



# CLEANING AND SANITIZING: KEEPING YOUR FOOD AND ENVIRONMENT SAFE

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## YOUNG REVIEWERS:



LEAH

AGE: 15



MEHRANEH

AGE: 15



MOHAMED

AGE: 9

## PROBIOTICS

Microbes that are considered good and beneficial to human health.

Germs, scientifically known as microbes (like bacteria and viruses), are found everywhere. Most microbes are completely harmless to people, but others can cause diseases that make us sick. They can survive on all kinds of surfaces, even food. If food is not handled correctly, it can make us very sick. One of the best ways to prevent this is to clean and sanitize the surfaces that food touches. Proper cleaning and sanitizing is an important way to keep your friends and family safe. In this article, you will learn the easy steps to prevent the spread of harmful microbes, see some examples of the process, and learn the science behind it all.

## GOOD AND BAD GERMS IN OUR FOOD

There are several types of germs (scientifically referred to as microbes) found in our food that can be good or bad. Good microbes, like **probiotics**, help our bodies digest the foods we eat and keep us healthy. Yogurt is a great source of probiotics. Some foods, like pickles, have microbes that help them last longer and taste delicious.

## SPOILAGE MICROBES

Microbes that causes foods to spoil.

## PATHOGEN

A microbe that causes illness.

## CROSS CONTAMINATION

The physical movement or transfer of harmful microorganism from one food, person, object, or place to another.

## SANITIZE

The process that reduces the level of pathogens on a surface.

### Figure 1

Cleaning and sanitizing. The first step is to remove any soil, debris, or food particles. The second step is to scrub the surface with soap. Next, rinse with water and sanitize the surface with an appropriate sanitizer concentration. Finally, allow the surface to air dry.

**Spoilage microbes** are the ones that tell us if our food has gone bad, like the smelly milk that has been in the fridge too long. The presence of these microbes makes food taste nasty and helps us know it should not be eaten—but they may not be serious health hazards. **Pathogens**, on the other hand, can make us very sick if we eat or drink them. Pathogens commonly found in foods are called foodborne pathogens. Some types of *Salmonella* and *Campylobacter* are common pathogens found in raw poultry. Another example is a type of *E. coli* (also called *E. coli* O157:H7) that has been associated with raw beef. Cooking these foods to the proper temperatures kills the microbes and makes the foods safe to eat.

Foodborne pathogens can spread via a process called **cross contamination**. Cross contamination is when a pathogen is spread from one surface to another. An example of cross contamination would be if you cut raw chicken on a cutting board then use that same cutting board to chop up vegetables for a salad. Any pathogens that were on the raw chicken, like *Salmonella*, could get into your salad and make you sick. Whenever something touches a potential pathogen, it is important to both clean and **sanitize** that object to stop the spread.

Cleaning and sanitizing are very different from each other (Figure 1). Both steps are important to ensure we reduce the spread of foodborne



pathogens. These activities must be done in a specific order to ensure safe conditions. Cleaning is the physical removal of “dirt” from surfaces, which can include the use of water and detergent. Sanitizing is treating a cleaned surface to effectively destroy microorganisms, usually with a chemical agent. It is very important to remember that you cannot sanitize a dirty surface!

The process of cleaning and sanitizing is done in four easy steps.

- The first step is to remove any obvious “dirt” (soil, food, or debris) from the surface.
- Next, apply soap and water and scrub the surface with a brush or rough sponge.
- Finally, rinse the surface with clean water, making sure to remove all the soapy water and visible dirt.
- To sanitize, apply an appropriate sanitizing agent (see below) to the surface and air dry.

## THE SCIENCE OF CLEANING AND SANITIZING

Cleaning is effective because of the chemical structure of detergents or soaps. Soap molecules are long chains with a **hydrophilic** head and a **hydrophobic** tail. These words are Greek in origin, beginning with “hydro-,” which means “water,” and ending with “-philic,” which means “loving,” or “-phobic,” which means “fearing.” Therefore, a soap molecule has one end that attracts water and another end that repels water. The hydrophobic tails repel water but attract oils and fats, like those present in foods and the outer membranes of bacteria and viruses. When the soapy water is rinsed away, the “dirt” goes with it.

