Odds and Ends of Veterinary Dermatology

From Alopecia X to Zinc Responsive Dermatosis

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MEDVET
Leading Specialty Healthcare for Pets

Diseases Covered

- Diseases
  - Alopecia X
  - Color Dilution Alopecia
  - Canine Flank Alopecia
  - Hepatocutaneous Syndrome
  - Perianal Fistulas
  - Sebaceous Adenitis
  - Zinc Responsive Dermatosis

Goals

- Learn to evaluate unusual (non-allergy related) skin diseases
  - Description and cause of disease
  - Diagnostics
  - Treatment options
- When to biopsy
- Biopsy sampling tips

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Alopecia X

- Hair cycle arrest
  - Sparse anagen hair follicles
- Previous terminology
  - Adrenal sex hormone imbalance of plush coated breeds
  - Castration responsive alopecia
  - Pseudo Cushing's
  - Growth Hormone responsive alopecia
- Hair regrowth can recur

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Alopecia X

- Suspected hereditary component
- Mode of inheritance and pathomechanism unknown
- Likely impaired anagen induction and promotion
- Affected Pomeranians- deregulation of genes involved in hair follicle stem cell markers (Brunner et al. 2017)
- Deregulation of genes involved in steroid hormone metabolism particularly estrogen metabolism (Brunner et al. 2017)

Alopecia X

- Signalment
  - Pomeranian, Chow Chows, Keeshonds, miniature Poodle, Plush coated Nordic breeds, Schipperkes
  - Seen in most breeds
  - Typically 2-5 years of age
- Clinical Signs
  - Primary hair loss followed by complete alopecia
  - Hyperpigmentation around neck, lateral trunk, caudal thighs and tail, symmetric
  - Skin may be thin
  - Does not affect head and limbs
  - May develop superficial pyoderma
  - Not systemically ill

Alopecia X

http://www.canis.se/innlegg.php?nr=104388&start=1

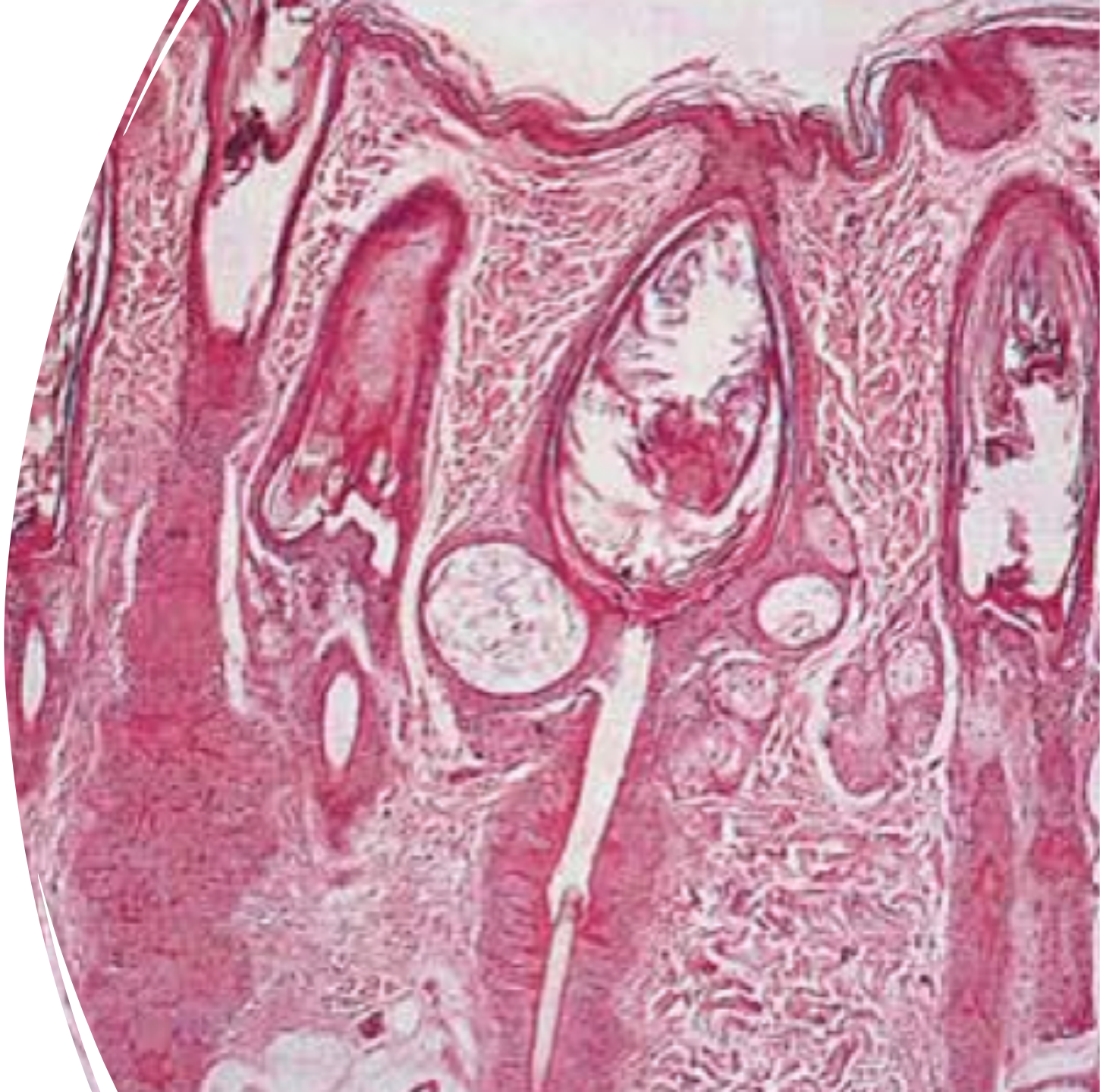
http://www.pomeraniancharitabletrust.org/5022/18982.html

