GOAL: Develop BMT Medical Surveillance Today ... for Tomorrow

Adenovirus at Lackland AFB in the Trainee Population

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Overview

- Background
- Surveillance
- The Outbreak
- Response
- Current Status
Background

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- Adenovirus; a frequent cause of mild to mod respiratory disease in basic military trainees (BMTs)
- Severe disease is rare in adults with normal immune systems
- 49 distinct strains of adenovirus with types 4 and 7 causing the majority of prior outbreaks seen in military recruits.
- Routine vaccination with oral adenovirus against serotypes 4 and 7 began at US training camps in 1971; production was stopped in 1996 and stores of vaccine were depleted by 1999.
- The most significant adenoviral respiratory disease at Lackland AFB occurred from Nov 1999 to Nov 2000 with over 2400 hospitalizations at a cost of $3M.
- 1999 to 2004, adenovirus caused illness in an average of 3000 recruits/yr at Lackland (rate of 1.35/100); majority caused by type 4 and no cases of life threatening pneumonia

1. “Adenoviruses” CDC, National Center for Infectious Disease, Respiratory and Enteric Viruses Branch
Lackland Adenovirus Activity

- No significant adenovirus activity at Lackland in 2005 and 2006
Surveillance

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- **Active:**
  - Febrile Respiratory Illness Study
  - Epidemic Outbreak Surveillance (EOS)
- **Passive:**
  - Disease Non-Battle Injury (DNBI) Data
FRI Study

"Triservice Population-Based Surveillance for Viral Respiratory Pathogens Among High-Risk U.S. Military Personnel"

Study Started in 1998-2009, PI is NHRC

Subjects are military trainees from the following eight training centers:
- Navy: Naval Recruit Training Center, Great Lakes, IL
- Marine Corps Recruit Depot, San Diego, CA
- Marine Corps Recruit Depot, Parris Island, SC,
- Army: Fort Jackson, Columbia, SC
- Fort Leonard Wood, Waynesville, MO
- Fort Benning, Columbus, GA
- Air Force: Lackland Air Force Base, San Antonio, TX
- Coast Guard: US Coast Guard Training Center, Cape May, NJ
FRI Surveillance Objectives

- Determine the attack rate of febrile respiratory illness (FRI) among military populations at risk.
- Serve as an early warning system for respiratory disease outbreaks.
- Determine the etiology of respiratory pathogens causing clinical disease among military training populations.
- Determine the proportional distribution of influenza A and adenovirus serotypes causing clinical disease among military training populations.
- Measure the sensitivity and specificity of PCR testing of ambient temperature specimens for the detection of adenovirus and influenza, using viral culture as the gold standard.
A trainee will be considered a FRI case if he/she seeks medical care and meets both of the following criteria:

- Fever of $\geq 100.5^\circ F (38^\circ C)$ or equivalent,
- Cough or sore throat

Also, any trainee having clinical or radiographic evidence of pneumonia will be a FRI case.

Any trainee meeting the above will be consented and a throat swab for viral culture obtained and sent to NHRC (3 yrs ago began swab to AFIOH).
• Provide real-time public health service for influenza like illness; real-time sample analysis
• Lackland AFB is a real world test bed
• EOS nurses obtain clinical samples from patients with FRI symptoms
• Samples delivered to Advanced Diagnostic Laboratory (ADL); culture based testing; direct immunofluorescence and PCR
• Test advanced molecular diagnostic technologies
• Population Health Support Division at Brooks City Base sends weekly DNBI report
• Unique identifier for AF trainees
• Disease and Injury Surveillance
The Outbreak

- The occurrence of any disease at a frequency that is unusual (compared with baseline) or unexpected
- Fri rates in 2005-6 about 0.2-0.4 cases per 100
- In 2006 per FRI study 3 adenovirus positive cultures all year
Adenovirus Cultures 2007

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RESPIRATORY VIRAL CULTURE POSITIVE COUNTS (NHRC) - THROAT SWAB
CONFIRMED PNEUMONIA
37 AMDS/ Public Health
Current as of 7 Jun 07
FRI Rates

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Lackland AFB FRI Rate Status

FRI Rate (cases/100 trainees/week)
Lackland AFB FRI Rate Status

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FRI Rate Status

Rate by Week

- Ed regarding respiratory precautions/hygiene
- Consulted ID
- Team meeting
- Interventions

At/Below Expected  Moderately Elevated  Substantially Elevated
Lab Testing

- **Capability**
  - May 2007: Viral culture from AFIOH, Viral culture/Serotyping from NHRC and Rapid adeno test from EOS (50% sensitivity)
  - June 2007: EOS able to perform PCR for adeno 14; AFIOH serum neutralization
  - July 2007: AFIOH PCR for adeno 14

- **Results**
  - May 2007; Rapid adeno pos from EOS; May 18 NHRC reports Adeno 14
  - June 2007; 3 adenovirus positives in 2006; 1 type 3; 1 type 14/21; 1 type 21 and March/April 2006 type 14 simultaneously emerged mostly as co-infections at 5 training bases: Lackland; Ft Benning/Ft. Leonard Wood; Navy, Great Lakes and MCRD, San Diego (weren't aware of this until June 2007); NHRC Results indicated: April1-June 1 out of 106 adenopositive cultures 90% were ADENO 14!!
Laboratory Case Definition

• Detection of adenovirus antigen using the rapid Adenovirus detection assay from a clinical specimen with subsequent confirmation using real time PCR for adenovirus and follow-on identification of the Adeno 14 strain OR

• Isolation in cell culture of adenovirus from a clinical specimen with subsequent confirmation of Adeno 14 in a reference lab OR

