Close this window to return to IVIS
www.ivis.org

10e Congrès de médecine et chirurgie équine

10. Kongress für Pferdemedizin und –chirurgie

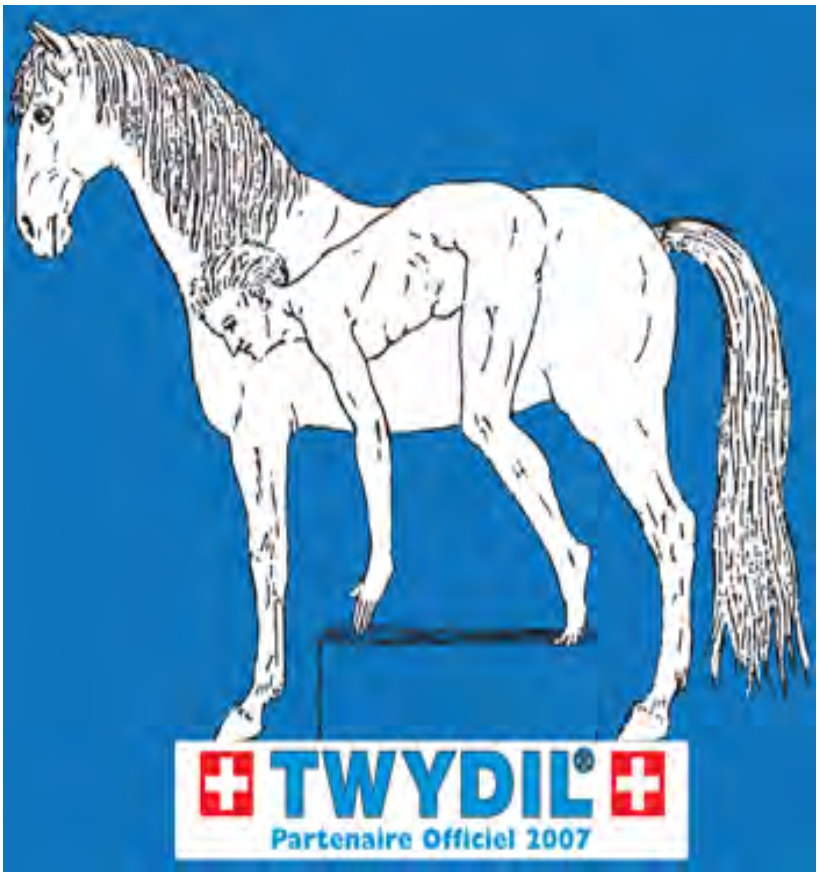
10th Congress on Equine Medicine and Surgery

Dec. 11-13, 2007 - Geneva, Switzerland

La pathologie du pied et son imagerie médicale

Hufpathologie und Deren Bildgebende Verfahren

Hoof Pathology and Medical Imaging



Reprinted in the IVIS website with the permission of the organizers

Close window to return to IVIS
www.ivis.org

10th Geneva Congress of Equine Medicine and Surgery (Organization : Pierre A. Chuit, Founex; Dr Stephane Montavon, Avenches), Geneva (CH), 11-13 December 2007

HOW TO UTILIZE STERILE MAGGOT DEBRIDEMENT THERAPY FOR FOOT INFECTIONS OF THE HORSE

(Reprinted from 2005 AAEP Proceedings)

