Bio Agents of Concern/Interest
Potential Biological Threats

1. Ricin

2. Botulism toxin
   \textit{(Clostridium botulinum)}

3. Anthrax \textit{(Bacillus anthracis)}

4. Plague \textit{(Yersinia pestis)}

5. Tularemia \textit{(Francisella tularensis)}

6. Smallpox \textit{(Variola)}

7. VHF \textit{(Ebola, Hanta virus)}
**Ricin** is a poison that can be made from the waste left from processing castor beans.

- Ricin is not communicable
- Decontamination is recommended if the person was exposed to the source (such as a dispersion cloud created when opening a letter)
- Treatment is supportive care

Ricin protein structure (ball and stick, ribbon). The A and B chains can be distinguished readily in the ribbon structure.
LC: shouldn't the second bullet specify something like (such as a dispersion cloud created when opening a letter containing ricin)? That is what is meant, isn't it?
Also - please check slide 4 - regarding the material in parentheses (for example, by opening a letter or being in a dispersion cloud) and fix to clarify meaning.
bgh7, 6/4/2003
Botulism is a muscle-paralyzing disease caused by a toxin made by a bacterium, *Clostridium botulinum*

- **Three Types**
  - Food-borne botulism
  - Infant botulism
  - Wound botulism

- Botulism is not communicable
- CDC maintains a supply of antitoxin
- Decontamination is not necessary
Botulism Symptoms

These symptoms can occur within 6 hours to 10 days of consuming toxin:
- double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness. Infants with botulism appear lethargic, feed poorly, are constipated, and have a weak cry and poor muscle tone.

These are all symptoms of the muscle paralysis caused by the bacterial toxin.

If untreated, these symptoms may progress to cause paralysis of the arms, legs, trunk and respiratory muscles.
Botulism Treatment

A supply of antitoxin against botulism is maintained by CDC. The antitoxin is effective in reducing the severity of symptoms if administered early in the course of the disease. Most patients eventually recover after weeks to months of supportive care.
Botulism vaccine

There is no vaccine for Botulism
CDC Suggested PPEs for Botulism

- N95 mask
- Safety glasses
- Disposable Gloves
- Disposable Coveralls
Sampling for Botulinum

- Surface Sampling with Wipes or Swabs
- Air Samples
- Check with your Lab.
Disinfection for Botulinum

*C. botulinum* is inactivated with a 1:10 dilution of household bleach. The appropriate disinfectant solution must be in contact with the toxin or the organism for 15 to 20 minutes to ensure effective inactivation. If the material is suspected to contain both toxin and organisms, the spill must be sequentially treated with bleach and sodium hydroxide.
Anthrax is an infectious disease caused by the bacterium *Bacillus anthracis*. Anthrax is not communicable. Infection occurs from exposure to spores.
Anthrax Symptoms

These symptoms can occur within 7 days of infection:

- Fever (temperature greater than 100 degrees F). The fever may be accompanied by chills or night sweats.
- Flu-like symptoms
- Cough, usually a non-productive cough, chest discomfort, shortness of breath, fatigue, muscle aches
- Sore throat, followed by difficulty swallowing, enlarged lymph nodes, headache, nausea, loss of appetite, abdominal distress, vomiting, or diarrhea
- A sore, especially on your face, arms or hands, that starts as a raised bump and develops into a painless ulcer with a black area in the center.
Anthrax Prophylaxis

CDC recommends that decontamination/cleanup workers receive antimicrobial prophylaxis, using standard regimens starting in conjunction with or prior to the time of first entry into a contaminated location and continuing for 60 days after final opportunity for exposure.

The current recommended regimens (for adults) are as follows:

- ciprofloxacin, 500 mg by mouth every 12 hours
- doxycycline, 100 mg by mouth every 12 hours
Anthrax vaccine

A protective vaccine has been developed for anthrax; however, it is primarily given to military personnel. Vaccination is recommended only for those at high risk, such as workers in research laboratories that handle anthrax bacteria routinely. The antibiotics used in post exposure prophylaxis are very effective in preventing anthrax disease from occurring after an exposure.