The effectiveness of soap can be increased by two factors. Using warm water improves the hydrophobic effect, making more dirt stick to the molecules. Scrubbing the dirty surface will agitate the dirt, suspending it in the soapy water and allowing the tails to bond more easily. Scrubbing also prevents and breaks up **biofilms**, or networks of microorganisms that can form on surfaces. Biofilms can be dangerous because the harmful microorganisms work together to defend against soaps and sanitizers used on them if they are not broken up first [1].

Sanitizers work as a final cleanup crew to eliminate any remaining pathogens after cleaning is complete. Sanitizing agents include various chemicals such as bleach, alcohol, or quaternary ammonium that work to destroy the cell membranes of pathogens. In general, higher concentrations of sanitizing agents are more effective. However, concentrations that are too high can be harmful for people, especially on surfaces that contact food. When using sanitizing products,

### HYDROPHILIC

A tendency to mix or dissolve in water.

### HYDROPHOBIC

A tendency to repel water.

### BIOFILM

A community of microbes that stick to each other and/a surface.

remember to read the label to make sure they are safe to use. It is important to note that sanitizing must be done *after* cleaning because sanitizing agents do not work well if there is too much dirt or food residue present. Very high temperatures and pressure can be used to kill pathogens as well.

## STAYING SAFE AT HOME AND SCHOOL

You are probably already using some cleaning and sanitizing techniques to keep your family and classmates safe, and you might not even know it.

- Kitchen dishwashers do a great job of cleaning and sanitizing, especially when you scrape all the food off the dishes first [2]. In the final step of a dishwashing cycle, high-temperature steam is created to help sanitize the dishes.
- The washer and dryer do a great job of cleaning and sanitizing your clothes [3]. Our clothes can pick up microbes from our bodies or from the environment throughout the day. The dryer uses heat to dry the clothes, while any leftover microorganisms are dried out and killed in the process.
- At restaurants, you can notice the servers following the steps of cleaning and sanitizing when they clean tables between guests. They remove all the items from the previous guests, like plates, cups, and napkins, then clean the table with detergent on a towel, before finally sanitizing with another towel.
- Disinfecting wipes are a great way to make sure that frequently touched surfaces do not spread foodborne pathogens at home or school [4]. These wipes have safe concentrations of chemical sanitizers that can quickly and easily sanitize hard surfaces after they have been cleaned.

## CONCLUSION

Cleaning and sanitizing are important for keeping your home and school safe from the spread of pathogens. When cleaning and sanitizing, remember the four easy steps: scrape/rinse, scrub, rinse, and sanitize. Using these steps, while following the directions on the back of any products that you use for cleaning or sanitizing, has been scientifically shown to reduce the spread of pathogens and prevent foodborne illness.

## REFERENCES

1. Lopez, D., Vlamakis, H., and Kolter, R. 2010. Biofilms. *Cold Spring Harb. Perspect. Biol.* 2:398. doi: 10.1101/cshperspect.a000398

- Sahai, D., Peterson, E., and Li, Y. 2015. Microbiological assessment of utensils cleaned by domestic dishwashers in Ontario small establishments. *Food Protect. Trends* 35:185–95.
- Gibson, L. L., Rose, J. B., and Haas, C. N. (1999). Use of quantitative microbial risk assessment for evaluation of the benefits of laundry sanitation. *Am. J. Infect. Cont.* 27:34-9. doi: 10.1016/S0196-6553(99)70040-4
- Wiemken, T. L., Curran, D. R., Pacholski, E. B., Kelley, R. R., Abdelfattah, R. R., Carrico, R. M., et al. 2014. The value of ready-to-use disinfectant wipes: compliance, employee time, and costs. *Am. J. Infect. Cont.* 42:329–30. doi: 10.1016/j.ajic.2013.09.031

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## YOUNG REVIEWERS

### LEAH, AGE: 15

Leah is going to start 10th grade. She has many interests and she is a wonderful older sister.

### MEHRANEH, AGE: 15

Mehraneh will be going to 10th grade. She enjoys drawing, spending time with friends and family and science.





**MOHAMED, AGE: 9**

I have a passion for science subjects like astronomy. I am also interested in art and football.

**AUTHORS**



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I am currently a research scientist at the University of Houston, Hilton College, conducting research in hospitality management and food safety. I have worked in food production systems across the United States and internationally. My interest in food safety stems from agricultural studies at Cal Poly, San Luis Obispo. In the fall of 2023, I will be pursuing my Ph.D. in hospitality management at Pennsylvania State University.



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