Ebola virus disease

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Ebola virus disease (Ebola hemorrhagic fever) first appeared in 1976 with two concurrent outbreaks of acute viral hemorrhagic fever involving 284 cases (151 deaths [53%]) centred in Nzara, Sudan (1), and 318 cases (280 deaths [88%]) in Yambuku (near the Ebola River), Democratic Republic of Congo (2). Since these original cases, there have been approximately 20 other outbreaks occurring through to 2013, involving nearly 2500 cases in the Democratic Republic of Congo, Sudan, Gabon, Côte d'Ivoire, Uganda and the Republic of the Congo (3).

Since January 2014, a new outbreak has been identified in several West African countries (3). As of April 16, 2014, 197 cases (122 deaths [62%]) have been reported by the Ministry of Health of Guinea, of which 101 have been laboratory confirmed (56 deaths [55%]) (3). The Ministry of Health and Social Welfare of Liberia has reported 27 clinical cases with associated deaths in 13 (48%) (3). Six and 12 suspected cases occurring in the neighbouring countries of Mali and Sierra Leone have been observed, respectively, but have not been laboratory confirmed (3).

The genus *Ebolavirus* belongs to the *Filoviridae* family, along with the genus *Marburgvirus*. There are five species of Ebola virus including Bundibugyo, Zaire, Sudan, Côte d'Ivoire (Taï Forest) and Reston ebolaviruses. The former three have been responsible for the large outbreaks that have occurred in Africa, whereas the Reston ebolavirus has been observed in animals in Asia but not as a cause of human disease (4).

Fruit bats of the *Pteropodidae* family, including the species *Hypsignathus monstrosus*, *Epomops franqueti* and *Myonycteris torquata*, are believed to be the natural hosts of Ebola viruses, with humans and other mammals serving as accidental hosts (5). A range of animal accidental hosts have been documented, and Ebola virus has been implicated as one of the major causes of decline of African chimpanzee and gorilla populations in recent decades (6,7). Ebola virus is transmitted to humans through close contact with blood and bodily fluids from another infected human or animal, either by direct contact or indirectly from a contaminated environment.

The incubation period for Ebola virus disease ranges from two to 21 days and is characterized by fever, headache, myalgias and gastrointestinal symptoms (3). Multisystem involvement with hypotension and respiratory, kidney and liver failure may ensue, as well as internal and external bleeding (8). In one detailed prospective assessment of 26 of 30 hospitalized patients with Ebola virus disease during the 2007–2008 Bundibugyo outbreak, the median duration of symptoms was nine days from onset to death and 10 days from onset to discharge for survivors (9). The most common self-reported symptoms were fever (73%), nausea/vomiting (73%) and diarrhea (73%), abdominal pain (60%) and conjunctivitis (33%). The most commonly clinically documented features were severe headache (95%), asthenia (86%), myalgia (76%), dysphagia (71%), anorexia (71%) and diarrhea (67%). Among the cohort of 26 cases, seven exhibited hemorrhagic features, which included melena, prolonged bleeding at injection sites, hematemesia, bleeding gums, hemoptysis, hematuria and postpartum vaginal bleeding (9).

Definitive diagnosis of a clinically suspected case of Ebola virus disease requires laboratory confirmation. However, because of the extreme biohazard risk, testing using antigen- or antibody-based assays, or reverse transcriptase-polymerase chain reaction testing in a biosafety level 4 laboratory is required.

Case-fatality rates for the outbreaks over the past decades have varied considerably and likely reflect, at least in part, differences in diagnostic accuracy, levels of acute care provision and infecting species. Based on data from the WHO, among the 2611 cases of Ebola virus disease reported to date, 1725 deaths have occurred, resulting in an overall case-fatality rate of 66% (3). Crude case-fatality rates for the Zaire, Sudan and Bundibugyo ebolaviruses are 79%, 54% and 32%, respectively. Case-fatality rates were 71% in the 1970s, 77% in the 1990s, 61% in 2000s, and 57% during 2010 to 2013 (3). Zaire ebolavirus is responsible for the current outbreak.

Management of patients with Ebola virus disease is supportive. While there are no currently accepted specific treatments, a number of promising and novel adjuvant medical, immunotherapy and nucleic acid therapy approaches have been reported and are under further investigation (10–23).

The current outbreak is novel in that it is centred in West Africa. With the exception of a single case identified in Côte d'Ivoire in the 1990s, previous large outbreaks have been limited to countries in the central and eastern areas of the continent. If one examines the distribution of the fruit bats that are likely the natural host of the Ebola viruses, it is not surprising that cases of human disease are now being observed in Guinea and neighbouring countries (5). However, why this has occurred now remains unexplained. Furthermore, while exposure to infected bats may occur as a result of being a food source for some individuals, there are no documented cases of direct bat-to-human transmission of Ebola virus disease (24). The epidemiology of the current outbreak and its potential link with the bat population remains poorly defined and is under further active investigation (24,25).

The current outbreak highlights the importance of infection prevention and control efforts. The first reported fatal case of Ebola virus disease in the Democratic Republic of Congo in 1976 was likely iatrogenic and acquired from use of a contaminated needle for administration of parenteral chloroquine for malaria treatment of a 44-year-old man (2). In addition, as recognized in the first reported outbreaks and repeatedly thereafter, health care workers and nosocomial acquired have represented a considerable proportion of all cases. Indeed, closure of the hospital in Yambuku was reported as the most important control measure in the original 1976 outbreak in the Democratic Republic of Congo (2). In the present (2014) outbreak in Guinea, 24 health care workers have been affected, with 13 (54%) associated deaths (3). The importance of early identification and rapid laboratory confirmation of cases, as well as access to protective equipment and environmental decontamination, cannot be understated (26–30).

Ebola virus disease is rare and represents a minuscule fraction of the major infectious diseases burden in Africa. However, its high case-fatality rate, potential for human-to-human transmission and propensity to be associated with hospital-based transmission is both

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concerning and a fertile source for hysteria (31,32). The current outbreak is defining a new geographical distribution for human Ebola virus disease. The potential for further involvement of humans and animals on a larger scale cannot be understated. With increasing

globalization and ease of international travel, it appears to be inevitable that we will eventually see cases in our country (33). We can only hope that our response will be commensurate with our status as a privileged, resource-rich country.

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