

Knox County Health
Department's
Public Health and Emergency
Response Training

**Part 1: Public Health's Role
During Emergencies**

Public Health Departments as Emergency Response Agencies

- Threat and reality of bioterrorism have focused attention on public health preparedness for emergencies
 - Planning for public health emergencies requires interagency agreements, training, and exercises
 - Health Departments work with many other agencies to detect and respond to situations that may impact the community, e.g.:
 - American Red Cross
 - Fire Department
 - Police
 - EMS
 - School Systems
 - EMA (Local and State)

Public Health Emergencies

- Examples of public health emergencies:
 - Natural disaster: hurricanes, floods, earthquakes;
 - Outbreaks from contaminated food or water, SARS, influenza pandemics;
 - Biological, chemical, radiological and nuclear WMD.

Knox County Health Department Emergency Response Duties:

- Responsibility and authority to investigate all epidemics, outbreaks, and issues of public health concern
- First responder for investigating and controlling biological WMD events
- Staffing:
 - Directors and Deputy Directors – Administration
 - Public Health Officer: Medical authority for county/region
 - Epidemiologist – disease detective
 - Nurses, Environmentalists, and others

Local-State-Federal Relationships

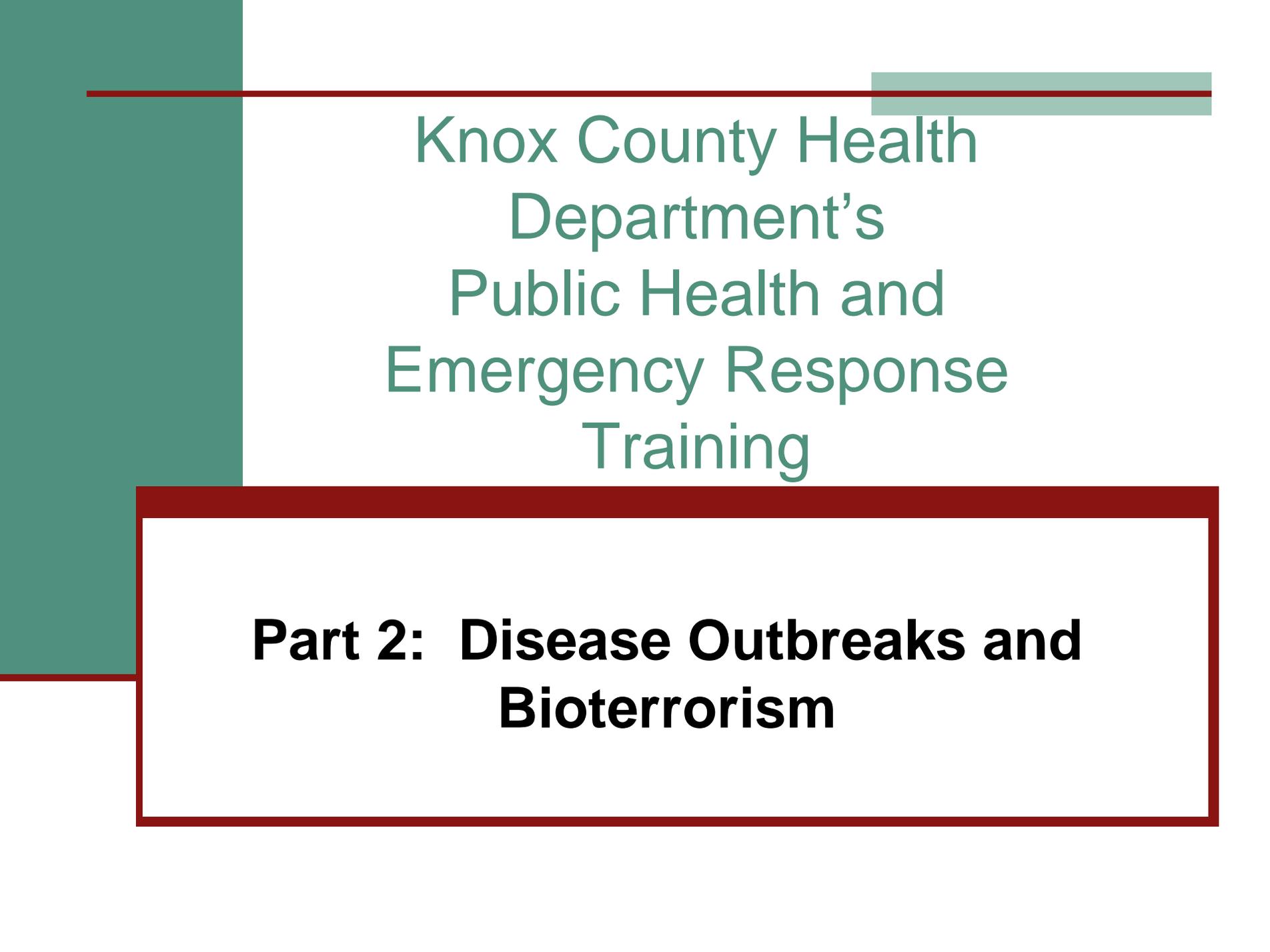
- Local health agencies: disease surveillance, initial outbreak investigations
- State health agencies: technical assistance, policy guidance, lab support, field assistance, resources (vaccines, drugs, ...)

