

Introduction

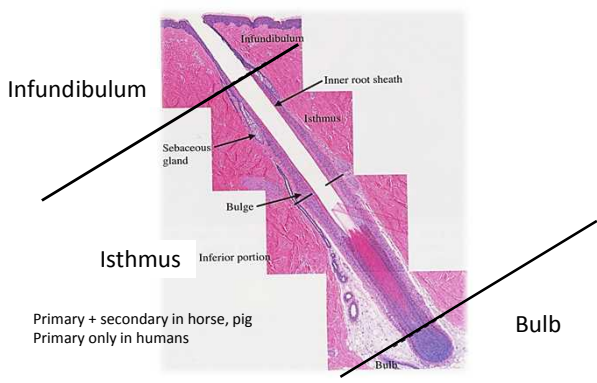
Alopecia (baldness): absence of hair in an area where it is normally present

Hypotrichosis: Partial hairloss or abnormal thinning of hair coat

May represent a mere cosmetic problem with no risk to patient (psychological effect)

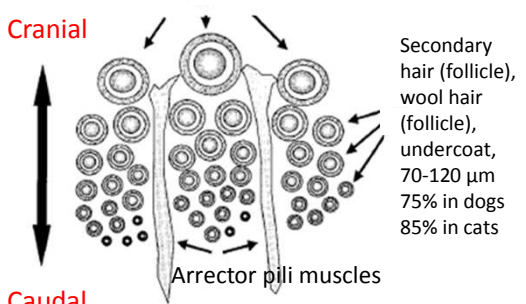
May be a manifestation of internal disease with potentially serious consequences

Single hair follicle



Compound hair follicle

Primary hair (follicle), guard hairs, 150-450 μm

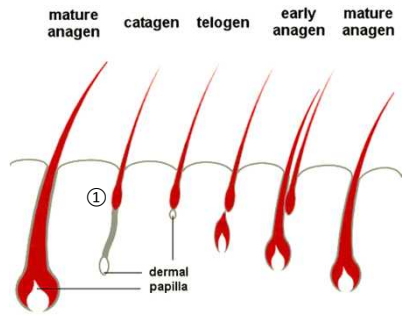


Largest central primary HF flanked by several primary and secondary HF and surrounded by a distinct arrector pili muscle

Canine Alopecia

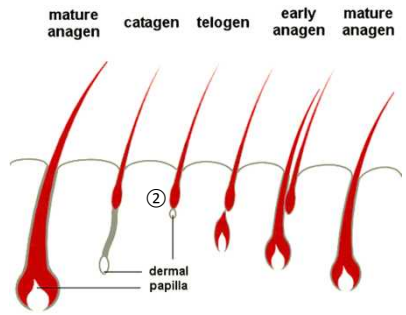
What Can It Be Other Than Hypothyroidism or Hyperadrenocorticism?

Hair follicle cycle



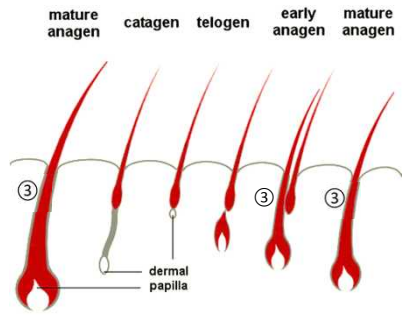
① Starts paradoxically by a short partial organ suicide via apoptosis (loss of 70% of tissue mass) called **catagen**. Hair follicle/shaft shortens. Papilla is drawn upwards but maintains close contact with hair follicle epithelium.

Hair follicle cycle



② When hair involution is complete, the hair follicle enters a period of relative rest called **telogen**. The resting phase is highly variable but often lasts a very long time.

Hair follicle cycle



③ Signals initiate the rapid active growth phase of hair follicle/shaft called **anagen**. At the end of the growing phase, signals cause the follicle to go back into the catagen phase.

Canine breeds

Anagen phase predominates in Poodles (hairs need to be cut regularly like humans)

Telogen phase prolonged in Nordic breeds (possibly developed as an energy-saving device in extremely cold climates, so they do not have to shed and regrow their coat)

True plush-coated breeds (Chow Chow, Pomeranian) have no guard hairs

Other Nordic breeds (American Eskimo Dog, Alaskan Malamute, Samoyed) have guard and a thick undercoat

Systematic approach – Step 1

Take history

What is the breed?

How old was the dog when alopecia was first recognized?

How long has the alopecia been present and how did it progress? Where on the body did the alopecia start ?

Is the dog pruritic?

