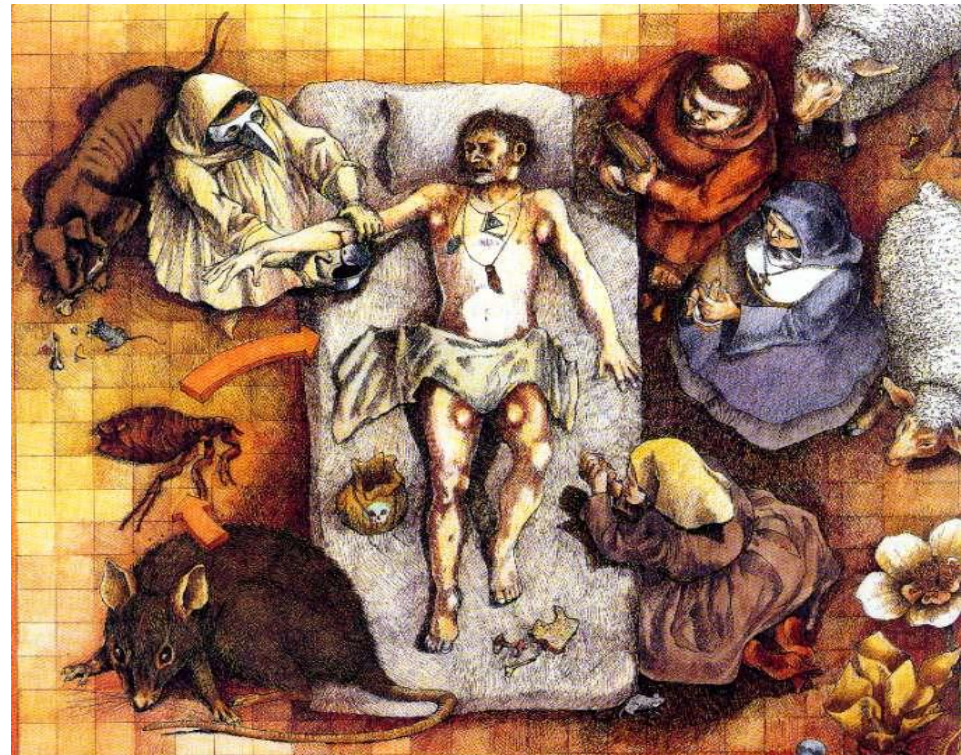
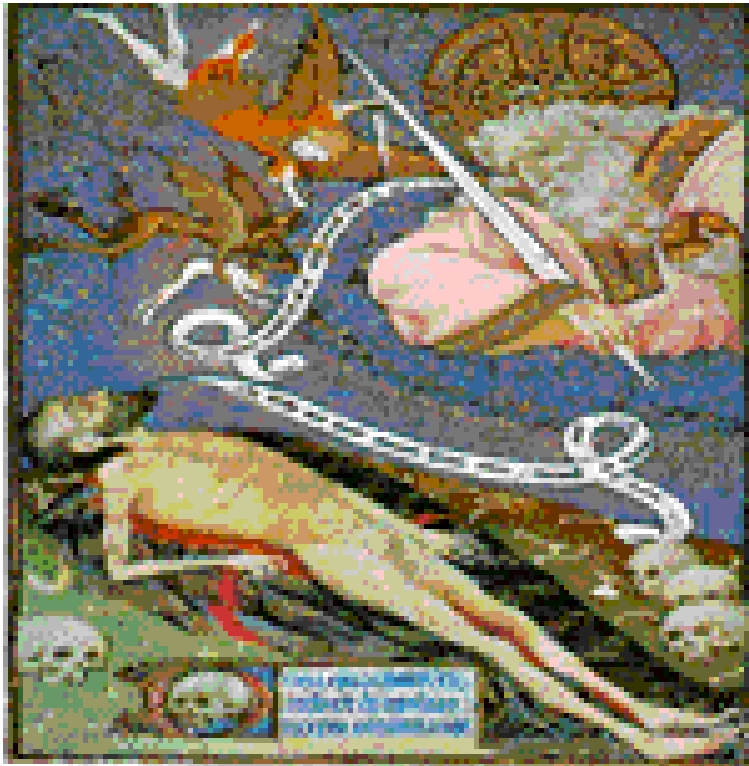




YERSINIA PESTIS: THE PLAGUE



SYNONYMS

- Black death
- Pestilential fever
- Buboes



HISTORY



The Three Plague Pandemics

- Justinian's Plague (~540-700AD)
- The Black Death (1346-1350)
- The China Epidemic (~1855-1908)

AKA "The Modern Pandemic"

First record of Plague was an outbreak among the Philistines in 1320 B.C.



