

# Old Foes and New Adversaries

Infectious diseases may come and go,  
but they rarely stay gone

By Marc Kennedy  
special to WMJ

In the 1960s, health care professionals were extremely optimistic about treating and preventing infectious diseases. Polio, smallpox, tuberculosis, malaria and diphtheria—all were virtually eradicated in the United States. The surgeon general declared in 1967 it was time to “close the book” on infectious diseases; the war was over and modern science had won.

Hardly.

Fast forward to 2003. New enemies are massing at the borders, literally. Global travel, climactic changes, antibiotic abuse, land use patterns, microbial adaptation and other factors have opened a Pandora’s Box of emerging diseases: Sudden Acute Respiratory Syndrome (SARS), monkeypox, AIDS, hantavirus, Lyme disease, just to name a few. Plus old foes, ostensibly erased from the map, began to reappear: tuberculosis (TB), dengue fever, malaria, diphtheria and cholera, among many others.

“These are only the ones that make the press,” said George Mejicano, MD, Associate Professor of Medicine at the University of Wisconsin Medical School, who serves on various committees at the Centers for Disease Control and Prevention (CDC) as well. “This is only scratching the surface.”

Holding his hands a yard apart, Mejicano added, “The list of emerging and re-emerging infectious diseases that threaten human health is this long. And it’s growing.”

Three major categories

There are three major categories of emerging diseases, according to Mejicano, who is also Assistant Dean of Continuing Medical Education and teaches medical students about emerging infectious diseases and lectures to health care professionals: new agents, microbial drug resistant agents, and resurgent agents.

“A new agent is not usually a totally new disease,” he explained. “New DNA sequences rarely happen.”

Rather, a new agent is actually an old disease that has developed a new type of virulence; it has extended its traditional range geographically like West Nile virus; or moved from its host species, such as HIV or monkeypox.

Antimicrobial drug resistant agents are infections that are plaguing hospitals, clinics and nursing homes. Overuse of antibiotics beginning in the 1950s helped produce a strain of staphylococcus aureus that was immune to penicillin. In the 1980s, to combat this form of *S. aureus*, scientists developed methicillin. In turn, this led to MRSA (methicillin-resistant staphylococcus aureus), which prompted a further escalation of the shot-in-the-arms race and the development of vancomycin. It was only a matter of time before nature leapfrogged science: enter vancomycin-resistant *enterococcus* (VRE) in 1997.

“VRE is the poster child for drug resistance,” said Mejicano. “We’re drowning in VRE in tertiary care hospitals in the United States. And soon the smaller community hospitals will be as well.”

The resurgent agents are the bugs most likely to be linked to socioeconomic and human activity, either through travel, exposure to exotic animals or encroachment or loss of habitat. Prime examples include cholera and West Nile virus.

“The El Tor cholera pandemic started in Peru in 1991,” said Mejicano. “It managed to cross the Andes and move into Brazil, then up the coast to Central America. How did it end up getting from Cartagena to the Gulf of Mexico? Merchant ships after they empty their cargo take on seawater for ballast—water from the port where they just delivered cargo, water that

---

contained cholera. That's how cholera gets transported 1000 miles north. In ballast tanks."

While the cause of the cholera outbreak has been identified, the same practices continue.

"Nothing has changed," Mejicano said. "No change in the laws, or the behavior, or the accountability."

Mejicano added that there is not just one simple cause for the rapid spread of emerging infectious disease over the last 30 years. Instead, he pointed to a more complex series of interrelated human behaviors and natural processes.

"This is a chronic problem," said Mejicano. "There are relentless and progressive forces that are causing these diseases."

#### Six degrees of explanation

As the list of emerging infectious diseases grows, so does mortality and morbidity and the concomitant costs. The CDC estimates that the cost of treating infectious disease and the economic impact due to lost productivity around the world exceeds \$120 billion annually, not to mention the millions who suffer and die. While many of these diseases are afflicting the developing world, the recent SARS scare shows that microbes can go anywhere planes travel. So it behooves the United States to practice an ounce of prevention abroad as well as at home, according to the CDC:

"...In terms of US health, it is far more effective to help other countries control or prevent dangerous diseases than try to prevent their importation because it is neither efficient nor feasible to examine each person who enters or returns to the United States for evidence of infection, or to examine all imported goods for evidence of contamination..."