Alopecia X

- Diagnosis
  - Clinical presentation and signalment
  - Normal biochemistry
  - Rule out hypothyroidism and hyperadrenocorticism
  - Consider abdominal ultrasound
  - Biopsy

Alopecia X

- Excessive trichilemmal keratinization of hair follicles
  - Keratin brightly eosinophilic and amorphous
  - Typical of endocrine related alopecias
- Hyperkeratosis, follicular keratosis, epidermal atrophy and hyperpigmentation, follicular atrophy, more telogen follicles



Alopecia X

- Diagnosis
  - Tennessee hormone profile
    - $$
    - Cortisol, Estradiol, Androstenedione, 17-Hydroxyprogesterone, Progesterone, Aldosterone
    - Measured pre- and post- administration of Cortrosyn™ at 5ug/kg IV
  - Plasma hormone concentrations vary between and within individuals
    - Ex. 17-Hydroxyprogesterone increased in 20.7% of the dogs with suspected endocrine alopecia (Frank et al. 2003)
  - Test results often confusing and non-diagnostic
    - No single hormone abnormality can explain the hair loss noted
    - Not all affected breeds have hormone alterations
  - Possibly deregulation occurs within the skin itself (Brunner et al. 2017)

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Alopecia X

- Treatment
  - Neuter
    - Results may be temporary
  - Melatonin
    - Pineal gland neurohormone
    - Controls circadian, seasonal reproductive, and hair growth cycles
    - May lower estradiol and intermediate steroid hormones
    - Inhibits ACTH-stimulated cortisol production
    - Modulates aromatase enzyme (converts androgens to estrogens)
    - Dosage: 3-12mg/dog q8-12 hours initially
    - Approximately 3 months
    - Frank et al. 2004: 62% of 24 Pomeranians, miniature poodles, and 1 Keeshond had partial to total regrowth within 4 months
      - Hair regrowth not associated with steroid hormone changes

https://naturesbounty.com

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Alopecia X

- Treatment
  - Lignans
    - Plant-derived phytoestrogens
    - Present in seeds, nuts, whole grains, legumes, vegetables, flaxseed, and flaxhulls
    - Able to decrease estrogen production and aromatase activity
    - May affect metabolism of sex hormones
    - Flaxseed lignans: 2.5-7mg/kg q 24 hours
    - In vitro lignans and melatonin shown to decrease andrestenedione, estradiol, and cortisol (Fectaue, et al. 2011)

www.lignans.net

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Alopecia X

- Treatment
  - Trilostane
    - Competitive inhibitor of 3β-hydroxysteroid dehydrogenase (essential for cortisol synthesis)
    - Cerundolo 2004: Trilostane: 22/24 Pomeranians and miniature poodles regrew hair 4-8weeks, 1 took 6 months
    - Requires monitoring
  - Mitotane
    - Adrenocorticolytic agent
    - Interferes with steroid biosynthesis
    - Frank et al. 2004: Mitotane: 6 dogs treated: no specific hormonal changes noted with treatment whether hair grew or not
      - 4/6 dogs had partial to complete hair regrowth
    - Requires monitoring

