

Erysipelothrix

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Erysipelothrix rhusiopathiae

- *Erysipelothrix rhusiopathiae* (previously named *Erysipelothrix insidiosa*)
- causes erysipelas, an important disease of swine and poultry and a sporadic disease of sheep and lambs.
- Pigs will also show red to purple skin lesions, geometrically shaped. Therefore erysipelas is also known as diamond-skin disease.



Host(s)	Disease syndromes
Pigs	<p>Swine erysipelas:</p> <p>Acute form</p> <p>Septicaemia (pregnant sows may abort)</p> <p>Skin lesions (diamond skin disease)</p> <p>Subacute form</p> <p>Milder septicaemia (pregnant sows may abort)</p> <p>Skin lesions (diamond skin disease)</p> <p>Chronic form (follows the acute and subacute forms)</p> <p>Endocarditis</p> <p>Polyarthritis</p> <p>Skin lesions (diamond skin disease)</p>
Turkeys, geese and other birds	<p>Acute septicaemia (sudden death)</p> <p>Endocarditis (chronic form)</p> <p>Arthritis (chronic form)</p>

Main hosts and disease syndromes of *Erysipelothrix rhusiopathiae*

Sheep (young)	Polyarthritis via umbilicus or wounds (chronic form)
Sheep (adult)	Post-dipping lameness: cellulitis with extension to laminae of feet
Dolphins, cattle, dogs, horses, lambs and rabbits	Occasional infections of varying severity
Humans	Erysipeloid, a localized cellulitis usually on hands and fingers, and rarely endocarditis, arthritis or acute septicaemic disease. Occupational hazard for veterinarians and workers in fish, poultry, and swine and agricultural industries

Habitat

- *E. rhusiopathiae* is widely distributed in nature and is often recovered from sewage effluent, abattoirs, slime surface of fresh and saltwater fish(both fresh and salt water), and soil.
- It has been recovered from over 50 species of mammals including swine, sheep, lambs, cattle, horses, dogs, mice, and rabbits
- and 30 species of wild birds such as turkeys, chickens, geese
- It is present in the soil and can survive for 20 days or longer in alkaline soil.
- The major source of infection for swine and turkeys is carrier animals of the same species.

Clinical presentations

Clinical presentations include

- septicemia
- arthritis
- vegetative endocarditis,
- generalized skin lesions.

