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Perspective

Understanding the Key to Outbreak Control — Sudan Virus Disease in Uganda

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On September 20, 2022, the government of Uganda declared an outbreak of Sudan virus disease (SVD) in the Mubende District. As of November 5, SVD cases had been confirmed in 132 people, 49 of whom had died; 21 other people had died from illnesses that began before September 20 and were considered probable SVD. The outbreak has spread to six other districts, including the capital, Kampala.

Sudan virus, like Ebola virus, belongs to the family *Filoviridae*, which includes four other viruses that also cause disease in humans: Bundibugyo virus, Taï Forest virus, Marburg virus, and Ravn virus. Uganda has the unhappy distinction of having had outbreaks of disease caused by all these viruses except Taï Forest virus, which has been found in only one human (in Ivory Coast) so far.[1,2] Unlike Ebola virus, neither Sudan virus nor any of the other filoviruses has yet been targeted by successful treatments or vaccines, though plans for developing such interventions are under way.

The first Ugandan filovirus outbreak occurred in 2000 and consisted of 425 cases of SVD. The first outbreak of Bundibugyo virus disease, which included 131 cases, occurred in 2007. Eight other outbreaks have been much smaller (15 or fewer cases), perhaps owing to earlier detection or to Uganda's growing expertise in managing such outbreaks.

Although Uganda has had more than its share of outbreaks big and small, none have approached the magnitude of the West African Ebola virus disease (EVD) outbreak of 2013–2016, which was nearly 100 times the size of Uganda's largest filovirus disease (FVD) outbreak. Although public health experts once hoped that the advent of effective vaccines and therapeutics for Ebola virus would make another such event unlikely, the EVD outbreak in the eastern Democratic Republic of Congo in 2018–2020 — which ultimately totaled 3841 cases and lasted for 2 years, despite the availability of vaccines and therapeutics — has called into question this assumption. Why did we still have outbreaks involving thousands of cases?

A major reason that small outbreaks become big is that people move. FVDs are transmitted primarily through social networks, since most people become infected while providing care to sick people, often relatives or friends, or by participating in funeral ceremonies for those who have died from an FVD. When FVD outbreaks occur in isolated rural villages, where epizootic spillover typically happens, they rarely

extend far because the social relationships of village inhabitants are usually limited in their spatial dispersal. Outbreaks become large when they reach cities, where hospitals provide care for people from myriad social networks together in one location. Patients who become infected while hospitalized, and health care workers who become infected while providing care, return to their homes and spread disease to friends and family.

Today, however, Africa has better road infrastructure than it once did, and transportation is affordable for more people, so family networks extend across more widely dispersed cities and villages. FVD outbreaks spread along the same roads that connect these families, as happened at the shared borders of Guinea, Liberia, and Sierra Leone, where the West African EVD outbreak began.[3] These roads also provide a means for people to pursue economic opportunities in distant locations, and these people can potentially bring incubating virus along with them — which is how the West African EVD outbreak arrived in Conakry, Guinea, only 2 weeks after the first case was detected in Guéckédou, 400 miles away.

The incubation period for FVD is estimated to be 2 to 21 days; the average varies, but is often around 6 to 10 days, which allows people who have been infected the time to travel a long way before becoming ill if they have the means and motivation to do so.[4] In the past decade, the means have become more commonly available, so perhaps motivation bears examination.

Not only do people who live where FVD outbreaks occur have ordinary reasons to travel — such as employment and visiting family — but outbreaks themselves provide additional reasons. Illness or death in the family brings relatives from afar to aid with caretaking or to attend funerals. These relatives may bring incubating disease back home. In addition, people with severe illness generally seek out the best care within their economic means, even if that requires travel to a referral hospital some distance away. During outbreaks, infected people commonly seek refuge with family living elsewhere, in an effort to conceal illness from their neighbors (to escape the associated social stigma) or from health authorities (to avoid being pressured into going to a treatment facility). All this movement has resulted in larger outbreaks.

Understanding the people facing FVD outbreaks is important in planning for the possible expansion of an epidemic, but it is vital for other aspects of outbreak control as well. People living where FVD outbreaks occur have cultural practices and beliefs that have evolved in an environment where infectious diseases occur frequently; such practices may include not only care of the sick and burial of the dead but also traditional medicine. These behaviors can facilitate filovirus transmission, and they generally have deep roots and are not easily modified. Outbreak-response agencies need to be aware of the social and cultural determinants of people's behavior when they seek to change it. Management of the SVD outbreak in Uganda in 2000 was complicated by the fact that the outbreak-response team did not understand the local health beliefs and missed an opportunity to align their risk communication with the population's understanding of disease transmission.[5] This hard-won lesson has led to the regular inclusion of anthropologists in response teams to aid in designing and implementing control measures.

Understanding needs to go both ways, however — communities affected by an outbreak need to understand the responders as well. Medical and public health responders ask members of affected communities to refrain from behaviors that are meaningful to them, such as caring for loved ones who are ill and touching the deceased during funerals, and to do things that may frighten them, such as entering a treatment facility — from which many patients do not emerge alive. If we do not successfully explain the process of developing effective vaccines and therapeutics, it is seen as nefarious experimentation rather than an attempt to help.

If health experts expect people to take our advice, accept the services we offer, and participate in outbreak control, we first need to gain their trust — a step that is too often omitted. It's hard to build relationships when each village is visited in turn by a case-investigation team, a contact-tracing team, a vaccination team, a burial team, and a decontamination team, none of which include a single familiar person who will stop and explain what's going on. In their understandable haste to set up treatment centers and surveillance systems, safely bury the dead, and train health care staff to safely care for patients, response groups too often defer what is most impor-

tant: engaging the assistance of the most valuable partners in outbreak control, the people they are trying to help. This disconnect has undermined control of nearly every outbreak to date.

The Ugandan authorities recently decided to send a single multidisciplinary team to provide an integrated response to SVD hotspots, rather than sending multiple separate teams to operate in silos. This approach provides an opportunity to present the community with a single point of contact from which a relationship may be built between the people responding to the outbreak and those affected by it that would allow for mutual understanding and building of trust, enabling responders and community members to work together as partners — and would perhaps prevent another small outbreak from becoming large.

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