Local-State-Federal Relationships

- CDC provides resources when outbreaks exceed state capacity, are multi-state or international, or result from bioterrorism
- For events within states, CDC usually investigates only on request of state health department

EMERGENCY PUBLIC HEALTH FUNCTIONS

- Mass Shelters
 - PH staff may be assigned to assist in shelters during an emergency.
- Surveillance and Disease Investigation
 - PH monitors for the occurrence of disease outbreak
- Mass Vaccination/ Antibiotic Dispensing
 - PH implements directives for mass vaccination (smallpox, influenza) or dispensing antibiotic prophylaxis to prevent a disease outbreak after a bioterrorism event.
- Quarantine and Isolation
 - PH works with the local community to use quarantine and isolation if needed to contain disease



Knox County Health Department's Public Health and Emergency Response Training

Part 2: Disease Outbreaks and Bioterrorism

What is a Disease Outbreak?

- An outbreak is the occurrence of more cases of a disease than expected in a population during a certain time
- One case of smallpox, anthrax, plague, or botulism anywhere in the US is an outbreak requiring immediate response
- Epidemic and outbreak mean the same thing
 - Epidemic is often applied to an outbreak of special concern

How Are Outbreaks Detected?

- Recognized and reported by individual doctors or groups (e.g., an emergency department).
- Recognized and reported by those affected (e.g., coworkers, school, banquet)
- Detected by public health agency through review of individual cases reported by doctors, or review of lab reports or other health care data
- Enhanced surveillance in cooperation with state and federal public health officials (Active surveillance)
- *In public health, “surveillance” means tracking the occurrence of diseases of importance – not watching individuals or premises...*

Notifiable Disease Reporting (Passive Surveillance)

- Roughly 75 diseases reportable in TN by law.
- Includes diseases linked with bioterrorism by:
 - Reporting: telephone, fax, secure email from doctors' offices and laboratories.
- Examples of reportable diseases:
 - Anthrax
 - Hepatitis A, B, and C
 - Pertussis
 - Plague
 - SARS
 - Tuberculosis
 - West Nile Virus

Knox County Local Syndromic (Symptom-Based) Surveillance:

- Active surveillance completed and analyzed daily: Public Health staff are looking for clues that indicate something out of the norm is happening.
- KCHD actively monitors for changes in the following:
 - Knox County 911 Ambulance Requests
 - Emergency Department Visits
 - Medical Provider (Doctor's Office) Visits
 - Knox County School Absenteeism

What Should Make You Suspect an Intentional Outbreak?

- Cases of an extremely rare disease (anthrax, plague, smallpox) that could be a bioterrorism agent
- Ordinary disease but out of season or area, or with wrong mode of spread or other unusual characteristics (e.g. antibiotic resistance, atypical symptoms, or victim demographics *meaning that there are more young patients when patients with disease are normally older or vice versa*)
- Unusually high numbers of Emergency Department visits/hospitalizations for any illness
- All victims share a common event/workplace/other common locale

