DoD Global Emerging Infections Surveillance & Response System (DoD-GEIS)

An Update

Presented to the Defense Health Board
23 May 2007

Ralph Loren Erickson, MD, MPH, DrPH
Functions

- Provides Emerging Infectious Disease (EID) consultation
- Identifies and addresses EID vulnerabilities in surveillance, response, and infrastructure
- Assists DoD partners in developing and implementing programs and projects to prevent and mitigate EID threats
- Provides coordination for assembling and sharing information on EID threats
Surveillance Priorities

- Respiratory Illnesses (esp. influenza)
- Febrile Illnesses (esp. malaria and dengue)
- Enteric (acute diarrheal) Illnesses
- Antimicrobial Resistance
- Sexually-transmitted Infections
“A Global Network”

DoD’s Unique Assets – Overseas Presence with OCONUS Labs
Former DoD-GEIS Directors

COL (Ret) Patrick W. Kelley MD, DrPH
June 1997- June 2003

CAPT (Ret) Joseph L. Malone MD
June 2003 – February 2006
New Home of DoD-GEIS
(Since 1 October 2006)

- Proto Armed Forces Health Surveillance Center
- Co-location with Army Medical Surveillance Activity (on 2nd floor)
- Within ½ mile of WRAIR and Forest Glen Annex
- Continued Support from WRAIR and USAMRMC

2900 Linden Lane
Silver Spring, Maryland 20910
DoD-GEIS
Communications Center

- Videoteleconference (VTC) Capability
- Main Suite & Workstations
- Main Control Desk
Interagency Collaboration

• Department of Health and Human Services/
  Centers for Disease Control and Prevention

• Department of Homeland Security

• Department of State

• Department of Defense
  – Joint Staff
  – COCOMs
  – DTRA
  – Homeland Defense
Disease Outbreak Responses by GEIS and its Partners, FY 2006

Box 1: Illness Codes
- A – Anthrax
- AJ – Acute Jaundice
- B – Brucellosis
- BM – Bacterial Meningitis
- C – Cholera
- D – Dengue
- FB – Fever w/ Baboes
- FRI – Febrile Respiratory Illness
- H – Hepatitis
- HF – Hemorrhagic Fever
- G – Gastroenteritis
- I(0) – Influenza (Type)
- ILLI – Influenza-Like Illness
- JE – Japanese Encephalitis
- L – Leishmaniasis
- M (A.R.) – Malaria with artemisinin failures
- MRSA – Methicillin-Resistant Staphylococcus
- Pn – Pneumonia
- S(0) – Streptococcus (Group)
- TB – Tuberculosis
- VEE – Venezuelan Equine Encephalitis
- Y – Yellow Fever

Box 2: U.S.A.
NHRC FRI Surveillance
(Name: Disease Outbreaks)
1 – Ft. Jackson: FRI, S(A)
2 – MCRD Parris Island: FRI, S(A)
3 – Ft. Benning: FRI
4 – NRTC Great Lakes: FRI
5 – Ft. Knox: S(A)
6 – Ft. Leonard Wood: FRI, S(A)
7 – MCRD San Diego: FRI, I(A)
8 – BUD/S San Diego: S(Pn)

Legend
- NHRC
- NEPMU-6
- NEPMU-5
- NEPMU-4
- NAMRU-3
- AFIRMS
- NAMRU-2
- AFSOH
- USAMRU-K

- In Military Population
- In Civilian Population
EID “In The News”

• XDR-Tb in South Africa
• Chikungunya in East Africa and Indian Ocean
• Threat Agents:
  – 300+ Sheep in Idaho with *Francisella tularensis*
  – 90+ cases with 5+ deaths of gastrointestinal anthrax in Indonesia
  – 18 cases of tularemia in R of Georgia
Rift Valley Fever Monitoring

Persistence mapping of “above” normal vegetation conditions

http://www.geis.ha.osd.mil/RVFWeb/index.htm
FIGURE 2. Number and percentage of reported Rift Valley fever cases (N = 404), by district — Kenya, November 2006–January 2007*

