Alopecia:
What to do when the Thyroid is Normal

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When a patient presents to a veterinarian with the complaint of hair loss, we have had it ingrained in us to investigate the thyroid and cortisol levels. When these tests reveal normal thyroid and adrenal gland function, a second tier of differential diagnosis needs to be considered.

There are normally several phases to the hair cycle. Anagen is when the follicle is in an active growing stage. Catagen is a transition phase between anagen and telogen which is the resting phase. Exogen is the shedding of the hair. Breeds in which anagen is the predominant phase will have minimal shedding but require regular grooming or cutting of the hair. Examples are poodles, Old English sheepdogs, Angora rabbits and humans. Breeds in which telogen is predominant will exhibit continuous or seasonal shedding. Labrador retrievers have continuous shedding while malamutes will be more seasonal with their shedding. Clients and others will use the term “blow the coat” to describe this dramatic shedding.

As with many dermatological abnormalities, the signalment and history can be important when determining the cause of hair loss. Questions regarding age of onset, sex of the patient, reproductive history, the medical history prior to onset of the alopecia are all potentially important.

When examining a patient with alopecia, the clinician should evaluate for the presence or absence of inflammation and look for lesions suggestive of pruritus with hair barbering. Changes in skin or coat color or texture might prove helpful diagnostically. Note the pattern, is the alopecia bilaterally symmetrical suggestive of hormonal or congenital abnormalities, or is there asymmetry or focal or multifocal lesions suggestive of inflammation of the skin or follicle. Lesions such as papules, pustules, crust or scale are also important to note and typically suggest an inflammatory cause to the hair loss, and/or secondary bacterial infection of the follicle.

Approach to hair loss diagnostics
A Trichogram, or hair pluck, is a vastly under-utilized diagnostic tool when evaluating a patient with hair loss. The technique involves plucking a group of hairs with a hemostat and placing the hair on a glass slide which has a drop of oil to hold the hairs in place. The microscope diaphragm should be closed. The hair shaft should be evaluated, is there breakage at the tip suggesting broken or barbered hairs? The presence of melanin clumping should be noted, as well as the shape of the hair bulb and the stage of hair growth. With practice a clinician can identify ectothrix hyphae of dermatophytes, and demodex mites can also be found with trichograms.

Congenital and heritable causes of alopecia
Examples of congenital or heritable alopecia include the well-known alopecic dog breeds such as the Mexican hairless (Xoloitzcuintle), Chinese crested, as well as the lesser-known American Hairless terrier and Inca hairless dogs. Cats with heritable alopecia include the Sphinx, Donskoy, Bramble cat, Dossow and Peterbald. In these breeds, the hairlessness is thought to have an autosomal dominant mode of inheritance, and some individuals may also have features of ectodermal dysplasia or may also exhibit abnormal dentition, glandular formation and/or function.

Black hair follicular dysplasia
An uncommon condition where the alopecia is confined to the black haired portions of the coat. The early clinical appearance may be broken or dull appearing hair which later develops more obvious alopecia and scaling. The condition is thought to be an autosomal recessive trait and susceptible breeds include Bearded collie, Saluki, Border collie, King Charles spaniel, Jack Russell terrier, Gordon setter and Yorkshire terriers. The diagnosis can be supported with a trichogram which reveals clumping of melanin in the hair shaft and confirmed with histopathology showing large clumps of melanin within the melanocytes of the hair matrix as well as atrophic or distorted hair follicles.

Color dilution alopecia
Affects blue, gray, fawn and red coats (aka “dilute coats) with clinical signs occurring between 3-24 months of age. These individuals typically have full hair coats as puppies and young adults. Alopecia is thought to be due to abnormal transfer of pigment into the hair which results in broken hairs and subsequent alopecia. Trichogram and histopathology findings are identical to that of black-haired follicle dysplasia, and no effective therapy exists for either condition.

Other even more uncommon or rare congenital or hereditary causes of alopecia will be shown during the lecture including melanoderma and alopecia in Yorkshire terriers, “Bald thigh syndrome” in greyhounds, and breeds with hair cycle abnormalities leading to alopecia such as Irish water spaniels and Portuguese water dogs.
Immune-mediated alopecia
One of the more common immune-mediated causes of alopecia is sebaceous adenitis. Breeds which are predisposed include the Standard poodle, Samoyed, Akita, Havanese, German shepherd, vizsla and dachshund. Clinically the condition may be generalized and symmetrical, or more focal or multifocal. There is often a change in both the color and texture of the skin and coat, and the clinicians should note the presence of follicular casts. Pruritus is variable. On histopathology the pathologist will see inflammation around sebaceous glands or even more commonly complete absence of these glands. Because the hair loss can be symmetrical, and dramatic in long-coat breeds, the disorder is frequently misdiagnosed as hypothyroidism.

Other rare immune-mediated causes of hair loss will be shown including alopecia areata, alopecia universalis, and canine familial dermatomyositis.

Hypothyroidism
The first test usually called for with symmetrical alopecia is resting thyroid. Thyroid hormone influences cell cycle kinetics of the hair bulb, and low thyroid levels leads to decrease proliferative activity. Thyroid receptors are found on sebocytes, cells of the outer root sheath and dermal papilla. With hypothyroidism the alopecia is a result of slower elongation of the hair shafts (prevention of anagen) and hair cycle arrest. Clinically the hair coat may appear dull and brittle, with nonpruritic, non-inflammatory and symmetrical truncal alopecia, although alopecia may be first noted in areas of wear or failure to regrow post-clipping. In some breeds such as boxers and Doberman pinschers, hair retention may lead to a “bleached out” appearance. Average age of onset is between 6-10 years of age, and dermatologic changes are seen in approximately 60-80% of cases. Other clinical signs include lethargy, weight gain, mental dullness and myxedematous changes (tragic facial expression). It is important to differentiate between true hypothyroidism and euthyroid sick syndrome, and to keep in mind the drugs that will interfere with thyroid levels when testing. An in depth discussion of thyroid testing is beyond the scope of these notes and lecture.

