There is no cure for the common cold, but there are plenty of ways to catch it. In this excerpt from the book Ah-Choo!, *Jennifer Ackerman describes the germiest places in our homes, schools, and playgrounds. Read the excerpt and answer the questions that follow.*

from Ah-Choo!

by Jennifer Ackerman

1 Not long ago, Charles Gerba, a microbiologist at the University of Arizona, sought to identify public areas where risk of exposure to all sorts of pathogens[1] might be greatest. Gerba is a man obsessed with the germs that lurk in our daily lives. A professor of environmental microbiology, he has for the last two decades or so focused his beam on everyday hangouts for viruses and bacteria. He once invented what he calls a "commodograph" to measure the aerosol of droplets emitted with each flush from a toilet bowl. After an investigation revealed the presence of *E. coli* in laundry machines, including his own, he started running an empty load with bleach to "mouthwash" the machine.

2 In 2005, Gerba and his team reported trawling more than 1,000 public surfaces in four U.S. cities, from shopping centers, day-care facilities, offices, airports, movie theaters, restaurants, and other public locations, looking for biochemical markers of substances that would carry pathogens—blood, saliva, feces, urine, mucus, etc. They found that surfaces from children's playground equipment and day-care centers were the most contaminated—perhaps not shocking, but distressing nonetheless. When Gerba's team members used an invisible fluorescent resin to artificially contaminate surfaces, they revealed that 86 percent of people who touched the surfaces carried away the tracer. Eighty percent transferred it to their personal belongings or took it home hours later. Biggest offenders were children's playground equipment and bus rails and armrests, followed by shopping cart handles, chair armrests, vending machine buttons, and escalator handrails.

3 Gerba and other researchers more tightly focused on the whereabouts of cold viruses have journeyed into hotels, doctors' offices, child-care facilities, and people's homes to parse where they hang out. So what are the hot havens for cold viruses?

4 **The Doctor's Office.** If you have small children, you probably suspect as much: toys in pediatric waiting rooms almost certainly harbor cold viruses. Dr. Diane Pappas and her team at the University of Virginia used DNA sampling to test toys in three locations in

[1] *pathogens* — microorganisms that cause disease

pediatricians' offices in Fairfax, Virginia: a sick-child waiting room, a well-child waiting room, and a bag of new toys offered to reward little patients after their doctor visits. Some 17 percent of the toys in the waiting room for well children were contaminated; 20 percent of those in the room for sick children were buggy. The bag of new toy "rewards" was the worst, with some 30 percent of the toys carrying remnants of viruses. What's more, says Pappas, cleaning the toys according to office protocol with disinfectants only minimally decreased the presence of viral remnants, from 40 percent to 26 percent.

5 **The (Jungle) Gym.** Children's playground equipment is the germiest of surfaces. But cold bugs catch rides not just on jungle gyms and swings. When researchers looked for pathogens at two fitness centers in a military community in Hawaii, they found the presence of viruses (primarily rhinoviruses) on 63 percent of hand-contact surfaces. Especially contaminated were barbells, dumbbells, and weight plates, as well as grips for bicycles and stair-climbers.

6 **The Elevator and Other Public Transportation.** In Gerba's four-city study, bus rails and armrests were second only to playground equipment in contamination. As for elevators: I have a friend who works on the 17th floor of an office building in downtown Manhattan. Every morning she avoids the elevator and instead takes the stairs up to her office. Though she's aware of the health benefits of stair-climbing, it's not the exercise she craves. And while the crowding is considerable in the lift,[2] it's not the claustrophobia factor that drives her to the stairwell. Rather, she sees the elevator as a virus's way of gaining perpendicular passage. She may have a point. Some experts suspect that the SARS epidemic spread when a professor from China, sick with the virus, stayed for a single night in room 911 on the ninth floor of Hong Kong's Metropole Hotel. By touching an elevator button, he may have unwittingly spread the disease to fellow guests. All 16 people who contracted SARS had stayed on the ninth floor or had a connection to it and would have been pressing that ninth-floor elevator button. Over the next few days, those 16 hotel guests spread the virus far and wide, to some 30 countries.