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Treatment

- Deslorelin implants
  - Deslorelin acetate contraceptive implant
  - Gonadotropin releasing hormone agonist
  - Not labeled for dogs in the U.S.
  - 2 intact Keeshonds regrew hair within 3.5mos and lasted for at least 14 mos (Layne and Richmond, 2018).
  - Spayed females not previously responded to treatment (Albanese et al. 2014)
    - Hair regrowth in 3 mos in 12/15 intact males
    - Intact females and castrated males not included

Alopecia X

- Treatment
  - Microneedling
  - Mechanical skin trauma superficially
  - Two neutered female Pomeranians: hair regrowth and loss of hyperpigmentation, 90% better in 12 weeks (Stoll, et al., 2015)
  - Anesthetized, sterile instrumentation, pain control
  - Microtrauma with microneedling device
  - May need second treatment
  - https://cvmbs.source.colostate.edu/microneedling-banishes-bareness-in-precious-pomeranian-patients/

Skinmedix.com

Alopecia X

- Treatment
  - Medroxyprogesterone acetate
  - Synthetic progestin
  - Can induce growth hormone secretion
    - Frank and Watson, *Vet Dermatol.* 2013
      - Partial hair regrowth in 3/8, total hair regrowth in 1/8 (2 months after completion of study)
      - Pomeranians every 4 weeks for 4 treatments
      - No increase in insulin-like growth factor
      - Similar to melatonin results
  - Benign neglect
  - Treat infections
    - If using shampoos, suggest mild shampoos (no benzoyl peroxide)

Alopecia X

- Treatment: sweater therapy

http://www.fotosearch.com/photos-images/dog-sweater.html

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Color Dilution Alopecia

- Follicular dysplasia of color dilute hairs
  - Associated with defective hair pigmentation and formation
  - Dilutions of black (blue) or brown (fawn)

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Color Dilution Alopecia

- Defective transport of melanosomes causing large clumps of pigments within melanocytes (macromelanosomes)
  - Color dilution due to genes at the D locus and others
  - Regulatory *MLPH* gene recessive mutation causative for coat color dilution in several dog breeds
    - *MLPH =* melanophilin, linker protein between the melanosome and actin filament
    - 3 variants within the MLPH gene
  - https://vgl.ucdavis.edu/test/dilute-dog
  - Gene mutation does not dictate alopecia
  - Alopecia: dendrites of melanocytes do not extend normally into keratinocytes

Color Dilution Alopecia

- Signalment
  - Doberman pinschers, Yorkshire terriers, Miniature pinschers, Great Danes, Whippets, Italian Greyhounds, Dachshunds, Boston Terriers, Chihuahuas, Poodles
    - Those bred to be blue (dilution of black), fawn (dilution of brown)
  - Typically 6 months to 2 years of age

http://www.google.com/search?q=image+of+color+dilute+dog&hl=en&prmd=imvns&tbm=isch&tbo=u&source=univ&sa=X&ei=yf0eUJjVNqfz0gHss4HAAw&ved=0CEUQsAQ&biw=1440&bih=779

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Color Dilution Alopecia

- Clinical Signs
  - Normal at birth
  - Hair loss begins over dorsum
  - Thinning of hair progresses to partial or complete loss
    - Initial hair loss – shaft fracture
    - Some broken hairs regrow
    - Less hair regrowth over time
  - Superficial pyoderma
  - Consider photoprotection

Color Dilution Alopecia

- Diagnosis
  - Clinical presentation
  - Trichogram
    - Hair cortices or medullas have melanin clumping
    - Macromelanosomes may distort hair shaft
    - Cuticle has defects and fractures
  - Dermatohistopathology
    - Abnormal clumping of melanin in epidermal and follicular basal cells and hair
    - Peribulbar melanophages with pigmentary incontinence
    - Hair follicles filled with keratin
    - Dilated and cystic follicles

Color Dilution Alopecia

- Treatment
  - Benign neglect
  - Mild shampoos
  - Anecdotal reports of oral retinoids
  - Cosmetic problem
  - Address secondary pyoderma

