

REVIEW

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# Department of Defense and other respiratory disease surveillance during the 2009 pandemic

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## Abstract

The Armed Forces Health Surveillance System (AFHSC-GEIS) surveillance system monitors infectious diseases, of importance to military personnel, by providing funding and technical support for respiratory disease surveillance. This report details the system's surveillance efforts in responding to the novel H1N1 influenza A (A/H1N1) pandemic. Active surveillance networks established by AFHSC-GEIS partner with military units in the U.S. and several other countries, and virus specimens are used to develop and produce vaccine. Partnerships with military units facilitate the rapid deployment of the novel A/H1N1 influenza A (A/H1N1) surveillance network to a ruggedized population of military personnel. Regular reporting of the system's worldwide surveillance data enabled leaders to make informed decisions on control measures. AFHSC-GEIS's support of a global surveillance network, while supporting global public health.

**Background** The Department of Defense (DoD) has a significant burden of disease, with an estimated 30 percent of both outpatient illness and hospitalizations among U.S. military personnel [2,3]. Respiratory viruses, such as influenza and adenovirus infections, are among the etiologic agents that greatly contribute to morbidity and mortality among military members [4]. During the 1918 influenza pandemic, the U.S. military experienced attack rates as high as 40 percent and case fatality rates averaging 5 percent (with some units experiencing rates from 1 percent to 8 percent) [5].

**In response** to the 1918 influenza pandemic, the U.S. Department of Defense (DoD) established the Global Emerging Infections and Neurobiological Threat Detection System (DOD-GENETS) to monitor and respond to newly emerging infectious diseases (EIDs) and other biological threats in a global population. The DoD-GENETS program was expanded with 2006 congressional supplementary

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appropriations [6-8]. Subsequent funding in 2007-2009 has maintained this effort. Today, AFHSC-GEIS provides direction, funding and oversight to a system that consists of a network of global partners, including approximately 500 sites in 70 countries (Figure 1).

During the past four years (2006-2009), the AFHSC-GEIS influenza surveillance system increased support for avian and pandemic influenza preparedness to include activities in surveillance and response to newly identified strains and pandemics, such as H5N1 and the 2009 novel A/H1N1. By supporting global surveillance and directing response efforts, DoD serves as a sentinel for local epidemics and can assist in limiting disease transmission. An immediate focus of DoD is decreasing the impact of the novel A/H1N1 pandemic on the armed forces, including reducing recruit- and other training-associated illnesses and deaths, and controlling secondary viral and bacterial associated morbidity. These efforts are similar in intent to those undertaken at the time of the appearance of the new virus strain during the 1918 H1N1 pandemic when efforts were also made

to reduce the impact of the virus on the military during World War I.

The AFHSC-GEIS influenza surveillance system plays a major role in the U.S. government's (USG) contributions to the global surveillance of influenza viruses and contributes to the World Health Organization's (WHO) Global Influenza Surveillance Network [9]. Core components of the AFHSC-GEIS influenza surveillance system are a network of specialized diagnostic and reference laboratories in the continental United States, medical treatment facilities within the Military Health System, and five DoD overseas laboratories, along with their respective detachments. The system, built around networks of hub and satellite laboratories, comprises many joint ventures with host countries.

This article focuses on the 2009 activities and accomplishments of the AFHSC-GEIS laboratory-based network regarding global surveillance for respiratory diseases and responding to the novel A/H1N1 influenza pandemic. These activities are described relative to, and by means of, AFHSC-GEIS strategic goals: surveillance

