



## PIGEON FEVER

### *(Corynebacterium pseudotuberculosis)*

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### Overview

Pigeon Fever refers to a collection of syndromes caused by infection with *Corynebacterium pseudotuberculosis*, a gram-positive bacteria with worldwide distribution. Equine cases have been reported throughout the United States and in areas of Canada. Infection has also been reported in equids, sheep, goats, cattle, buffalo, camelids, and, on rare occasions, humans. The distribution of this disease appears to be expanding, and outbreaks in areas in which the bacteria had previously not been reported have occurred during times of drought. Biotypes isolated from small ruminants and camelids are nitrate negative, while those from horses are nitrate positive. While natural cross-species transmission does not occur between small ruminants and horses, cattle can be infected by either biotype.

### Clinical Signs

Three forms of Pigeon Fever have been described in horses: external abscesses, internal infection, and ulcerative lymphangitis. *C. pseudotuberculosis* produces various extracellular exotoxins which play a role in virulence, and cause pain and edema at the site of infection. Clinical signs vary depending on disease form, and often include nonspecific signs of malaise, fever, inappetence, and lethargy.

#### **External Abscesses**

- Single or multiple external abscesses occurring anywhere on the body, but most frequently in the pectoral region (in which swelling resembles a pigeon's breast) and along the ventral midline. Abscesses may also develop in the prepuce, mammary gland, triceps, axilla, limbs, and head.
- Abscesses contain tan, odor-free purulent exudate and are usually well encapsulated.
- Horses with external abscesses do not usually develop signs of systemic illness. If signs of systemic illness are present, further diagnostics to rule out internal infection are warranted.



Fig 1. Typical pectoral abscess caused by *Corynebacterium pseudotuberculosis*. Image courtesy of Sharon Spier, DVM, Ph.D., DACVIM.

### **Internal Infection**

- Internal disease occurs in approximately 8% of affected horses and is associated with a high case fatality rate (30-40%). Commonly affected organs include liver, kidney, spleen, and lungs.
- Clinical signs in horses with internal disease vary by organs involved, and often include fever and malaise.
- Horses with internal abscesses may not have concurrent external abscesses.
- Horses with internal infection are more frequently seen one to two months following the peak number of cases with external abscesses.
- Septic arthritis and osteomyelitis have been reported and are associated with severe lameness.

### ***Ulcerative Lymphangitis***

- Least common form, characterized by severe limb swelling and cellulitis, with multiple draining tracts following lymphatics. One or both hind limbs are most commonly affected.
- Clinical signs include severe lameness, fever, lethargy, and anorexia.
- Support limb laminitis is a common complication



Fig 2: Ulcerative Lymphangitis caused by *Corynebacterium pseudotuberculosis*. This form of disease requires aggressive antimicrobial therapy. Image courtesy of Diane Rhodes, DVM, DACVIM.





## Incubation Period

Abscesses form 3-4 weeks following infection

## Risk Factors

- Horses residing in regions endemic for *C. pseudotuberculosis* are at risk of developing Pigeon Fever
- The incidence of disease fluctuates considerably from year to year, presumably due to herd immunity and environmental factors such as rainfall and temperature.
- Cases are often seasonal, occurring most often during the dry months of the year.

## Transmission

*C. pseudotuberculosis* exists in the soil and gains access to the host via skin breaks and mucous membranes. *Haematobia irritans* (horn fly), *Musca domestica* (house fly), and *Stomoxys calcitrans* (stable fly) can act as mechanical vectors. Horse to horse transmission is also likely.

## Diagnostic Sampling, Testing and Handling

A definitive diagnosis can be made via bacterial culture and/or PCR of purulent material from abscesses. The diagnosis of internal infection can be challenging, and often requires a combination of clinical signs, clinicopathology, diagnostic imaging and serology (SHI test). Abdominal ultrasonography can be helpful for identifying abscesses, facilitating abscess surgical drainage or aspiration for diagnostic testing, and monitoring response to treatment.

Clinical pathologic abnormalities can occur with either internal or external abscesses but are more consistently observed with internal abscesses. Common abnormalities include:

- anemia of chronic disease
- leukocytosis with neutrophilia
- hyperfibrinogenemia
- increased SAA
- hyperproteinemia due to hyperglobulinemia

The Synergistic Hemolysis Inhibition (SHI) test detects IgG antibody to *C. pseudotuberculosis* and can support a diagnosis of internal abscesses in horses that do not have concurrent external abscesses. Serology is generally not helpful for confirming that external abscesses are due to *C. pseudotuberculosis*, and may be negative early in the course of disease and even at the time of abscess drainage. Positive SHI titers must be interpreted carefully and combined with clinical signs to distinguish active infection from past exposure or convalescence, and should not be used alone to diagnose internal disease without additional supportive diagnostics.



## Treatment

Treatment depends on location and severity of abscesses and presence of systemic signs of illness. Whenever possible, abscesses should be lanced, drained, and flushed. In all cases, a current tetanus vaccination is recommended. The case fatality for horses with external abscesses is very low (0.8%), but considerably higher for internal abscesses (30-40%) and ulcerative lymphangitis.

