecules in a polymer called a monomer.



Milk contains many molecules of a protein called casein. When you heat milk and add an acid (the vinegar), a chemical reaction takes place which results in the casein molecules unfolding and reorganizing into a long chain, otherwise known as a polymer!



Minds in Motion



This image shows the unfolding of the blue casein molecules, their reaction with an added acid, and their formation of a long polymer.

Fun fact: Did you know that casein can be used to make a huge variety of different products? It can also be used to make paint, glue, and our favourite: CHEESE!

***If you have the time, try recreating this casein experiment with different amounts of vinegar, different types of milk, and different milk temperatures. Make sure to record each experiment and its results, we would love to hear which recipe works best for you.

Reach out!

We would love to hear from you about all the amazing STEM projects you are doing at home! Show us your finished products on any of the following social media platforms by tagging us or by using the following hashtags. We hope these projects have brought some excitement to your day during these difficult times.

Let us know how we did! Please click below to fill out a short survey on how well we did and what you would like to see more of in the future. Thank you!

<https://bit.ly/MindsSurvey2020>

Twitter: @MyMindsInMotion
Facebook: @mindsinmotion2014 & @ucactiveliving
Instagram: @ucalgaryactive

Please use the following hashtags!
#ucalgarycamps #ucalgarytogether