

## *Exposed: A germaphobe in quarantine*

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During the COVID-19 pandemic, a lot of people called themselves “germaphobes.” It was *rational* to avoid getting COVID, but that is not germaphobia. Germaphobia is an *irrational* fear of getting sick. Germaphobes have panic attacks when they are triggered and rely on avoidance behaviors that don’t necessarily make sense—like continuing to wash groceries or to quarantine mail after the data showed that COVID wasn’t spread that way. If you have never had a fight-or-flight, all-consuming panic attack about getting infected with something like COVID or bird flu or norovirus, or had a panic attack when someone around you sniffled, you probably aren’t a germaphobe.

Here’s what it was like to be a germaphobe early in the pandemic: refreshing the news websites I had open in my browser every few minutes grasping for something that could help me calm down and feel like I had some control over what was happening; feeling my chest tighten and heart race with each new headline; asking to work from home before it was mandated because I could no longer focus on anything except the SARS-CoV-2 virus that could already be circulating the office; not being able to hold non-COVID thoughts; being in fight or flight while my friends and family were still going to the grocery store and concerts as if everything was normal. My response to COVID wasn’t all that different from my response to a normal cold and flu season. That’s germaphobia.

Specific phobias, like germaphobia, are treated with cognitive behavior therapy, including exposure response prevention (ERP). Not a particularly fun form of therapy, ERP entails purposefully exposing oneself to panic triggers in a graded fashion to elicit panic and to practice responding rationally to increasingly distressing triggers without relying on avoidance

behaviors. Doing ERP for germaphobia during a pandemic posed the risk of getting COVID, which wasn't the goal of therapy—the goal of therapy was to habituate the body to *irrational* alarms.

Another pandemic-related challenge was that the “exposures” that I was unconsciously doing in my everyday life disappeared when I was staying home. I learned that those daily “exposures” had been helping me control my panic. When I realized this, I made myself return to the grocery store in person, because if I didn't, I was afraid I would develop another phobia and start panicking every time I needed groceries. Going to the grocery store felt relatively safe; it would have been more distressing to pick something like socializing in groups or indoors. My therapy goal was to follow CDC or local guidance but to *not go beyond* their recommendations. My personal goal never wavered: avoid getting COVID.

On a Saturday morning in early August 2022, I missed a call from my mom, and she sent a follow-up text with those two dreadful words: call me. My stomach plummeted through my bowels. My skin flushed with heat. My heart beat into my ears. My mind briefly flitted to my eighty-year-old grandma, but I was pretty sure my mom was calling to tell me that COVID had finally found our family. I was desperately hoping to make it a few more weeks without being exposed because updated vaccines were in sight. My body was in fight or flight mode as I imagined what *might* happen in the next couple of days and weeks if I *had* been exposed, but I couldn't flee if COVID was already in my body, actively replicating in my nose and throat. I paced the living room as the phone rang and I waited for my mom to answer.

The night before, we celebrated my dad's birthday with a family dinner and cake. We would have celebrated in my parents' backyard like we had for all the other summer birthdays,

but the temperature was above 90°F and I had been feeling particularly sensitive to the heat. I had asked to celebrate indoors. I wasn't sure if indoors or outdoors made as much of a difference in the era of Omicron—I suspected not—but I still cursed myself for being negligent.

Long before the pandemic, in 2011, I went to graduate school for microbiology. My admissions essay was about my love of inquiry and my laboratory experience, which I did not inflate but strategically framed. (There was a reason I did not mention my math skills or the freezer of “super competent cells” I once prepared for the Landick Lab that were an order of magnitude more competent than ever before.) I didn't have a good reason for choosing microbiology except that my other scientific interest was entomology and it was harder to get a job doing that. Then I read Paul de Kruif's *Microbe Hunters*.

Paul de Kruif chronicled major discoveries in microbiology by introducing key researchers in the field and their scandals, follies, and foes, as well as their accomplishments. After reading the chapter on Koch, I understood what people meant when they called an experiment “elegant.” Koch outlined an elegant, though arguably imperfect, system for determining the etiological agent of disease, which we call Koch's Postulates. Observe, isolate, inoculate, observe, re-isolate—it seemed so simple.

