

Emerging Zoonotic Viruses: Response and Preparedness

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Numerous viral diseases have emerged and re-emerged over the past decades. Aside from many others, the so called 'high containment' viruses in particular are a threat to our public health systems due to limited experience in case management and lack of appropriate resources. Many of these viruses are zoonotic in origin and remain a major challenge for animal and human health worldwide as evidenced by the emergence/re-emergence of influenza, SARS-CoV, Rift Valley fever virus and other exotic or more common pathogens. Many countries have established infectious disease centers with primary responsibility for disease surveillance, reference microbiology and quality assurance, preparedness and response to these threat agents. Rapid reference diagnostics is provided in most of these centers but on-site diagnostic capabilities are still underdeveloped and often hamper national and international outbreak investigations.

The animal/human health response mandate cannot be accomplished without a strong research component focused on pathogen biology, pathogenesis and immune response to provide the fundamental data and concepts for the development of antivirals, therapeutics and vaccines. Therefore, animal models that mimic disease become key elements for research operations. The reservoirs, if known, are often persistently infected with no or mild clinical symptoms and the distribution of the infectious diseases basically reflects the range and the population dynamics of the reservoir hosts. Studies in reservoir species are rare and animal models that mimic the reservoir host and the transmission of the pathogen to humans are limited. Small animal models, in particular the mouse, are the most feasible in high containment and they offer the most options for research due to greater access of immunological and genetic tools. However, their mimicry of human disease as well as their predictive value for therapeutic efficacy is often limited thereby making them, at best valuable initial screening tools for pathophysiology, treatment and vaccine studies. Future efforts need to focus on the development of more relevant small animal models through pathogen adaptation or by the use of genetically altered host or pathogen species. In parallel, the much needed immunological and genetic tools for new animal models need to be produced.