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OHIO STATE UNIVERSITY EXTENSION

Jr. Scientist Newsletter

Cuyahoga County February 20201

Happy February Jr. Scientist.

Welcome to the second month of our Jr. Scientist program. I hope you are having fun exploring each months' topic. Keep sending me your pictures and sharing what you learned. I also appreciate your comments and suggestions. Email all pictures and comments to: Stone.363@osu.edu

If you have any suggestions or comments, please send them my way. This month our topic is food science, we will learn how ingredients interact and some exciting ways to take food and transform it into something different, so are you ready?? …"Let's Eat"!!!!

1. Making Butter Science Experiment

Science is everywhere. One of the best places in your home to find science is your kitchen. Cooking and baking requires chemistry. Eating and digestion requires biology. It's all science! Many of the foods we eat are created by using principles of chemistry. Butter is one of them. Butter is created from cream. Cream is basically milk with a high fat content. When cream is agitated with a churn, or shaken in a jar, the fat starts to glob together and separate itself from the liquid. This glob of fat is butter, and the liquid is called buttermilk.
Let's learn how to make butter and then we'll take a closer look at the science behind it.

To make a small amount of butter, you really only need two things – heavy cream and a clean jar. Fill your jar half full and tightly replace the lid. Now, you are ready to shake!

Now it's time to shake and shake and shake! And shake some more…

Stop every once in a while, to check the progress. You should start to see a little ball forming. When it seems to stop growing and the liquid looks thin, you are done! Note how long this process takes.

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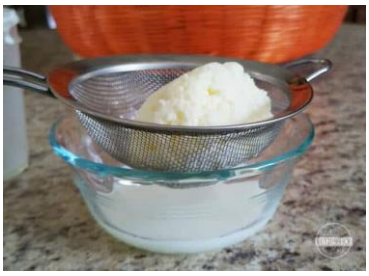
Take the butter out of the jar. The remaining liquid is buttermilk. You can save the buttermilk in the refrigerator for a recipe if you would like.

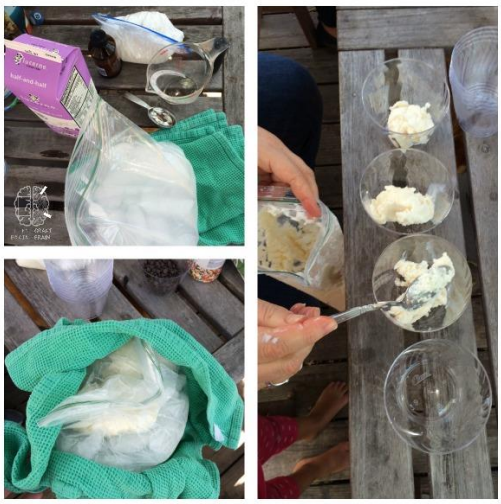


You can spread the newly made butter on crackers or bread to have a taste. Does it taste like the butter you buy from the store? Regular butter has added salt. So your butter might taste a little different unless you use unsalted butter in your home. Refrigerate any leftover butter.

The Science Of Making Butter

As I said before, butter is created when the fat in cream starts to stick together. You might be asking, “What keeps the fat from sticking together all the time?” Small amounts of fat cells in cream and milk are held together by a tight membrane. Under normal conditions, these membranes keep fat cells from grouping together to form large globs.

When the cream is agitated by the shaking of the jar, the fat cells bump against each other and the membranes burst. This frees the fat cells to clump together to form large globs and finally a large clump of butter.



2. Homemade Ice Cream

This ice cream comes together in less than 10 minutes. It will be soft serve, but you can build a little toppings bar, and everyone can add their favorite candies, sprinkles or syrup directly to their own bag of ice cream. You only need to have three ingredients, but additions and substitutions can be made.

- You can substitute Splenda or some other artificial sweetener if you are watching your sugar consumption
- You can add flavorings and extracts like vanilla, peppermint, orange or any other concentrated bottled flavoring you like
- Of course, you can add sprinkles, candy bar pieces, nuts, chocolate chips, hard candy or syrups to your finished product
- Fresh fruit can be used too! For the best results, I would use those as toppings or mix-ins at the end after your ice cream has already “set up”

TIPS FOR SUCCESS TO MAKE ICE CREAM IN A BAG

As usual with recipes, even when it's easy, there are always a few things you need to know to make everything go more smoothly.