FIGURE 3. Number of reported Rift Valley fever cases (n = 330), by date of illness onset — Kenya November 2006–January 2007*

*As of January 25, 2007, for cases with known date of onset.
EID in the Military

- Antibiotic resistance in Acinetobacter strains (wound infections)
- Respiratory disease
  - In deployed forces (Afghanistan)
  - Adenovirus 14 at recruit bases
- Hepatitis E in deployed forces
- Possible under-diagnosed diseases
  - Q fever in deployed forces
  - Scrub Typhus (Korea)
  - Malaria (Afghanistan)
Growing Relationships for GEIS
Seul Institut de médecine tropicale militaire en Europe
Institut de médecine tropicale
du service de santé des armées
French Foreign Operations

- **9 Active theaters**
- **11 Operations in progress**
- **55% Multinational**
- **4% = Rate SSA / strength**
- **500 Permanents on duty**

2007
Forces hors métropole

40.000 militaires, 5 continents, 30 localisations
Unité du méningocoque

Situation de la méningite en Afrique de l'Ouest en 2004 (OMS)

- Majorité de groupe A
- Burkina : A et W135

Afrique de l'Ouest : Mali, Burkina Faso, Niger, Côte d'Ivoire, Ghana, Togo, Benin, Nigeria
Bundeswehr Institute of Microbiology, Munich

Bayern State Health Department, Munich
Current Situation Troop Strength

- **EUFOR**
  - Total: 798
  - Med: 113

- **UNOMIG**
  - Total: 11
  - Med: 8

- **TERMEZ**
  - Total: 308
  - Med: 23

- **KFOR + ORF BTL**
  - Total: 2808
  - Med: 213

- **KUNDUZ**
  - Feyzabad
  - Total: 676
  - Med: 81

- **UNIFIL**
  - Total: 843
  - Med: 29

- **UNMIS**
  - Total: 39

- **UNMEE**
  - Total: 2

- **OEF Marine**
  - Total: 455
  - Med: 13

- **UNAMA**
  - Total: 1

- **MeS**
  - Total: 1645
  - Med: 165

- **KABUL**
  - Total: 562
  - Med: 33

- **STRATAIRMEDEVAC* readiness:** 42

**Total Strength*)**: 8149

**Total Strength Med*)**: 678

*) without STRATAIRMEDEVAC
**Facit: New Background Level of Tularemia in Germany**

**Endemic-enzootic areas**

- **Eiderstedt County** (1949-61) 140 cases
- **Main-Tauber Valleys** (1950-61) 57 cases
- **Mecklenburg-Vorpommern, Uckermark** (1949-60) 102 cases
- **Göttingen County** 2002, 2004, 2005
  - Autumn 2005 (13 cases)

Identification of a new natural focus of Tularemia in Germany!
Correlation of Occurrence of Human Cases and Hantavirus Positive Rodents

- **Lindberg**: 3 cases
- **Hohenau**: 3 cases
- **Schöfweg**: 3 cases
- **Spiegelau**: 3 cases
- **Thurmannsbang**: 3 cases
- **Kirchberg**: 2 cases
- **Mauth**: 2 cases
- **Jandelsbrunn**: 2 cases
- **Frauenau**: 1 case
- **Zenting**: 1 case

- **11. Haidmühle**: 1 case
- **12. Schönberg**: 1 case
- **13. Grafenau**: 1 case
- **14. Neureichenau**: 1 case
- **15. Zachenberg**: 1 case
- **16. Bischofsmais**: 1 case
- **17. Waldkirchen**: 1 case
- **18. Philippsreut**: 1 case

