Dermatologic diseases in small animal veterinary medicine comprise roughly 20% of a general practitioner’s caseload.1

The skin has many functions, including thermoregulation, camouflage, and protection, but one of its most interesting purposes is its function as a marker of internal disease.2,3 While many skin and ear diseases of dogs and cats are allergic (eg, atopy, food allergy, flea allergy) or infectious (eg, bacterial or yeast pyoderma/otitis, dermatophytosis), skin lesions can also be manifestations of internal disease.

Pet owners may see skin lesions long before bringing their pets to the veterinarian. With a thorough history and physical examination, these lesions, along with other nondermatologic signs, can help identify underlying disease.

Following is a list of some common as well as uncommon internal diseases that may insult the skin. This article focuses primarily on dermatologic signs; a complete list of signs associated with these diseases can be found in the literature.3

1 HYPOTHYROIDISM

Profile
Hypothyroidism is a commonly diagnosed canine endocrine disease, with golden retrievers and Dobermans at approximately 0.2% to 0.8% higher risk.4 Neutered males and female dogs may be at higher risk, and while animals of any age can be affected, risk is greater in 6- to 10-year-old dogs and 2- to 3-year-old giant breed dogs.5

Dermatologic Signs
Because thyroid hormones affect most every body tissue, it is not surprising that dermatologic effects are seen in 60% to 80% of cases.6 Most common dermatologic signs include (Figure 1):

- Nonpruritic, bilaterally symmetric alopecia that mainly affects the lateral trunk and flank
- “Rat-tailed” appearance, with alopecia to the tail
- Poor or rough hair coat.

Diagnosis & Treatment
In most patients, with appropriate diagnosis and case management, such as thyroid hormone replacement, dermatologic signs will slowly resolve in a 6- to 8-week period.

2 HYPERADRENOCORTICISM

Profile
Hyperadrenocorticism (Cushing’s disease) is a very common endocrinopathy. Naturally occurring hyperadrenocorticism is most often seen in middle-aged to older dogs. Dachshunds, Boston terriers, poodles, and boxers have a higher incidence of disease,6 and studies point to a higher incidence in female dogs.

This disease often presents in my practice with only dermatologic signs. Many cases have normal serum biochemistry and complete blood count values, although some will have the “classic” elevated serum alkaline phosphatase and stress leukogram.

Dermatologic Signs
Dermatologic signs range from:

- Truncal, nonpruritic bilaterally symmetric alopecia
- Thin skin and comedones (especially on the ventral abdomen)
- Flaccid pustules
- Pinnal alopecia
- Scaling
- Calcinosis cutis
- Very commonly, nonpruritic pyoderma (Figure 2).

A review of 10 cases of hyperadrenocorticism with only cutaneous signs found that nonpruritic alopecia and nonpruritic pyoderma were most common.7
Diagnosis & Treatment
There are several diagnostic tests for hyperadrenocorticism.
• Adrenal function tests are most commonly used, including the adrenocorticotropic stimulation test and low-dose dexamethasone suppression test.
• Urinary cortisol:creatinine ratio evaluation can also be performed; a level greater than 13 is typically diagnostic for canine hyperadrenocorticism. If using this diagnostic test, a plasma cortisol value is needed as a starting point.
• Many serum biochemistry values may be abnormal, with elevated triglycerides, cholesterol, increased alkaline phosphatase (steroid-induced isoenzyme), and decreased blood urea nitrogen. Alkaline phosphatase is elevated in 80% to 95% of cases.6

3 CALCINOSIS CUTIS
Profile
Calcinosis cutis is the deposition of calcium in the dermis, resulting from dystrophic or metastatic calcification. It is most commonly seen as a result of dystrophic calcification, which usually occurs more often in dogs than cats. Widespread calcinosis cutis is referred to as calcinosis universalis, whereas more localized disease is called calcinosis circumscripta.9

The most common underlying cause of calcinosis cutis is hyperadrenocorticism—either endogenous or iatrogenic Cushing’s disease. Additionally, metastatic calcification can occur in dogs or cats with chronic renal failure.9

Dermatologic Signs
Dermatologic signs include:
• Variable sized areas of patchy alopecia
• Firm papules or nodules on the dorsal trunk; the paw pads and inguinal region may also be affected (Figure 3)4
• Pruritus is variable; however, most cases are moderately pruritic.
I have also seen bilaterally symmetric nodules on the preauricular region.

Diagnosis & Treatment
Calcinosis cutis is definitively diagnosed through skin biopsy that shows calcium deposition in the tissue.

Treatment involves:
• Management of underlying disease, with slow resolution of mineral resorption
• Direct application of DMSO gel to affected areas once daily to assist with mineral dissolution. Serum calcium levels should be monitored as calcium release from the larger nidus of calcium in the tissue may elevate levels.