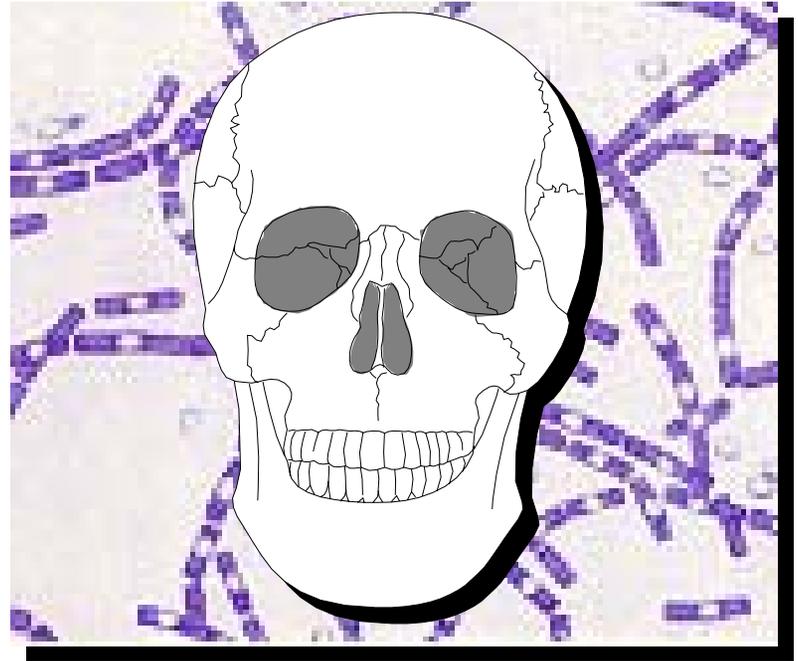
Goal of Disease (Epidemiologic) Investigation: **Prevention**

This is the source of urgency for public health staff

- Find and fix ongoing point source (like contaminated water supply, food source, or terrorist release)
- Eliminate the source (close location until fixed, take food product off the market)
- Find, isolate, and treat infectious people
- Find exposed people, give them prophylactic treatment or vaccine, and/or quarantine them

Biological Warfare - DEFINITION

Biological warfare is the intentional use of microorganisms (bacteria, viruses and fungi) or toxins to produce death or disease in humans, animals and plants



Biological Warfare

The Early Years

- Poison darts and arrows
- 14th Century: Plague-infected cadavers catapulted over wall into town of Kafka (Ukraine) by the attacking Tartars
- 18th Century: Smallpox-infected blankets and handkerchiefs given to Native Americans by British forces.



Biological Warfare

The World Wars

- World War I: German agents infected allied cavalry horses, mules, and livestock feed with glanders and anthrax; they also experimented with chemical agents
- World War II: Japan
 - Trials in China with anthrax, cholera, salmonella, plague
 - Millions of plague-infested fleas released by airplane over Chinese cities

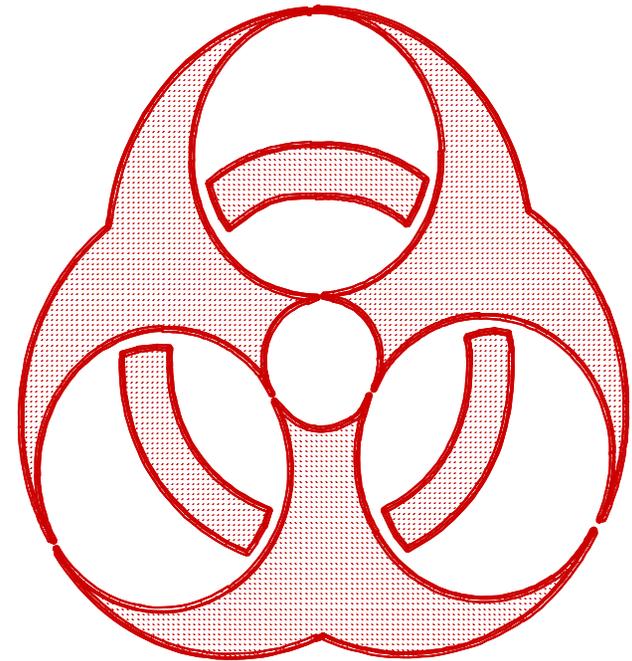
Biological Warfare

Modern Day - Bioterrorism

- Iraqi threat of weaponized biological agents
 - Scud missiles, bombs, aerosol-spraying drones
- International Terrorism Potential Threats
 - Al-Qaeda and threat of smallpox
- Domestic Terrorism:
 - U.S., 1984 - Rajneeshee Cult in Oregon spreads salmonella on salad bars to thwart local election
 - Fall 2001: Letters containing anthrax sent through the mail

Attributes of Bioterrorism Agents

- **Easy Accessibility, Low Cost**
- **Low visibility; Easy delivery:**
 - **Difficult to detect (odorless, tasteless)**
 - **High infectivity by aerosol delivery**
 - **Ability to cause large outbreaks over large areas**
- **High morbidity (amount of infection) and mortality (death)**
- **Potential for person-to-person transmission**
- **Threat of use creates fear and panic**
- **Delayed onset of effects allow escape of terrorist.**



