Opinion

Can We Learn to Live With Germs Again?

The health of our bodies and microbiomes may depend on society's return to lifestyles that expose us to bacteria, despite the risks.

By Markham Heid

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The video is intended to comfort and reassure, but it feels undeniably dystopian.

A person clad in goggles, a mask and a reflective vest dusts a plane's cabin with a fine mist of disinfectant. The chemical spray is charged with "breakthrough" electrostatic technology that helps it coat every surface and lay waste to any microscopic threats that may be lurking, specifically the coronavirus.

United Airlines produced and uploaded this particular video last April, but the sanitization regimen is not unique. Mass transportation authorities and countless businesses have gone to similar lengths in an effort to abide by guidelines and to mollify a rightly fearful public. And for the most part, the efforts have been welcome. One of the top comments posted to the United video reads, "Even after this pandemic you guys should keep this up."

For more than a century — since scientists first learned that unseen germs cause infection and illness — we've tended to think of sterile environments as the safe ones. And at the start of the outbreak, when we didn't know any better, it was sensible to disinfect as much as possible, including our groceries, clothing and personal spaces.

It took time for coronavirus researchers to figure out that the risk of surface transmission is low — the Centers for Disease Control and Prevention only recently pegged it at generally less than one in 10,000 — and that masks, physical distancing and ventilation are our most-effective safeguards.

Despite the now consensus recognition that air transmission, not surface spread, is more important, most pandemic sanitation practices have continued. We continue to annihilate every microbe in our midst, even though most are harmless. The New York City subway, for example, has been undergoing a 24-hour cleaning protocol that includes ultraviolet light and a variety of disinfecting solutions. Survey data shows most subway riders feel safer because of it.

But some health experts are watching this ongoing onslaught with a mounting sense of dread. They fear that many of the measures we've employed to stop the virus, even some that are helpful and necessary, may pose a threat to human health in the long run if they continue.

Their worries center on the human microbiome — the trillions of bacteria that live on and inside our bodies. They say that excessive hygiene practices, inappropriate antibiotic use and lifestyle changes such as distancing may weaken those communities going forward in ways that promote sickness and imperil our immune systems. By sterilizing our bodies and spaces, they argue, we may be doing more harm than good.

In January, a global consortium of health researchers published a paper in the Proceedings of the National Academy of Sciences (PNAS) in which they raise the alarm about the microbial fallout that may follow in the pandemic's wake. "We're starting to realize that there's collateral damage when we get rid of good microbes, and that has major consequences for our health," says B. Brett Finlay, first author of the PNAS paper and a professor in the department of microbiology and immunology at the University of British Columbia.

Almost everything we know about the microbiome is uncertain, including how our activities and environments influence its makeup. But Dr. Finlay and others argue that our collective health may depend on our willingness to holster our sanitizers and cleansers, moderate our use of bacteria-slaying drugs, and resume old habits that nourish our microbial communities. In other words, we're going to have to live with germs again.

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The world and just about everything in it, including people, are awash in microbes. Bacteria blanket our surfaces, suffuse the air we breathe and saturate certain areas of our bodies, especially the gut. While some microbes and other microscopic particles are a threat to us, a vast majority are benign. And there's mounting evidence that our health relies on our early and ongoing interactions with them.

Dr. Graham Rook, an emeritus professor of medical microbiology at University College London, likens the immune system to a computer. He says that the microbes we encounter in daily life — on other people and in our spaces — are the data that the immune system relies on to program and regulate its operations.

Deprived of these exposures, especially at the start of life, the immune system is prone to malfunction. The result can be allergies, asthma, autoimmune disorders, obesity, Type 2 diabetes and other chronic medical conditions.

The "hygiene hypothesis," introduced in 1989 by the epidemiologist David Strachan, first made the case that bodies deprived of contact with microbes could be at risk for health problems. The hygiene hypothesis has evolved over time, and experts continue to debate many of its finer points. But it's now clear that exposure to "good" bacteria is necessary for a person's health, and that living in too-sterile environments may threaten us in ways scientists are only just beginning to grasp.

Before the pandemic, there was growing recognition among both doctors and the public that aspects of modern life may be upsetting our balance of healthy microbes, perhaps especially in our guts, and hurting our health as a result. This idea is not so much controversial as simply too new to be fully appreciated; roughly 95 percent of the published microbiome scholarship has come in just the last decade, and two-thirds of it only in the last five years. But already, research has revealed that, apart from training the immune system, our bacteria produce molecules that affect the workings of our every cell and organ.

