



Keeping Food Healthy

Have you ever purchased strawberries or blackberries at the grocery store and tasted one before you got home to wash it? You may want to rethink your decision.

Terms to Know

Bacteria	microscopic living organisms that can be found everywhere; some bacteria are good for your body, while other types can be very harmful
Citizen scientist	people — young or old — who help collect data for research projects conducted by professional scientists
Contamination	when bacteria or other harmful microorganisms spoil food; it is a common cause of food poisoning
Escherichia coli/ E. coli	bacteria found in the environment, foods, and intestines of people and animals; most strains of E. coli are harmless, while others cause diarrhea, urinary tract infections, respiratory illness, pneumonia, and other illnesses
Food recall	an action by a food manufacturer to protect us from food that might cause health problems due to contamination ; when food is recalled , it is removed from the shelves
Foodborne illness	any illness resulting from the spoilage of contaminated food, pathogenic bacteria , viruses, or parasites that contaminate food
Public health	the science of protecting and improving the health of people and their communities
Salmonella	bacteria found in the intestines of people and animals; most types of <i>Salmonella</i> cause salmonellosis, which causes diarrhea, fever, and stomach cramps, and sometimes infection in the urine, blood, bones, joints, or the nervous system

Understanding Foodborne Diseases

Foodborne illness outbreaks happen when two or more people get the same illness from the same **contaminated** food or drink. Detecting an outbreak, finding out the cause, and determining steps to stop the outbreak are very important. Two of the most common outbreaks are caused by **E. coli** and **Salmonella**. Simple steps like washing your hands, keeping food at the correct temperature, and cleaning your produce can have a positive impact.



Think About It

1. Are all bacteria harmful?
2. What are two bacteria that can be found in the human intestines?
3. Have you heard of any food items that were recalled?



Food Safety and the Centers for Disease Control and Prevention (CDC)

We are able to consume food without much thought about **foodborne illness** thanks to the work of many scientists within the Division of Foodborne, Waterborne and Environmental Disease. Together, they monitor the surveillance systems created to track and monitor reports of foodborne and waterborne diseases in the United States. Most often, information in these systems comes from state and local health agencies. Although some of these systems have been used extensively for decades, new surveillance methods have improved the quality, quantity, and timeliness of their data.



One of the surveillance systems CDC uses to track **foodborne illnesses** is PulseNet. PulseNet is a national laboratory network that connects **foodborne illness** cases to detect outbreaks. PulseNet uses DNA fingerprinting of **bacteria** making people sick to detect thousands of local and multistate outbreaks. Since the network began in 1996, PulseNet has improved our food safety systems through identifying outbreaks early. This allows investigators to

find the source, alert the public sooner, and identify gaps in our food safety systems that otherwise would not be recognized.

Another surveillance system used by CDC is FoodNet. FoodNet conducts surveillance in ten sites for infections of nine **bacterial** and parasitic pathogens transmitted commonly through food. FoodNet provides a foundation for food safety policy and prevention efforts in the United States in the following ways: estimating the number of **foodborne illnesses**, monitoring changes in how often they occur over time, and attributing illnesses to specific foods and settings.



Data from FoodNet can be found using FoodNetFAST (<https://www.cdc.gov/foodnet/foodnet-fast.html>), which provides charts and tables of the **foodborne illness** data collected for each year since 1995. Here you can also learn more about the 4 steps to protecting yourself from **foodborne illness**: clean, separate, cook and chill.



Think About It

1. Why would an **E. coli** outbreak with broccoli in California be important to residents of other states across the country?
2. What dangers could consumers experience if strict guidelines weren't in place for food handling?
3. What safety protocols have you noticed when shopping for fresh produce in your local grocery store? Ask your family what they have noticed.