Is the alopecia seasonal?

Are there systemic signs?

Are there other animals in the household?

Do they have a skin disease?

Does any person in the household have skin disease?

Systematic approach – Step 2

Rule out infectious skin diseases

Rule out demodicosis

Deep skin scraping

Trichogram

Rule out bacterial folliculitis

Dermatological examination

Skin cytology

Bacterial culture and sensitivity

Response to antibiotic therapy

Rule out dermatophytosis

Wood's lamp examination

Fungal culture

Canine Alopecia

What Can It Be Other Than

Hypothyroidism or Hyperadrenocorticism?

Systematic approach – Step 3

Rule out endocrine diseases

Rule out hypothyroidism

Rule out hyperadrenocorticism

History

Dermatological examination

Physical examination

Complete blood count

Serum biochemistry profile

Urinalysis

Hormone assays

Abdominal ultrasound

Atypical Cushings syndrome

	Atypical Cushings syndrome	Hyperadrenocorticism (HAC)
Incidence	Rare	Common
Findings	Clinical signs same as HAC Complete blood count, serum biochemistry profile abnormalities and urinalysis same as HAC	N/A
Hormone assays	Normal LDDST ACTH stimulation test – Adrenal panel (5) Normal or increased pre- and post-ACTH cortisol Increased pre- and post-ACTH estradiol, androstenedione, 17-hydroxyprogesterone, progesterone and aldosterone	ACTH stimulation test Increased pre- and post-ACTH cortisol

Reference laboratory: <http://www.vet.utk.edu/diagnostic/endocrinology/index.php>

Gonadal sex hormone imbalance

	Canine Sertoli cell tumor-associated skin disease	Canine female hyperestrogenism
Synonym(s)	Hyperestrogenism Male feminizing syndrome	Ovarian imbalance type I
Incidence	Rare	Rare
Breed predilection	Boxer, Shetland Sheepdog, Pekingese, Weimaraner, Cairn Terrier, Collie	English Bulldog, French Bulldog
Age of onset	Middle age or older	Old
Sex predilection	Intact or cryptorchid male	Female only
Pathogenesis	Functional Sertoli cell tumor Occasionally associated with seminoma, interstitial cell tumors Inguinal hernia	Cystic ovaries Functional ovarian tumor Iatrogenic (estrogen supplementation, ie. urinary incontinence)

Canine Alopecia

What Can It Be Other Than

Hypothyroidism or Hyperadrenocorticism?

	Canine Sertoli cell tumor-associated skin disease	Canine female hyperestrogenism
Nondermatological signs	Feminization syndrome (25% cases) Gynecomastia Galactorrhea ↓ libido Attraction intact male dogs Pendulous prepuce Penile atrophy Standing in female posture to urinate Prostatic squamous metaplasia Prostatitis	Gynecomastia Vulvar swelling Endometritis, pyometra, cystic endometrial hyperplasia Abdominal distension, palpable abdominal mass Prolonged, frequent estrus False pregnancies
Dermatological signs	Symmetrical bilateral alopecia Trunk, perineum, genital Linear preputial dermatosis (linear pigmentation, comedones from prepuce to scrotum) Macular hyperpigmentation Neck, perineum Diffuse hyperpigmentation Lateral, medial thighs, perineal Lichenification Lightening or darkening of hair coat Pruritus, secondary bacterial, fungal infection	Symmetrical bilateral alopecia Trunk, perineum, genital Comedones on, around vulva Macular hyperpigmentation Diffuse hyperpigmentation Lichenification Lightening or darkening of hair coat Pruritus, secondary bacterial, fungal infection

Gonadal sex hormone imbalance

	Canine Sertoli cell tumor-associated skin disease	Canine female hyperestrogenism
Complete blood count	Pancytopenia < bone marrow suppression	Pancytopenia < bone marrow suppression
Hormone assays	ACTH stimulation test – Adrenal panel Increased pre- and post-ACTH estradiol, progesterone Decreased pre- and post-ACTH testosterone	ACTH stimulation test – Adrenal panel Increased pre- and post-ACTH estradiol, progesterone
Prognosis	Good Rare metastases	Good
Treatment outcome	Complete hairgrowth noted within 6 months following gonadectomy/tumor removal	Complete hairgrowth noted within 6 months following gonadectomy/tumor removal or estrogen discontinuation
Treatment options	Surgical	Surgical Estrogen discontinuation

Classification

- Disorders of hair follicle cycling (12)
- Disease of sebaceous glands (1)
- Color-linked hereditary diseases of hair follicles (4)
- Mural diseases of hair follicles (2) and vascular diseases of dermis and panniculus (6) – NOT COVERED

Canine Alopecia
What Can It Be Other Than
Hypothyroidism or Hyperadrenocorticism?