Scott Morrison, DVM, Rood & Riddle Equine Hospital, Lexington, USA

INTRODUCTION

Hoof disease and injuries are common and often serious problems for the horse. The horse's foot is constantly in contact with and interacting with its domesticated environment. Therefore puncture wounds by foreign bodies and ascending infections from defects in the white line are not uncommon. In order for an infection to become established within the horse's foot bacteria must breech the barrier of the protective hoof capsule (hoof wall, sole and frog) and gain access to the inner sensitive tissues. Once an infection has occurred we can classify the infection as deep or superficial (Richardson, Pascoe, & Meagher,1986). Superficial abscess only involve the tissue directly beneath the hoof capsule of the dermis/corium. Superficial infections are effectively treated by establishing drainage, soaking the foot in Epsom salt solution, poulticing the foot until drainage has ceased, and protecting the foot until the hoof capsule defect has healed. Deeper infections are more serious and may involve the coffin bone, distal interphalangeal joint, navicular bursa, tendon sheath, collateral cartilages, and digital cushion. Most deep infections if treated early are effectively treated with light debridement, lavage, systemic antibiotics, regional limb perfusions, and foot soaks. Infections that have become more established and diffuse can become more problematic and difficult to treat effectively. Tissue damage from the infection and extensive surgical debridement can cause structural damage to the foot, permanent lameness, and prolonged healing time can be expected. Occasionally the opposing digit experiences a supporting limb laminitis from the chronic lameness. Non-traumatic removal of necrotic tissue and bacteria is imperative for the most optimal outcome. Maggot debridement is a non-traumatic, minimally invasive method to remove necrotic tissue from an extensive foot infection. Often times this therapy is used in conjunction with and after light surgical debridement. Maggot therapy decreases healing time in post surgical coffin bone debridements, useful in treating chronic reoccurring non-healing foot ulcers, canker, quittor (necrosis of collateral cartilage), navicular bursa sepsis, chronic osteomyelitis/septic arthritis of DIP joint, chronic soft tissue abscess and osteomyelitis secondary to digital instability such as chronic laminitis and reverse rotation secondary to ruptured deep digital flexor tendon.

MATERIALS

The maggot therapy laboratory at the University of California, Irvine has made disinfected fly larvae (phaenicia sericata) available for clinical use by requesting physicians and veterinarians since 1995. Eggs collected from gravid females are disinfected. The eggs are then transferred to sterile vials. 500-1000 larvae are hatched per vial, embedded in sterile gauze, and are available for overnight shipment for clinical use. The procedure for egg collection, disinfection, and quality assurance is described by Sherman and Wyle, 1996. In the years 2003-2005, maggot debridement therapy has been used on 108 podiatry cases at Rood and Riddle Equine Hospital. This therapy most often followed a light surgical debridement. However in some instances it was used as the primary method of debridement.

PATIENT PREPARATION

Necrotic tissue from the foot wound is usually previously lightly surgically debrided and packed with saline soaked gauze. It is important not to pack the site with disinfectants 24 hours prior to maggot application as the residue may kill the larvae. All bleeding must be stopped before the larvae are applied to the wound. 1 vial of 500-100 larvae embedded in gauze and are applied lightly to the external surface of the lesion. A stack of dry sterile gauze is gently bandaged over the larvae and wound to absorb any exudate. Bandages are changed daily to remove any discharge/excretions created by the maggots

Published in the IVIS Website with the permission of the organizers.

and the suppurating wound. A dose of maggots usually lasts 5-7 days before the larvae are satiated and can no longer remove any necrotic tissue. A new batch of maggots is applied to the wound every 5-7 days until the wound is completely debrided. Depending on the location of the wound, maggots can be placed underneath a hospital plate of a shoe, into a small window cut into a foot or leg cast, or underneath a bandage. If the infection is deep within a puncture wound, placement of the penrose drain can ensure a constant open portal for the larvae to maintain access to the necrotic tissue. Each batch of maggots placed into the wound usually lasts 5-7 days before they become satiated. At this time they need to be replaced by another batch if needed. Repeated applications of maggots are kept in the wound until all necrotic tissue is debrided and a healthy bed of granulation tissue is evident. In cases in which the area is unable to be visualized, such as a deep puncture wound, I usually continue therapy until the patient walks sounds for at least 1 week and the larvae persistently exit the wound.

RESULTS

1) **Coffin bone osteomyelitis :** maggot therapy significantly speeds recovery time in post-op coffin bone debridements. 43 cases, 41 healed uneventfully with only one light surgical debridement followed by maggot therapy. In 2 cases the maggots died in wound. Both of these cases grew a proteus on culture. Maggot therapy eliminated the need for any second debridement.

2) **Chronic laminitis :** Of the 222 chronic laminitic horses studied at Rood and Riddle Equine Hospital from 2003-2005, 38 had severe chronic re-occurring abscessation which were unresponsive to surgical debridement. All 38 cases had severe digital instability which was addressed with either special shoeing, foot casts, resections, and/or transection of the deep digital flexor tendon. 17/38 cases were euthanized due to the severe untreatable digital instability. The remaining 18 cases, the secondary infections were resolved with larval therapy alone. 3 cases are still under treatment.

