News @ Virology

The new emerging tick-born virus of novel bunyavirus

By Dr. Kai Wang*

A 50-year-old woman with a 1-day abrupt onset of sudden fever (39.2°C), headache, myalgia, arthralgia, dizziness, and malaise presented to the village clinic on October 31, 2006, and despite all efforts, the patient died at 6:45 AM, November 5, 2006. The final diagnosis was hemorrhagic fever with renal syndrome, but there are a lot of controversies because of no hantanvirus were found by laboratory diagnosis. Prof. Xu Jianguo, director of national institute of communicable disease control and prevention, China CDC, revealed that the patient was belong to human granulocytic anaplasmosis (HGA) that was likely nosocomial transmission of HGA from direct contact with blood or respiratory secretions through the laboratory diagnosis and epidemiological survey [1].

Unfortunately, reports of febrile patients with similar clinical presentations were increasing in China, and some patients were died. Since May 2010, active syndrome surveillance in Henan and Hubei province had been launched by China CDC with the case definition of severe fever with thrombocytopenia syndrome (SFTS) for the etiological identification. Prof. Li Dexin, Director of National Institute for Viral Disease Control and Prevention, China CDC, identified and isolated a novel *phlebovirus* from patients who presented with SFTS. Followed epidemiological investigation revealed this virus to be the etiological pathogen of SFTS, and the cases were widely distributed in six provinces in central and northeast China (Figure. 1), these results were published in New England Journal of Medicine In 2011 [2].

Now the virus was named after clinical features of the illness which caused as severe fever with thrombocytopenia

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Figure 1: Geographic Distribution of SFTS in Mainland China.
(Yu et al. N Engl J Med. 2011;364(16):1523-32)
Areas where SFTS surveillance was carried out and SFTS bunyavirus was isolated from patients are shown in red.

syndrome virus (SFTSV). Genetic analysis revealed that the virus was a newly member of the genus *phlebovirus* in the *Bunyaviridae* family. Electron-microscopical examination revealed virions with the morphologic characteristics of a bunyavirus (Figure. 2) [2]. *Bunyaviridae* are vector-borne viruses, and have tripartite genomes consisting of a large (L), medium (M), and small (S) RNA segment. The L segment encodes the RNA Dependent RNA-polymerase, necessary for viral RNA replication and mRNA synthesis. The M segment encodes the viral glycoproteins, which project from the viral surface and aid the virus in attaching to and entering the host cell. The S segment encodes the nucleocapsid protein (N). These RNA segments are single-stranded, and exist in a helical formation within the virion. Though generally found in arthropods or rodents, certain viruses in this family occasionally infect humans. Members of the *bunyaviridae* family are known to cause four major types of human disease: febrile illness, encephalitis, hemorrhagic fever and severe respiratory illness. Human infections with certain

Bunyaviridae, such as Crimean-Congo hemorrhagic fever virus, are associated with high levels of morbidity and mortality, consequently handling of these viruses must occur with a biosafety level 4. The family *Bunyaviridae* comprises five genera (*Hantavirus*, *Nairovirus*, *Orthobunyavirus*, *Phlebovirus* and *Tospovirus*). Bunyavirus morphology is somewhat similar to that of the *Paramyxoviridae* family. There are a number of viruses that have not yet been placed in a genus: these include Gan Gan virus, Maprik virus, Mapputta virus and Trubanaman virus. *Bunyaviridae* form enveloped, spherical virions with diameters of 90-100 nm. These viruses contain no matrix proteins [3].

The investigation of SFTSV has been started since the identification of the etiological pathogen, such as laboratory diagnosis, pathogenesis, animal model, vaccine and so on. Sensitive quantitative real-time RT-PCR assay for rapid detection of SFTSV viral RNA and its potential use for clinical diagnosis of SFTS have been developed and evaluated [4]. A combinatorial Fab antibody phage library from human patients recovered from SFTSV infection has been established and large number of human recombinant MAbs were obtained, and revealed the important role of the N protein in humoral responses to SFTSV infection [5]. In addition studies of cytokines associated with the disease

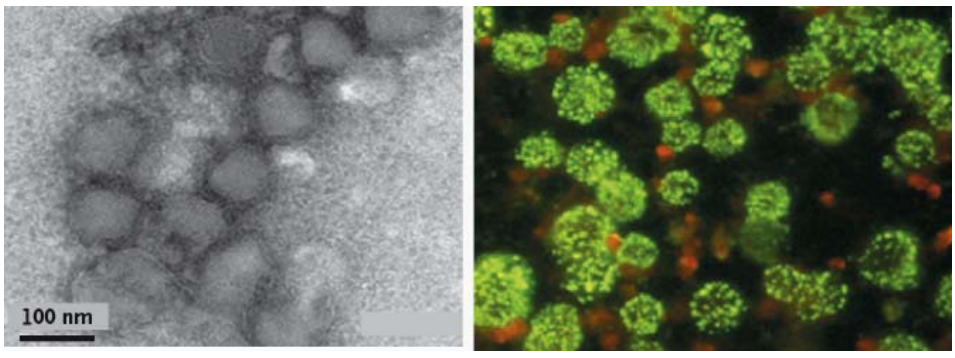

Figure 2: Morphologic Features of SFTS Bunyavirus.
(Yu et al. N Engl J Med. 2011;364(16):1523-32)
Left: shows negatively stained virions purified from SFTSV-infected Vero cells.
Right: shows virus grown in Vero cells and detected on immunofluorescence assay from a serum sample obtained from a patient with SFTSV infection.

severity [6] and establishments of infection model of SFTSV in C57/BL6 mice enhanced the understanding of pathogenesis of SFTSV [7]. The natural maintenance and transmission cycle of SFTSV are under studying in many labs in China [8], these works will no doubt benefit the public health control and prevention of SFTSV in the near future.

Reference

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