

Ebola and art

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The cover image of the current issue of our journal shows an embroidered image of the Ebola virus. The complex shape of viruses has inspired artist to render these microscopic sized particles (1,2). In a submission to our Art-and-Medicine series in 2013, which includes the cover image of this issue, artist Mia Weiner described her interest in the correlation between working in fibers and the microscopic world (1). She described that by embroidering images of Ebola, the virus becomes an object of beauty, with its destructive nature and danger to the human body hidden.

On August 8, 2014 the World Health Organization (WHO) declared the Ebola outbreak in West Africa a “public health emergency of international concern” (3). According to information published by the WHO Ebola Response Team in a recent *NEJM* article (4), by September 2014, a total of 4,507 probable and confirmed cases, including 2,296 deaths from Ebola virus disease (EVD) (Zaire species) had been reported from five countries in West Africa (Guinea, Liberia, Nigeria, Senegal, and Sierra Leone). The authors estimate that the case fatality rate is 70.8% [95% confidence interval (CI), 69% to 73%] and that the course of infection is similar to that reported in previous outbreaks of EVD. Assuming no change in the control measures for this epidemic, the authors project that by November 2014, the cumulative reported numbers of confirmed and probable cases will exceed 20,000. The authors conclude that without drastic improvements in control measures, the numbers of cases of and deaths from EVD are expected to continue increasing from hundreds to thousands per week in the coming months.

EVD, previously known as Ebola hemorrhagic fever, is a severe, often fatal illness in humans and nonhuman primates (monkeys, gorillas, and chimpanzees). It is caused by infection with one of the Ebola virus strains, a virus of

the family *Filoviridae*. Ebola first appeared in 1976 in two simultaneous outbreaks, one in Nzara, Sudan, and the other in Yambuku, Democratic Republic of Congo. The latter occurred in a village near the Ebola River, from which the disease takes its name. Since then, outbreaks have appeared sporadically in Africa. The average case fatality rate is around 50% (25% to 90% in past outbreaks). According to data from the WHO and CDC (5,6), the current outbreak in West Africa is considered the largest and most complex since the Ebola virus was first discovered, and the number of cases and deaths are already higher than in all others combined. It has spread starting in Guinea (first cases notified in March 2014) to Sierra Leone, Liberia, Nigeria, and Senegal.

Researchers believe that the virus is animal-borne and that bats are the most likely reservoir. Ebola is introduced into the human population through close contact with the blood, secretions, organs or other bodily fluids of infected animals such as chimpanzees, gorillas, fruit bats, monkeys, forest antelope and porcupines. The virus spreads in the human population through human-to-human transmission via direct contact (through broken skin or mucous membranes) with blood, secretions, organs or other bodily fluids of infected people, and with surfaces and materials (e.g., bedding, clothing) contaminated with these fluids.

The incubation period is 2 to 21 days. First symptoms are the sudden onset of fever fatigue, muscle pain, headache and sore throat. This is followed by vomiting, diarrhoea, rash, symptoms of impaired kidney and liver function, and in some cases, both internal and external bleeding (e.g., oozing from the gums, blood in the stools). Clinically it can be difficult to distinguish EVD from other infectious diseases such as malaria, typhoid fever and meningitis. Laboratory findings include low white blood cell and

platelet counts and elevated liver enzymes. Confirmation is obtained with several tests including antibody-capture enzyme-linked immunosorbent assay (ELISA), antigen-capture detection tests, serum neutralization test, reverse transcriptase polymerase chain reaction (RT-PCR) assay, electron microscopy, virus isolation by cell culture. Samples taken from humans and animals for investigation of Ebola infection must be handled by trained staff and processed in suitably equipped laboratories.

Treatment consists of supportive care, including rehydration and treatment of specific symptoms improves survival. However, currently there is no proven treatment available for EVD. A range of potential treatments including blood products, immune therapies and drug therapies are being evaluated. No licensed vaccines are available, but two potential vaccines are undergoing human safety testing.

Raising awareness of risk factors for Ebola infection and education about protective measures that individuals can take is an effective way to reduce human transmission. These measures include reducing the risk of wildlife-to-human transmission and reducing the risk of human-to-human transmission from direct or close contact with people with Ebola symptoms.

The brutal clinical reality of these viruses is contrasted by their orderly appearance, when visualized under the electron microscope. The Ebola virus belongs to a virus family called *Filoviridae*. Structurally, filovirus virions may appear in several shapes. These shapes include long, sometimes branched filaments, as well as shorter filaments shaped like a “6”, a “U”, or a circle. Viral filaments may measure up to 14,000 nanometers in length, have a uniform diameter of 80 nanometers, and are enveloped in a lipid (fatty) membrane. Each virion contains one molecule of single-stranded, negative-sense RNA. The virus infects and replicates the living cells of the host. New viral particles are created by budding from the surface of their hosts' cells;

however, filovirus replication strategies are not completely understood.

The ‘Art and Medicine’ series in our journal demonstrates that artists and scientists often seek answers to the same questions, both in microscopic ‘Small Worlds’ (7) and global environments (8).

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