Maisie Cousins for The New York Times

"The microbes we carry in our gut could affect the function of the brain, the spinal cord, the joints or things far from where those microbes live," says Dr. Eran Elinav, another of the PNAS paper's authors and a principal investigator at the Weizmann Institute of Science in Israel.

While the gut microbiome has thus far garnered the most scientific attention, humans have other reservoirs of microbes — on our skin, in our lungs, maybe even in our brains — that also seem to perform crucial jobs, from strengthening tissues to influencing the function of our heart and hormones. While scientists don't know exactly how these tiny communities form and work, or how much people's environmental exposures influence them, researchers know enough to recognize that indiscriminately killing microbes could have irreversible consequences.

There's some conjecture that the imbalance or loss of good microbes may heighten a person's susceptibility to infection — including, perhaps, to the coronavirus. Late last year, researchers based in Hong Kong observed a link between certain microbiome characteristics and severe Covid-19. Experts have hypothesized that unwell gut microbiomes may partly explain why older adults and adults with conditions such as obesity or Type 2 diabetes seem to be at greater risk of serious Covid-19 illness. There's even some speculation that microbiome factors play a part in so-called long Covid — the brain fog, fatigue and other persistent symptoms that afflict many in the aftermath of the infection.

"There's a wealth of evidence to suggest the microbiome has an influential role in our response to viral infections," says Brent Williams, an assistant professor in the department of clinical pathology and cell biology at Columbia University. This raises intriguing questions about how the microbiome might influence disease outcomes for Covid, he says, "or how it might be altered by Covid, and whether those alterations persist."

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The picture that's emerging is that the human body, much like a rain forest, is home to a vast and symbiotic ecosystem of organisms. When that ecosystem is disrupted, there are consequences.

"We can look at many of the things we're doing now to prevent infection and see how this could have major effects," says Dr. Finlay.

Topping the list of concerns, he and others say, is our injudicious use of powerful antibiotics — drugs that can kill some pathogens but can also wipe out healthy bacteria in the body. A recent analysis found that during the first six months of the pandemic, among the hospital admissions studied, more than half of Covid-19 patients received antibiotics even in situations where the benefit of those drugs was uncertain.

Lance Price, a professor at George Washington University's Milken Institute School of Public Health and the founding director of the Antibiotic Resistant Action Center at George Washington, says that as doctors have figured out how best to treat the coronavirus, antibiotic use has dropped. But, he says, "Even before the pandemic, we know that half of antibiotic use was inappropriate."

In addition to antibiotic overuse, Dr. Finlay says that "hyper-hygiene" is, quite literally, overkill. "Wiping down or spraying every surface with antimicrobial agents gives people comfort, but it's probably not doing much to protect us from Covid," he says.

Hygiene zealotry not only deprives people of interactions with helpful bacteria, but it may also be driving some essential microbes into extinction. "We really don't know what effect all this hyper-hygiene and hyper-cleanliness will have," Dr. Finlay says. "This is the biggest experiment in a century, and unfortunately we have more questions than answers."

While improper antibiotic use and excessive sanitization are two threats to our microbes that we can probably dispense with now, some other pandemic safety measures involve thornier risk-reward trade-offs. In the months to come, the health of our microbiomes may partly depend on the willingness of those who are vaccinated and at low risk to take off their masks and intermingle with one another, as we all used to do.

"A lot of things people do when they're together that we didn't use to think about — shaking hands or embracing, kissing or hugging — these sorts of sociocultural practices could play a part in the exchange of microbes," says Tamara Giles-Vernick, another of the PNAS paper's authors and a medical anthropologist at the nonprofit Pasteur Institute in Paris.

Already, there's been some debate about whether people should eventually "go back" to shaking hands or congregating indoors in large numbers. These sorts of interactions undoubtedly expose people to pathogens. And as we learned last year, ditching them would most likely help to spare us the worst of the cold-and-flu season. But it's also possible that abandoning these customs, and spending more time isolated from one another, could deprive us of contact with healthy microorganisms.

This idea is controversial. “I’ve always felt that people don’t do enough to prevent cold and flu, and so in a sense many of these changes have been healthy,” says Jo Handelsman, an infectious-disease researcher and professor at the University of Wisconsin-Madison. She says it’s unclear whether shaking hands or spending time in crowded places meaningfully contributes to microbiome health, and so avoiding such risky practices may be all upside — a view that many infectious disease experts share.