Morphology and Staining

E. rhusiopathiae is a -gram-positive,

- non-motile,

- non-acid-fast,

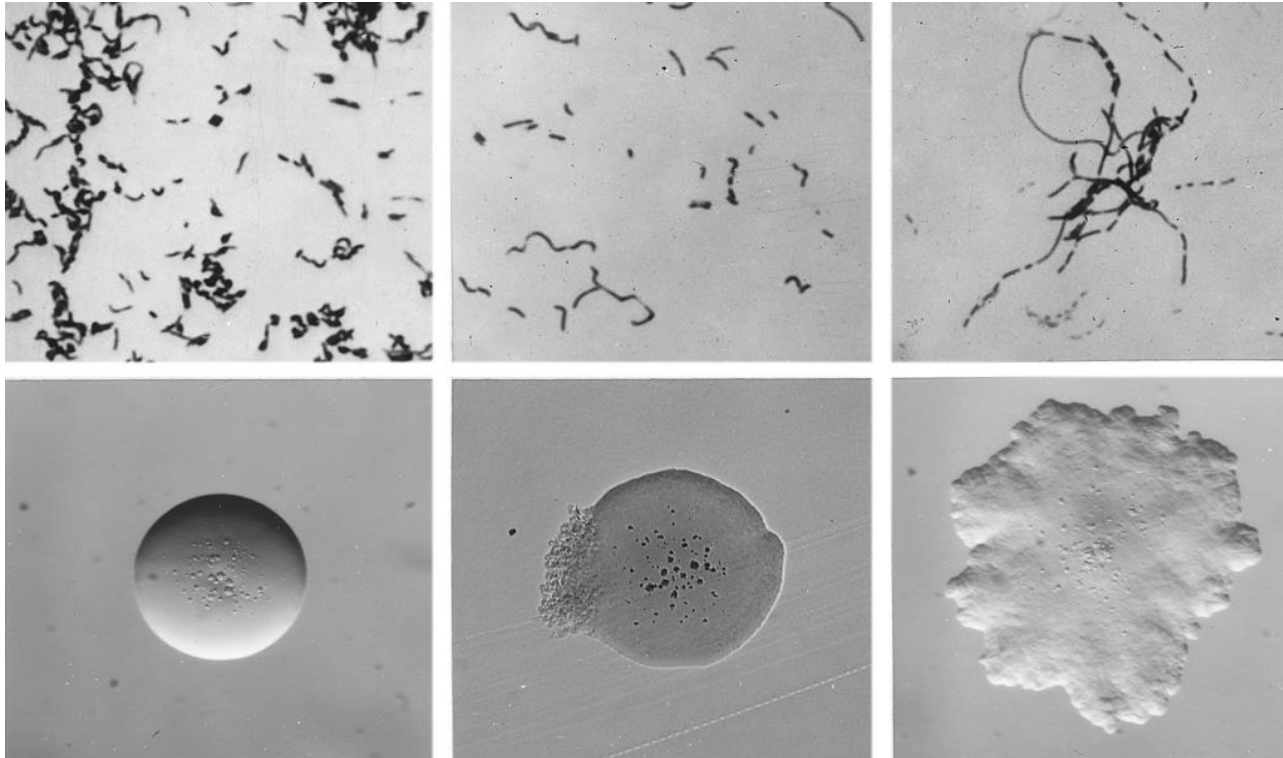
- non-spore-forming bacillus,

- which measures 0.2–0.4 μm by 0.8–2.5 μm in size.

- On subculture, rough colonies may develop and produce filamentous forms $\geq 60 \mu\text{m}$ in length.

Morphology

- *Erysipelothrix rhusiopathiae* form S (Smooth) colonies and usually from acute syndromes is a Gram-positive rod,
- the R (rough) form colonies usually from chronic disease is a Gram-positive filament.
- They occur either singly, in groups or in chains.



Rough colonies may develop and produce filamentous forms $\geq 60 \mu\text{m}$ in length

Growth Characteristics

- *E. rhusiopathiae* grows readily on most standard media.
- However, growth is enhanced in slightly alkaline media (pH of 7.2–7.6) with the addition of serum and glucose.
- *E. rhusiopathiae* is a facultative anaerobe preferring a reduced oxygen environment containing 5–10% CO₂.
- Optimal growth occurs in 24–48hrs 30–37 °C;
- however, it is capable of growing over a temperature range of 5–42 °C

Culture Characteristics

- On blood agar, non-haemolytic pinpoint colonies (0.5 mm) appear at 24 hrs incubation.
- Colonial variation becomes obvious at 48 hrs incubation when a zone of greenish Hemolysis often develops under and just around the colonies.
- The smooth form colonies are convex, circular with an entire edge. The large rough form colonies are flatter, more opaque and have an irregular edge.

Transmission

- Transmission among animals is mostly by ingestion of contaminated material (food, soil, water, and feces).
- Wound infections and arthropod bites are other possible routes.

Pathogenicity and pathogenesis

- Erysipelas in birds, especially turkeys, is usually a septicemia. Turkeys develop a cyanotic skin, become droopy, and may subsequently die. Other affected avian species include chickens, chukars, ducks, geese, peacocks, and pigeons.
- Sheep: Polyarthrititis is the most common presentation of *E. rhusiopathiae* infection in sheep..
- *E. rhusiopathiae* causes arthritis and endocarditis in dogs.
- Human infections of skin and subcutis are called erysipeloid and are seen mostly in animal and fish handlers.

Virulence factors and pathogenicity

Erysipelothrix rhusiopathiae produces some virulence factors :

- Neuraminidase enzyme which splits α sialic acid and leads to damage of the vascular system.
- Coagulase and hyaluronidase (hydrolyzes matrix substance or hyaluronic acid) can facilitate bacterial spread.
- The bacterial polysaccharide capsule and capsular antigen can resist the phagocytic action of macrophages and helps in the intracellular survival of the pathogen.
- Some virulence proteins such as adhesive surface protein (RspA, Rsp B and RspC) can bind and adhere to cellular surfaces of the hosts and formed biofilm

Diagnosis

- Can be achieved by staining: Gram-positive rods in acute cases and Gram-positive filaments in chronic cases.
- Based on cultural characters and biochemical tests.
- Serological tests are not applicable for diagnosis.