- You can use half and half or even whole milk as ONE HALF of the volume of liquid, but heavy cream seems to work best.
- I wouldn't leave out the salt! Salt makes the ice melt more slowly and evenly. You don't want all your ice to melt, and your cream isn't set.
- If you don't have rock salt, substitute (in this order) Kosher Salt or Table Salt. It's the size of the crystals that matter as much as what the salt does (slow melting.) So if you have some kind of fancy sea salt, save it – unless it is larger chunks.
- Add only extracts and liquid flavorings in the "making" phase, and toppings after the ice cream sets up. You can stir in larger things like chocolate chips or candy bar pieces.
- If you have several participants, increase the recipe and mix together in a big pitcher or bowl until the sugar is dissolved. Then add portions to the small bags.

EQUIPMENT

- You will need 1 Gallon size zip-top bag and one quart size zip-top bag for each person making ice cream.

INGREDIENTS

- 1 cup heavy cream
- 1/4 cup sugar, Splenda or another sweetener is fine
- 1 teaspoon vanilla
- 1 quart size zip-close bag
- 1 gallon size zip-close bag
- 3 –4 cups ice
- 1/2 cup rock salt optional

INSTRUCTIONS

Mix all ingredients until the sugar is dissolved. Pour the ice cream base into the smaller bag. Make sure the bag is sealed tight.

Place the small bag into the larger one. Add enough ice to the large bag so that it surrounds the one with the ice cream base. Add salt, trying to get it well distributed with the ice. The salt makes the ice melt more slowly.

Massage the bag gently for 8 to ten minutes, taking care not to burst the seal on your smaller bag. (Suggestion: have your kids wear gloves as the bag will get cold) The ice cream base will firm up to a soft-serve consistency. Add more ice if needed.

Remove the ice cream bag. Rinse the salt off the outside, add toppings.

Get a spoon and Enjoy right from the bag!

The Science of Ice Cream

What makes ice cream creamy? This ice cream is made of sugar, fat, ice crystals, and air. The more you shake, the smaller the ice crystals become, and the more air is incorporated into the ice cream. Doing both makes for a creamier cream. You can also adjust the creaminess by changing the fat content of your dairy – heavy whipping cream has 6g of fat per Tbsp. vs 3.25g for whole milk. We went with half and half at 1.7g fat per Tbsp.

Why does shaking some dairy in a bag make ice cream? Ice cream is an emulsion, which means small droplets of one liquid dispersed or spread throughout another liquid. Think salad dressing… Oil and vinegar don't dissolve, but they can disperse into an emulsion with the help of a whisk. So when you shake the bag, it emulsifies the ice cream, dispersing the ice crystals, fat molecules and air.

Why do you need salt in the ice? Salt lowers the melting temperature of ice. This lets you shake that bag of ice long enough to get the ice cream to solidify. The more salt you add, the lower the melting temperature. And the colder the temperature of the icy solution around the ice cream, the faster the cream freezes. This is the same reason that salt is put on the roads when it's cold and wet. Lowering the freezing temperature (which is the same as the melting temperature!) keeps the roads covered with water, not ice.

3. Candy Geodes

Want a sure-fire way to get kids really excited about science? Bring the science into the kitchen! Especially if you make it a candy science session. Kids love learning with candy and this Candy Geode Kitchen Science Activity is sure to be a big hit with your older kids.

In nature geodes are created in the hollow areas of soil such as animal burrows or tree roots. They are also formed in the bubbles in volcanic rock. Over time, dissolved minerals seep into a hollow area and harden into an outer shell. Crystals form inside the hollow making a geode.

Cracking open the seemingly mundane shell of a geode to discover the beautiful crystals within is an experience like no other. Except maybe eating this candy version of a geode. It is surprisingly tasty, and everyone loves to get involved in the science behind the creation of these beautiful crystals.

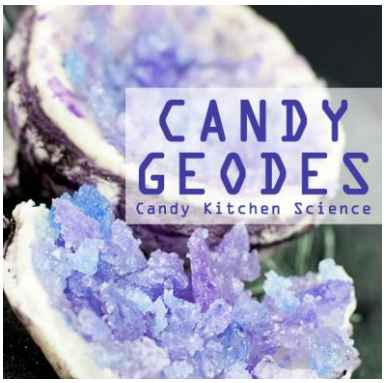
Making Geodes Using Candy Science

We will make the shell out of gum paste and then using supersaturated syrup, grow our crystals from sucrose. The resulting candy looks just like a geode from the ground but is delicious and edible. Then we will delve into the chemistry and lots of interesting science around the creation of sweet treats.