Biological Agents Delivery

- Aerosolization (Particles in the range of 1 to 5 micrometers)
 - Crop Dusters
 - Backpack Sprayers
 - Perfume Atomizers
- Percutaneous – skin provides a fairly impermeable barrier
- Human – Human Spread for some agents

AGROTERRORISM ISSUES

(Infectious Diseases Infecting Primarily Animals)

- Traditional thinking and planning regarding Bioterrorism has focused primarily on humans as the primary target.
- Agricultural terrorism also attractive:
 - Agents that affect animals are relatively easy to procure, produce, and disseminate
 - Unlikely to pose a direct threat to the perpetrators during production or delivery.
 - Would have enormous economic impact on cattle, dairy, or other food industry (Economic destruction as a goal).
 - Would create panic that the food supply could not be trusted.

LISTS OF DISEASES AS POTENTIAL AGROTERRORISM AGENTS

- Foot and mouth
- Rinderpest
- Contagious bovine pleuropneumonia
- Lumpy skin disease
- Rift Valley Fever
- Newcastle Disease
- Highly Pathogenic Avian Influenza, etc.

(All but one are viral)

Terrorist incidents involving chemical agents will be very different from those employing biologic agents!

- Relatively immediate effect, so an attack would be recognized quickly.
- Distinct signs and symptoms following exposure
- More defined geographic area of exposure
- DECONTAMINATION a big issue on the area where the chemical agents were released.
- Local supply nerve agent antidotes available for first responders.

Overt (Chemical) vs. Covert (Biological) Event

| | <u>Overt</u> | <u>Covert</u> |
|--------------|--------------------------------|--------------------|
| Recognition: | early | delayed |
| Response: | early | delayed |
| Treatment : | early | delayed |
| Responders: | Traditional “First Responders” | HealthCare Workers |

CDC BIOLOGICAL AGENTS – Potential use for Bioterrorism

CDC has prioritized them in Lists A – C

- A List:
 - Easily transmitted/disseminated
 - High mortality rate
 - Potential for public panic
 - Public Health impact requiring preparedness
- B List:
 - Moderate easy to disseminate
 - Moderate to low mortality
- C List:
 - Emerging
 - Ease of availability, production, and dissemination
 - High morbidity and mortality

“A” LIST

- Smallpox*
- Anthrax
- Plague*
- Botulism toxin
- Tularemia
- Viral Hemorrhagic Fevers*

*person to person transmission possible

Smallpox (Variola)

- Caused by variola virus
- 1949 – last US case
- 1972 - Routine US vaccination ended
- 1977 – last naturally occurring case in Somalia
- Declared eradicated in 1980 by WHO
- Humans were only known reservoir (carrier of the disease)
- Clandestine stockpiles remain a concern
- One case would be an international emergency because most of the population has not been vaccinated.



Smallpox

- Person-to-person spread possible
- Highest risk in close contacts
- Less contagious than measles, flu or chicken pox
- Death rate 30% in 1970's

Smallpox: Clinical Features

- Incubation period (period from exposure to development of illness) = 12 days
- Early symptoms – very ill
 - Acute onset of fever, headache, backache, vomiting
- Typical rash
 - Begins inside mouth, on face, upper forearms, hands
 - Spreads to lower extremities, then trunk over ~ 7 days
 - Red & flat rash → blisters → pus-filled → scabs
 - Rash on palms of hands and soles of feet
- Contagious to others from time rash starts until all scabs fall off