From the Experts:

Sometimes foods we love to eat and rely on for good health are **contaminated** with **bacteria**, viruses, and parasites that cause illness, and can be deadly for certain people. Scientists at CDC are working to protect people and reduce **foodborne illnesses**. Watch this informative video from CDC about **foodborne illness** outbreaks and the important process of collecting information and quickly taking action. <https://www.youtube.com/watch?v=ilaKWNZh74>

Learn about outbreaks & the steps in a **food recall**: <https://youtu.be/kKDNEW8XHvs>

Learn about the four steps to food safety: <https://www.cdc.gov/foodsafety/>

Call to Action

As a **citizen scientist**, you can assist CDC in sharing the importance of protecting yourself from **foodborne illnesses** by following these three steps:



1. Conduct an experiment - By experimenting with washed and unwashed fruits and vegetables, you will be able to capture and grow **bacteria** over a certain period of time.



2. Create a public service announcement (PSA). Public Service Announcements are messages in the public interest to raise awareness about issues that are important. Using your creativity and knowledge about the four steps of food safety will influence others to make healthy changes.



3. Share your findings. One of the ways CDC communicates information is through social media. The data you collect from your experiment will inform others about the consequences of eating unwashed produce. Your demonstrations can help CDC communicate the work they have done and are doing to improve food safety.



Why Participate? A Message from CDC

Following these four simple steps to cook safely at home to help protect you and your loved ones from **foodborne illness**.

- 1) **Clean**: Wash your hands and surfaces often. Germs that cause food poisoning can survive in many places and spread around your kitchen.
- 2) **Separate**: Don't **cross-contaminate**. Raw meat, poultry, seafood, and eggs can spread germs to ready-to-eat foods—unless you keep them separate.
- 3) **Cook**: Get to the right temperature. Food is safely cooked when the internal temperature gets high enough to kill germs that can make you sick.
- 4) **Chill**: Refrigerate promptly. Keep your refrigerator at 40°F or below and know when to throw food out.

As a **citizen scientist**, you are now able to make an impact on **public health** by sharing your knowledge of safe food practices with your family, friends, and peers at school. You can find more information to share at <https://www.cdc.gov/foodsafety/keep-food-safe.html>



Think About It

1. Why should raw meat be prepared separately from fruits and vegetables?
2. Why is cooking food to the proper temperature important?
3. What do you think is the best way to convince other people to follow Clean, Separate, Cook, and Chill?



Conduct an Experiment

The scientific method is a great tool to use to create a plan to address possible **bacteria** that lurk on your fresh fruits and vegetables. Use the flow chart below to think out your plan. Record your answers on a piece of lined paper.

Ask a question

Describe the question you are trying to answer. There are several questions you could use to guide your investigation:

- Why can't I see bacteria growing on my fresh produce?
- Are stores doing enough to keep us safe?
- What are the best methods for getting rid of harmful bacteria?

Do background research

Use the internet to find reference materials about the topic.

- [Safety Tips for Preparing and Handling Food](#)
- [Salmonella Illness Linked to Chicken](#)

Construct a hypothesis

Make a prediction about the results from an experiment. Try using an if/then statement format.

- If _____ (I do this), then _____ (this) will happen.
- Ex: If I soak fruit for 15 min, it will destroy harmful bacteria.

Test with an experiment

Conduct the 3 parts of your experiment.

- Part 1: Conduct the bacteria growing experiment.
- Part 2: Implement your prevention plan.
- Part 3: Record accurate and detailed results daily for one week.

Analyze data

Think about these questions for the data you recorded:

- Which unwashed fruits/vegetables had the most/least **bacteria**?
- Which washed fruits/vegetables had the most/least **bacteria**?
- What day did you see the most change with visible **bacteria**?
- What were the differences between the samples?

Draw conclusions

Interpret your data by looking for patterns.

- Were you able to see the dangers of not washing fruits and vegetables? How would you explain the results to others?
- What changes would you make if you repeated the experiment?

Communicate results

Share your information with others!

- Use social media to share with CDC accounts listed.
- Challenge yourself to communicate your procedure and results to at least 5 other people. Encourage them to practice food safety habits.



