Infection Control in an Age of Bioterror
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Why is Infection Control Important?
• Healthcare workers are among most likely to become infected
  SARS 2003: Canada, >75% of those infected were HCWs (Taiwan, reported >90%)
• Other patients and visitors may also become infected
  Ebola in Africa: Vast majority of cases are acquired in hospital
• Appropriate infection control precautions DO prevent transmission

Role of Infection Control
• Advise, provide PPE
• Train staff on PPE and personal precautions
• Maintain environmental controls
• Prevent spread to other patients, community
• Follow up to ensure no secondary transmission
• Work with other partners to carry out objectives

Some General Considerations
• Generally similar for bioterrorist agents as for other infectious diseases with similar transmission
• Have a plan
• Inventory PPE (personal protective equipment)
• Inventory isolation rooms (negative pressure)
• Will need to educate and train personnel (including support staff)
• If isolation required, will need to work with your Engineering Department

EMERGING INFECTIONS: SOME RECENT EXAMPLES
• Ebola, 1976 –
• HIV/AIDS
• Hantavirus pulmonary syndrome, 1993
• Hemolytic uremic syndrome, 1990’s –
• West Nile, multistate, 1999 –
• SARS 2002 –
• Influenza (H5 avian influenza in Asia, 2004?)

Emerging Infectious Diseases vs. Bioterrorism
Many similarities: Most biothreat agents are naturally occurring, zoonotic (like many emerging infections)
“Fear factor”
Recognition likely to be similar (sick people in emergency room)
Importance of Early Recognition

- More effectively treat those infected and prevent new cases
- Alert and educate medical community regarding clinical management
- Expedite epidemiologic and criminal investigations
- Mobilize antimicrobial and vaccine supplies
- Recruit additional resources from federal and state governments

Many bioterrorist agents cause an initial illness that looks like influenza (Flu)

Initial presentation of:
- Anthrax
- Plague
- Brucellosis
- Tularemia
- Q Fever
- Glanders
- Smallpox
- Viral hemorrhagic fevers

Fever
- Headache
- Muscle pain
- Malaise = “Flu-like illness”

SOME EPIDEMIOLOGICAL CHARACTERISTICS

Point-source or common source outbreak
- Unusual disease not endemic to the area or cannot be naturally ascribed to the setting (e.g. hemorrhagic fever)
  - Agent: Outbreak of anthrax, etc.
  - High case fatality rate
  - Unusual epidemiologic grouping (e.g. only adults) or geographic clustering
  - Respiratory or enteric transmission
  - Sudden onset of disease
  - Concurrent unusual animal deaths (many of these agents are zoonotic)

Bioterrorism Agents: Category A, CDC

- Variola major (Smallpox)
- Bacillus anthracis (Anthrax)
- Yersinia pestis (Plague)
- Francisella tularensis (Tularemia)
- Botulinum toxin (Botulism)
- Viral hemorrhagic fevers (Filoviruses and others)

Category A Agents: Transmission & Precautions

<table>
<thead>
<tr>
<th>AGENT</th>
<th>PERSON-TO-PERSON</th>
<th>PPE PRECAUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variola major (Smallpox)</td>
<td>✅</td>
<td>✅ Airborne (incl. N95 or PAPR)</td>
</tr>
<tr>
<td>Viral hemorrhagic fevers (Filoviruses and others)</td>
<td>✅ (at times)</td>
<td>✅ Airborne *</td>
</tr>
<tr>
<td>Yersinia pestis (Plague)</td>
<td>✅</td>
<td>✅ Droplet or airborne (*)</td>
</tr>
<tr>
<td>Francisella tularensis (Tularemia)</td>
<td>✅ (or rarely)</td>
<td>✅ Standard</td>
</tr>
<tr>
<td>Bacillus anthracis (Anthrax)</td>
<td>✅</td>
<td>✅ Standard</td>
</tr>
<tr>
<td>Botulinum toxin (Botulism)</td>
<td>✅</td>
<td>✅ Standard</td>
</tr>
</tbody>
</table>

Some Case Studies

- SARS
  - Importance of PPE (infection control)
  - Importance of rapidly and widely reporting the unusual!
- Anthrax 2001
  - Environmental health is important
- Smallpox preparedness
  - Was helpful with SARS: similarities in plans and procedures

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Some of the Challenges
- Precautions require considerable time and effort
  Estimates: Patient with smallpox, visited twice each hour, will require 16 changes of PPE by each staff member, 2 hrs spent in changing (ref.: Grow & Rubinson 2003)
- Hospital may quickly run out of equipment, isolation facilities
  Where to put the other patients?
- Staffing needs
  How to handle changes of shift? Do employees go home?

Training is Important!
- SARS (2003), some hospital staff became infected despite precautions
- Reasons unknown, but one reason may be improper removal of PPE

Isolation
- Will need for some of the Category A agents, SARS, others
- Require negative pressure
- Suitable rooms may be very limited
- May be possible to improvise, or portable units
- Special handling to protect immunosuppressed patients?

What If the Hospital is a Target?
- Example: Anthrax, 2001
  An inhalation anthrax patient in NYC was a hospital employee
- Need to consider epidemiology
- May need environmental control, decontamination

Preparedness Plans: Healthcare Facilities
- Everyone needs a plan!
- Generic templates available (APIC)
- But not sufficient: Must customize

Bio Events: Special Features (APIC plan as example)
- Reporting requirements (to Health Dept.)
- Detection of outbreaks:
  Syndrome recognition in emergency dept. Lab.
- Infection control procedures/PPE
- Post exposure management (decon, triage, treatment resources)
- Samples: Transport to lab, lab security
- Protocols for specific agents when known
Preparedness

- Plan not enough: Must train
- And must practice
- Include your other partners
- Hospitals and other healthcare institutions: JCAHO (U.S.) requirements for drills

Short review on general aspects of infection control for bioterrorism


Resources Available on the Web

CDC Bioterrorism Preparedness and Response: http://www.bt.cdc.gov

CDC Div. of Healthcare Quality Promotion (Hospital Infections Program)

ProMED-mail (Reports of disease outbreaks internationally): http://www.promedmail.org

APIC: http://www.apic.org

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