Color Dilution Alopecia

- Silver Labradors
  - Bred to be Chocolate

Picture courtesy of Valerie Fadok DVM, DACVD, PhD

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Canine Flank Alopecia

- Recurrent flank alopecia, Seasonal Flank Alopecia, Cyclic Flank Alopecia, Cyclic Follicular Dysplasia
- Seasonally (possibly) recurrent follicular dysplasia
- Cause
  - Photoperiod control of prolactin and melatonin may play a role
  - Decreased presence of FGF18 (fibroblast growth factor) protein in hair follicular epithelium in CRFA-affected dogs (Vandenabeele et al., 2011 and 2012)
  - FGF18 may play a significant role in hair cycle regulation
  - FGF18 part of regulating hair growth and skin regeneration in mice
  - Estrogen receptors higher in alopecic areas (Ohnemus et al, 2006)

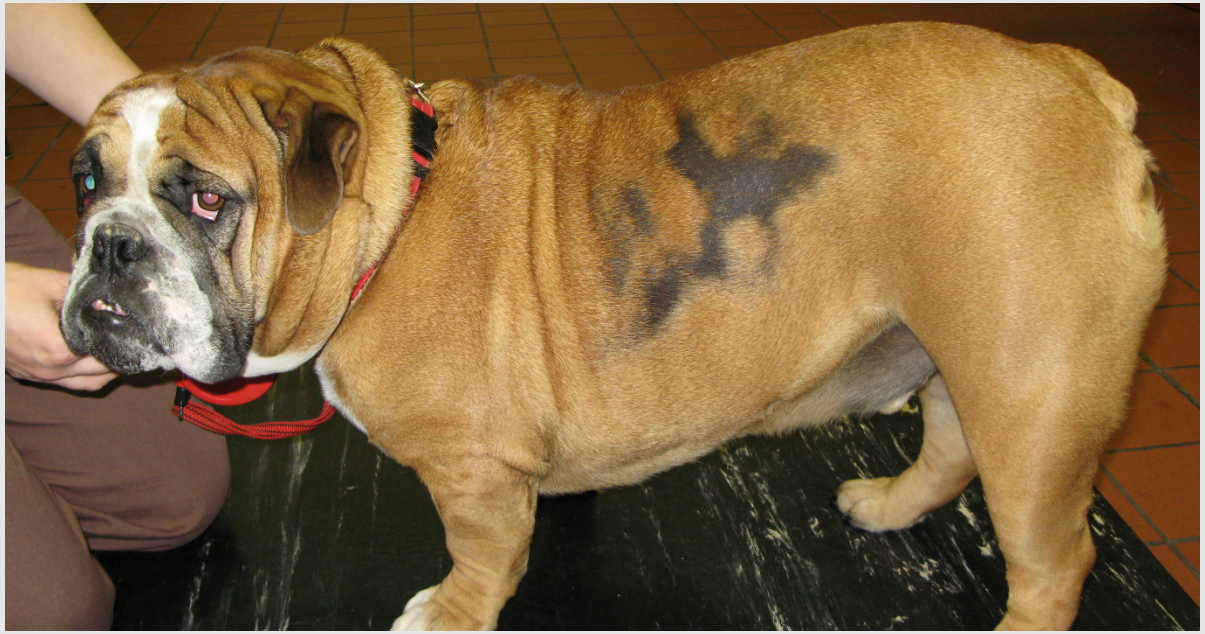
Canine Flank Alopecia

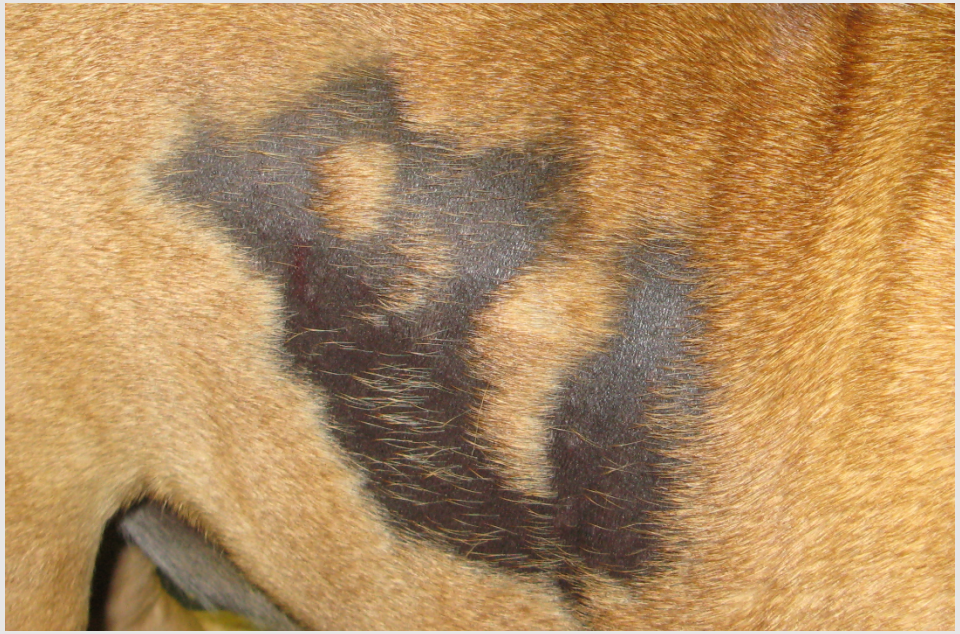
- Signalment:
  - Boxers, Bulldogs, Airedales, Schnauzers
  - Both sexes
  - 1-11 years of age; 3-6 years
- Clinical Signs:
  - Typically lose hair in fall and regrow in spring; vice versa
  - Usually regrow hair in 3-8 months
  - Hair loss may occur sporadically or regularly
  - Progressive with repeated episodes
  - Nonpruritic, noninflamed
  - Well-demarcated alopecia
  - Hyperpigmented
  - Usually symmetric, but not identical
  - Typically lateral to dorsolateral lumbar and thorax
  - Hairs around area usually normal (exception Airedale may have more generalized poor coat)
  - Possible secondary folliculitis

