

## Veterinary KINsights

### Etiology of Fever in the Horse

#### KEY POINTS

- Fever in an adult horse is defined as a body temperature of  $\geq 101.5^{\circ}$  F, slightly higher in foals.
- Inflammation (infectious or non-infectious) of any body system may cause fever in a horse.
- Fever is a frequent presenting clinical sign associated with an underlying disease.
- Fever warrants a thorough physical examination and diagnostic work-up if persistent.
- Respiratory disease is the most common cause of fever in the horse.

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#### ELEVATED CORE BODY TEMPERATURE

Elevated core body temperature in the horse is most commonly due to either fever or hyperthermia. Clinically, it is important to determine if the horse is febrile or hyperthermic — and the underlying etiology.

Fever (pyrexia) is defined as “a state of elevated core temperature, which is often, but not necessarily, part of the defensive response of multicellular organisms (hosts) to the invasion of live (microorganisms) or inanimate matter recognized as pathogenic or alien by the host.”<sup>1</sup> Hyperthermia is the passive (external) or active (exercise) gain of heat in excess of the body’s ability to dissipate the heat.<sup>2</sup> Hyperthermia does not result from a change in the hypothalamic set point and is non-responsive to anti-pyretics.<sup>3</sup> Pyrexia is the body’s endogenous response to infectious, inflammatory, and other processes which trigger the release of cytokines and pyrogens.<sup>4</sup> These mediators initiate a cascade of events targeting the centrally located hypothalamus, elevating the hypothalamic set point and producing pyrexia.<sup>3</sup>

Normal body temperature in adult horses ranges from 99.0 to 101.0 °F and ranges slightly higher in neonatal foals, from 100.0 to 102.0 °F.<sup>3</sup> In a 2016 survey of 160 equine veterinarians in the United States, participating veterinarians saw a mean of 16 horses with fever per month

(median=12 horses), which translates to about 690,000 incidences of febrile horses annually.<sup>5</sup> Of these febrile horses, 30% were determined to be due to a respiratory infection.<sup>5</sup> Determining the underlying cause of fever in horses is based upon the history, thorough physical examination, diagnostic testing, and additional, more specific tests based on preliminary findings. Commonly, the initial testing consists of a minimum data base; complete blood count, serum chemistry, and Serum Amyloid A (SAA) level.

## CAUSES OF FEVER IN THE HORSE

Respiratory disease is the most common cause of pyrexia in horses.<sup>5</sup> Etiologic agents of respiratory disease in the horse include bacteria, viruses, and, less commonly, fungi. Diagnosis of respiratory disease is based on clinical signs including nasal discharge, coughing, exercise intolerance, or abnormal sounds on thoracic auscultation. Additional diagnostic tests may include polymerase chain reaction (PCR) on nasal swabs for virus identification, transtracheal aspirates for cytology and culture and sensitivity, bronchoalveolar lavage (BAL) for cytology and viral screening, and thoracic ultrasound or radiographs if indicated. A few of the more common respiratory diseases which typically cause fever in horses include *Streptococcus equi* infections (strangles), Equine Herpes Virus 4/1 (EHV 4/1), pneumonia/pleuropneumonia, and guttural pouch infections (including fungal).

The gastrointestinal tract is frequently the source of infectious or inflammatory diseases which result in a febrile horse. Typical clinical signs vary with the anatomic site and duration of the disease but may include anorexia and weight loss, abnormal manure volume and/or consistency (frequently diarrhea), and abdominal pain. Additional diagnostic procedures when suspicious of the gastrointestinal system include rectal palpation, abdominal ultrasound examination, abdominocentesis, and fecal examination/culture. Common gastrointestinal ailments producing fever in horses include salmonellosis, duodenitis/proximal jejunitis, parasitism, some hepatic disorders, and peritonitis.