First Up – Making the Shell

For the shell, you will need gum paste and a small dish to form the shell in. Depending on the size and shape you wish for your final geode, there are lots of candy and cake molds that can work.

You can buy gum paste ready to use or make it using this very simple recipe.
Gum paste is often known as fondant in certain places of the world.



Gum Paste Recipe

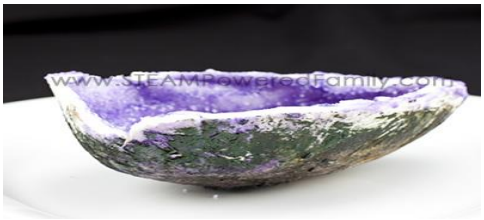
GUM PASTE INGREDIENTS:
1 lbs bag of marshmallows
1 lbs bag of icing sugar
Tylose powder or cornstarch
Icing coloring and flavoring if desired.
Crisco for hands and tools

GUM PASTE DIRECTIONS:

Put the marshmallows into a large microwave dish. Run for cycles of 15 seconds until melted. Stir between cycles. It takes about 1.-2 minutes but be careful because its very hot and will burn if you get it on your skin.
When melted stir in 1 ½ cups of icing sugar. Mix until you have a smooth paste and its cool enough to work with.
Coat your hands with a film of Crisco and turn out onto a sugar-coated board and start kneading.
When you have a soft pliable sugar dough, incorporate the tylose by sprinkling it over the top of the dough and kneading until fully incorporated.
Whether you bought gum paste or made your own, the next steps are the same.

Making the Geode Stone Shell

Split the gum paste into two sections. Add flavoring if desired (peppermint was amazing!) to both portions, then set one portion to the side.
To the other section add icing coloring. I used black icing coloring to produce the stone coloring of the outside shell. Don't over work the color. You want to produced a realistic stone coloring which will be speckled and veined. Leave the second portion white.



Let the whole lot rest for at least 2 hours.
Roll out a small amount of the white gum paste.
Roll out a small amount of the colored gum paste.
Lightly wet the colored gum paste to help it adhere to the white paste.
Now roll the two pieces out to the size needed for your mold.
Tip: Line the mold with tinfoil to make removal easier. You can also create your own mold using an plastic or silicone container.
Press the gum paste – stone colored side out into your mold and let harden for a day (more if you live in a humid area) in a warm dry area.

Making the Crystals

To make the crystals we need to create a super saturated solution. You will need a stove top for this portion of our kitchen science activity.
In a pot combine ½ cup of water with 2 cups of granulated sugar.
Slowly bring to the boil and cook at medium heat until the temperature reaches 237 Fahrenheit.
Remove from the heat and add coloring and flavor. I used violet food coloring (red and blue mixed) and peppermint flavoring.
Use two large sheets of tinfoil. Set your gum paste shell (still in the mold) on the tinfoil.
Allow to the syrup cool a bit and then pour into your gum paste shell.
Carefully wrap the foil around the shell and fold it so that the gum paste shell and the supersaturated sucrose is completely enclosed.
Place in a warm area and do not disturb. It took awhile (2-3 days) for the crystals to form, unwrap and turn the geode upside down to drain away the excess sucrose syrup. Carefully pull off the foil lined mold and leave the geode to dry for a couple days.
Now you will have a beautiful edible geode to show to your friends! It tastes great too!

4. Edible Sedimentary Rock Cycle Bars

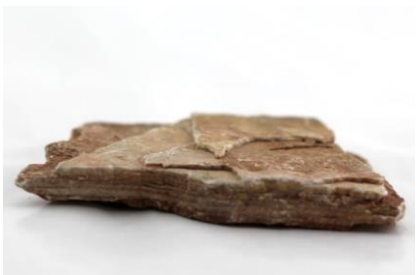
Use this edible sedimentary rock activity to start to learn about the rock cycle and fun way to introduce Geology and earth science.
Sedimentary rocks are one of the three types of rocks along with igneous and metamorphic.
Making edible rock layers is a great way to visualize how the rocks are formed.

