

Contagion! How can we combat the Ebola Virus Epidemic and prevent it from spreading in South Africa?

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The current Ebola epidemic in West Africa is the largest and most complex outbreak of the disease to date. First discovered in 1976 following an outbreak in the DRC and Sudan, the virus is thought to be transmitted to humans from bushmeat. It is spread through direct contact of broken skin or mucous membranes with bodily fluids such as blood, sweat, semen and other secretions, or with surfaces like bedding and clothing that have been infected with these substances. The current outbreak is caused by the deadliest species of the *Ebolavirus* (the *Zaire* strain) and has a 50% fatality rate.

Unlike previous instances, the disease has not remained contained within remote rural villages, but has spread to urban areas since the first case was reported in Guinea in March 2014. This has only sped up its transmission to other countries, and it now seriously affects Liberia and Sierra Leone. There are fears that it could develop into a major pandemic, but certain measures can be taken to combat the virus and prevent it from spreading in South Africa.

In order to combat the outbreak, infected individuals need to be identified so that they can be separated from the healthy population. If the sick are not identified quickly, they cannot be treated and are free to pass on the disease to friends and family. Because of this it is crucial that health workers are able to make rapid diagnoses. Currently available polymerase chain reaction (PCR) tests are unsuited to the magnitude of the outbreak as they are costly, can take up to eight hours to produce results under optimal laboratory conditions (but much longer when poor transportation, communications and power supplies are taken into account), involve hazardous blood samples and are only readable by trained laboratory technicians.

In response to this, U.S. company Corigenix is developing a disposable test that can be easily administered in clinics, homes and airports. It consists of a strip of paper that develops a dark red line within 15 minutes of exposure to infected blood - a result that can be easily interpreted by someone with no laboratory experience. There would be no need for patients awaiting diagnosis to remain in wards and risk exposure to Ebola if they do not have the virus. It is also significantly cheaper and only requires a pinprick of blood, thus minimizing risk for health workers. If widely distributed to health workers, tests like these could make a significant contribution towards slowing the spread of the epidemic as health workers would be able to better direct their efforts and attention to where it was most needed. Mobile labs can also quicken diagnoses in remote areas. Currently they provide results within three to five hours.

Once diagnosed, it is important to isolate the sick to prevent them from passing on the disease to others. Separate isolation wards and treatment centres need to be provided for this purpose, with infection control procedures put in place to protect health workers and contain the virus. Patients with severe symptoms should be held and treated separately to less severe or unconfirmed cases, with strict access control into and between wards. Owing to close contact with patients, caregivers run a high risk of infection and should use full body protective gear such as gloves, masks, eye protection, gowns and boots. The same applies to all visitors to wards. This equipment (as well as any other objects coming into contact with infected bodily fluids, such as bedding or clothing) poses a serious biohazard after use so must be safely destroyed or thoroughly disinfected, along with any waste or bodies generated by wards. Blood samples taken to laboratories for diagnostic purposes must also be handled under biological containment conditions. Staff should also take shifts as working longer than the recommended

number of hours in wards whilst wearing uncomfortable protective gear decreases concentration and increases risk of mistakes and resultant exposure to the virus. Equally important are safe injection practices, basic hand hygiene and respiratory hygiene.

Although these facilities are crucial in treating the sick and breaking the chain of transmission, many areas (especially countries worst affected by the outbreak, such as Liberia) are poor and have inferior health care structures. There is a shortage of treatment centres, staff and equipment, and governments need money from foreign aid to provide this support. Improvements to existing facilities could improve their efficiency - for example, installing Plexiglass walls would allow health workers to check on patients without wearing full protective gear. Establishing Community Care Centres would alleviate pressure on treatment facilities and increase the number of people receiving Ebola-related care by providing isolation and basic care for patients awaiting diagnosis or more sophisticated treatment. These can be built quickly and have been used successfully in Liberia. Basic training and protective equipment is provided and community involvement is encouraged so staffing requirements are lower. Families of patients isolated in homes need to be monitored daily and provided with basic training and protective equipment, then moved into a more secure facility as soon as space is available.

