

## Emerging Viral Hemorrhagic Fevers in Southern Africa and the Philippines

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Viral hemorrhagic fevers (VHF) are caused by viruses in four families: *Filoviridae*, *Arenaviridae*, *Bunyaviridae*, and *Flaviviridae*. Symptoms include fever, weakness, vomiting, and, in about 30% of cases, hemorrhage. Recent events have shown the emergence of two hemorrhagic fever viruses: Ebola Reston, a previously known virus, in a new host in the Philippines, and a novel arenavirus in Zambia.

In 2008, the Plum Island Animal Disease Center of the United States Department of Agriculture tested specimens from pigs from the Philippines. Several viral isolates were obtained, and, using an in-house developed panviral microarray, it was determined that some of the isolates were Ebola viruses, a species known as Ebola Reston [1]. This particular virus was first identified in a 1989 outbreak in cynomolgus monkeys that had been imported from the Philippines to Reston, VA. Here, the virus had infected and killed the Philippine monkeys, but no clinical disease developed in humans who were infected with this virus. Since it is required that Ebola virus is handled in a Biosafety Level 4 facility, the Philippine pig specimens and viral isolates were sent to CDC. Immunohistochemical assays found Ebola virus antigen in swine lymph node and lung. Electron microscopy of the viral isolates showed long, filamentous viral particles by negative stain and thin section (Fig 1A). This is the first occurrence of Ebola Reston virus to be identified in swine. It is likely that the virus was transmitted to pigs from fruit bats; similar spillover of Nipah virus into swine from bats has been reported [2].

In Zambia in October, 2008, a travel agent fell ill and was transported to South Africa for treatment, where she subsequently died. Three medical caretakers who had contact with the patient and one tertiary case also fell ill; three died and one survived. Tissue samples were sent to CDC, where histopathological evaluation of 2 patients suggested a VHF, and immunohistochemical assays revealed arenavirus antigens in the liver [3]. Viral isolates were obtained, and showed round, extracellular arenavirus particles by electron microscopy (Fig. 1B). PCR assays and sequence analysis confirmed this virus to be a novel Old World arenavirus, now known as Lujo virus. This is the first novel arenavirus identified in over 40 years. Arenaviruses are zoonotic diseases, having a rodent as the virus reservoir; the rodent reservoir for this arenavirus has yet to be identified.

The emergence of a known filovirus in a novel host and the recognition of a previously unknown arenavirus are examples of the One World, One Health concept. These cases illustrate the importance of remaining vigilant for novel presentations of zoonotic diseases.

### Acknowledgements

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### References

- [1] RW Barrette, et al., submitted for publication.
- [2] JM Yob, et al., *Emerging Infectious Diseases*, 7 (2001)439.
- [3] JT Paweska, et al., submitted for publication.

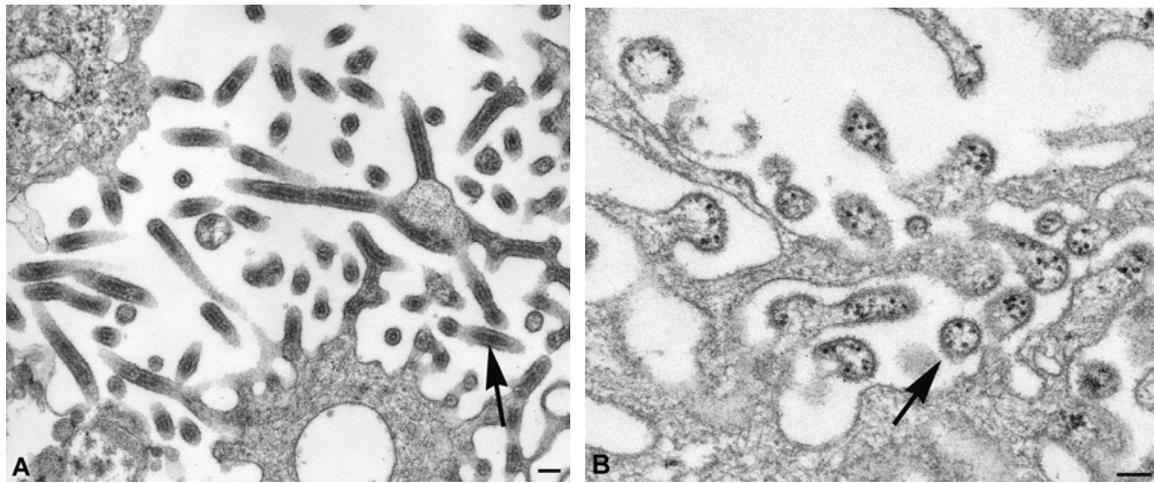


Figure 1. A) Filamentous Ebola virus particles grown in Vero E6 tissue culture cells. Note the nucleocapsid (arrow) within the enveloped virion. B) Arenavirus particles (arrow) grown in Vero E6 tissue culture cells. Virions are pleomorphic, and contain cellular ribosomes. Bars, 100 nm.