Microbial Survey of the Built Environment

One thing that humans are great at is engineering our own personalized landscape. Like other creatures (i.e. beavers), we customize our surroundings to suit our needs. However, unlike other creatures, we are capable of doing so at remarkable levels. Through our skills in engineering we have been able to turn a coastal marsh into what is now New York City. Likewise, this city of Dubai is not only a marvel in building architecture, but the island it inhabits is also 100% man made.

Recently, we have started to wonder about the complex microbial communities that inhabit our build environment. People have now shown that the microbes in an air sample can be used to identify the city that air came from[1]. In addition, it has been shown that you can identify a person based on the microbial signature left on a keyboard[2]. However, there are many more relationships that microbes can have with our build environment and numerous labs are currently studying these relationships (see www.microbe.net for more information)

Today, you are going to assess the built environment. Get out of your seat and move around. Walk into the hallway or even outside for a bit of fresh air. The build environment includes both physical structures as well as landscapes that have been engineered by humans. As you look around, think about the microbes we have been studying. Where are they? What are they doing? Walk around for 5-10 minutes and take notes about your build environment.

1. Please list three habitats you observed that are likely 'hot-spots' for microbes.
    a.

    b.

    c.

2. What features make these locations ideal for microbial communities to thrive?
    a.

    b.

    c.

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[1] Bowers, R. M. *et al.* Sources of bacteria in outdoor air across cities in the midwestern United States. *Appl. Environ. Microbiol.* **77,** 6350–6 (2011).

[2] Fierer, N. *et al.* Forensic identification using skin bacterial communities. *Proc. Natl. Acad. Sci.* **107,** 6477–81 (2010).

3. Which (indoor) habitat is likely to have the most diverse community (and why):

4. What are the likely sources of these microbes?
    a.

    b.

    c.

5. What are the major roles (positive and negative) played by organisms in these habitats:
    a.

    b.

    c.

6. In medical settings, nosocomial (or in hospital) infections are a major concern. People go to hospitals with major illnesses, but all too often develop new illnesses while being treated. The sources of these pathogens are the other patients seeking medical attention. Therefore, the source is uncontrollable. However, it may be possible to control the transmission of these pathogens. One way is to use regimented cleaning schedules to keep surfaces clean. Another way is to provide ample supplies to hand sanitizer to prevent direct (person-to-person) transmission. However, many of these organisms are transmitted via aerosols. How can these organism best be managed? Please develop a system for a new local hospital. Please describe the system and how it works to control the spread of organisms within the hospital. Be creative.