

Daniel Lucey, M.D. '81: Outbreak expert

By Laura Stephenson Carter

For more than 30 years, Daniel Lucey has been chasing things you wouldn't want to catch.

In the 1980s, he took care of patients in San Francisco who were suffering from a mysterious disease that would become known as AIDS. He was in Washington, D.C., when an anthrax scare closely followed the terrorism attacks of 9/11, and he was on the front lines of the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003. Since 2004, he has been working with colleagues in Thailand, Vietnam, Indonesia, Hong Kong, and Egypt on the H5N1 avian influenza virus ("bird flu"), and he is now investigating other emerging infectious diseases, such as the fatal Nipah virus.

Even as a medical student in the 1970s, Lucey was already interested in international work. He went twice to Soweto, South Africa, recalls Joseph O'Donnell, M.D., '71, a Geisel professor of medicine. O'Donnell taught him in an introductory course and was his attending physician when Lucey did a rotation at the VA Medical Center in White River Junction, Vt. The two have stayed in touch over the years. Today it's common for medical students to spend time abroad, O'Donnell says, "but in those days it wasn't."

Another medical student—John Lawrence, M.D., DC '76, Geisel '80—was influential in Lucey's decision to travel to Baragwanath Hospital in Soweto. Lawrence, now a pediatric surgeon at the University of Vermont, had worked at the Soweto hospital and continues to do international work today. "I thought it was productive and educational for me and encouraged others," Lawrence says, adding that there were "lots of chances for hands-on experience."

Lucey was eager for that kind of experience. He had grown impatient with the memorization and classwork of the first year of medical school and was thrilled to have a chance to work directly with

Born: Castle Air Force Base (now closed), in Merced County, Calif.

Grew up: All over the U.S., including Florida, Ohio, Virginia, South Carolina, Pennsylvania, and North Dakota

Education: Dartmouth College '77 (B.A. in psychology); Geisel School of Medicine at Dartmouth '81 (M.D.); Harvard School of Public Health '88 (M.P.H. in tropical public health). Lucey was the first person in his extended family to attend college.

Training: University of California, San Francisco (residency in internal medicine); Harvard Medical School (fellowship in infectious diseases)

Military service: Attending physician at U.S. Air Force's Wilford Hall Medical Center, San Antonio, Texas (1988-1990); viral immunologist doing research on HIV at Walter Reed Army Institute of Research (1990-1992)

Children: Alexander (Dartmouth College class of 2012); Abraham (University of St. Andrews in Fife, Scotland, class of 2015)

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patients. "The summer in Africa transformed me," he says. When he returned for his second year, he was happy to learn whatever the faculty wanted to teach him. "Learn about the liver? I had had patients with liver problems," he says.

But what captured Lucey's imagination the most were infectious diseases. The hospital in South Africa provided "my first exposure to infectious disease, and it heightened my interest," he says.

In the 1980s, after medical school, Lucey worked with AIDS patients in San Francisco, Boston, and San Antonio. He loved the clinical work, but he also wanted to understand the mechanisms of AIDS and other infectious diseases. So in 1993, he went to a lab at the National Institutes of Health (NIH) to study the basic biology of HIV. Lucey was "one of the clinicians who understood exactly how

the virus affected the immune system," says renowned AIDS expert Henry Masur, M.D., DC '68, chief of critical care medicine at the NIH Clinical Center. Lucey "could tell the basic scientists what they needed to focus on."

In 1996, Lucey took his expertise to the Center for Biologics Evaluation and Research at the Food and Drug Administration (FDA) to work on biodefense vaccines, as well as vaccines for hepatitis A and B, Lyme disease, and HIV. He was a "clear and influential voice at FDA," Masur says, helping the agency to "recognize that they needed to make faster decisions than in the 1980s."

It wasn't long before Lucey turned his attention to biopreparedness—what to do in the event of a deliberate release of an infectious agent. After 9/11, Lucey warned officials that "bioterrorism was going to be the second type of attack," he says. As chief of the infectious diseases section at Washington Hospital Center in Washington, D.C., he helped develop protocols and convinced the pharmacy director to order a lot of antibiotics. They arrived on Monday, September 17. "We put them in individual vials for individual patients and stockpiled them," Lucey says. The large order almost cost Lucey his job.

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But at about the same time, letters containing anthrax spores were mailed to several media outlets. In early October, contaminated letters were also mailed to two U.S. senators. The attacks killed five people and infected 17 others. Thanks to Lucey, Washington Hospital Center was prepared. “When the letter was opened on Capitol Hill, we had our antibiotic stockpile and many people came to us thinking they might have anthrax,” Lucey says. The hospital also had written protocols for how to respond to the threat.

Soon after the anthrax attacks, Lucey developed a reputation as the go-to person for biopreparedness, a field that was in its infancy. “Dan is often the person called when there is a suspected outbreak,” Masurel says. “He has great expertise [and] bridges a lot of different worlds and has the knowledge to talk to the different groups,” including clinicians, federal and public health officials, and professional societies.