ETIOLOGY

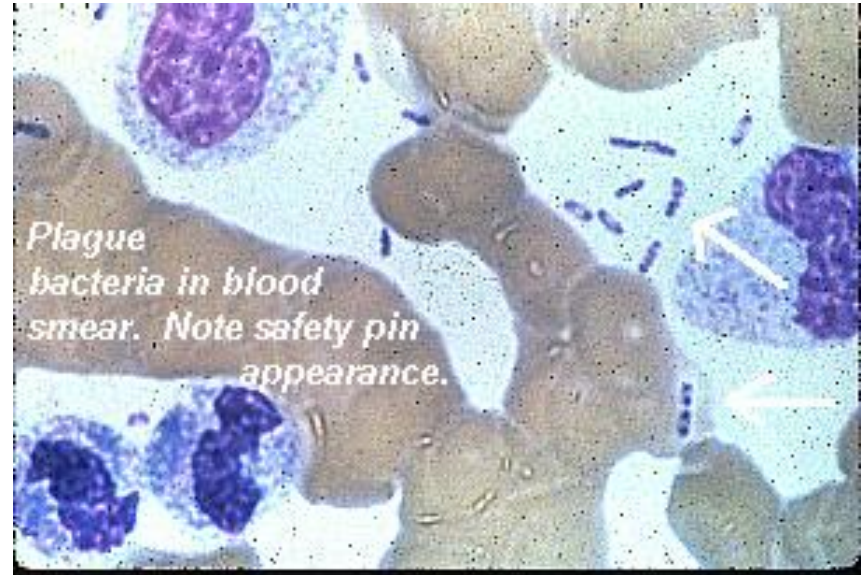
- *Yersinia pestis* ,Gram negative coccobacillus
- Non-motile
- Enterobacteriaceae family
- Non-spore forming
- The characteristically demonstrate ' bipolar staining' in giemsa stained smear from animal tissues.

- Facultative anaerobe
- Obligate parasite



Discovery of Plague Bacterium

- **June 1894:**
Alexandre Yersin successfully isolates the plague organism which he calls *Bacterium Pestis*.
- ‘Safety pin’ appearance



Reservoirs

- Rock squirrels
 - dogs
 - Deer mice
 - Field mice
 - Voles
 - Marmots
 - Guinea pigs
 - Kangaroo rats
- ...over 200 identified reservoirs



Vectors

- *Xenopsylla cheopis* (the oriental rat flea; nearly worldwide in moderate climates)

~30 identified flea vectors



Incidental Hosts

- humans
- Domestic and feral cats
- Dogs
- Coyotes
- Camels
- Goats
- Deer
- Antelope



Modes of Transmission

- ***BITES FROM FLEA VECTORS***
- Direct contact with infectious body fluids or tissues while handling an infected animal (which can be dead or alive)
- Ingestion of raw or uncooked meat from an infected animal (dogs, goats, camel)
- Inhalation of infectious droplets.
- *Yersinia pestis* may enter in to the body through skin,conjunctiva, oral route and inhalation route.

Species Affected

- Ruminants[cattle]
- Sheep
- Goat
- Fowl



DISEASE IN ANIMALS

- Self – limiting illness in dog, and severe, often fatal infection in cats, with fever
- Lymphadenopathy
- Haemorrhagic pneumonia
- Encephalitis

