

Canine Staphylococcal Pyoderma: Pathogenesis and Classification

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Pyoderma is Common



- ◆ Primary or **secondary**
- ◆ Often hides the primary disease
- ◆ Important to recognize and treat as an initial step for any patient

Canine Pyoderma: Etiology

- ◆ Normal cutaneous microflora
 - *Micrococcus*
 - Coagulase-negative staphylococci, such as *Staphylococcus epidermidis*
 - *Corynebacterium*
 - Coagulase-positive staphylococci, such as *Staphylococcus intermedius*
 - *Malassezia*

Canine Pyoderma: Etiology

- ◆ Cause = *Staphylococcus intermedius**
- ◆ *S. intermedius* is a normal resident or transient organism on canine skin
- ◆ Therefore, **some cutaneous insult is necessary** to start colonization by *S. intermedius* and result in pyoderma
 - "Staph infections" are not contagious to other dogs, or to people in the household
 - A "staph infection" is not acquired from another animal, or unsanitary conditions
 - "All dogs have staph normally on their skin"

Canine Pyoderma: Etiology

- ◆ Trauma (scratching)
- ◆ Water exposure
- ◆ Endocrinopathy
- ◆ Allergy
- ◆ Parasites
- ◆ Systemic Disease
- ◆ "Immunodeficiencies"
- ◆ Anatomic Problems

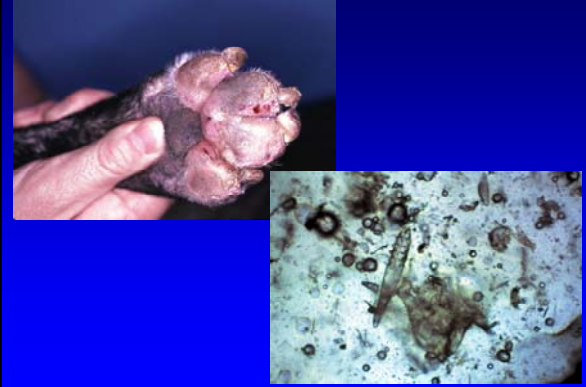
Anatomical Predisposition



Predisposition due to Metabolic Disease

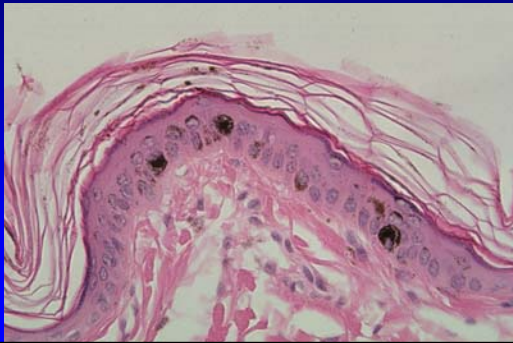


Interdigital Pyoderma due to Demodicosis



Pyoderma and Cornification Defects (Seborrhea)

Cornification: the process of division and maturation of epidermal cells to form the stratum corneum.



Pathogenesis of Seborrhea

- ◆ Increased mitotic rate of epidermal cells
- ◆ Change in composition of surface lipids
- ◆ Change in bacterial flora
 - » 100-1000x increase in number of organisms/cm²
 - » Shift towards coagulase (+) staphylococci
 - » Leads to frequent bacterial pyodermas

Alternate *Staphylococcus* species

- ◆ *S. aureus* (normally a human origin strain)
 - Uncommon to see in dogs
 - Probably was transmitted from human to dog
 - Is there some unusual condition?
 - More often seen in households where owner is a healthcare worker?
- ◆ Practical significance
 - Some strains are highly antibiotic-resistant (methicillin-resistant *Staphylococcus aureus* or MRSA)
 - Owner may be colonized with the same strain
 - May be transmissible from dog to other humans
 - Not of great concern unless owner is immunosuppressed, or will undergo surgery, etc.

Alternate *Staphylococcus* species

- ◆ *Staphylococcus schleiferi*
 - A "new" coagulase (+) staphylococcus reported in dogs
 - No strong correlation with disease severity, recurrence, antibiotic susceptibility, etc.
 - No real practical significance
 - Commercial labs do not perform tests which differentiate this species from others, so you probably won't know if you have it!