Canine Flank Alopecia

- Diagnosis
  - Clinical presentation
  - Histopathology
    - Follicular atrophy and hyperkeratosis
    - Hair follicle bulbs atrophic or misshapen
      - “Witches feet”
    - Sebaceous glands have melanin

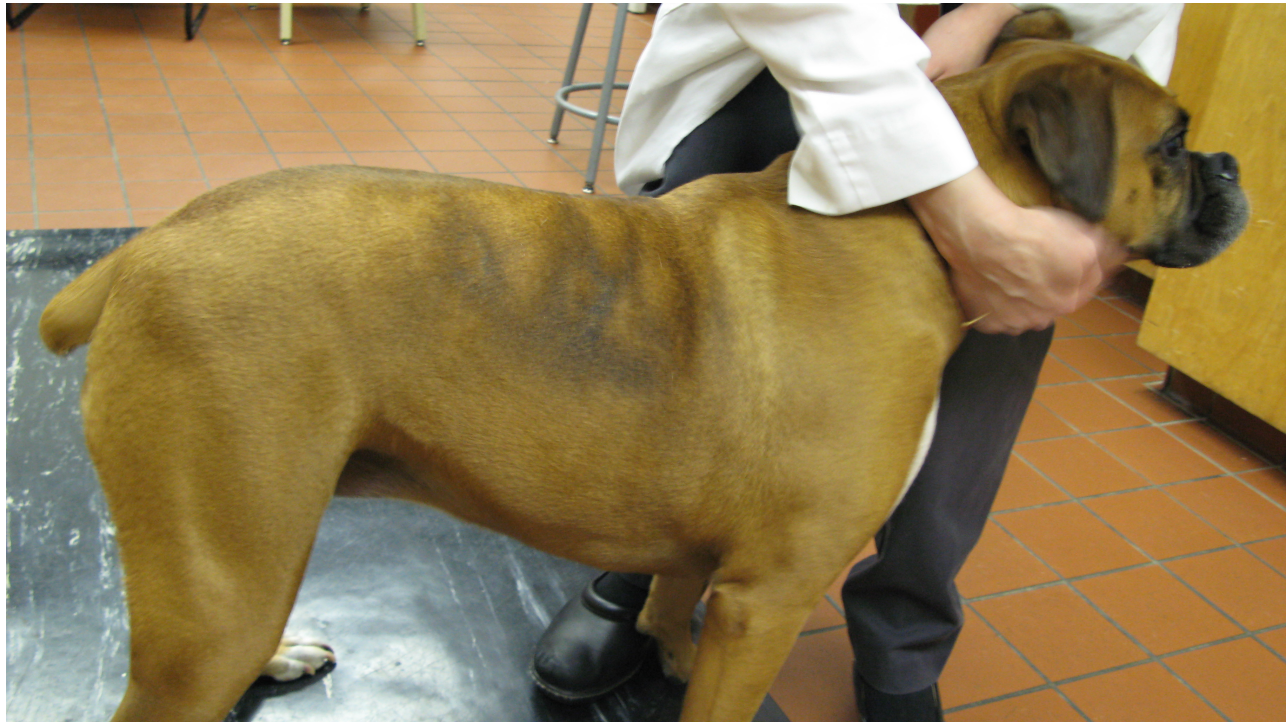
Canine Flank Alopecia





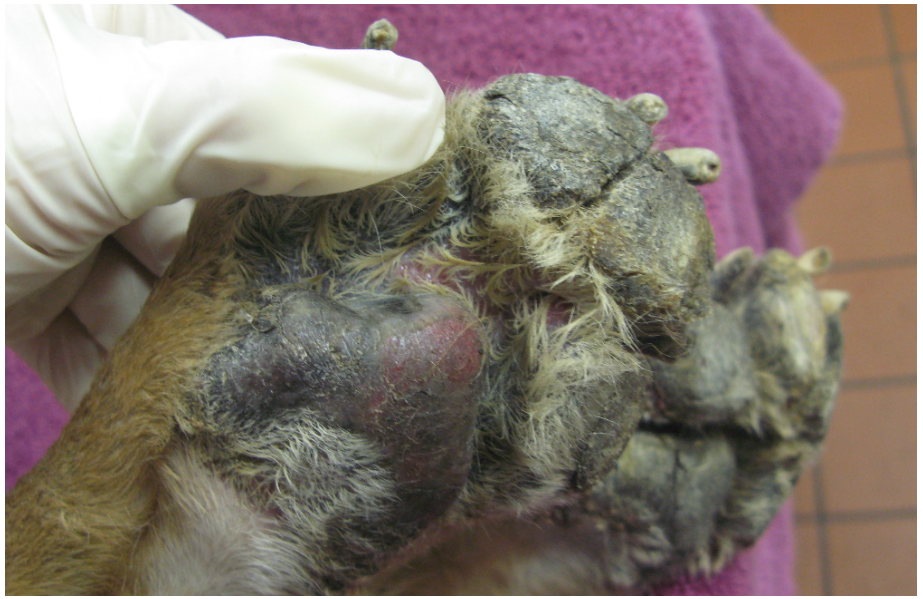
Canine Flank Alopecia

- Treatment
  - Benign neglect (cosmetic)
  - Melatonin: 3-12 mg/dog q 8-12 hours, 1-2 months to see benefits
  - Subcutaneous melatonin implants
    - Sustained release
    - 1-4 implants (12mg)/dog
  - Address secondary folliculitis
  - New hairs may be duller or drier



Hepatocutaneous Syndrome

- Superficial Necrolytic Erythema, Metabolic Epidermal Necrosis
- Named from human disease: Necrolytic Migratory Erythema
  - Characteristic clinical skin presentation due to
    - Glucagonoma syndrome (pancreatic tumor that secrets glucagon)
