Emergence and Control of Zoonotic Viral Encephalitides

C.H. Calisher and D.E. Griffin, Editors

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The viral encephalitides of Eastern, Western, and Venezuelan equine encephalitis viruses have been of public health concern for years. Over the last decade, several outbreaks caused by emerging zoonotic viral encephalitides, such as West Nile virus in North America and Nipah virus in Malaysia and Singapore in 1999, resulted in serious illnesses and deaths in persons, domesticated food animals, and wildlife. The Institute of Medicine has cited a number of factors that have led to these and other emerging disease outbreaks: 1) a growing human population that is moving into habitats of wildlife and domesticated livestock and poultry; 2) global climate changes that have caused changes in arthropod vector and rodent reservoir populations; 3) rapid travel and movement of people and animals worldwide; and 4) changing human behaviors (1). Emergence and Control of Zoonotic Viral Encephalitides is a timely book that gives an overview of agent, host, environmental, and other factors that have led to the emergence and transmission of several zoonotic viral encephalitides, including flaviviruses, alphaviruses, and rabies virus. The book also details important avenues for their control.

This book is a special issue of the Archives of Virology, and its 244 pages comprise 21 presentations that were made at a symposium on "Emergence and Control of Zoonotic Viral Encephalitides." The symposium was held April 6–8, 2003, in Les Pensieres, Veyrier du Lac, France. The first presentation gives an overview of the emergence of zoonotic viruses maintained by wildlife reservoir hosts and describes a conceptual model of processes that would account for the transmission of viruses among species. The second presentation describes the role of disease surveillance in polio eradication and the identification of emerging viral encephalitides. The third presentation gives an overview of the mechanisms of genetic changes and neurovirulence of encephalitogenic arboviruses.

The following 13 presentations include overviews of molecular determinants of virulence of West Nile virus in North America, genetic determinants of Venezuelan equine encephalitis virus, evolution and dispersal of encephalitic flaviviruses, and West Nile and other zoonotic viruses in Russia. Presentations that follow address lyssaviruses and henipaviruses transmitted by frugivorous bats, host-management strategies of novel viral encephalitides associated with bats, regulation of transcription and the nature of the cell receptor with regard to henipaviruses, and entry machinery of flaviviruses. Also included are presentations on persistent infection and suppression of host response by alphaviruses, subversive neuroinvasive strategy of rabies virus, neurovirulence and host factors in flavivirus encephalitis, regulation of apoptosis by viruses infecting insects, and Semliki Forest virus infection of laboratory mice as models to study the pathogenesis of viral encephalitis.

The book finishes with presentations on a novel principle of attenuation for developing new generation live flavivirus vaccines, on tick-borne encephalitis, and on a recombinant vaccine developed from a canarypox virus carrying the prM/E genes of West Nile virus that will protect horses against a West Nile virus–mosquito challenge, and on diagnosis of zoonotic viral encephalitis.

The book will be worthwhile to virologists and other infectious disease researchers and practitioners interested in the biology, virulence, and genetic evolution of viral encephalitides, and the factors involved in their emergence.

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Reference

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Prions and Prion Diseases: Current Perspectives

Glenn C. Telling, Editor

Horizon Bioscience, Norfolk, England
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Prion diseases, also known as transmissible spongiform encephalopathies, are rapidly progressive, uniformly fatal brain diseases that can infect humans and animals, including cattle, sheep, goats, mink, deer, elk, cats, and zoo ungulates. In humans, prion diseases can occur as a sporadic

or inherited disease, or as a result of iatrogenic transmission. Prion diseases generated great public concern after an outbreak of bovine spongiform encephalopathy occurred in many European countries and scientific evidence indicated its transmission to humans.

Research in prion diseases is hampered by certain unconventional properties of the presumed etiologic agent and the long incubation period associated with these diseases. Most conventional laboratory methods used to study viruses and bacteria may not be applicable. In the past, the etiologic agent of transmissible spongiform encephalopathies was believed to be a slow virus, primarily because of its transmissibility, ability to retain infectivity after filtration, and long incubation period. The successful transmission of scrapie, a centuries-old prion disease of sheep, to mice in 1961 greatly facilitated identification and characterization of the scrapie agent. Several characteristics of the scrapie agent suggest that the agent is not a virus but is likely composed primarily of a protein. The agent's characteristics include the absence of disease-specific nucleic acids; resistance to radiation, nucleases, and standard sterilization and disinfection methods; and inactivation by protein-modifying procedures. These observations and purification of the scrapie prion in the early 1980s led to widespread acceptance of the prion hypothesis.

Since the 1980s, both the scope and nature of prion disease research has progressed rapidly. The economic and human cost associated with the bovine spongiform encephalopathy outbreak fueled the need to better understand the etiologic agent of prion diseases and their basic transmission mechanism. Prions and Prion Diseases: Current Perspectives summarizes the advances in prion disease research. It expands on a previous volume edited by David Harris that was published in 1999 under the title Prions: Molecular and Cellular Biology. The book's 10 chapters describe the biochemical and molecular features of prions and the normal prion protein, various laboratory methods for studying prions, and advances in the pathogenesis and immunology of prion diseases.

Chapters 2 through 6 detail laboratory methods developed to study the unconventional agent of prion diseases. Chapter 2 describes a cell-free conversion reaction system to study how pathogenic prions associated with different species interact with host cellular prion protein. Such systems have been used to study the biochemical mechanisms of prion diseases and can potentially be used to screen new therapies for their effectiveness against prion diseases. Chapter 3 describes the mechanisms underlying the biosynthesis and cell biology of the cellular prion protein by using cell culture systems. Understanding the detailed biochemical properties of the cellular prion protein will help show the molecular basis of its interaction with, and conversion to, the pathogenic prions. Subsequent chapters in the book describe other laboratory methods, including transgenic mouse models, which can be used to investigate the transmissibility of prions among different species, the extent and degree of the "species barrier," the mechanism of prion propagation, and prion disease pathogenesis.

Overall, the book provides a wealth of information on the progress made in understanding the molecular, immunologic, and genetic aspects of prion diseases and the laboratory methods used to study them. This book will be valuable to prion disease researchers, to scientists who want to gain more knowledge about the progress made in understanding the mechanisms of prion propagation, and to persons just beginning to study these unconventional, fatal brain diseases.

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Veterinary Institutions in the Developing World: Current Status and Future Needs

Cees de Haan, Editor

World Organisation for Animal Health Scientific and Technical Review

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Veterinary institutions help improve animal health by providing training that will enhance livestock production and trade and protect public health. The increasing role of animals in emerging infectious diseases has emphasized the need to improve veterinary services and integrate them with public health services more effectively.

The World Organisation for Animal Health devoted its Scientific and Technical Review (Volume 23, No. 1, April, 2004) to addressing these weaknesses and the rapidly changing environment of veterinary services in developing countries. The issue consisted of an introduction and summary by the coordinator and contributions from 28 persons organized into six sections. The first section

Prion diseases, which include Creutzfeldtâ€“Jakob disease in humans and scrapie and bovine spongiform encephalopathy in animals, are caused by accumulation of proteinaceous infectious particles, or the so-called prions, in the brain. Conformational conversion of the normal cellular isoform of prion protein, designated PrPC, into the relatively protease-resistant, amyloidogenic isoform, PrPSc, is the underlying mechanism of prion propagation and subsequent degenerative neuronal cell death. Although extensive studies have uncovered many aspects of prion diseases, the diseases still remain incurabl