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Ebola Foresight: The Role of Livestock and Wildlife in the Biology of Ebolaviruses

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Abstract

The Ebola virus (EBOV) outbreak in West Africa in 2013–2016 severely affected Sierra Leone, Guinea, and Liberia, which have very weak health systems and limited human and infrastructural resources. Described as the largest ebolavirus outbreak ever recorded, more than 28,000 people were affected with more than 11,000 deaths. The need for a proactive response to manage future outbreaks has led to the conception of the “Ebola Foresight” project, funded by the German Federal Ministry of Food and Agriculture. The project is implemented by a consortium including the Friedrich-Loeffler-Institut, the Sierra Leone Agricultural Research Institute, Njala University, and the Institut Pasteur de Guinée. It aims to build laboratory capacities in Sierra Leone and Guinea in order to ensure preparedness and a rapid response to potential future outbreaks of ebolaviruses or other emerging diseases. Further, a second focus of the project is to investigate the role of wildlife and livestock, in particular pigs, in the biology of ebolaviruses. Though serological and molecular evidence points towards certain fruit bat species as the natural reservoir host for EBOV, experimental studies indicated that pigs can also be infected with EBOV. Thus, the potential role of pigs in the maintenance and transmission of EBOV is yet to be understood. In December 2016, 400 pig serum samples were collected in three districts in Sierra Leone for serological investigation. Surveillance targeted communities that were heavily hit by the EBOV epidemic with reported close interaction between wildlife population and domestic pigs. The pig sera were initially tested for ebolavirus antibodies by using an in-house ELISA, and positive sera were tested for confirmation by immunoblot based on several ebolavirus nucleoproteins and virus-like particles (VLPs). Those sera were also analysed in a serum neutralisation test based on transcription and replication competent VLPs under biosafety level (BSL) 2 conditions as well as against EBOV under BSL4 conditions. The results suggest the occurrence of ebolaviruses in swine in Sierra Leone that are antigenically related but not identical to EBOV, and carry an unknown pathogenic and/or zoonotic potential.

Keywords: Capacity building, ebolaviruses, pigs, serology, West Africa