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Finding My Future Beyond the Bench

Taking part in California's interdisciplinary research on Valley fever changed the way an early-career scientist conducts research, prioritizes community collaboration, and engages with policy.

For the last five years, I've done research on Valley fever as part of a multidisciplinary lab at the University of California, Merced. This experience has convinced me that for my work at the bench to pay the greatest dividends for society, my future must also include working in direct conversation with community members, clinicians, industry, and policymakers.

Valley fever is a respiratory disease caused by the *Coccidioides* soil fungus that is endemic to most of the American Southwest, including Arizona and California's Central Valley. People who work with or around soil in agriculture, construction, landscaping, and even solar farms are particularly at risk. People suffering from Valley fever experience symptoms similar to a cold or the flu—cough, chest pain, fever, and body ache—which can make swift and accurate diagnosis difficult. Valley fever is estimated to kill about 200 people per year, though the true number is probably higher. In California's Central Valley, infection rates are 90 times higher than in the northern part of the state, a disparity that is exacerbated by the region's low ratio of physicians to patients.

The heavy burden of the disease on the Central Valley's political, social, and economic landscape created the impetus for an unusual interdisciplinary collaboration between clinicians, researchers, community members, educators, and local policymakers. In 2018, two state legislators from the Central Valley city of Bakersfield, Vince Fong and Rudy Salas, proposed a $7 million bill to research and raise awareness of the disease. The bill included $3 million for the University of California (UC) to share funds between major research groups, allowing traditional competitors to become collaborators.

Working together, seven labs from five UC campuses determined how to split up the total UC funding allocation. Katrina Hoyer, an assistant professor whose lab does research on Valley fever and immune dysfunction within the Molecular and Cell Biology Department at UC Merced, was active in advocating and building support for the initiative. "The field has always been welcoming," she told me. "But after the increased state funding, it opened up collaborations with more individuals and brought in more diverse voices that can bring the unique perspectives and innovations that are critical for rapid change."

I first experienced this inclusive dynamic as a grad student when I attended a Valley fever health symposium hosted by the Bakersfield Disease Group in 2018. As I took my seat, I noticed that the roughly 70 attendees included folks in pressed suits, people in T-shirts and jeans, as well as some in work clothes with mud still clinging to their boots. The event began with updates from local elected officials regarding legislation that was in the works to promote better public health education through schools and medical offices. Presentations from clinical and biomedical researchers were followed by questions from the audience about disease statistics and how experiments were conducted. After that, Valley fever survivors shared their personal stories about the difficulty of getting a diagnosis and dealing with medical bills. One survivor spoke about how they could barely sit up most days and rarely got out of bed.

Following the symposium, the presenters and audience spent an hour together in a dedicated space to collaborate—a practice that makes communication the norm, rather than something individuals need to seek out. During this time together, community members made recommendations to policymakers, while researchers explained where more funding was needed. Clinicians took note of barriers preventing community members from accessing health care and talked with researchers about connections between lab data and clinical observations.

A month later, I joined Hoyer's lab as her first Valley fever graduate student researcher. The symposium was on my mind as I outlined my thesis and planned experiments. Now that I had seen firsthand how the disease affected individuals in the Central Valley, the magnitude of what I wanted to accomplish weighed on me: I wanted my work to make a tangible impact on the community I resided in, and I wanted it to happen during my graduate career, not decades down the line.

At the Coccidioidomycosis Study Group Meeting in 2019, I came to realize how the collaborative environment could make me a more effective researcher. I gave my first presentation on preliminary data about the immune responses that follow inhalation of the fungi. Afterward, a doctor from UC Davis's Center for Valley Fever asked me how I identified and defined various immune cell types in the study and if this matched existing clinical definitions. Whether it was the conference jitters or just new-grad-student nerves, I flubbed my answer and he reasonably doubted my data.

The doctor followed up later to discuss the study at length with Hoyer and me, and kindly contextualized his question: if my immune cell definitions did not translate to the clinical field, it would limit the applicability of my data to health care professionals working directly with patients. This interaction with a senior clinician in my field taught me that conducting "good science" meant more than replicating good examples; it meant making science that others could immediately use.