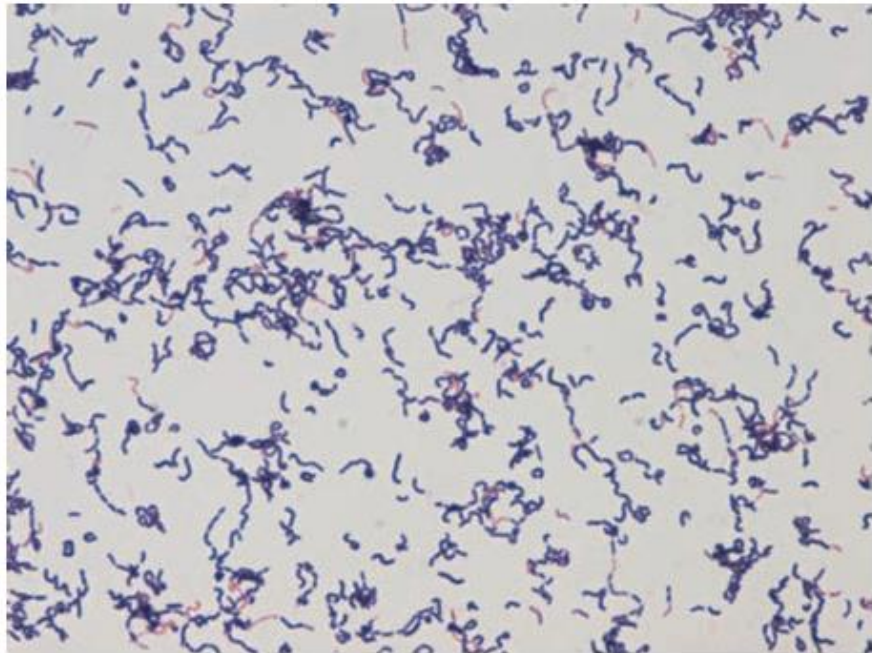


Figure 1. Gram stain image of a smooth colony of *Erysipelothrix rhusiopathiae*

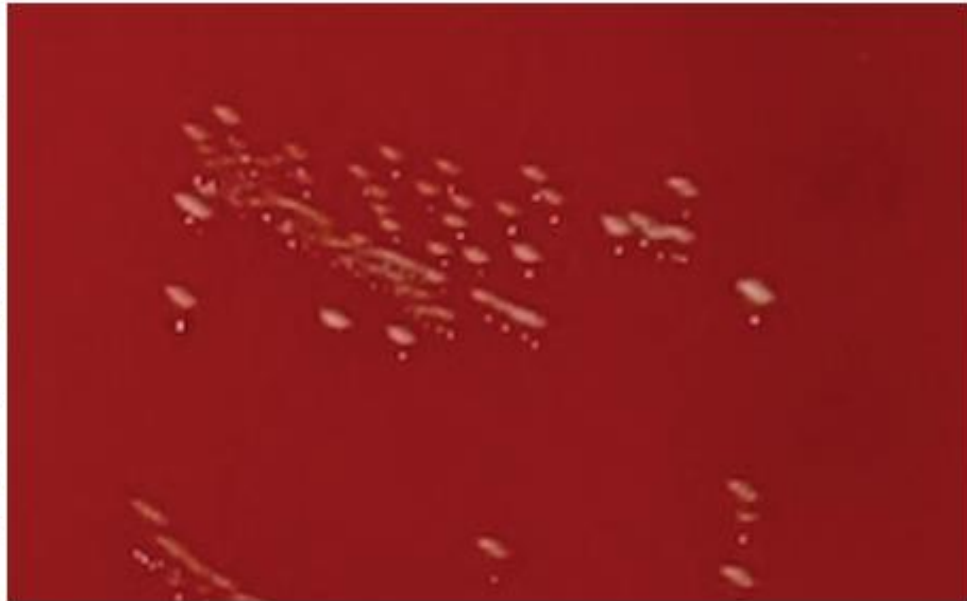


Figure 2. Plate culture showing both smooth and rough colonies of *Erysipelothrix rhusiopathiae*

Diagnosis

Biochemical properties

- The bacterium is coagulase positive, catalase negative and oxidase negative.
- It does not hydrolyse aesculin or produce urease.
- *Erysipelothrix rhusiopathiae* usually ferments lactose, glucose, But the acid production is poor.
- Indole, Methyl red and Voges proskauer tests are negative.

Question