Disorders of hair follicle cycling (12)

Nonbreed-specific hair cycle abnormalities (6)

- Canine alopecia X
- Canine recurrent flank alopecia (CRFA)
- Ventral-type pattern alopecia (VT-CPA)
- Pinnal-type pattern alopecia (PT-CPA)
- Canine telogen effluvium
- Canine post-clipping alopecia (PCA)

Breed-specific hair cycle abnormalities (6)

Alopecia X vs. CRFA

	Alopecia X	CRFA
Synonym(s)	Adrenal hyperplasia-like syndrome Adrenal sex hormone imbalance Adult-onset growth hormone deficiency Adult-onset hyposomatropism Biopsy-responsive alopecia Black skin disease of Pomeranians Castration-responsive dermatosis/alopecia Coat funk Congenital adrenal hyperplasia-like syndrome Estrogen-responsive dermatosis Follicular dysplasia of Nordic breeds Follicular (growth) dysfunction of plush-coated dogs Growth hormone-responsive alopecia/dermatosis Mitotane (o,p'-DDD) or Lysodren-responsive alopecia Ovariohysterectomy-responsive dermatosis Pseudo-Cushings disease Pseudo-Cushings syndrome Testosterone-responsive dermatosis	Cyclic(al) flank alopecia Cyclic follicular dysplasia Cyclic recurrent flank alopecia Flank alopecia Idiopathic cyclic flank alopecia Seasonal flank alopecia

Alopecia X vs. CRFA

	Alopecia X	CRFA
Type of alopecia	Non-inflammatory	Non-inflammatory
Mechanism of alopecia	Most likely multifactorial Unidentified hormonal imbalance? Unproven late-onset partial deficiency of 21-hydroxylase enzyme Change in receptor sensitivity at hair follicle level? Genetic? No mutation identified in gene coding for 21-hydroxylase enzyme in affected Pomeranians No mutation identified in cathepsin L2 gene (CTSL2) in affected Pomeranians and Keeshonden It is not yet proven that this is actually a single disease entity with similar etiology and pathogenesis	Effect of short photoperiod? Effect of long photoperiod and indoor housing? Genetically influence melatonin secretion dysregulation?

Canine Alopecia
What Can It Be Other Than
Hypothyroidism or Hyperadrenocorticism?

Alopecia X vs. CRFA

	Alopecia X	CRFA
Incidence	Common in certain breeds Worldwide distribution Nonseasonal	Common in certain breeds Higher incidence at latitudes around or higher than 45° parallel in Northern hemisphere Higher incidence during periods of short day length = November to March in Northern hemisphere. Resolution in late spring.
Breed predilection	Almost exclusively in plush-coated Nordic breeds Pomeranian > Alaskan Malamute, Chow Chow, Keeshond, Siberian Husky, Samoyed, Norwegian Elkhound Miniature and Toy Poodles	Boxer, Airedale Terrier, English Bulldog, Affenpinscher, Griffon Korthals, Bearded Collie, miniature/standard/giant Schnauzer, French Bulldog, Doberman Pinscher, Bouvier des Flandres, shorthair and wirehair German Pointer, Briard, Bullmastiff, Mastiff, Rhodesian Ridgeback, Scottish Terrier, Staffordshire Terrier, Rottweiler, Labrador Retriever, Golden Retriever, Chesapeake Bay Retriever, Dalmatian, Kuvasz, Miniature Poodle, Chihuahua, Pekingese, Shetland Sheepdog Rare in plush-coated Nordic breeds
Age of onset	9 months-12 year old (median 2-6 years)	8 months-11 year old (median 4 years)
Sex predilection	Male>female	None reported

Alopecia X vs. CRFA

	Alopecia X	CRFA
Clinical aspects	Initially preferential loss of guard hairs (hypotrichosis) resulting in dull, dry coat; lighter or differently-colored coat (ie. reddish-brown rusty color in Siberian Husky) Increased matting of the coat may also be an early clinical sign Sometimes, a more generalized loss of guard hairs gives the coat a "puppy" or "wooly" appearance Retained secondary hairs also lost with time resulting in complete alopecia Hyperpigmentation (except white Poodles) Tufts of hair regrowth at site of trauma (ie. biopsy, surgical site, sunburn) Failure of clipped hair to regrow Neck, trunk, tail base, tail, perineum, genital region, proximal limbs, caudomedial thighs	Alopecia (well-demarcated serpiginous borders, visually striking geographic maps or islands) Marked hyperpigmentation (except wirehaired Pointers) Thoracolumbar area > bridge of the nose, postauricular region (base of pinnae), tail base, perineum, dorsal midline, axillae Dorsal and lateral thorax (saddle-like or H pattern in Airedale Terriers)