Recently, Lucey put his expertise to good use as an infectious disease specialist on a 16-member Institute of Medicine (IOM) committee that outlined how to prepare for a possible anthrax attack. Lucey was charged with looking into questions that would form the basis for policy decisions, such as how fast inhaled anthrax makes people sick and how quickly the disease can kill a person if not treated immediately.

Two incidents provide much of the current knowledge about anthrax attacks—the 2001 attacks in the U.S. and a 1979 outbreak in Russia. In the attack in Russia, dozens of patients were felled by inhalational anthrax that was accidentally released from a military facility. “We don’t know with accuracy how many,” Lucey says. “All of the clinical records were confiscated and never released by the KGB.”

The 1979 anthrax outbreak was in the city of Sverdlovsk (now called Ekaterinburg), about 850 miles east of Moscow. The Soviet government initially claimed that the outbreak was really intestinal anthrax that came from tainted meat. It wasn’t until 1992 that the government admitted that anthrax spores had been accidentally released from a military facility and allowed a team of American scientists to investigate. Russian pathologists and clinicians, working with some members of the American team, published a paper in 1993 in the *Proceedings of the National Academy of Sciences* describing the 1979 outbreak as due to inhalational anthrax. In 1994, the Americans and Russians jointly published a paper in *Science*.

Lucey used to believe that it was sufficient to read published re-



Daniel Lucey has been studying infectious diseases since medical school and is an expert on preparing for and responding to outbreaks.

search to get a complete picture of scientific findings. But by interviewing the scientists who wrote the papers, the Russian clinicians who treated patients during the 1979 outbreak, and the pathologists who did the autopsies, he learned more than what the literature had to offer. He also discovered that the two Russian pathologists, whom he met on a visit to Russia in November 2011, had bravely submitted three manuscripts in April 1992 to a Russian pathology journal before the American team ever arrived. The papers were translated into English in January 2012.

When Lucey was in Russia, he met a pulmonologist whose job it had been to remove the hemorrhagic fluid out of the area around the lungs of patients during the outbreak. Draining the fluid gets rid of the bacteria and the toxins produced

by the bacteria. After draining the fluid, the Russian physicians did something that Lucey had never heard of: they injected the antibiotics directly into the space around the lung and not just into the arm. “I think [injecting antibiotics into the lung area] is a fascinating idea,” Lucey says, “potentially something that we should consider doing in the future.”

Lucey had a lot of questions for the pulmonologist. “Basically it was clinician to clinician,” he says. He asked questions about the size of the needle the pulmonologist used, where it was positioned, and how the pulmonologist knew how much fluid there was. The pulmonologist pulled out a piece of paper and sketched a view of the lung showing Lucey how the clinicians knew where the fluid was and how the needle was inserted.

Antibiotics can kill anthrax bacteria, but they are powerless against the fatal toxins the bacteria produce. There are two antitoxins in the Strategic National Stockpile maintained by the Centers for Disease Control and Prevention, but neither has been approved by the FDA.

This past January, the IOM issued its report, recommending where and how anthrax-preventing antibiotics should be stored as part of preparations for a large-scale attack.

Lucey has also traveled recently to Bangladesh to get a better understanding of the Nipah virus, which is so deadly that even health-care workers are afraid of it. The outbreak in the 2011 movie *Contagion* is based on the virus, which currently has no treatment or vaccine. Nipah virus outbreaks were initially identified in 1998 to 1999

continued on page 52

Grand Rounds

continued from page 17

patient who has previously had a c-section, and the high c-section rate becomes understandable.

Solving this problem will not be easy. Efforts to enact tort reform have so far not been successful. It is my hope that patient and provider education regarding elective early inductions will be successful. Changes in how obstetric providers collaborate to cover the labor floor are beginning to catch on, as is the use of laborists, hospitalists specializing in obstetrics. Simulation training in lost hand skills could help if young providers also received encouragement and mentoring from more experienced obstetricians. Hospitals should recognize that a c-section is a major operation with potentially severe complications and added costs.

It is worth the effort to try to lower the c-section rate. Even a small percentage change in the primary c-section rate could lead to significant progress as it would help avoid the repeat procedures that currently account for one-third of these all-too-common surgeries. ■

Alumni: Lucey

continued from page 49

in Malaysia and Singapore and then found multiple times in Bangladesh and nearby parts of India. In the 1998 to 1999 outbreaks, the virus spread from bats to pigs to humans. But in the dozen or so subsequent outbreaks, the virus spread from bats to humans. Under the right conditions, humans can also transmit it to each other.

"It's us against the virus," O'Donnell says of Lucey's mission. And even after three decades of chasing, Lucey is far from ready to slow down.

"I like to travel and go to places and talk to doctors, whether it's [about] anthrax, or bird flu, or pandemic flu, or dengue," Lucey says. "It's taking care of patients, and that's something that's universal." ■



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