3) **Septic navicular bursa :** maggot therapy combined with systemic antibiotics and regional limb perfusion cured the infection in all 8 cases. On admission, all cases received light debridement of the puncture tract, navicular bursa lavage, with a needle placed into the navicular bursa from the palmer pastern, and lavaged out the entry tract, regional limb perfusion, intravenous penicillin and gentocin and special shoeing with heel elevation. A ¼" penrose drain was fed through the entry tract directed just palmer to the deep digital flexor tendon and secured to the skin at the palmer pastern. The purpose of the drain is to keep an open tract to the vicinity of the infection for the maggots to maintain access to the diseased tissue. On the 2nd to 3rd day, sterile maggot therapy was initiated. One batch of 500-1000 larvae were applied to the tract, penrose drain site. After 10-14 days the drain was removed and any remaining maggots flushed from the tract. Some of the cases received Na-hyalurnic acid injections into the navicular bursa after the infection had resolved. However mechanical damage (adhesions) to the tendon and flexor surface damage prevented 4 cases from returning to athletic soundness (all 4 cases were admitted later then optimal 7-14 days after puncture wound.) 1 unsound horse received a palmer digital neurectomy because of persistent lameness. The other 3 are pasture sound (sound at the walk). 4 cases are sound for athletic use. All cases were admitted in the chronic stage of the disease (after 72 hours). Cases admitted prior to this (before extensive tissue necrosis) are usually successfully treated with light debridement, lavage, regional perfusions, special shoeing, systemic antibiotics, and there is no need for larval therapy.

4) **Chronic distal interphalangeal joint sepsis :** 4 cases were treated with maggot therapy for chronic DIP joint sepsis and P-1 and P-2 osteomyelitis. 4 cases have been treated with systemic antibiotics, penrose drain placement into dip joint and maggot therapy into drain tracts. In 3 cases the infections resolved and 2 are pasture sound with no reoccurrence of infection. 1 case is still lame at the walk and currently under treatment. 1 case euthanized for massive necrosis and digital instability.

5) **Canker :** of the 6 canker cases, 3 cases were treated with maggots after surgical debridement followed by lasering of the surrounding tissue. These cases had diffuse areas affected with canker. The remaining 3 cases were treated with light surgical debridement of the focal area of canker followed by maggot application after the bleeding has stopped (1-2 days after debridement). In all 6 cases the canker lesions resolved with no known reoccurrences. 1 horse developed a supporting limb laminitis and is currently pasture/breeding sound. The other 5 cases returned to their intended use.

6) **Acute caudal coffin bone rotation :** 6 cases with chronic advanced navicular disease with secondary ruptured deep digital flexor tendons and subsequent acute reverse rotation. 5 cases were euthanized due to chronic digital instability and secondary osteomyelitis of the wings of the P-3, however maggot therapy was useful in debriding the secondary infection. 1 case is pasture sound with special shoeing and no reoccurrence of the infection after maggot therapy of the extensive heel infection.

7) **Non-healing foot ulcers :** 2 pregnant mares with non-healing ulcers in the palmer region of the foot. Radiographs and fistulogram revealed no bone involvement. Inspection/probing of the wound only involved ulceration to the underlying dermis. Lesions were resected on both mares several times by different clinicians and packed with antibiotics and antiseptic dressings at different times. Lesions in both mares never epithelialized over and were non-

Published in the IVIS Website with the permission of the organizers.

Close window to return to IVIS
www.ivis.org

healing lesions which appeared similar to avascular necrosis or non-healing foot ulcers seen in humans. Both lesions were quickly healed with 10-14 days of larval therapy.

8) **Necrosis of collateral cartilage (Quittor) :** trauma to the collateral cartilage with subsequent necrosis is usually caused by interference by another foot. Treatment is usually with surgical removal of the necrotic cartilage above the level of the coronary band and the establishment of drainage distally, usually through a resected area of distal hoofwall. Systemic antibiotic therapy, regional perfusion, lavage, antibiotic impregnated beads, and antiseptic dressings are usually the treatment. In the one case seen over the past 2 years, maggot therapy placed in the drainage tract has resolved the condition with no re-occurrence.

The only side effect of maggot therapy is the occasional patient may experience irritation or itching at the wound site. The movement of the larvae within the wound may be a cause for this. Some bacterial infections may be resistant to maggot debridement. 2 cases had the larvae die in the wound. Both of these wounds grew proteus mirabilis on culture. Other than the minor irritation/itching experienced by the rare case there are no other known side effects experienced in the 104 podiatry cases to date.

