What You Need To Know About

H1N1 FLU

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United States Department of State / Bureau of International Information Programs

A doctor checks for swine flu symptoms in downtown Mexico City, Tuesday, April 28, 2009. (©AP Images)

H1N1 Flu Outbreaks Mobilize International Public Health Effort

April 27, 2009
By Science Writer Cheryl Pellerin

Outbreaks of a new strain of influenza virus that began in north-central Mexico March 22 and have spread to the United States, Canada and Spain so far have prompted the World Health Organization (WHO) to declare the event a public health emergency of international concern.

Mexican authorities have reported up to 1,600 influenza cases and more than 100 influenza deaths. Twenty six of the deaths have been confirmed as caused by the new H1N1 swine flu virus, WHO spokesman Gregory Hartl said in an April 27 briefing.

The number of U.S. cases has risen to 40, and on April 26 the United States declared a public health emergency, which "allows us to free up federal, state and local agencies and their resources for prevention and mitigation," Secretary of Homeland Security Janet Napolitano said. Flu cases in the United States so far have been mild.

"We do not yet have a complete picture of the epidemiology or the risks," WHO Director-General Dr. Margaret Chan said at an April 25 briefing, including possible spread beyond the currently affected areas. In the assessment of WHO, this is a serious situation that must be watched very closely.

Scientists and experts from the U.S. Centers for Disease Control and Prevention (CDC), WHO and its Global Outbreak Alert and Response Network — a collaboration of institutions and networks that pool human and

technical resources to rapidly identify and respond to international outbreaks — have traveled to Mexico to help answer many questions that remain about the new H1N1 variant, which contains bird and swine viruses from North America, a swine flu strain found in Asia and a human flu strain, Nancy Cox, head of CDC's Influenza Division, said during an April 26 briefing.

"Influenza viruses are notoriously unpredictable and full of surprises, as we are seeing right now," Chan said.

"The viruses causing cases in some parts of Mexico and the United States are genetically the same," she added. "This is an animal strain of the H1N1 virus and it has pandemic potential because it is infecting people. However, we cannot say, on the basis of currently available laboratory, epidemiological and clinical evidence, whether or not it will indeed cause a pandemic."

FLU VIRUS ABCs

There are three kinds of flu viruses: A, B and C. Influenza viruses can infect people, birds, pigs, horses, seals, whales and other animals, but wild birds are their natural hosts. A-type viruses mutate much faster than B and C types, so they are divided into subtypes based on two proteins on the virus surface: hemagglutinin (HA) and neuraminidase (NA).

There are 16 HA subtypes and nine NA subtypes, and subtypes are named according to the numbers of their HA and NA surface proteins. The letters H and N in subtype names like H1N1 or H5N1 refer to these proteins.

The new H1N1 variant that arose in Mexico is being called a swine flu, but experts do not yet know how the disease was transmitted to people.

"H1N1 is being called 'swine flu' because of the outbreak of a different 1918-origin virus that caused significant mortality in swine and human populations and was known as the Spanish flu," said Dr. Peter Cowan, associate professor of epidemiology and public health at the College of Veterinary Medicine at North Carolina State University. "The [1918 H1N1] virus probably has a wild bird origin but its definitive origin remains unknown."

The Spanish flu killed up to 50 million people worldwide, nearly half of them young, healthy adults. H1N1 viruses still circulate today after being re-introduced into the human population in the 1970s.

Cowan is a moderator for ProMED-mail, a global electronic reporting system for outbreaks of emerging infectious diseases and toxins that is a program of the International Society for Infectious Diseases.

NEXT STEPS

WHO declared the outbreak a public health emergency of international concern based on the International Health Regulations, which were revised in 2005 and went into effect in June 2007. (See "Updated Rules Offer New Framework for Health Security.")

Many of the tracking systems and processes that allow WHO to rapidly issue infectious disease alerts and proactively respond to disease outbreaks that could affect other countries are a result of these regulations, whose revisions updated the 1969 regulations. The 1969 regulations asked countries voluntarily to report only cholera, plague and yellow fever.