Moreover, *Microbe Hunters* was full of characters who were obsessed with microbial diseases. Obsession with microbes was something I understood. But there was a key difference between the men in those stories and me: I was less obsessed with experimenting than I was obsessed with avoiding microbes. And for me, it wasn't fun, it was frightening.

Can you believe a germpahobe signed up for a PhD in germs? It sounds like the start of a bad joke, doesn't it? Here's one: *C. diff*, *Shigella*, and *Campylobacter* walk into a bar... the

bartender says, “Oh shit! You all better scat before I get the runs!” So maybe it’s not a great joke, but it is *sort of* funny whereas a case of Norovirus on a cruise ship is *not at all* funny.

Before my dad’s birthday party, I sat in my parents’ driveway staring at the surgical loop masks and the N95 hanging from the gearstick. COVID cases were high in Dane County and the official numbers didn’t mean as much in the era of at home testing. It seemed like everyone around me was getting COVID, yet I hesitated. I knew what I wanted to do—mask—but I didn’t want my family to roll their eyes and think, *there’s Abby being overly-cautious*. More importantly, my eldest niece was four and a half and had started asking why I was wearing a mask around her when no one else was. I didn’t want her to think I was afraid of *her*, which I suppose I was. Kids hold innate and very twisted beliefs about how swapping spit equates to intimacy (1) and my niece was in preschool *and* daycare—not one but *two* germ factories. If I stopped letting her give me pretend dental exams, during which she spoke and spit directly into my mouth, she might have kicked me out of her circle of trust. As one of my two pandemic buddies (R.I.P. Whiley, we wish could visit you in cat heaven) and my sole source of hugs in 2020, I couldn’t bear that.

Would it have been irrational to wear a mask? As a germaphobe, this was a particularly important question to ask myself. Objectively, it was the time to wear masks again, even the public health officials were saying so. But I did not don my mask. As my favorite four-and-a-half-year-old often said, “I can be brave.”

Admittedly, reading *Microbe Hunters* took the wind out of my future-microbiologist sails. The simple, elegant experiments it described were already done and their discoveries were

printed in textbooks as facts. What was left to discover? Blue bands in agar or a western blot? I wanted to be excited by molecular discoveries—and I could get excited by my own discoveries on the rare occasions when my experiments worked—but going to seminars and reading papers felt like torture. Data didn't engage me like de Kruif's stories had.

Scientists are told to tell stories in their writing but the stories they need to tell don't lend well to the elements of story craft that students learn in language arts—setting, characterization, plot with an introduction, rising action, climax, and resolution, and a character arc. Instead of story, the scientific manuscript follows the structure of the persuasive argument: introduction, thesis, supporting data, counter argument, conclusion, which I was taught as “sandwich writing” using paper plates and strips of colored paper. The bread is the story and the meat is everything it takes to make the story convincing. Counter to the prevailing advice to stay abreast of the literature by reading the methods and the figures of as many papers as possible, I consumed papers same way I would a sandwich: after a few bites, I tossed out the meaty interior so that I could focus on the good stuff: the condiment-slathered bread and the cheese.

Journal club was my own personal hell because we spent a full hour each week consuming the meat of a paper, one nauseating bite after another. But there was one article we were assigned to read that I actually enjoyed. I read the whole paper. I read it again. I took notes in the margins. I read it a third time and I don't even think I was the one assigned to present it. I was excited. I understood it. It was an epidemiological investigation—not as elegant as Koch's Postulates—but simply put, it was a good story.

As I set the heart healthy carrot cake I made for my dad's birthday on the kitchen counter, the rest of my family arrived, including my two nieces. My nieces went from person to person

doling out hugs. The youngest pulled me by the hand into the living room to show me a project she made with my mom earlier that week. Then the oldest asked if she could sit on my lap and talk. I spent the hour before dinner carefully balancing my time between the girls. I played kitchen and dollhouse with one in the basement, then went upstairs to wait for the other to delegate tasks to me as she spread all of her Barbies and Barbie accessories around the bedroom.

After assigning me a Barbie horse and rider to set up near the foot of the bed, my niece coughed. It wasn't a wet one. It wasn't a coughing fit. There wasn't even much force behind it. It was a normal, little cough, like she had a tickle in her throat. My stomach dropped. Without looking up from the Barbie arm she was struggling to get into a Barbie dress, she said, "I've been coughing all day." My chest seized with dread. I asked her how she felt otherwise. She said fine. I pictured the masks I'd left dangling from the gearstick. Was it too late to go get one?