Alopecia X vs. CRFA

	Alopecia X	CRFA
Clinical aspects	Spared head, distal limbs and distal tail Islands of normal coat may be present on thorax Slow progression (complete alopecia may take several years)	Spared head, neck, caudal thighs and distal tail Typically rapid onset Typically symmetrical (sometimes unilateral or one side more affected than the other) Typically seasonal (short photoperiod) Typically reoccurs on annual basis, however course is unpredictable Up to 20% of cases may only have one isolated episode in their whole life Some dogs have an occasional year when it does not occur Extent and duration of alopecia can be the same or increase as years go by Occasionally, a reverse clinical course (alopecia in summer and hairgrowth in winter) is observed
Pattern of alopecia	Regional / symmetrical	Regional / symmetrical

Alopecia X vs. CRFA

	Alopecia X	CRFA
Biopsy site selection	Multiple sites obtained for areas of maximal alopecia	Multiple sites obtained for areas of maximal alopecia
Histopathological findings	<p>"Hairless flame follicles" Excessive trichilemmal keratinization with spike of keratin appearing to protrude through outer root sheath, creating a fiery effect</p> <p>Orthokeratotic hyperkeratosis, follicular keratosis, follicular dilatation, epidermal melanosis, telogenization hair follicles</p>	<p>"Witch's feet or octopus-like hair follicles" Most hair follicles in catagen Hair follicles with marked infundibular orthokeratotic hyperkeratosis extending to secondary follicles Hair shafts generally absent Sebaceous gland melanosis</p>
Other diagnostic tests	<p>Diagnosis by exclusion (can be confusing) Normal or increased urinary urine cortisol/creatinine ratio Normal LDDST or marginal suppression of the pituitary-adrenal axis ACTH stimulation test – Adrenal panel (5) Increased pre- and post-ACTH 17-hydroxyprogesterone, significance?</p>	None reported

Alopecia X vs. CRFA

	Alopecia X	CRFA
Prognosis	Hair will typically not grow back without treatment Some dogs recover spontaneously (sometimes after numerous failed treatments)	High prevalence of spontaneous hair regrowth (over a period of 1-14 months, typically 3-8 months) Hair typically regrows of normal quality and density Hair may regrow darker (Boxers) or golden color (aurotrichia, Schnauzers) Uncommonly, hair regrowth may become less complete after several episodes Alopecia can become permanent

Alopecia X vs. CRFA

	Alopecia X	CRFA
Treatment options	<p>Oral trilostane Under 2.5 kg = 20 mg/dog q24hours Between 2.5 and 5kg = 30 mg/dog q24hours Between 5 and 10 kg = 60 mg/dog q24hours Over 10 kg = 3-4 mg/kg q12hours</p> <p>Oral melatonin 3 mg/dog q24hours to 12 mg/dog q12hours for 1-2 months Administer as needed</p> <p>Subcutaneous melatonin implant Under 11.4 kg = 8 mg Between 11.4 and 22.7 kg = 12 mg Over 22.7 kg = 18 mg</p>	<p>Oral melatonin 3 mg/dog q24hours to 12 mg/dog q12hours for 1-2 months Treatment should be started 1-2 months before the next anticipated episode of alopecia or shortly after onset of alopecia</p> <p>Subcutaneous melatonin implant Under 11.4 kg = 8 mg Between 11.4 and 22.7 kg = 12 mg Over 22.7 kg = 18 mg</p>

Alopecia X vs. CRFA

	Alopecia X	CRFA
Treatment options	<p>Other reported treatment</p> <p>Bovine or human growth hormone (not readily available, not recommended because of potential serious adverse reactions), methyltestosterone, diethylstilbestrol, mitotane /o,p'-DDD (not recommended because of potential serious adverse reactions)</p> <p>Fulvestrant (not recommended because ineffective)</p> <p>Dutasteride, finasteride, leuprolid acetate, dermal abrasion by use of a dishwashing "Scotch pad" (anecdotal use)</p>	<p>Other reported treatment</p> <p>Minoxidil (not recommended because of potential serious adverse reactions)</p>