PREVENTION

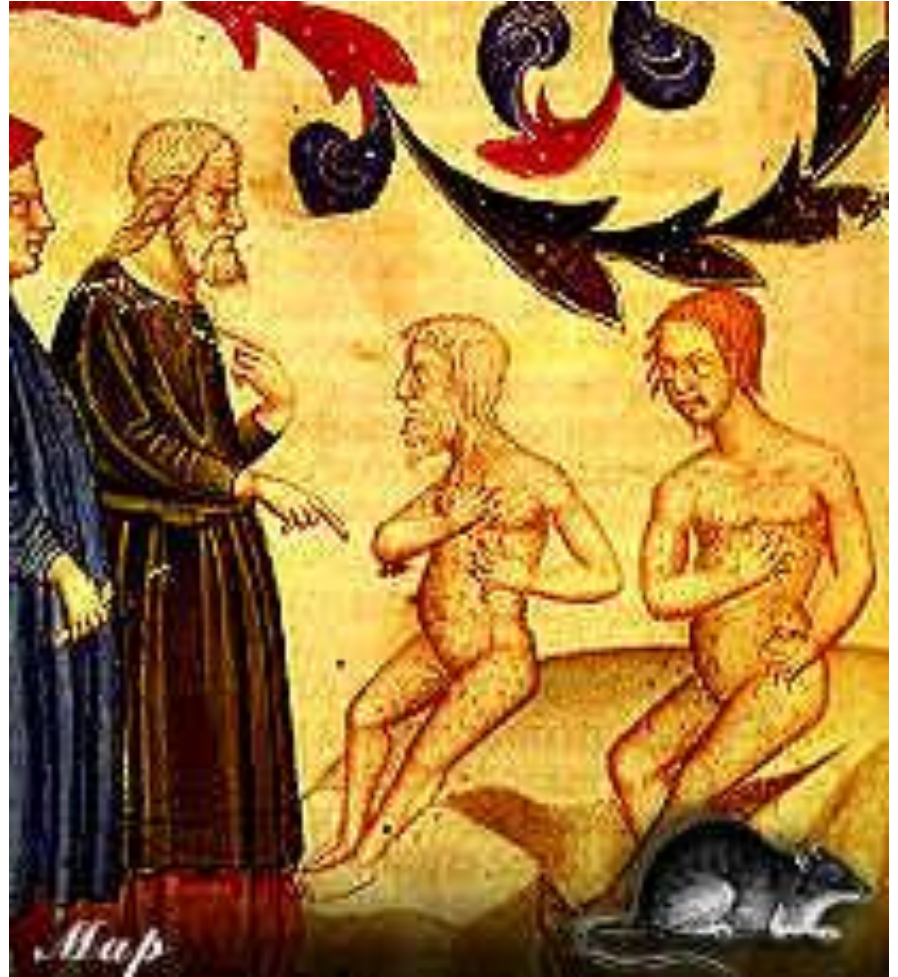
- Rodent control
- Elimination of fleas
- Masks, gowns and gloves should be worn when handling to be infected animal.
- Disinfection of all contaminated surface with sputum, discharges and dead rats by sanitations.

TREATMENT

- Streptomycin – 7.5 to 15 mg/kg body weight ,i/m at 12 hrs interval
- Tetracycline 5to10 mg/kg body weight, i/v at 6 hrs interval

Types of Plague in human

- Bubonic
 - Primary
 - Secondary
- Pneumonic
 - Primary
 - Secondary



PATHOGENESIS

- The flea inject *Y. pestis* through the skin, where it is engulfed by macrophages and transported to the lymph nodes.



- It is characterized by acute onset of high fever, painful enlargement of lymph node, 'suppurative periglandular edema' known as **buboes**. [bubonic plague]