Alternate *Staphylococcus* species

- ◆ *Staphylococcus pseudintermedius*
 - Very recent genetic sequencing studies that compare DNA sequence of pathogens to DNA sequence of “reference” organisms
 - Possible that the staph species usually found in canine pyoderma is not *S. intermedius* but actually *S. pseudintermedius*
 - No real practical significance...really it's just a name change

“Staphylococcal Hypersensitivity”

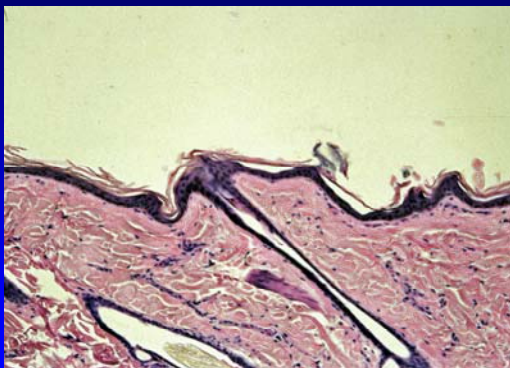


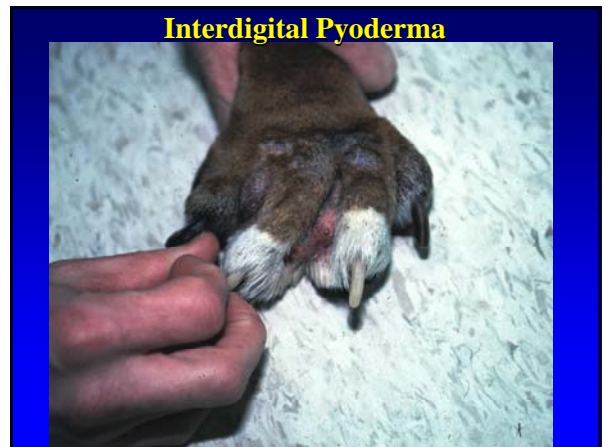
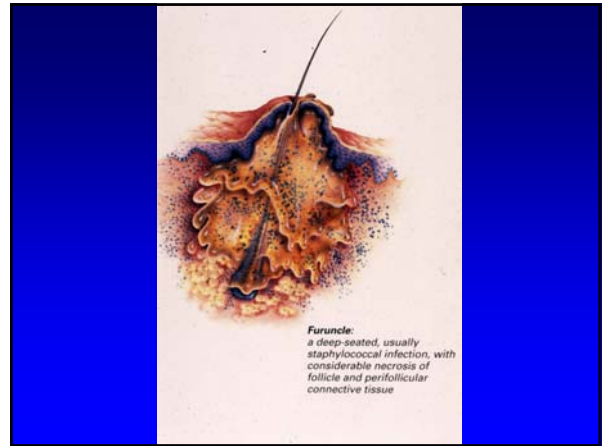
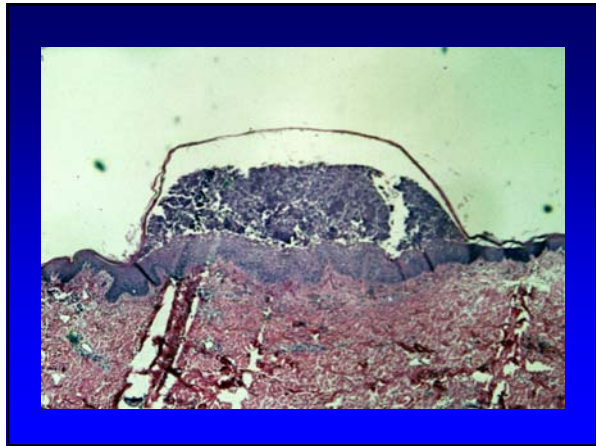
Bacterial Hypersensitivity?