**Location** | **Voles** | **PCR+** | **Serology+**
--- | --- | --- | ---
- **Falkenstein**: 9 | 33% | 33%
- **Raimundsreuth**: 14 | 21% | 21% + 33% y-n. mouse
- **Hangenleithen**: 5 | 40% | 20%
- **Langfurth/ Mutzenwinkel**: 5 | 0 | 40%
<table>
<thead>
<tr>
<th>Year/Period</th>
<th>Disease/Outbreak</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Since 1989</td>
<td>Orthopox virus diseases</td>
<td>Germany</td>
</tr>
<tr>
<td>Since 1996</td>
<td>Meliodosis cases</td>
<td>Germany/Southeast Asia</td>
</tr>
<tr>
<td>1997</td>
<td>Plague epidemics</td>
<td>Madagascar</td>
</tr>
<tr>
<td>1999</td>
<td>Glanders (horses)</td>
<td>Turkey</td>
</tr>
<tr>
<td>Since 1998</td>
<td>Tularemia cases</td>
<td>Germany</td>
</tr>
<tr>
<td>2000/2002</td>
<td>Tularemia epidemics</td>
<td>Kosovo</td>
</tr>
<tr>
<td>Since 2000</td>
<td>Monkeypox outbreaks</td>
<td>Zaire/Congo</td>
</tr>
<tr>
<td>Since 2002</td>
<td>Brucellosis Surveillance</td>
<td>Germany</td>
</tr>
<tr>
<td>2003</td>
<td>Tularemia outbreak</td>
<td>Sweden</td>
</tr>
<tr>
<td></td>
<td>Ebola fever outbreak</td>
<td>DR Congo</td>
</tr>
<tr>
<td>2004/05</td>
<td>„Konjunktivitis“- outbreaks</td>
<td>Germany</td>
</tr>
<tr>
<td></td>
<td>Tularemia outbreak</td>
<td>Germany</td>
</tr>
<tr>
<td></td>
<td>Nephropathia epidemica</td>
<td>Germany</td>
</tr>
<tr>
<td></td>
<td>Glanders outbreak</td>
<td>United Arab Emirates</td>
</tr>
<tr>
<td>Since 2005</td>
<td>Plague outbreaks</td>
<td>DR Congo</td>
</tr>
<tr>
<td></td>
<td>Chikungunya-fever, Rickettsiosis</td>
<td>Germany (imported)</td>
</tr>
</tbody>
</table>
DoD Influenza Surveillance and Response Activities
# Applicable Guidance & Authority

<table>
<thead>
<tr>
<th><strong>National Strategy</strong></th>
<th><strong>National Implementation Plan</strong></th>
<th><strong>DoD Implementation Plan</strong></th>
</tr>
</thead>
</table>
| • Preparedness and Communication  
• Surveillance and Detection  
• Response and Containment  
*Signed by the President Nov 2005* | • POTUS level document - *signed by the President May 5, 2006*  
• Directs Departments and Agencies to develop supporting plans  
• Assigns 323 inter-agency tasks  
• Clarifies roles/responsibilities of all stakeholders with key topics  
• HSC identified 4 planning priorities – Protection of Health/Safety of Personnel/Resources, Determination of Essential Functions/Services, Support to Federal-State-Local levels, Effective Communications  
• DOD added 5th Priority – Support to Int’l Partners, Int’l Stability and Security | • “Top priority protection of DOD forces...critical military, civilian, contractor roles...and resources to maintain readiness...priority consideration...given to protect DOD beneficiaries”  
• 114 of the 323 total tasks assigned to DOD  
• 31 as Lead and 83 as Support  
• DOD Implementation Plan tasks subordinate DOD Departments/Agencies |
Biosurveillance, Disease Detection, and Information Sharing Requirements for PI Expanded Missions (GEIS Tasks)

Expansion of Mission Tasks Requiring Additional Funding (FY07/Outyears)

- 4.2.2.5 – Inpatient/Outpatient Disease Surveillance ($3M/17M)
- 4.2.2.7 – Assist with Influenza Surveillance in Host Nations ($8M/57M)
- 4.2.3.8 – Develop/Enhance DoD Network of Overseas Infrastructure ($15M/99M)
- 6.2.2.9 – Enhance Public Health Response Capabilities ($9M/58M)
- 6.2.3.4 – Access to Improved Rapid Diagnostic Tests ($2M/13.8M) “related to GEIS, but not a GEIS task”
- 6.3.4.7 – Enhance Influenza Surveillance Reporting Techniques ($10M/66M)
Lab-Based Influenza Surveillance