Conduct an Experiment with Fruits & Vegetables

Safety First

1. Do NOT open the petri dishes once you have taped them closed. You could be culturing dangerous **bacteria**.
2. Proper disposal is critical for both safety and sanitation. Follow the guidelines at the end of the experiment to properly dispose of your petri dishes.

Tools of the Trade

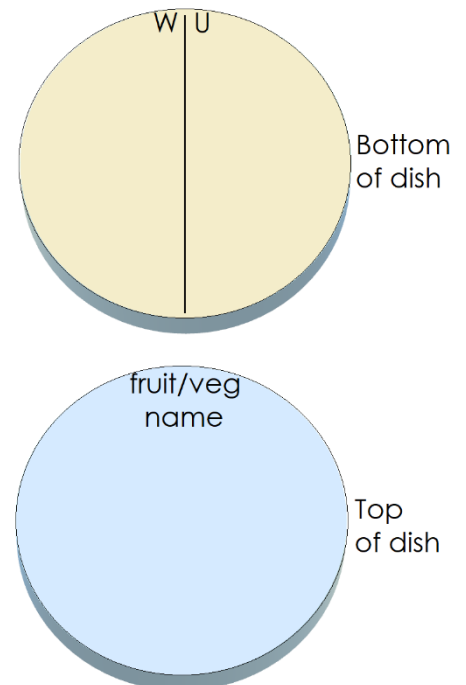
- 5 unwashed fresh fruit/vegetable samples (Suggestions: strawberries, kale, lettuce, tomatoes, blackberries, cucumbers, spinach, sprouts, peaches)
- Nutrient agar petri dishes (see link below for ordering information)
- 10 cotton swabs
- 1-gallon size sealable bag
- Clear tape
- Permanent marker
- Plastic gloves
- 5 Paper towels
- Large bowl
- Spoon
- Knife
- 2 cups of water
- 1 cup of bleach
- ½ cup of apple cider vinegar (optional)

Nutrient agar petri dishes are easy to order online. Here's one source:

<https://www.homesciencetools.com/product/nutrient-agar-prepared-media-plates-5-pack/>

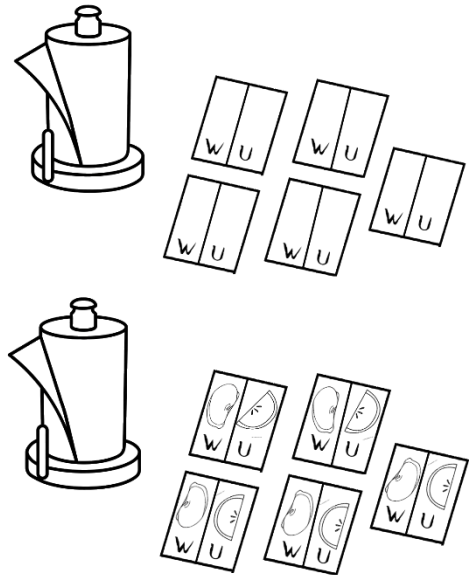
Prepare the Petri Dishes & Cleansing Solution

1. Wash your hands with soap and water.
2. Remove the petri dishes from the box and place them on a clean counter. Do not take the lids off the dishes yet.
3. Turn each dish over to the bottom. Use a permanent marker to draw a line down the middle of each dish. On one side of the line write "W" for washed. On the other side of the line, write "U" for unwashed.
4. Turn the dishes over and write the name of the fruit/vegetable on the top.
5. You now have a choice to make. You will decide which cleansing solution you will use to wash your fruit/veggies. Your choices are plain water, or a mixture of apple cider vinegar & water.
6. If you choose plain water, simply fill the large bowl with water. If you decide to use an apple cider vinegar/water mix, add both to the large bowl and gently stir with the spoon.