I had originally thought of my data as something only scientists could use and appreciate. Until those data culminated into a "big enough" or "significant enough" body of knowledge, they would remain too specific and esoteric for anyone else to find useful. Getting this review from a peer in a collaborative space taught me to be a scientist critical of not only what questions I was asking, but also how I was interpreting and presenting the answers. My work could have much more reach and impact if I used language that was immediately accessible to clinicians and community members. This lesson was invaluable, and I don't think it would've been possible if it weren't for the collaborative learning fostered by the Valley fever community.

The study of Valley fever is characterized by a sense of urgency—not only are more people moving into regions where the fungus is endemic, but the fungus itself is expanding its range. When I first entered graduate school, I was convinced I would remain in academia for my career, but thinking about the increasing spread of Valley fever made me eager to do more. Seeing my impatience, Hoyer steered me toward places where I could provide direct service to the community. Although I was only required to give two public talks

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Illustration by Shonagh Rae

for my graduate program, I ultimately gave about 15, which included workshops on an introduction to fungi with excited elementary students, research updates with community educators, and policy presentations to local elected officials.

The collaborative community around Valley fever initially inspired my leap into the gap between science and policy, in part because my science training made me keenly aware of the time, effort, and resources needed to take an idea from experiment to real-world application. Tests and treatments may be years away, so I've come to believe that the most pragmatic thing I can do in the meantime is to be involved in science communication and policy.

One policy takeaway from Valley fever work is that funders have the potential to transform research impact by involving diverse communities in the process of deciding what research is conducted. The 2018 Valley fever legislation not only incentivized labs to collaborate rather than compete; it also opened up funding so that smaller, less prominent labs could bring their ideas to the mix. "The Valley fever funding has been a game changer for us. It's brought in so many new, young voices that in turn have brought their expertise and perspective to an otherwise small field," Hoyer told me.

Policymakers can take this further and look for ways to ensure that disease research stays attuned to community needs. In addition to promoting collaboration, allocating designated funding for particularly serious problems can promote more rapid and efficient collaboration between research groups, as well as between researchers and communities. This could aid research on topics similar to Valley fever in other ways. Today's principal investigators (PIs) spend a lot of their time writing grants and are often pulled away from the bench. Making funding for targeted public health research more secure could ensure that PIs spend more time in the lab and less time seeking funding. This would have the additional benefit of enabling PIs to pass on their knowledge to the next generation of scientists rather than mentoring from a distance.

For their part, researchers can begin to build deliberate space for public discussion into conferences, meetings, and even at their home institutions. Dedicating time to forming collaborations and seeking expertise and advice could elevate research progress and innovation. Today, collaboration is still largely driven by individuals who put the time into poring over conference brochures and reaching out to colleagues in the hope that their schedules align long enough to accommodate a productive conversation. Collaborations and discussions often get their start in quick chats in hallways or over lunch between events, tending to bleed from conference spaces into social spaces. Researchers' work would benefit from creating "sacred" shared time instead of being hurried and rushed in between other obligations. And rather than gearing these social spaces only toward researchers and their work, industry and policymakers should be invited as collaborators rather than merely as vendors or passive listeners. Intentionally creating dedicated space for collaboration—both in terms of a physical area to meet and a time commitment on meeting agendas—would maximize interactions.

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As both Valley fever and COVID-19 have demonstrated, infectious disease can affect all parts of daily life; the response must also encompass research, education, policy, health care, manufacturing, distribution, and the broader community. The sheer scale of the task implies the need for broad and diverse communication and collaboration across all parties involved, and the research community should not wait passively for outside institutions to take the lead. In the spirit of good science, I challenge my scientist colleagues to do more to implement best practices that increase collaboration while fostering dialogue between traditionally separated parties. The future of science lies far beyond the bench.

Anh Loan Diep *is a 2022–2023 California Council on Science and Technology Science & Technology Policy Fellow. This article is copublished in collaboration with Zócalo Public Square.*