Alopecia X vs. CRFA

	Alopecia X	CRFA
Treatment outcome	<p>Neutering is treatment of choice in intact dogs</p> <p>Complete hairgrowth noted within 6 months following gonadectomy in 43% of castrated males</p> <p>A relapse may occur</p> <p>Oral trilostane is treatment of choice in neutered dogs</p> <p>Good to excellent results in 85% of Pomeranians</p> <p>Hairgrowth should be noted within 1-2 months following initiation of treatment</p> <p>New hair is rarely permanent and may fall out in months to years despite continued treatment</p> <p>May be associated with side effects (adrenal necrosis)</p> <p>Melatonin is also a good choice</p> <p>Good to excellent results in 40% of dogs</p> <p>For cosmetic, not medical, reasons</p> <p>May be refractory to neutering or therapy</p>	<p>Melatonin is treatment of choice (used to prevent recurrent or shorten an existing episode)</p> <p>Good to excellent results in 50-75% of dogs</p> <p>For cosmetic, not medical, reasons</p> <p>May be associated with side effects</p> <p>May be refractory to therapy</p>
Advice to breeder	<p>Pomeranian breeders may decrease the incidence of Alopecia X by selective breeding (avoid retention of the juvenile prototype)</p>	<p>Affected dogs, their parents and siblings should preferably not be used for breeding</p>

VT-CPA vs. PT-CPA

	VT-CPA	PT-CPA
Synonym(s)	<p>Canine pattern alopecia</p> <p>Acquired pattern alopecia</p> <p>Canine pattern baldness</p> <p>Dachshund pattern baldness</p>	<p>Canine pattern alopecia</p> <p>Acquired pattern alopecia</p> <p>Canine pattern baldness</p> <p>Dachshund pattern baldness</p> <p>Canine pinnal alopecia</p> <p>Alopecia and melanoderma of Yorkshire Terrier</p>
Type of alopecia	Non-inflammatory	Non-inflammatory
Mechanism of alopecia	Abnormality in hormone receptor on hair follicle?	Abnormality in hormone receptor on hair follicle?
Incidence	Common in certain breeds	Less common than VT-CPA, also seen in certain breeds
Breed predilection	<p>Breeds with short / fine hair coat</p> <p>Dachshund, Chihuahua, Miniature Pinschers, Whippet, Greyhound, Italian Greyhound, Boston terrier, Manchester Terrier, Boxer</p>	<p>Almost exclusively seen in Smooth-haired and Wirehaired Dachshunds</p> <p>Yorkshire Terrier</p>
Age of onset	6 months old or after	6-9 months old or after
Sex predilection	Female > male	Male > female

VT-CPA vs. PT-CPA

	VT-CPA	PT-CPA
Clinical aspects	Alopecia Conversion of normal guard hair to vellus-like hairs Ventral neck/thorax/abdomen Caudomedial aspect of thighs Perineum, perianal region Hyperpigmentation Postauricular region (base of pinnae) Remaining hairs appear finer than normal Slowly progressive over a period of 1 year	Alopecia Entire outer pinna > bridge of the nose Hyperpigmentation Mild scaling, no crusting* Slowly progressive over a period of several years
Pattern of alopecia	Regional / symmetrical	Regional / symmetrical
Biopsy site selection	Multiple sites obtained for areas of maximal alopecia. Also obtain one specimen from normal skin for comparison (normal control).	Pinnal biopsies require general anesthesia and may lead to damaged cartilage, permanent scarring and distortion. If hair loss is present on regions besides pinnae, these should be selected.

* Scaling, crusting and involvement of the margin of the pinna is consistent with canine ear margin seborrhea

VT-CPA vs. PT-CPA

	VT-CPA	PT-CPA
Histopathological findings	"Miniaturization of hair follicles" Moderate to severe decrease in hair follicle size and length with fine residual hair shafts No follicular distortion No hair growth cycle arrest Small anagen hair follicles with petite hair bulbs Overall numbers of adneal units are not reduced	Indistinguishable from VT-CPA
Prognosis	Hair will not grow back without treatment	Hair may spontaneously grow back without treatment, with possible recurrences over the years
Treatment options	Oral melatonin 3 mg/dog q24hours to 12 mg/dog q12hours for 1-2 months Administer 1-2X / year Subcutaneous melatonin implant Under 11.4 kg = 8 mg Between 11.4 and 22.7 kg = 12 mg Over 22.7 kg = 18 mg Other reported treatment Estrogen (not recommended because of potential serious adverse reactions) Finasteride (anecdotal use)	Same