There is no known cure for Ebola, so patients receive symptomatic treatment. Recovery depends on good supportive care and the victim's immune response. Chances of survival can be improved by maintaining blood volume, oxygen and blood pressure levels and treating any other infections that may arise. Possible Ebola treatments undergoing research include blood, immunological and drug therapies. Experiments involving antibodies from survivors and RNA based drugs that block virus reproduction seem particularly promising. Once recovered, patients can still infect others for as long as the virus remains in their bloodstream. Men need to be especially cautious as the virus remains in their semen for seven weeks after recovery.

Education and community involvement are key in combating the outbreak. Ignorance, cultural beliefs and a distrust of Western Medicine have all facilitated the spread of Ebola. Many people are not familiar with the disease and need to be taught how to identify it, employ basic sanitation and protect themselves and their families. People should also be warned about the dangers of eating bushmeat. Careful surveillance of animal populations may also help indicate new outbreaks of the disease, as an animal Ebola infection usually precedes a human one.

There is a need for basic training amongst caregivers, as many may put themselves at risk through incorrect use of personal protective equipment (for example, infecting themselves while removing gloves). Information and communication are key. The public can be informed and educated through basic training programmes and spreading public health messages (stressing the importance of good hygiene and a clean environment) through the television, posters, pamphlets, speeches, social media, prominent leaders and religious institutions. Radio broadcasts can be used to reach remote areas and Ebola awareness and prevention events with drummers and performers would raise public awareness around the disease.

Rural leaders and healers also need to be taught how prevent the virus's spread and to cooperate with health workers. Ambulance drivers and burial teams have been pelted with stones in some areas, compromising their ability to assist. Dangerous misconceptions about health workers need to be changed if Ebola is to be contained. The sick need to seek care, not remain at home. Communities can be enlisted in surveillance and actively searching for sick people and referring them to Ebola units for isolation and treatment. All people who may have had contact with someone infected with Ebola also need to be traced and quarantined for 21

days. It is important that people are safely transported to facilities, without coming into contact with ambulance drivers.

Safe, prompt burial is also vital. Certain burial ceremonies require people to wash the dead by hand, bringing them into direct contact with infected bodily fluid. This is a sensitive issue and suggestions to burn bodies have been met with violent opposition and caused many families to hide bodies in their homes. Burial procedures involving specially designed graveyards are gaining acceptance, however, and allow people to be buried in a safe yet dignified way by qualified individuals. Already in use in Liberia, this is a concept which could be widely applied to and promoted in the epidemic zone.

Various strategies can be implemented to prevent Ebola from spreading in South Africa. Hospitals should be on standby with adequate supplies of personal protective equipment such as gloves, masks, eye protection, gowns and boots and additional funding if necessary. Staff also need to be briefed on treatments and infection control measures that would apply to potential Ebola cases, and trained to isolate and test suspected cases.

Surveillance is crucial, especially at border posts. The disease is only contagious when symptomatic (2-21 days after exposure) and cannot be detected earlier, so it is possible to enter the country before displaying symptoms. It is not realistic to halt flights to the epidemic zone or refuse visas to people from these areas though, as it only increases the chances of someone slipping through a loophole with the virus. Better control can be attained by enforcing rigorous screening before boarding flights leaving the epidemic zone and monitoring all entrants into South Africa for a minimum of 21 days. Transport airports such as Dubai need to be particularly vigilant. When released, the Corigenix tests could be used to great effect in airports.

Although there are no licensed vaccines available at present, two are currently under development. Both of these involve a harmless live virus and added Ebola protein, and have been successfully tested on monkeys. The one developed by British pharmaceutical company Glaxo Smith Kilne is currently undergoing human testing. WHO officials have endorsed large safety trials in the epidemic zone (necessary to ensure the vaccinations are safe for widespread use on healthy people) and 10 to 20 thousand CSK doses and eight thousand Public Health Agency of Canada doses have been donated to African health workers. Although supplies of experimental drugs and vaccines are extremely limited and therefore unlikely to have a real impact on the course of the outbreak in West Africa, they could be used to stop it spreading to other countries and prevent future epidemics. If the vaccinations are successful, immunizing South African citizens would eliminate the possibility of an Ebola outbreak in the country.

In conclusion, the Ebola outbreak can be successfully contained by improving health care infrastructure, providing basic training and community education and implementing innovative diagnostic and treatment methods. It can be prevented from spreading to South Africa by carefully screening all entrants to the country, equipping hospitals and promoting vaccinations when available.

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