Studying indoor microbial ecology means sampling in public restrooms

May 11 2015, by Erica Hartmann

The author, collecting dust via vacuum for lab analysis. Credit: Clarisse Betancourt Román, CC BY-NC-ND

"Ok, Clarisse, you stand guard and I'll go in. Just… make sure no one comes in after me."

When most people talk about the challenges facing women in science, I

bet they don't have sneaking into the boys' bathroom in mind. But today, that is precisely the challenge that my colleague Clarisse Betancourt Román and I have to deal with.

We're interested in the microbial ecology in the spaces where we live – the so-called built environment. People have been studying ecology for centuries – the way organisms relate to each other and their surroundings. But until recently, most ecologists focused on creatures in their natural habitats in the great outdoors. Now my field of indoor microbial ecology is starting to look at what kinds of microbes live in the buildings we inhabit, which is important since we spend an awful lot of time indoors.

The knee-jerk reaction to the idea that there are microbes (germs!) in our homes is to load up on antimicrobial hand soaps, and maybe even to embed flooring, paints and other household products with antimicrobial chemicals. But no one has actually looked at the effect of all of those antimicrobial chemicals on indoor bacteria.

Stocking up on antimicrobial cleaners might have some serious side effects. Credit: Keith Williamson, CC BY

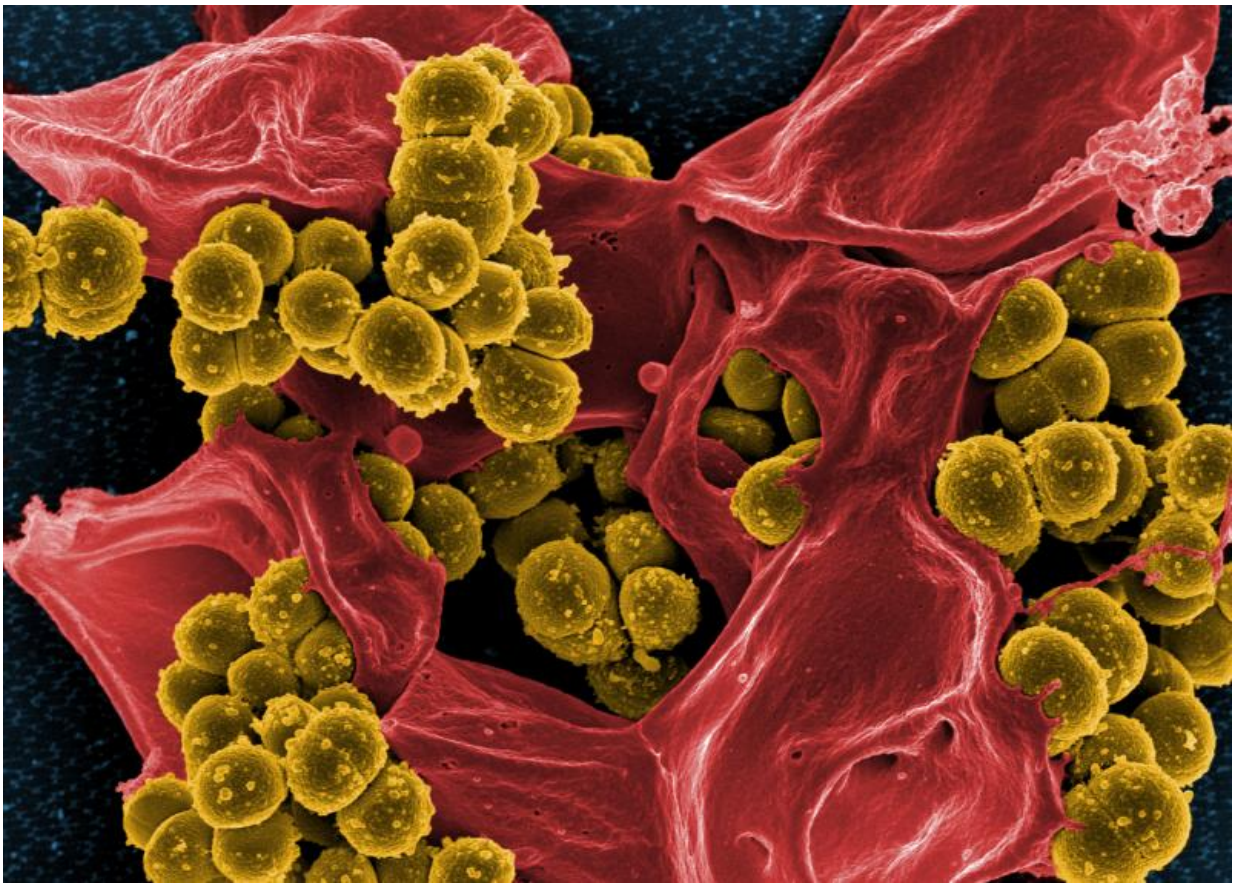
I'm concerned that by constantly exposing the bacteria in our buildings to these chemicals, we might actually be increasing the spread of antibiotic resistance. When I came to this field, I saw that some people had looked at what kinds of antimicrobial chemicals were present in buildings, because we know they can have serious negative effects on indoor air quality and human health. Others had looked at what kinds of bacteria were in buildings. But no one had put the two together. It seemed like an obvious next step, so I decided to investigate, starting with one of the buildings on campus here at the University of Oregon.

