

Ebola Virus: Sensationalism, Science, and Human Rights

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Outbreaks of the filoviruses, Ebola and Marburg, usually garner immense public attention, often with a sensationalist bent in the lay press, focused on the apparently mysterious origins of the outbreak and the high mortality rates. The scientific community may present a more objective viewpoint, but usually with a rather technical focus on identifying epidemiological risk factors and experimental therapies and vaccines. Often lost in the discussion are the human rights elements that consistently underlie large outbreaks of these dangerous viruses.

Keywords. Ebola; Marburg; viral hemorrhagic fever; human rights.

“The biggest problems at Donka are no electricity, no water, no equipment, no sanitation, and very high rates of infection.”

Bintu Cissé, adjunct midwife supervisor at Donka National Hospital in Conakry, Guinea, site of an outbreak of Ebola virus disease with nosocomial transmission [1].

THE POPULAR VERSION

The filoviruses, Ebola and Marburg, cause occasional outbreaks in sub-Saharan Africa, with case-fatality ratios routinely >50%. The major and tragic outbreak of Ebola virus disease that started in 2013 with its epicenter in the impoverished nation of Guinea has once again thrust this disease into the limelight [2]. Ebola virus outbreaks have held a special public fascination since the mid-1990s. A deadly virus mysteriously emerges from the remote jungles of sub-Saharan Africa, wreaking unspeakable havoc on nearby villagers, and then just as mysteriously recedes from whence it came. Unknowingly, an unlucky traveler in the area is also infected, incubating the virus as he completes his travels and arrives home to a major metropolitan area. Suddenly,

fever sets in, and within days the man is deathly ill, bleeding from the eyes, his internal organs liquefying. His disease quickly spreads to all those in proximity. Case numbers mount rapidly. Chaos ensues, overwhelming the local healthcare system. Fears that the event is a bio-terrorist attack rattle the population. Such is the notion of Ebola virus garnered from popular accounts, such as Richard Preston’s best-selling novel *The Hot Zone* and the 1995 film *Outbreak*. Although such scenarios may still sell movies, accumulating scientific knowledge and experience debunk much of this popular notion.

THE SCIENTIFIC VERSION

Science has, in a sense, benefitted from the public fascination and fear; the recent economic downturn aside, funding for Ebola virus and other real or perceived bio-terrorist agents has increased dramatically in recent decades, as have related publications [3, 4]. Although they are obviously very dangerous, it is now clear that Ebola and Marburg viruses are far less transmissible than first feared, requiring direct contact with blood and bodily fluids during the period of acute illness. The risk of significant secondary transmission from imported cases into industrialized countries, where protective materials and clean needles are routinely available and used, is low. Natural transmission through aerosol seems to be rare, if it occurs at all. Both field and laboratory research have shed light on the epidemiology of these viruses, which are all zoonotic. Bats seem to be the reservoir for the filoviruses, and seasonal fluctuations in bat breeding

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populations and proportions of infected animals may influence risk of transmission to humans [5–7]. Numerous experimental vaccines have demonstrated efficacy in animal models and have recently been accelerated into clinical trials in humans [8, 9].

THE HUMAN RIGHTS VERSION

There are still mysteries to be solved and scientific advances to be made regarding the filoviruses, especially with regard to viral pathogenesis and treatment options. Nevertheless, the factors dictating the location of large filovirus outbreaks have been empirically clear for decades, if understated, and are inevitably intertwined with the sociopolitical landscape. Such outbreaks almost invariably occur in areas where the public health system has been decimated from years of civil conflict or failed development (Table 1) [3, 10–13]. Biological and ecological factors may drive emergence of these viruses from the jungle, but clearly the sociopolitical landscape dictates whether they are then confined to a few isolated cases or explode into a major outbreak.

This process represents, in part, the unfortunate and unintended result of the incorporation of “Western medicine” into the “traditional medicine” backdrop of sub-Saharan Africa over the past century, followed in some places by years of stalled development, as in Guinea, Liberia, and Sierra Leone. These 3 countries are all presently ranked near the bottom of the 187 nations on the United Nations Development Programme Human Development Index [14], with a majority of their populations living below the national poverty lines. Colonial powers and missionaries, followed later by African governments and nongovernmental organizations, began establishing clinics and hospitals for persons in need in remote and impoverished areas. Walls and roofs were built, a few physicians or nurses employed, and a basic stock of medicines and supplies provided.

Years later, worn down by war and civil unrest, the walls may still exist and a tenacious healthcare worker may be hanging on, eking out a living in an informal fee-for-service small-scale economy, but the formal supply chain is long gone, including a reliable supply of clean needles and gloves. Consequently, when a patient with filovirus infection, presumably representing one of the early infections from a zoonotic source, presents to one of these centers, the likelihood of hospital-based transmission is high. Having few options, the healthcare worker may reuse the needle just used to administer an injection to the patient with (unrecognized) Ebola virus disease for the patient with malaria in the next bed, who subsequently leaves the hospital cured of malaria but incubating Ebola virus. This person then falls ill at home, infecting a few family members in the process, who then come to the hospital, renewing the cycle of hospital-based transmission and delivery to the community. The absence of gloves and other personal protective equipment also puts healthcare workers at risk; indeed, many filovirus outbreaks are first detected by noting clusters of infection and deaths among healthcare workers. Thus, filovirus outbreaks

can be considered fundamental problems related to a lack of a basic human right—the right to health, defined in the United Nations Declaration of Human Rights as “a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care.” [15].

