Key Points:

- Conventional treatment of cellulitis includes administration of IV antimicrobials, non-steroidal anti-inflammatory drugs, and cold hosing and bandaging the limb.
- Survival rates of 55-89% have been reported, but even horses that do recover can experience continued lameness or recurrence of infection.
- Adjunctive therapies aimed at achieving higher antibiotic concentrations at the tissue level, improving analgesia, and taking advantage of the beneficial effects of cryotherapy and compression should be considered to help improve the outcome for horses with cellulitis.

Cellulitis is defined as a diffuse infection of the subcutaneous tissue. The disease is relatively common in horses and has been divided into cases with a known cause, or secondary cellulitis, and those with no obvious underlying cause, or primary cellulitis. Primary cellulitis seems to be particularly common in Thoroughbred racehorses, but can occur in any type of horse. Causes of secondary cellulitis include infections that occur following surgery, joint injections, wounds, or blunt trauma. However, only about half of the reported cases of equine cellulitis occur secondary to a known event. Typically horses with cellulitis have marked swelling and lameness of one limb (more commonly a hind limb than a front limb). The lameness develops acutely and may precede the marked swelling that follows within a few hours. Owners often suspect that the horse has a fracture due to the severity of the lameness (i.e. horses can be toe-touching to non-weight bearing lame). By the time of the veterinarian’s evaluation most horses with cellulitis will be febrile (temperature ≥ 101.5°F) and have marked swelling from the stifle or elbow to the foot. The swelling is usually hot, painful, and is pitting when firm pressure is applied. Upon initial evaluation other causes of the lameness such as fractures or septic joints should be ruled out. This can be done largely based on clinical exam findings, but sometimes adjunctive diagnostics such as radiography, ultrasonography, and blood work values can be helpful in establishing the diagnosis. Findings consistent with cellulitis include the characteristic generalized pitting edema, fever (if no non steroidal anti-inflammatory drugs [NSAIDs] have been given), marked thickening and increased echogenicity of subcutaneous tissues +/- areas of fluid pockets seen on ultrasonographic evaluation, and hyperfibrinogenemia. Bacteria are commonly isolated from aspirates taken from subcutaneous fluid and therefore culture is recommended in all cases in order to direct antimicrobial therapy. The most common bacteria isolated are *Staphylococcus* and *Streptococcus sp.*, but gram negative bacteria and polymicrobial infections are also commonly found. Conventional treatment consists of broad-spectrum IV antimicrobial administration (pending the results of bacterial culture and sensitivity testing), NSAIDs, cold hosing the limb and bandaging with or without application of various topical preparations. Even with treatment life-threatening complications such as contralateral limb laminitis and skin necrosis and sloughing may occur. Survival rates between 55-89% have been reported, with horses that are febrile upon admission to referral hospitals or those that develop laminitis more likely to be euthanized. Amongst those that survive the prognosis for full return to function is guarded; many horses continue to have an abnormal contour of the limb, and about one-third will experience lameness when resuming exercise or recurrence of infection. Therefore, adjunctive therapies are
indicated to help resolve the infection, alleviate pain, and re-establish the normal appearance and use of the limb as quickly as possible.

It can be difficult to achieve therapeutic concentrations of antimicrobials at the tissue level in horses with cellulitis due to changes in blood flow caused by the disease and the presence of edema in the limb. Therefore, means of local antimicrobial delivery are indicated in order to attain higher levels of antimicrobials in the affected tissues. Intravenous regional limb perfusions (IV RLPs) achieve tissue levels up to 25-55 times the MIC, or the minimal inhibitory concentration, needed to kill bacteria. To perform an IV RLP the horse is sedated, a tourniquet is applied above the affected area, and then antimicrobials are injected into a vein below the tourniquet. The tourniquet is typically left in place for ~20 minutes. This procedure is done daily; the antimicrobial used is typically an aminoglycoside but can be changed as indicated by results of bacterial culture and sensitivity testing. Other methods of local delivery, such as an antimicrobial impregnated polymethyl methacrylate (PMMA) beads or collagen sponges are used less commonly to treat primary cellulitis, but if wounds or surgical incisions are present in cases of secondary cellulitis they can be placed in those areas to further increase antimicrobial concentrations.

