

## PANDEMICS: NOVEL VIRUSES

Typically, pandemics are caused by novel viruses or variant strains of known viruses since few, if any, people have been exposed or developed antibodies to the virus. Since there is little resistance, many people often get sick. Depending on the virulence (the ability to make a person sick and the severity of that illness), many people may have serious complications or die from their illness.

Often, pandemics are caused by influenza viruses (1918 Spanish Flu, 2009 H1N1) but not always. SARS was a novel coronavirus; the same type of virus that causes the common cold – just not one that had ever been identified before. MERS-CoV (Middle East Respiratory System - Coronavirus) is the same type of virus and also had never been identified in animals or humans. Other diseases that are considered at possible risk for causing a pandemic are the groups of diseases known as viral hemorrhagic fevers. These include diseases such as Ebola, Marburg, Lassa and Valley Rift fevers. These diseases cause concern because their mortality (death) rate is so high, but the disease is somewhat limited in ability to move great distances since from the onset of symptoms to profound illness or death is short. This allows time for quarantines to be put in place to contain the diseases to specific areas. Still, with air travel being so available, the risk does remain that a global outbreak could occur. During the Ebola outbreak of 2014, there were a few cases of Ebola that made it to the US. Most of them were known cases that were transferred here for treatment; a few were cases brought here through travel but unknown before they got sick here or on the way here. On the other hand, ZIKA is caused by an infected mosquito and was considered to be at Pandemic level last year. The number of cases for 2017 was much less than for 2015/2016, although new cases are occurring at a much slower rate. The United States has had very limited local cases; most cases have been imported by travel from countries where it is more endemic. Endemic means that a disease is found in a specific community(ies) but is not growing in the number of cases seen within that community. Ultimately, many of the people in a given geographic area become infected and then immune, resulting in less new cases. Many diseases remain endemic in regions for generations. Example of endemic diseases are malaria in many African and Island nations, Hepatitis A in many countries, Tuberculosis in many 2<sup>nd</sup> and 3<sup>rd</sup> world countries, although many consider TB, particularly the MDR (multi-drug resistant) to be a pandemic. Some also put MRSA-CA (Methicillin-resistant Staph aureus) in this same category. Which transitions to the bacteria that have been responsible for pandemics although not recent ones, since antibiotics, when available, can control the infection rate. Some bacterial infections that have been pandemics include TB, Plague, Cholera. MDR TB and Cholera are considered current pandemics.

Currently, there are more novel influenza viruses currently circulating than ever before (that have been identified). These novel viruses include many avian flu viruses but most have had little human-to-human transmission. This means that most humans have been infected by direct contact with wild or domestic fowl or pigs, although some humans have been infected by those living with them or taking care of them while they are sick. Just for name recognition, the following novel flu viruses are being carefully monitored. Most of them have occurred in China with limited transfer to other parts of Asia but some have also found their way to countries in Europe and a few have even been found in the US and Canada.

Novel Viruses: Influenza A strains are commonly found in asymptomatic waterfowl and transmittable to both wild and domestic birds of all varieties, including chickens. Transmission to humans can occur from wild or domestic birds but is more common from co-living with poultry or waterfowl or with contact from markets.

**Highly pathogenic H7N9 (Asian lineage)** was first found in humans in China in 2013. It currently seems to be a little better at binding to human airways than the low pathogenic H7N9 found earlier in China. Worse, there is a mutation on the highly pathogenic H7N9 which resists the flu antivirals currently in use. This mutation can occur very rapidly, making this mutated virus not only dangerous to birds but also to humans. Human infection is severe with high mortality. Note: high and low pathogenic is actually used to describe the effect on the birds or other carrying animal. Low pathogenic indicates that some may show signs of illness but the illness is mild if detectable at all, fewer are infected, and there is no mortality, while the opposite is true for highly pathogenic strains. The risk to humans is considered so risky, that the World Health Organization (WHO) has already recommended the development of a vaccine to protect from the H7N9. Other H7 flues have infected some humans but have resulted in only mild symptoms of conjunctivitis or an upper respiratory infection. Humans have survived these milder flues.

**Highly pathogenic H7N9 and H7N9 (US lineage)** cases have been found in backyard and commercial birds. No human infections have been reported.

**Highly Pathogenic H5N1 (Asian lineage)** has caused infections in poultry in Asia and the Middle East. Human infections have been reported in sixteen countries with a mortality rate of more than 50%, most caused by severe pneumonia.

**Highly Pathogenic (US lineage) H5 viruses including H5N2 and H5N8**, have been identified in both backyard and commercial birds. However, there have been no human infections identified and the CDC considers the risk of human infection low. There was a human case in the North America (Canada) of H5N1 imported by travel from China.

**Low Pathogenic Influenza A H9N2** has been detected in birds on multiple continents including Asia, Africa, Europe and the Middle East. Occasional human infections have caused a very mild URI (upper respiratory illness) and only one death amongst those reported.

Just one more point on Novel viruses. Although humans can get infected from Avian viruses directly from contact with birds or areas that have been contaminated by birds, the greatest risk for human infection is from mutation or reassortment of viruses. That reassortment is more easily done in swine since pigs can be infected with avian, swine or human flues. When there is infection with more than one type of flu, the likelihood of “combining” the flues (reassortment) is much more likely. This can also happen in birds, if they have more than one avian influenza type.