Learning about Sedimentary Rocks

Start by showing your child a sedimentary rock. Try to choose one with several visible layers like the one I have here.
Look at the rock.

- Why do you think the rock has layers (stripes/different colors)?
- How do you think the rock formed?
- Sedimentary rocks are made from sediments – bits of dirt, sand, rocks, shells, bones, etc. – that settle into layers. The older layers are on the bottom. They settled first. With a little bit of pressure and time, the sediments stick together and form the rocks we see.

Ingredients for these Sedimentary Edible Rocks



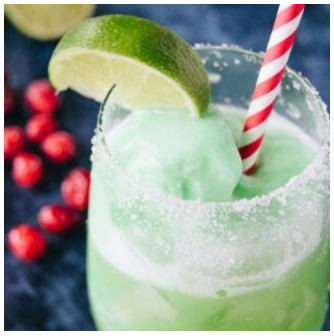
- 3 Cups rice cereal
- 3 Cups mini marshmallows
- 4 Tablespoons butter
- Pinch of salt
- Splash of vanilla extract
- Mini chocolate chips
- M&M's, other candies, or more chocolate chips
- Cooking spray or oil to coat the pan

How to Make the Sedimentary Rocks that you can Eat

- Melt the butter in a saucepan on low heat.
- Remove pan from heat.
- Add mini marshmallows one cup at a time stirring to melt.
- You can add the pan back to the heat as needed to melt the marshmallows.
- Melting the marshmallows slowly will result in a softer treat.
- Once the marshmallows have melted into the butter, add the salt and vanilla.
- Stir in the rice cereal.
- Coat the bottom and sides of an 8" x 8" pan with a thin layer of oil. I use a paper towel to wipe out the excess.
- Add half of the rice cereal and marshmallow mixture to the pan.
- Use a rubber spatula to press it down into a flat layer.
- Cover this layer with mini chocolate chips.
- Add another layer of the rice cereal and marshmallow mixture.
- Press down firmly to make sure the layers all stick together.
- Top with M&M's, other candies, or more chocolate chips.

5. Fizzing Sherbet

To make home-made fizzing sherbet, you will need:



1 tsp baking soda

1 tsp citric acid

3 Tbsp icing sugar

2 Tbsp flavored jello

Bowls and measuring spoons

You should be able to find baking soda and citric acid in the baking section of your local grocery store. Citric acid is a natural preservative and is often used to add a sour taste to food and drinks. (It's sometimes called 'sour salt'.)

Icing sugar is also known as powdered sugar or confectioner's sugar. You can make your own icing sugar by blending regular white sugar in blender for about a minute, until it becomes a superfine powder. It's much cheaper to make it this way.

What to do

1. Measure out each ingredient into a small bowl.

It's a good chance to talk about how to level off a measuring spoon, count out quantities, chat about the different ingredients and guess how they might taste (and react) when mixed together.

Mix and taste!

You may wish to vary the ingredients slightly to suit your own taste preferences. Experiment and see what you come up with. Sugar adds sweetness. Citric acid creates a sour contrast and reacts with the baking soda to create the fizzy sensation on your tongue. The jelly crystals are there to add flavor (and color). i made four different flavors of sherbet, using four different packets of jelly crystals. The blackcurrant (purple), raspberry (pink) and lime (green) contain only natural colors and flavors – yay! The berry (blue) one however is slightly more guilt-ridden… If you haven't tried it before, then sherbet is sure to surprise you. It's a real sensory experience. It's part sweet, part sour, part fizzy, part soapy, but all very delightful. This dry mixture would be great to serve over your homemade ice cream, can be added to punch or just put a small amount on your tongue to experience that fizzing sensation.

Store your left-over sherbet in a sealed container or zip-lock bag and store it in your pantry. It should last for ages as long as you keep it sealed and dry.

The Science

The 'fizzing sensation' of sherbet is formed by an acid-base chemical reaction between citric acid and baking soda (which is a base), in the presence of a liquid (which in this case, is your saliva), causing tiny bubbles of carbon dioxide (CO_2) that tickle your tongue.

6. Popcorn science

HOW TO DO THE DANCING POPCORN SCIENCE PROJECT

Good news- the dancing popcorn science project is super easy, inexpensive and fun- and promotes scientific thinking! It inspires us to marvel at the power of chemistry.

