DEMODICOSIS, also called “red mange” or “demodectic mange,” is an inflammatory skin disease caused by an overabundance of demodex mites. The most common causative demodex species in dogs is Demodex canis; however, D. injai and D. cornei have also been reported and are seen in practice. Different species can be seen simultaneously in the same patient. Hallmarks of the disease in dogs include alopecia, erythema, comedones, increased keratosebaceous exudate (greasy skin), and folliculitis, which can progress to deep furunculosis. Secondary pyoderma is common.

Canine demodicosis has classically been categorized as either juvenile or adult onset, and as either localized or generalized disease. These classifications play a role in determining the underlying cause, as well as the prognosis, of the disease. Though true adult-onset generalized demodicosis is uncommon, it is more serious than juvenile-onset and is more often associated with underlying immunosuppression. Generalized demodicosis is one of the most serious canine skin diseases, with a potentially fatal outcome in the absence of treatment.

While demodicosis is initially diagnosed by skin scraping and cytology, additional diagnostic testing, including hematologic and urologic assessments are important when evaluating these patients. Concurrent disorders recognized in dogs with adult-onset demodicosis include, but are not limited to: hypothyroidism, spontaneous or iatrogenic hypercortisolism, leishmaniasis, malignant neoplasia, and concurrent immunosuppressive therapy. In more than 50% of cases, an underlying disease cannot be documented at the time of diagnosis with demodicosis; however, these dogs should continue to be closely monitored, as malignancy or systemic illness may become obvious in the subsequent weeks to months.

The case described herein is one of adult-onset generalized demodicosis, deep pyoderma, and furunculosis in which hematologic and urologic evaluations were an important part of the diagnostic workup and patient monitoring.

An 11-year old, female spayed Shih Tzu was presented with a 5-month history of non-seasonal dorsal and pedal draining and crusted lesions that had been unresponsive to enrofloxacin. Similar lesions had occurred 2 years prior and had resolved with an unknown medical therapy. The patient showed no signs of systemic illness apart from mild lethargy and intermittent stranguria. No other animals or people in the household were affected with dermatologic disease.
On presentation, the patient had numerous, thick, yellow-black crusts overlying draining tracts, erosions, and ulcerations along the cranial dorsal trunk and ventral chin. All paws were markedly swollen and had similar draining tracts, erosions, ulcerations, and matting of the hair with hemorrhagic exudate (Image 1). Otoscopic examination revealed bilateral moderate ear canal erythema and ceruminous debris; however, ear canals were normally distensible on palpation. The presentation was consistent with truncal and pedal folliculitis and furunculosis, with bilateral otitis.

**Diagnostics**

The three primary causes of folliculitis in the dog are demodicosis, pyoderma, and dermatophytosis. In some dogs, the three conditions may be present simultaneously. Initial diagnostic testing for these conditions should include skin scraping, dermatophyte culture, and cytology.

A skin scraping of the dorsal crusted area, as well as a pluck of the interdigital hair, revealed numerous (5-10/low power field) D. canis mites (Image 2). Impression cytology of the dorsal trunk draining tracts revealed significant presence of intra- and extracellular coccoid bacteria in a neutrophilic milieu. Dermatophyte culture was obtained and was determined to be negative three weeks later. Cytology of the ceruminous debris revealed D. injai mites within the cerumen but no other microorganisms.

Based on these results, a diagnosis of adult-onset demodicosis with a deep pyoderma, otitis and pododermatitis was made.

Labwork, including blood chemistry, complete blood count, thyroid evaluation and urinalysis with culture, is an important minimum data base when evaluating a case of adult-onset demodicosis. Diagnostic imaging may also be warranted. Aerobic skin culture was also obtained, given the history of non-response to enrofloxacin.

Aerobic culture of the dorsal trunk draining tracts revealed a methicillin-susceptible Staphylococcus pseudintermedius. Urinalysis revealed significant bacteriuria and hematuria with mild proteinuria. Aerobic culture of the urine identified Enterococcus species. Both bacterial species were susceptible to amoxicillin-clavulanate.

Blood chemistry results revealed a marked hyperproteinemia of 11.2 g/dL (range 5.5-7.5) with marked hyperglobulinemia of 9.6 g/dL (range 2.4-4.0) and moderate hypoalbuminemia of 1.6 g/dL. Albumin to globulin ratio was correspondingly decreased at 0.2 (range 0.7-1.5). The complete blood count was unremarkable and the total T4 was just below the normal range at 0.9 ug/dL (range 1.0 – 4.0ug/dL). Given the concurrent extent of skin disease and the lack of corresponding hematologic and chemistry abnormalities (e.g. hypercholesterolemia, anemia, etc.), the patient was considered euthyroid. Differential diagnoses for the significant serum protein abnormalities included...
neoplastic versus a severe inflammatory process. It was not suspected that the hypoalbuminemia reflected urinary or gastrointestinal losses given the patient’s clinical appearance, lack of suggestive history, and mild proteinuria on urinalysis. Hypoalbuminemia was attributed to a compensatory response to severe hyperglobulinemia.

To further evaluate the hyperglobulinemia, Coccidioidomycosis titers (endemic in the region) were performed and were negative for IgG and IgM. Protein electrophoresis indicated a polyclonal gammopathy. Based on these results, inflammatory processes remained a potential cause for the hyperglobulinemia. The owners elected to perform serial monitoring of globulin levels via chemistry panel over time with treatment of the demodicosis, pyoderma and cystitis.

Ivermectin (0.5 mg/kg PO daily) and a 6-week course of oral antibiotic (amoxicillin-clavulanate at 22 mg/kg PO BID) therapy were initiated. Twice weekly bathing with a benzoyl peroxide shampoo was initiated for antibacterial and follicular flushing effects.

At the scheduled recheck four weeks after initiating therapy, the patient was significantly improved. The crusting and draining tracts from the trunk and feet had resolved indicating clearing of the deep pyoderma. The ears contained only subtle amounts of ceruminous debris. Multiple skin scrapings, ear cytology and hair plucks revealed one dead adult mite. A urinalysis was normal indicating the cystitis had cleared. Repeating the blood work showed improvement in the hyperproteinemia (9.0 down from 11.2 g/dL) and hyperglobulinemia (7.0 down from 9.6 g/dL) and hypoalbuminemia (2.0 up from 1.6 g/dL).

Examination and blood work after three months of ivermectin therapy revealed normal skin, feet and ears with negative skin scrapings and blood work all within normal levels.

This case illustrates the importance of additional laboratory testing in the diagnosis of adult-onset demodicosis. Though this patient had no history of known underlying disease, hematologic and urologic evaluation revealed concurrent urinary tract infection and a marked hyperproteinemia and hyperglobulinemia. Continued monitoring of this patient with serial complete blood counts and chemistry panels constitute an important element of care for these patients and may help to identify an underlying disease in its earlier stages.

4 weeks after initiating antibiotic and anti-parasitic therapy, all crusting and deep pyoderma has resolved. Follicular casting and comedones with residual hyperpigmentation are evident.