SHROUDS FOR NON-TIGHT FITTING PAPR USED BY FIRST RECEIVERS

PROTECTION FROM DERMAL BIOTERRORISM AGENTS

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FIRST RECEIVERS

• “...those hospital personnel (clinicians and other hospital staff) who have a role (i.e., triage, decontamination, medical treatment, security) in receiving and treating contaminated victims, and those whose roles support these functions (e.g., set-up and patient tracking).”

OSHA BEST PRACTICES
for
HOSPITAL-BASED
FIRST RECEIVERS OF VICTIMS
from Mass Casualty Incidents
Involving the Release of Hazardous Substances
2005
SHROUDS

• “A covering that conceals, protects, or screens.”

• Composition
  - rubber
  - cotton
  - polyester
  - polyvinylchloride
  - tyvek® (very fine polyethylene fibers)
  - tychem® (tyvek with saranex 23P film)
HOSPITAL RATIONALE FOR USE OF NON-TIGHT FITTING PAPR

- No need for fit testing
- Can be used with eyeglasses and facial hair
- More comfortable than Tight-Fitting APR
- Decreased work of breathing compared to Tight Fitting Air Purifying Respirators
- Cooling effect
- Standard hospital masks can be worn concurrently (not NIOSH approved)
NEGATIVE ASPECTS OF SHROUDS ON NON-TIGHT FITTING PAPR

- DEGRADE HEARING
- ATTENUATE SOUND TRANSMISSION
- IMPAIR MOBILITY
- CAN BECOME TANGLED IN EQUIPMENT
- CLAUSTROPHOBIC POTENTIAL
- MORE THREATENING APPEARANCE TO VICTIMS
- INABILITY TO USE SOME MEDICAL EQUIPMENT
ISSUE: SHOULD SHROUDS BE STANDARD ON PAPR USED BY FIRST RECEIVERS DURING RESPONSE TO BIOTERRORISM EVENTS?

• QUESTION: Do self-referred victims of acute bioterrorism exposures, who have not undergone decontamination, pose a threat of dermal transmission of bioterrorism agents to First Receivers?
DERMAL BIOLOGICAL AGENT RISK ASSESSMENT

- DERMAL RISK FACTORS
- VIRULENCE/INFECTIVITY
- ENVIRONMENTAL PERSISTENCE
- REAEROSOLIZATION POTENTIAL
- DERMAL CONTACT TRANSMISSION RISK
DERMAL RISK FACTORS

◆ Dermal barrier INTEGRITY
  - traumatic lesions (e.g., lacerations, abrasions)
  - ulcerations (e.g., herpetic, burns, etc.)
  - skin disorders (e.g., eczema, acne, etc.)
  - allergic dermal disorders (e.g., dermatitis, etc.)

◆ Infective Dose

◆ Age (very young, very old)

◆ Immune status
<table>
<thead>
<tr>
<th>AGENT**</th>
<th>DERMAL INFECTIOUS DOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillus anthracis (anthrax)</td>
<td>&lt;50 organisms subcutaneously</td>
</tr>
<tr>
<td>Francisella tularensis (tularemia)</td>
<td>10 organisms subcutaneously</td>
</tr>
<tr>
<td>Yersinia pestis (bubonic plague)</td>
<td>1 – 10 organisms subcutaneously</td>
</tr>
</tbody>
</table>

**Dermal infection with any of these agents can lead to systemic disease**
ENVIRONMENTAL PERSISTENCE

**ANTHRAX**
- bacteria survive ± 24 hours outside of host
- spores survive decades (or more)

**TULAREMIA**
- bacteria survive up to 16 days on metal surfaces (10% RH, temperature 25°C)
- bacteria can survive for weeks in moist soil, water, hay, decaying carcasses
- aerosolized tularemia undergoes exponential decay over 3 – 3.5 hours
- no spore form

**PLAGUE**
- bacteria remain viable on metal surfaces for >3 days at (10% RH, temperature of 30°C), paper surfaces for 5 days (60% RH, 26°C)
- aerosolized plague undergoes exponential decay over 1 – 3 hours
- WHO analysis suggests aerosolized Plague would remain viable for one hour
- no spore form
REAEROSOLIZATION POTENTIAL

ANTHRAX

“Viable B anthracis spores reaerosolized under semiquiescent conditions, with a marked increase in reaerosolization during simulated active office conditions.”


“After a terrorist attack, exposures to B anthracis spores can occur through primary and secondary (reaerosolization) aerosolization.”


“If heavy contamination of skin and clothing has occurred and initial decontamination has not been performed, reaerosolization and person-to-person spread are possible.”

REAEROSOLIZATION POTENTIAL

- **TULAREMIA**

Activities leading to reaerosolization of *F. tularensis*
resulting in tularemia have been described:


- **mowing lawns, brush cutting, and weed-wacking**

REAEROSOLIZATION POTENTIAL

PLAGUE

“Reaerosolization of infectious particles is theorized to be a low, but possible risk.”


“The risk from reaerosolization of Y. pestis from the contaminated clothing of exposed persons is low. In situations where there may have been gross exposure to Y. pestis, decontamination of skin and potentially contaminated fomites (e.g., clothing or environmental surfaces) may be considered to reduce the risk for cutaneous or bubonic disease.”

University of Texas Medical Branch, Bioterrorism and Emerging Infectious Disease Readiness Plans
DERMAL CONTACT TRANSMISSION

- Anthrax

  General notation: person-to-person transmission of anthrax is rare, however:

  “If heavy contamination of skin and clothing has occurred and initial decontamination has not been performed, reaerosolization and person-to-person spread are possible.”
  

- Case report of a sibling-to-sibling transmission.
  

- Case report of a mother-to-child transmission.
  

- Case report of an adult-to-child transmission.
  
TRANSMISSION OF ANTHRAX BY FOMITES

- ANTHRAX
- Spread of anthrax by fomites is reported:
  - shared communal toilet article
  - bedding
  - clothing
  - untreated leather products
DERMAL CONTACT TRANSMISSION

- TULAREMIA
  - Person-to-person transmission has never been documented.
  - Laboratory-acquired ulceroglandular tularemia has been reported.
  - Handling of infected animals has resulted in ulceroglandular disease (with or without being bitten or scratched).
  - Standard hospital precautions are recommended for draining ulcers, clothing, bedding, equipment.
DERMAL CONTACT TRANSMISSION

♦ PLAGUE
  ♦ In rare cases, *Y. pestis* bacteria enter through an opening in a person’s skin, from a piece of contaminated clothing or other material used by a person with plague.
    National Institute of Allergy and Infectious Diseases, NIH
  ♦ Bubonic plague occurs when a flea bites a person or when materials contaminated with *Y. pestis* enter through a break in the skin.
    OSHA, U.S. Department of Labor
  ♦ Exudates from plague buboes or abscesses should be considered infectious.
SUMMARY

Some bioterrorism agents are dermally-active. Dermal exposure can lead to systemic disease.
Individual risk factors and dermal characteristics increase the potential for bioterrorism agent dermal transmission.
Without a shroud, use of non-tight fitting powered air purifying respirators (PAPRs) exposes the neck region to bioterrorism agent contamination.
Shrouds offer protection against dermally-active bioterrorism agents.
THE END

• QUESTIONS?

• COMMENTS?