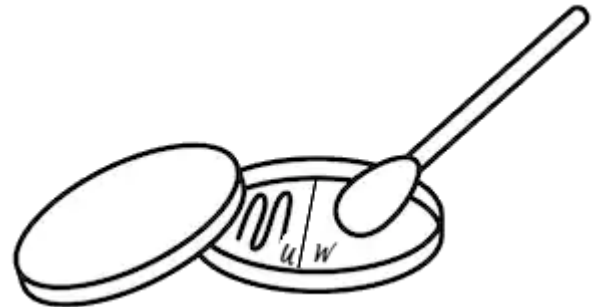
Prepare the Fruits/Vegetables

- Place 5 paper towels on the table. Draw a line down the middle of each paper towel. On one side write "W" and on the other side of the line write "U."
- Cut the fruit/vegetables into many pieces.
- Place a few pieces of unwashed fruit from each fruit/vegetable onto the five paper towels on the "U" side.
- Place the remainder of the fruit/vegetable pieces into your cleansing solution. Soak the pieces for 5 minutes, gently rub each piece with your hands, and rinse the samples. Place each sample on the paper towel with the unwashed piece. Make sure to put the washed sample on the side marked "W."



Conduct the Experiment with the Unwashed and Washed Samples

- Use a clean cotton swab for each sample.
- Wet each cotton swab with water.
- Rub each piece of unwashed fruit/vegetable with the wet cotton swab. Be sure to swirl the cotton swab with your fingers as you brush it against the fruit/vegetable to make sure you have fully covered the swab.
- Open the petri dish for the fruit/vegetable you just swabbed and draw a wavy line down the side labeled "U."
- Discard the cotton swab. Get a clean, wet swab for each sample. Repeat the process for each unwashed sample.
- On the "W" side of each petri Dish, repeat the same process with the washed pieces of fruits/vegetables.
- Using clear tape, seal each petri dish carefully.
- Find a dark, cool place in your home for the petri dishes to remain for 1 week. Make sure the spot is safe from family members and pets. Often condensation will form in the petri dish. To make sure water doesn't drip on the agar, turn each petri dish upside down.



Think About It

- What cleansing solution did you select? Why?
- How could condensation affect the outcomes?
- If your fruits and vegetables are carried home together in the same bag, does that change the risk of **bacteria** exposure?



Implement the Plan: Data Collection

You will conduct data collection for one week.

- Take a picture of each dish each day and use the chart below to document changes.
- Use a different data collection table for each of the fruit/vegetable samples. Try to be very specific with your description and your drawing. Use your daily pictures to help with the details. This will allow you to truly see changes each day. See the example below.

SAMPLE DATA COLLECTION

Fruit/Vegetable: Romaine Lettuce

Describe Packaging: Head of lettuce was sealed in a plastic bag (not chopped)

Day	Unwashed Observations	Washed Observations	Draw your Observations
1	There is a thin light green line forming where I swabbed. I also see two small black dots towards the top right of the line.	I don't see anything where I swabbed yesterday. Two small black dots area forming on the bottom of the dish.	
2	The green line is darker and there is a green dot towards the bottom. The two black dots are much larger.	There are now two black dots on the dish. The two black dots remain the same size from yesterday.	
3	The black dots are much larger. A new oval shaped growth appeared close to the edge of the petri dish.	One of the black dots doubled in size. Also, a wavy purple line has formed at the top of the dish.	

Dispose of Your Petri Dishes

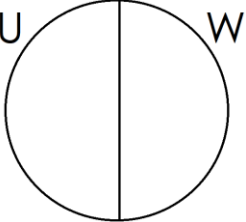
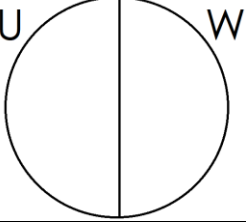
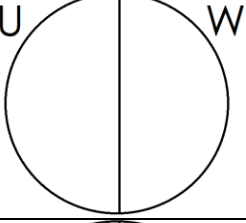
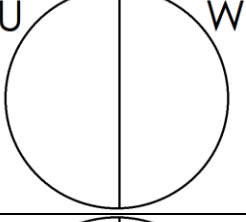
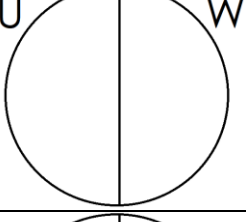
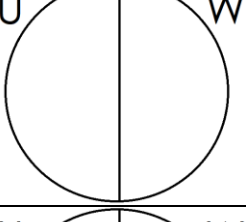
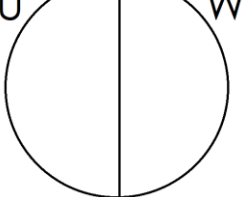
1. After 1 week of observations, place all the petri dishes into the gallon sealable bag. With a parent's assistance, add 1 cup of bleach to the bag and seal it. **Do NOT open the sealable bag once it is sealed!** Any bacteria that has grown may be dangerous.
2. Throw the entire sealed bag of petri dishes into the trash.