Of course, filoviruses are not the only diseases to which the populations of struggling nations and healthcare systems are rendered vulnerable. A common criticism in the field of filoviruses and emerging viruses is “Why waste time and money on this exotic esoterica while millions of persons suffer daily from AIDS and malaria?” Indeed, despite the large outbreak in West Africa, Ebola and filoviruses remain low on the problem list for most of the world’s population, including most persons living in sub-Saharan Africa. Nevertheless, filoviruses can be considered the proverbial “canaries in the coal mine,” indicators of some of the world’s most vulnerable communities, not only for filoviruses, but for a host of other infectious and noninfectious diseases, for poverty-related conditions, for mental and physical trauma due to civil strife, for environmental degradation, in populations whose basic human rights are routinely not respected and distinctly in jeopardy.

STEPS FORWARD

One key step in confronting filoviruses and other emerging diseases is building capacity on the front lines where diseases emerge, primarily at the zoonotic interface in the developing world [16]. Much more than simply building a laboratory in a developing country, this entails stemming the “brain drain” through the training and provision of home-country research and public health career opportunities for developing world scientists, exploring novel and technology-appropriate approaches to local problems, and advocating for funding mechanisms that enable their execution. Long after the Ebola virus outbreak in West Africa is contained, these will be our true measures of success and capacity to prevent future outbreaks.

Although no one should advocate a major displacement of funds from global and pandemic diseases such as AIDS, tuberculosis, and influenza, we nevertheless must keep one eye out for what might come next. How different might the scourge of AIDS be today if we had had the capacity to detect the virus when it first emerged in sub-Saharan Africa in the early 20th century? How much worse would the 2003 severe acute respiratory syndrome–coronavirus pandemic (which resulted in only about 8000 infections worldwide—0.0001% of the global population) have been had we not been able to discover and fully sequence the virus, develop first-generation diagnostic assays, and implement global infection control measures, all within a few months after the disease first came to international recognition? In the case of Guinea, with no access to such modern biomedical means or communications systems, Ebola virus circulated undetected for at least 3 months, causing 111 cases and 79 deaths, quietly slipping into neighboring Liberia and Sierra Leone [2].

Table 1. Laboratory-Confirmed Outbreaks of Ebola and Marburg Virus Disease Since Discovery Through June 2015^a

Year of Onset	Virus	Country	Epicenter(s)	Cases, No. (CFR, %)	Source of Primary Infection	Factors Contributing to Secondary Spread	Underlying Civil Unrest in Country or Region?	Country UNDP HDI Ranking ^b
1967	Marburg	Germany and Yugoslavia	Marburg and Cologne, Germany; Belgrade, Yugoslavia	32 (22)	Imported monkeys from Uganda	Dissection of monkeys to harvest organs, Nosocomial transmission	No	Germany, 5; Yugoslavia, 64
1975	Marburg	Rhodesia (present-day Zimbabwe) and South Africa	Travelers; exact site of infection unknown	3 (33)	Unknown	Nosocomial transmission	No	Rhodesia, 172; South Africa, 121
1976	Ebola	Zaire (present-day DRC)	Yambuku	318 (88)	Unknown	Nosocomial transmission	Aftermath of DRC independence crisis (1960–1965); Mobutu “kleptocracy” and failed state (1965–1997)	186
1976	Ebola	Sudan	Maridi and Nzara	284 (53)	Unknown	Nosocomial transmission	First Sudan civil war (1955–1972)	171
1979	Ebola	Sudan	Maridi and Nzara	34 (65)	Unknown	Nosocomial transmission	First Sudan civil war (1955–1972)	171
1980	Marburg	Kenya	Kisumu	2 (50)	Cave entry	Nosocomial transmission	No	145
1994	Ebola	Gabon	Mékouka, Ogooué-Ivindo Province	52 (60)	Infection in gold mining camps	Traditional healing practices; nosocomial and community-based transmission	No	106
1995	Ebola	DRC	Kikwit	315 (81)	Unknown	Nosocomial and community-based transmission	Mobutu kleptocracy and failed state (1965–1997)	186
1996	Ebola	Gabon	Mayibout, Ogooué-Ivindo Province	21 (57)	Consumption of dead chimpanzee	Community-based transmission	No	106
1996	Ebola	Gabon	Booué, Ogooué-Ivindo Province	45 (74)	Consumption of chimpanzee?	Nosocomial and community-based transmission	No	106
1996	Ebola	South Africa	Johannesburg	2 (50)	Imported from Gabon by infected physician	Nosocomial transmission	No	121
1998	Marburg	DRC	Durba	154 (83)	Repeated primary introductions from exposure in gold mine	Community-based transmission	Second DRC civil war (1996–1997); Mobutu kleptocracy and failed state (1965–1997)	186
2000	Ebola	Uganda	Gulu	425 (53)	Unknown	Nosocomial and community-based transmission	Lord’s Resistance Army insurgency, 1987 to present	161
2001	Ebola	Gabon and ROC	Ogooué-Ivindo Province, Gabon; Cuvette Ouest Region, ROC	65 (82)	Hunting and consumption of nonhuman primates	Nosocomial transmission and community-based transmission; traditional healing practices	ROC civil war (1997–1999)	Gabon, 106; ROC, 142
2001	Ebola	Gabon and ROC	Ogooué-Ivindo Province; Cuvette Ouest Region	57 (75)	Unknown	Community-based transmission	ROC civil war (1997–1999)	Gabon, 106; ROC, 142

Table 1 continued.