SMALLPOX RASH ON HANDS



SMALLPOX RASH ON FEET

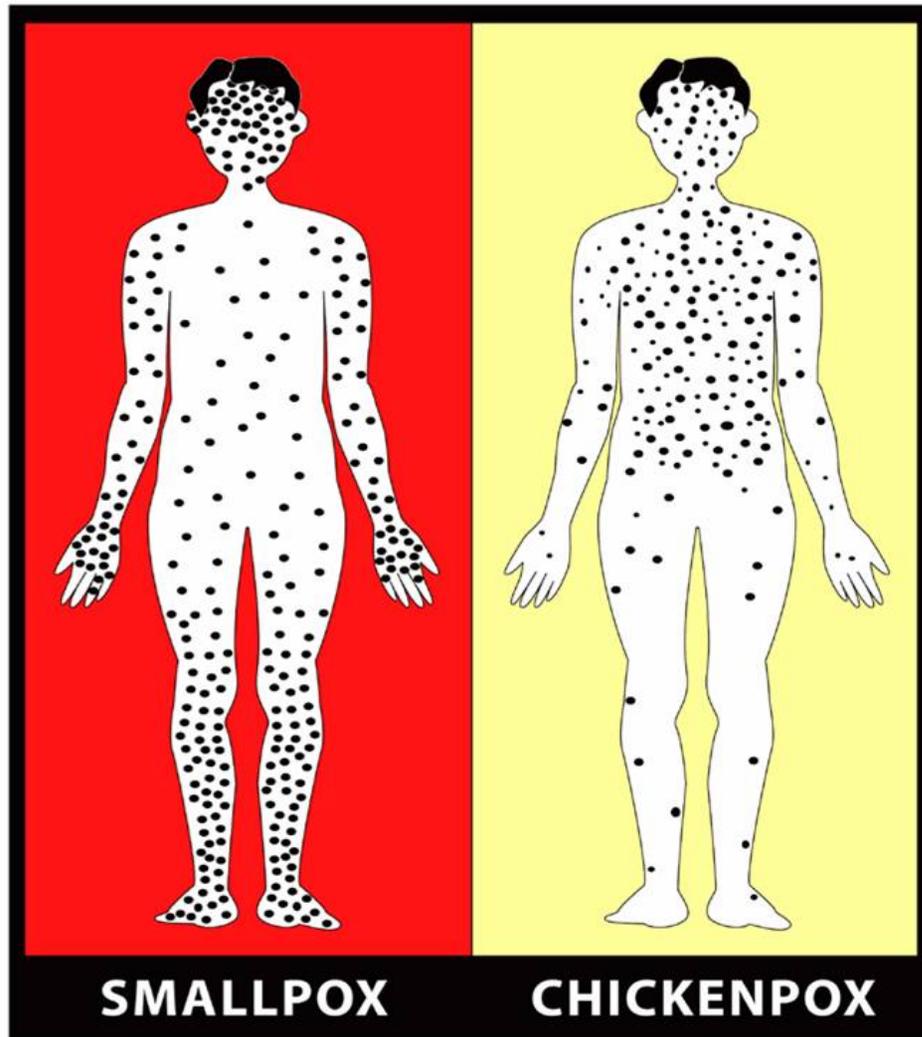


Differential Diagnosis

Chickenpox is the disease most likely to be confused with smallpox

Rash Distribution

Peripheral
Spread of
Rash



Central
Spread of
Rash

Smallpox: Public Health Contact Management

- Notify public health authorities immediately for suspected case
- Identify contacts to the smallpox patient rapidly, monitor contacts for 17 days after contact for development of fever and/or rash
- “Ring” vaccination - identify and vaccinate all contacts, even if previously vaccinated
- Vaccination prevents disease if given within 3-4 days of exposure

Anthrax: Overview

- Primarily disease of animals who ingest anthrax spores from soil, (spores can last in soil for decades)
- Natural transmission to humans by contact with infected animals or contaminated animal products
- Cutaneous form most common form of anthrax (usually occupational); 224 cases in U.S. between 1944 – 1994