Under the 1969 version, if countries reported the diseases at all, WHO published the information once a week in an epidemiological record. Measures for dealing with the diseases were outlined in the regulations, and only member countries were allowed to report disease outbreaks.

In 2007, the regulations went from a set of guidelines that asked nations to report three diseases to a reporting of all public health events. The revised regulations include smallpox, polio, SARS and new strains of human influenza, whose occurrences member states must report immediately to WHO.

Still to be determined is whether a vaccine will be produced for the H1N1 variant, although WHO and CDC are proceeding as though such a decision might be made.

"Whenever we see a novel strain of influenza, we begin our work in the event that a vaccine needs to be manufactured," CDC Acting Director Dr. Richard Besser said in an April 26 White House briefing. "We've created that seed stock, we've identified that virus and discussions are under way, so should we decide to work on manufacturing a vaccine, we can work toward that goal very quickly."

The WHO Emergency Committee met April 27 to

determine next steps for the potential pandemic. They raised the phase of pandemic alert from 3 to 4. In Phase 3, an animal or human-animal virus has caused sporadic cases or small clusters of disease in people but has not resulted in person-to person transmission sufficient to sustain community-level outbreaks. Phase 4 is characterized by verified person-to-person transmission of an animal or human-animal flu virus able to cause community-level outbreaks. The change to a higher phase indicates that the likelihood of a pandemic has increased but not that a pandemic is inevitable.

Chan recommended leaving national borders open and international travel unrestricted, and said that seasonal flu vaccine production should not be stopped to produce an H1N1 vaccine at this time unless the situation worsens.

From the America.gov archive

Emerging Infectious Diseases Focus of International Meeting

By Science Writer Cheryl Pellerin

14 March 2008

Infectious diseases are among the world's leading causes of death, and scientists from every nation perform research, share information, build laboratory capacity in poorer nations and create global surveillance networks to help prevent and control their spread.

When the incidence of such a disease in people increases over 20 years or threatens to increase, it is called an "emerging" disease, and a growing number have made watch lists and headlines in nearly every country -- highly pathogenic H5N1 avian influenza, severe acute respiratory syndrome (SARS), Ebola virus, food- and waterborne illnesses, and a range of anti-microbial-resistant bacterial diseases like multidrug-resistant and extensively drug-resistant tuberculosis (TB).

Public health professionals from across the globe will meet in Atlanta March 16-19, at the sixth International Conference on Emerging Infectious Diseases, to discuss these and other emerging pathogens and current work on surveillance, epidemiology, research, bioterrorism and more.

"I view [the meeting] as an opportunity," Dr. Joel Gaydos, coordinator for Military Health System Emerging Disease Programs in the Department of Defense Global Emerging Infections Surveillance and Response System (GEIS), told America.gov, "for all the groups involved in surveillance and response to emerging and infectious diseases to get together, [determine] the priorities and assess how well we're doing and where the gaps are."

PATHOGENS NEW AND OLD

Emerging diseases can be new infections that arise from changes in existing organisms or known infections that spread to new geographic areas or populations. They can be previously unrecognized infections that appear when, for example, tropical forests are cleared to make way for new roads, displacing disease-carrying animals and insects. And old infections can re-emerge because of anti-microbial resistance or breakdowns in public health measures.

Most emerging infectious diseases (60.3 percent) are zoonoses, or animal diseases that can be transmitted to people, according to the authors of "Global Trends in Emerging Infectious Diseases," a paper published in February in the journal Nature.

They analyzed a database of 335 emerging infectious disease events from 1940 to 2004 and found that most zoonoses (71.8 percent) arise from wildlife, are increasing significantly over time, and "are more concentrated in lower-latitude developing countries." According to the authors, the findings "provide a basis for identifying re-

gions where new emerging infectious diseases are most likely to originate (emerging disease 'hotspots')."