Year of Onset	Virus	Country	Epicenter(s)	Cases, No. (CFR, %)	Source of Primary Infection	Factors Contributing to Secondary Spread	Underlying Civil Unrest in Country or Region?	Country UNDP HDI Ranking ^b
2002	Ebola	ROC	Mbomo and Kéllé, Cuvette Ouest Region	143 (89)	Hunting and consumption of nonhuman primates	Nosocomial and community-based transmission, Traditional healing practices	ROC civil war (1997–1999)	142
2003	Ebola	ROC	Mbomo and Mbandza, Cuvette Ouest Region	35 (83)	Hunting and consumption of nonhuman primates	Traditional healing practices	ROC civil war (1997–1999)	142
2004	Marburg	Angola	Uíge	252 (90)	Unknown	Nosocomial transmission and community-based transmission	War of independence (1961–1974) and civil war (1975–2002)	148
2004	Ebola	South Sudan	Yambio	17 (41)	Exposure to baboon meat?	Nosocomial transmission and community-based transmission	Second Sudan civil war (1983–2005)	171
2007	Marburg	Uganda	Ibando, Kamwenge	4 (25)	Bat exposure in gold mine	Community-based transmission	No	161
2007	Ebola	DRC	Kasai Occidental Province	264 (71)	Exposure to local wildlife, including bats	Nosocomial and community-based transmission	Ongoing armed conflict	186
2007	Ebola	Uganda	Bundibugyo	149 (25)	Unknown	Nosocomial transmission and community-based transmission	No	161
2007	Ebola	DRC	Mweka and Luebo	32 (47)	Exposure to fruit bats through hunting?	Unknown	Ongoing armed conflict	186
2012	Marburg	Uganda	Kimbele, Ibando, Kamwenge	41 (58)	Unknown	Community-based transmission	No	161
2012	Ebola	Uganda	Kibaale	11 (36)	Unknown	Community-based transmission	No	161
2012	Ebola	DRC	Province Orientale	36 (36)	Hunted bushmeat?	Community-based transmission	Ongoing armed conflict	186
2012	Ebola	Uganda	Luwero	6 (50)	Unknown	Unknown	No	161
2013	Ebola	Republic of Guinea, Liberia, and Sierra Leone	Southeast forest region of Guinea	Ongoing; >27 500 cases at this writing	Unknown	Nosocomial and community-based transmission	Guinea: long-standing civil unrest and tribal conflict, coup d'état (2009); Liberia: civil wars (1989–1996 and 1999–2003); Sierra Leone: civil war (1991–2002)	Guinea, 178; Liberia, 174; Sierra Leone, 177
2014	Ebola	DRC	Province Equateur	66 (74)	Hunted bushmeat?	Community-based transmission	Ongoing armed conflict	186

Abbreviations: CFR, case fatality rate; DRC, Democratic Republic of the Congo; ROC, Republic of the Congo; UNDP HDI, United Nations Development Programme Human Development Index.

^a Single cases and cases related to laboratory infections are not shown.

^b Of 187 ranked countries, 2013 rankings [14]. The median ranking for countries with a recognized Ebola or Marburg virus outbreak is 154.5.

Second, we must not forget the all-important sociopolitical component of filoviruses and so many other diseases, which even the most advanced scientific technology cannot solve. Health science training in the United States has often presents a false dichotomy that implies that one is either a “science type” or a “human rights type,” either a future “virus hunter” or an “activist.” As it turns out, if we truly want to make a difference in people’s health, we need to pursue social justice as avidly as we do virology.

Finally, the question we must ask—no, demand—of health science, is “So what?” After all, health science should not be an entity unto itself, but rather a means to an end, primarily about, well, *health*. In the United States and Europe our fears of filovirus-related bioterrorism and imported infections have driven considerable research investment, with, for example, the development of numerous promising Ebola virus candidate vaccines and prophylactics. Although the unprecedented acceleration in clinical trials of therapeutics and vaccines for Ebola virus disease has been most welcome, these products still face significant hurdles if they are to be translated into tangible measures to improve and protect health, for both persons concerned about bioterrorism and those at risk of natural transmission in endemic areas. Advocacy is needed to move this process forward, for Ebola virus and many other emerging diseases, especially to make sure that the benefits indeed “trickle down” to those most in need in sub-Saharan Africa, hopefully without necessitating a major humanitarian crisis to make it happen.

Notes

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