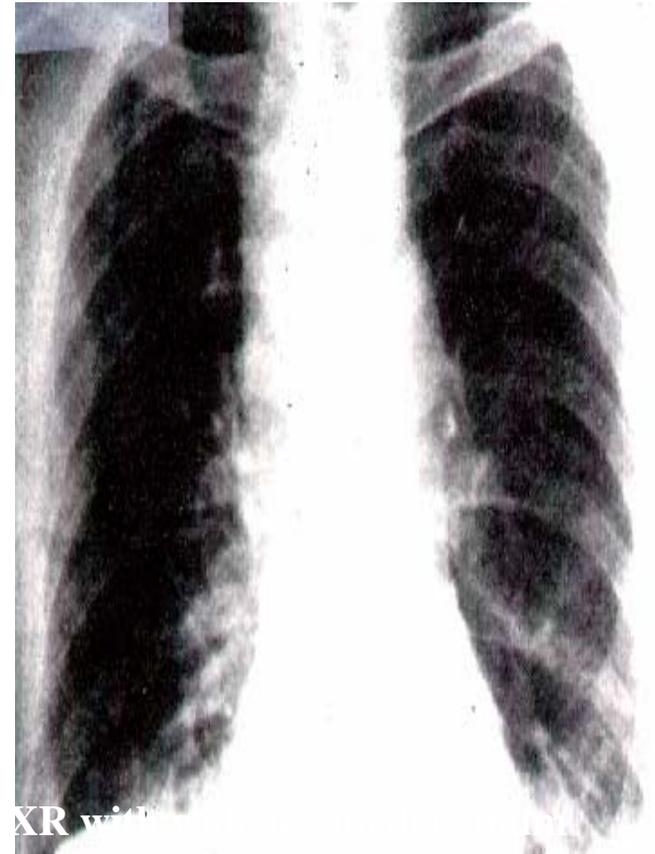
Anthrax: Cutaneous

- Inoculation of spores under skin through cut/abrasion
- Incubation: hours to 7 days (average 5 days)
- Death 20% untreated; rare treated



Anthrax: Inhalational

- Inhalation of spores, which then grow into bacteria in the lungs and lymph nodes around the heart.
- Incubation: 1 to 43 days
- Initial symptoms (2-5 days)
 - fever, cough, body aches
- Terminal symptoms (1-2 days)
 - high fever, shortness of breath
 - rapid progression to shock / death because toxins released by the anthrax bacteria
- Mortality rate ~100% despite aggressive Rx



Anthrax: Post-exposure

■ Treatment

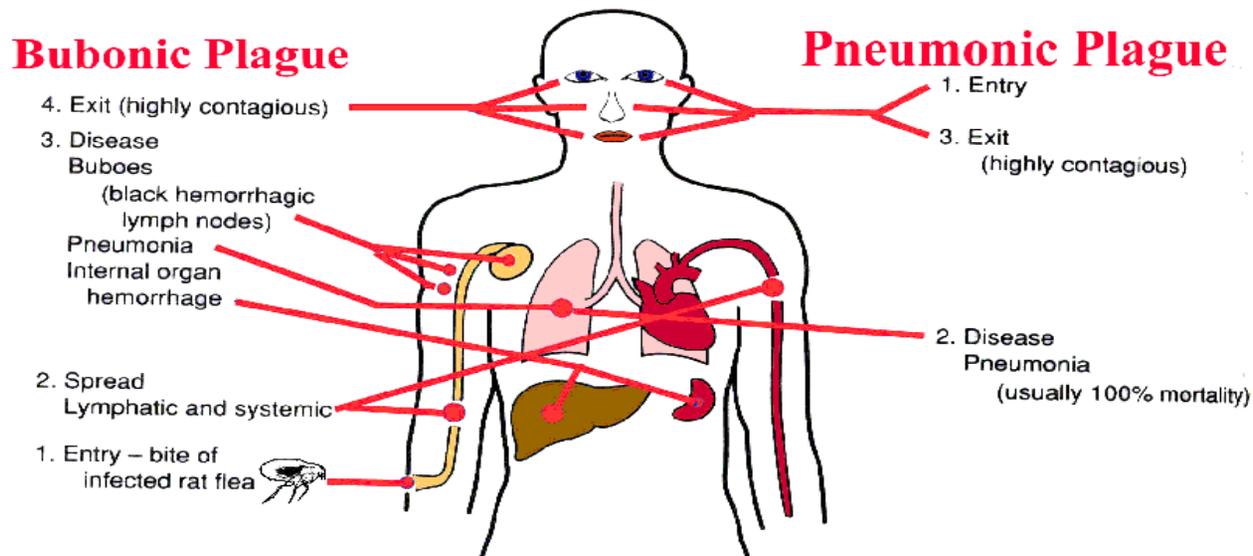
- Antibiotics for 60 days without vaccine (Doxycycline or Ciprofloxacin)

■ Prophylaxis (Preventive Treatment)

- Doxycycline or Ciprofloxacin, or Amoxicillin (last resort) for 60 days
- Vaccination may also be a possibility in a post exposure situation