      - Pathogenesis: hypoaminoacidemia from glycogenesis of amino acids causing necrosis of keratinocytes from a protein deficiency
    - Hepatic cirrhosis
      - Hyperglucagonemia
      - Pancreatitis
      - Zinc Deficiency



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Hepatocutaneous Syndrome

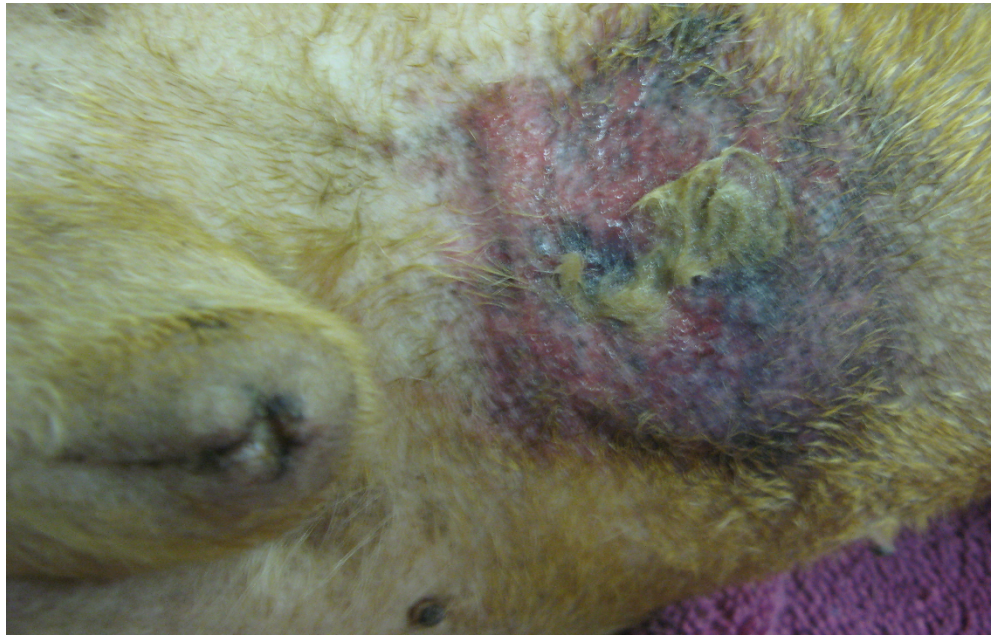
- Most cases in veterinary literature related to hepatic disease (93%)
- Few cases in dogs associated with glucagonoma
  - Pancreatic
  - Minority extrapancreatic
- Other cases due to phenobarbital induced hepatopathy
- Exact pathogenesis not known in dogs
  - Increased gluconeogenesis from hyperglucagonemia or increase catabolism of amino acids from liver disease
  - Loftus et al., 2017 evaluation of 20 affected dogs
    - Most consistent abnormalities of amino acids: glutamine, proline, cysteine, hydroxyproline, and lysinuria
    - Amino acids associated with urea cycle and synthesis of glutathione and collagen