Hyperadrenocorticism
(Cushing’s disease) is the second most common endocrine disorder resulting in alopecia in the dog. In addition to symmetrical alopecia, other cutaneous abnormalities can include thin skin, comedones, hair color changes (bleaching) and hyperpigmentation. Non-dermatologic clinical signs include PU/PD, polyphagia, muscle wasting and pot-belly formation, excessive panting and lethargy. The diagnosis and treatment of Cushing’s disease is beyond the scope of this presentation.

Alopecia X
This is yet a different endocrine abnormality resulting in alopecia. The exact etiology is unknown, but thought to be related to imbalance of adrenal gland steroid hormone intermediates such as 17-hydroxyprogesterone. Plush coated breeds are predisposed such as Pomeranians, Alaskan malamutes, Chow chows, Keeshonds, Samoyeds, Siberian huskies. Age of onset can be younger than other endocrinopathies, often between 1-3 years of age. Initially loss of guard hairs results in a dry, dull coat which progresses to hair loss, especially in frictional areas, that becomes more wide-spread. The underlying skin may become scaly or hyperpigmented. The diagnosis is generally one of exclusion. Histopathology will show the classic changes of an endocrinopathy, but may also have features of follicular dysplasia or flame follicles. The sex-hormone stimulation test available at the University of Tennessee can also help rule out other sex-hormone disorders. Since this condition is not known to cause other systemic illness (unlike hypothyroidism or Cushing’s disease), conservative therapy is called for. Melatonin and flax seed oil with lignans may cause regrowth in about 40% (caution with diabetics). Mitotane and Trilostain can cause hair growth but have a higher risk of side effects.

Transdermal absorption of topical sex hormones
A growing cause of alopecia in dogs is being recognized due to accidental or unintended, transcutaneous absorption of human topically applied hormone replacement cream. This is often a testosterone cream for males or more commonly a combination cream (progesterone and/or estrogen and/or testosterone) for female application. In our experience the affected dogs are usually smaller (less than 15 kg) and have direct exposure to the human skin where the sex hormone replacement has been applied. The resulting alopecia in dogs is usually “patchy” and hyperpigmentation may also be seen. Other clinic signs have included onset of sexual behavior, enlarged nipples, or estrous like behavior in females. The diagnosis is based on history and the University of Tennessee sex-hormone panel can also confirm abnormal sex hormone levels. It is critical to question owners about exposure to exogenous sex-hormone replacement products in dogs with abnormal blood levels, especially before expensive imaging or invasive exploratory surgeries.

Pattern alopecia
Aka pattern baldness, is a non-inflammatory, non-pruritic, slowly progressive alopecic dermatosis which most commonly affects the convex pinna, periaurial areas, ventral trunk and caudal thighs, usually in a bilateral symmetrical pattern. Breeds most commonly affected include Boston terrier, boxer, Chihuahua, dachshund, Italian greyhound, miniature pinscher and whippet. No affected therapy is known, although there are anecdotal reports of melatonin having some efficacy.

Traction alopecia
Can develop after application of a hair clip or rubber band that is too tight, causing disruption of cutaneous blood flow and follicular atrophy. The alopecia is localized, typically on the dorsum of the head.
**Flank alopecia**
Aka seasonal flank alopecia, cyclic flank alopecia or recurrent flank alopecia is a localized, potentially seasonally recurring, non-inflammatory alopecia which is often accompanied with hyperpigmentation. Some consider this another variation of Alopecia X. It is often bilateral but not necessarily symmetrical. Melatonin and Flax seed oil with lignans is the normal recommended therapy, but this has variable and sometimes poor efficacy.

**Post-vaccination panniculitis**
Occur most commonly, but not limited to, a rabies vaccination. Lesions are most commonly alopecic patches at or near the injection site, but can be wide spread, and even multiple sites. Alopecia may be noted 2-4 months after an injection and small dogs (under 10 kg) are predisposed. Topical tacrolimus and systemic pentoxifylline are therapeutic options.

**Chemotherapy induced hair follicle dystrophy**
Is caused by chemotherapeutic agents which affect cell division, resulting in impaired mitotic and metabolic processes in actively growing hair follicles. Hair loss begins 7-10 days following initiation of treatment and is most dramatic within 1-2 months. Breeds with hair follicle in which anagen is the dominant stage (poodles, Old English sheepdogs and terriers) are at increased risk.

**Post-clipping alopecia**
A term to describe failure of regrowth within 3 months of clipping. “Plush coated” breeds are at higher risk such as the Alaskan malamute, American eskimo, chow chow, pomeranian, samoyed, Siberian husky and keeshond. Because complete regrowth can occur within a year, it is also speculated these breeds normally have a very slow hair growth rate.

**Paraneoplastic alopecia**
A rare syndrome which is most commonly associated with pancreatic malignancy. The alopecia is generally acute with rapid onset spreading over the entire body and is accompanied with a characteristic shiny skin and large scale.

**Telogen effluvium**
Results from a stressful occurrence (pregnancy, shock, drugs and anesthesia) which results in abrupt premature cessation of growth and synchronization of hair follicles into catagen and then telogen. Hair loss typically occurs within 1-3 months of insult a trichogram may help identify large numbers of telogen follicles. The condition will spontaneously resolve.