



# Hand Hygiene

**Hand hygiene** is the process of cleaning one's hands to prevent the spread of infectious diseases. Good **hand hygiene** means washing your hands with soap and water or using alcohol-based rubs (hand sanitizer) to keep them germ free. Since many diseases spread to others through dirty hands and contaminated surfaces, maintaining clean hands is an effective way to stay healthy.

## Terms to Know

<b>Antibiotic resistance</b>	occurs when bacteria can no longer be killed by antibiotics that were once effective against them; also known as drug resistance
<b>Diarrhea</b>	a condition characterized by episodes of frequent liquid stools (poop)
<b>Germ</b>	tiny microbes such as viruses and bacteria, which can cause disease
<b>Hand hygiene</b>	a way of cleaning one's hands that substantially reduces potential pathogens; includes hand washing with soap and water and alcohol-base hand rubs
<b>Pneumonia</b>	an infection of the lungs caused by viruses, bacteria, or fungi; common causes include influenza, RSV, <b>SARS-CoV-2</b> , and <i>Streptococcus pneumoniae</i>
<b>Public health</b>	the science of protecting and improving the health of people and communities
<b>Safe Water System (SWS)</b>	a disinfectant/storage system that provides a clean water source for homes, health facilities, and schools in places where access to clean water is scarce
<b>SARS-CoV-2</b>	a type of coronavirus that causes the respiratory disease COVID-19

## Understanding Hand Hygiene

Feces (poop) from people or animals is an important source of **germs** that cause diarrhea, like *Salmonella*, *E. coli* O157, and norovirus, and it can spread some respiratory infections like adenovirus and hand, foot, and mouth disease. These kinds of **germs** can get onto hands after people use the toilet or change a diaper, but also in less obvious ways, like after handling raw meats that have invisible amounts of animal poop on them. **Germs** can multiply in some types of foods or drinks, under certain conditions, and make people sick. **Germs** can also get onto hands if people touch an object that was touched by some other contaminated object or was coughed or sneezed on. When these **germs** get onto hands and are not washed off, they can be passed from person to person and make people sick.



## Think About It

1. When do you generally wash your hands?
2. What barriers might people have that prevent them from washing their hands?
3. Did COVID-19 change your **hand hygiene** behaviors?



## Hand Hygiene and the Centers for Disease Control and Prevention (CDC)

About 1.8 million children under the age of 5 die each year from **diarrheal** diseases and **pneumonia**, the top two killers of young children around the world. Although people around the world clean their hands with water, very few use soap to wash their hands. Washing hands with soap removes **germs** much more effectively. Handwashing with soap could protect about 1 out of every 3 young children who get sick with **diarrhea** and almost 1 out of 5 young children with respiratory infections like **pneumonia**.



Estimated global rates of handwashing after using the toilet are only 19%. Proper handwashing education in a community has been shown to reduce cases of **diarrhea** by 23-40% and respiratory illnesses by 16-21%. Handwashing education and access to soap in schools can help improve attendance and child development in some settings.

Handwashing is one of the best ways to protect yourself and your family from getting sick. Washing hands can keep you healthy and prevent the spread of respiratory and **diarrheal** infections from person to person. It is very important that everyone, including young children, washes their hands:

- Before, during, and after preparing and eating food
- Before and after caring for someone who is sick with vomiting or **diarrhea**
- After using the toilet or cleaning up a child who has used the toilet or a diaper
- Before and after treating a cut or wound
- After blowing your nose, coughing, or sneezing
- After touching an animal, animal feed, animal waste, or treats
- After touching garbage
- Before and after touching your eyes, nose, mouth, or face mask due to COVID-19
- After interacting with high-touch surfaces like doors, tables, and checkouts due to COVID-19



Washing hands with soap and water is the best way to get rid of **germs** in most situations. If soap and water are not readily available, you can use an alcohol-based hand sanitizer that contains at least 60% alcohol instead. Sanitizers can quickly reduce the number of **germs** on hands in many situations; however, sanitizers do not get rid of all types of **germs**.



CDC and its partners promote handwashing as a **public health** measure globally in response to epidemics and disasters. In places where clean water was not easily available, **Safe Water System (SWS)** provided clean, accessible water to make proper handwashing practices possible. During the 2014-16 West African Ebola outbreaks, cleaning stations full of 0.05% chlorine water were set up around countries. Buckets and chlorination tablets also provided clean water sources for handwashing, cooking, and drinking after a major earthquake and cholera outbreak in Haiti in 2010. A 1994 cholera outbreak in Rwandan refugee camps in Zaire (now the Democratic Republic of the Congo) was stopped with

better sanitation and access to handwashing stations. During the **SARS-CoV-2** outbreak, handwashing and sanitation guidelines were implemented worldwide to stop COVID-19.



### Think About It

1. What effects can proper **hand hygiene** have on the health of a community?
2. Why do you think handwashing is so important during food preparation?
3. How can education play a role in improving rates of childhood illness?