Case reports are like short, scientific mysteries, which makes them particularly fun to read. I lost an hour one day reading a case series of a botulism outbreak in rural Ethiopia while I was supposed to be writing a grant. I came across it while deciding what to highlight on my principal investigator's biosketch. It wasn't the best paper for the biosketch, but it was engaging, and it helped me to better understand what makes a good story.

My writing teachers said that setting should shape and drive plot, a concept I understood after reading the case report. The paper described how a family's interactions with their environment—the traditional foods they ate at a holiday celebration, food preparation techniques, and ambient temperature food storage—led to the botulism outbreak. Setting mattered in this story. If the family had lived in an urban area with access to refrigeration, their ceremony might not have ended with ten cases of botulism and five deaths.

Setting, of course, was just one factor. Modern American storytelling also demands that characters act as the agents of their own downfall, unlike the classical stories and myths that relied on preordination or divine intervention. With refrigeration or immediate consumption of the prepared food—both modifiable human behaviors—there would have been no botulism and no story, inarguably a better situation for this family. (2)

Traits unique to characters—their psychology or circumstance—drive the decisions they make and how their decisions affect them. Decisions determine how a story unfolds, regardless of whether the characters truly had a choice—indeed many writers would say that characters should be written into a corner where they have no choices left. Stakes, adversity, and setbacks are essential to good storytelling.

At dinner, my older niece, the one who said she had been “coughing all day,” insisted on sitting next to me at the table. I was flattered but sort of wished that just this once, she would want to sit next to her mommy or daddy. I sat next to her and cut her chicken. I cut her corn on the cob off the cob when she complained about getting spritzed with corn juice. I was happy to oblige her while she still wanted my help. She still thought of me as her playmate and I feared that someday she would catch me at the adult table and stop asking me to play with her.

When she finished her chicken and corn off the cob, she asked my mom to put on *Once Upon A Christmas Cheery in the Lab of Shakhashiri*. While I was clearing plates from the table, she patted the couch and asked me to come snuggle with her. Warning bells went off in my head. She has never been much of a snuggler. But I loved her and I cherished my time with her so there was no way I could say no, just like there was no way I could have donned my N95 before

joining her without drawing attention. Ready or not, my niece was giving me the opportunity to do exposure response therapy. Of course, I hoped the exposure was *figurative*.

I didn't put on my mask, but I did put a pillow between us while we snuggled so that she didn't breathe directly on my face. I didn't know if viral load was still a predictor of disease severity, but it wouldn't hurt to act as if it was. (I wouldn't be a germaphobe if I didn't try to weasel in *some* avoidance behaviors.) While we watched nutcrackers dance around Dr. Shakhashiri's lab, visions of infection curves and positive antigen tests danced in my head.

My favorite epidemiological case report, the one from that journal club, goes like this: Patients 1 and 2, both scientists, returned to their Colorado homes from a research trip in Senegal. Patient 1 had sexual intercourse with his wife upon his return. Patients 1 and 2 showed symptoms consistent with Zika on days 6 and 9 after their return to Colorado. Patient 3, the wife of Patient 1, developed symptoms of Zika on day 11. Neither child of Patients 1 and 3 developed symptoms. They concluded that Patient 3 got zika by human-to-human transmission, likely through sexual intercourse. (3)

Here's what I love about this case report: though not stated, it's obvious that Patients 1, 2, and 3 are co-authors on the paper. I can imagine Patients 1 and 2 developing symptoms and giddily recording them in a notebook, less concerned about contracting Zika than they were excited about a possible publication. It turns out that's pretty close to the truth. Patients 1 and 2 started recording their symptoms as soon as they noticed them, and after Patient 3 developed symptoms, they expanded their data collection to include samples of their blood and the mosquitoes swarming their backyards in Colorado. Indeed, Patients 1, 2, and 3 are the first, second, and third authors, respectively. (4)



I love a good story and I particularly love reading memoir. For good reasons—ethics and human subjects protections—we’re not allowed to experiment on ourselves, but that wasn’t always true. In the scientific lore, there is a story about John Hunter, a scientist who gave himself syphilis in order to prove that gonorrhea and syphilis were the same disease, which unfortunately, they are not. He missed a key step in Koch’s Postulates—to isolate and grow the organism in pure culture before introducing it to a healthy subject—and he wound up giving himself syphilis *and* gonorrhea. (Burn.) However, he didn’t know that; he thought he’d proven his hypothesis and his bad methods led to bad results and bad conclusions. His foible set gonorrhea research back a few decades. (5)