"Once you know the trends in emerging diseases, you can do something to prevent them," said study co-author Dr. Peter Daszak, executive director of the Consortium for Conservation Medicine, based at the Wildlife Trust in New York. "I know there's been a lot of effort for avian influenza surveillance, but who's going out there to look for the next one? That's my message -- that we can put a little bit of our resources into seeking out the next pathogen and doing something about it," he told America.gov.

The authors also found that drug-resistant microbes made up about 20 percent of the database and that there is a significant increase in those over time as a proportion of emerging diseases.

"We don't just need to be worried about SARS and Ebola," Daszak said. "We should also worry about extremely drug-resistant TB."

According to the study, disease surveillance is concentrated not in developing countries, where emerging diseases are most likely to arise, but in developed countries that can afford laboratories and other means to conduct it effectively.

All disease surveillance is important, said Gaydos, who was not involved in the work. The study shows "where emerging diseases have occurred or might occur," he added, "but we really don't know where they're going to occur."

DISEASE DEFENSE

Two of the most effective global disease surveillance networks are the U.S. Defense Department's GEIS and the World Health Organization's (WHO's) Global Outbreak Alert and Response Network (GOARN), a technical collaboration of institutions and networks established in 2000 that pool resources to identify, confirm and respond to outbreaks of international importance.

GEIS, established by presidential directive in 1996, is a network of overseas laboratories that work with each country's health ministry -- and sometimes militaries -- on disease research and surveillance and on a range of efforts with international partners, including WHO.

The labs are the U.S. Naval Medical Research Unit Number 3 in Cairo, Egypt (established 1946); the U.S. Naval Medical Research Unit Number 2 in Jakarta, Indonesia (1940s); the U.S. Army Medical Research Unit in Nairobi, Kenya (1969); the U.S. Naval Medical Research Center in Lima, Peru (1983); and the U.S. Army Armed Forces Research Institute of Medical Sciences in Bangkok, Thailand (1959).

"It's impressive when you look at the scope of the work that some of our partners are doing," Dr. Jean-Paul Chretien, a U.S. Navy lieutenant commander and coordinator of the GEIS Overseas Research Laboratories, told America.gov.

The lab in Cairo, for example, "is working in so many countries and is important regionally for influenza," he added. "But even with all the work that GEIS and CDC [Centers for Disease Control and Prevention] and USAID [U.S. Agency for International Development] and many other governments, international organizations and nongovernmental organizations are doing, a lot more could be done in the way of surveillance in these areas."

In the developing nations of Peru and Thailand, GEIS works with the militaries to strengthen disease surveillance programs run by the ministries of health.

Chretien said that military-to-military and military-to-civilian partnerships, with the support of national and international civilian health organizations, could help bolster global infectious disease surveillance, particularly in remote and post-disaster areas where military forces are present.

From the America.gov archive

International Laboratory Network Watches for Disease Outbreaks

By Science Writer Cheryl Pellerin

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This is the first in a series of articles on the U.S. contribution to global disease surveillance.

Disease outbreaks arise from simple movements: a sick person boards a plane to a far-off place; a virus jumps from a duck to a person, changing itself in the process; land developers clear a forest and microbes there seek new hosts; viruses and bacteria evolve into drug-resistant strains.

Until about 10 years ago, it would have been impossible to recognize a resulting epidemic or pandemic early enough in the event to mitigate its effects. Today, an international network of laboratories and scientists is doing just that, with tools on the ground and in space.

At the core of the network is the U.S. Department of Defense Global Emerging Infections Surveillance and Response System (GEIS), with laboratories in the United States and in Cairo, Egypt; Jakarta, Indonesia; Nairobi, Kenya; Lima, Peru; and Bangkok, Thailand. (See related article.)

"We coordinate global disease surveillance for the Department of Defense," GEIS director Colonel Loren Erickson said in a May 17 USINFO interview, "and collaborate across the U.S. government with other federal agencies" and with international groups like the World Health Organization (WHO).