### From the Expert:

Watch the video from Michele Hlavsa, a CDC epidemiologist, to learn more about how and why to wash your hands to remove **germs** and chemicals. <https://youtu.be/eZw4Ga3jg3E>

Remember to wet, lather, scrub, rinse, and dry your hands. Make sure you're washing for at least 20 seconds to ensure that all **germs** are soaped up and rinsed away.

### Call to Action

In order to understand handwashing, it is essential that people understand why it is important. You can help people by following these three steps:



**1. Develop an effective handwashing process.** In this experiment, you will observe the efficiency of your current handwashing method and then try to create a more efficient method by generating a step-by-step guide.



**2. Create hand hygiene art.** The David J. Sencer CDC Museum curated the art exhibition *Watching Hands: Artists Respond to Keeping Well* to showcase the work of 6 artists and their interpretation of the act of handwashing and why it matters. Create your own piece of art that fits in with that overall theme.



**3. Share your findings.** One of the ways CDC communicates information is through social media. Your demonstrations can help CDC communicate the work they have done and are doing to improve knowledge about the practice and importance of **hand hygiene**.



### Why Participate? A Message from CDC

Preventing sickness reduces the amount of antibiotics people use and therefore the likelihood that **antibiotic resistance** will develop. Handwashing can prevent about 30% of **diarrhea**-related sicknesses and about 20% of respiratory infections (e.g., colds). Antibiotics often are prescribed unnecessarily for these health issues. Reducing the number of these infections by washing hands frequently helps prevent the overuse of antibiotics—the single most important factor leading to **antibiotic resistance** around the world. Handwashing can also prevent people from getting sick with **germs** that are already resistant to antibiotics and that can be difficult to treat. Watch this video from the World Health Organization (WHO) for more info: <https://youtu.be/kOKeFv5VvY4>

Research shows that community education plays a huge role in hygiene and sanitation practices. Spreading the knowledge you gain through completing these tasks can positively impact your community and future generations.



### Think About It

1. CDC recommends you wash your hands for at least 20 seconds. How does this make a difference in its effectiveness?
2. Why is art an important part of **public health**? Can you think of any examples of art pieces or graphics you have seen that have **public health** messages?
3. How can **antibiotic resistance** that develops in one person ultimately end up affecting an entire community?



## Engineering Design Process Overview

The engineering design process allows engineers to develop and test solutions to problems. You can use the process to develop an effective handwashing procedure.

### Define the problem

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

- What is required to effectively sanitize hands?
- Does my handwashing routine cover all areas of my hands?
- What duration of handwashing is required to be effective?

### Do background research

Find information about the problem.

- <https://www.cdc.gov/handwashing>
- <https://www.cdc.gov/global-water-sanitation-hygiene/about/about-global-hygiene.html>

### Specify requirements

Determine what your solution needs to have to succeed.

- What would indicate that hands are clean?

### Brainstorm, choose and develop solutions

For each part of your design, ask yourself the following:

- Observe the effectiveness of your current handwashing method.
- Look for areas of improvement in your current routine and brainstorm solutions.

### Build a prototype

Design and build your model.

- Design a new handwashing method that includes thoroughly cleaning all areas of the hands.

### Test and redesign

Test the prototype you made.

- Try out your new step-by-step procedure to see how effective it is at full coverage of your hands.
- If gaps persist, redesign your procedure.

### Communicate results

Sharing the information you collect is key!

- Create an art piece about the importance of handwashing.
- Share your information using social media with the CDC accounts listed.



## Tools of the Trade

- Disposable gloves (3+ pairs)
- Acrylic paint
- Paint protection measures

Cover the area around you in newspaper, plastic, cardboard, or another material that will stop any paint drips or splatters. Make sure you are wearing clothes that can get messy or wear an apron or other covering to protect them. Consider performing this experiment outside over grass or dirt.

Put on a pair of disposable gloves. Squeeze paint into the palm of one of your hands, making sure to use at least a tablespoon or two. **Close your eyes.** Pretend that the paint is soapy water and use it to “wash” your hands. Your goal here is to see how effective your normal handwashing routine is, so don’t worry about making it perfect. Just do what you would normally do. When you are finished washing, open your eyes. Any unpainted area of your glove represents an area where **germs** could still be hiding.

## Part 2: Develop a more effective handwashing method

Put on a fresh pair of disposable gloves. Add more paint to the palm of one of your hands. Use the paint to visualize your germ removal. Develop a step-by-step procedure for proper handwashing that you could teach to others. Write your steps in the space below, adding pictures if necessary.