Hepatocutaneous Syndrome

- Signalment
  - Middle-aged to older dogs
  - Mixed breed most common
  - May have heritable component in Shih Tzu's
  - Very rare in cats, 4 in literature
  - More common in males
- Clinical Signs
  - Erosive, crusting, and scaling
  - Symmetric lesions: face, distal paws, inguinal area, areas of friction
  - Mucocutaneous junctions, genital area, ventrum, and pressure points
  - Secondary bacterial infection
  - Hyperkeratosis, fissuring, and ulceration of the pads
    - Painful

Hepatocutaneous Syndrome

- Clinical Signs
  - Lethargy, anorexia, weight loss, painful walking
  - Wax and wane in severity
  - Systemic signs not typical at onset
  - Typically no icterus



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Hepatocutaneous Syndrome

- Diagnosis:
  - CBC/Chem
    - CBC: Neutrophilia, normocytic, normochromic, nonregenerative anemia
    - Chemistry: +/- increase in serum alkaline phosphatase, alanine aminotransferase, total bilirubin, bile acids; possible decrease BUN and hypoalbuminemia, possible hyperglycemia
  - Abdominal Ultrasound
    - Evidence of chronic liver disease
    - “Honey-combed” pattern: reticular pattern around hypoechoic areas
    - Possible pancreatic tumor +/- mets to liver
  - Amino acid profile
    - https://www.vetmed.ucdavis.edu/labs/amino-acid-laboratory
    - Hypoaminoaciduria in 58/58 dogs with confirmed superficial necrolytic dermatitis (Burns DeMarle et al., 2021)

