

18 May 2010

This supplement has been prepared to present scientific and technical news items that may be of more interest to technical personnel at RDT&E activities and the labs, or the medics rather than the broader readership of the basic CB Daily. Due to the nature of the material, the articles, if available online, are usually only available through subscription services thus making specific links generally unavailable. Thus, usually only the bibliographic citation is available for use by an activity's technical library.

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Chem-Bio News – Pandemic Influenza Edition #112

1. MOLECULAR AND GENETIC CHARACTERISTICS OF HEMAGGLUTININ AND NEURAMINIDASE IN IRANIAN 2009 PANDEMIC INFLUENZA A(H1N1) VIRUSES:

“Although genomic analysis of hemagglutinin and neuraminidase genes of Iranian strains in comparison to the corresponding vaccine strain revealed some mutations, none of these were identified in functionally important receptor-binding sites.”

2. SELECTION FOR RESISTANCE TO OSELTAMIVIR IN SEASONAL AND PANDEMIC H1N1 INFLUENZA AND WIDESPREAD CO-CIRCULATION OF THE LINEAGES:

“Using phylogenetic analysis of neuraminidase sequences, we show that both seasonal and pandemic lineages of H1N1 are evolving to direct selective pressure for resistance to oseltamivir. Moreover, seasonal lineages of H1N1 that are resistant to oseltamivir co-circulate with pandemic H1N1 throughout the globe.”

3. NECROTISING PNEUMONIA DUE TO INFLUENZA A (H1N1) AND COMMUNITY-ACQUIRED METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS CLONE USA300: SUCCESSFUL MANAGEMENT OF THE FIRST DOCUMENTED PAEDIATRIC CASE:

“Bacterial necrotising pneumonia should be suspected in those presenting with worsening flu-like symptoms and clinical and/or radiological evidence of PVL infection (multifocal infiltrates, effusion and cavitation). These patients may benefit from the administration of toxin neutralising agents.”

4. WINTHROP-UNIVERSITY HOSPITAL INFECTIOUS DISEASE DIVISION'S SWINE INFLUENZA (H1N1) PNEUMONIA DIAGNOSTIC WEIGHTED POINT SCORE SYSTEM FOR HOSPITALIZED ADULTS WITH INFLUENZA-LIKE ILLNESSES (ILIS) AND NEGATIVE RAPID INFLUENZA DIAGNOSTIC TESTS (RIDTS):

“The Winthrop-University Hospital Infectious Disease Division's diagnostic weighted point score system for swine influenza H1N1 pneumonia is based on key clinical and laboratory features. During the "herald" wave of the swine influenza H1N1 pandemic, the diagnostic weighted point score system accurately identified probable swine influenza H1N1 pneumonia and accurately differentiated swine influenza H1N1 pneumonia from ILIs and other viral and bacterial community-acquired pneumonias.”

- 5. INFLUENZA AND RESPIRATORY DISEASE SURVEILLANCE: THE US MILITARY'S GLOBAL LABORATORY-BASED NETWORK:** *"This article describes the system, details its contributions and the critical gaps that it is filling, and discusses future plans."*
- 6. HEALTHCARE PERSONNEL AND NOSOCOMIAL TRANSMISSION OF PANDEMIC 2009 INFLUENZA:** *"This article focuses on the development of an algorithm for intensive care unit intake precautions, based on the early identification of potential source patients, as well as appropriate selection and adequate use of personal protective equipment."*
- 7. 'GOOGLE FLU TRENDS' FOUND TO BE NEARLY ON PAR WITH CDC SURVEILLANCE DATA:** *"Google Flu Trends is updated daily, and according to data from the 2007–2008 flu season, it can bridge the CDC's two-week lag, potentially buying officials critical extra time to devise a public health response and curtail the virus's spread."*
- 8. DFA UNRELIABLE IN H1N1 TESTING IN CRITICALLY ILL PATIENTS:** *"Direct Immunofluorescence Assay (DFA) testing for H1N1 influenza ("swine flu") is unreliable in ICU patients, according to a new study from Stanford University."*

CB Daily Report

Chem-Bio News

MOLECULAR AND GENETIC CHARACTERISTICS OF HEMAGGLUTININ AND NEURAMINIDASE IN IRANIAN 2009 PANDEMIC INFLUENZA A(H1N1) VIRUSES

