Fighting Modern Plagues

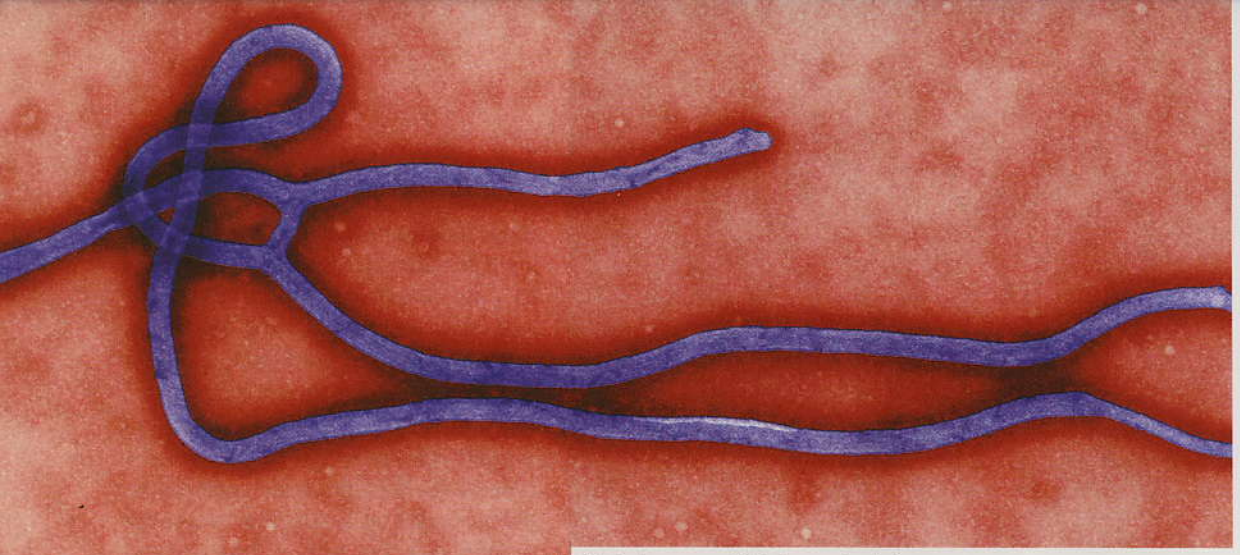
With novel emerging diseases a constant threat, a sturdy defense is assembled

BY SHARON GUYNUP

In the late 1990s, wildlife veterinarian William Karesh observed that a growing number of human maladies—tuberculosis, measles, Ebola—were infecting and killing Africa's gorillas and other great apes. Karesh, now a vice president of the Wildlife Conservation Society (WCS), realized that it wasn't just a wildlife issue. He recognized a rising threat from infectious diseases that jump between species in a borderless world.

Of 1,400-plus known human pathogens, over 60 percent are shared between people and animals. But a more ominous statistic is this: "Three-quarters of human diseases discovered over the last three decades are shared

TOP: INNOKENTIY RAKIN, RHRN



Ebola virus causes Ebola hemorrhagic fever

with animals—and a new disease emerges every 6 to 12 months," says Karesh. Among them are Ebola, monkeypox, and Creutzfeldt-Jakob disease, the human variant of mad cow disease. HIV is now endemic worldwide.

With growing globalization in an ever-more crowded world, people are swapping microbes with other creatures at an unprecedented rate. New settlements encroach into wild landscapes, bringing people and livestock into close proximity with wildlife. Those animals are hunted for food, the pet trade, for use in traditional Asian medicine, and are most often shipped between countries. Increasing travel jets microbes around the world. Crowded factory farms often become petri dishes for disease. "Another concern is the use of antibiotics in livestock feed: it could act as an agent of pathogen mutation."

As a result, age-old diseases are evolving, infecting new, vulnerable hosts. Some viruses like influenza are always of concern because they mutate rapidly, sometimes picking up genes from bird or swine flu, and they transmit readily between people.

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In the right species, even harmless microbes sometimes turn deadly. SARS is a recent example, a benign virus in horseshoe bats and civets that sparked a 26-country human pandemic in 2002. The World Health Organization (WHO) pinpointed wildlife markets in Guandong, China as the likely source of infection—where hundreds of species sit side by side in baskets and cages. "Where wildlife, livestock and humans intersect is where novel diseases emerge and have the opportunity to infect humans," says Ali Khan, U.S. Assistant Surgeon General. Since many disease outbreaks are linked to environmental changes, they are sometimes dubbed "ecodemics."

Some novel organisms get into humans and become evolutionary dead ends, dying out quickly. "That experiment is happening somewhere every day," says Karesh. "With six billion people in the world, it becomes a numbers game: some of those 'experiments' are successful." When they are successful, there's no guarantee that drugs or vaccines will be available to protect us.

The WCS put together a "One World, One Health" paradigm to better prevent, prepare for, diagnose and respond to new zoonotic disease threats. Researchers are trying to determine what's jumping and why. Over the last decade, they have pioneered unlikely alliances across science and medicine—connecting physicians, veterinarians, ecologists, virologists, zoologists and global animal and human health agencies that would normally operate independently. "It's a new mindset that I think is necessary if we're really going to address the next SARS or the next HIV," says Khan.

Large initiatives include the Centers for Disease Control and Prevention's recently created National Center for Emerging and Zoonotic Infectious Diseases that Khan currently helps direct. Last October, the U.S. Agency for International Development launched a new Emerging Pandemic Threats Program; one consortium will monitor geographic hotspots for emerging diseases in bats, rodents, primates, and other high-risk wildlife.

A recent Institute of Medicine report called for political and financial commitment, estimating the cost to maintain a fully integrated global surveillance system at $800 million per year. Experts also note that better regulation of transport, inspection and quarantine of animals is crucial, similar to current livestock regulations.

"This is about more than better human health," says Khan. "The One Health strategy is also about better animal health and better environmental stewardship."

EBOLA: CDC/ CYNTHIA GOLDSMITH MAYOSI: UNIVERSITY OF CAPE TOWN