

# Yersinia pestis

## Colony Morphology

- Grey-white translucent colonies in 24 h on Blood Agar (BA) and Chocolate Agar (CA) at ambient and 35/37°C (growth faster at 28°C)
- 1-2 mm colonies in 48 h that may be opaque and yellow
- "Fried egg" or "hammered copper" appearance on BA in older cultures
- Clear or white colonies on MacConkey (MAC) agar at 48 h

## Gram Stain

- Gram-negative rods (0.5 - 0.8 x 1-3 µm)
- Giemsa stain: Bipolar staining
- Gram stain: Bipolar staining may be poor

## Biochemical/Test Reactions

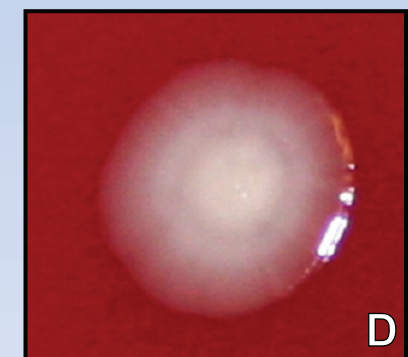
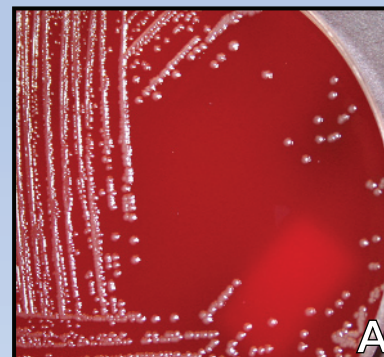
- Flocculent or "stalactite" growth in broth (35/37°C)
- Non-Motile at 25°C - 35°C
- Catalase: Positive
- Oxidase, Urease, and Indole: Negative

## Additional Information

- Can be misidentified as: *Shigella* spp., H<sub>2</sub>S(-) *Salmonella* spp., *Acinetobacter* spp., or *Yersinia pseudotuberculosis* by automated ID systems
- Biosafety Level 2 agent (Use BSL3 for large volume or high titer culture)
- Infective Dose: <100 colony forming units
- Transmission: Inhalation, flea bite
- Contagious: Yes (only pneumonic form)

## Acceptable Specimen Types

- Bronchial wash/tracheal aspirate (≥ 1 ml)
- Whole blood: 5-10 ml blood in EDTA, and/or Inoculated blood culture bottle
- Aspirate or biopsy of liver, spleen, bone marrow, lung, or bubo



*Yersinia pestis* growth on BA at (A) 48 h, (B) 72 h, (C) 96 h, (D) 96 h "Fried egg"

Giemsa stain (100X from blood culture): note *Y. pestis* bipolar appearance



Gram stain: note that bipolar staining may be poor



# Sentinel Laboratory Rule-Out of *Yersinia pestis*

Grey-white translucent, non-hemolytic colonies on BA or CA (24 h)  
 Yellow and opaque (48 h) raised, irregular, "fried egg" or "hammered copper" shiny appearance (48-72 h)  
 Small, non-lactose fermenters on MAC ( $\geq 48$  h)  
 Slow growing at 35/37°C (prefers 28°C)  
 Growth in broth culture at 48 h: Clumped, flocculent, or stalactite

Gram-negative rods  
 Bipolar staining (resembling closed safety pin) may be evident with Gram stain but more apparent with Giemsa or Wayson stain

**Perform all additional work in a certified Class II Biosafety Cabinet**

- \*Catalase: **Positive**
- \*Motility: **Non-Motile** at 25° C and 35/37° C  
 (use semi-solid media rather than wet mount;  
 2,3,5-triphenyltetrazolium chloride indicator)
- \*Urease: **Negative**
- \*Oxidase: **Negative**
- Indole: **Negative**

\*Catalase, Motility, Urease, and Oxidase: Appearances of test results are not agent-specific. Photos represent typical reactions

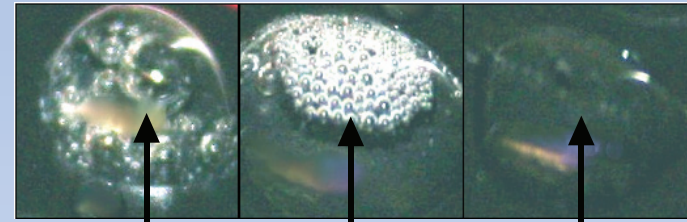
No

Yes

Continue laboratory identification procedures

Immediately notify Wadsworth Center Biodefense/Bacteriology Laboratories if within the 5 boroughs of NYC, please call (212) 447-1091

Catalase

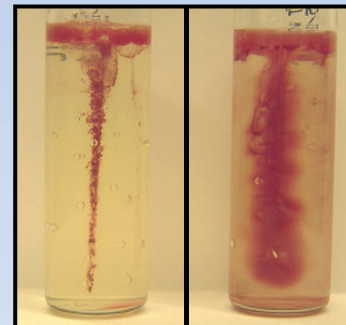


Positive

Weak Positive

Negative

Motility



Non-Motile

Motile

48 h Broth



*Y.pestis*

*Y.pseudo.*

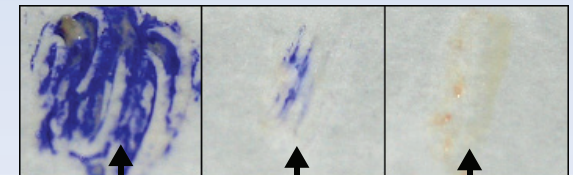
Urease



Negative

Positive

Oxidase



Positive

Weak Positive

Negative