• **Sentinel Surveillance**
  - Air Force Institute for Operational Health (San Antonio, Texas)

• **Population-based Surveillance**
  - Navy Health Research Center (San Diego, California)

• **International Surveillance**
  - NAMRU-2 (Jakarta, Indonesia)
  - NAMRU-3 (Cairo, Egypt)
  - NMRCDD (Lima, Peru)
  - AFRIMS (Bangkok, Thailand)
  - USAMRU-K (Nairobi, Kenya)
Influenza Surveillance by DoD

“Over 273 sites in 56 countries”
Sentinel Surveillance Impact

• CDC has received > 900 isolates (1998-2006)
  – Total of 120 isolates in FY06
• Growing number of sites internationally
• Identify genetic drifts/shifts through sequencing
  – H1N1 in Japan, RoK, Thailand & Kuwait (Summer 06)
• Vaccine contributions in the past (year used):
  – A/Panama/H3N2: Seed virus for vaccine 4 yrs (2000-04)
  – A/New Caledonia/H1N1: Peruvian cadets, 1999 (2000-07)
  – A/California/H3N2: Nepal, 2004 (2005-06)
Febrile Respiratory Illness (FRI) Surveillance

Influenza Diagnostic Collaborators:
- Center for Disease Control and Prevention (CDC)
- Armed Forces Institute of Operational Health (AFIOH)

Population-based Surveillance
Naval Health Research Center

7th Fleet (Japan)

3rd Fleet (San Diego)

MCRD San Diego
Calexico, CA
San Ysidro, CA

MCRD Parris Island

Fort Leonard Wood

NSTC Great Lakes

CGTC Cape May

Fort Jackson

CDC

Lackland AFB
AFIOH

Fort Benning

MCRD San Diego

2nd Fleet (Norfolk)

CDC

AFIOH

Influenza Diagnostic Collaborators:
- Center for Disease Control and Prevention (CDC)
- Armed Forces Institute of Operational Health (AFIOH)
Estimated vaccine effectiveness among basic trainees in 2005-06 = 92%
EUCOM-led Surveillance

- Population-based ILI surveillance throughout EUCOM
- Collaboration between LRMC, USACHPPM-Eur and AFIOH
- Inclusion of approximately 65 surveillance sites
- Referral of Influenza-positive specimens to AFIOH for genetic sequencing in support of seasonal vaccine development
- Laboratory Response Network (LRN) site for confirmation of H1, H3 and H5 (in future H7 and H9)
- BSL-3 level facility to be completed in FY08 with assistance of German authorities & sharing of data with German (Koch Institute) NIC
Participating Military Treatment Facilities in Europe

*A few specimens have also been submitted by deployed locations in CENTCOM (Kuwait, Qatar).
THAILAND
AFRIMS

Highlights of AI/PI Work in FY06/07

• Sentinel surveillance sites established in Nepal, Thailand and the Philippines and at regional US Embassies

• Philippines: New sites in early FY07

• Nepal-based Influenza surveillance network:
  • Detected H1N1 and H3N2 strain emergence in Jun-Jul 04-05
  • Jul-Aug 06 outbreak with 174 cases sampled by WARUN staff
  • H3N2 subtype similar to vaccine strain for 2006-07 (Wisconsin-like strains)
Highlights of AL/PI Work in FY06/07

• US Embassy site reporting from 11 countries in region

• Internet-based reporting from Thai civilian hospitals in 18 key provinces and 6 Royal Thai Army hospitals in border areas of Burma, Laos, Cambodia & Malaysia

