Flu doesn't die out, it hides out

May 27 2010

Every autumn, as predictably as falling leaves, flu season descends upon us. Every spring, just as predictably, the season comes to a close. This cyclical pattern, common in temperate regions, is well known, but the driving forces behind it have been in question.

Do existing strains die off each spring, only to be replaced each fall by new founding strains from other parts of the world, or does a "hidden chain of sickness" persist over the summer, seeding the next season's epidemic? A genetic analysis by University of Michigan postdoctoral fellow Trevor Bedford and colleagues at U-M, Howard Hughes Medical Institute and Florida State University reveals that in the United States, not all strains of influenza die off at the end of winter; some move southward to South America, and some migrate even farther. The paper is scheduled to be published online May 27 in the open-access journal *PLoS Pathogens*.

"The prevailing view that has developed over the past three years or so is the out-of-tropics hypothesis, in which the strains that bring about each temperate flu season originate from China and Southeast Asia, where influenza A is less seasonal," Bedford said. He and his colleagues tested that hypothesis by analyzing genetic sequences from influenza A (H3N2) viruses collected from patients around the world between 1998 and 2009 and constructing a tree showing relationships among the viruses. The resulting mathematical model accounted for evolutionary processes and rates of migration.

"We found that although China and Southeast Asia play the largest role

in the influenza A migration network, temperate regions---particularly the USA---also make important contributions," Bedford said. Rather than dying off at the end of our flu season, many strains simply move on to more favorable environments.

The results have implications for public health efforts aimed at combating the disease. For example, the new knowledge that influenza frequently migrates out of the U.S. argues for caution in using antivirals, which can promote development of drug-resistant strains. If, as previously thought, those strains died out at the end of the season, they would not be a problem, but their newly-discovered ability to survive and circulate means resistant strains can spread from the U.S. throughout the world. On the flip side, the finding also means that vaccination programs outside of China and Southeast Asia can be effective in curbing influenza's spread.

In addition, growing knowledge about patterns of flu migration eventually may make it possible to tailor vaccines to particular locations, Bedford said. "We found, for instance, that South America gets almost all of its flu from North America. This would suggest that rather than giving South America the same vaccine that the rest of the world gets, you could construct a vaccine preferentially from the strains that were circulating in North America the previous season. As we gather more data from other regions, this could be done for the entire world."

The research also can inform disease surveillance, Bedford said. "By doing this kind of research, we get a clearer idea of where in the world flu is actually coming from. We know that it's mostly Southeast Asia, but now we see that it can come out of temperate regions as well, so our surveillance needs to become more global."

More information: PLoS Pathogens---www.plospathogens.org/home.action

Provided by University of Michigan