The microbiome scientists all acknowledge the gaps in the research. But they say that what is known about the importance of our microbes should caution us against major changes to the ways we live and interact.

While experts are concerned about the threat the pandemic poses to our microbiomes, they all say it’s difficult to offer succinct, universally appropriate advice for how to behave. A person’s age, health, location, vaccination status and other variables all change the risk-reward equations.

“The general public always wants a straightforward answer, but in an evolving situation like this, we’re going to have to learn to be more nuanced about things,” says Marsha Wills-Karp, chair of the department of environmental health and engineering at the Johns Hopkins Bloomberg School of Public Health. “I’m married to an infectious disease physician, and he and I don’t always agree on what’s appropriate.”

In this moment, when so much of the population remains unvaccinated and at risk, she says that people must continue to wear masks and follow physical distancing directives. It’s also prudent to wash or sanitize hands, especially before eating.

“But trying to sterilize everything and create these artificially germ-free environments is probably not essential,” she says. “And for the people close to you, if you’re both vaccinated, I think it’s OK to get close again and hug.”

Undoubtedly, many will struggle to resume their old prepandemic habits. “Things that used to feel normal are initially going to feel weird and uncomfortable,” says Michelle Newman, an anxiety specialist and professor of psychology at the Pennsylvania State University. “Even to me, the thought of getting on a plane or going to a big conference feels more intimidating.”

But she says re-engaging with our old lifestyles will help quell any attendant anxieties. “If you associate a situation with discomfort, the more you put yourself in that situation, the easier and more comfortable it will become,” she says.

For those who aren’t yet able to mix and mingle — and right now, that’s most of us — there are other ways to support microbial health. “If you want to do something proactive right now, I would put eating a healthy diet high on your list,” says Dr. Emeran Mayer, a professor

of medicine, physiology and psychiatry and co-director of U.C.L.A.'s Cure: Digestive Diseases Research Center. He says that plant foods (legumes, greens, whole fruits, a variety of vegetables), as well as fermented foods, support the richness and diversity of the gut microbiome. So, too, does limiting one's intake of processed and fast foods, especially those that contain added sugar.

Other healthy habits like exercise and getting adequate sleep are all supportive of microbiome health. Gardening, hiking and other interactions with nature may be especially beneficial.

"The more we learn about our relationships with the microbial world, the clearer it is that we are connected to them and to the rest of the natural world," says Brendan Bohannan, a professor of environmental studies and biology at the University of Oregon. "Getting outside and exposing ourselves to microbes beyond our indoor spaces may have many positive impacts." Such exposure, he notes, might even counterbalance any negative effect that extended indoor stays might be having on our microbiomes.

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For politicians and health officials, the great challenge of the pandemic has been weighing the immediate threat of the virus against the many detriments (social, economic, psychological, developmental) that accompany business and school closures, distancing imperatives and other measures intended to slow its spread. The longer the pandemic lasts, the more these collateral concerns start to feel like primary ones.

While there is much we can do, and much we can stop doing, to strengthen our microbial communities without exposing ourselves to undue risk, experts say that convincing a rightfully skittish public is a tall order. As this pandemic has made clear, all people are walking and coughing vectors for infectious disease. In the United States and elsewhere, there are also long-held and deeply embedded sociocultural norms that prioritize hygiene and denigrate dirt and bacteria. Meanwhile, technology has made it easier than ever for us to live and work in isolation.

When he educates people about the importance of intermingling with microbes, Dr. Finlay likes to point out that our bodies contain at least as many bacterial cells as human cells. He also emphasizes that, before the pandemic, only one of the top 10 causes of death in America — influenza — was attributable to an infectious disease that someone could "catch." Nearly all the rest, such as heart disease and stroke, cancer, brain disease and diabetes, are associated with poor microbiome health or dysfunction.

“You can’t change your genes, but you can change your microbes,” he says. “They’re our friends.”

He and other experts will continue to work to raise awareness about the importance of bacteria and the microbiome. But for many people, only the passage of time and the suppression of the coronavirus will assuage fears of hidden pathogens.

“What I’m most worried about after this pandemic has passed is that people will be nervous about being exposed to microbes, and so they won’t interact with other people and with the world,” says Dr. Bohannan. “That’s totally understandable — we’re all going to be traumatized by this. But like a storm, this will pass. And after the storm we’re going to need to go outside and be with each other again.”

Markham Heid is a health and science journalist who writes regularly about the microbiome and human health. His work has appeared in Time, Popular Mechanics, Everyday Health, Sports Illustrated and elsewhere.

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