

Forum: Environmental Council

Issue: Measures to Address the Increase in Zoonotic Diseases

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Introduction

Every year, zoonotic diseases kill about 2.2 million people worldwide. Zoonotic diseases are those which are transmitted between animals and people, with 13 zoonoses known to researchers. As reported by Live Science, “At least 61% of all human pathogens are zoonotic, and have represented 75% of all emerging pathogens during the past decade”.

One example of a zoonotic disease is Lyme disease which is extremely widespread but many people are unaware that they have it. The disease is caused by the bacterium *Borrelia burgdorferi* and is transmitted through the bite of blacklegged ticks. In the United States alone, which has a population of about 300 million people, 300,000 people have gotten Lyme within the past year. Immediate symptoms include rashes, headaches, and fatigue, however, when left untreated it can spread to joints, the heart, and the nervous system. When identified, a few weeks of antibiotics will be sufficient to cure it. Another more serious zoonotic disease is the Ebola virus disease (EVD), which is a virus that was initially transmitted from wild animals to humans and then spread within the human population. The fatality rate for the disease is rather grave with an astounding 50% of cases resulting in death. In order to prevent the spread of and eradicate the disease, community engagement was key. Interventions that occurred included infection prevention and control practices, surveillance of the disease and contact tracing, and performing safe burials to ensure the body wouldn't infect others. The EVD outbreak ended in 2016 due to these tireless efforts.

The spread of zoonotic diseases is furthered by unsanitary conditions which explains why many LEDCS who don't enforce high standard working conditions or public health standards have higher rates of zoonotic disease transmission. Countries which have public health problems, like contaminated water, are shown to have higher rates of zoonotic diseases. Countries with a lot of pastoral industry are also more vulnerable to the spread of zoonotic diseases because of the increased presence to livestock. Livestock carrying diseases can transmit them through direct contact or indirect with farmers or infect surrounding water supplies which will carry the zoonoses to different areas.

There are many measures that have been taken to address the spread of zoonotic diseases in the past and many measures that can be taken to stop to spread of zoonotic diseases in the present.

There are prevention strategies that can be put in place like the administration of vaccines and maintaining sanitary standards as well as solutions for after it has spread such as prescribing antibiotics and purifying water supplies.

Definition of Key Terms

Zoonotic Diseases (Zoonoses)

Zoonotic diseases are diseases transmitted between animals and people. These diseases can be transmitted directly, like through physical contact with infected animals, or indirectly, like by consuming contaminated foodstuffs.

Vectors

A vector is a organism that transmits a disease or parasite from one animal or plant to another. Examples of vectors include ticks and biting insects like mosquitoes.

Vaccines

Vaccines are substances that are administered in order to stimulate the production of antibodies to fight against a certain disease. They are created from causative agent of the disease or a synthetic alternative, and are made to act like an antigen without inducing the disease.

Antigen

A foreign substance that enters the body and produces an immune response, especially the production of antibodies. Antigens are administered in small doses in vaccines to trigger the production of antibodies that fight against the disease the antigen carries and enable the body to better fight against the disease when in encounters it.

Pathogen

A bacterium, virus, or another form of microorganism that can cause disease. Pathogens can be located in food and water supplies. When food or water containing pathogens is consumed, then diseases is transmitted.

Background Information

Ways a zoonotic disease is transferred

Direct contact and indirect contact with animals

Direct contact with any infected fluids from an animal, such as saliva, urine, blood, or feces, can result in infection. This can happen when petting an animal, or if they bite or scratch someone. Coming in contact with a place an animal has been or roamed and left infectious germs in can infect a person indirectly. Examples of such places include: habitats such as cages, chicken coops, and stalls, plants, soil, and pet food and water. Diseases transmitted in this way include Avian Influenza (bird flu), which is a viral disease occurring in poultry and other birds and occasionally pigs. In order to prevent the transmission of zoonotic diseases in this way, animals and humans alike can be vaccinated. In the case that someone has already been infected with a zoonotic disease that is viral, such as Avian Influenza, antiviral drugs can be used as treatment.

Vector-Borne

A vector is a living organism that transfers disease from animals to humans. Vectors are commonly arthropods such as mosquitoes, ticks, flies, fleas and lice. Common zoonotic diseases transferred by vectors are malaria, West-Nile virus, and Lyme disease. Vector-borne diseases are very common and are often severe diseases that result in fatalities causing more than a million deaths per year. In order to prevent West-Nile and Lyme disease, insect repellents are used to prevent mosquito and tick bites respectively as those are the vectors that carry those diseases. In order to prevent malaria, anti-malaria pills are taken and though it does not yet exist, scientists are working on a vaccine to prevent malaria. Even though malaria pills exist, it is advised that young children and pregnant women not travel in areas where malaria is common.