VT-CPA vs. PT-CPA

	VT-CPA	PT-CPA
Treatment outcome	Melatonin is treatment of choice Good to excellent results in 50-70% of dogs For cosmetic, not medical, reasons May be associated with side effects (sedation, abscess) Hairgrowth may be noted as early as 6 weeks following initiation of treatment Maximal hairgrowth achieved 3-4 months later May be refractory to therapy	Same
Advice to breeder	Over the last decades, smooth hair Dachshunds breeders have been able to significantly decrease the incidence of VT-CPA by selective breeding (but coat is not as fine)	Same

Canine telogen effluvium vs. PCA

	Canine telogen effluvium	Canine post-clipping alopecia (PCA)
Synonym(s)	Telogen defluxion	None reported
Type of alopecia	Non-inflammatory	Non-inflammatory
Mechanism of alopecia	Disorder of hair follicle cycling Excessive loss of telogen hairs < hair follicles undergo synchronous anagen development developing between 3 weeks to 3 months after stress (pregnancy, parturition, lactation, severe systemic illness, marked febrile episode, shock, surgery, anesthesia, drugs)	Disorder of hair follicle cycling Prolonged telogen phase in Nordic breeds (possibly developed as an energy-saving device in extremely cold climates, so they do not have to shed and regrow their coat) Effect of decreased temperature from shaving?
Incidence	Very rare	Common
Breed predilection	None reported	Almost exclusively in plush-coated Nordic breeds Pomeranian , Alaskan Malamute, Chow Chow, Siberian Husky, Samoyed, American Eskimo Dog, Keeshond German Shepherd Dog, Labrador Retriever, Golden Retriever
Age of onset	None reported	None reported
Sex predilection	None reported	None reported

Canine telogen effluvium vs. PCA

	Canine telogen effluvium	Canine post-clipping alopecia (PCA)
Clinical aspects	Alopecia Easy epilation Trunk Spared face Typically rapid onset	Failure of clipped hair to regrow Venipuncture, surgery, mat removal, grooming, wound management, myelography, epidural anesthesia Alopecia usually remains complete, but occasionally a few guard hair may regrow Hyperpigmentation Scaling
Pattern of alopecia	Symmetrical or generalized	Localized
Biopsy site selection	Multiple sites obtained for areas of maximal alopecia. Biopsy early!	Multiple sites obtained for areas of maximal alopecia. Also obtain one specimen from normal skin for comparison (normal control).
Histopathological findings	Mostly telogen hair follicles without hairshafts (synchronous non haired telogen) No follicular atrophy	Mild epidermal hyperkeratosis Mostly telogen hair follicles with retained hairshafts (synchronous haired telogen) True flame follicles are rare

Canine telogen effluvium vs. PCA

	Canine telogen effluvium	Canine post-clipping alopecia (PCA)
Other diagnostic tests	Trichogram Telogenization of hair shafts	None reported
Prognosis	Hair spontaneously grows back within a few months	High prevalence of spontaneous hair regrowth (over a period of 6-12 months, which is much longer than the 3-month average documented in Labrador Retriever) Hairgrowth is significantly slower on dosolumbar area than lateral thigh in Siberian Husky Hair typically regrows of normal quality and density Hair may regrow darker initially
Treatment options	No treatment required	No treatment required Topical melatonin and brushing have no impact on hair regrowth
Treatment outcome	No treatment required	No treatment required
Advice to breeder		It is recommended to never shave sled dogs, unless absolutely necessary.

Breed-specific hair cycle abnormalities (6)

- Alopecia in the Irish Water Spaniel
- Alopecia in the Portuguese Water Dog
- Alopecia in the Chesapeake Bay Retriever
- Alopecia in the Curly-coated Retriever
- Alopecia in the Greyhound
- Alopecia in the Pont Audemer Spaniel

Canine sebaceous adenitis (SA)

Synonym(s)	Granulomatous sebaceous adenitis
Type of alopecia	Inflammatory Inherited in autosomal recessive mode (Standard Poodles, Akitas)
Mechanism of alopecia	Sebaceous gland destruction and decreased amount of sebum production results in hair shaft fragility Primary structural defect in sebaceous gland/duct? Primary cornification defect? Abnormal lipid metabolism? Cell-mediated auto-immune disease? Target = Sebaceous gland
Incidence	Uncommon
Breed predilection	Long-coated breeds Standard Poodle, Akita, Samoyed, German Shepherd Dog, English Springer Spaniel, Howavart, Bernese Mountain Dog, Lhasa Apso, Belgian Sheepdog, Old English Sheepdog, Toy Poodle, Chow Chow, Collie Short-coated breeds Vizla, Dachshund, Miniature Pinscher, Plott Hound, Boxer