• Detection of adenovirus by PCR assay from a clinical specimen with subsequent confirmation of Adeno 14 in a reference lab
Clinical Presentation of Adenovirus

- Clinical Case Definition
  - **Mild** (Outpatient) Febrile Respiratory Illness
    - Temp >100.4 AND cough, sore throat or nasal congestion
  - **Moderate** (Outpatient or Inpatient)
    - Temp > 100.4 AND x-ray evidence of pneumonia
    - Temp >100.4 AND one or more clinical findings of lower respiratory illness or systemic inflammatory response (tachycardia, leukopenia, tachypnea)
  - **Severe** (Inpatient)
    - Moderate Illness and acute respiratory distress or sepsis
- 1 April to 24 June 06: 14 pneumonias (3 admitted) Rate of .4% (4 per 1000)
- 1 April to 24 June 07: 51 pneumonias (27 admitted) Rate of 1.4% (14 per 1000)
- *** Pneumonias confirmed by chest x-ray
BMT WHMC Pneumonia Cases Hospitalized
37 AMDS/ Public Health
3 Apr- 6 Jul 07

# of Airman

Pneumo Cases Cummulative Total
Inpatient Pneumonias

- Inpatient Pneumonias, 1 Apr-24 Jun 07 n= 27
- BMT, 24 (89%); tech trainee, 3 (11%);
- Male: 26 (96%), Female: 1 (4%);
- Comorbid conditions: monospot pos(1), rhabdo(2)
- Median LOS: 3 days; ICU, 5 (19%); intubated, 3 (11%);
  deaths, 1 (not until 7 August);
- WBC < 4.5: 15 (55%), Plts < 150: 9 (33%)
- 20 out of the 27 patients had adenovirus throat swab; 19 were positive. Subtyping on 13 of those adeno positive patients; all 13 (100%) adeno 14 PCR positive by EOS or NHRC.
Local Response

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- Met as a team: Preventive med, public health, ID, clinicians and squadron leadership
- Recommended segregation of trainees into a fever (bed rest) flight in the 319th Squadron; Return to training when afebrile for 24 hours and decreased respiratory symptoms
- Public Health measures
  - Hand washing utilizing soap and water for 20 seconds duration as much as practical. Use Purell hand sanitizer when soap and water is unavailable.
  - Proper coughing/sneezing techniques.
  - Dormitory sleeping configuration should remain head-to-toe with 3 foot minimal gap between beds.
  - Common use phones should be sanitized between each use utilizing sanitizing wipes.
  - Clean all floor surfaces daily with antiviral agents (trade name to follow).
  - Clean/disinfect all contact surfaces daily to include all hand rails
  - Daily PH/IDMT dorm hygiene inspection.
Number of Pneumonia Cases (by BMT Squadron)
37 AMDS/Public Health
1 Apr - 3 Sep 07

Total hospitalized = 42 (37 BMTS shown + 3 Techs & 1 TI, 1 DS)
Currently hospitalized: 2 BMTs (326th) + 1 ADAF Dental Officer

* Please review notes for additional comments
Pneumonia Cases (BMT Week of Training)
37 AMDS/ Public Health
1 Apr- 3 Sep 07

Number of Airman

BMT Week of Training

* Please review notes for additional comments
Interaction with Outside Agencies

- AF agencies; AFIOH and AETC (tech training bases)
- Army; CHPPM and staff from Phase 3 vaccine trials
- CDC
- Texas State Health Dept
Initial Results From Response

Lackland AFB FRI Rate Status

FRI Rate (cases/100 trainees/week)

- At/Below Expected
- Moderately Elevated
- Substantially Elevated
- Expected Rate

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Current Status

Still seeing an increased FRI rate (.6-.9) and positive cultures for adenovirus and PCR for adeno 14

Outpatient and inpatient pneumonia rates still elevated as compared to last year (about 3 x)

Less confirmed adeno positive pneumonias (about 25-30%). Looking for other organisms as etiologies.

Continuing segregation of the trainees
Bed rest (Fever) Flight

Suspected Respiratory Cases in Medical Hold (319th)
37 AMDS/Public Health
Data 26 May- 2 Sep 07

Number of Airman

Number In
Number Out
Current 319th Bed Rest Flt

Legend:
- Red: Number In
- Dark Blue: Number Out
- Green: Current 319th Bed Rest Flt
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Pneumonia Cases in BMTs (Month Admitted)
37 AMDS/ Public Health
1 Apr- 3 Sep 07

Aug – 7 BMTs (shown) + 2 SFS Tech School = 9 Total

* Please review notes for additional comments
Current FRI Rates

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Lackland AFB FRI Rates and Adenovirus Serotype Distributions

(Months with <8 serotyped samples shaded)

Serotype Distribution

FRI Rate

Total Serotyped
Total Received

2006 2007

0% 25% 50% 75% 100%

FRI Rate

4 (a, p) 7 14 21

At/Below Expected Moderately Elevated Substantially Elevated Actual Rate Expected Rate

Other
Acknowldgements

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• 37 AMDS SQ/CC: Col Mike Bunning and Lt Col Shoor
• 37 AMDS PH: Lt Cols Cogburn & Blakeslee
• ID Docs: Dr. Mark Rasnake and Major Vince Marconi
• Trainee Health Doc: Capt Ruth Brenner
• EOS: Lt Col Livingstone, Dr. Lisa Lott, Roger Bravo and Christina Gardner
• NHRC: John Gomez and Tony Hawksworth
• AFIOH: Major Natalie Johns, Dr. Macias and Dr. Jill Trei
• AETC: Lt Col Brian Ortman and Capt Larry Noel
• CDC: Dr. Tate and team
• TX State Health Dept: Dr. Vince Fonseca and Dr. John Su
QUESTIONS??