The US Military: A Partner in Immunization Healthcare

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Disclosures and Disclaimer

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Learning Objectives

Participants will be able to:

• Describe the scope and functions of the US military’s immunization programs in California.

• Identify special issues related to military-unique immunizations, including anthrax and smallpox vaccines.

• Appreciate the potential for civilian-military collaborations, to support California immunizations programs.
US Military Population

- Current total 1.4 million members
  - 560,000 Army
  - 320,000 Navy
  - 320,000 Air Force
  - 200,000 Marines

- Operational experience:
  Active duty members all considered worldwide deployable; 
  ~30,000 currently deployed and >2.2 million (active and veterans) have deployed to combat theatres since 2001

- Demographics of active duty members:
  - 85% male
  - average age 28 years (mode 21 years)
  - 55% married
US Military Healthcare Beneficiaries

• TRICARE serves more than 9 million military-connected people
  Active duty members (1.4 million)
  Reserve/National Guard (~0.3 million activated)
  Retirees (~3.3 million)
  Family members (~4.0 million)

• More than 825,000 TRICARE beneficiaries reside in California

• This is a **dynamic** population, with many members moving and deploying overseas, and new members coming in continually
Military Epidemiology

“Healthy worker effect”
Working populations may not be comparable to the general population due to age and health selection biases

“Healthy military effect”
Department of Defense (DoD) applies high health standards for both entrance and retention

“Healthy warrior effect”
Military members who deploy to combat zones meet even more rigorous health standards
Military Occupational Hazards

Infections associated with living and working in close quarters

- Adenovirus
- Influenza
- Pertussis
- Meningococci
- Measles
- Mumps
- Varicella
- Infections that are not yet vaccine-preventable, including Streptococci, Norovirus, and many others
Military Occupational Hazards

Infections associated with international travel

- Hepatitis A
- Yellow Fever
- Japanese Encephalitis
- Rabies
- Typhoid
- Infections that are not yet vaccine-preventable,* including Tuberculosis, Cholera, Malaria, Dengue, Ebola, and many many others

*vaccines not available or not included in current US standards
Military Occupational Hazards

Infections associated with potential exposure to bioweapons

- Anthrax
- Smallpox
- Other potential bioweapons that are not vaccine-preventable

US military experiences with anthrax and smallpox vaccines highlight important issues in risk evaluation, risk communication, and response to adverse events following immunization (AEFI)...
Anthrax

- *Bacillus anthracis*: Gram-positive spore-forming bacteria

- Common pathogen in livestock, can also infect humans, and can survive in spore form outside of a host for decades

- Human infections include:
  - Cutaneous anthrax – responds well to antibiotic treatment
  - Gastrointestinal anthrax – toxin-mediated inflammation and bleeding with 25-60% case-fatality rate
  - Inhalational anthrax -- toxin-mediated pulmonary edema and bleeding with 50-90% case-fatality rate
Anthrax as a Bioweapon

- In WWII, British tested anthrax bombs on Scottish island of Guinard, killing sheep, and concluding that a large scale release of anthrax spores could render a city uninhabitable for decades.

- In 1979, accidental release of anthrax spores from bioweapons plant in Sverdlovsk, Russia caused illness in 94 people and killed 68.

- In 2001, unidentified bioterrorists distributed anthrax in US postal system; caused illness in 22 people and killed 5.
Anthrax Vaccine

- Livestock vaccine originally developed by Pasteur in 1881
- Inactivated injectable vaccine originally licensed in US in 1970; use limited to laboratory workers
- Beginning in 1998, US military required anthrax vaccination of troops based on potential bioweapons threats
  - Subcutaneous six-dose vaccine series was associated with many large local reactions
  - In 2008, FDA approved military application for intramuscular five-dose vaccine series to reduce local and systemic reactions
Anthrax Vaccine Challenges

• Mistrust of military anthrax vaccine program was prominent in late 1990s, and included concerns about:
  • Chronic health effects
  • Non-optional vaccine mandate in an era of growing public skepticism about many vaccines
  • Suspicion that vaccine program was experimental
• Concerns abated, to some extent, after US anthrax bioterrorism incident in 2001
Smallpox

- **Variola** (orthopox) virus causes fever with characteristic rash

- Transmitted from human-to-human only, via respiratory droplets, direct contact, or contact with contaminated fomites

- Case-fatality rate 20-60%

- Survivors often scarred or blinded

- Evidence of human epidemics since ancient times (seen in Egyptian mummies from 1500 BCE)

- Natural infection results in lifelong immunity in survivors; therefore deliberate “variolation” became widespread in 1700s, even though practice was associated with 2-3% case-fatality rate
Smallpox as a Bioweapon

• In French and Indian War (1754-67), British troops deliberately and effectively introduced smallpox via contaminated blankets to Native Americans.