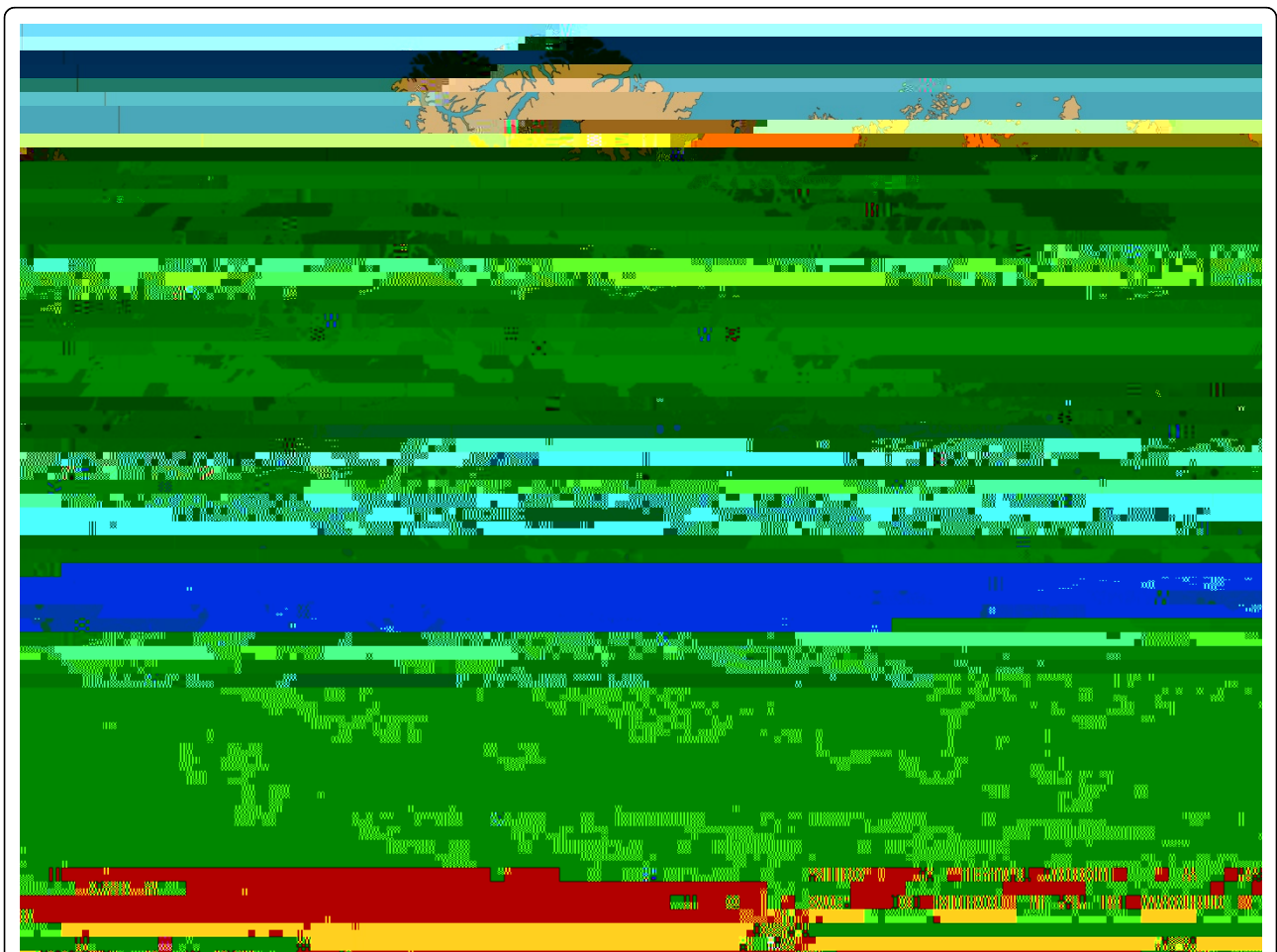


Figure 1 AFHSC-GEIS global influenza surveillance presence worldwide, as of May 2009.

and response; training and capacity building; research, innovation and integration; and assessment and communication of value added.

#### 2009 contributions

During April 2009, the first two U.S. cases of novel A/H1N1 were detected in two separate Naval Health Research Center (NHRC) surveillance projects supported by AFHSC-GEIS. In the first instance, NHRC investigators collected a specimen from a 10-year-old DoD dependent who had enrolled in a biomedical trial to test a new influenza diagnostic platform conducted at the Naval Medical Center, San Diego, Calif. Initial results by an external reference laboratory suggested an

viruses. Over 50 percent of EIDs are zoonotic, including the H5N1 and 2009 novel A/H1N1 viruses [12]. In 2009, AFRIMS and NAMRU-2 scientists, in collaboration with the University of Iowa'

In addition to the CDC H5N1 assays, AFHSC-GEIS also supported FDA approval of a rapid avian H5N1 influenza test (Arbor Vita Corp., AVantage™) using NHRC clinical trial data and validation of the National Veterinary Service Laboratory assay for the AI matrix, H5N1 and H7N3 strains on the JBAIDS by the DoD Veterinary Food Analysis and Diagnostic Laboratory at Fort Sam Houston, Texas. These capabilities will help to

further increase DoD's capacity for HPAI surveillance and outbreak response in remote settings.