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7 **Day-Care Centers and Schools.** "Unlike the old days, when we had our young children playing outside much of the day, now we concentrate them in little spaces," says Birgit Winther—"optimal circumstances for spreading viruses." While many kids with colds stay home from school (the average schoolchild takes 11 days off for colds each year), others hop on the bus anyway. It's now common knowledge that epidemics of colds start up with the start of school in late summer and early fall. "Some 17 days after children return to school, we see a peak in occurrence of respiratory infections three to four times the background rate," notes Sebastian Johnston of Imperial College London. "People go on vacation, come home with viruses, and the schoolchildren share them with all their friends." According to

[2] *lift* — elevator

the Centers for Disease Control and Prevention, there are more than 52 million cases of the common cold each year among Americans under the age of 17.

8 In a study of the occurrence of viruses on elementary school classroom surfaces in 2009, Gerba found that half of the surfaces tested positive for virus. Frequently used fomites[3] were the most contaminated: desktops, faucet handles, paper towel dispensers, and entrance doorknobs. (Teachers' desks are also germ havens, Gerba discovered in a previous study, harboring up to 20 times more microbes per square inch compared with desks of people in other professions—the reason my sister, a special education teacher in Maryland, slathers her desk with cleanser and washes her hands some 30 times a day.)

9 Studying virus transmission in a school or child-care facility is tricky. No scientist wants to plant real bugs for kids to pick up, so one enterprising group of scientists came up with a safe way of studying virus transmission in child-care facilities. They used a fragment of a plant virus, the cauliflower mosaic virus, as a surrogate marker to mimic a real human viral pathogen and smeared it onto toy balls; then they introduced the toy balls into several child-care settings. Within just a few hours of handling, the viral DNA on the toy balls had spread—to other, unsmeared balls, to the hands of the children and caregivers, to benches and boxes touched frequently by the children. Although the smeared balls were removed after a day, the viral DNA continued circulating in the facilities for as long as two weeks and showed up in the children's homes, on the hands of family members, and on several surfaces, including high chairs, toys, cribs, and bathtub rims.

10 **The Home.** Unfortunately, when children get colds at school or day care, they usually bring them home. Indeed, the presence of infants or children in a household doubles the cold rate for the adults living there. "If you have kids, chances are good that you'll get infected," says Ron Turner. "Our children transmit viruses efficiently because of the way we interact with them. We love them, so we wipe their noses."

11 But even households without kids are hardly bug-free. In sleuthing germs in 15 homes, Gerba discovered that the cleanest spot in the house—at least where bacteria are concerned—was the toilet seat; the dirtiest, the sponge or drain. "The cutting board was very bad," he writes. "There are 200 times more faecal coliforms [bacteria] on a cutting board than a toilet seat. From these data it would appear that the safest place to make a salad in the home seems to be on the top of the toilet seat."

12 In 2008 Winther's team looked specifically for rhinoviruses in the homes of people with colds. The team asked 30 cold-ridden adults to indicate 10 spots in their houses that they had touched in the past 18 hours, then tested the spots for the genetic fingerprints of the viruses. Sixty-seven of the 160 surfaces tested positive for rhinovirus. The genetic fingerprinting may have yielded some false positives. Nonetheless, says Winther, "surfaces in the home that are commonly touched by people are far more important than we ever imagined in the spread of colds."

[3] *fomites* — objects that transfer germs from one person to another

13 To follow up, the team later deliberately contaminated commonly touched surfaces with the subjects' mucus and asked them to turn on the lights, answer the phone, and do other kinds of daily activities to see whether the virus on the object would stick to their fingers. After 1 hour, the virus fused to fingertip close to 90 percent of the time; after 24 hours, it had dropped only to 70 percent; and after 48 hours, to 53 percent. So even a full two days after the mucus was smeared, participants got the virus on their fingertips more than half the time.

14 Cold viruses may also lurk in less obvious spots. The tucks and folds of clothing, for instance—especially hankies and the shirtsleeves of children. "I never realized how risky doing laundry was," says Gerba. "It may be one of the major transfer points in the home for pathogenic microorganisms. . . . Anyone transferring a load of underwear [from washer to dryer], for example, will get *E. coli* on their hands." Washing eliminates 99 percent of the bacteria, but if there are a million to begin with, that leaves some 10,000. And viruses are even harder to wash out of fabric than bacteria. "So laundry is a hazardous activity in the home," notes Gerba, "particularly if that home includes an ill individual or a small child: all those children's underwear and diapers, and soiled handkerchiefs when somebody has a cold."