**Vectors, Hosts, Fomites and Food….The challenge of controlling Ebola in West Africa**

John T. Hoffman

Colonel, USA, Retired

Senior Research Fellow

National Center for Food Protection and Defense

University of Minnesota

September 29, 2014

Control of VHF Ebola in West Africa is complicated by the fact that we know so little as to the mechanisms for the spread of the disease other than direct contact with infected persons or their bodily fluids, which local wildlife and rodents actually serve as hosts for the virus and the actual survivability of viable Ebola virus on fomites. Given these knowledge gaps, modeling the spread and control of the disease with any probability of being close to reality is unlikely. Potentially, these gaps suggest that the current focus on treatment and traditional control protocols have be insufficient to stop the outbreak and produce an Ebola free West Africa.

The vectors that facilitate the spread of Ebola virus have been assumed to be direct contact with infected persons or bodies of those who have died from Ebloa, or direct contact with their bodily fluids. Hence control and containment measures focus on these pathways for transmission. However, several cases of infection appear to defy such measures or the known pathway was more persistent or resistant to disinfection than has been understood. Despite strict adherence to control protocols, several health workers have become infected in West Africa. When local family member care customs and local funeral customers are considered, along with the lack of scientific awareness of the nature of pathogens, or the pre-microbiology perceptions, on the part of the local populations, even the established virus control protocols are difficult to institutionalize in the local communities.

West African fruit bats are believed to be one host for Ebola virus and the likely source of this outbreak. However, other wildlife in this region, commonly a source of supplemental nutrition for both rural and urban residents in the region, commonly referred to as “bushmeat”, may well serve as hosts for the virus or they may become infected and, in turn, infect the human population when they consume their infected flesh. There is some research on virus hosts in this region but the extent of hosts for viruses like Ebola and Marburg are unknown[[1]](#footnote-1). We lack data on such transmission possibilities but that may well be becuases we have not been capturing the data. Yet several countries in West Africa, such as the Ivory Coast, have instituted bans on the consumption of certain bush meats, such as rats, in an effort prevent the spread of the Ebola in that country[[2]](#footnote-2). It must be noted that the cultural norms and need for supplemental nutrition are difficult to overcome and it will require a substantial educational and enforcement effort to change such consumption practices. Further, if such bushmeats are a vector to this virus, the broad practice of smuggling illegal bushmeats may suggest a higher risk of global spread of this virus than may currently be considered. The United Kingdom has stepped up efforts to prevent the import of bushmeat[[3]](#footnote-3). Indeed a recent study at Oxford University may shed new light on the issue. The Oxford study’s author Nick Golding, a researcher at the University’s Department of Zoology, said: "Our map shows the likely ‘reservoir’ of Ebola virus in animal populations, and this is larger than has been previously appreciated[[4]](#footnote-4). It must also be noted that insect may play a role as a vector between infected animals and humans. It has been recognized that rodent and insect control may essential steps in controlling the disease[[5]](#footnote-5). Yet such steps are more than problematic in West Africa.

If rats and insects are potential vectors, then the presence of these vermin in the homes, cooking and food storage areas within the outbreak region may raise the potential for rapid spread and further challenge efforts to contain the outbreak. If this is the case, then the food safety and food security situation in West Africa will worsen. This, in turn, when combined with the already present fear of the disease and its perceived causes, may produce a substantial spread in regional unrest, which could be exploited by local radical and revolutionary groups already active in the region[[6]](#footnote-6). This may well result in a further surge in the level of violence that has begun to manifest towards the very people trying to help this region defeat the Ebola virus[[7]](#footnote-7).