DATA COLLECTION

Name: _____

Fruit / Vegetable Sample: _____

Describe Packaging: _____

Day	Unwashed Observations	Washed Observations	Draw Your Observations
1 Date: _____			
2 Date: _____			
3 Date: _____			
4 Date: _____			
5 Date: _____			
6 Date: _____			
7 Date: _____			



Create a Public Service Announcement (PSA)

Topic: Four Steps to Food Safety: Clean, Separate, Cook, Chill

A Public Service Announcement (PSA) is an engaging way to tell others about an important topic. Usually, PSAs are created to encourage positive change in society. Perhaps you've seen a PSA about the dangers of smoking, or the need for sunscreen to prevent skin cancer. For this PSA, you will follow these steps to create a persuasive case for cleaning, separating cooking, and chilling food.

Steps to Create a Powerful PSA

1. Consider your audience. Are you trying to inform your parents, teachers, friends? Narrow down your audience to 1-2 groups.
2. Research the topic: [Four Steps to Food Safety](#) (see recommended links below)
3. Write down 5-6 things that you think are important for your audience to know.
4. Grab your audience's attention with a short and catchy slogan. For example, the United States Forest Service coined the phrase, "Give a hoot. Don't pollute!"
5. Create a script. Try to keep it under 30 seconds, like the length of a commercial. Remember to be concise with your information. Don't overwhelm your audience.
6. Be sure to watch what you filmed and make any necessary changes before you show it to others. It's okay to ask for help with filming your PSA. You want this to be personal!



Recommended videos

Example PSA: <https://www.youtube.com/watch?v=jSGmm9NtcQg>

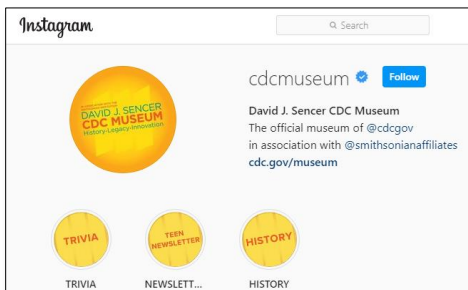
How to Make a PSA: <https://www.youtube.com/watch?v=eywBa0xfQFw>



Share Your PSA

Sharing your results is not only interesting to others, it is also extremely informative!

1. Challenge yourself to communicate your procedure and results to at least 5 other people. Encourage them to practice food safety habits
2. With parental permission, share your PSA on social media:
 - Share with **@CDCmuseum** on Instagram.
 - Share with **@foodsafety.gov** on Facebook.
 - Share with **@foodsafetygov** on Twitter.





Reflections

Now that you have completed this investigation, think about what you learned from your research and experiment. Answer the questions below.

1. Does washing fruits & vegetables reduce the chances of getting sick from dangerous **bacteria**?

2. Tell three important facts about washing and storing food safely.

3. What are the signs of a **foodborne illness**? What should you do if you feel sick?

4. Were you able to make a link between **bacteria** growth and how the fruit was packaged? Explain.

5. Look inside your refrigerator. What are some ways your family is being safe? Name one change you could make to make your food safer.

6. What other food safety topics concern you? How can you research solutions for your concerns?