Six shots with an annual booster

- Note: even with the vaccine with documented exposure antibiotics are still recommended.
CDC Suggested PPEs for Anthrax

- Powered Air-Purifying Respirator with Full Face piece and High-Efficiency Particulate Air (HEPA) Filters
- Disposable Protective Clothing with Integral Hood and Booties
- Disposable Gloves
Sampling for Anthrax

- Bulk Sampling
- Surface Sampling with Wipes or Swabs
- Surface Samples Collected by High-Efficiency Particulate Air (HEPA) Vacuuming
- Air Samples
Disinfection for Anthrax

See attached EPA fact sheet.
CDC Health Advisory
Purpose: To Update Public & Private Labs & others on rapid anthrax test
Hand-Held Immunoassays for Detection of Bacillus Anthracis Spores

- Intended only for the screening of environmental samples
- Positives need to be confirmed by Lab
- Not used to determine Patient treatment
- CDC does not recommend the use of these assays
Plague (Yersinia pestis)

- Plague is communicable in the pneumonic stage
  - Follow universal precautions
  - Droplet and airborne precautions

Three forms
- Bubonic plague
  - from flea bite
- Septicemic plague
  - Blood agent
- Pneumonic plague
  - Airborne aerosol transmission

Wayson stain of Yersinia pestis. Note the characteristic "safety pin" appearance of the bacteria.
Plague Carriers
Plague Symptoms

- Pneumonic plague symptoms can occur within 1-6 days of infection:
  - fever, chills, cough, and difficulty breathing; rapid shock and death if not treated early

- Bubonic plague symptoms can occur within 2-6 days of infection:
  - enlarged, tender lymph nodes, fever, chills and prostration
Plague Prophylaxis

CDC recommends **Streptomycin** is the antibiotic of choice. **Gentamicin** is used when streptomycin is not available. **Tetracyclines** and **chloramphenicol** are also effective.

Currently, no plague vaccine is available in the United States.
CDC Suggested PPEs for Plague

- N95 mask
- safety glasses
- Disposable Gloves
- Disposable Coveralls
- Deet for flea control
Sampling for Plague

- **Surface Sampling with Wipes or Swabs**
- **Air Samples**

- Naturally occurring plague is thought to die outside the host within one hour; collection will be difficult.
- Under controlled conditions, viable plague cells were maintained for up to 5 days on paper and other surfaces.
Decon for Plague

- Plague can survive in the environment but is susceptible to heat, disinfectants, and sunlight.
- Soap and water is an effective for individuals.
- Vector control measures for naturally occurring outbreaks.
Tularemia is an infectious disease caused by a hardy bacterium found in animals, *Francisella tularensis*.

- Ways of contracting tularemia
  - Bite of infected animal or arthropod
  - Handling an infected carcass
  - Eating or drinking items contaminated with *F. tularensis*
  - Inhaling *F. tularensis*

- Tularemia is not communicable

Gram stain of *F. tularensis*, X1000

Thumb with skin ulcer of tularemia
Tularemia Symptoms

These symptoms can occur within 3 - 5 days of infection but could take 14 days:

- sudden fever
- chills
- headaches
- diarrhea
- muscle aches
- joint pain
- dry cough
- progressive weakness

- People can also catch pneumonia
  - develop chest pain
  - bloody sputum

- Other symptoms
  - ulcers on the skin or mouth,
  - swollen and painful lymph glands,
  - swollen and painful eyes,
  - sore throat
## Tularemia Prophylaxis

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>Recommended Therapy</th>
</tr>
</thead>
</table>
| Adults           | **Preferred choices:**  
|                  | Streptomycin, 1g IM twice daily  
|                  | Gentamicin, 5 mg/kg IM or IV once daily†  
|                  | **Alternative choices:**  
|                  | Doxycycline, 100 mg IV twice daily  
|                  | Chloramphenicol, 15 mg/kg IV 4 times daily  
|                  | Ciprofloxacin, 400 mg IV twice daily† |

