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

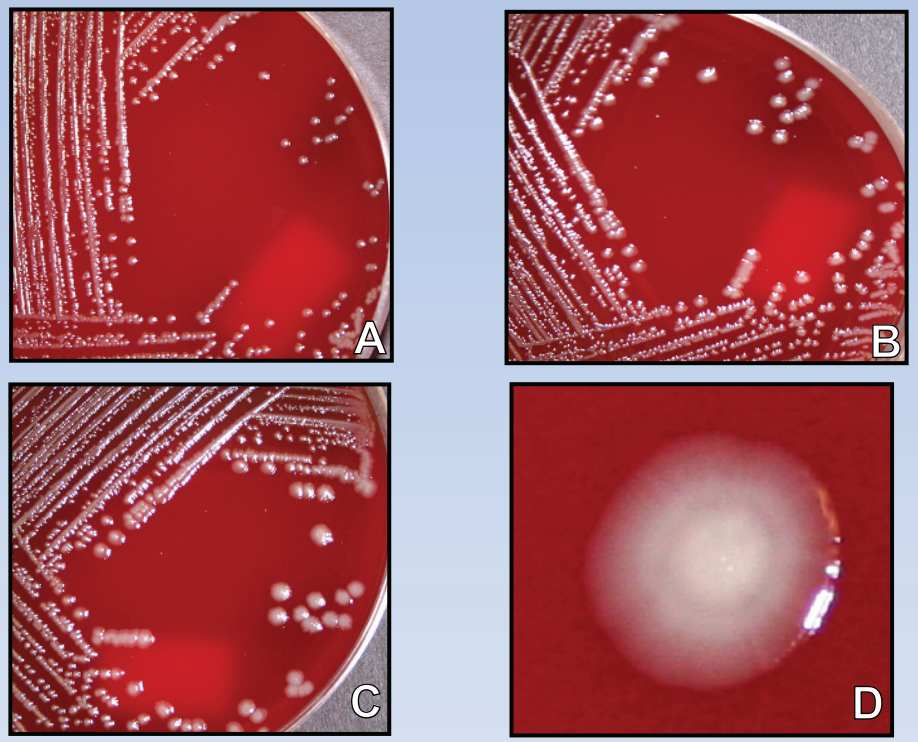
- Flocculent or "stalactite" growth in broth (35/37°C)
- Non-Motile at 25°C - 35°C
- Catalase: Positive
- Oxidase, Urease, and Indole: Negative

Additional Information

- Can be misidentified as: *Shigella* spp., $H_2S(-)$ *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

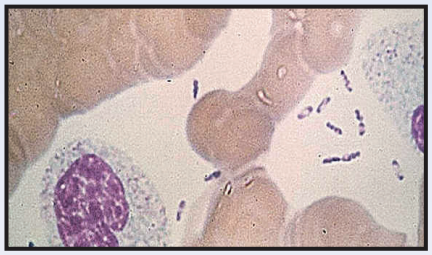
- Bronchial wash/tracheal aspirate (≥ 1 ml)
- Whole blood: 5-10 ml blood in EDTA, and/or Inoculated blood culture bottle
- Aspirate or biopsy of liver, spleen, bone marrow, lung, or bubo



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

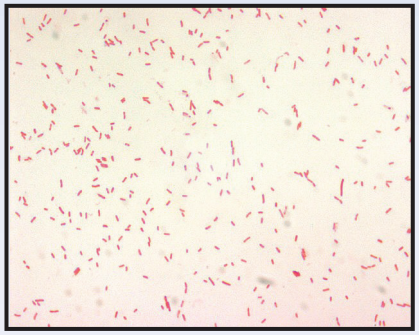
Giemsa stain (100X from blood culture): note *Y. pestis* bipolar appearance

‡



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 (≥ 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

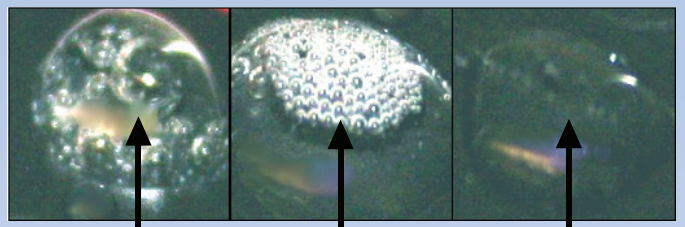
*Catalase: Positive
*Motility: Non-Motile at 25° C and 35/37° C
(use semi-solid media rather than wet mount; 2,3,5-triphenyltetrazolium chloride indicator)
*Urease: Negative
*Oxidase: Negative
Indole: Negative

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

No → Continue laboratory identification procedures

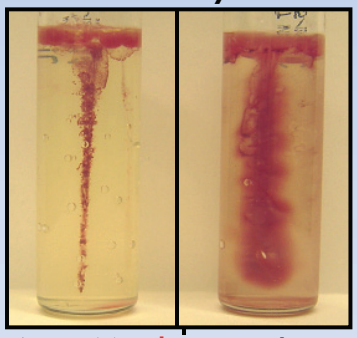
Yes → Immediately notify and call the HI State BT Response Lab @ 368-3373 or pager # 251-4014.

Catalase



Positive | Weak Positive | Negative

Motility



Non-Motile | Motile

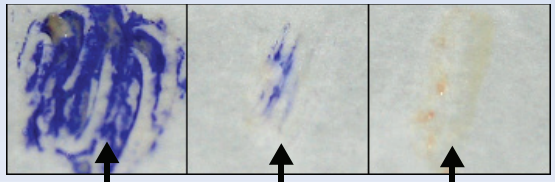
48 h Broth

Y.pestis | *Y.pseudo.*

Urease

Negative | Positive

Oxidase



Positive | Weak Positive | Negative

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