Canine sebaceous adenitis

Age of onset	Young adult to middle-aged dogs
Sex predilection	None reported
Clinical aspects	Long-coated breeds Alopecia Dull, brittle hair coat Discoloration of hair coat (brown to red tint) "Follicular casts" (silvery white scales adhering to hair shafts) Scaling Dorsal midline, trunk, temporal region, face, pinnae, dorsal neck, dorsal muzzle, limbs "Rat tail" Secondary bacterial folliculitis, otitis externa Short-coated breeds Alopecia Nodules Annular plaque "Follicular casts" Scaling Trunk Waxing and waning course

Canine Alopecia
What Can It Be Other Than
Hypothyroidism or Hyperadrenocorticism?

Canine sebaceous adenitis

Pattern of alopecia	Regional (Standard Poodle) Multifocal or generalized
Biopsy site selection	Multiple sites obtained for areas of minimal alopecia but maximal scaling, follicular casting (subtle early lesions are most useful to document active sebaceous gland inflammation)
Histopathological findings	Marked orthokeratotic hyperkeratosis (epidermis and follicular infundibulum) Nodular, mixed inflammatory cell infiltrate composed of lymphocytes, neutrophils and histiocytes in vicinity of previous sebaceous glands (sebocytes are destroyed and may be absent) Hair follicles are typically spared by inflammation Atrophic hair follicles in late stage No demodex or dermatophytes
Other diagnostic tests	Trichogram Follicular casts

Canine sebaceous adenitis

Treatment options	Anti-inflammatory treatment Oral cyclosporine 5 mg/kg q12-24hours Restoration of barrier function of skin and epidermal turnover Oil soaks are obsolete Use phytosphingosine based spot-ons, shampoo and spray Oral vitamin A 10000-30000 IU q12hours Treat secondary pyoderma Other reported treatment Retinoids, corticosteroids (not recommended because of potential serious adverse reactions)
Treatment outcome	Hair may come back with treatment Cyclosporine is more efficient in early stage of disease than in chronic cases, hairgrowth should be noted within 4 months following initiation of treatment With oral vitamin A therapy, hairgrowth should be noted within 3 months following initiation of treatment, improvement in 80-90% of dogs Lifelong therapy is recommended
Advice to breeder	Affected dogs, their parents and siblings should not be used for breeding Orthopedic Foundation of America has developed a registry for affected dogs

Color-linked hereditary diseases of hair follicles (4)

Common, several breeds (2)

- Canine black hair follicular dysplasia (BHFD)
- Canine color dilution alopecia (CDA)

Rare, 1 breed only (2)

- Canine follicular lipidosis
- Hair follicle dysplasia in the Weimaraner dog

Canine Alopecia
What Can It Be Other Than
Hypothyroidism or Hyperadrenocorticism?

BHFD vs. CDA

	BHFD	CDA
Synonym(s)	None reported	Blue dog disease Blue of fawn Doberman Syndrome Fawn Irish Setter syndrome Color mutant alopecia
Type of alopecia	Non-inflammatory Congenital (neuroectodermal defect?) Inherited in autosomal recessive mode	Non-inflammatory Congenital (neuroectodermal defect?) Inheritance unclear
Mechanism of alopecia	Dysplasia of hair follicle pigmentation (irregular distribution of melanosomes within the hair shaft) resulting in hair shaft fracture	Dysplasia of hair follicle pigmentation (irregular distribution of melanosomes within the hair shaft) resulting in hair shaft fracture
Incidence	Common in certain breeds	Common in certain coat colors in certain breeds

BHFD vs. CDA

	BHFD	CDA
Breed predilection	Bearded Collie, Saluki, Border Collie, Cavalier King Charles spaniel, Jack Russel Terrier, Gordon Setter, Beagle, Basset Hound, Papillon, American Cocker Spaniel, Dachshund, Large Munsterlander	Blue Chihuahua, blue Chow Chow, blue and tan Dachshund, fawn, blue and red Doberman Pinscher, blue Miniature Pinscher, blue Great Dane, Italian Greyhound, blue Standard Poodle, Rhodesian Ridgeback, Saluki, Schnauzer, blue Shetland Sheepdog, Silky Terrier, blue Whippet, grey/blueYorkshire Terrier, Bernese Mountain Dog, Boston Terrier, Newfoundland, German Shepherd Dog, blue Schipperke, fawn Irish Setter
Age of onset	First weeks of life As early as 4 weeks old Rarely later in life	2.5 months to 3 years old Rarely later in life (5-6 years old)
Sex predilection	None reported	None reported