* One antibiotic, appropriate for treatment for patient age, should be chosen from among the alternatives. Treatment with streptomycin, gentamicin, or ciprofloxacin should be continued for 10 days; treatment with doxycycline or chloramphenicol should be continued for 14-21 days. Persons beginning treatment with intramuscular (IM) or intravenous (IV) doxycycline, ciprofloxacin, or chloramphenicol can switch to oral antibiotic administration when clinically indicated.† Not a U.S. Food and Drug Administration-approved use.  
†‡ Ciprofloxacin dosage should not exceed 1 g/d in children.
Tularemia vaccine

A vaccine for tularemia is under review by the Food and Drug Administration and is not currently available in the United States.
CDC Suggested PPEs for Tularemia

- N95 mask
- Safety glasses or face shield
- Disposable Gloves
- Disposable Coveralls
Sampling for Tularemia

The smallpox virus is not strong and is killed by sunlight and heat. In lab experiments, 90% of aerosolized smallpox virus dies within 24 hours; in the presence of sunlight, this percentage would be even greater.

For this reason CDC depends on EPI surveillance, vaccinations, and isolation.
### Chemical Inactivation of Vaccinia Virus on Surfaces:
Inactivation after 10 minutes contact time at room temperature.

<table>
<thead>
<tr>
<th>Chemical Disinfectant</th>
<th>Minimum Concentration to Achieve Inactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl alcohol</td>
<td>40%</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>30%</td>
</tr>
<tr>
<td>Benzalkonium Chloride</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>200 ppm</td>
</tr>
<tr>
<td>Ortho-phenylphenol</td>
<td>0.12%</td>
</tr>
<tr>
<td>Iodophor</td>
<td>75 ppm</td>
</tr>
</tbody>
</table>

**Chemicals Uses on Environmental Surfaces for Low or Intermediate Level Disinfection**
Smallpox (Variola virus)

- Smallpox is communicable
  - Droplet and airborne precautions
  - Infectious until scabs separate
  - Strict quarantine

- Note: any temperature above 101°F within 17 days of exposure suggests infection
Scabs have fallen off. Person is no longer contagious. Scabs resolved

The scabs begin to fall off, leaving marks on the skin that eventually become pitted scars. Most scabs will have fallen off 3 weeks after the rash appears. The person is contagious to others until all of the scabs have fallen off.

<table>
<thead>
<tr>
<th>Incubation Period</th>
<th>Exposure to the virus is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about 12 to 14 days, but can range from 7 to 17 days. During this time, people are not contagious.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Duration: 7 to 17 days)</td>
<td>Not contagious</td>
</tr>
<tr>
<td>Initial Symptoms (Prodrome)</td>
<td>The first symptoms of smallpox include fever, malaise, head and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the prodrome phase; it may last for 2 to 4 days.</td>
</tr>
<tr>
<td>(Duration: 2 to 4 days)</td>
<td>Sometimes contagious*</td>
</tr>
<tr>
<td>Pustular Rash</td>
<td>A rash emerges first as small red spots on the tongue and in the mouth. These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes most contagious. Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better. By the third day of the rash, the rash becomes raised bumps. By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. (This is a major distinguishing characteristic of smallpox.) Fever often will rise again at this time and remain high until scabs form over the bumps.</td>
</tr>
<tr>
<td>(Duration: about 5 days)</td>
<td>Contagious</td>
</tr>
<tr>
<td>Pustules and Scabs</td>
<td>The pustules begin to form a crust and then scab. By the end of the second week after the rash appears, most of the sores have scabbed over.</td>
</tr>
<tr>
<td>(Duration: about 5 days)</td>
<td>Contagious</td>
</tr>
<tr>
<td>Resolving Scabs</td>
<td>The scabs begin to fall off, leaving marks on the skin that eventually become pitted scars. Most scabs will have fallen off 3 weeks after the rash appears. The person is contagious to others until all of the scabs have fallen off.</td>
</tr>
<tr>
<td>(Duration: about 6 days)</td>
<td>Contagious</td>
</tr>
<tr>
<td>Scabs resolved</td>
<td>Scabs have fallen off. Person is no longer contagious.</td>
</tr>
<tr>
<td>Not contagious</td>
<td></td>
</tr>
</tbody>
</table>
Small Pox Prophylaxis

