On October 22, 2015, Michael Osterholm, Director of the Center for Infectious Disease Research & Policy (CIDRAP) at the University of Minnesota, discussed *Middle East Respiratory Syndrome (MERS-CoV)*, with an emphasis on current trends and factors that make us vulnerable to future outbreaks. The webinar concluded with a discussion of lessons learned from recent experiences with MERS outbreaks and measures that can be taken to be better prepared to address this health issue.

There are a number of demographic and technological trends that are increasing the risk of pandemics and emerging zoonotic diseases. In terms of population, we are currently experiencing very rapid rates of population growth in urban areas of the developing world. These rapidly expanding areas are characterized by relatively poor public health services which could facilitate the spread of infectious diseases such as Ebola and others. For instance, there are more people living in the slums of Kinshasa, the capital of the Democratic Republic of the Congo, than in the slums of all three of the countries most affected by the recent outbreaks of Ebola.

Many of the countries where this rapid growth is taking place are experiencing problems of governance. The Peace Fund’s Fragile State Index assesses the stability of governments and identifies those where pressures could potentially lead to state failure. There are over 30 countries categorized by this index as having alerts or showing signs of weak or failing states. Those conditions could favor the spread of an infectious disease such as MERS since government response would be weak. Recent events, such as the killing of health workers in Pakistan who were participating in a polio vaccination drive, show how difficult it is to address public health concerns in some parts of the world.

In addition to these demographic factors, technology changes have allowed the movement of people and goods across the world to increase to unprecedented levels. World container ship traffic, for example, has doubled in less than ten years. Similarly, international tourism has more than doubled in the last twenty years. This movement of people and goods can also favor the spread of infectious diseases such as MERS.

These trends and factors suggest that the risks associated with MERS and other infectious diseases are very real. The World Economic Forum includes infectious disease as one of the greatest threats in terms of both high probability of occurrence and high impact in its global risk landscape. Chikungunya virus is now affecting Latin America and the Caribbean and it did not exist there just a few years ago. The MERS outbreak in the Republic of Korea shut down one of the most modern hospitals in the world for three weeks which shows that even a state-of-the-art hospital in a wealthy country is vulnerable to MERS. Such an event could take place in any hospital in any major city in the world.
Other experiences with coronaviruses suggest how far and how quickly these viruses can spread. **Severe Acute Respiratory Syndrome (SARS-CoV)** spread from China when an infected person travelled to a Hong Kong hotel and transmitted it to others who then travelled to different parts of the world. SARS-CoV is believed to have followed a pathway from a wildlife reservoir, thought to be a species of bat, to an intermediate host such as palm civets that were sold in markets, and then to humans. Measures were taken to eliminate the sale of these animals in markets and their consumption to reduce the risk of infection.

In 2012 there was a case in Saudi Arabia that was similar to SARS-CoV. Now we call it Middle East Respiratory Syndrome (MERS-CoV). It is also a corona virus. There was a large outbreak in Saudi Arabia in Spring 2014 and it’s become something we now see every year. Figure 1 shows the number of global cases of MERS-CoV.

**Figure 1. Confirmed Global Cases of MERS-CoV**

Most of the cases reported to date have been in the Arabian Peninsula, in countries such as Saudi Arabia and the United Arab Emirates (UAE). The disease has a mortality rate of about 30%. People exposed to MERS-CoV in the Arabian Peninsula and traveling to places such as the Republic of Korea can spread the virus. In the case of MERS-CoV the pathway of exposure also includes a wildlife reservoir, probably a
The disease does not kill camels but gives them a respiratory infection. The cultural importance of camels to the UAE and Saudi Arabia has made it very difficult to engage those who keep them and government officials in conversations about how to address the problem. Saudi Arabia has had four different health ministers in the last few years but they release very little information about MERS-CoV cases and they do not communicate that contact with camels and with camel products such as raw milk might be dangerous. People do not believe their camels might be involved.

Another important challenge with MERS-CoV is that we do not understand why some people become super-spreaders of the virus and others do not. In one outbreak in UAE, seven different patients came to a hospital and they did not transmit the virus to anyone. In a separate incident, another patient was admitted to the hospital and transmitted the virus to tens of people.

There is little evidence of the virus currently affecting camels in Africa. But given the population of camels in those countries and the current problems of governance in several countries in East Africa, if the virus spreads to that region it could be amplified. This could potentially fuel the explosion of the virus in other parts of the world.

Another factor in the Arabian Peninsula that could contribute to the spread of the virus to other parts of the world is the large number of temporary workers from other countries residing there. About 75% of domestic workers are from India or the Philippines, and the virus could spread to those countries via air travel. As mentioned earlier, the experience in the Republic of Korea indicates that this virus can affect a top hospital comparable to any of the best hospitals in the world, so it is very concerning to think about the spread of this virus to hospitals in cities with health care facilities of poorer quality. There is also concern that the virus may be more transmissible from person to person than it was previously thought.

In an average month about 75,000 people travel from Saudi Arabia and the UAE to North America. Some of those traveling to the U.S. are seeking medical attention and services so hospitals need to be prepared for the potential spread of this virus. MERS-CoV is not going away. The population of camels, the host of the virus, will not decrease, and the global community needs to be aware of measures to reduce the spread of the virus to other areas. But we do not have a good plan to address this issue. A vaccine for camels is not in sight and we are languishing in this area.

The symptoms of MERS-CoV are similar to flu and require intensive care. It’s not clear what the incubation period is but it is thought to be around 2-10 days.

In terms of precautions for people that travel to the Arabian Peninsula or work there, first, an important measure is to avoid consuming or coming into contact with raw or undercooked camel products like milk. Second, if you need medical services in the region it would be good to know which hospitals have had problems and to avoid those. Third, quick intelligence is important, if there is an outbreak anywhere it is good to be informed.
For health care facilities in the U.S. it is important to develop policies so that patients that show symptoms similar those of MERS-CoV have their travel history ascertained. Patients that display these symptoms and that have travelled to the Arabian Peninsula should be put in seclusion to avoid transmission.

**Additional Resources:**

- Center for Infectious Disease Research & Policy (CIDRAP), University of Minnesota: [http://www.cidrap.umn.edu/](http://www.cidrap.umn.edu/)