• Build-up of new BSL-3 laboratory in Bangkok

• PCR lab in Burmese border in FY07

• Upgrade of Vet Med BSL-3 facility
INDONESIA
· Surveillance sites in 3 countries
· BSL-2+ Labs in Jakarta & Phnom Penh
· Collaborative Lab in Vientiane (at NCLE)
· Singapore Diagnostic Lab Platform
· Key Studies in FY06-07:
  · Longitudinal cohort study of 600+ households in Cambodia & Thailand (H1-H9 surveillance; w/ Univ of Iowa-CEID)
  · Remote sensing & environmental risk factor modeling project
  · Migratory and domestic bird surveillance
  · Pediatric and Influenza-like illness study
NIHRD, WHO and CDC collaboration and investigative support for all H5N1 suspected cases

- Total of 83 confirmed cases (Jun 05-Apr 07), young age
- Peak of cases in May 06 and Jan 07; activity throughout past 2 years
- High-level mortality (63 deaths, 76%)
- Twelve familial clusters identified (Jun 05-Apr 07)
Karo District, N. Sumatra, Indonesia

Home of Index Case
### Timeline of suspect and confirmed H5N1 cases, Karo District, North Sumatra Province, Indonesia

#### 24 April – 22 May 2006

<table>
<thead>
<tr>
<th>Case</th>
<th>Onset</th>
<th>Clinic</th>
<th>*C</th>
<th>Died</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>index 37/F</strong> Case 1</td>
<td>24 April</td>
<td></td>
<td></td>
<td>Died</td>
</tr>
<tr>
<td><strong>nephew 10/M</strong> Case 2</td>
<td>2 May</td>
<td>9</td>
<td>11</td>
<td>13 Died</td>
</tr>
<tr>
<td><strong>niece 1.6/F</strong> Case 3</td>
<td>2 May</td>
<td>5</td>
<td>8</td>
<td>14 Died</td>
</tr>
<tr>
<td><strong>son 19/M</strong> Case 4</td>
<td>4 May</td>
<td>*C</td>
<td>Died</td>
<td></td>
</tr>
<tr>
<td><strong>brother 25/M</strong> Case 5</td>
<td>4 May</td>
<td>*C</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>son 18/M</strong> Case 6</td>
<td>4 May</td>
<td>*C</td>
<td>12</td>
<td>Died</td>
</tr>
<tr>
<td><strong>sister 29/F</strong> Case 7</td>
<td>4 May</td>
<td>*C</td>
<td>10</td>
<td>Died</td>
</tr>
<tr>
<td><strong>brother 32/M</strong> Case 8</td>
<td></td>
<td></td>
<td></td>
<td>15 May 22 Died</td>
</tr>
</tbody>
</table>

**Relation to index case**

**Family Gathering**

- **A** = admission to Kabanjahe Hospital
- **B** = admission to Saint Elizabeth Hospital
- **C** = admission to Adam Malik Hospital (*denotes seen at Klinik Mandala, Kabanjahe prior to admission)
PERU
Highlights of AI/PI Work in FY06/07

- Respiratory disease surveillance for past 6 years
  - FY00 under Project Gargle ~ 200-300 samples/year (isolation rates ~ 20-25%)
  - FY06: ~ 2,000 samples (isolation rate ~ 40%)
  - FY06: Surveillance at 35 clinic/hospital sites in 6 countries
  - FY07: Expansion to ~ 71 sites in 10 countries
- Lab Capacity: ~ 3,000-4,000 samples in FY07
- Increased capability for cell culture of viral pathogens & PCR testing (under BSL-2+)
- New BSL-3 suite approved; to be completed by mid-FY07
- EWORS-based surveillance in 9 sites in Peru (2-Tumbes, 7-Lima)
- Alerta-DISAMAR syndromic surveillance reporting in Peruvian Navy and expanding to Peruvian Army bases
Wild Bird Specimen Collection