In 2009, AFHSC-GEIS also sought to integrate influenza full genome sequencing within DoD. To this end, the Walter Reed Army Instit

countries were fully sequenced and submitted to GenBank. In turn, this sequencing provided valuable information on current viral mutations to DoD and the global public health community.

#### Assessment and communication of value added

By utilizing data from the Defense Medical Surveillance System, AFHSC conducts assessments on influenza activity, safety of the novel A/H1N1 influenza vaccine and effectiveness of influenza vaccine. Influenza activity among all DoD beneficiaries is monitored weekly and summarized in a weekly report disseminated to service-specific public health centers, preventive medicine physicians and DoD leadership. In addition, AFHSC-GEIS generates a weekly summary of all influenza surveillance reports from DoD laboratories, service-specific public health centers, Combatant Commands and other AFHSC-GEIS partners. The weekly report is posted on the DoD Pandemic Influenza Watchboard (<http://fhpr.osd.mil/aiWatchboard/>). Both reports are valuable in providing DoD decision makers and global public health leaders with a timely and succinct accounting of influenza activity, severity and geographic distribution.

AFHSC has also partnered with the Military Vaccine Agency, CDC and FDA to provide weekly safety assessments of the novel A/H1N1 influenza vaccine among active component servicemembers. AFHSC provides the only data within DoD for this collaboration. As a result, the center plays a valuable role in the country's assessment of the safety of this vaccine.

Each year, AFHSC-GEIS conducts mid-season assessments of the effectiveness of the seasonal vaccines, and during 2010, will examine the effectiveness of the novel A/H1N1 influenza vaccine. Initial estimates of seasonal vaccine effectiveness against novel A/H1N1-associated illness have been presented at scientific meetings and have been published. [17] Mid-season evaluations generated in January and February 2010 aimed to provide crucial information to the Vaccine and Related Biologic Products Advisory Committee and the public health community at large.

Additionally, network partners at NHRC and USAF-SAM also evaluate vaccine effectiveness among important subpopulations throughout DoD. NHRC has established a framework for evaluating influenza vaccine effectiveness among basic military trainees that has served as a valuable tool in the larger effort to monitor this important indicator. USAFSAM works diligently each season to identify and molecularly analyze viruses from cases considered potential vaccine breakthroughs (e.g., cases occurring  $\geq 14$  days after vaccination) as determined by the surveillance questionnaire data collected as part of routine sentinel surveillance. The Defense Department is well positioned to determine the

overall effectiveness of both seasonal and pandemic vaccines in military populations. However, results of these evaluations may not be generalizable to the population at large, given the young, healthy and highly vaccinated nature of military populations. This function is viewed favorably and of great value to the vaccine and public health communities.

#### Discussion

Although many goals were accomplished during this past year, the novel A/H1N1 influenza virus pandemic of 2009 presented unique management challenges for AFHSC-GEIS and its network of partners. The first significant problem centered on "sensitivity" in terms of

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examine the pandemic's impact on the U.S. military health care population and evaluate the effectiveness of potential intervention measures, including vaccine-specific effectiveness and non-vaccine interventions, such as hand washing, febrile screening, cohorting and recruit space allocation.

Besides continued surveillance within DoD, AFHSC-GEIS partners are fostering and developing new relationships for surveillance within other military populations to expand the center's global surveillance program and enhance its contribution to global public health. Examples of potential future collaborations include NMRCDC partnerships with Bolivia and Ecuador; AFRIMS surveillance in Vietnam; NAMRU-3 development of a veterinary and human influenza surveillance network in western Africa with Burkina Faso, Cote d'Ivoire and Ghana armed forces; establishment of a central African military alliance by the Global Viral Forecasting Initiative in Cameroon; and expansion of DoD and foreign military influenza and EID surveillance efforts in East Africa (Kenya, Tanzania and Uganda) and Central America (El Salvador, Guatemala and Honduras). Further expansion of AFHSC-GEIS-sponsored partnerships with Ministries of Health will also be explored (e.g., by PHCR-South in Central America) to provide improved surveillance in regions of the world where surveillance is lacking or inadequate.

Surveillance of zoonotic influenza will become more focused in 2010. While waterfowl, especially ducks and geese, can be infected and shed many subtypes of influ-



Disclaimer

The opinions stated in this paper are those of the authors and do not represent the official position of the U.S. Department of Defense.

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