• In American Revolutionary War (1775-84), General Washington ordered variolation of US troops to deter British use of smallpox as a bioweapon.

• After global elimination of natural smallpox in the 20th century, cultures of variola virus were maintained by US and Russia. In 1992, Colonel Kanatjan Alibekov defected to US from Russia, and described potential for reintroduction of smallpox as a bioweapon in naïve populations.
Smallpox Vaccine

- Vaccinia (cowpox) virus inoculation replaced variolation after Edward Jenner demonstrated the effectiveness of the practice in 1796

- Modern-era smallpox vaccines are much like original vaccine, creating cutaneous vaccinia infection to induce immunity to variola virus

- WHO successfully used live-vaccinia vaccines in global smallpox eradication campaign, 1967-1977; one the world’s greatest achievements in public health

- In 2001, US military reinstated smallpox vaccine requirements for some service members based on potential bioweapon threats
Smallpox Vaccine Challenges

- Potential adverse reactions include:
  - Myo/pericarditis (1/300 vaccinees)
  - Generalized vaccinia (1/15,000 vaccinees)
  - Vaccinia keratitis (1/45,000 vaccinees)
  - Encephalitis (1/83,000 vaccinees)
  - Eczema vaccinatum (rare; in eczema patients)
  - Progressive vaccinia (rare; in immune-compromised)
  - Fetal vaccinia (rare; after exposure in pregnancy)

- Contact transmission of vaccinia virus to susceptible people is also possible when the primary vaccinee’s inoculation site has unhealed vesicles that are left uncovered
Military Public Health Response to Anthrax and Smallpox Vaccine Challenges

- Special agency (now called DHA Immunization Healthcare Branch) originally established in 1998 to address anthrax vaccine concerns; subsequently expanded scope to address all military vaccine issues

- Education and training programs provide in-person and e-delivered information to vaccinees and vaccine administrators
  
  - Continuous provision is required due to rapid turnover of military personnel
  
  - Risk communication addresses general vaccine hesitancy and recognizes validity of concerns about adverse events following immunization (AEFI)
Military Public Health Response to Anthrax and Smallpox Vaccine Challenges

- 24/7 call center staffed with DHA immunization clinical professionals with expertise in vaccine administration and AEFI response [1-877-GET-VACC or 1-877-438-8222]

- Established procedures for rapid administration of vaccinia immune globulin, vaccinia antiviral agents, and similar products when needed

- Provide case management to support care of AEFI cases

- Provide WHO-defined causality assessment of AEFI cases when indicated
Military Public Health Response to Anthrax and Smallpox Vaccine Challenges

- Established ‘Countermeasure Injury Compensation Program,’ similar to Vaccine Injury Compensation Program, for AEFI related to anthrax vaccine, smallpox vaccine, pandemic influenza vaccine, and other countermeasures

- Enhanced surveillance for AEFI includes:
  - Review of all cases referred to DHA or submitted to VAERS
  - Anthrax Vaccine in Pregnancy Registry
  - Smallpox Vaccine in Pregnancy Registry
  - Smallpox Vaccine Myopericarditis Registry

- Publication of AEFI surveillance experiences considered important in moving the field of immunology forward
Military Vaccine Research and Development

- Historically, the US military provided leadership in the development of:
  - Yellow Fever vaccine
  - Influenza vaccines
  - Meningococcal vaccines
  - Adenovirus vaccines

Walter Reed

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Military Vaccine Research and Development

- US military is currently providing support in development of vaccines against challenging and emerging infections, including:
  - Next-generation smallpox vaccines
  - Malaria vaccines
  - Dengue vaccines
  - Ebola vaccines
  - HIV vaccines
  - Norovirus vaccines
Summary and Conclusions

• The US military health system serves a large, unique, and critically important population

• Vaccine requirements protect military members from infectious disease risks of occupational exposures, international travel, and bioweapon threats

• US military experiences with anthrax and smallpox vaccines necessitated development of special expertise in risk evaluation, risk communication, and response to AEFI

• US military immunization experiences and expertise create opportunities for collaboration with academic, state, and federal partners to better protect public health
For additional information, please see:

[www.vaccines.mil](http://www.vaccines.mil)

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