- ◆ Clinical appearance suggests hypersensitivity (pruritus, inflammation)
- ◆ Yesterday: humans with staphylococcal infections sometimes have serum IgE specific for bacterial antigens
- ◆ Today: less and less evidence; more evidence for alternate mechanisms
- ◆ Is not a proven concept in dogs

Classification of Pyoderma

- ◆ **Primary vs. secondary**
- ◆ **Depth of involvement**
 - Surface pyoderma
 - Superficial pyoderma
 - Deep pyoderma
 - **Importance: determines length of treatment**





Interdigital Pyoderma



Interdigital Pyoderma

- ◆ *Staphylococcus intermedius*
- ◆ Trapped hair shaft material – foreign body reaction
- ◆ Chronic scar tissue
- ◆ Anatomical factors?



Interdigital Pyoderma as part of "GSD Pyoderma"



Canine Juvenile Cellulitis



Canine Juvenile Cellulitis



IN SUMMARY:

- ◆ *S. intermedius* (*pseudintermedius*?) is normal flora
- ◆ Look for a reason!
- ◆ Complicating factors may occur
- ◆ Watch for the emergence of alternate staph strains

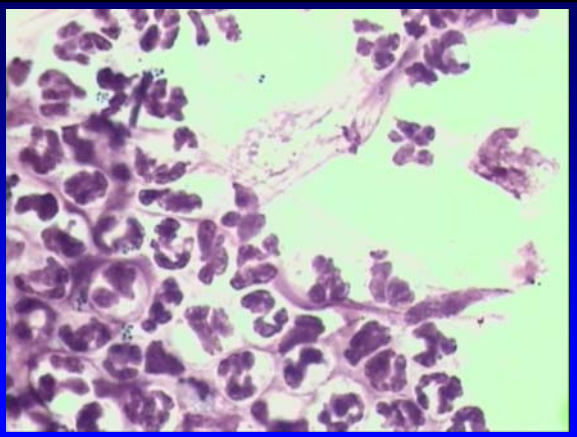
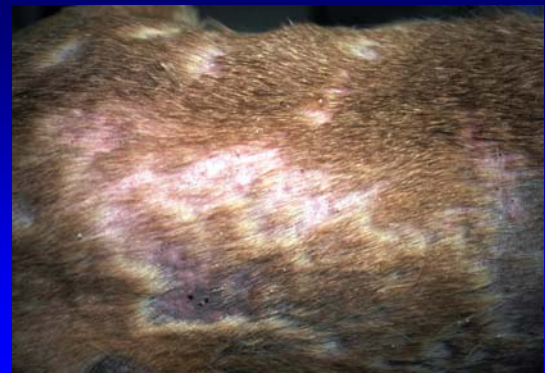
29. Internationaler Fortbildungskurs "Kleintierkrankheiten"

Canine Staphylococcal Pyoderma: Topical and Systemic Treatment

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Treating Pyoderma: Basics

- ◆ Appropriate use of **systemic antibiotics**
 - Eliminates organism from deeper skin tissue
- ◆ Adjunct use of **topical antimicrobial**
 - Reduces overgrowth on the skin surface
- ◆ Finding and treating the **underlying cause**
 - Prevents recurrence

Canine Pyoderma: Treatment

◆ ANTIBIOTICS

- Use the right antibiotic
- Use it for long enough

Which Antibiotic for Pyoderma?

- ◆ Ineffective antibiotics
- ◆ Moderately effective antibiotics



Which Antibiotic for Pyoderma?

- ◆ Excellent antibiotics
- ◆ “Effective but usually not necessary” antibiotics



Cephalosporins: Drugs of Choice



- ◆ Nearly 100% of *S. intermedius* canine skin strains are susceptible*
- ◆ Good tissue penetration
- ◆ Bacteriocidal
- ◆ Cost-effective
- ◆ Cephalexin, cefadroxil, and cefpodoxime have about equal efficacy



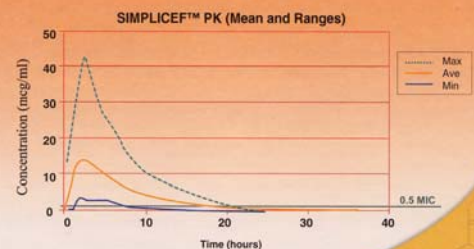
*this is changing!