EMERGING INFECTIOUS DISEASES

GEIS was created in 1996 by a presidential directive that expanded the role of federal agencies, including the Defense Department, to improve domestic and international infectious disease surveillance, prevention and response.

The directive defined emerging infectious diseases as "new, resurgent or drug-resistant infections for which the incidence in humans has increased within the past two decades or threatens to increase in the near future" that present "one of the most significant health challenges facing the global community."

Such diseases include HIV/AIDS, now a pandemic; severe acute respiratory syndrome (SARS), which caused a major epidemic in 2002-2003 of more than 8,000 known cases and 774 deaths; and avian influenza, a disease of birds that has infected people, producing 306 human cases and 185 deaths worldwide since 2003. (See related article.)

Disease surveillance begins in hospitals and clinics, where physicians report cases of targeted diseases to public health laboratories.

In the case of avian flu, cases are confirmed by specially equipped laboratories, and epidemiologists investigate key aspects of disease activity -- time, location, virus type and disease severity. Analyzing such information allows scientists to predict disease transmission and guides control measures.

Outbreaks of some diseases can be predicted in advance. Beginning in the late 1990s, scientists from NASA's Goddard Space Flight Center and the Walter Reed Army Institute of Research in Maryland found a way to do this with Rift Valley fever, a viral disease carried by mosquitoes that infects cattle, buffalo, sheep and goats. From those hosts, the virus then can infect people.

According to WHO, Rift Valley fever can cause severe disease in animals and people, leading to high morbidity and mortality.

MONITORING DISEASE FROM SPACE

For about 10 years, through the GEIS program, NASA

scientists have been using satellite climate observations -- near-real-time vegetation measurements, sea-surface temperatures and more -- to monitor rainfall conditions in East Africa that are associated with the outbreak of diseases, including Rift Valley fever.

"These are areas that undergo frequent droughts and flood events," said Assaf Anyamba, a research scientist with the Goddard Earth Sciences and Technology Center, in a recent USINFO interview. "For example, two years ago there was a huge drought in eastern Africa. This year there are huge floods. These changes in climate are resulting in the emergence of various types of diseases."

Every month, Anyamba and his colleagues submit disease risk maps based on satellite observations of rainfall and vegetation. Last year, the U.S. National Oceanic and Atmospheric Administration issued an unscheduled advisory about an El Niño weather pattern, indicating that warmer-than-normal sea surface temperatures across the equator could affect global tropical rain patterns.

"When we first saw the El Niño emerging from the Pacific and the Indian Ocean beginning to warm," Anyamba said, "we issued an early warning. As we began to see the rain, we issued another early warning, showing that the rainfall was on the scale of [a Rift Valley fever outbreak there in] 1997-1998. As the land began to green up, because these areas were very dry, you had conditions that were conducive to the emergence of mosquito vectors [virus carriers] and their propagation."

In that series of warnings, Anyamba and his colleagues provided the forecast that helped Kenya, Somalia and Tanzania prepare for the Rift Valley fever outbreak that is occurring now, and allowed international partners -- WHO, the U.N. Food and Agriculture Organization and others -- to help mitigate the outbreak by arriving with personal protective equipment, such as gloves, masks and mosquito nets, to protect against the spike in malaria cases that occurs during flooding rains.

December is a month of sacrifice for Muslim populations in the region, and because blood and tissues from sick animals can infect people who handle them, the government temporarily banned the slaughter of camels, sheep, goats and cattle, saving potentially thousands of lives.

Ten years earlier, during the 1997-1998 outbreak, WHO estimated that there were 89,000 human cases of Rift Valley fever and up to 250 resulting deaths in eastern Kenya and southern Somalia, one of the largest outbreaks of the fever in recorded history.

"The advantage we had this year," Anyamba said, "is the mechanism in place to do observations. It has lessened the impact in terms of the loss of human lives because we have an early-warning system in place."

