

Chickens and Humans and Pigs ... *Oh My!* A Case Study About Influenza



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Part I – Background

Influenza is in the news on a daily basis during the winter months. This week we will draw on your collective knowledge to examine the intersection between the influenza virus and the immune response. To begin your exploration, we have provided the following questions that we would like you to prepare answers for before coming to class. You may discuss these questions with your group, classmates, experts in the field, etc. (i.e., this is not expected to be individual work but ultimately you will be responsible for the information).

Questions

1. What is the structure of the influenza virus? What are its unique characteristics?
2. What is an antigen? How does the immune system recognize antigens?
3. What are the immunodominant antigens of influenza? On what part of the virus are they located?
4. Define *antigenic shift*, *antigenic drift*, and *original antigenic sin*.

Part II – Yearly Flu

It is January and the beginning of a new semester. Just as you get settled in to your new routine, you begin to notice that illness is spreading across campus and other students in your classes are succumbing in droves. People are saying that it's the flu, and your friend describes having a fever, chills and body aches. It doesn't sound fun, and you begin to wonder if you should have gotten your flu shot when they were advertised at the Health Center last semester. You were just too busy at the time, and you're not a big fan of needles, in any case. Besides, you had one friend last year that got the shot and still got the flu. You had another friend that said they got the flu from the vaccine. So, you are just a little leery of the whole idea. Because you are interested in biology, you decide to do a bit of research into the subject.

Questions

1. What are the components of the yearly influenza vaccine? How is it manufactured? How do you explain your friends' experiences with the flu vaccine?
2. Do we have to get vaccinated every year against influenza? What effect will previous years' vaccines have on the immune response to the current influenza strain?
3. Other organisms can be infected by influenza—what are they? How does it spread within and between species, and what determines whether productive replication of the virus occurs?

Part III – Avian and Swine Flu

In 1997, several thousand chickens died at three farms in Hong Kong. Soon afterward, humans began getting sick as well, and the illness was determined to be H5N1 influenza from chickens. Out of a couple hundred people in Hong Kong with the infection, 18 people were hospitalized and 6 died. Most people who were affected lived in direct contact with chickens, and approximately 1.5 million chickens in Hong Kong were slaughtered to prevent further spread of the disease. With the emphasis on avian flu in the media, it surprised many that the next influenza pandemic was an H1N1 strain from swine in 2009. The virus spread to 198 countries, with 2.1 billion people infected and over 40,000 deaths by summer 2010.

Questions

1. What are the epidemiological characteristics of infection with avian and/or swine flu as compared to yearly flu? What about these viruses causes such public concern?
2. How does the immune response to yearly flu differ from that of the avian flu? How does this relate to the characteristics of infection with avian flu?
3. H1N1 influenza has been the cause of four pandemics in recent history: 1918, 1957, 1968, and 2009. How is it possible to have multiple H1N1 pandemics in the same century?
4. What possible outcomes might happen if swine flu (H1N1) and avian flu (H5N1) reassorted?
5. Would it be efficient to vaccinate against yearly swine and avian flu at the same time? Why or why not?
6. What is the significance of a virus that can directly infect humans from chickens? Why do you think that the 1997 threat did not turn into a pandemic?



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