



Pathology & Biology Section – 2004

G77 SARS, Monkeypox, West Nile, Dengue, and Plague: Pitfalls of Globalization

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After attending this presentation, attendees will explore the ramifications of political, social, and economic forces that impact mortality, morbidity, and public health issues. They will learn about the global mechanisms that foster aberrations in traditional biological and scientific relationships, and how to utilize the knowledge gained to create solutions.

Participants will consider the challenges and positive implications of unexpected phenomena. The development of new methodologies and technologies, and the applications of these unexpected experiences offer the potential for predictive modeling processes to expedite future valid solutions.

Forensic specialists and experts must be well grounded in factual elements. For truth to prevail forensic scientists must bring to light the crucial and all related ancillary facts. These must include the limitations of the science employed and the extent to which the opinions generated represent subjectivity, causality, and validity.

Over the past few decades and especially in the last few years changing patterns relating to human infectious diseases have emerged. For example, with the encroachment of human living environments especially in the western United States, into traditional animal habitats, the Hanta viruses have crossed over from being infections solely carried by the deer mouse, to ones infecting humans. Lyme disease (named in 1977) has emerged and has become embedded in a geographic distribution (the northeast, mid-Atlantic, upper north-central regions, and northwestern California) with progressive infection of humans manifesting an acute and/or chronic form of the disease. This is an infectious disease transmitted by an arthropod (the deer tick) and causes more than 16,000 cases in the United States each year. An effective vaccine has been developed and produced, but has been abandoned. In addition, the re-emergence of known but thought to be controlled infectious diseases such as Smallpox and Anthrax has occurred, including the potential use of these biological agents as weapons of terrorism. Smallpox vaccine exists in sufficient quantities to protect all 280 million United States citizens. Phase I of a stepwise program that would initially vaccinate 500,000 healthcare workers has been placed on hold. A program which protects most of the U.S. population would render the Smallpox virus ineffective as a terrorism weapon and truly be the application of prevention.

The Ebola virus has caused disease periodically since 1976 when it was initially recognized in Africa. It produces a severe, acute disease in humans and non-human primates with a high death rate. The origin and natural reservoir of the virus remains unknown but is suspected to be animal-borne (zoonotic). Death occurs due to a hemorrhagic fever. Dengue fever is caused by four closely related, but antigenically distinct virus serotypes. Infection with one of the serotypes does not render cross-protective immunity. However, until the late 20th century each of the serotypes remained primarily in its endemic region. The introduction of additional serotypes and mosquito vectors into various regions has resulted in the human population now being at risk for two or more Dengue infections. Dengue has emerged as a major public health problem in the region consisting of the Americas. In 1997 it was determined that the geographic distribution of the mosquito vector has progressively widened. Dengue is presently the most important mosquitoborne viral disease affecting humans, with a case-fatality rate of 5%.

A number of human diseases are spread by mosquito vectors. In addition to Dengue, Malaria, Yellow fever, West Nile virus, and filariasis are included. Some mosquitoes are great travelers. However, much depends on the facilities for travel. The mosquito is, in fact, a hardy and enterprising colonist, ready to exploit any and every chance. The advent of the airplane in the 20th century provided the mosquito, including disease-bearing members of its family, with the opportunity to spread to the far reaches of the world. If the mosquito cannot get there as an adult, it sends an egg or a larva as a substitute.

Though West Nile virus was first found in Uganda in 1937, its progression in the United States, identified first in New York in 1999, has generated great interest and concern. In that year only four states were affected, with 62 cases and seven deaths. By 2002, West Nile was present in 40 states, resulting in 4156 cases and 284 deaths. West Nile has proven to be extremely aggressive and versatile and can affect more than 130 species of birds, and is carried by at least 36 types of mosquitoes. No medical treatment or vaccine presently exists. The rapid expansion of this disease in only three years raises significant questions and serious problems to be evaluated.

This past year, 2002-2003, brought the emergence of SARS (Severe Acute Respiratory Syndrome) caused by a corona virus and spread human-to-human via droplet infection. The world outbreak began in Guangdong Province of mainland China in November 2002. The four month silence about the existence of the epidemic by the Chinese government until February 2003 played a significant role in the uncontrolled spread of the disease. Open communication and cooperation with healthcare entities like the World Health Organization (WHO) would have proven successful in alleviating the ensuing consequences. Healthcare workers played a significant role in the spread of SARS throughout the world, and closing healthcare facilities helped bring the epidemic under control. SARS infected 8439 people in 30 countries on



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five continents with a death rate of 10% (812 people). No vaccine or specific treatment presently exists. The disease has primarily been controlled by isolating patients and quarantining those in close contact with them. Re-training of hospital doctors and healthcare workers in infection control measures (proper use of gloves, masks, face shields, barrier techniques, strict isolation) was necessary because hospital workers were exposing others. SARS may prove to be a seasonal disease that returns in the winter each year. There is a need to develop predictive models in preparation for its return should a reservoir exist as many experts believe. The application of techniques like forensic patterns would be most helpful. No rapid laboratory identification testing presently exists to help in the early identification of SARS. All present approaches are focused primarily on response while they should be equally focused on prevention. The SARS epidemic, its rapid progression and world-wide public health and economic impact, provide a unique opportunity to use the SARS experiences in developing models for the control of future disease epidemics, and even terrorism planning.

Globalization, Predictive Models, Forensic Patterns