International Partners Work to Prevent Next Pandemic

From the America.gov archive

By Science Writer Cheryl Pellerin

12 November 2008

This is the second in a two-part series of articles on global cooperation to fight the spread of emerging and infectious diseases.

Most emerging infectious diseases are zoonoses — animal diseases that can be transmitted to people — and most zoonoses arise from wildlife, so anywhere in the world that wild animals and people interact, a new disease can enter the human population.

Diseases that have entered the human population this way include HIV/AIDS, severe acute respiratory syndrome and highly pathogenic H5N1 avian flu.

Google.org, the philanthropic arm of the company behind the world's most popular Internet search engine, is supporting efforts to identify hot spots where such diseases are most likely to emerge and to detect new pathogens circulating in animals and people.

An initial $14.8 million, announced October 21 as part of the Predict and Prevent initiative, is going to six part-

nerships working in Africa and Southeast Asia. Their shared goal is to help nations and global organizations for animal and human health learn about and respond to outbreaks before they become global crises.

"Predict and Prevent has adopted a 'one health' approach integrating human, animal and environmental health," Frank Rijsberman, Predict and Prevent program director, wrote October 21 in his Google.org blog. "We focus on knowing where to look for outbreaks of emerging infectious diseases, detecting those outbreaks through digital and genetic approaches, and supporting early warning and quick response."

He added, "These grants will increase our understanding of emerging infectious diseases and generate vast amounts of data, samples, sequences and, hopefully, discoveries."

PANDEMIC SIGNALS

To detect new pathogens circulating in animals and people and acquire early signs of possible pandemics, Google.org grants included $2.5 million to Columbia University's Mailman School of Public Health in New York City for research to accelerate the discovery of new pathogens and establish molecular diagnostics in "hot spot" countries.
Close-up on orangutan face (AP Images)
An orangutan smuggled out of Indonesia looks out of its cage at a wildlife sanctuary in Ratchaburi province, Thailand.

Another grant for $3 million is going to Children's Hospital Boston in Massachusetts to support the Internet-based disease surveillance initiatives HealthMap and ProMED-mail. The effort will assess emerging-disease reporting systems, expand regional networks in Africa and Southeast Asia, and develop new tools to improve outbreak detection and reporting. (See "Internet Latest Tool in Emerging Infectious Disease Surveillance.")

The California-based nonprofit Global Viral Forecasting Initiative, headed by Dr. Nathan Wolfe, received $5.5 million, with equal funding from the Skoll Foundation in California, to support animal and human blood-sample collection and analysis in such emerging disease "hot spots" as Cameroon, Democratic Republic of Congo, China, Malaysia, Laos and Madagascar.

"Our mission is to understand how pandemics are born," Wolfe told America.gov, "to come up with systems to more quickly identify the threats and then to work with other organizations to stop those threats before they become pandemics."

SAMPLING AT THE INTERFACE

The work is accomplished through a global network of partners — collaborators and field teams, and laboratories where increasingly advanced techniques allow researchers to understand and discover disease agents in completely new ways.

"We think about where in the world do we believe there to be important viruses — what are the hot spots," Wolfe said. "Then we charge into the hot spots and focus our energy on the interface between humans and animals — hunters, maybe people working in wet markets, wildlife veterinarians — people in close contact with animals. Then we sample at that interface — what's in the animals, what's in the humans, and what's jumping from the animals into the humans."

Of the many diseases that pass from animals to people, it is not yet easy to determine which are likely to be important.

"We are still at the very beginnings of the science of pandemic prevention, but that doesn't mean that we are without skills or facilities," Wolfe said.

"We know, for example, that viruses that are closely related to other viruses that are harmful are probably likely to be important risks," he said. "We can monitor individuals and see who's ill and look to see if there are associations between new viruses and illness. We can look to see if new viruses we find are spreading among people, which is a major reason for concern."