

FACTS & FIGURES

Life-and-death matter

A rough, tough cough: Was it, or wasn't it, the whooping kind?

In the spring of 2006, a number of DHMC employees began exhibiting classic signs of pertussis, or whooping cough—runny nose, watery eyes, a slight fever, and a severe, repetitive cough that can sound like a “whoop” as the person gasps for breath. The disease can even be fatal for infants or vulnerable adults, such as those with cystic fibrosis. (The vaccinations that protect children from pertussis, diphtheria, and tetanus don't begin until two months of age, and the protection wears off by adulthood. And until very recently, there was no adult booster.)

Dr. Kathryn Kirkland and her DHMC infection control team sprang into action: screening and testing almost 1,000 employees (16% of the staff); ordering ill people to stay home; giving prophylactic antibiotics to 1,300 contacts of suspected cases; and vaccinating over 4,500 people (72% of the staff) in a three-day period. There were 134 suspected cases, with 98 of them considered positive (33 definite and 65 indeterminate) based on a molecular test called polymerase chain reaction (PCR).

Cold: “Once you conclude pertussis is circulating, then any respiratory symptom has to be considered as possibly suspect pertussis,” Kirkland explains, “because early in the first week of the illness, the symptoms are just cold symptoms—runny nose, runny eyes, congestion. That’s



1425

Year the word “palliative” (meaning “that relieves the symptoms of a disease or condition without dealing with the underlying cause”) was first used, according to the *Oxford English Dictionary*

1967

Year of the founding, by Dr. Cicely Saunders, an English physician and nurse, of the world's first hospice

1967

Year the phrase “palliative care” (meaning “care for the terminally ill and their families”) was first used, according to the *Oxford English Dictionary*

1980

Year Dame Cicely Saunders was knighted by the British Empire

2003

Year Dr. Ira Byock was named director of palliative care at DHMC

9,813

Number of deaths in New Hampshire in 2001

193

Number of new patients receiving palliative care at DHMC in 2002

602

Number of new patients receiving palliative care at DHMC in 2006

30%

Percentage of U.S. hospitals with a palliative-care program in 2006

SOURCES: OXFORD ENGLISH DICTIONARY, NEW YORK TIMES, NEW HAMPSHIRE BUREAU OF HEALTH STATISTICS DATA MANAGEMENT, MEDLINEPLUS, DHMC

the time at which people are the most contagious.”

Then, months after the outbreak ended, DHMC officials announced that it might not have been pertussis after all. Follow-up testing failed to confirm the PCR results. The 27 specimens sent to the state health department for traditional culture testing were negative, and those sent to the Centers for Disease Control for PCR yielded just one positive result.

Diagnosing illnesses like pertussis is complicated, and positive results from molecular tests are hard to confirm. A culture test is still considered the gold standard, though it is less sensitive and may not detect individuals with mild infections.

Gel: The traditional way of “identifying a bacterial illness is to actually grow up the bacteria,” says Dr. James AuBuchon, chair of pathology at DHMC. “You take a sample from whatever site would be infected with the bacterium, like the throat—nasopharynx in the case of pertussis. That swab [is] then smeared on an agar gel that has nutrients that allow the organism to grow. And the organism, if present, would multiply and ultimately would become visible.”

An additional problem with culture testing is that it takes several days before the bacteria have multiplied enough to be detectable. So clinicians have begun relying on fast molecular tests. In a situation like DHMC faced, fast testing is essential to protect vulnerable patients.

“We typically do about 200 [pertussis tests] a year and we did



Kathy Kirkland, left, and Elizabeth Talbot found a silver lining in a pertussis scare.

1,300 in a month and a half,” says Dr. Gregory Tsongalis, DHMC’s director of molecular pathology. “We were getting frequent pleas from the leadership to turn these tests around as quickly as possible, because so many people presented for care that we were in danger of not having enough staff to run the institution.” Luckily, 90% of the screened employees tested negative for pertussis. The other 10% had either equivocal or positive findings and so had to be treated. “Equivocal results are typically associated with individuals who have low levels of infection that may not be clinically significant,” Tsongalis explains.