Nothing in life is 100%



Nothing in life is 100%

Plasma Concentration of Cefpodoxime in Dogs Given a Single Oral Dose of 10mg/kg Cefpodoxime Proxetil



Recent Emergence of MRS



- ◆ Recent increase in reports of highly-resistant staph strains (*intermedius*, *aureus*, or *schleiferi*)
- ◆ **Methicillin** is a laboratory antibiotic used to test for susceptibility to the “penicillinase-resistant penicillin” group of antibiotics
- ◆ Clinically used antibiotics in this group include oxacillin, dicloxacillin, amoxi/clav.
- ◆ If the organism is “**methicillin resistant**” in the laboratory, it will be clinically resistant to all penicillins and cephalosporins!!

Recent Emergence of MRS



- ◆ If you treat a patient with a beta-lactam antibiotic, and there is no response, **culture and susceptibility testing is now mandatory.**
- ◆ Most veterinary strains of MRS are still susceptible to trimethoprim-sulfa, clindamycin, or a fluoroquinolone

Recent Emergence of MRS

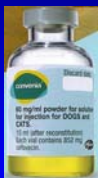


- ◆ If you have MRS, you should order a **staphylococcal speciation** test from the laboratory, to determine if you have a human (*aureus*) or canine strain (*intermedius*, *schleiferi*).
- ◆ **MRSI** is not a special human health hazard
- ◆ **MRSA** – dog may serve as a reservoir in the home environment, very important that infection is treated to full recovery, owner should be informed

How long to treat with antibiotics?

- ◆ **Superficial pyoderma**
 - 1-2 weeks past clinical resolution
- ◆ **Deep pyoderma**
 - 2+ weeks past clinical resolution

Cefovecin (Convenia™)



- ◆ Soluble, injectable cephalosporin, similar spectrum to cephalexin, cefadroxil, or cefpodoxime
- ◆ Binds tightly and extensively to albumin, slowly released
- ◆ Half-life is 5-7 days
- ◆ One injection lasts 2 weeks
- ◆ ...in dogs and cats!!!

Cefovecin (Convenia™)



- ◆ Skin and urinary tract infections
- ◆ *Staph*, *Strep*, *E. coli*, *Pasteurella*
- ◆ Advantage: client compliance. You know all the doses are given.
- ◆ Disadvantage: expense
- ◆ Cefovecin in canine pyoderma
 - Effective
 - In many mild cases, a single injection may be sufficient
 - Some dermatologists believe it may work very well for deep pyoderma

Adjunct Therapy

◆ NO STEROIDS!

- May prolong course of the infection, or cause owner to stop antibiotic treatment prematurely
- You want to know if the pruritus disappears with antibiotics, because it helps you know the underlying cause!

Adjunct Therapy



- ◆ Shampoo twice weekly with antibacterial shampoo (chlorhexidine, benzoyl peroxide)

Adjunct Therapy



- ◆ The most effective topical ointment is mupirocin



“Zena”

“Zena”: history

- ◆ 4 year old spayed female Retriever/Shepherd
- ◆ 3 year history of nonseasonal, moderate to severe pruritus, principally ventral abdomen and axillary.
- ◆ Owner states that Zena often has a “red rash” in the areas where she scratches, and an odor.



“Zena”

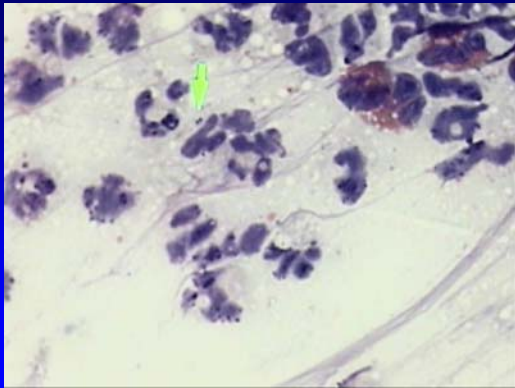
"Zena"



Initial Thoughts

- ◆ **Differential diagnoses**
 - Atopic dermatitis
 - Food allergy
 - Mites?? (Sarcoptes, Cheyletiella)
 - Lesions suggest secondary infections present
- ◆ **In-clinic diagnostic tests**
 - Skin scrapings for mites
 - Scotch tape or combing for mites
 - Skin cytology of pustule and of waxy material