Even though many of my earliest memories are memories of panic, it took decades to find a therapist who could properly diagnose and treat specific phobias like germaphobia. Perhaps my distress wasn’t concerning because it was mostly internal. No one could feel what I was feeling in my body when I was panicking, and I was too ashamed of my fears to vocalize them because I knew they made me different from other kids. So, no one knew that after reading a book about an Egyptologist who died after entering King Tut’s tomb, I was too scared to fall asleep because I was worried I’d gotten Tutankhamen’s Revenge from reading about it, as if the pages of the library book were imbued with a viral enchantment. Nor did anyone know how many times I scrubbed my hands after picking up a keychain at Claire’s with a rust-red smear on the price tag that looked like dried blood, an unfortunate occurrence after a sidebar on HIV/AIDS and Ryan White had just appeared in my Weekly Reader. Or that I didn’t want to go to the fourth grade Pioneer Day because part of the event took place in the gym, where one of my classmates

puked at the last all-school assembly, and every time I thought about the gym, I felt nauseous all over again and had to lie down.

As an adult, these stories are almost funny for their naivety, except that my suffering was real. I can still feel the fear, anger, frustration, the flush, and the nausea I felt in those moments. I ache for the child who kept her worries to herself because she was afraid she would be laughed at or made fun of for having them and couldn't bear to be made fun of by the adults, too. But it was worse to be told by the adults—teachers, therapists, doctors—that there was nothing wrong with me when I knew there was and I desperately wanted help.

Amid a viral pandemic, I finally got the diagnosis. When my therapist recognized my anxiety as phobias, he didn't call me "spirited" or "stubborn." He didn't say that I was "seeking attention" or being "manipulative." He acknowledged that my distress was real and he told me there were well-studied, effective treatments. For once, my tears were from relief.

Maybe it's not surprising that a germaphobe found herself working in a microbiology laboratory. After all, my bugs stayed where I put them: on a plate or in a test tube. In the laboratory, I had more control than I would ever have in the "real world," where I was a cough away from influenza or a doorknob away from norovirus. Plus, I could use what I learned in my classes or in the laboratory to quell my fears. For example, after I learned that Salmonella is most infectious as the multinucleated elongated filaments that form in peanut butter, I stopped worrying so much about cooking chicken. (Surprisingly, I kept eating peanut butter.) Instead of worry, I felt intrigue when pink films of Serratia grew around the bathtub drain or a block of tofu sat in the fridge too long and gave off the unmistakably sweet, grape-like scent of Pseudomonas. Knowledge gave me the power to live more normally.

I haven't been at the laboratory bench in almost a decade. I didn't leave microbiology because of my phobia; I left because I realized that I wasn't a numbers person, I was a words person and a people person. Sometimes I miss pipetting and I really loved doing mini preps, but I'm happier contributing to science behind the scenes, where I'm often writing about science.

The person who got me excited about scientific inquiry and discovery was Professor Douglas Rouse who taught Plants, Parasites, and People at UW-Madison. We learned about *Phytophthora infestans*—the agent of potato late blight—through the story of the Irish potato famine. We learned that a fungal pathogen caused the hallucinatory trips known as St. Anthony's fire because it produced lysergic acid. We learned that modern farming methods were transformed by a bacteria, *Bacillus thuriengensis*, and we went to the laboratory to learn how to transform cells and create recombinant DNA like the scientists who created Bt crops. By the end of the semester, I changed my major to zoology, but looking back, I don't think it was the science that I liked as much as I liked the way Dr. Rouse taught science through storytelling.

While I waited to hear from my mom, I kept catastrophizing but wondered if I was overreacting. My niece said she had been coughing all day, but I only heard her cough once at the party. She had sounded a little congested, but maybe that was my imagination.

But it wasn't my imagination. When my mom answered the phone, she said that my niece spent a fitful night coughing and tested positive for COVID when she woke up. I admitted that the first thing I did when I woke up was pop a zinc lozenge, even though it was probably useless. "I feel like a sitting duck," I said. My mom felt bad that the girls wanted so much of my attention at the party and said that if anyone was sure to get COVID, it was me.