All you need is:

Unpopped popcorn / dried corn

- Vinegar
- Baking Soda
- A clear glass

Start by putting the vinegar in the clear glass. If you don't have a clear drinking glass, you could use a mason jar, pickle jar without the label, or a vase. You just want to see inside it through the sides because that's where the magic happens!

Next pour in the corn. I did a layer on the bottom. The amount of corn will depend on how big your container is. Mess around with it and see what works best.

Next you add baking soda. This chemical reaction is what will make the corn dance around. The dancing sometimes continues even after the major bubbles are done. It can last a couple minutes long!

BRIEF INTRODUCTION TO THE CHEMICAL REACTION HAPPENING IN THIS SCIENCE PROJECT

When there was no more dancing, I added a little more baking soda… the whole thing erupted outside of the glass and the kernels began dancing again!

Eventually, adding baking soda stops causing a reaction because the vinegar (acid) has no more protons to give the baking soda (base).

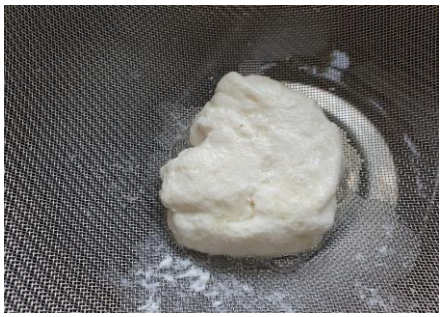
If you want to experience the dancing popcorn science project again, dump out the vinegar and start over. You can use the same popcorn kernels over and over again!

FINAL THOUGHTS ON THE DANCING POPCORN SCIENCE PROJECT

Add food coloring to the vinegar. You don't want to add too much that vinegar becomes too dark and hides the corn, but a little extra color can make this dancing popcorn science experiment that much more fun!

7. Turn Milk into Plastic

Did you know it's possible to turn milk into plastic? All you need to do is warm it up with a little bit of vinegar. This would make a good exploration when looking at chemical changes.
It's called Casein Plastic and in the early 1900's it was a common way to make plastic for household use.
Casein is the name of the protein in milk.



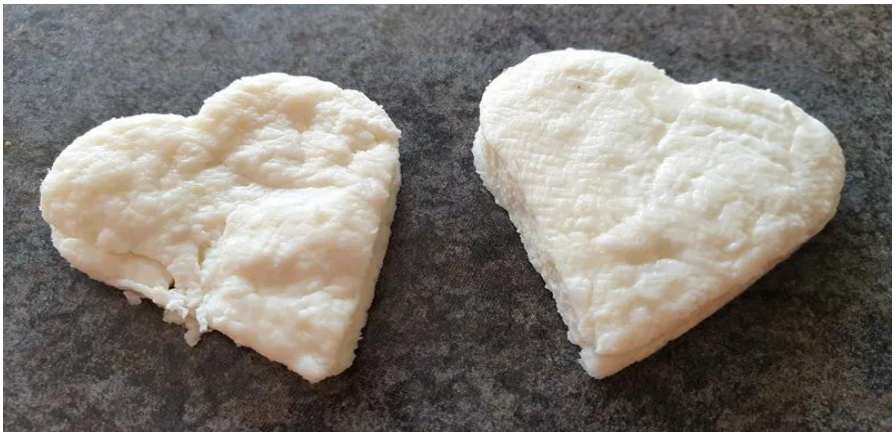
YOU WILL NEED

- One cup of milk
- 4 teaspoons of white vinegar
- A bowl
- A sieve or strainer
- Paper towels
- A saucepan or access to a microwave
- Plastic cookie cutter shapes

First you will need to warm up the milk. You can either do this in a saucepan or put it in the microwave for 90 seconds. You want it warm but not boiling
Then stir in 4 tablespoons of white vinegar. Keep stirring for about a minute.
The acid in the vinegar will make the protein in the milk (the casein) clump together.
Once the milk has gone all lumpy, pour it into a sieve (do this over a sink or over another bowl) to drain away the excess liquid.
The plastic will stay in the sieve. Press it down with a spoon to squeeze out all the liquid.
Transfer the plastic to a paper towel and squeeze out any more liquid.
You can then shape the plastic using your hands or use cookie cutters to cut out shapes.
Leave the plastic to dry for a few days until it's hard and ready to use. If you want to use the plastic as a pendant (or Xmas tree bauble), don't forget to make a hole for the string while it's still soft.