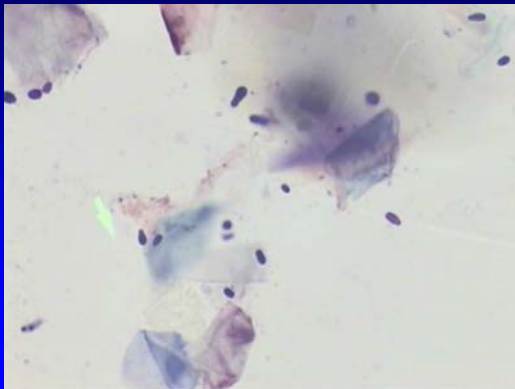
"Zena" – Pustule Cytology



"Zena"



"Zena" – Skin Cytology



Initial Plan

- ◆ **Treat staphylococcal infection**
 - Antibiotics, 4-6 weeks
- ◆ **Treat yeast component**
 - Ketoconazole, 10-21 days
- ◆ **Consider antiseborrheic shampoo**
- ◆ **No corticosteroids!**
- ◆ **Recheck in 4 weeks: what's left?**

“Zena”: recheck exam

- ◆ Pruritus has resolved by nearly 100%, only very mild signs
- ◆ Lesions have resolved substantially – still hyperpigmented and thick skin, but pustules and waxy texture has disappeared.
- ◆ Owner elected to “wait”

“Zena”: telephone call!

- ◆ 3 months later, owner says the greasiness and thick skin are still gone, but Zena is scratching again and the red rash is returning.
- ◆ I wonder: was treating staphylococcus most important in her improvement, or yeast, or both?
- ◆ This time, treat with antibiotics only
- ◆ Result: lesions and pruritus resolve by 100% again!
- ◆ This pattern repeated about every 3 months.

Further Evaluation

- ◆ Extensive evaluation for atopic dermatitis, food allergy, parasitic diseases, hypothyroidism, and other internal diseases was performed, all normal!

Strategies for Management of Idiopathic Recurrent Pyoderma

Strategy #1. Frequent Topical Treatment

- ◆ Decrease skin counts of *S. intermedius*
- ◆ Products to use: chlorhexidine, benzoyl peroxide



Newer Ingredients: Phytosphingosine

- ◆ Component of intercellular matrix of epidermis
- ◆ Antimicrobial
- ◆ Anti-inflammatory (in vitro)
- ◆ Barrier-enhancing?
- ◆ Douxo® Shampoo, Spray

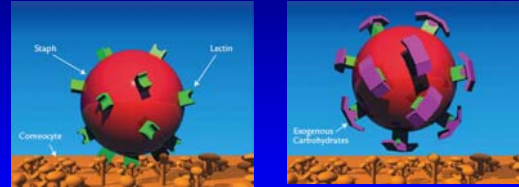


Newer Ingredients: “Glycotechnology”



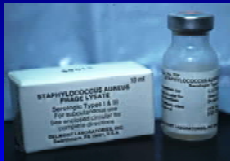
- ◆ Virbac products
- ◆ Addition of monosaccharides, polysaccharides, glucosides
- ◆ Sugars interfere with attachment of organisms to the epidermal cell surface

Newer Ingredients: “Glycotechnology”



- ◆ Demonstrated in vitro only; no clinical studies available yet to demonstrate benefit

Strategy #2. Immunomodulation



- ◆ Drug treatments (cimetidine, levamisole) are poorly studied
- ◆ Up to 70% of dogs may benefit from staphylococcal bacterin (Staphylococcus phage lysate, or an autogenous staphylococcal bacterin)

Strategy #3. Pulse-therapy with antibiotics

- ◆ Treat until infection completely resolves
- ◆ Then, treat every other week at full dose
- ◆ If no relapse for several months, try “one week on, two weeks off”
- ◆ “Weekend Therapy” works also!
- ◆ Choice of antibiotics is important
 - Sulfa, macrolide, fluoroquinolone – rapid resistance
 - Cephalosporin – developing resistance less common