[illegible]

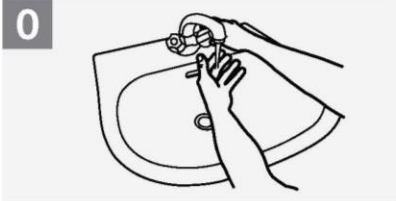
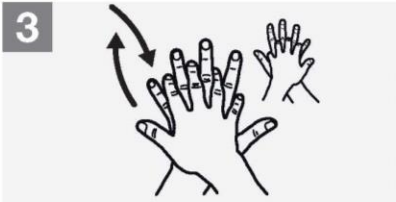
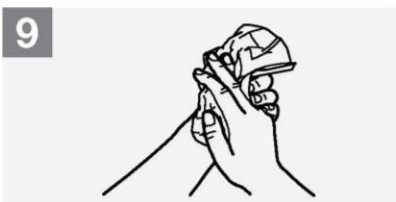


### Part 3: Try the World Health Organization handwashing method

The World Health Organization (WHO) developed a handwashing routine for use in healthcare settings. This method provides a consistent routine that cleans all areas of the hands thoroughly and ensures enough time has passed to remove **germs**. Put on another clean pair of gloves, add some paint, and try this method to see how effective it is.

Video instructions are also available here: <https://youtu.be/3PmVJQUcm4E>

 **Duration of the entire procedure: 40-60 seconds**

 <p><b>0</b></p> <p>Wet hands with water;</p>	 <p><b>1</b></p> <p>Apply enough soap to cover all hand surfaces;</p>	 <p><b>2</b></p> <p>Rub hands palm to palm;</p>
 <p><b>3</b></p> <p>Right palm over left dorsum with interlaced fingers and vice versa;</p>	 <p><b>4</b></p> <p>Palm to palm with fingers interlaced;</p>	 <p><b>5</b></p> <p>Backs of fingers to opposing palms with fingers interlocked;</p>
 <p><b>6</b></p> <p>Rotational rubbing of left thumb clasped in right palm and vice versa;</p>	 <p><b>7</b></p> <p>Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;</p>	 <p><b>8</b></p> <p>Rinse hands with water;</p>
 <p><b>9</b></p> <p>Dry hands thoroughly with a single use towel;</p>	 <p><b>10</b></p> <p>Use towel to turn off faucet;</p>	 <p><b>11</b></p> <p>Your hands are now safe.</p>

Bonus activity: The website Wash Your Lyrics was developed in March 2020 by a 17-year-old who wanted to help people stay safe during the coronavirus pandemic. You can use the site to make your own memorable handwashing poster using the lyrics to any song. Try it!

<https://washyourlyrics.com>



## Create Hand Hygiene Art

When Ignaz Semmelweis instituted mandatory handwashing in 1847 at Vienna General Hospital to help curb maternal deaths due to childbed fever, he was met with resistance from his colleagues. Twenty years later, Joseph Lister published “An Address on the Antiseptic System of Treatment in Surgery” in *The Lancet*, which proposed that surgeons should clean their hands and instruments before operating. This practice was adopted and led to a revolution in healthcare by dramatically increasing a patient's likelihood of survival. Handwashing and tool cleaning were critical to stopping the spread of disease and infections from one patient to another.

**How can art communicate and interpret the practice of one of the most simple and effective disease prevention strategies – handwashing?**

In 2011, the David J. Sencer CDC Museum curated the art exhibition *Watching Hands: Artists Respond to Keeping Well*. Artists were asked how art can communicate and interpret the practice of one of the most simple and effective disease prevention strategies: handwashing. The six artists who participated created paintings, drawings, installations, and graphic communications that live on in an online exhibition. Look through the works, read more about the artists, and watch the videos to hear them talk about the artistic process and how it relates back to **public health**.

Read the introductory essay from curator Louise E. Shaw for insight into the exhibition and its message. <https://www.cdc.gov/museum/online/watching-hands/essay.html>

*Watching Hands: Artists Respond to Keeping Well*

<https://www.cdc.gov/museum/online/watching-hands.html>

When you have finished exploring the exhibition, create your own piece of art that centers around the act and importance of handwashing. It may seem small, but simple handwashing has saved countless lives during the last 150+ years. You have your choice of medium, including photography, sculpture, drawing, digital media, painting, needlecraft, or any other art form.



## Share Your Findings

The David J. Sencer CDC Museum uses award-winning exhibits and innovative programming to educate visitors about the value of **public health** and presents the rich heritage and vast accomplishments of CDC. Your demonstration could be a valuable contribution! Share your demonstration with the CDC Museum on Instagram using **@CDCmuseum**.





## Reflections

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

1. Why is handwashing a necessary behavior to improve **public health**?  
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2. How does access to safe and clean water affect the rate of handwashing? Why?  
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3. How has the introduction of alcohol-based hand sanitizers improved **hand hygiene** amongst healthcare professionals and the general public? What are their advantages?  
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4. Cruise ships have hand sanitizer stations in all dining areas that passengers are required to use before eating to prevent norovirus outbreaks. Why do you think this is an essential **public health** practice to implement? Why do diseases spread so quickly on ships?  
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5. If you worked for a school district that was trying to reduce absences during cold and flu season, what specific things would you suggest that your school system do? Why?  
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6. Health equity is achieved when every person has the opportunity to attain his or her full health potential and no one is disadvantaged from achieving this potential because of social position or other socially determined circumstances. What are the equity issues surrounding good **hand hygiene**?  
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