International travel, whether of humans, animals or goods, is just one of six primary reasons Mejicano and other public health officials cite as causing increased spread of pathogens worldwide.

"We can move around the world today in a day and a half," he pointed out. "It took a year 150 years ago. The population then was less than 1 billion; today it's about 6 billion. And more and more people are urbanized, concentrated in higher numbers. It's a perfect environment to breed and spread bugs."

Another cause is industry and commerce. "More methane and carbon dioxide in the atmosphere raises the temperature, creating global warming," Mejicano said. Warmer temperatures in temperate climates can enable certain diseases to survive and even flourish.

"It's no wonder that viruses and bacteria thrive in the tropics. It's like a huge Petri dish there," he added.

It takes more than rising temperatures, though.

Human activity of another kind, development of heretofore undisturbed land, helps to stir the pot as well.

"Encroachment on habitat displaces animals and insects that carry diseases. Once pushed out by a dam project or expanded farmland, they are going to move and come into contact with domestic animals and eventually humans," Mejicano said.

He also blames importation of fresh fruit and vegetables. As an example, he cited a recent incident in which raspberries from Guatemala led to a cyclospora outbreak in the United States.

Microbes adapt and change naturally, but this is exacerbated by overuse of antibiotics. But physicians who over-prescribe penicillin are not the only source of blame.

"Agricultural misuse of antibiotics dwarfs human misuse," said Mejicano. A 1994 study in Denmark showed that humans used 24 kg of vancomycin, while 24,000 kg of similar antibiotics were used in agriculture to promote growth in chickens and pigs.

The sixth primary factor is what Mejicano refers to as a "breakdown in public health measures."

He cites the case of TB. Between 1968 and 1973, New York City spent \$40 million annually on TB and had 1000 dedicated beds for TB patients. In 1974, because of New York's financial crisis, the TB contracts were canceled. By 1980, the budget was cut to \$300,000 and there were no dedicated TB beds available.

What do we do?

On a larger scale, confronting the problems that enable infectious diseases to thrive calls for four major steps nationally and internationally:

- Surveillance and response
- Applied research
- Infrastructure and training, and
- Prevention and control

In Wisconsin, health care professionals need to be vigilant.

"When we encounter a suspicious illness, we need to increase the index of suspicion," Mejicano said. "Maybe this isn't just the flu; maybe it's something else. We also need to do a better job of reporting infectious illnesses. There may be numerous cases of a disease around the state, but we may not tell each other. Since they haven't been reported, we don't know. I encourage physicians to report weird illnesses they encounter. We need to get the overall perspective. Only from 30,000 feet can we see the whole picture."

Mejicano also urges physicians to keep up-to-date and says both the CDC web site and Wisconsin's Health Alert Network are excellent ways to get current data on these diseases.

---

He adds that it is up to health care professionals to spread the word about the spreading diseases and what to do about them. It is absurd to think that humans are going to win a battle of one-upmanship with nature by keeping one drug ahead of evolving microbes.

“There is a certain level of belief in US society that the pharmaceutical companies will come to the rescue,” said Mejicano. “They will always come up with the next antibiotic, so why worry. Creating new drugs is exciting, prevention is boring.”

Public health vs individual freedom

To effectively cope with a new epidemic or bioterrorism, Mejicano says public attitudes will have to change.

“There are times when the good of the public outweighs the good of the individual. Ultimately it may come down to a situation where an individual goes to the doctor, who tells him or her ‘I can help you but I’m not going to give it to you for the good of society.’ That’s what we’re talking about here.”



The mission of the *Wisconsin Medical Journal* is to provide a vehicle for professional communication and continuing education of Wisconsin physicians.

The *WMJ* (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of *WMJ*. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the *WMJ* nor the Society take responsibility. The *WMJ* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

For reprints of this article contact the *WMJ* Managing Editor at 866.442.3800 or e-mail [wmj@wismed.org](mailto:wmj@wismed.org).

© 2003 Wisconsin Medical Society