I took a rapid test when I got off the phone. I expected it to be negative, but nevertheless, my heart raced and my palms sweated while I waited fifteen minutes to check the result. After long-COVID and brain fog, I was most afraid of the sensation of not being able to breathe and not being able to tell if it was from dyspnea or panic. Early in the pandemic, people went to the emergency room with shortness of breath and got diagnosed with anxiety, not COVID, which made sense to me. It's hard to discern "real" symptoms from panic when they feel the same. The test was negative, but I wasn't relieved because it did not seem like a matter of *if* I tested positive for COVID, but a matter of *when*.

On Sunday evening, my throat started to hurt. I hoped it was from the zinc lozenges because I didn't want a sore throat from COVID. I had read that sore throat was associated with long-COVID. I also didn't want anosmia because of its connection to inflammation of the brain. The data that once quelled my fears, now fueled them.

On Monday morning, I re-tested and as soon as the buffer crossed the test line, I saw it. It was faint, but it was there: I had COVID. I texted my mom a picture of my rapid test and she sent one back. Her test line was thicker, a rich purple where mine was pale pink. My heart pounded, but I felt resigned. There was no way left but through.

I never expected to be the person sitting at home recording her COVID symptoms and trying to spin the experience into a publication. Nor did I expect to be monitoring an outbreak within my own family, waiting on the edge of my seat for the slow reveal: who was going to get COVID, when, and how? The slow reveal is a favorite device of mysteries and thrillers for a reason: it keeps readers turning the page, and I was enthralled.

There were seven of us at the party. The original strain of COVID had an R0 of about 2.5, meaning that the average person with COVID spread it to two and a half other people. Delta had an R0 of about 7. Omicron BA.5 was thought to be even more infectious.

A few hours after my mom and I tested, we had another positive and a presumed positive. On Tuesday, four days after the party, we had our sixth positive. On Wednesday, we had the final. Seven of seven were infected, for an attack rate of 100%.

It was almost laughable: entire family gets COVID at an indoor birthday party. Just for fun: guess who blew out the candles on the birthday cake? (Cringe.) Thankfully, no one developed symptoms that couldn't be managed at home.

I should have known that getting COVID would be the ultimate exposure, but the truth is, I hadn't been able to see past my fear. Once I had COVID, I wasn't surprised that my baseline anxiety level hit the lowest point in years. Here's why: my anxiety is anticipatory. I'm afraid of what *might* happen. My anxiety exists in the in between, in possibility, in imagined futures; it flourishes when I have the *perception* of control. As soon as I had COVID, I lost the ability to prevent myself from getting it. I had it. The COVID train was barreling down the track and I was going wherever it was, and there was no longer a way for me to will it otherwise.

In the months before I got COVID, I watched my friends' attitudes change dramatically after getting it and I watched them return to the activities they paused in early 2020. If I'm being honest, I resented them for it. But now, I get it. The thing they feared happened; it was no longer unknown. Now, my life no longer revolves around avoiding COVID. I still think about it and the future is obviously unknown, but COVID is no longer the predominant factor in my decision-making.

While I am relieved to have a bit more normalcy in my life and not be locked in the grip of panic, I would not have chosen to get COVID. I sincerely wanted to be one of the few people who survived the pandemic without ever getting COVID. (Could I call myself a germaphobe if that weren't true?) That said, my message to fellow germaphobes is not "Go get COVID," it's "Seek treatment." Life is *so much better* on the other side of exposure response prevention. Find a therapist who has experience treating panic disorders using ERP. Start small. Let yourself panic. Keep doing the exposures. Graph your peak anxiety scores over time and let the data speak for itself.

It shouldn't come as a surprise that I wonder how this ending would have been different if we had celebrated my dad's birthday in the backyard or if I had worn a mask, the two factors that were within my control. One N-95 would have been a nice variable in our accidental experiment. An *n* of one doesn't mean much unless *you* are the one and *the one* stayed healthy. I'm sure the four family members in that Ethiopian case series who didn't get botulism were relieved, just like I'm sure John Hunter sought to be the hero, not the villain of gonorrhoea research. There are some stories that no one wants to be written into, like the classic COVID birthday party superspreader event, but alas. In memoir, you don't get to choose how the story ends, only where to call it.

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