

New York autopsies show 2009 H1N1 influenza virus damages entire airway

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In fatal cases of 2009 H1N1 influenza, the virus can damage cells throughout the respiratory airway, much like the viruses that caused the 1918 and 1957 influenza pandemics, report researchers from the National Institutes of Health (NIH) and the New York City Office of Chief Medical Examiner. The scientists reviewed autopsy reports, hospital records and other clinical data from 34 people who died of 2009 H1N1 influenza infection between May 15 and July 9, 2009. All but two of the deaths occurred in New York City. A microscopic examination of tissues throughout the airways revealed that the virus caused damage primarily to the upper airway—the trachea and bronchial tubes—but tissue damage in the lower airway, including deep in the lungs, was present as well. Evidence of secondary bacterial infection was seen in more than half of the victims.

The team was led by James R. Gill, M.D., of the New York City Office of Chief Medical Examiner and New York University School of Medicine, and Jeffery K. Taubenberger, M.D., Ph.D., of the National Institute of Allergy and Infectious Diseases (NIAID) at NIH. The findings are reported in the *Archives of Pathology & Laboratory Medicine*, now available online and scheduled to appear in the February 2010 print issue.

"This study provides clinicians with a clear and detailed picture of the disease caused by 2009 H1N1 influenza virus that will help inform patient management," says NIAID Director Anthony S. Fauci, M.D. "In fatal cases of 2009 H1N1 influenza, it appears the novel pandemic

influenza virus produces pulmonary damage that looks very much like that seen in earlier influenza pandemics."

The new report also underscores the impact 2009 H1N1 influenza is having on younger people. While most deaths from seasonal influenza occur in adults over 65 years old, deaths from 2009 H1N1 influenza occur predominately among younger people. The majority of deaths (62 percent) in the 34 cases studied were among those 25 to 49 years old; two infants were also among the fatal cases.

Ninety-one percent of those autopsied had underlying medical conditions, such as heart disease or respiratory disease, including asthma, before becoming ill with 2009 H1N1 influenza. Seventy-two percent of the adults and adolescents who died were obese. This finding agrees with earlier reports, based on hospital records, linking obesity with an increased risk of death from 2009 H1N1 influenza.

The researchers examined tissue samples from the 34 deceased individuals to assess how 2009 H1N1 influenza virus damaged various parts of the respiratory system. "We saw a spectrum of damage to tissue in both the upper and lower respiratory tracts," says Dr. Taubenberger. In all cases, the uppermost regions of the respiratory tract—the trachea and bronchial tubes—were inflamed, with severe damage in some cases. In 18 cases, evidence of damage lower down in the finer branches of the bronchial tubes, or bronchioles, was noted. In 25 cases, the researchers found damage to the small globular air sacs, or alveoli, of the lungs.

"This pattern of pathology in the airway tissues is similar to that reported in [autopsy](#) findings of victims of both the 1918 and 1957 influenza pandemics," notes Dr. Taubenberger.

The researchers also examined 33 of the 34 cases for evidence of pulmonary bacterial infections. Of these cases, 18 (55 percent) were

positive for such infections. Not all of those individuals who had bacterial pneumonia along with 2009 H1N1 virus infection had been hospitalized, however, indicating that some had acquired their bacterial infections outside of a health-care setting. This raises the possibility, say the authors, that community-acquired bacterial pneumonia is playing a role in the current pandemic. "Even in an era of widespread and early antibiotic use," write the authors, "bacterial pneumonia remains an important factor for severe or fatal influenza."

Computerized tomography (CT) lung images were available in four cases of pulmonary bacterial infection. In all four cases, the CT scans showed an abnormality known as ground-glass opacity, which are patches of rounded haze not seen in normal lung images. It is not known, say the researchers, whether the abnormalities detected by CT in the four cases also occur in people who have milder H1N1 infections. They call for additional investigation into the utility of CT scans as a tool to help clinicians identify and better treat severe H1N1 infections.

More information: JR Gill et al. Pulmonary pathological findings of fatal 2009 pandemic [influenza](#) A/H1N1 viral infections. *Archives of Pathology & Laboratory Medicine*. Published online Dec. 7, 2009. Full text of the paper is available at www.archivesofpathology.org .

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