

ERYSIPELOTHRIX

Learning objectives

To know in detail about,

- Principal host and diseases caused by *E.rhusiopathiae*
- Morphology, cultural and biochemical characteristics of *E.rhusiopathiae*
- Different forms of diseases caused by *E.rhusiopathiae* in swine
- Clinical symptoms and laboratory findings to a possible diagnosis of diamond skin disease in pigs
- Explain bottle brush type growth of *E.rhusiopathiae* in gelatin stab culture

• SYSTEMATICS

Domain	<i>Bacteria</i>
Phylum	<i>Firmicutes</i>
Class	<i>Mollicutes</i>
Order	<i>Incertae sedis</i>
Family	<i>Erysipelotrichaceae</i>
Genus	<i>Erysipelothrix</i>
Species	<i>Erysipelothrix rhusiopathiae</i>

HABITAT

- The bacterium is widespread in nature and has been recovered from a wide variety of wild and domestic animals including mammals, fish (both fresh and salt water), birds, reptiles and amphibians.
- 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.
- It is reported that 30-50% of pigs carry the bacterium in their tonsils, other lymphoid tissues.
- It is present in slurry of piglets and can be recovered from the faeces of carrier pigs.

MORPHOLOGY

- *Erysipelothrix rhusiopathiae* (previously named *Erysipelothrix insidiosa* form S (Smooth) - form 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.
- The organism is non-motile, non-spore forming, non-acid fast, occur either in singly, in groups or in chains.

CULTURAL CHARACTERISTICS

- It is a facultative anaerobe, but growth is enhanced by 10% CO₂.
- It is able to grow in a temperature range of 5°C to 42°C, within a pH range 6.7 to 9.2 and 8% NaCl₂.
- Growth occurs on nutrient agar but is improved by the addition of serum or blood. It will not grow on Mac Conkey agar.
- Media contain either sodium azide (0.1%) or crystal violet (0.001%) may be used as selective media.
- 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 haemolysis 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.
- A characteristic reaction is produced when triple sugar iron agar is stab inoculated.
- When incubated at 37°C for 24 hrs H₂S is produced as a thin, black line just along the inoculation stab.
- The R forms gives a bottle-brush type of growth in stab cultures of gelatin incubated at 21°C for 5 days.

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, levulose and dextrin. But the acid production is poor.
- To obtain good result, carbohydrate tests can be carried out in peptone water with added sterile horse serum (5-10%) with phenol red as the indicator.
- Indole, Methyl red and Voges proskauer tests are negative.

RESISTANCE, ANTIGENS AND TOXINS

- *Erysipelothrix rhusiopathiae* is resistant to several chemicals including sodium azide, and to drying, pickling, salting and smoking.

- It is capable of surviving for nearly a year in putrefying meat. But they are susceptible to caustic soda and hypochlorites.
- They are readily killed in moist heat at a temperature of 55°C for 10 mts.

Antigens and toxins

- Based on heat labile and heat stable antigens so far 23 serotypes have been identified.
- Strains of serotype 1 are subdivided into 1a and 1b. Serotypes 1a, 1b and 2 are most frequently involved in disease in swine.
- Hyaluronidase and neuraminidase are produced by some strains.

PATHOGENESIS

- The carrier animals are an **important** source of the organism.
- Entry of the organism may be by the oral, cutaneous or respiratory route.
- Ingestion of contaminated feed or water or contamination of abraded skin are the most common means of infection in swine.
 - Contaminate environment
 - Carrier animals
 - Organism ingested
 - Enter small intestine
 - Adhere to epithelium
 - Penetrate intestine
 - Blood stream
 - Localization Vascular damage
 - Immune complex Thrombosis
 - Fever
 - Vascular damage
 - Arthritis
 - Endocarditis
 - Skin lesions
- *Erysipelothrix rhusiopathiae* is able to adhere to epithelial cells, and that they invade the blood stream and cause localization.
- The more virulent strains produce high levels of neuraminidase that can cause vascular damage and thrombus formation.
- Congestion of dermal capillaries results in diamond skin disease.
- Arthritis is associated with initial infection of joints and prolonged retention of bacterial antigen in the joints.
- The diseases caused by *Erysipelothrix rhusiopathiae* are as follows

Main host (s)	Disease syndrome
Pigs	<ul style="list-style-type: none"> • Swine erysipelas • Acute septicaemic form (Pregnant sows may abort) • Urticarial form (Diamond skin disease) • Vegetative endocarditis and Polyarthritis (Chronic form)
Sheep	<ul style="list-style-type: none"> • Poly arthritis in lambs • Post-dipping lameness

	<ul style="list-style-type: none"> • Valvular endocarditis and pneumonia
Turkeys , Geese and other birds	<ul style="list-style-type: none"> • Acute septicaemia (Turkey erysipelas) • Vegetative endocarditis and arthritis (Chronic form)

PATHOGENECITY

Symptoms

- Erysipelas occurs in pigs of all ages, but pigs from 2 months to one year age are highly susceptible.
- Four forms of clinical disease in swine have been described.
 - Acute septicaemia
 - Urticarial or diamond skin lesions
 - Vegetative endocarditis
 - Arthritis
- These may occur alone or in combination. Swine erysipelas manifest in three forms.

Acute

- The acute disease is characterized by high fever, inappetance, depression, a rapid course of illness, and death within 2-3 days in untreated animals.
- Some animals may show a stiff gait and reluctance to stand or move, and urticarial cutaneous lesions may develop.
- The diamond shaped raised skin lesions are pathognomonic. Pregnant sows may abort.

sub acute

- Sub acute disease is similar to the acute except that it is less severe and animals are likely to recover within 5-7 days.

chronic course

- In the chronic form arthritis is more common.
- The hock, stifle, elbow and carpal joints are most likely to be affected resulting in severe lameness.
- The mitral valves are involved in valvular endocarditis.

DIAGNOSIS, TREATMENT, PUBLIC HEALTH SIGNIFICANCE

- Diamond shaped skin lesions are pathognomonic.

Specimens to be collected

- It includes liver, spleen, heart valves or synovial tissues.
- Organisms are rarely recovered from skin lesions or chronically affected joints.

Diagnosis can be achieved by

- 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.

Treatment

- In addition to hyper immune serum, treatment with antibiotics such as penicillin and tetracyclines are effective.

Public health significance

- Workers engaged in the fish and poultry industries are highly susceptible.
- The organism enters through minor skin abrasions causing localized cellulitis referred as erysipeloid.