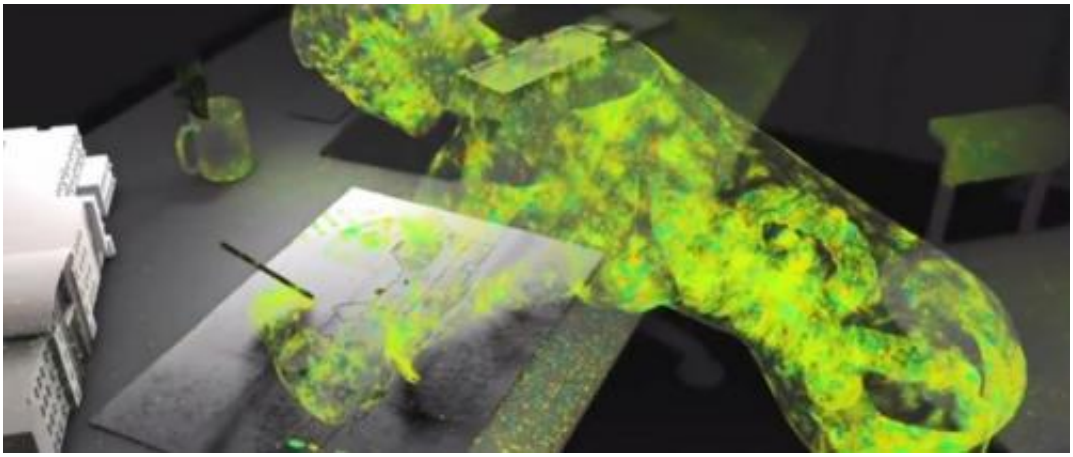
Home Microbiome Project announces results of study on household microbes

August 28 2014



A person's home is their castle, and they populate it with their own subjects: millions and millions of bacteria.

A study published today in *Science* provides a detailed analysis of the microbes that live in houses and apartments. The study was conducted by researchers from the U.S. Department of Energy's Argonne National Laboratory and the University of Chicago.

The results shed light on the complicated interaction between humans and the microbes that live on and around us. Mounting evidence suggests that these microscopic, teeming communities play a role in human health

and disease treatment and transmission.

"We know that certain bacteria can make it easier for mice to put on weight, for example, and that others influence brain development in young mice," said Argonne microbiologist Jack Gilbert, who led the study. "We want to know where these bacteria come from, and as people spend more and more time indoors, we wanted to map out the microbes that live in our homes and the likelihood that they will settle on us.

"They are essential for us to understand our health in the 21st century," he said.

The Home Microbiome Project followed seven families, which included eighteen people, three dogs and one cat, over the course of six weeks. The participants in the study swabbed their hands, feet and noses daily to collect a sample of the microbial populations living in and on them. They also sampled surfaces in the house, including doorknobs, light switches, floors and countertops.

Then the samples came to Argonne, where researchers performed DNA analysis to characterize the different species of microbes in each sample.

"We wanted to know how much people affected the microbial community on a house's surfaces and on each other," Gilbert said.

They found that people substantially affected the microbial communities in a house—when three of the families moved, it took less than a day for the new house to look just like the old one, microbially speaking.

Regular physical contact between individuals also mattered—in one home where two of the three occupants were in a relationship with one another, the couple shared many more microbes. Married couples and their young children also shared most of their microbial community.

Within a household, hands were the most likely to have similar microbes, while noses showed more individual variation.

Adding pets changed the makeup as well, Gilbert said—they found more plant and soil bacteria in houses with indoor-outdoor dogs or cats.

In at least one case, the researchers tracked a potentially pathogenic strain of bacteria called Enterobacter, which first appeared on one person's hands, then the kitchen counter, and then another person's hands.

"This doesn't mean that the countertop was definitely the mode of transmission between the two humans, but it's certainly a smoking gun," Gilbert said.

"It's also quite possible that we are routinely exposed to harmful bacteria—living on us and in our environment—but it only causes disease when our immune systems are otherwise disrupted."

Home microbiome studies also could potentially serve as a forensic tool, Gilbert said. Given an unidentified sample from a floor in this study, he said, "we could easily predict which family it came from."

The research also suggests that when a person (and their microbes) leaves a house, the microbial community shifts noticeably in a matter of days.

"You could theoretically predict whether a person has lived in this location, and how recently, with very good accuracy," he said.

More information: The paper, "Longitudinal analysis of microbial interaction between humans and the indoor environment," was published today in *Science*: www.sciencemag.org/lookup/doi/ …

1126/science.1254529

Provided by Argonne National Laboratory

Citation: Home Microbiome Project announces results of study on household microbes (2014, August 28) retrieved 17 April 2024 from https://phys.org/news/2014-08-home-microbiome-results-household-microbes.html

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