BHFD vs. CDA

	BHFD	CDA
Clinical aspects	Blueish discoloration first Partial alopecia (fractured hair shafts) Scaling Head, pinnae, neck, dorsum > other black-haired areas may exhibit almost normal hairs Adjacent white haired areas are normal Slowly progressive with age Secondary bacterial folliculitis	Partial alopecia (fractured hair shafts) Scaling Hyperpigmentation Trunk, dorsum > head, extremities Differently-colored areas are spared if present Slowly progressive with age Secondary bacterial folliculitis
Pattern of alopecia	Black or very dark brown haired areas	Symmetrical or generalized Dilute coat = brighter shade of black or brown (blue, gray, fawn and red) The more color dilute, the greater the severity of alopecia
Biopsy site selection	Multiple sites obtained for areas of maximal alopecia	Multiple sites obtained for areas of maximal alopecia

BHFD vs. CDA

	BHFD	CDA
Histopathological findings	Large clumps of melanin within melanocytes of hair matrix, outer root sheath, +/- epidermis Irregular clumps of melanin found within medulla, cortex, inner root sheath Distorted follicular infundibulum filled with keratin Fractured or absent hair shafts Atrophic hair follicles and large numbers of perifollicular melanophages in late stage	Indistinguishable from CDA
Other diagnostic tests	Trichogram Melanin clumping in hair shafts	Indistinguishable from CDA

BHFD vs. CDA

	BHFD	CDA
Prognosis	Alopecia is typically permanent	Alopecia is typically permanent
Treatment options	None specifically for the alopecia Treat secondary pyoderma, seborrhea Avoid harsh shampoos and vigorous grooming	None specifically for the alopecia Treat secondary pyoderma, seborrhea Avoid harsh shampoos and vigorous grooming Anecdotal use of oral melatonin in a few blue Dobermans 3 mg/dog q24hours to 12 mg/dog q12hours for 1-2 months Administer 1-2X / year Other reported treatment Retinoids (decrease scaling and frequency / severity of bacterial folliculitis, not recommended because of potential serious adverse reactions)
Treatment outcome	Incurable	Incurable
Advice to breeder	Affected dogs, their parents and siblings should not be used for breeding	Same

Rare forms seen in one breed only

	Canine follicular lipidosis	Hair follicle dysplasia in the Weimaraner dog
Synonym(s)	Hair matrix lipidosis in the Rottweiler dog	None reported
Type of alopecia	Non-inflammatory	Non-inflammatory Congenital (neuroectodermal defect?)
Mechanism of alopecia	Dysplasia of hair follicle (lipid deposition within hair bulb) resulting in increased hair shaft fragility	Dysplasia of hair follicle pigmentation (irregular distribution of melanosomes within the hair shaft) resulting in hair shaft fracture
Incidence	Very rare	Rare
Breed predilection	Only in Rottweiler	Only in Weimaraner
Age of onset	First months of life (5 to 11 months old)	1-3 years old (later in life than CDA)
Sex predilection	None reported	None reported

Rare forms seen in one breed only

	Canine follicular lipidosis	Hair follicle dysplasia in the Weimaraner dog
Clinical aspects	Partial alopecia (fractured hair shafts) Subtle loss of pigmentation of remaining point hairs (mouse-grey) Face and feet	Partial alopecia (fractured hair shafts) Dorsum, lateral/ventral thorax, flanks, abdomen Spared head and limbs Secondary bacterial folliculitis
Pattern of alopecia	Mahogany or tan colored haired areas	Symmetrical or generalized All Weimeraners have a dilute coat
Biopsy site selection	Multiple sites obtained for areas of maximal alopecia and pigmentation change	Multiple sites obtained for areas of maximal alopecia
Histopathological findings	Ballooning of matrical cells of anagen hair bulbs	Same as CDA but less severe
Other diagnostic tests	None reported	Trichogram Melanin clumping in hair shafts

Rare forms seen in one breed only

	Canine follicular lipidosis	Hair follicle dysplasia in the Weimaraner dog
Prognosis	Alopecia is typically permanent	Alopecia is typically permanent
Treatment outcome	Incurable	Incurable
Treatment options	No medical treatment	None specifically for the alopecia Treat secondary pyoderma, seborrhea Avoid harsh shampoos and vigorous grooming
Advice to breeder	None reported	Affected dogs, their parents and siblings should not be used for breeding