PCR tests are highly sensitive and can detect tiny numbers of bacteria even if the patient has no active infection. But they may be positive in cases where older methods do not detect disease, and the import of a positive result is not always clear.

“In any of these PCR tests you start out with what’s called a primer—that is, a short length of DNA that is meant to mimic the DNA that would be found in the bacterium you’re trying to identify,” says AuBuchon. The bacterial DNA binds to the primer DNA, and the enzyme systems

“identify this coupling and then produce more DNA that ultimately gets amplified and identified.” DHMC’s assay has 50 to 100 copies of the DNA target per bacterium. The CDC used an assay with only one target per organism. “So,” says AuBuchon, “it was easier for us to find [pertussis] because of the 100-fold natural amplification.”

Pseudo-epidemics of pertussis have occurred elsewhere, including Children’s Hospital Boston; definitive tests failed to confirm the illness there, too. The molecular pathology community, which has used PCR-based pertussis testing for over 10 years, is working to further develop the tests and their interpretation. For example, DHMC is “sending blinded, unknown samples of pertussis . . . to 30 labs around the country,” says Tsongalis, who is president-elect of the Association of Molecular Pathology.

Screen: DHMC learned a lot from the experience. “We were able to aggressively screen our health-care worker population,” Kirkland says, giving her “hope for the potential for controlling the next unknown epidemic, whether that’s pandemic flu or the next SARS or whatever.”

Laura Stephenson Carter

Around the world in 80 (or so) minutes

If “geography class” conjures up images of memorizing capital cities and principal products, think again. A course called Global Health and Society is one of the popular offerings of Dartmouth College’s Department of Geography. This winter, some 50 Dartmouth undergraduates signed up for the course, which is taught by Drs. Lisa Adams and John Butterly, members of the Medical School faculty. An outgrowth of Dartmouth’s Global Health Initiative, the course explores the epidemiology and social impact of infectious diseases in the developing and developed world. Think AIDS and Ebola instead of Cairo and cotton.

Adams’s own interest in international health had its roots at DMS, where she earned her M.D. in 1990. She did a primary-care elective at a Navajo reservation in Tuba City, Ariz. Then, during her residency at Harvard’s Cambridge Hospital, she did an elective at a Navajo reservation in Shiprock, N.M.

“That started the spark,” says Adams, who at the time thought that a career with the Indian Health Service was probably in her future. She loved working in different cultures and even intended to learn the Navajo language. But later she decided to explore international health. A third-generation Albanian, she managed to set up a six-week elective on the cardiology unit of a hospital in Albania.

“That was the life-altering experience. I said, ‘This is what I

want to do,’” she recalls. Soon after completing her residency in the mid-1990s, she worked on tuberculosis-prevention projects in Kosovo, Albania, Bulgaria, South Africa, Tanzania, and other countries. Then for a couple of years she ran a TB-control program in New York City, while continuing to do international consulting work.

Trips: Along the way, she reconnected with DMS faculty doing international health work. In 2003, she was hired as the coordinator of Dartmouth’s Global Health Initiative and as the program director of DMS’s DarDar pediatric HIV treatment program in Tanzania. She makes several trips there each year and continues to consult on international TB projects, too.

She teaches at DMS as well, including an elective that “encouraged students to think beyond the health concerns of the United States,” says second-year medical student Dan Kaser. “Dr. Adams is a dynamic teacher,” he adds. She also works with the Dartmouth International Health Group, helps bring in speakers on international health topics, and mentors students who travel abroad.

In the undergraduate course, “we focus on infectious diseases, so [students] . . . understand the key causes of global morbidity and mortality,” Adams explains. The topics on the syllabus range from the “micro”—basic concepts of epidemiology—to the “macro”—the political, economic, and ethical aspects of provid-