nature medicine

# Man versus microbe



Centuries ago, when science took a back seat to superstition, infectious diseases must have been terrifying—a sign of supernatural powers or the wrath of God. Today, more than 100 years after Robert Koch unequivocally showed that a disease—anthrax—was caused by bacteria, we are more enlightened. We know that *Yersinia pestis* was the probable cause of the Black Death, that variola and measles viruses contributed to the decline of the Aztec civilization, and that *Mycobacterium tuberculosis* is the cause of the disease known in the nineteenth century as consumption. Indeed, we have an astounding depth of understanding about the diversity of infectious pathogens and the mechanisms they use to counter host defenses and cause disease. Yet this knowledge only partially mitigates the threat of infectious pathogens.

Last year's experience of severe acute respiratory syndrome (SARS) amply illustrated that newly emerging pathogens still have the power to instill widespread panic. The extent of the devastation wrought by HIV-1 shows how a new virus that does not immediately kill the host can spread like wildfire through human populations. And the increasing emergence of multidrug-resistant bacteria, viruses and parasites warns that diseases once thought of as controllable can resurge as prominent concerns for global health.

Incredible progress has been made in preventing, treating and even eradicating some infectious diseases that over the centuries have caused high mortality and human suffering worldwide. But scientists' ingenuity is continually taxed by nature's ability to churn out new pathogens. This *Nature Medicine* supplement brings together a collection of articles that explore the science behind emerging infectious diseases. How and why do new infectious diseases emerge? What have we learned about the pathogenesis of some newly emerged diseases? What progress has been made toward the search for effective vaccines and therapies? And what lessons have we learned from recent outbreaks of disease?

Humans have always been plagued by infectious diseases, but in recent years, the number of newly emerging pathogens has seemed to escalate. Why? Robin Weiss and Anthony McMichael offer an illuminating perspective on how human behavior and the environment shape the emergence and spread of new diseases. Richard Webby, Erich Hofmann and Robert Webster look at a different aspect of how new pathogens emerge, as they discuss the molecular barriers that viruses must overcome in order to switch species from animals to humans. In a series of five review articles, we then turn the spotlight on specific emerging or re-emerging pathogens—influenza virus, SARS coronavirus, hemorrhagic fever viruses, flaviviruses (Japanese encephalitis virus, West Nile virus and dengue) and multidrug-resistant bacteria.

Unfortunately, diseases once eradicated remain a concern—the potential risk of the intentional release of infectious pathogens such as anthrax and smallpox necessitates vigilance and preparedness. Lisa Rotz and James Hughes discuss the progress that has been made in developing systems to detect and respond to disease outbreaks. Lastly, Robert Ridley outlines the challenges that need to be overcome, particularly in developing countries, to achieve global control of emerging infectious disease.

We hope that this collection of articles highlights not only the unanswered questions—of which there are many—but also the substantial scientific achievements that underpin efforts to control the outcome of our frequent encounters with infectious pathogens.

The accompanying website (which can be accessed from http://www.nature.com/nm/supplements/) provides free access to this content plus a library of related articles from Nature Publishing Group for three months. We acknowledge the financial support of the Faculty of Medicine of the University of Hong Kong and of the International Centre for Infectious Diseases, Winnipeg, Canada. *Nature Medicine* retains sole responsibility for editorial content and peer review.