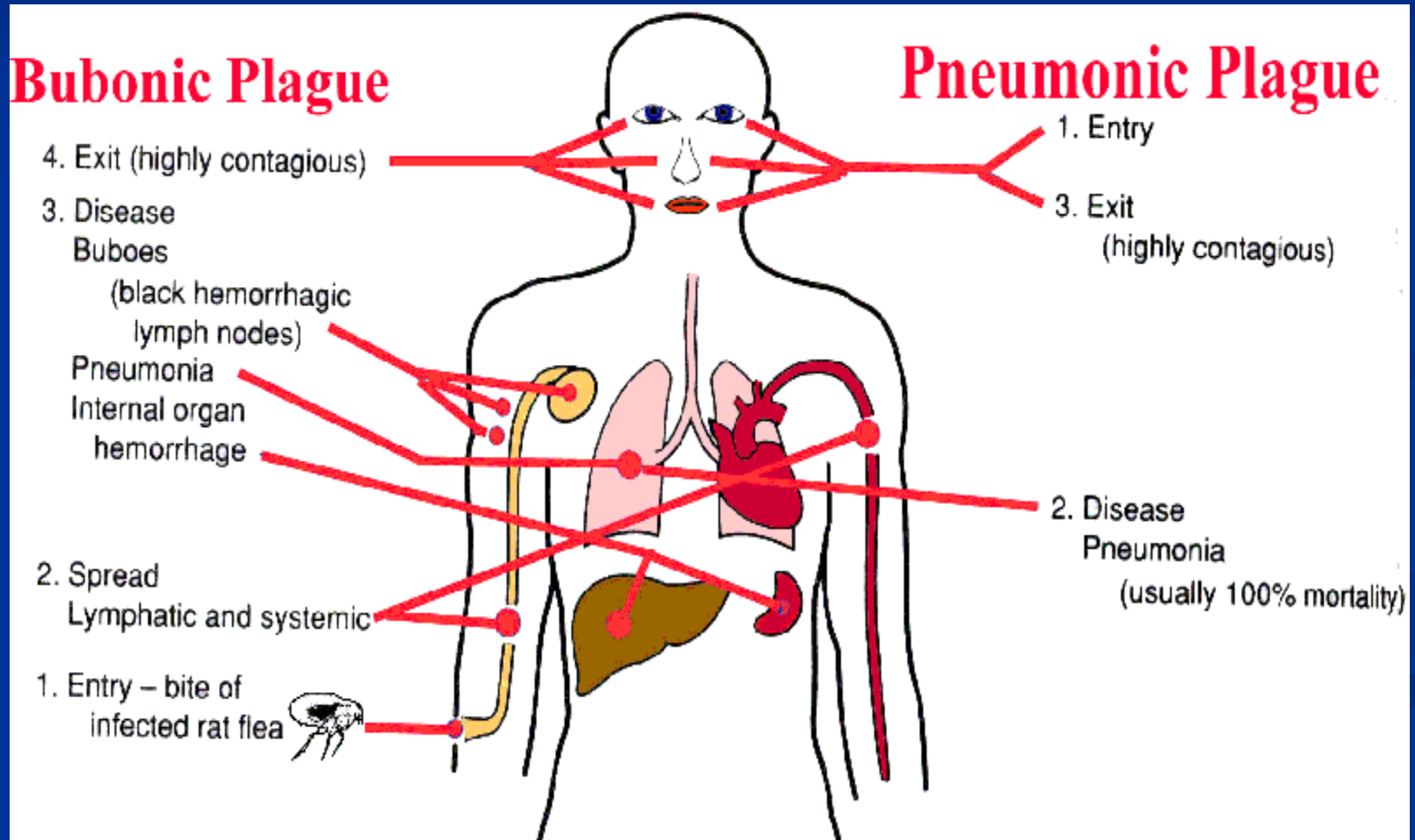


- *Y. pestis* enter into the bloodstream & causes '**septicemic plague**' it may cause death in 2 days



- *Y. pestis* move from bloodstream to the lung otherwise inhaled infected respiratory droplets [from either cat or human] where the bacteria reproduces actively in lung macrophages. This phase of plague is called '**pneumonic plague**'.

Bubonic Plague vs. Pneumonic Plague



Signs and Symptoms (Bubonic Plague)

- Pain/tenderness at regional lymph nodes enlarge to become “buboes”

- Extremely painful

- occur in groin , axilla or cervical areas



- Ulcer or skin lesions at site of flea bite in <10% of cases



Signs and Symptoms (Septicemic Plague)

- Hemorrhagic changes in skin called "purpuric lesions"



- Disseminated intravascular coagulation (DIC)

- Extremity gangrene



Signs and Symptoms

Pneumonic Plague

- **Incubation period of 1-3 days**
- **Productive cough**
- **Hemoptysis**
- **Rapid, shallow breathing**
- **Cyanosis**
- **Nausea and vomiting**
- **Abdominal pain**
- **Chest x-ray with alveolar infiltrates**



Treatment



- **Adult-** Streptomycin, 1gm
IM twice daily

Gentamicin, 5mg/kg IM or
IV once daily

Doxycycline, 100mg IV
twice daily or 200mg IV
once daily

Ciprofloxacin, 400mg IV
twice daily

Chloramphenical, 25mg/kg
IV 4 times daily



- **Children**- Streptomycin, 15mg/kg IM twice daily
- Gentamicin, 2.5mg/kg IM or IV 3 times daily
- Ciprofloxacin, 15mg/kg IV twice daily
- Chloramphenicol, 25mg/kg IV 4 times daily

- **Pregnant women-** Gentamicin, 5mg/kg IM or IV once daily
- Doxycycline, 100mg IV twice daily or 200 mg IV once daily
- Ciprofloxacin, 400mg IV twice daily

THANK YOU!