Vaccine Weekly
May 19, 2010

"The efficacy of vaccines varies due to antigenic differences between the circulating influenza strains and the vaccine. Neuraminidase inhibitors are effective for prophylaxis and treatment of influenza infections, and the emergence of drug resistant mutants is an important challenge. Full-length nucleotide and deduced amino acid sequences of the hemagglutinin and neuraminidase genes of three 2009 pandemic influenza A/H1N1 isolates were compared with the vaccine strain and some strains from different countries. Phylogenetic analysis for hemagglutinin and neuraminidase showed they were related to their vaccine strain, with an average of 99.56 and 99.53% sequence identity, respectively. No genetic indication of resistance to neuraminidase inhibitors was found."

"Although genomic analysis of hemagglutinin and neuraminidase genes of Iranian strains in comparison to the corresponding vaccine strain revealed some mutations, none of these were identified in functionally important receptor-binding sites."

The full article can be found at: (N.Z. Jandaghi, et. al., "Molecular and genetic characteristics of hemagglutinin and neuraminidase in Iranian 2009 pandemic influenza A (H1N1) viruses". Archives of Virology, 2010; 155(5): 717-21). Link not available.

[Return to Top](#)

SELECTION FOR RESISTANCE TO OSELTAMIVIR IN SEASONAL AND PANDEMIC H1N1 INFLUENZA AND WIDESPREAD CO-CIRCULATION OF THE LINEAGES

TB & Outbreaks Week

May 11, 2010

"There are currently two main branches of H1N1 circulating in humans, a seasonal branch and a pandemic branch. The primary treatment method for pandemic and seasonal H1N1 is the antiviral drug Tamiflu® (oseltamivir). Although many seasonal H1N1 strains around the world are resistant to oseltamivir, initially, pandemic H1N1 strains have been susceptible to oseltamivir. As of February 3, 2010, there have been reports of resistance to oseltamivir in 225 cases of H1N1 pandemic influenza. The evolution of resistance to oseltamivir in pandemic H1N1 could be due to point mutations in the neuraminidase or a reassortment event between seasonal H1N1 and pandemic H1N1 viruses that provide a neuraminidase carrying an oseltamivir-resistant genotype to pandemic H1N1. Using phylogenetic analysis of neuraminidase sequences, we show that both seasonal and pandemic lineages of H1N1 are evolving to direct selective pressure for resistance to oseltamivir. Moreover, seasonal lineages of H1N1 that are resistant to oseltamivir co-circulate with pandemic H1N1 throughout the globe. By combining phylogenetic and geographic data we have thus far identified 53 areas of co-circulation where reassortment can occur. At our website POINTMAP, <http://pointmap.osu.edu> we make available a visualization and an application for updating these results as more data are released. As oseltamivir is a keystone of preparedness and treatment for pandemic H1N1, the potential for resistance to oseltamivir is an ongoing concern."

The full article can be found at: (D.A. Janies, et. al., "Selection for resistance to oseltamivir in seasonal and pandemic H1N1 influenza and widespread co-circulation of the lineages". International Journal of Health Geographics, 2010;9():13). Link not available.

[Return to Top](#)

NECROTISING PNEUMONIA DUE TO INFLUENZA A (H1N1) AND COMMUNITY-ACQUIRED METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS CLONE USA300: SUCCESSFUL MANAGEMENT OF THE FIRST DOCUMENTED PAEDIATRIC CASE

Virus Weekly

May 11, 2010

"Necrotising pneumonia in young, previously healthy patients due to Panton-Valentine leucocidin (PVL) producing Staphylococcus aureus has been increasingly recognised. PVL pneumonia is often associated with influenza co-infection and high mortality."

"This case report describes the successful management of the first documented paediatric case of a previous healthy adolescent who developed necrotising pneumonia due to community-acquired methicillin-resistant (CA-MRSA) clone USA300 with pandemic influenza A (H1N1) co-infection, and highlights the importance of early recognition and initiation of appropriate therapy for this potentially fatal co-infection. PCR remains the gold standard to diagnose pandemic H1N1 since it may not be detected by rapid antigen tests. Bacterial

necrotising pneumonia should be suspected in those presenting with worsening flu-like symptoms and clinical and/or radiological evidence of PVL infection (multifocal infiltrates, effusion and cavitation). These patients may benefit from the administration of toxin neutralising agents."