Foodborne

Pathogens located in food can transmit disease to the consumer of said food. Common pathogens in food include bacteria such as *Salmonella* and *Campylobacter* as well as viruses such as Trichinella. Additional examples of foodborne zoonotic diseases include E.coli and Bovine Spongiform Encephalopathy (BSE). These pathogens cause symptoms of what is referred to as food poisoning; diarrhea, nausea, vomiting, fever, headache, and fatigue. Most adults are able to recover within a few days but this condition can be life threatening for young children who lose significant body mass through diarrhea and whose underdeveloped immune systems have a harder time fighting off the pathogens. To prevent the spread of zoonotic diseases through food, foods such as meats are cooked thoroughly and water is boiled in order to kill pathogens it might've contained. This is why it is common advice to cook meat thoroughly to prevent Salmonella.

Parties at high risk of serious illness from zoonotic disease

Though anyone can contract illness from zoonotic diseases, certain groups of people are more likely to be afflicted and when more likely to be more affected when they contract a zoonotic disease. The groups of people at higher risk of serious illness from zoonotic disease are: children under the age of 5, adults over 65, and those with weak immune systems. Over a person's lifetime, they encounter antigens for various diseases and these antigens trigger the production of antibodies. Once initially produced, these antibodies stay in a person's body so that if they contact the disease again, they are prepared to fight it. Since young children have not had the opportunity to be presented with a lot of diseases throughout their lifetime, they don't have developed immune systems with all the antibodies that allow them to fight disease as effectively as adults can. Similarly, the elderly whose immune systems have degraded over time, are also more susceptible to serious illness, and possibly death, at the hands of a zoonotic disease.

The role of water, sanitation, and hygiene in the zoonotic diseases

Foodborne pathogens can be transmitted through sources of water meaning that when there is no clean water available, drinking contaminated water poses the threat of spreading zoonotic disease. In situations where animals or livestock that contain zoonotic diseases are drinking from the same water sources as people, the spread of zoonotic diseases is facilitated in this way.

Major Countries and Organizations Involved

World Health Organization (WHO)

The World Health Organization addresses a variety of health concerns worldwide and functions with the overall goals of promoting equity in health, reducing health risks, and promoting healthy lifestyles. One of their focuses is on neglected zoonotic diseases. Initiatives that they are working on to address this issue include ensuring clean water through sanitation and proper hygienic techniques, educating the public about zoonotic diseases, and developing and distributing vector control tools in areas of need. One zoonotic disease that the WHO has worked to address is malaria in Nigeria. The response included: the use of bed nets, spraying insecticides in shelters, expanding health facilities, and improving data collection through surveillance systems.

Ethiopia

Ethiopia is plagued by many zoonotic diseases, the most prevalent of which being rabies, anthrax, brucellosis, leptospirosis, and echinococcosis. These diseases are easily spread because large numbers of livestock give them to farmers who continue to transmit them among their populations. The budget allocated to health services in Ethiopia is extremely inadequate and there is a high dependence

on donors to fund health services; donors contribute 42% of the annual health budget. In order to solve their issues with zoonotic diseases, the government's allocated budget has to be significantly increased.

Nigeria

Nigeria has numerous zoonotic disease including malaria, tuberculosis, trypanosomiasis, toxoplasmosis, taeniasis, rabies, lassa fever and yellow fever. In addition, food-borne diseases like E.coli and Salmonella are emerging. The problem in Nigeria continues to grow as it is neglected by the government. Two-thirds of health facilities have been partially or fully destroyed as a result of conflict within the state resulting in 3.7 million internally displaced persons being left at risk of disease. NGOs such as the WHO have played a large part in rebuilding and developing new health facilities as well as working to find localized solutions for each disease.

India

India has had rabies, salmonellosis, leptospirosis and tuberculosis present for a long time and has distributed vaccines but because of newer resistant versions are continuously arising the problem hasn't been able to be resolved. India needs new medicines and vaccines that will cure those afflicted with new resistant versions of diseases. Additional measures that need to taken are researching the diseases domestically, collaborating with international organizations, and placing restrictive policies on the sharing of clinical and research materials.

Somalia

In Somalia, 370,000 to 400,00 people have been internally displaced due to drought. Among the top causes for morbidity in Somalia are diarrhoeal diseases, especially cholera, and malaria. Because of the drought, countless animals have died and their carcass lie scattered. Somalia's citizens are desperate to drink any water they come by so they often drink from water sources that have been contaminated by the dead animal carcass scattered everywhere. 53,015 cases of cholera have been reported as well as 2,937 deaths from malaria. A measure that needs to be taken to address this problem is finding a solution for the contaminated water sources which are spreading diseases.

Timeline of Events

Date	Description of Events
1950	Antibiotics were first discovered and WHO began advising countries on their use.

