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## Only 5% of People Wash Their Hands Properly

Misconceptions about hand-washing are as rampant as the germs themselves

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When a highly contagious stomach virus blew through a Colorado school district in November, sickening 30% of students and 20% of staff at one high school, some of the victims felt fine one hour and were vomiting in public the next. It was a reminder of how quickly viruses can make a lot of lives miserable. Especially during winter months. And especially when people don't wash their hands often and properly.

Health experts agree that hand-washing is a vital defense against stomach-turning viruses, deadly bacteria, and other communicable germs including the flu, the common cold, and the particularly nasty norovirus thought to be the cause of the Colorado outbreak.

But there are several misconceptions regarding what works and what doesn't and research finds most people just don't get it. The key, science shows, is to wash the old-fashioned way, with soap and water and lots of scrubbing bubbles. And do it often, because the germs are everywhere. A quarter-teaspoon of infected diarrhea can have 5 billion norovirus particles, but it only takes 20 of them — which can fit on the head of a pin — to infect you.

### Germs love to linger

A simple sneeze can transport flu virus particles across an entire room, an MIT study found. When a person infected with norovirus vomits, which they're prone to do, microscopic virus particles "can travel in the air for up to 25 feet," according to the health department that dealt with the Colorado outbreak. But you don't have to walk through a sneeze or an invisible cloud of vomit to become infected.

According to the British National Health Service:

- Common cold viruses can lurk alive on a person's hand for more than an hour, eager for a handshake and a new host.
- Flu viruses can remain viable up to 24 hours on hard surfaces like countertops.
- MRSA, a bacteria that causes intractable, sometimes deadly staph infections, can endure for days or weeks on a variety of surfaces, awaiting your touch.

Viral outbreaks are more common in winter in part because viruses thrive in the cooler, drier temperatures. Also, “cold temperatures drive people indoors” and “it’s easier to catch bugs because everyone’s in closer proximity,” says Suzanne Salamon, MD, a geriatrician with Harvard-affiliated Beth Israel Deaconess Medical Center.

## How and when to wash

The U.S. Centers for Disease Control and Prevention (CDC) recommends you wash your hands much more frequently than you probably do: before prepping or eating food and after using the bathroom, blowing your nose, touching garbage, touching an animal, changing diapers, or caring for someone who is sick.

Here’s the CDC’s how-to:

1. Use regular soap and running water.
2. Lather up between fingers and on the back of your hands and especially under your nails. Soap helps lift germs from skin, and microbes congregate under fingernails.
3. Scrub for at least 20 seconds (sing “Happy Birthday” twice). The friction is key to dislodging germs.
4. Rinse well with running water.
5. Use a clean towel to dry, or air dry.

Soap works because of some simple chemistry. All molecules have polarity, which determines which other molecules they can interact with. Polar molecules, like sugar, mix well with water. Nonpolar molecules, like oil, do not. Soap molecules are amphipathic, meaning they have polar and nonpolar properties, explains Gabriel Rangel, a PhD candidate in biological sciences at Harvard University. “This gives soap the ability to dissolve most types of molecules,” Rangel says, “making it easier to wash them off your hands.”

Does the water need to be hot? Nope, unless the temperature simply feels good and therefore encourages you to wash up frequently and thoroughly. Otherwise, cold water is fine, and has the benefit of saving energy, researchers pointed out in a 2017 study in the *Journal of Food Protection*. The scientists put bacteria on the hands of 21 people several times over a six-month stretch, and had them wash with soap and water at temperatures of 60, 79, and 100 degrees. The study said that “no significant difference in washing effectiveness was found at different temperatures.”

“People need to feel comfortable when they are washing their hands but as far as effectiveness, this study shows us that the temperature of the water used didn’t matter,” said study leader Donald Schaffner, PhD, a food-science professor at Rutgers University.

## What doesn't work

Antibacterial products don't kill viruses. In fact, in 2016 the Food & Drug Administration banned 19 of the most common antibacterial ingredients for over-the-counter soap products, because "we have no scientific evidence that they are any better than plain soap and water" and they "may do more harm than good" by fostering bacterial resistance that makes those types of germs stronger.

An alcohol-based hand sanitizer with at least 60% alcohol can help when you don't have access to soap and water. But these products — mainstays in hospitals and many homes — do not get rid of all germs, the CDC says, and they won't work as well if your hands are filthy or greasy.

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In fact, alcohol-based hand sanitizers have just been exposed as less effective than thought. A recent study published in the journal *mSphere* found the influenza A virus (IAV) remains infectious in — here comes one of the grosser revelations of what scientists do—wet mucus from infected patients exposed to an alcohol-based disinfectant for up to four minutes.

Secretions of mucus, the gooey stuff of snot, ramp up to fight infections. Mucus aims to disable and eject viruses and other invading microbes, but it can also serve as a protective gel. Its viscous nature slows the spread of a hand sanitizer, the researchers discovered. "The physical properties of mucus protect the virus from inactivation," says study leader Ryohei Hirose, a physician and molecular gastroenterologist at Japan's Kyoto Prefectural University of Medicine. "Until the mucus has completely dried, infectious IAV can remain on the hands and fingers, even after appropriate antiseptic hand rubbing."

Baby wipes aren't made to remove germs, so wash your hands of that notion.

## Watch out for the other guy

If nothing else convinces you to wash your hands often, consider this: Most other people fail miserably at the task, thereby potentially picking up and packing germs to who knows where.

In a 2013 study, Michigan State University researchers trained college students to covertly observe hand-washing in the restrooms of bars, restaurants, and other public places. 15% of men and 7% of women didn't wash at all, and among men who did wash, half failed to use soap, while 22% of women skipped the soap.

The observations, detailed in *Journal of Environmental Health*, found that only 5% of people washed their hands long enough, and with soap, to kill the germs that cause bad health.

*Written by Robert Roy Britt: Explainer of things, former editor-in-chief of Live Science and Space .com, author of the science thriller “5 Days to Landfall.”*