Recent research on fomite transmission of Ebola virus is limited and has addressed only such transmissions in a clinical environment. In such studies, where clinical environmental conditions existed, transmission via fomites was considered, transmission was seen as unlikely where “currently recommended infection control guidelines for the viral hemorrhagic fevers are followed”.[[8]](#footnote-8) Yet, such infection control guidelines are not followed in the living spaces, work places, agricultural operations or product export operations in the infected regions of West Africa. The actual viability of such viruses on everyday items that may become contaminated from infected populations engaging in routine daily activities in the region has not be studied. What needs to be considered is what types of educational and practical initiatives can be undertaken at the local level to aid the community members in minimizing risks of transmission from direct human to human contact, potentially risks foods and contaminated fomites from sleeping mats to housewares to work environments. The objective would be to build resilience communities empowered to safeguard their own residents from such disease outbreaks.

With the spread of the disease and fear, traditional infrastructure functions fail. These failures range from routine maintenance of water, power and communications systems to suspension of customary agricultural production and harvest activities to collapse of educational and health care systems. All of these failures will often cascade into the failure of the food supply infrastructures that support the more densely populated urban and slum areas in and around the cities and towns. When food becomes potentially unsafe and scare, unrest expands and destruction of existing infrastructure components may well follow. This means the long term prospects for these regions, from community level up through regional and national governments, are not good and the level and expense of global interventions to stabilize and restore these regions to normalcy will grow substantially.

These challenges and knowledge gaps suggest a need for rapid expansion into new areas of research for VHF viruses like Ebola and Marburg. Studies on potential virus hosts, vectors and their interaction, virus survivability on a range of fomites (from household items to foods to shipping containers) and on innovative community level approaches to resilience to such disease outbreaks. Additionally, we need to address the food security issues of regions like West Africa if we are to curtail current bushmeat consumption and similar high risk nutrition supplement practices. Without such focused research and related social and nutrition interventions, we will be blindly fighting this virulent disease not just in West Africa but in other regions of the globe over the next few years. It must also be understood that the global food industry has just as large stake in this situation as does the public health community. Addressing these issues rapidly will aid in preserving key global commodity supply chains, keep the operation of these supply chains safe and protect customers from cost increases and reduce the chance of further disease spread. The surge in cocoa prices is but one example of this effect on global trade[[9]](#footnote-9). Finally, it is far cheaper to empower it to be resilient at the community level and feed it than it is to treat it for virulent disease outbreaks and then to rebuild its infrastructures and sense of community.

1. See: http://www.cdc.gov/ncidod/dvrd/spb/mnpages/dispages/vhf.htm [↑](#footnote-ref-1)
2. See: http://www.japantimes.co.jp/news/2014/09/18/world/science-health-world/west-african-powerhouse-cote-divoire-battles-keep-ebola/#.VCm2M9gtC00 [↑](#footnote-ref-2)
3. http://www.dailymail.co.uk/news/article-2711474/Experts-warn-deadly-Ebola-virus-spread-Britain-MEAT-Scientists-fear-contaminated-bush-produce-illegally-smuggled-UK-carry-killer-bug-market-stall-London.html [↑](#footnote-ref-3)
4. See: http://www.telegraph.co.uk/news/worldnews/ebola/11086598/Millions-more-at-risk-in-Ebola-outbreak-British-study-finds.html [↑](#footnote-ref-4)
5. See: http://www.hopkinsmedicine.org/healthlibrary/conditions/travel\_medicine/viral\_hemorrhagic\_fevers\_85,P01464/ [↑](#footnote-ref-5)
6. See: http://nation.time.com/2011/08/26/an-explosive-glimpse-of-the-future-of-the-long-war-in-africa/ [↑](#footnote-ref-6)
7. See: <http://www.who.int/violence_injury_prevention/violence/workplace/en/>

 <http://www.washingtonpost.com/news/morning-mix/wp/2014/09/19/why-the-brutal-murder-of-eight-ebola-workers-may-hint-at-more-violence-to-come/> [↑](#footnote-ref-7)
8. See: http://jid.oxfordjournals.org/content/196/Supplement\_2/S142.full [↑](#footnote-ref-8)
9. See: http://www.ft.com/cms/s/0/75f4c542-427e-11e4-847d-00144feabdc0.html#axzz3EjeMJtQW [↑](#footnote-ref-9)