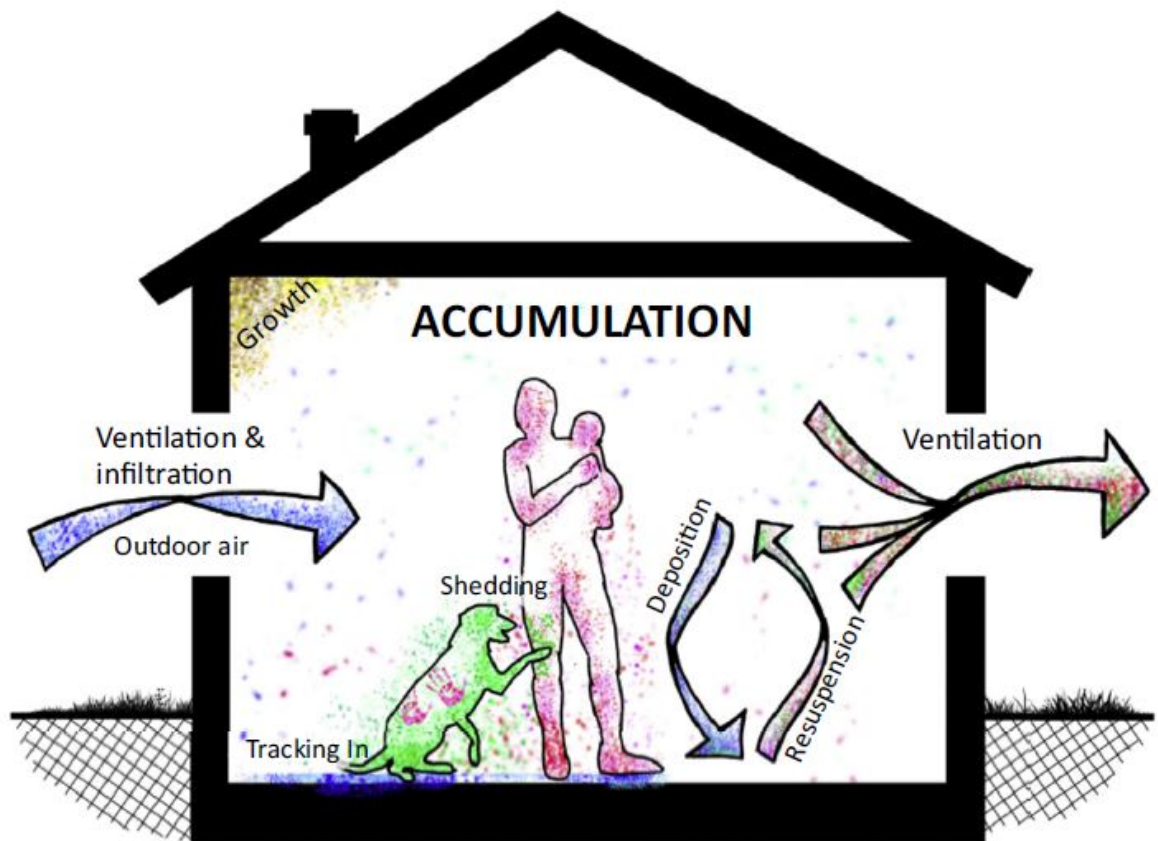


Why architects should let the microbes in

July 7 2016



Trends in Microbiology

The sources and physical processes that govern assembly of indoor microbial communities. Credit: Peccia and Kwan/*Trends in Microbiology* 2016

Architectural design is often concerned with energy efficiency or aesthetics, not microbial exposure. But, in a Science & Society article

published July 7 in *Trends in Microbiology*, Yale environmental engineers make a case for assessing the benefits of having these unseen organisms in our homes. Maybe, they say, instead of pushing all of them out, we should let the right ones in.

"It's a common misconception that all [microbes](#) found in one's home are hazardous to your health," says Yale Professor of Chemical and Environmental Engineering Jordan Peccia, co-author of the review with PhD student Sarah Kwan. "Many have no impact on health, while some may even be beneficial."

Past studies have shown that children growing up on a farm (or even in a home close to a rural area), are exposed to such beneficial microbes, and are less likely to develop allergies as a result. In one example, children from a Bavarian family (a population known for their agrarian lifestyle, such as working the fields, using horses for transport, and drinking unpasteurized milk) had less than half the levels of asthma compared to a suburban European family (5.2% versus 19.1%). This effect was found to persist into adulthood. This is likely because some microbes in the body send signals to white blood cells known as T cells to form T regulatory cells, which prevent unnecessary immune responses.

"One big question becomes how building design (e.g., the geographical layout, the building materials, occupancy, and ventilation) modulates microbial exposure, and our own microbiomes," says Peccia. "As more and more beneficial microbes are identified, we—architects, engineers, and the general public—need to think about how we can facilitate our exposure to them."

"There are certainly trade-offs we need to better understand and circumvent," he adds. "Indoor air quality is often worse than [outdoor air](#) quality, so building ventilation with outdoor air makes a lot of sense. However, in cities with very poor outdoor [air quality](#), increased

ventilation results may result in unhealthy exposures to outdoor air contaminants."

Short of working on a farm, one way we can "train" our immune system is through exposure to animals, especially cats and dogs. Aside from carrying their own families of microbes, they also can track in common bacteria and fungi from the outdoors, further contributing to the aforementioned "beneficial diversity" of indoor microbes. These can then be easily inhaled or swallowed when trapped in a tightly enclosed space, such as a home or office building, where we inhale gallons of air each day and sometimes ingest floor dust.

Although this field is still in its infancy, Peccia does have some advice for building occupants, namely, that there is not a "one size fits all" approach to improving the microbiome in one's home. "Not everyone should run out and get a dog, of course," he says, "but we can work to develop new, quantitative approaches for solving these problems—something better than our portable air filters and inhalers."

More information: *Trends in Microbiology*, Peccia and Kwan: "Buildings, Beneficial Microbes, and Health," [www.cell.com/trends/microbiolo...0966-842X\(16\)30021-X](http://www.cell.com/trends/microbiolo...0966-842X(16)30021-X) , DOI: [10.1016/j.tim.2016.04.007](https://doi.org/10.1016/j.tim.2016.04.007)

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