The musculoskeletal system can be the source of fever in the horse. Most often a single focal site is involved, as opposed to the entire musculoskeletal system. Clinical signs associated with fevers arising in the musculoskeletal system are wounds, focal sites of pain or swelling, or lameness. Diagnostic techniques may include lameness examination, radiographs, ultrasound examination, and synovial fluid analysis for cytology, culture, and sensitivity. A recent study demonstrated measurement of amyloid A levels in synovial fluid may be of benefit when evaluating cases of septic arthritis.<sup>6</sup> In addition to wounds, cellulitis, osteomyelitis, septic arthritis/tenosynovitis, and injection site reactions are relatively common causes of fever in horses.

The cardiovascular system may be the affected system in a febrile horse presented with a history of exercise intolerance or with jugular pulses, painful swelling over a jugular vein, or dependent edema. In addition to the minimum data base cardiac auscultation, cardiac or focal ultrasonography, electrocardiogram, or cardiac-specific muscle isoenzyme assays may be performed. Differential diagnoses include thrombophlebitis, endocarditis, or pericarditis. Genitourinary system diseases which result in fever may present with a history of infertility, discharge from the external genitalia, painful focal swelling, or changes in frequency or character of urination. Rectal examination, ultrasonography, culture and sensitivity and urinalysis may provide information localizing the infection. In mares,

metritis and mastitis may cause fever, with painful localized swelling in cases of mastitis. In male horses, orchitis, or scirrhous cord in recently castrated geldings, can cause fever and painful focal inguinal swelling. Urinary tract infections, while not common in horses, are frequently secondary to another problem, such as urolithiasis.<sup>7</sup>

Neoplastic diseases may present with non-specific clinical signs such as, but not limited to, weight loss, anorexia, poor performance, or lymphadenopathy. Specific clinical signs may relate to the extent and location of the neoplastic disease. Imaging modalities may be used to examine areas of suspicion based on physical examination findings. Biopsies and fluid aspirates, in addition to blood, may be submitted for histopathological examination. Horses with lymphosarcoma, metastatic melanoma, or paraneoplastic syndrome associated with any tumor type may present with fever.<sup>8</sup> Immune system causes of fever may present with skin lesions, pruritis, edema, focal swelling, or petechial or ecchymotic hemorrhages. A thorough medical history including prior disease, recent drug treatment, and recent vaccinations is needed. Immune-specific clinical pathology and biopsy of skin lesions may be indicated. Diagnoses include drug-induced fevers, toxin-induced fevers and purpura hemorrhagica, which frequently occurs following *S. equi* infection but may be seen secondary to vaccination, respiratory disease, neoplasia, or wounds.<sup>9</sup>

Fever of unknown origin (FUO) has been defined meeting three criteria: 1) Illness of  $\geq$  three weeks duration with non-specific signs; 2) multiple fevers of  $> 38.6$  °C (101.5 °F); 3) no diagnosis after initial physical examination, complete blood count/chemistry.<sup>10</sup> Clinical signs are non-specific, including weight loss, anorexia, depression, or poor performance. Reaching a diagnosis may be challenging but is aided by repeated physical examinations and specific diagnostic tests, performed sequentially, based on previous findings and results. A retrospective study of FUO in horses revealed only 9.5% of cases initially presented as FUO went undiagnosed. The remaining horses were found to have fever as a clinical sign secondary to infections (43%), neoplasia (22%), immune-mediated conditions (6.5%), or miscellaneous causes (toxins, parasites) (19%).<sup>10</sup>

## SUMMARY

When presented with a horse with an elevated temperature, veterinarians must first determine whether the elevated body temperature is the result of fever or hyperthermia. If it is determined that the horse is febrile, one must attempt to identify the source of the fever before definitive treatment can be initiated. Fever, a complex physiologic response to infectious, inflammatory and other triggers of cytokines, may be managed while the diagnosis is determined. While all body systems may be the source of fever, the respiratory system is the most common cause in horses. Through repeated physical examinations, clinical pathologic testing, and more specific diagnostic testing, the cause of most fevers may be determined. This enables one to determine the definitive course of treatment.

## References

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