In all but two cases, maggot therapy has been useful in treating the disease process however in most cases, predominately in cases in which infection is secondary to digital instability, special shoeing, surgery, casting, and braces is imperative for a successful outcome. None of the cases described were euthanized for failure to treat the infection. The cases that were euthanized were because of the inability to treat the primary problem of digital instability. Once stability is achieved, maggot therapy has been able to rid the infection.

DISCUSSION

Maggot therapy has long been used to treat chronic infections in humans (Robinson, 1935, Sherman, et al 2000, 2002) but only rarely has it been reported in the treatment of infections in animals (Dixon 1933, Dicke 1953, Iverson 2000, Bell and Thomas 2001). Maggot therapy is believed to not only debride necrotic tissue but also to stimulate fibroblast activity and angiogenesis. Thus the healing effect may be more than just aiding the wound in the debridement phase. The most useful cases for maggot therapy appear to be deep penetrating wounds which have a lot of hard to reach soft tissue necrosis such as infections of the palmer regions of the foot. Most wounds to the anterior regions of the foot are easily debrided surgically and usually heal uneventfully. This is probably because of the tight compact architecture of the anterior foot. Maggot therapy is not practical for removing large necrotic areas such as a large area of osteomyelitis or a sequestrum and the author does not recommend larval therapy as an alternative to surgery in these cases. However larval therapy can be useful in debriding residual necrotic tissue after a surgical debridement in these cases. Chronic infections to the palmer regions of the foot including osteomyelitis of the palmer process, penetrating wounds to the navicular apparatus, digital cushion, and coffin joint often times have diffuse soft tissue involvement and multiple tracts. These cases seem to benefit the most from larval therapy following light surgical debridement and lavage. This combination of treatment is an effective way to debride diseased tissue without disturbing the normal architecture of the foot. Regional limb perfusions and systemic antibiotics can be used along with maggot therapy and seem to have no harmful effects on the larvae within the wound. Using maggot therapy in cases with digital instability such as chronic laminitis or acute reverse rotation secondary to ruptured deep digital flexor tendon is useless unless the primary condition is addressed and the pedal bone stabilized. If a lower limb or foot cast is required to provide stability such as in a case with a complete hoof wall ablation, maggot therapy is unique in its ability to debride necrotic tissue within the cast. In these cases the larvae are applied through a window cut into the cast and replaced as needed.

REFERENCES

HONNAS CM, DABAREINER RM, MCCAULEY BH. Hoof wall surgery in the horse: approaches to and underlying disorders. *Vet Clin Equine* 19 (2003) 479-99

PRETE PE. Growth effects of Phaenicia sericata larval extracts on fibroblasts: mechanisms for wound healing by maggot therapy. *Life-Sciences* 1997; 60 (8): 505-10

SHERMAN RA, WYLE FA. Low-cost, low maintenance rearing of maggots in hospitals, clinics, and schools. *Am J Trop Med Hyg* 1996; 54:38-41

WRIGHT IM, PHILLIPS TJ, WALMSLEY JP. Endoscopy of the navicular bursa: a new technique for the treatment of contaminated and septic bursae. *Equine Vet J* 1999; 31: 5-11

RICHARDSON GL, O'BRIEN TR, PASCOE JR, ET AL. Puncture wounds of the navicular bursa in 38 horses: a retrospective study. *Vet Surg* 1986; 15:156-60

RICHARDSON GL, PASCOE JR, MEAGHER D. Puncture wounds of the foot in horses: Diagnosis and treatment. C*ompendium* 1986; 8: 45-53

SMITH J. Debridement of diabetic foot ulcers. *Cochrane-Database of Systemic Reviews* 2002; 4: CD003556.

HONNAS, CLIFFORD M., CRABILL MARK R., MACKIE JOHN T, ET AL. Use of Autogenous Cancellous Bone Grafting in the Treatment of Septic Navicular Bursitis and Distal Sesamoid Osteomyelitis in Horses. *JAVMA* 1995; 206: 1191-94

HONNAS, CLIFFORD M. SCHUMACHER JIM, KUESIS BRUCE S., Ankylosis of the Distal Interphalangeal Joint in a Horse after Septic Arthritis and Septic Navicular Brulitis. *JAVMA* 1992; 200: 964-68

Published in the IVIS Website with the permission of the organizers.