

## Swine Flu Issue Brief

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### An Influenza Virus Naturally Can Have Multiple Genetic Sources: Why the Current Swine Flu Virus Is Not Bioterrorism

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#### Is the Current Swine Flu Bioterrorism?

During the [DHS/CDC/White House press briefing](#) on Sunday, April 26, a reporter asked if the current swine flu outbreak is a naturally occurring event or evidence of bioterrorism. She based her question on reports that the swine flu virus is composed of portions of virus from multiple sources (pigs, humans, etc.). Understanding how a virus can have multiple sources naturally is important to understanding why this is not bioterrorism.

[Press Briefing on Swine Influenza with Department of Homeland Security, Centers for Disease Control and Prevention, and White House, Release Date: April 26, 2009:

[http://www.dhs.gov/ynews/releases/pr\\_1240773850207.shtm](http://www.dhs.gov/ynews/releases/pr_1240773850207.shtm)]

#### No, It Is the Product of Genetic Re-assortment

Genomic analysis clearly indicates that this virus is the product of genetic re-assortment, a natural phenomenon of shuffling genes that occurs frequently with influenza viruses and is the cause of all influenza pandemics. It is not at all likely that the current outbreak is the result of bioterrorism.

#### Gene Shuffling Is Unique to Flu Viruses

This ability to shuffle genes is unique to influenza. It occurs because the influenza virus has a segmented genome: it is composed of 8 pieces of RNA that are not connected. When a host—whether pig, bird, or human—becomes infected simultaneously with 2 different influenza viruses—for example, a swine influenza virus and a seasonal human influenza virus—a new virus can be formed that has a combination of genes from the 2 parent viruses. As a normal part of the infection, viruses make many copies of themselves. As the viruses are being packaged and assembled within the infected cell, mixing of the viral RNA segments can occur; some segments of the genetic material (RNA) from one virus may become incorporated into the other virus's packaging. Thus, a new influenza virus is created with components of 2 different viruses. (On April 27, 2009, the *Wall Street Journal* had an excellent graphic that explains the “viral mixing pot” effect that produces viruses like swine flu:

<http://online.wsj.com/article/SB124078887309757539.html>.)

## Co-infection Is Likely To Have Occurred

The current swine flu virus appears to have genes from different swine viruses and possibly human and avian viruses. Some genes are similar to North American swine influenza viruses, while others are from viruses isolated from Eurasian pigs. At some point in the past, it is likely that a co-infection (or co-infections) occurred to allow the mixing of different viruses and the swapping of genetic elements. Even though the swine flu appears to have disparate origins, the virus is labeled as “swine flu” because most components are of swine origin.

In the future, there may be scientific disagreement about the exact origins of each segment in swine flu, but its mixed genetic origin is a hallmark of naturally evolving influenza viruses, not bioterrorism.

**For Further Reading:** Treanor JJ. Influenza viruses. In: Mandell GL, Bennett JE, Dolin R, eds. *Principles and Practice of Infectious Diseases*. Philadelphia: Elsevier Churchill Livingstone; 2005:2060-2085.

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