Dr. Salazar collecting dead bird
KENYA
Influenza Surveillance Sites - Kenya

- Largest sub-Saharan country with ongoing human influenza surveillance system
- Collaboration with CDC’s IEIP and KEMRI with referral of specimens to the National Influenza Center, Kenyatta Hospital, Nairobi.
- Eight sites established in key areas:
  - Malindi District Hospital, SE Coastal region
  - Isiolo District Hospital, NE region
  - Port Reitz District Hospital, Mombassa
  - Mbagathi District Hospital, Nairobi
  - Kondele Children’s Hospital, Kisumu, West, Lake Victoria region
  - Kisii District Hospital
  - New Nyanza Provincial Gen Hospital (NNPGH)
  - Busia District Hospital (Jun 07)
USAMRU-K
Future Efforts in FY07-08

• Uganda:
  • Agreement with Makerere Univ (Kampala) through HJF-MRI
  • Human surveillance: 3-4 hospital sites

• Cameroon:
  • Agreement with Univ of Buea (Yaounde) through HJF-MRI
  • Human surveillance: 3-4 hospital sites
  • Additional sites with JHUCWR Project (Nate Wolfe) for avian & animal surveillance

• Nigeria:
  • Establish mil-mil collaboration with Nigerian MoD
  • Human surveillance at 3-4 surveillance sites in FY08
USAMRU-K
Future Efforts in Nigeria-FY08

44 NARHK
(Kaduna)

DHQ-MRS
(Abuja)

445 NAF
(Ikeja)

NNH
(Ojo)
EGYPT
• Seasonal human (11 countries) & animal surveillance
  • Over 30 locations and clinical centers
  • At least 19 countries in Africa, East Europe, the Middle East and the FSU
• Afghani MoH GEIS-AI funded lab in Kabul has petitioned the WHO to become an NIC (Apr 07)
• Assisting Jordanian MoH with establishment Influenza Surveillance Network
• Assisting Libyan MoH to develop an Influenza Reference Laboratory in Tripoli
NAMRU-3
Ghana Detachment
UN-FAO Afghanistan Detachment

NAMRU-3 AOR
2005-6
Active Programs/Partners
NAMRU-3
Highlights of AI/PI Work in FY06/07
(Jul 05-Apr 07)

• Approx 6,360 human specimens obtained during influenza seasonal surveillance and outbreak investigations:
  • 39 (6.9%) of 565 tested positive for H5N1 (36-Egypt, 1-Djibouti, 1-Iraq, 1-Jordan)

• Of 2,890 avian specimens obtained during AI surveillance and outbreak investigations:
  • 97 (3.4%) of 2,890 tested positive for H5N1

• Ongoing coordination for co-location of CDC’s Global Disease Detection (GDD) and response unit (separate funding by DHHS)
**Influenza & Other Respiratory Pathogen Isolations - Egypt**
(Jul 06-Apr 07)

- 110 of 2,173 samples grew an isolate
  - 31 (1.4%) - Influenza
  - 79 (3.6%) – Other

- Predominance of isolates in Dec – Feb timeframe
H5N1 Cases – Egypt
(as of 16 May 07)

Fig. 3: N5H1 human cases per month, Egypt, 2006-07, as of 30 April 2007 (n = 34)

<table>
<thead>
<tr>
<th>Month</th>
<th>Cases</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Mar</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>May</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Jul</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Sep</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nov</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Jan</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mar</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

34 of 35 cases (one in mid-May 07)

Fig. 4: Distribution of H5N1 cases by age group, Egypt, as of 30 April 2007 (n = 34)

Age group (years)

<table>
<thead>
<tr>
<th>Age Group</th>
<th># Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 9</td>
<td>16</td>
</tr>
<tr>
<td>10 to 19</td>
<td>8</td>
</tr>
<tr>
<td>20 to 29</td>
<td>4</td>
</tr>
<tr>
<td>30 to 39</td>
<td>4</td>
</tr>
<tr>
<td>40 to 49</td>
<td></td>
</tr>
<tr>
<td>50+</td>
<td></td>
</tr>
</tbody>
</table>

Source: NAMRU-3 Influenza Report (Apr 07)
Contact

COL Ralph Loren Erickson, MC USA, Director, DoD-GEIS

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