Folliculitis:
The Big 3 and How I Treat Them

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As all veterinarians know, the big three causes of follicle infections are demodicosis, dermatophytosis and bacterial pyoderma. It may be surprising to learn that I probably receive more telephone requests for advice for the up to date treatment options regarding demodicosis and dermatophytosis than any other topic. This fact plus the rise in incidence of methicillin resistant Staphylococcus makes this discussion timely.

Demodicosis

Without a doubt the number one telephone call received at Dermatology for Animals (D4A) from veterinarians is how to treat a refractory case of demodicosis. The short answer is usually ivermectin, but there are certainly cases where this is not an appropriate or acceptable therapy. Typically demodex is considered to be either generalized or localized, although the distinction in practice is not always obvious. If a patient, especially one under a year of age presents with just a few small patches of alopecia I will typically attempt topical therapy only. Products such as rotenone or benzoyl peroxide gel can be applied until skin scrapes are negative. Realize the alopecia will persist for a few weeks to months even after the mites are cleared.

If the mite infestation is more severe, with more numerous lesions present, then I will initiate some type of systemic therapy along with supportive topical treatment. Despite the fact amitraz dips are one of the few approved therapies for treatment of generalized demodicosis, I rarely utilize this product. In my *opinion* there are usually safer options for both the dog and the human household members. I usually recommend weekly (or more) bathing with a product designed to have follicle flushing and antibacterial properties. Benzoyl peroxide and ethyl lactate shampoo both are helpful adjunctive therapies for a patient with demodicosis. DermaBenSs™ from Dechra is a nice choice as it contains 2.5% benzoyl peroxide with ceramides which minimize the drying effects of benzoyl peroxide while repairing the epidermal barrier. If treatment includes amitraz dips, then prewashing with a benzoyl peroxide product is again recommended. Most patients with generalized demodicosis require several months minimum before control or "cure" is achieved, so owners need to be educated to expect this.

The majority of patients treated at D4A with generalized demodicosis receive ivermectin orally at a dose ranging from 0.4-0.6 mg/kg daily. This therapy is used because for most patients it is safe, inexpensive and effective. There are well known published list of dog breeds where ivermectin should not be used, or used with caution. The adage "white feet don't treat" while not a very precise screening process, is actually a consideration.

Ideally patients will be screened for a MDR1 gene defect which leads to cytochrome P450 liver enzymes unable to properly metabolize ivermectin. This results in higher blood levels of ivermectin, which may then cross the blood brain barrier and lead to side effects. Gingival swabs or blood may be submitted to the diagnostic lab at Washington State University. Forms and instructions for submission of samples can be downloaded from their website at www.vetmed.wsu.edu/VCPL Owners should still be aware of clinical signs of ivermectin toxicity and we always have owners sign consent forms for its usage. The clinician should also keep all the other drug interactions in mind. Concurrent use of cyclosporine might increase ivermectin blood levels and lead to toxicity in breeds not usually prone to such reactions.

Several options exist for a patient where ivermectin is not or cannot be used. Milbemycin oxime is safe in dogs which might not tolerate ivermectin. The orally given dose is 1.6-3.8 mg/kg and the main drawback of the drug is the expense. Another macrocylic lactone similar to ivermectin, but with perhaps fewer side effects is doramectin. The efficacy appears to be similar to ivermectin, and we have used this drug successfully both in ivermectin "failures" and in patients which did not tolerate ivermectin. However reactions can still occur in ivermectin sensitive breeds. The dose is 0.2 mg/kg given weekly by SQ injections although there are anecdotal reports of giving as much as 0.6 mg/kg weekly, or giving 0.3 mg/kg orally every other day. Another product approved for the treatment of generalize demodicosis contains a combination of metaflumizone and amitraz (Promeris®) and is applied every four weeks. This product is currently off the market although some practitioners may have product in stock. Efficacy in patients with naturally occurring demodicosis was 43% and 65% at three months in patients treated monthly or biweekly, respectively. Side effects included lethargy, temporary hyperglycemia, and an unpleasant odor and texture after application. There have also been many documented cases of a pemphigus foliaceus like drug reactions caused by this product. Finally one study of imidacloprid + moxidectin (Advantage Multi®) showed efficacy at killing demodex mites, especially with off label weekly dosing, although ivermectin at 0.5 mg/kg daily showed superior efficacy. As a final note, both lime sulfur and Selemectin are ineffective for the treatment of canine demodicosis