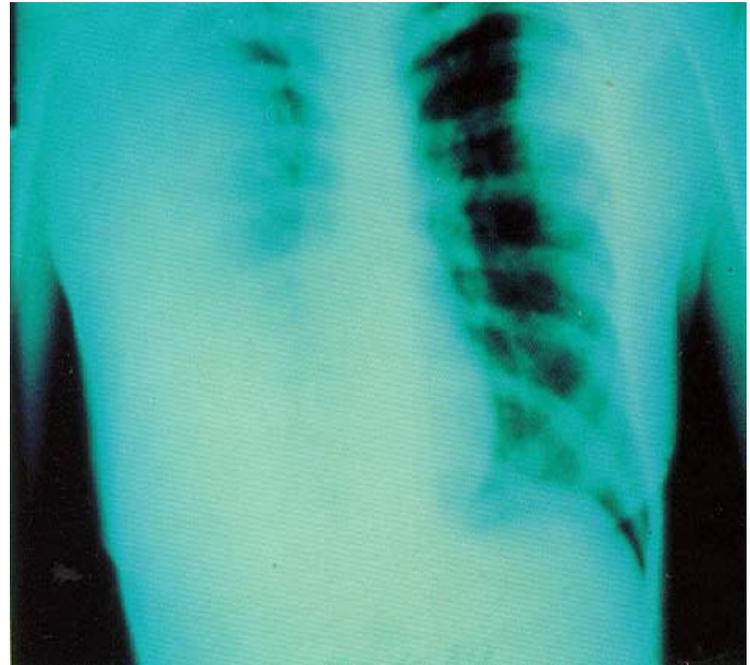
Plague: Overview

- Bacterial disease found in certain animals:
 - rats, squirrels, chipmunks, rabbits, and carnivores
- Usual infection through contact with rodents/fleas that have bitten animals carrying plague
- Three forms
 - Bubonic (skin infection)
 - Pneumonic (lung infection)
 - Septicemic (blood infection)



Plague: Pneumonic

- Most likely form of intentional infection
- Incubation: 1-3 days
- Sudden onset headache, fatigue, fever, muscle aches, cough
- Pneumonia progresses rapidly to shortness of breath, patient coughs up blood
- Death from respiratory collapse and spread of infection to blood
- **Can be contagious**



USAMRIID: Pneumonic infiltrate of pneumonic plague

Plague: Post-exposure

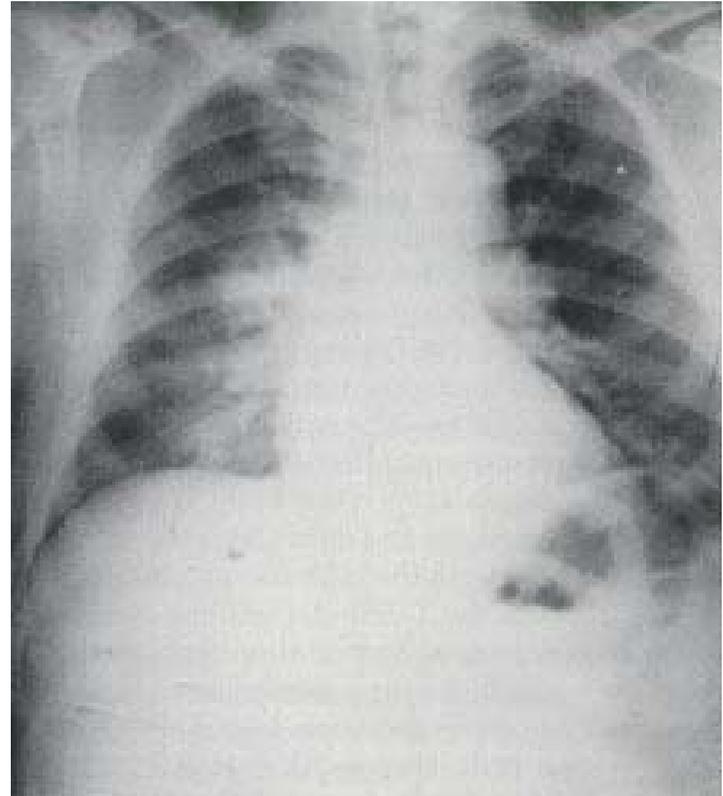
- Treatment
 - Streptomycin, Gentamicin, Doxycycline, Ciprofloxacin, or Chloramphenicol
- Prophylaxis
 - Doxycycline, Ciprofloxacin, or Amoxicillin for 10 days
- Vaccine no longer manufactured in U.S.
 - not protective against pneumonic plague
 - New vaccine under research

Tularemia: Overview

- Acquired through contact with blood/tissue of infected animals, or bites of infected deerflies, mosquitoes, or ticks
- Many different clinical forms including skin, lymph node, or eyes
- Pneumonia
 - Possible presentation for bioterrorist attack
- **No person-to-person transmission**