4 ALOPECIA ASSOCIATED WITH FOLLICULAR ARREST
Profile
Adrenal sex hormone alopecia is a somewhat controversial topic, with both evidence for and against specific pathomechanisms, testing, and treatments. This condition has been given several names over the years, including castration-responsive dermatosis, adrenal hyperplasia-like syndrome, biopsy-responsive alopecia, growth hormone-responsive alopecia, pseudo-Cushing’s syndrome; however, the currently suggested names are alopecia X or alopecia associated with follicular arrest. The former names have now been separated into various sex hormone dermases.10

Nordic breeds and Pomeranians appear more commonly affected.9 The median age of clinical sign onset is 4 years, with a range of 10 months to 10 years.11

Dermatologic Signs
The dermatologic sign most commonly seen is nonpruritic truncal alopecia, which spares the head and distal extremities (Figure 4). In some cases, bacteria pyoderma and yeast can be seen cytologically.

Diagnosis & Treatment
Diagnosis requires:
• Ruling out common canine endocrinopathies, such as hypothyroidism and hyperadrenocorticism
• Performing adrenal sex hormone testing (www.vet.utk.edu/diagnostic/endocrinology/index.php); however, this test may not provide a definitive diagnosis
• Taking skin biopsies to help rule out other dermatologic conditions.

Several medical therapies are available, including melatonin, flax lignans, trilostane, and mitotane. If intact patients have hyperestrogenism (female dogs) or hyperandrogenism (male dogs), castration or ovariohysterectomy are the treatments of choice, with response seen in 3 to 6 months.11

5 PRIMARY HYPOPARATHYROIDISM
Profile
Primary hypoparathyroidism is an uncommon endocrinopathy in dogs and cats; however, it can result in moderate to severe pruritus and can be mistaken for allergic disease. The disease has been seen in dogs as young as 6 weeks and as old as 13 years. Toy poodles, Labrador retrievers, miniature Schnauzers, German shepherds, and terriers are most commonly affected.12

Dermatologic Signs
Facial pruritus has been reported in more than 60% of cases, and is exhibited by:12,13
• Muzzle, eye, and ear pawing
• Rubbing the muzzle on the ground
• Paw chewing/biting.

It has been hypothesized that pain associated with hypocalcemia in the masseter and temporal muscles, which causes cramping and possibly a “tingling” sensation around the mouth, is responsible for pruritus.
Diagnosis & Treatment
Along with dermatologic signs, neurologic abnormalities are the most common clinical problems. In addition, serum biochemistry will reveal a decrease in serum calcium and increase in serum phosphate levels. The disease can be confirmed by measuring serum concentrations of parathyroid hormone (PTH), with most dogs having low to undetectable serum PTH concentrations. Treatment commonly involves administering oral calcium supplementation in the form of antacid tablets (calcium carbonate), along with vitamin D analogues. Good references for these medications and supplements are Textbook of Veterinary Internal Medicine and Plumb’s Veterinary Drug Handbook.

ACQUIRED SKIN FRAGILITY SYNDROME

Profile
Acquired skin fragility syndrome is a rare condition seen in cats. It results from an underlying condition, which is usually difficult to identify because the syndrome is a multifactorial disease. Feline cholangiohepatitis, multicentric lymphoma, diabetes mellitus, and Cushing’s-like syndrome have all been reported.

Dermatologic Signs
Cases present with tearing of very thin and fragile skin that lacks hyperextensibility, which is in contrast to the hyperextensibility of the skin seen in Ehlers-Danlos syndrome or dermatosparaxis—rare dermatoses in cats that are differential diagnoses for acquired skin fragility syndrome.

Many times the tearing is initially seen when the cat is “scruffed” for routine restraint (Figure 5).

Diagnosis & Treatment
Identifying and treating the underlying condition is crucial to therapy, but diagnosis and management of these diseases can sometimes be challenging. Treatment also involves avoidance of trauma to the skin (eg, avoiding restraint, cats fighting/playing).

PARANEOPLASTIC DISEASE

Several paraneoplastic disorders present as internal neoplasms with cutaneous manifestations:

Paraneoplastic pemphigus is a rare blistering disease that affects the mucocutaneous junctional areas (eg, oral and genital orifices) along with haired skin.

Thymic lymphoma and splenic sarcomas have been reported as underlying neoplastic conditions.

Diagnosis requires a skin biopsy and, likely, immunologic staining.

In dogs, the proteins targeted by antibodies are demoplakin, enoplakin, periplakin, and dermoglein 1 and 3, which play an integral role in normal cohesion of keratinocytes.