- 1995 The strategy for fighting Tuberculosis started and by the end of 2013, 37 million lives had been saved through TB diagnosis and treatment.
- 2001 The Global Fund to stop AIDS, Tuberculosis, and Malaria started by the WHO is created in collaboration with the UN.
- 2006 The number of kids who live to die before their fifth birthday is less than 10 million for the first time in recent history
- 2014 The biggest outbreak of Ebola ever in history strikes West Africa

UN Involvement, Relevant Resolutions, Treaties, and Events

- In 2006, the UN collaborated with the WHO on the Global Fund which aims to stop the spread of AIDS, Tuberculosis, and Malaria
- Global Early Warning System for Major Animal Diseases, including Zoonoses (GLEWS) was developed by the United Nations

Previous Attempts to Solve the Issue

Ending tuberculosis (TB)

The strategy to fight tuberculosis which was enacted in 1995 proved extremely effective. This strategy entailed the widespread administration of vaccines across the world. Vaccines were continuously adapted in order to be effective for the latest strand of the disease. The huge success of this strategy can be seen in the statistics: 37 million lives were saved as a result. However, despite these efforts, tuberculosis has still not been eradicated. The reason tuberculosis is one of the most successful pathogens is because a person can have the diseases for up to two years without showing symptoms and it can take several months before evidence of the disease is shown in lab tests. Solutions to the problem are still being worked on. At its annual convention at the UN Palais des Nations in Geneva, World Health Assembly passed a resolution in May 2014 with a new post-2015 strategy to end TB. The strategy ends to cut TB deaths by 95% with interim milestones set for 2020, 2025, and 2030.

Ebola outbreak strategy

2014 marked the start of the ebola epidemic. Starting in Guinea, it spread to Sierra Leone and Liberia then to other countries in West Africa. Due to many factors including poorly developed healthcare

infrastructure and a slow internal response because the health care workers in the area hadn't had much experience with the disease, ebola was able to continue spreading. Doctors Without Borders was able to administer treatment nearly 29,000 people and through tireless efforts, including those involving quarantine, the spread of ebola was said to have stopped in 2016. What was necessary is stopping the spread of ebola, was stopping its transmission. By monitoring cases of the disease, officials in the area were able to track its spread and contain it. The WHO also played a large part in ending the ebola epidemic. Shortly after the first case was reported, they mobilized their laboratory in Lyon, France with those in Donka, Guinea, Dakar, Senegal, Kenema, and Sierra Leone to prepare for diagnosis and to set up isolation facilities. One hundred twelve experts were also sent across the region to aid. The WHO also appealed to donors for \$100 million needed to finance their plan of action. This quick and comprehensive response was exactly what was needed.

Possible Solutions

The administration of vaccines

Vaccines are a crucial part of zoonotic disease prevention. The impact that they have on keeping the public healthy is unmatched by any other solution. Administering veterinary vaccines can combat a wide variety of viral zoonotic diseases such as avian influenza, brucella, E. coli, campylobacter, salmonella, methicillin-resistant staphylococcus aureus, leptospira, mycobacterium, cholera, and rabies. This approach to solving the problem would necessitate setting up vaccination clinics in hard-to-reach areas where zoonotic diseases are prevalent and, of course, proper resources and workers/volunteers to administer the vaccines are needed.

Water purification

Since water is often a major carrier of zoonotic diseases, water purification can help prevent a large amount of illness by eliminating pathogens in the water causing these diseases. One way to go about this would be going into communities and setting up water purification systems or providing a source of clean, safe water. Another method could be the distribution of technologies that would allow people to purify their own water, such as filters or chlorine tablets. A learn approach to this is educating populations about the importance of drinking clean water. Once they are aware of the risks to one's life that result of drinking contaminated water they would be more motivated to avoid drinking it or use simple purification techniques such as boiling water in order to prevent themselves and their families from contracting a zoonotic disease.

Education

As touched upon in the previous paragraph, education is a powerful tool to prevent the spread of zoonotic diseases. The first subject to educate communities upon that was mentioned is the importance of water purification. Additionally, communities need to be educated about the dangers of having their livestock share the same spaces as them and how they might be contaminating food and water supplies. This sort of an education is especially necessary for those working in agriculture or are pastoralists and have a higher risk of direct and indirect contamination because of the animals they raise.

Food Irradiation

Food irradiation is a technology used to make food safer for consumption and extend its shelf life. It is similar to pasteurizing milk or canning fruits and vegetables, in that it makes food safer for the consumer. The process involves using one of three approved types of radiation: gamma rays, x-rays, and electron beams. Food irradiation eliminates organisms that cause foodborne diseases such as E. coli and salmonella. This solution is more difficult to implement in less economically developed countries (LEDCS) because developed nuclear plants and irradiation technologies are required.

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