The full article can be found at: (I. Obando, et. al., "Necrotising pneumonia due to influenza A (H1N1) and community-acquired methicillin-resistant Staphylococcus aureus clone USA300: successful management of the first documented paediatric case". Archives of Disease in Childhood, 2010;95(4):305-306). Link not available.

[Return to Top](#)

WINTHROP-UNIVERSITY HOSPITAL INFECTIOUS DISEASE DIVISION'S SWINE INFLUENZA (H1N1) PNEUMONIA DIAGNOSTIC WEIGHTED POINT SCORE SYSTEM FOR HOSPITALIZED ADULTS WITH INFLUENZA-LIKE ILLNESSES (ILIS) AND NEGATIVE RAPID INFLUENZA DIAGNOSTIC TESTS (RIDTS)

Genomics & Genetics Weekly

May 14, 2010

"Hospital emergency departments (EDs) were inundated with patients with influenza-like illnesses (ILIs) requesting screening for H1N1. Our ED screening, as well as many others, used a rapid screening test for influenza A (QuickVue A/B) because H1N1 was a variant of influenza A. The definitive laboratory test i.e., RT-PCR for H1N1 was developed by the Centers for Disease Control (Atlanta, GA) and subsequently distributed to health departments. Because of the extraordinary volume of test requests, health authorities restricted reverse transcription polymerase chain reaction (RT-PCR) testing. Hence most EDs, including our own, were dependent on rapid influenza diagnostic tests (RIDTs) for swine influenza. A positive rapid influenza A test was usually predictive of RT-PCR H1N1 positivity, but the rapid influenza A screening test (QuickVue A/B) was associated with 30% false negatives. The inability to rely on RIDTs for H1N1 diagnosis resulted in underdiagnosing H1N1. Confronted with adults admitted with ILIs, negative RIDTs, and restricted RT-PCR testing, there was a critical need to develop clinical criteria to diagnose probable swine influenza H1N1 pneumonia. During the pandemic, the Infectious Disease Division at Winthrop-University Hospital developed clinical criteria for adult admitted patients with ILIs and negative RIDTs. Similar to the one developed for the clinical diagnosis of legionnaire's disease. The Winthrop-University Hospital Infectious Disease Division's diagnostic weighted point score system for swine influenza H1N1 pneumonia is based on key clinical and laboratory features. During the "herald" wave of the swine influenza H1N1 pandemic, the diagnostic weighted point score system accurately identified probable swine influenza H1N1 pneumonia and accurately differentiated swine influenza H1N1 pneumonia from ILIs and other viral and bacterial community-acquired pneumonias."

The full article can be found at: (B.A. Cunha, et. al., "Winthrop-University Hospital Infectious Disease Division's swine influenza (H1N1) pneumonia diagnostic weighted point score system for hospitalized adults with influenza-like illnesses (ILIs) and negative rapid influenza diagnostic tests (RIDTs)". Heart & Lung, 2009;38(6):534-538). Link not available.

[Return to Top](#)

INFLUENZA AND RESPIRATORY DISEASE SURVEILLANCE: THE US MILITARY'S GLOBAL LABORATORY-BASED NETWORK

Virus Weekly

May 11, 2010

"The US Department of Defense influenza surveillance system now spans nearly 500 sites in 75 countries, including active duty US military and dependent populations as well as host-country civilian and military personnel. This system represents a major part of the US Government's contributions to the World Health Organization's Global Influenza Surveillance Network and addresses Presidential Directive NSTC-7 to expand global surveillance, training, research and response to emerging infectious disease threats."

"Since 2006, the system has expanded significantly in response to rising pandemic influenza concerns. The expanded system has played a critical role in the detection and monitoring of ongoing H5N1 outbreaks worldwide as well as in the initial detection of, and response to, the current (H1N1) 2009 influenza pandemic."

"This article describes the system, details its contributions and the critical gaps that it is filling, and discusses future plans."

The full article can be found at: (J. Jeremy Sueker, et. al., "Influenza and respiratory disease surveillance: the US military's global laboratory-based network". *Influenza and Other Respiratory Viruses*, 2010;4(3): 155-61). Link not available.