Testicular neoplasias, such as Sertoli cell tumors, are seen most commonly in cryptorchid male dogs in association with feminization syndrome.

- The clinical sign linear preputial erythema, in which a linear erythematous band runs along the preputial region, has been seen in cases of Sertoli cell tumors (Figure 6).
- Removal of the affected testis commonly results in resolution of hyperestrogenism.

Feline paraneoplastic alopecia is an uncommon skin disease; however, it is usually easy to recognize in affected cats. Its underlying cause is usually pancreatic adenocarcinoma or bile duct carcinoma.

- The exact mechanism of this alopecia is unknown.
- These cats have extremely shiny to glistening alopecic skin that is dry with a very smooth texture (Figure 7); common areas affected include the ventrum, legs, and face.
- Most cats die or are euthanized within 8 weeks of initial appearance of alopecia.

Feline thymoma-associated exfoliative dermatitis is a rare disease seen in middle-aged to older cats.

- The exact cause is unknown, although erythema multiforme has been thought to possibly initiate it, because it is also seen in cases without thymoma.
- Skin lesions often are seen prior to clinical signs of neoplasia. Most patients are nonpruritic and have marked scaling and erythema, patchy alopecia, and occasionally, crusting. Periocular and perioral or interdigital brown keratosebaceous debris may be present.
- Histopathology from skin biopsies can help with pattern recognition; however, it cannot differentiate between graft–versus–host disease or erythema multiforme. Thus, radiographic or ultrasonographic studies are needed to confirm the presence of a mediastinal mass (thyma).

Nodular dermatofibrosis (collagenous nevi) has been associated with renal cystadenocarcinomas or cystadenomas, most often in German shepherd dogs or crosses.

- These dogs have an autosomal dominant inheritance due to a mutation in the BHD gene, characterized by an onset of lesions between 3 to 7 years of age.
- Skin lesions may be stimulated by growth factors (transforming growth factor alpha and beta) produced by renal tumors.
- Multiple nodules, which may be relatively symmetri-
cal, are found on the distal extremities. These nodules may ulcerate, creating pain and lameness.

- Treatment is either benign neglect with observation or surgical tumor removal.

Other paraneoplastic disorders in this category include acquired skin fragility syndrome in cats (see #6) and superficial necrolytic dermatitis in dogs and cats (see #8).

HEPATOCUTANEOUS SYNDROME

Hepatocutaneous syndrome, also referred to as superficial necrolytic dermatitis, necrolytic migratory erythema, and metabolic epidermal necrosis, is an uncommon disease in both dogs and cats.

This syndrome can be associated with several chronic liver diseases or, less commonly, a glucagonoma-secreting neoplasia (8 of 75 cases reported). The author has seen 2 cases in dogs in which the underlying pathology was diabetes mellitus. Reports have also linked administration of phenobarbital and development of this syndrome.

A nutritional effect, such as hypoalbuminemia, biotin deficiency, or zinc deficiency, on the skin cells is thought to create the clinical signs.

Dermatologic Signs

The paw pads are most commonly affected, with extreme thickening, pad margin proliferation, and fissures (Figure 8). In addition, crusts, erosions, and ulcerations can be present at the mucocutaneous junctions of the perioral and perigenital regions.

Diagnosis & Treatment

Diagnosis is made by:

- Histopathology, with a common appearance of epidermal “red, white, and blue” color changes on routine staining
- Liver ultrasound, which commonly reveals a “Swiss cheese” or “moth-eaten” appearance (considered nearly pathognomonic for the disease).
- Serum hepatic function tests, with typically elevated alkaline phosphatase and alanine transaminase
- Blood analysis, with elevated blood glucose and normocytic, normochromic nonregenerative anemia.

Treatment is focused on management of pancreatic or liver disease. Many clinicians have implemented intravenous amino acid infusions and dietary modifications to help with disease control.

- Aminosyn 10% (hospira.com) is used for IV infusions (see reference 19 for further details).
- A high-protein diet with essential fatty acids may be helpful; commercial diets and home-prepared diets have been used. Consultation with a veterinary nutritionist is helpful, especially if the owner chooses to feed a home-prepared diet.

This disease carries a poor prognosis. I have had 2 cases that survived more than 2 years after initial biopsy diagnosis, with dietary modification and management of underlying liver/pancreatic disease (eg, diabetes mellitus).

PHOTO CREDITS

Figures 3A and 3B: Wayne Rosenkrantz, DVM, Diplomate ACVD/Animal Dermatology Clinic, Tustin, CA

Figure 8: Mona Board, DVM, Diplomate ACVD/Animal Dermatology Clinic, San Diego, CA

References