Horses with cellulitis are markedly painful, and although many will improve after administration of NSAIDs others remain painful despite this therapy. In those horses additional analgesics are indicated to increase the horse’s comfort as rapidly as possible and to prevent the development of contralateral limb laminitis. Opioids, alpha-2 agonists, local anesthetics, and ketamine can be used alone or in various combinations as single IM or IV injections or as a continuous rate infusion (CRI). In horses with hind limb cellulitis, epidural administration of these agents should be considered. This can be done as a single injection, or more practically via an epidural catheter. Topical application of Surpass® to the affected area can also be helpful in decreasing the inflammation in the limb and the pain associated with it. Continuous icing of the contralateral foot in horses that remain markedly painful beyond ~24 hours after the initiation of treatment is indicated to help prevent the development of laminitis.

The application of various topical preparations to the limb is aimed at reducing inflammation and edema and is largely chosen based on clinician preference. Many products contain a combination of NSAIDs, dimethylsulfoxide (DMSO), corticosteroids, and antimicrobials. These preparations probably do have some therapeutic effect, but care should be taken to ensure that no overly harsh or irritating products are used as horses with cellulitis often have compromised skin with areas of cracks and full-thickness tears. As mentioned above, the author prefers to apply Surpass® +/- a solution of 10% DMSO and 1% amikacin to the entire limb (but avoiding any open wounds, incisions, or areas of full thickness skin defects). Gloves should be worn when applying these substances to the limb.

Physical therapy is extremely important in the treatment of horses with cellulitis. The swelling that occurs due to edema accumulation is not only painful in the initial stages, but is often hard to get rid of even once the infection has resolved and this can contribute to continued lameness issues. Principles of therapy aimed at to minimizing inflammation, edema accumulation, and swelling include compression and cryotherapy. Compression has been shown to be effective in stimulating tissue healing, minimizing edema, and increasing blood flow. Cryotherapy reduces the inflammatory response in the tissue, reduces the metabolic demand of the tissue, and provides a short-term analgesic effect. Compression can be provided by bandaging the limb, or by boots or other devices that provide intermittent pneumatic compression. Cryotherapy can performed via a variety of ice boots or whirlpool systems. Minimally, hydrotherapy and hand walking (if the horse is comfortable enough to walk) 2-3 times daily helps decrease edema and improve circulation and

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comfort. After walking, the topical preparation of choice is applied to the leg and then a compressive full-limb bandage is applied.

While hand walking, cold water hosing and bandaging of the leg is a mainstay of treatment for horses with cellulitis, new rehabilitation tools that have shown promise as adjunctive treatments are becoming more readily available. The Game Ready™ system has specific boots designed for equine use and provides both intermittent pneumatic compression and cryotherapy. It has been used successfully by the author in cases of cellulitis—typically the system is applied to the limb 1-2 times daily for 20-30 minutes at a time. Cold salt-water spas provide cold, hypertonic water with aeration that combines the efficacy of cryotherapy with the osmotic action of salt water in order to decrease soft tissue inflammation and provide analgesia. Hyperbaric oxygen (HBO) chambers are becoming increasingly available for equine patients; they increase the oxygen content delivered to the tissues by having the horse breathe 100% oxygen within a pressurized hyperbaric chamber. Proposed therapeutic effects of HBO therapy that would be beneficial for treatment of cellulitis include: hypoxia reversal, reduction in edema, modulation of nitric oxide production, acceleration of microbial oxidative killing, improvement of antibiotic exchange across membranes, and decreasing ischemia-reperfusion injury.7 In humans HBO therapy is an accepted treatment for conditions similar to equine cellulitis such as clostridial myositis, crush injuries, compartment syndrome, and necrotizing soft tissue infections.8 Suggested HBO protocol for treating equine patients with cellulitis are treatment for 60 minutes every 12-24 hours until resolution.7

References: