



## Treatment of Pododermatitis in the Guinea Pig

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### Definition

Pododermatitis is a chronic dermatitis of the footpads. It is also known as “bumblefoot.” The condition ranges from mild, where the feet are pink to red and warm to the touch to severe cases in which ulceration and infection may be present.

### Signalment

Pododermatitis is a common condition seen in obese guinea pigs and those housed on wire or abrasive floors. Poor sanitation is also a predisposing factor, and contributes to pododermatitis in guinea pigs **not** housed on abrasive or wire floors. Any illness that results in a sedentary guinea pig predisposes them to the development of pododermatitis. This condition is often found in conjunction with some other sort of illness and rarely as a primary problem.

### Pathogenesis

The pathogenesis in part will depend upon the insighting cause, however most lesions will go through the same progression regardless of the underlying cause. The lesions start as erythematous decubital ulcers that over time become infected, usually with *S. aureus*, from contaminated bedding. Infected, ulcerated feet progress to abscessation with raised, dry, hyperkeratotic, fibrotic scabs. Infection can then spread to underlying bone, causing osteomyelitis and sepsis.

### Signs

Clinical signs which may be noticed are swollen paws, lameness and reluctance to move. Many guinea pigs are too sore to walk across the cage to get to the food and water. Thus if the food and water are not right in front of the guinea pig the lack of food intake together with the pain and discomfort often initiates gastrointestinal stasis. If the pododermatitis is moderate or severe you will notice gait abnormalities while observing the guinea pig ambulate. Guinea pigs with pododermatitis are in extreme pain, vocalize frequently and are reluctant to walk. Early onset pododermatitis can be recognized by bright pink foot pads (Figure 1). Clinical examination may reveal swollen paws with erosions or ulcers 0.5 – 3 cm in diameter on the palmar or plantar footpad surfaces. (Figures 2, 3, 4, 5) The feet

and joints may also be hot to the touch and the guinea pig may cry out in pain when they are manipulated<sup>1</sup>.



**Figure 1**

Note the bright pink tissue on the plantar aspect of the guinea pigs' hind foot. This is an indication of early pododermatitis.

### Causes and Risk Factors

- Infection *Staphylococcus aureus* is the usual causative agent and probably enters the foot through a cutaneous wound from wire or abrasive flooring.
- Infection by way of bacterial embolic showering from a primary source elsewhere in the body.
- Any debilitating illness which causes the guinea pig to remain sedentary (and thus decreased perfusion and increased pressure on the feet) can result in pododermatitis.
- Awns and straw in the bedding can also cause foot punctures.
- The inflammation can progress to osteoarthritis and systemic amyloidosis secondary to chronic staphylococcal infection.
- Vitamin C deficiency (Scurvy) occurs if the diet is not adequately supplemented. Collagen synthesis becomes problem-

atic and impaired clotting mechanisms result in delayed healing, joint swelling and lameness<sup>2</sup>.

- Untreated chronic pododermatitis can progress to osteoarthritis and rarely to osteomyelitis. Guinea pigs with osteoarthritis and osteomyelitis have poorer prognoses<sup>3</sup>.



**Figure 2**  
This is an example of ulcerative pododermatitis on the palmar aspect of the forepaw of a guinea pig.

## DIAGNOSIS

### Differential Diagnosis

The lesions of pododermatitis are unique and should not be confused with other conditions.

### CBC/Biochemistry

Serum chemistry and complete blood count values are often unremarkable. The main purpose of the CBC is to determine whether an infectious process is occurring. Leukocytosis, typically characterized by lymphocytosis, may be seen in guinea pigs with a bacteria-infected pododermatitis. Long-standing cases of chronic pododermatitis can develop systemic amyloidosis secondary to chronic staphylococcal infection. In such animals, kidney and liver function tests may be abnormal.

### Histopathology

Interpretation of biopsies from a footpad with pododermatitis may be misleading to pathologists who do not routinely examine rodent tissues. The exuberant nature of the chronic-active inflammation may be mistaken for a fibrosarcoma.

### Bacteriology

Swab cultures do not effectively reveal the infecting organism as they only collect surface contaminating organisms. Tissue biopsy and culture, fluid aspiration cultures and possible bone biopsy are better alternatives for culturing the infecting organism. In humans with chronic foot ulcers, osteomyelitis is detected in 70% of the cases where the WBC count is elevated and the radiographs show evidence of bony lesions. Therefore, *the need for an invasive bone biopsy may be reduced* in similar cavian cases. Tissue biopsies should be submitted in bacteriology culture medium such as broth, for clinical micro-

biology. Contact your diagnostic laboratory first to arrange appropriate culture and transport media. Antibiotic sensitivity should always be requested. Keep in mind that surgery should be avoided. This exuberant tissue is very vascular and it can be difficult to achieve hemostasis. Guinea pigs do not tolerate the pain associated with invasive surgical debridement and biopsy well.

### Imaging

Radiographs of the affected paw (two views) are useful to determine the extent of inflammation before treatment, to monitor treatment and to provide a prognosis. Patients that exhibit osteoarthritis and osteomyelitis have poorer prognoses. Digital radiography is ideal to provide sufficient detail for diagnosis of osteoarthritis. If digital radiography is not available conventional radiographs made with mammography film are superior to normal film as it is high-contrast film which provides greater detail.

## TREATMENT

### Surgical Considerations

Surgical treatment is often unsuccessful because there is rarely an abscess to be excised or drained. The lesion is a diffuse cellulitis that infiltrates the surrounding tissue. The tissue is very vascular and thus cutting into it results in severe bleeding. The bottom line is a surgical approach is not recommended.

### Wound Cleansing

The benefits of cleaning must be weighed against trauma to the tissue bed caused by the cleaning. I recommend soaking the affected paw(s) in a warm saline solution before applying the wound dressing. Hydrotherapy would be ideal to stimulate perfusion to the feet. The guinea pig could be held with the affected foot beneath a faucet of warm running water to flush away any debris as well as increase perfusion. Alternatively a spray nozzle attached to the sink would provide more direct, forced water or a syringe may be filled with an irrigating solution and it can be used with or without a needle to flush the affected foot/feet. Do not use povidone iodine, iodophor, sodium hypochlorite solution, hydrogen peroxide, acetic acid or chlorhexidine disinfectants (e.g. Nolvasan, Hibitane) as they are cytotoxic to fibroblasts, reduce white blood cell viability and decrease phagocytic efficiency which may actually slow wound healing. In the initial phases of treatment when the footpad ulcer can be considered an infected chronic wound, it may be appropriate to use cleansers and disinfectants until the infection has resolved (remember to dilute disinfectants and cleansers to avoid their toxic effects). Many disinfectants and cleansers are drying agents as well as antimicrobial. Exudates are necessary to create an environment that stimulates wound healing. By drying the wound bed, the exudates and its beneficial cells are removed from the area. Dry tissue also tends to necrose and serve as a bacterial medium.

### Wound dressing

Once the wound is cleaned, a hydrogel or hydrocolloidal wound dressing should be applied over the entire ulcer. Hydrogel wound covers do not have to be changed every day as hydrogel wound filler does.



**Figure 3**

This is an example of ulcerative pododermatitis on the palmar aspect of the forepaw of a guinea pig which extends to the dorsal aspect of the foot and the leg demonstrated additional dermatological issues.

In addition hydrogel wound fillers contain large amounts of propylene glycol that can sting when applied to raw tissue. Use hydrogels on wounds with minimal or no exudate; use hydrocolloids on wounds that are draining low to moderate amounts of exudate. If there is an open ulceration on the plantar aspect, and infection is suspected, silver sulfadiazine cream can be considered for topical application. Protective padding, such as a non-adhesive pad should be applied over the wound. The foot should then be gently wrapped with cotton cast padding (cut to approximately ¼ - ½ inch width) followed by an adhesive layer of a flexible bandage material. Be sure to apply the bandage tight enough that it will not fall off but loose enough that the circulation is not impaired (pay particular concentration to the hock region). The combined wound dressing, padding and adhesive bandage should not be so thick that the guinea pig cannot use its leg<sup>4,5,6</sup>.

In early stages wound dressing, assessment and redressing of the wound may be required daily. Anesthesia or sedation should be considered to minimize distress and pain. Redressing of the wound may be adjusted to twice weekly or once weekly once the patient is adapted to the wound dressing. It can be challenging to keep the bandage clean and dry if it is a hind foot that is affected. Bandage changes are required often to keep the urine from soaking through to the affected tissue. It is helpful to have the guinea pig on a very absorptive surface so that the urine wicks away from the bandage/foot when the animal relieves itself.

### Low-level Laser Therapy

Low-level laser therapy (LLLT) is also termed phototherapy. These 'cold lasers' are used to help modulate cellular processes. Lasers used for therapy are low power, generally less than 100mW and energy density less than 35J/cm<sup>2</sup>. Treatment regimens are described in Joules/cm<sup>2</sup> or per application of the laser. Lasers seem to have the ability to accelerate wound healing through fibroblast development and effects on colla-

gen production. There is evidence that lasers may accelerate angiogenesis as well as stimulate vasodilation and increased lymphatic drainage. There is data on the use of laser therapy in other types of healing, including ligament and tendon injuries. There is also evidence that lasers may help modulate chronic pain by altering the nerve pathways to the brain<sup>7</sup>.

I have used LLLT (gallinium 904-nm laser) at 1 J/cm<sup>2</sup> daily on affected (non-infected) feet with excellent results.



**Figures 4 & 5**

This is an example of severe ulcerative pododermatitis on the plantar aspect of the hock (VD and oblique lateral images of the same hock). Note the open ulcer at the base of the hock. Surgical debridement is discouraged due to the incidence of hemorrhage and lack of focal abscessation.



## MEDICATIONS

### Antibiotic

- Chronic antibiotic administration for the course of treatment is essential. Treatment may be required for as long as 2-6 months. I have found enrofloxacin or ciprofloxacin 5-10 mg/kg PO q 12 hr are safe and effective for pododermatitis in guinea pigs.
- If a culture has been performed antibiotic selection should be based upon the sensitivity report.



### **Analgesic**

- Analgesia is essential. Any swelling in the footpad is extremely painful as the tissues are tightly contained within the paw. During the initial stages when pain is the greatest you should consider buprenorphine 0.03 – 0.05 mg/kg q 8-12 hours IM or SC.
- It is also ideal to administer a drug with anti-inflammatory properties for this condition. I use Meloxicam at 0.1-0.2 mg/kg PO q 24 hr. If the guinea pig is dehydrated this non-steroidal anti-inflammatory drug can result in renal stress and elevated renal values on blood work and in some cases result in renal failure. Please use cautiously.
- The use of topical analgesics can help temporarily alleviate pain and discomfort. Lidocaine cream or patches can be used. EMLA Cream (lidocaine 2.5% and prilocaine 2.5%) is one example and is indicated as a topical anesthetic for use on normal intact skin for local analgesia (pain relief).

### **Adjunct Therapies**

Other adjunct therapies such as Colloidal Silver application as well as omega fatty acid and vitamin C supplementation have also been used with favorable outcomes.

### **Other considerations**

I find necrotic core tissue usually comes loose and detaches in 1-2 weeks. Measure and record the diameter of the ulcer at each dressing to assess progress. I also use a digital camera and take pictures to assess the progress. House the affected guinea pig in a clean cage with dry, soft bedding (fleece, artificial sheepskin, 2 inch deep recycled paper bedding etc.).

If pododermatitis is noticed early (at the stage when the feet are bright pink but not ulcerated) I have found it helpful to apply a layer of liquid bandaide to the affected site(s) once daily for two weeks. This allows for a false callus to develop which protects the underlying tissue. In many instances this is sufficient to halt the progression of pododermatitis. However, it is important to investigate for any other possible ailments which may be predisposing the guinea pig to bumblefoot.

### **FOLLOW UP**

Chronic pododermatitis is a slow healing condition and may require 2-6 months to heal. A veterinarian needs to regularly reassess and redress the wound and the follow up visit should occur within 2 weeks. Redressing requires at least 2 experienced persons. Guinea pigs do not tolerate pain well. It may be necessary to syringe feed them if they are anorexic or are experiencing any gastrointestinal stasis. Weight should be monitored daily and the amount fed altered accordingly.

Although with time ulcerated lesions generally heal and reepithelialize, I have found some healed lesions are predisposed to ulcerate again. Often the affected paws remain swollen after healing. These guinea pigs may need to have a permanent soft boot worn on the affected paw or be provided with thick bedding material long term to prevent reoccurrence.

1. Taylor, J.L., et al. Chronic pododermatitis in guinea pigs, a case report. *Lab. Anim. Sci.* **21**(6), 944-5 (1971).
2. Brewer, N.R. and Cruisee, L.J., Antioxidants simplified: Some species differences, *Contemporary Topics in Laboratory Animal Science*, 34, 92, 1996.
3. Gupta, B.N., G.H. Conner, and D.B. Meyer. Osteoarthritis in guinea pigs. *Lab. Anim. Sci.* **22**(3), 362-8 (1972).
4. Horncastle, J. Wound dressings. Past, present, and future. *Med Device Technol.* **6**(1), 30-4, 36 (1995).
5. Fletcher, J. The benefits of using hydrocolloids. *Nurs. Times.* **99**(21), 57 (2003).
6. Jones, J., Winter's concept of moist wound healing: a review of the evidence and impact on clinical practice. *J. Wound Care.* **14**(6), 273-6 (2005).
7. Zender, A. et al. Physical Rehabilitation in Avian Species. *Conf. Proc. Assoc. Avian Vet.* 73-79 (2007).

Dr. Brown sees primary and referral appointments as well as emergency appointments Monday, Thursday and Friday and late day appointments on Tuesdays. Dr. Brown also sees appointments on alternating Wednesdays at Bay State Veterinary Emergency Services in Swansea.

## **OSVS Announcements**

OSVS would like to welcome to our staff the following intern-trained emergency veterinarians:

**Lea Sheldahl, DVM**

**Maryanne Gaul, DVM**

**Kristina DePaula, DVM**

Our Internal Medicine Department will also be growing with the addition of

**Benjamin Nolan, DVM, PhD, DACVIM**

Dr. Nolan recently finished his residency at Tufts Cummings School of Veterinary Medicine, where he also received his veterinary degree. He completed a rotating small animal internship at Alameda East Veterinary Hospital. Dr. Nolan will begin seeing appointments in mid-August.

## **Outpatient Ultrasounds**

Please remember that outpatient ultrasounds are performed by our radiologist, Dr. Sue Newell on an appointment-only basis Monday through Friday.  
Thank you.

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## Staff Spotlight ~ Changing of the Guards

OSVS would like to congratulate Emily Christiansen DVM, Jessica Gramlich DVM, Adam Kane DVM, and Sam Lester DVM for successfully completing their internships! Congratulations also go out to Keith Schoen BVMS for the completion of his surgical internship.

Dr. Gramlich is going through the interview process in the Boston area. Dr. Kane is headed back to Syracuse to take an Emergency position at the Veterinary Medical Center of Central NY. Dr. Christiansen is looking for an aquarium to call her home. Dr. Schoen has taken a position as an associate veterinarian at NorthPaws Veterinary Center. And finally, we are very happy to have Dr. Lester staying on with us as an Emergency doctor.

We wish them all much success and happiness in all their future endeavors.

As this class finishes it's time for another class to begin. Our new interns are **Dr. Seth Gurney** - Univ of Georgia, **Dr. Kara McArdell** - Univ of Minnesota, **Dr. Virginia Reynolds** - Texas A&M, **Dr. Oni Springer** - Univ of Georgia and **Dr. Andrea Weissman** - Univ of Pennsylvania.

**Cassandra Pugh, DVM** will also be joining us as a first-year resident in Emergency/Critical Care. Dr. Pugh comes to us from Angell Animal Medical Center, where she completed her internship.

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### Continuing Ed Seminars at OSVS

Ocean State Veterinary Specialists will continue offer RACE approved CE Seminars in 2009. If you have any topics you feel would benefit referring veterinarians in the area, please feel free to contact Betsy Hall via email at [bhall@osvs.net](mailto:bhall@osvs.net) or at (401) 886-6787.

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### The Vital Question ...

Which of the following is *not an* actual medical term?

- 1) Hickey-Hare Test
- 2) Vogt-Koyanagi Harada syndrome
- 3) Anosmia
- 4) Double Klein test
- 5) Ehler-Danlos syndrome

Be the first to email [bhall@osvs.net](mailto:bhall@osvs.net) with the correct answer and win a 4-pack of tickets to a PawSox game.

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### MRI & Neurology services at OSVS

OSVS continues to provide MRI services six days each week - Monday through Saturday. A routine MRI includes IV catheter +/- IV fluids, anesthesia and monitoring, MRI procedure (one major site), contrast injection, day stay in hospital, and MRI interpretation by our radiologist.

We also have a board-certified neurologist, Dr. Scott Schatzberg seeing appointments and performing MRIs two days a month when his schedule permits.

If you have any questions regarding neurology consults or to schedule an MRI, please feel free to call and speak with Dr. Sue Newell.

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 David W. Hunley DVM, DACVIM  
 Justine A. Johnson DVM, DACVECC  
 Susan M. Newell DVM, MS, DACVR  
 Benjamin Nolan DVM, PhD, DACVIM  
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 Kara McArdell DVM  
 Virginia Reynolds DVM  
 Oni Springer DVM  
 Andrea Weissman VMD  
 Heather York DVM

**Surgical Resident**

Trey Townsend DVM

**Emergency/Critical Care Residents**

Rebecca Rader DVM  
 Alison Elias DVM  
 Cassandra Pugh DVM

**Client Liaison**

Linda Adams

**Hospital Administrator**

Cheryl Rizzo



***Proud Papas***

OSVS had many new, proud fathers this Father's Day. Dr. Christopher Ralphs welcomed his second daughter, Sienna last August. Sienna joins big sister Addison, and their mom is Dr. Kristen Ralphs who works part-time at Portsmouth Veterinary Clinic. Dr. Trey Townsend and his wife Heather were blessed with their first child, a daughter named Adeline in October. Most recently, Dr. Fred Levy and his wife, Dr. Margee Levy from our sister hospital, Bay State Veterinary Emergency Services, welcomed their second daughter, Katy Elizabeth in May. Katy is little sister to Sarah.

**Congratulations to all on their new arrivals!**