

Nathan Wolfe, Epidemiologist

Emerging Explorer

Where is the next disease pandemic lurking? Will it find us ... or will we find it? Dr. Nathan Wolfe fights worldwide epidemics with an innovative, untraditional approach—he's working to create an early warning system that can forecast and contain new plagues before they kill millions.

Wolfe compares the system to compounding interest. "As you go further out in time, you save more and more lives. If you compound a chronic pandemic over decades, you begin to see the enormous impact viral forecasting could have."



Photograph by Tom Clynes

He adds: "Today, global disease control is in the stone age." Scientists typically respond and react after viruses have already spread. Once a major outbreak starts, stopping it is virtually impossible. Yet no global monitoring system exists to identify and control diseases as they emerge. Wolfe and his team seek to do just that—implement a plan to detect the next HIV, Ebola, SARS or West Nile virus at the very point it will most likely originate.

His survey of diseases that have historically had the greatest impact on humanity revealed that most started with animals. Based on this, he created a global network of field sites in viral hot spots where people are highly exposed to animals and most at risk for early infection when those viruses leap from animals to humans. He works with local villagers and scientists to conduct detailed studies of Cameroon bush meat hunters, Chinese wet-market workers and butchers, wildlife sanctuary employees, Malaysian bat hunters, and others.

"When I started this work in 1999," Wolfe recalls, "we were particularly interested in retroviruses because we knew they had the potential to cause devastating pandemics like HIV. But we didn't have a good idea of the frequency with which they were crossing over from animals to humans. Our results were shocking. We discovered that cross-species transmission wasn't rare; it was happening on a regular basis. What's more, the current mechanisms for detecting it were wholly inadequate."

Wolfe and his colleagues work to spot viruses as soon as they surface by collecting and cataloguing blood samples, surveying wild animals, scanning urban blood banks, and documenting the transfer and distribution of disease. His data, gleaned from a dozen field sites and analyzed by more than 15 laboratories worldwide, has already led to the discovery of several previously unknown retroviruses, notably simian foamy, a primate virus with which hundreds of thousands of people worldwide may be infected.

Today, globalization and transportation create unprecedented opportunities for disease to spread exponentially. "You can travel from a remote village in Congo to New York or Tokyo in 24 hours.

From the perspective of infectious agents, the whole world is now one village. Individuals infected almost anywhere have the potential to seed pandemics everywhere," he says.

"As a species, I think we have no choice but to try and forecast pandemics. We've put huge resources into predicting tsunamis, hurricanes, and earthquakes. HIV/AIDS is like an earthquake that's lasted 30 years and touched every country on the planet. We have such incredible capacity to think about the future, it's time we used it to predict biological threats. Otherwise we'll be blindsided again and again," he says.

"There's this entire, unknown microbial world waiting to be discovered," Wolfe stresses. "If an alien visited Earth, they would take some note of humans, but probably spend most of their time trying to understand the dominant form of life on our planet—microorganisms like bacteria and viruses.

"For the first time in history we have the tools necessary to explore this incredible diversity of organisms. It's really the dawn of a new scientific era. As we try to detect viruses that can do great harm, we could also discover the next generation of vaccines and cures. If we can provide even a few months of early warning for just one pandemic, the benefits will outweigh all the time and energy we're devoting. Imagine *preventing* health crises, not just responding to them."