**External abscesses:** While there is considerable variation in severity among horses, most uncomplicated external abscesses respond favorably to drainage and supportive care with hot packing and anti-inflammatories. The use of antimicrobials for external abscesses is often not necessary and may prolong time to resolution. The proximity of the fibrous abscess capsule to the skin varies, often being <1 cm deep for ventral midline abscesses, to greater than 10 cm deep underlying muscle for some pectoral, axillary, triceps, or inguinal abscesses. The use of ultrasound is helpful for identifying deep abscesses and planning a surgical approach. Horses with deep intramuscular abscesses that require extensive dissection to access for drainage may benefit from antimicrobial therapy.

**Internal Infection and Ulcerative Lymphangitis:** Horses should be treated early and aggressively with antimicrobials. Parenteral antimicrobials (e.g., penicillin) alone or in combination with rifampin are used until lameness and swelling improves, and then therapy with orally administered antimicrobials such as trimethoprim sulfa are continued to prevent relapse. The average duration of antimicrobial therapy for internal infection is 4–6 weeks and response to treatment is best determined by serial ultrasound and clinicopathologic results. In cases of ulcerative lymphangitis, aggressive supportive care with anti-inflammatories, hydrotherapy, hand walking, and limb bandages to prevent tissue damage and permanent limb swelling. Antimicrobials are often continued for several weeks, and the time to complete resolution reported in one study was approximately 35 days.

### Antimicrobial regimens with efficacy against *C. pseudotuberculosis* include:

- Procaine Penicillin G (PPG; 22,000 IU/kg IM q12hrs) alone or in combination with Rifampin (5 mg/kg PO q12hrs)
- Trimethoprim-sulfa (24-30 mg/kg PO q12hrs), alone or in combination with Rifampin (5 mg/kg PO q12hrs)
- Minocycline (4 mg/kg PO q12hrs)
- Doxycycline (10 mg/kg PO q12hrs)
- Enrofloxacin (7.5 mg/kg PO q12hrs)

### NOTES:

-Ceftiofur crystalline free acid (*Excede*) is NOT recommended as this drug fails to achieve minimum inhibitory concentration (MIC).

-Fluoroquinolones such as enrofloxacin should also be reserved for use only in the event of alternative therapeutic failures as they are considered a WHO and WOAHP high priority for judicious antimicrobial stewardship.



*-Anecdotally, preferred options for internal abscesses include TMS + rifampin, , minocycline, or enrofloxacin. Penicillin is often avoided for internal disease because of the need for repeated intramuscular injections.*

## **Vaccination**

A conditionally-licensed commercially available vaccine is available in the United States for control of *C. pseudotuberculosis* in horses, and is recommended in conjunction with multifaceted insect control for horses residing in endemic regions. The feed-through insect growth regulators are highly effective for reducing fly populations when started early in the season.

Use of autogenous bacterin-toxoids designed for horses has demonstrated increased SHI titers following two injections; however, protection from disease has not yet been established.

## **Biosecurity Considerations**

Biosecurity practices to limit the spread of *C. pseudotuberculosis* focus on reducing environmental contamination and preventing transmission via insects and fomites. Suggested measures include:

- Exam gloves and diligent hand washing when flushing abscesses and handling infected horses
- Collect and dispose of all purulent material and contaminated supplies when treating infected horses. Do not allow purulent material to drain onto the floor or other environmental surfaces.
- Separate infected horses from naive and/or unvaccinated herd mates
- Reduce insect exposure by regular application of insect repellent, particularly to the ventral midline
- Practice meticulous wound care (topical fly repellents, antimicrobial ointments, and bandages) to prevent contamination with *C. pseudotuberculosis*

## **Environmental Persistence**

The organism has been shown to survive for up to two months in hay and shavings, and more than eight months in soil samples at environmental temperatures. In experimental studies, the presence of manure favored survival and replication of bacteria in soil.

## **Prevention of Introduction to a Facility**

Only healthy horses should be allowed to enter a new facility, with a supporting certificate of veterinary inspection (CVI) and should be promptly examined for signs of infectious disease upon entry. New arrivals should be isolated for a minimum of 7 to 14 days if arriving from a facility with minimal perceived risk, but this period should be appropriately extended if a known infection has recently occurred at the origin facility. Any horse suspected of having an infectious disease should be immediately isolated.



### **Zoonotic Potential**

Rare reports exist of human *C. pseudotuberculosis* infection from contact with infected sheep, particularly during shearing, as well as a single case of pneumonia following exposure to an infected horse, presumably from inhalation of the bacteria. Personal protective equipment including gloves and respiratory protection (mask) may be considered when treating infected horses.

### **Additional Reading:**

Jeske JM, Spier SJ, Whitcomb MB, Pusterla N, Gardner IA. Use of antibody titers measured via serum synergistic hemolysis inhibition testing to predict internal *Corynebacterium pseudotuberculosis* infection in horses. *J Am Vet Med Assoc.* 2013 Jan 1;242(1):86-92. doi: 10.2460/javma.242.1.86. PMID: 23234286.

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