Clinical Chemistry

The Evolving Threat of Influenza Viruses of Animal Origin and the Challenges in Developing Appropriate Diagnostics

Article:
P.W.Y. Mak, S. Jayawardena, and L.L.M. Poon
The Evolving Threat of Influenza Viruses of Animal Origin and the Challenges in Developing Appropriate Diagnostics.
Clin Chem 2012;58:1527-1533.
http://www.clinchem.org/content/58/11/1527.abstract

Guest:
Dr. Leo Poon is Associate Professor at the Center of Influenza Research and School of Public Health, Li Ka Shing Faculty of Medicine at the University of Hong Kong.

Bob Barrett: This is a podcast from *Clinical Chemistry*. I am Bob Barrett.

Influenza is a contagious respiratory disease responsible for both seasonal epidemics and pandemics. During the 20th century there were three influenza pandemics, namely the Spanish Flu in 1918, the Asian Flu in 1957, and the Hong Kong Flu in 1968.

Because of the relatively frequent transmissions of influenza viruses from poultry to humans, diagnostic testing has been primarily focused on avian influenza viruses.

In 2009, however, nature caught us by surprise in the first pandemic of this century, which was caused by a swine virus that is of the same subtype as a human seasonal H1N1 virus. This reflects the highly unpredictable nature of the influenza A virus.

In the November 2012 issue of *Clinical Chemistry,* Dr. Leo Poon and colleagues from the Center of Influenza Research and School of Public Health at the University of Hong Kong discussed the nature of influenza viruses and the challenges of developing molecular diagnostic tests for detecting new pandemic strains.

Dr. Poon is our guest in this podcast. Doctor, can you explain why it is so difficult to prevent influenza pandemic?

Dr. Leo Poon: Well, actually we know a fair bit about human influenza virus. We know how they transmit between humans, but the lateral vessel for the virus actually is not in human. They all came from animals, in particular from birds. We know the virus actually have been -- some of the virus has been circulated in swine by the swine H1 and swine H3. Then the

other animals like horse, they also have their own influenza virus.

But then all these previously were derived from avian poultry or our aquatic birds specifically. They are 16 H subtypes and 9 N subtypes. So there is a huge genetic diversity in this aquatic bird population. And some of these viruses can jump into other species. Because we are never able to get rid of this virus in wildlife so then it's basically impossible for us to prevent attacks of this virus from the bird population.

On top of that we basically know very little how this virus is circulating among the wildlife. Recently, this year, there was a report, actually we detected new influenza virus in bats. This virus is very different from avian influenza virus and then we found that there may be another diversity of influenza virus circulating in the wildlife. So as long as these viruses are circulating in wildlife, then we will be under threat.

Bob Barrett: Doctor, the H1N1 pandemic in 2009 is considered to have been very mild. Why do we still need to care about pandemic preparedness?

Dr. Leo Poon: Yes, I agree that 2009 pandemic was very mild and I think this is the mildest pandemic of all these last four pandemics. But having said that, the Hong Kong just between, just after five months after the pandemic alert had been issued by WHO, 50% of the children in Hong Kong had been infected by this new virus. We found that this virus is highly transmissible and it can infect a great proportion of the human population in a very short time.

Luckily, in 2009 the pandemic was very mild, but if you have a pandemic like what we had in 1918, the case fatality of the 1918 pandemic is about 2 to 3%. So that means 2 or 3% will die out of 100. In that particular pandemic about 15 million people died because of the infection.

So if we have such a pandemic similar to the 1918, we will be in great trouble. In fact, the World Bank has estimated that if we have a pandemic with evidence comparable to that of 1918 Spanish Flu our GDP, the global GDP may be dropped by 5% and more than 17 million people may die, because of the infection in that particular pandemic year.

So for me I am a bit concerned that people may think pandemic may no longer be a serious health issue to human, but really if we have encounter with a very bad one, we will be in great trouble.

Bob Barrett: How can a clinical diagnostic lab face the challenges of influenza pandemic preparedness?

Dr. Leo Poon: I think it depends upon the diagnostic capacity. If we actually encounter a pandemic, there will be hundreds or thousands of samples will be sent to the diagnostic lab everyday and that will increase -- that will consume a lot of resources and manpower to make a diagnosis at the beginning of the pandemic.

Even when we have that capacity then we really have to be prepared for detecting something which is unusual. And right now except having H5, H7, N7 viruses which we may have a well-validated diagnostic test for these animal influenza virus, but for the other avian influenza virus I don't think we really have a very good and solid investigation and try to come up with a very good and robust, diagnostic method for these avian influenza virus.

So that would be a problem, because if we have encountered generally--have encountered virucides that will take some time to make a diagnosis on this. So I think if right now we encounter some atypical viruses the best way to do that is just send it to the WHO Collaborating Center to diagnose this, or at least to make an inquiry and make sure that we didn't miss that type of atypical influenza infection, because these early cases may actually help to tackle these emerging viruses at the beginning of the pandemic.

Bob Barrett: Doctor, you have mentioned that animal influenza viruses can contribute to the genesis of pandemic influenza. Are there ways we can prevent them from jumping to humans?

Dr. Leo Poon: Well, as I have mentioned before the aquatic birds are the lateral vessels for these avian influenza viruses, and they may jump to other species. So it will be hard to prevent that, but having said that we know quite a bit of these determinants that may affect or facilitate these viruses to jump to other species such as the viral receptive findings, specificity, and there are some known methods that may facilitate a virus to replicate like in human.

But most important of all, based on what we learned from previous zoonotic event caused by influenza virus, we know that these jumping, make primary cross by close contact with the infected poultry or swine population. So it would be a good idea to try to have a better understanding or perhaps a better control of this influenza activity in these domesticated populations.

With a better understanding of the influenza virus activity or even by reducing this activity in these domestic populations, we may help to reduce the risk of having a pandemic. Of

course, I really cannot agree more on the concept of one world and one health because taking a good care of animal health or even the health of wildlife, will eventually help us to prevent the problem of zoonotic transmission of these animal viruses to humans and then that will help us to prevent the next pandemic.

Bob Barrett: Dr. Leo Poon is Associate Professor at the Center of Influenza Research and School of Public Health, Li Ka Shing Faculty of Medicine at the University of Hong Kong. He has been our guest in this podcast from *Clinical Chemistry*.

I am Bob Barrett. Thanks for listening.