

# Manual Dishwashing Study Digs Up Dirt On Dish Cleanliness

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New research at Ohio State University answers an infectious question about eating at restaurants: How clean are manually washed dishes?

Jaesung Lee and Melvin Pascall found that even when they washed dishes in cooler-than-recommended water, numbers of bacteria on the dishware dropped to levels accepted in the Food and Drug Administration's Food Code. They also found that certain foods—especially cheese and milk—can be safe havens for bacteria when dried onto dishware. Lipstick, however, proved to be dangerous to bacteria.

“After washing, there were lipstick stains still left on a few glasses, but it was the least hospitable substance for bacteria,” Pascall said. “It seems to have antimicrobial properties, which was a big surprise to us.”

Lee, a doctoral candidate of food, agricultural and biological engineering, and Pascall, assistant professor of food science and technology, published their findings in the *Journal of Food Engineering*.

When restaurants manually wash dishes, they follow a three-step process: Dishes are washed and scrubbed in soapy water, rinsed with clean water, and finally soaked in water containing germ-killing sanitizers. But employees often use water that is cooler than 110 degrees Fahrenheit—the minimum washing temperature recommended by the FDA—because it is uncomfortably hot. The FDA also requires that washing cause a 100,000-fold drop in amounts of bacteria on those

dishes.

To investigate effective lower-temperature dishwashing tactics, the researchers coated dishes individually with cheese, eggs, jelly, lipstick, and milk, and then added *Escherichia coli* and *Listeria innocua* bacteria. Contaminants like *E. coli* and *L. innocua* can survive for long periods of time if they make their way into food dried onto dishes. If those dishes aren't thoroughly washed, they can sometimes cause food-borne disease outbreaks.

After letting the food dry on to the dishes for an hour—a plausible wait in a busy restaurant dish room—they gave each utensil a few scrubs per side and measured the amount of microscopic organisms still clinging to the dishes.

Lee and Pascall discovered that washing dishes in hot dish water, followed by soaking in extra sanitizers, eliminated almost all of the bacteria on them, even when coated with dried-on cheese. But dishes washed in soapy room-temperature water, rinsed, and then weakly sanitized with ammonium-based chemicals also achieved FDA-acceptable results.

The find is important because acceptable sanitization can be achieved with cooler dish-washing water, as dishes washed in room-temperature water and then rinsed in more-concentrated sanitizers achieved results comparable to higher-temperature alternatives.

“We wanted to show that employees could use a more comfortable washing technique and still get clean dishes,” Pascall said. “We were able to do that, and we did it by using different combinations of washing, rinsing, and sanitizing.”

But all dishes are not created equal. Compared to ceramic plates, steel

knives, spoons, and plastic trays, steel forks seemed to be the best home for bacterial contaminants.

“The prongs of forks actually shield food from the action of scrubbing,” Pascall said. “Taking extra time to wash forks is a good idea, especially those covered with sticky foods like cheese.”

Although cheesy forks were the most problematic utensil, milk dried onto glasses protected bacteria more than any other food. Pascall explained that milk is a good growth medium in the laboratory, but why it adheres to glass so well isn't clearly understood.

“Milk is an area of research we'd like to explore further,” Pascall said. “We want to find ways to safely and quickly remove milk dried on glasses.”

The research aimed to explore restaurant dishwashing conditions, but Pascall explained that homeowners can benefit from the findings, too.

“Leaving food on eating utensils and dishes could easily cause bacteria to grow on them, especially if it's moist,” Pascall said. “The best thing you can do is wash your dishes off right away, before the food dries. It saves washing time and gets rid of places where bacteria can survive drying and washing.”

Source: Ohio State University

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