INVESTIGATE

If you want, you could add food coloring to change the color of the plastic before you would it.
You could turn this into an investigation by changing the type of milk; is full fat better than skimmed? Does this work with other types of milk? Or use different acids such as lemon or orange juice. Change the ratio of milk to vinegar. Does this make more/less or stronger/weaker plastic?



8. Disappearing Egg Shell

How to Make an Eggshell Disappear

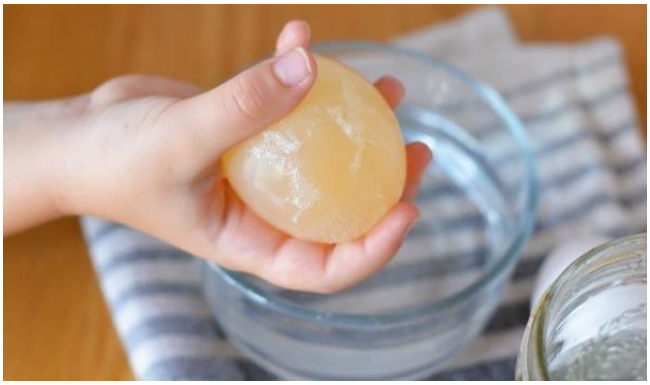
The eggshell dissolves because eggshells contain calcium carbonate, the main ingredient in many antacid tablets. This dissolves in the acidic vinegar to produce calcium ions (which stay dissolved in the vinegar) and carbon dioxide gas. The carbon dioxide produces the bubbles that you will see while the egg is dissolving. Now that you know the science behind this cool activity, below is everything you need to give this fun science experiment a try!

Supplies:

- 16-ounce mason jar with lid and ring
- white vinegar
- fresh egg

Directions:

1. Gently place the egg into the mason jar.
2. Fill with vinegar leaving 1/2" space at the top. It is important to leave room at the top of the jar or it might burst from the carbon dioxide gas produced by the reaction.
3. Loosely cover the jar with the lid and ring. Again, make sure it is not too tight so that the gas can escape the jar.
4. Let sit for about two days. Remove from jar and rinse off in water. Enjoy your shell-less egg!



9. How to make Bubble Gum

This recipe on how to make bubble gum is not just a recipe, it's a science experiment. How cool is that? And did you know? Ancient Greeks chewed resin from mastic trees and that was the first chewing gum. But it wasn't until 1928 when Walter Diemer made the very first bubble gum, a chewing gum that can let you make bubbles.

Ingredients:

1/3 cup Gum Mix or Xanthan (Xanthan gum is a popular food additive that's commonly added to foods as a thickener or stabilizer. It's created when sugar is fermented by a type of bacteria called Xanthomonas campestris. When sugar is fermented, it creates a broth or goo-like substance, which is made solid by adding an alcohol.)
1/2 tsp Citric Acid
3/4 cup Icing Sugar
3 tbsp Corn Syrup
1 tbsp Food Coloring
1 tsp Flavoring
1 tsp Glycerol

Method:

Get a microwave-safe bowl and put in the gum mix, corn syrup, glycerol, citric acid, and flavoring. Place it in the microwave for 60 seconds and give it a stir. Microwave it again for another 30 seconds and stir. Repeat the process until it's all melted. Add Food coloring and stir again. Pour half of the icing sugar on a flat surface, make a well in the middle, and pour in the gum mixture in the middle. Leave it for 5 minutes to cool. Slowly knead it together and put more icing sugar in if it starts to become sticky. Once done, flatten it down with a rolling pin or with your hands then cut it into small pieces.

What is a food scientist?

Food scientists and technologists use chemistry, biology, and other sciences to study the basic elements of food. They analyze the nutritional content of food, discover new food sources, and research ways to make processed foods safe and healthy.

You'll need to have an HND or foundation degree in food science or food technology. An undergraduate degree in food science or a related subject is highly desirable.

Louis Pasteur was a French microbiologist and chemist in the 1800s who made many huge advances in the world of medicine as well as food. After created the first vaccines for anthrax and rabies, he went on to develop a process for killing bacteria in food that we have been using ever since: pasteurization.

Food science is crucial to the success of the food industry, helping to develop thousands of products that make life better for today's consumer. ... Also, thanks to food science, consumers can experience food products from all over the world.