- There is no specific treatment for smallpox disease, and the only prevention is vaccination.
- Patients with smallpox may be helped by intravenous fluids, medicine to control fever or pain, and antibiotics for any secondary bacterial infections that may occur.
Small pox vaccine

- If given to a person before exposure to smallpox, the vaccine can completely protect them. Vaccination within 3 days after exposure will prevent or greatly lessen the severity of smallpox in most people. Vaccination 4 to 7 days after exposure likely offers some protection from disease or may decrease the severity of disease. Vaccination will not protect smallpox patients who already have a rash.
- Currently, the smallpox vaccine is not widely available to the general public. However, there is enough smallpox vaccine to vaccinate everyone who would need it in an emergency.
CDC Suggested PPEs for Small Pox

- N95 mask
- Safety glasses or face shield
- Disposable Gloves
- Disposable Coveralls
Sampling for Small Pox

- The smallpox virus is not strong and is killed by sunlight and heat. In lab experiments, 90% of aerosolized smallpox virus dies within 24 hours; in the presence of sunlight, this percentage would be even greater.

- For this reason CDC depends on EPI surveillance, vaccinations, and isolation.
Disinfection for Small Pox

Table 1: Chemical Inactivation of Vaccinia Virus on Surfaces: Inactivation after 10 minutes contact time at room temperature.

<table>
<thead>
<tr>
<th>Chemical Disinfectant</th>
<th>Minimum Concentration to Achieve Inactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl alcohol</td>
<td>40%</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>30%</td>
</tr>
<tr>
<td>Benzalkonium Chloride</td>
<td>100 ppm</td>
</tr>
<tr>
<td>Sodium Hypochlorite</td>
<td>200 ppm</td>
</tr>
<tr>
<td>Ortho-phenylphenol</td>
<td>0.12%</td>
</tr>
<tr>
<td>Iodophor</td>
<td>75 ppm</td>
</tr>
</tbody>
</table>
## Viral Hemorrhagic

### Marburg virus and Ebola virus, Hanta Virus

<table>
<thead>
<tr>
<th>Virus</th>
<th>Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lassa virus</td>
<td>Lassa fever</td>
</tr>
<tr>
<td>Junin virus</td>
<td>Argentine hemorrhagic fever</td>
</tr>
<tr>
<td>Machupo virus</td>
<td>Bolivian hemorrhagic fever</td>
</tr>
<tr>
<td>Guanarito virus</td>
<td>Venezuelan hemorrhagic fever</td>
</tr>
<tr>
<td>Sabia</td>
<td>Brazilian hemorrhagic fever</td>
</tr>
</tbody>
</table>
VHF Signs and Symptoms

- Specific signs and symptoms vary by the type of VHF, but initial signs and symptoms often include marked fever, fatigue, dizziness, muscle aches, loss of strength, and exhaustion.
- Patients with severe cases of VHF often show signs of bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes, or ears. However, although they may bleed from many sites around the body, patients rarely die because of blood loss.
- Severely ill patient cases may also show shock, nervous system malfunction, coma, delirium, and seizures. Some types of VHF are associated with renal (kidney) failure.
Disinfection for Ebola VHF

Environmental surfaces or inanimate objects contaminated with blood, other body fluids, secretions, or excretions should be cleaned and disinfected using standard procedures. Disinfection can be accomplished using a U.S. Environmental Protection Agency (EPA)-registered hospital disinfectant or a 1:100 dilution of household bleach.
CDC Director’s Emergency Operation Center

770-488-7100 24/7

- When you call identify yourself and ask for:
  - Bioterrorism On call (NCID)
    - LRN Contact
    - CDC Lab
  - ATSDR Duty Officer (for chemicals)
    - Or you can call your ATSDR Regional Rep.
  - NCEH/ATSDR On call

- www.cdc.gov