I feel like I'm in 2nd grade again, when we used to dare each other to go into the boys' bathroom. Only this time, the goal isn't just to run in and run out. We have to collect dust to extract bacteria and chemicals, and this dust is precious. It's the key to finding out if there's a link between antimicrobial chemicals and antibiotic resistance indoors. And this is why I'm standing in the hallway armed with purple nitrile gloves (think Johnny Depp in *Charlie and the Chocolate Factory*) and a handheld vacuum equipped with special filters to collect our samples. I'll have to scour the corners, the pipes under the sinks and behind the toilets, the tops of the walls of the cubicles to get enough. And that's just in the bathrooms! It'll take days to go through the whole building. We actually have a whole other project planned to look at homes, but for now we're concentrating on public spaces.

We're currently in the thick of this research. The goal is to see whether the bacteria in dust that contains high levels of antimicrobial chemicals have genes that make them resistant to the antimicrobial cleaning products we use to kill them – or even antibiotics we use to treat infections.

Clarisse collects dust from the tops of bathroom stalls with a touch of class. Credit: Erica Hartmann, CC BY-NC-ND

Once we get the dust, it will take a small army to process the samples. Clarisse will take care of the DNA extraction and preparation, but then we'll send it off to be sequenced by someone else. The same goes for the chemicals. And the computational tools to pull information out of our results and put everything together are pretty specialized, so I'll need a lot of training with that as well. In the end, this project will directly involve about 15 people from four different disciplines and probably take over a year, from the time it was conceived to the time the results are peer-reviewed and published. It will cost tens of thousands of dollars, not counting people's salaries and indirect costs that go to the university. So, in addition to designing and performing this study, I am working with the team to help secure funding for it, too.



Antibiotic-resistant bacteria – including methicillin-resistant Staphylococcus aureus (MRSA) are a threat to human health. Credit: NIAID, CC BY

Working on the grant proposals to get that funding, I'm always struck by the odd juxtapositions of our research: the sophisticated next-generation DNA-sequencing techniques to assess the microbial community composition, the high accuracy, high-resolution mass spectrometry for analytical chemistry, the complicated and not user-friendly bioinformatics analysis to make sense of the data – and the simple, childish fun of climbing around buildings, getting up on the furniture and hanging from the rafters looking for fat dust bunnies, ripe for the picking. In scientific writing, the whole thing comes across as so serious.

And it is serious. We're looking for reservoirs of antibiotic-resistant pathogens, germs that could land you in the hospital, infections for which we have no more cures. If I can find a particular source, one thing that we're doing that increases antibiotic resistance, maybe we can use my discovery to help curb the spread of antibiotic resistance and preserve our arsenal of antibiotics, preventing the return of fatal infectious diseases. But first, I have to get into the boys' bathroom.

Source: The Conversation