Tularemia: Pneumonic

- Incubation: 3 to 5 days (range 1-21 days)
- Abrupt onset fever, chills, headaches, muscle aches, non-productive cough
- Patchy pneumonia on chest x-ray
- Mortality 30% if untreated (< 10% if treated with antibiotics)



Tularemia: Treatment/Prophylaxis

- Antibiotic Treatment
 - Streptomycin or Gentamicin
 - Tetracyclines
- Vaccine investigational
 - Not available for general use
 - Role in treatment of disease or post-exposure prophylaxis unknown
- Prophylaxis
 - Doxycycline, Ciprofloxacin, or Amoxicillin (last resort) for 10-14 days

Botulism

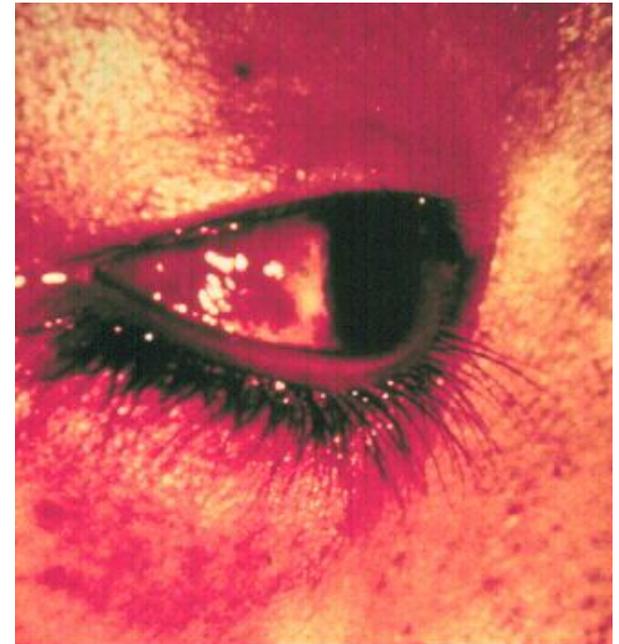
- Botulism is a muscle-paralyzing disease caused by a toxin made by a bacterium called *Clostridium botulinum*.
- Foodborne: a person ingests pre-formed toxin that leads to illness within a few hours or days.
- Main bioterrorism concerns are aerosolized botulism that can directly enter the lungs and foodborne botulism because contaminated food may be available to other persons beside the patient.

Botulism (Cont.)

- **Classic symptoms include:** double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth and muscle weakness.
- **If left untreated**, botulism can result in paralysis of the arms, legs, trunk, and respiratory muscles.
- Can be fatal; although mortality rates have dropped significantly over the past 50 years.
- **Symptoms usually occur between 18-36 hours of eating contaminated food.** Can occur between 6 hours and 10 days.
- **Treatment:** Antitoxin - prevents worsening condition, but takes many weeks to recover.
- **BOTULISM IS NOT SPREAD FROM PERSON TO PERSON!!!** Only people exposed to the toxin need antitoxin.

Viral Hemorrhagic Fevers (VHF)

- Refer to a group of illnesses that are caused by several distinct families of viruses that cause illness which affect multiple organ systems in the body.
- Examples:
 - Ebola, Marburg, and Lassa
- Transmission varies depending on type of disease
 - Through contact (bites, ingestion, or direct contact) with infected animals or insects
 - Person to person



VHF Symptoms and Treatment

- Symptoms can vary depending on the type of virus, but they often include:
 - Initial: fever, fatigue, dizziness, muscle aches, loss of strength and exhaustion.
 - Severe cases: bleeding under the skin, in internal organs, or from body orifices like the mouth, eyes, or ears
 - Extreme cases: shock, nervous system malfunction, coma, delirium, and seizures.
- There is no cure for VHF.
 - Supportive therapy
 - Anti-virals may be effective in treating some VHF

Bioterrorism in the Future

- Genetically altered organisms carrying abnormal toxins or antigen are considered to be a threat (e.g. Plague with botulinum toxin).
- Multi-drug resistant bacteria (i.e. plague, tularemia, anthrax) that cannot be treated by conventional means
- Emerging pathogens such as SARS and avian influenza
- Agents of Agroterrorism could cause much economic destruction and fear (e.g. Foot and mouth, Rinderpest, Contagious bovine pleuropneumonia, Lumpy skin disease, Rift Valley Fever, Newcastle Disease).



More Information on
Bioterrorism/Disease Agents Can
Be Found at:

<http://www.bt.cdc.gov/agent/agentlist.asp>