Dermatophytosis

Although some advocate that treatment of a local dermatophyte lesion, especially in a dog, is self limiting, due to the zoonotic potential of this disease I am usually uncomfortable treating to conservatively. I therefore prefer to treat dermatophytosis in dogs and cats with both topical and systemic therapies. Lyme dip remains one of the most effective and safe topical products available for the treatment of dermatophytosis, but due to the objectionable odor, many clients and veterinarians prefer alternative options. Various "azoles" are available in formulations including cream, shampoo, and leave on conditioner. Chlorhexidine is not effective in the treatment of dermatophytosis. I prefer the lyme dip or a shampoo with miconazole or ketoconazole to avoid simply "chasing the spots" and have owners apply terbinafine (OTC) to local lesions if they are few in number. The systemic options for treating dermatophytosis include ketoconazole, fluconazole, itraconazole, griseofulvin and terbinafine. I never use ketoconazole (to many side effects), or griseofulvin (to toxic *and* to expensive). Generic fluconazole (5-10 mg/kg daily) is inexpensive and many patients have responded favorably. Compared to itraconazole and terbinafine, fluconazole does not reach the same levels in the skin, and now that terbinafine is available in a generic form we have started using this drug more frequently. A dose of 30-40 mg/kg daily is our starting dose, and the pharmacokinetics of this drug suggest that pulse dosing will be effective. Several protocols have been used, and we have seen regiments of "one week on, one week off" succeed. Terbinafine may cause vomiting, diarrhea, or elevation in liver enzymes, so monthly monitoring of liver values is suggested. Itraconazole is also very effective for the treatment of dermatophytosis, but a generic option is unavailable. Itraconazole is frequently compounded from bulk drugs or the proprietary capsules, however, during compounding, inactivation may occur. Itraconazole is insoluble in water and cannot be formulated into aqueous vehicles. Itraconazole may also adsorb to plastic and glassware, decreasing product drug concentrations. For these reasons this author never uses compounded itraconazole. For small patients (especially cats) the brand name itraconazole is available in a liquid formulation, and we use this product frequently at 5-10 mg/kg daily. When multiple pets are in the home, it is wise to culture all in house pets, and segregate those positive from negative. Weekly prophylactic lyme dips or "azole" baths is also recommended for all pets. All positive pets are treated until two negative DTM cultures have been obtained, and we generally culture every four weeks. Since therapy may slow the growth of the dermatophyte, we hold all cultures three weeks before concluding they are negative.

Treatment of the environment is usually indicated as well, especially when multiple pets are involved. Effective but reasonable environmental control is usually the challenge. At a minimum we recommend frequent vacuuming of carpeted areas, and disinfection of hard surfaces with a diluted bleach solution. It is also recommended to discard all grooming instruments (brushes) and cat trees if they are present. In summary the optimum therapy for the treatment of dermatophytosis includes:

- Clipping the hair coat
- Twice weekly topical antifungal therapy
- Concurrent systemic antifungal therapy
- Environmental decontamination
- Fungal culture monitoring every 2–4 weeks until mycological cure

Therapies which have fallen out of favor and shown ineffective for the treatment of dermatophytosis include lufeneron, and dermatophyte vaccines.

Pyoderma

Over the last several years there has been a worldwide increase in cases of multidrug and methicillin resistant *Staphylococcus pseudintermedius* (MRSP) and *S. aureus* (MRSA) infections. While MRSA is the dominant infection in people, it is MRSP that is responsible for most of the drug resistant infections in veterinary patients. Some regions of North America are reporting that as many as 50% of skin infections treated are due to MRSP. The escalating incidence of both MRSA and MRSP are causing some medical and public officials to call for regulation and restriction of the usage of certain antibiotics in veterinary medicine. Veterinarians must become even more judicious in the usage of antibiotics in the future, and should employ some of the basic and reasonable methods to reduce the spread of MRSP and MRSA within their practice and facilities. Fortunately even though the incidence of MRSP has clearly increased, the virulence of these bacteria has not seemed to worsen in our dermatology patients. Much of the pathology that Staphylococcus causes is due to the various toxins these bacteria can produce.

For many of the "milder" forms of pyoderma in the dog, I have become much more of an advocate of topical therapy. Numerous chlorhexidine shampoos, sprays, and leave on conditioners are now available, with strengths from 2%-4% and combined with either Tris-EDTA (TrisChlor 4™ Dechra), or phytosphingosine, or formulated to "stick" to the epidermis and hair for as long as a week after bathing. If the skin is particularly greasy, then benzoyl peroxide is indicated (DermaBenSs™ Dechra). The clinician should utilize these products in all cases of pyoderma. Even dogs which are difficult to bathe can at least be sprayed with these products. Obviously not all clients are able to comply with a vigorous topical regiment, and not all patients will respond to topicals as the sole therapy, but with the rising rate of MRSP it should compel us to try. When antibiotics are necessary, it is more imperative than ever to utilize proper doses and treatment duration. We are not doing our patients, clients or society any favors by utilizing inadequate doses in an

attempt to save clients money. Remember “Dead bugs don’t mutate.” The other issue which many times is overlooked is investigation of the underlying cause of the pyoderma. Even with successful control of the active infection, if the underlying etiology is not identified and controlled, the patient is susceptible to further infections. There has been a true “paradigm shift” regarding our approach to the use of antibiotics. In previous years, it was “do everything reasonable” to avoid the chronic use of corticosteroids, but now we attempt everything reasonable to avoid the repeated use of antibiotics. Techniques such as “pulse dosing” are no longer utilized for our dermatology patients.

There are several studies to support the hypothesis that the frequent use of fluoroquinolone antibiotics has been one of the factors responsible for the rise in MRSP. Therefore they should be used for cases of pyoderma only when there are no other feasible or effective options. I still prefer the cephalosporins such as cephalexin or cefpodoxime as my first line of antibiotics, although clavulonic acid potentiated amoxicillin, Trimethoprim sulfas, and clindamycin all remain appropriate first line empirical choices. I am now much quicker to recommend a culture if a patient is not responding to an empirically chosen antibiotic. Simply choosing a different antibiotic empirically risks wasting more time and money, especially since most MRSP are resistant to many of the empirically chosen antibiotics. For patients who do have a MRSP infection, there still may be oral antibiotics to which the bacteria are sensitive. My preference in order that I will use is clindamycin, Trimethoprim/sulfa, doxycycline and chloramphenicol only as a last resort. Injectable aminoglycosides are only used in the most serious and refractory cases. Drugs such as vancomycin are not absorbed if given orally, and are used in life-threatening infections in people. Most feel they should not be used in veterinary patients to minimize the risk of this drug loosing efficacy in people.