[Return to Top](#)

HEALTHCARE PERSONNEL AND NOSOCOMIAL TRANSMISSION OF PANDEMIC 2009 INFLUENZA

Medical Letter on the CDC & FDA

May 16, 2010

"The greatest threat to healthcare personnel and patients appears to be exposure to patients, healthcare personnel, or visitors who have not been recognized as contagious. The processes used within healthcare facilities must hold this concept central to any infection control plan and act in a preventive manner. This article focuses on the development of an algorithm for intensive care unit intake precautions, based on the early identification of potential source patients, as well as appropriate selection and adequate use of personal protective equipment. Visitor management, hand and respiratory hygiene, and cough etiquette have been used as measures to decrease the spread of infection. Vaccination of healthcare personnel, combined with work furlough for ill workers, is also explored."

The full article can be found at: (F.E. Poalillo, et. al., "Healthcare personnel and nosocomial transmission of pandemic 2009 influenza". *Critical Care Medicine*, 2010;38(4 Suppl):e98-

102). Link not available.

[Return to Top](#)

'GOOGLE FLU TRENDS' FOUND TO BE NEARLY ON PAR WITH CDC SURVEILLANCE DATA

By Katie Moisse
Scientific American
May 17, 2010

"Before visiting a clinic, many flu sufferers visit Web sites for information about symptoms and remedies—a tendency that Google engineers took advantage of to create a real-time flu tracker called 'Google Flu Trends.'

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"By comparing the popularity of the 50 million most common Google search queries in the U. S. with flu-like illness rates measured by the U.S. Centers for Disease Control and Prevention's (CDC) national surveillance program, the Flu Trends team narrowed down the pool to 45 search terms (relating to symptoms, complications and remedies) that correlated with the agency's data on the prevalence of flu symptoms. "It shows the trends—whether flu-like illness rates are going up or down in certain regions," says Yood."

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"The CDC's national surveillance program is based on weekly reports from 3,000 health clinics that count the number of patients with a fever and a cough or a sore throat. But it takes up to two weeks for these numbers to be compiled into meaningful and publicly available information about flu trends, Yood says. Google Flu Trends is updated daily, and according to data from the 2007–2008 flu season, it can bridge the CDC's two-week lag, potentially buying officials critical extra time to devise a public health response and curtail the virus's spread."

The full article can be found at: <http://www.scientificamerican.com/article.cfm?id=google-flu-trends-on-par-with-cdc-data>

[Return to Top](#)

DFA UNRELIABLE IN H1N1 TESTING IN CRITICALLY ILL PATIENTS

American Thoracic Society on EurekaAlert!
May 17, 2010

"Direct Immunofluorescence Assay (DFA) testing for H1N1 influenza ("swine flu") is unreliable in ICU patients, according to a new study from Stanford University. Multiple methods exist for diagnosing influenza, but data on the utility and accuracy of these tests

for H1N1 are still emerging, given the relatively recent onset of the epidemic.

"Our findings suggest that in patients with severe H1N1 influenza, in whom rapid and precise diagnosis would be most important, DFA unfortunately does not perform well. This is in contrast to less severely ill patients, where DFA appears to be quite reliable." said Chanu Rhee, M.D., a physician at Stanford University School of Medicine and lead author of the study.

The results will be presented at the ATS 2010 International Conference in New Orleans."

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"One possible explanation for the poor performance of DFA in ICU patients is that it is an over-exuberant host inflammatory response, rather than high viral load, that is responsible for severe disease. However, it remains unclear why certain patients develop severe respiratory failure from H1N1 while others with similar risk factors develop only mild symptoms.

If confirmed by further research, these findings have important ramifications. "This study reinforces the fact that patients with suspected H1N1 influenza who are severely ill should be placed in respiratory isolation and receive antiviral treatment without delay, even if DFA testing is negative" said Dr. Rhee. "This includes patients with a negative DFA from lower respiratory tract samples. Furthermore, all critically ill patients with suspected H1N1 should have PCR testing done to confirm the diagnosis, as PCR is significantly more sensitive than DFA, though not perfect either."

The full article can be found at: http://www.eurekalert.org/pub_releases/2010-05/ats-dui051010.php

[Return to Top](#)

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