Disorders of keratinization lead to hyperkeratosis and occur in specific breeds. The hyperkeratosis may be parakeratotic or orthokeratotic. The epidermis and follicular epithelium may be hyperplastic. The changes in the epidermis and the accumulations of keratin may lead to secondary infections which need to be treated and controlled. Diagnosis is usually made by ruling out other differential diagnoses and then confirming through histopathology. Biopsies should be obtained from the thickest areas of scaling, moderate scaling areas and relatively normal areas.

Keratinization defects require lifelong management. Treatment of secondary infections (both bacterial and yeast) is very important. Bathing with a shampoo that is keratolytic and keratoplastic and non-drying is very helpful in reducing scale and preventing secondary infections. Systemic therapy with vitamin a (10,000 iu sid to bid or in large breeds as high as 20,000 iu bid) or retinoids may be useful.

Specific disorders

Primary seborrhea
Is an inherited disorder of cornification that has been reported in cocker spaniels, english springer spaniels, bassett hounds, golden retrievers and shar peis, doberman pinschers, irish setters and german shepherd dogs. Seborrhea is clinically described as greasy (oleosa) or dry (sicca). It is extremely important to rule out other causes of excessive scaling such as endocrinopathies, ectoparasites, pyoderma, malassezia dermatitis, demodicosis, leishmaniasis, neoplasia, follicular dysplasias, allergic dermatitis or environmental influences because the majority of seborrhoeic cases will be secondary. Primary seborrhea should be confirmed through histopathology.

Management of primary seborrhea involves controlling secondary infections, proper grooming to reduce the build up of scale with weekly keratolytic/keratoplastic shampoos and systemic therapy. Oral vitamin a and retinoids have been used to help "normalize" the keratinization process.

Vitamin a responsive dermatosis
Is a rare keratinization defect seen primarily in cocker spaniels. This may be a vitamin a responsive form of primary seborrhea. Clinically the vitamin a responsive dermatosis is seen predominantly ventrally where as primary seborrhea has a more dorsal distribution. Management involves oral vitamin a, weekly bathing with a keratoplastic/keratolytic shampoo and control of secondary infections.

Canine ear margin seborrhea
Is a relatively common keratinization defect confined to the pinnal margins and is seen primarily in dachshunds. The primary differential diagnosis is ischemic dermatopathy or scabies. A biopsy can confirm the diagnosis. A small shave biopsy is recommended. Histopathology resembles primary seborrhea and knowledge of clinical distribution is needed.

Topical antiseborrhics and/or vitamin a may be helpful in the management of ear margin seborrhea.

Hereditary nasal parakeratosis of labrador retrievers
In this disorder clinical signs are seen between 6 months and 2 years of age. Hyperkeratosis and depigmentation of the nasal planum are the only clinical signs. Histopathology reveals parakeratosis with serum lakes and superficial interstitial to interfasciular lymphoplasmacytic dermatitis. Propylene glycol or white petrolatum topically are effective but need to be continued.

Schnauzer comedone syndrome
Is a common disorder of miniature schnauzers. Lesions occur along the dorsal midline and may be very mild to severe. There may be small comedones that are just visible to severe crusting and scaling with secondary infections. Diagnosis is based on breed and clinical findings. Bacterial, yeast or demodex infections do need to be ruled out. Management involves controlling secondary infections, weekly bathing with benzoyl peroxide and/or anti-seborrheic shampoos and vitamin a.

Sperulosus
A rare disorder of kerry blue terriers. There are hard and brittle spicules emerging from hair follicles usually over the lateral hocks. These spicules may be irritating and the dogs may lick or chew at them.

Ichthyosis
A rare disorder of dogs that resembles the ichthyotic diseases in people. In humans four types of ichthyosis have been reported (ichthyosis vulgaris, x-linked ichthyosis, epidermolytic hyperkeratosis and lamellar ichthyosis). Ichthyosis is characterized by adherent scale resembling “fish scales” that is usually present at birth. Canine ichthyosis resembles lamellar ichthyosis.
Ichthyosis has been reported in west highland white terriers, doberman pinschers, irish setters, collies, bull terriers, boston terriers, labrador retrieves, jack russell terriers (parson terriers) and golden retrievers.

Primary differential diagnoses include, demodicosis, pyoderma, malassezia dermatitis, dermatophytosis, sebaceous adenitis, cheyletiella. Histopathology should be done to confirm the diagnosis.

Frequent bathing with a moisturizing antiseborrheic shampoo may be helpful in managing these cases. The author has treated golden retrievers with ichthyosis with doxycycline (5 mg/kg bid) with good response.

Norfolk terriers
A mild cornification defect in seven related norfolk terrier dogs has been reported. Lesions were present at birth and an autosomal recessive mode of inheritance is suspected. Clinically there was hyperpigmentation with scaling following mild trauma. The lesions were generalized but most prominent in the glabrous skin of the axillary and inguinal regions-areas.

The most striking histological change was vacuolation in the upper epidermis, which often resulted in epidermolysis and blister formation. Ultrastructural changes included abnormal keratin filament clumping, prominent clear spaces in the cytoplasm of suprabasal keratinocytes, and abnormal keratohyaline granules. Immunohistochemical labeling for keratin 10 demonstrated a lack of expression in the superficial epidermis of affected dogs (barnhart).

Sebaceous adenitis
A heritable disorder that has been recognized primarily in standard poodles, akitas, viszlas and samoyeds. Other purebred dogs and some mixes have also been reported. The etiology of sa is still unknown. A keratinization defect has been suspected based on histopathology and responsiveness to vitamin a or retinoid. However, research also has shown that sa may be mediated by immune mediated targeting of the sebaceous glands (personal communication with j. Rybnicek). Additional evidence to support an immune mediated etiology is responsiveness to cyclosporine a at a dosage of 5 mg/kg/d. Long-term treatment appears to be necessary to control the disease. The american standard poodle breeders determined an autosomal recessive mode of inheritance in standard poodles and have actively campaigned to eliminate the disease from the breed. An autosomal recessive mode of inheritance is also suspected in akitas. The orthopedic foundation for animals (ofa) operates an open registry for sebaceous adenitis in the standard poodle. Owners and breeders of standard poodles are encouraged to have a punch skin biopsy done on any standard poodle exhibiting suspicious signs of skin disease or on any standard poodle that is utilized in a breeding program. Protocol for registering tested animals requires that the biopsy be evaluated by a ofa approved dermatopathologist.

Clinically, there is progressive alopecia with adherent scale. Hairs epilate easily and have a “keratin cuff” adhered to the base of the hair. Sa is caused by an inflammatory destruction of sebaceous glands. The lack of sebaceous excretions leads to abnormal follicular function, an impaired epidermal barrier and dry skin.

Diagnosis is made by histopathology. Multiple samples from severely affected to normal should be submitted for evaluation.

Management involves weekly bathing with a moisturizing antiseborrheic shampoo followed by a leave in moisturizer, oral vitamin a, 75% propylene glycol topically, and control of secondary infections. A protocol of “baby oil” soaks followed by a degreasing shampoo has been recommended but in the authors experience this is cosmetically unacceptable. Even propylene glycol will leave the hair coat greasy. Dogs with sa are prone to secondary infections as well.

Congenital follicular parakeratosis
Two recent case reports described a congenital keratinization defect (congenital follicular parakeratosis; cfp) in rottweiler and siberian husky dogs. Skin biopsy specimens revealed marked parakeratosis targeting the hair follicle and numerous intracorneal vacuoles.

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