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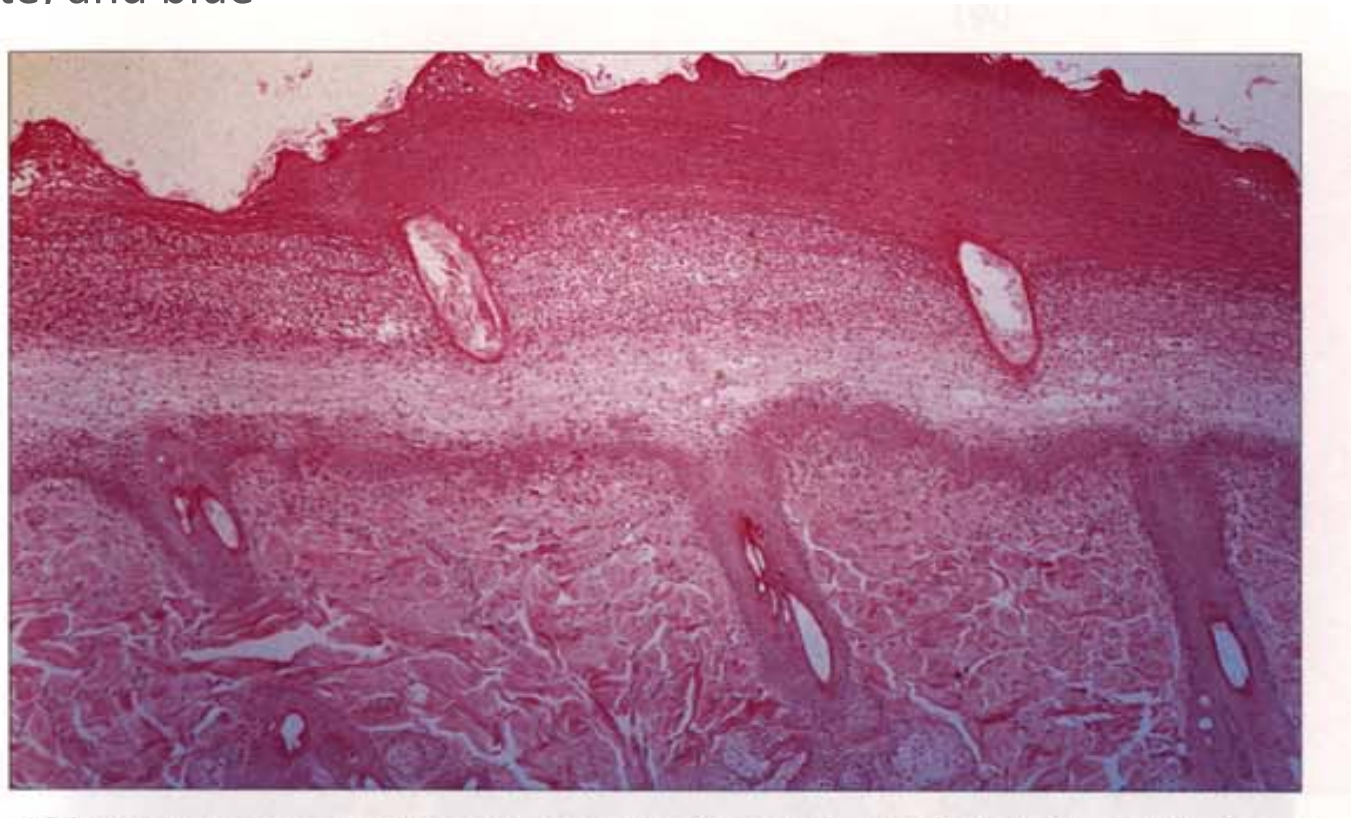
Hepatocutaneous Syndrome

- Diagnosis
  - Dermatohistopathology
    - “Red, white. and blue”



Yager J., Wilcock B. Color Atlas and Text of Surgical Pathology of the Dog and Cat. Jan. 1994

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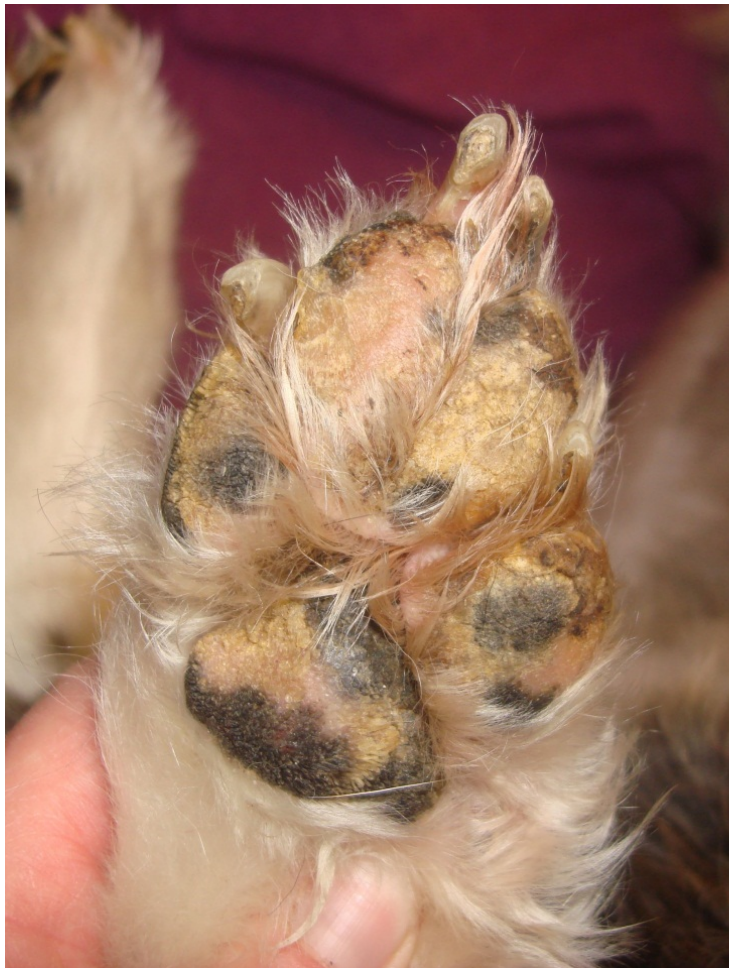
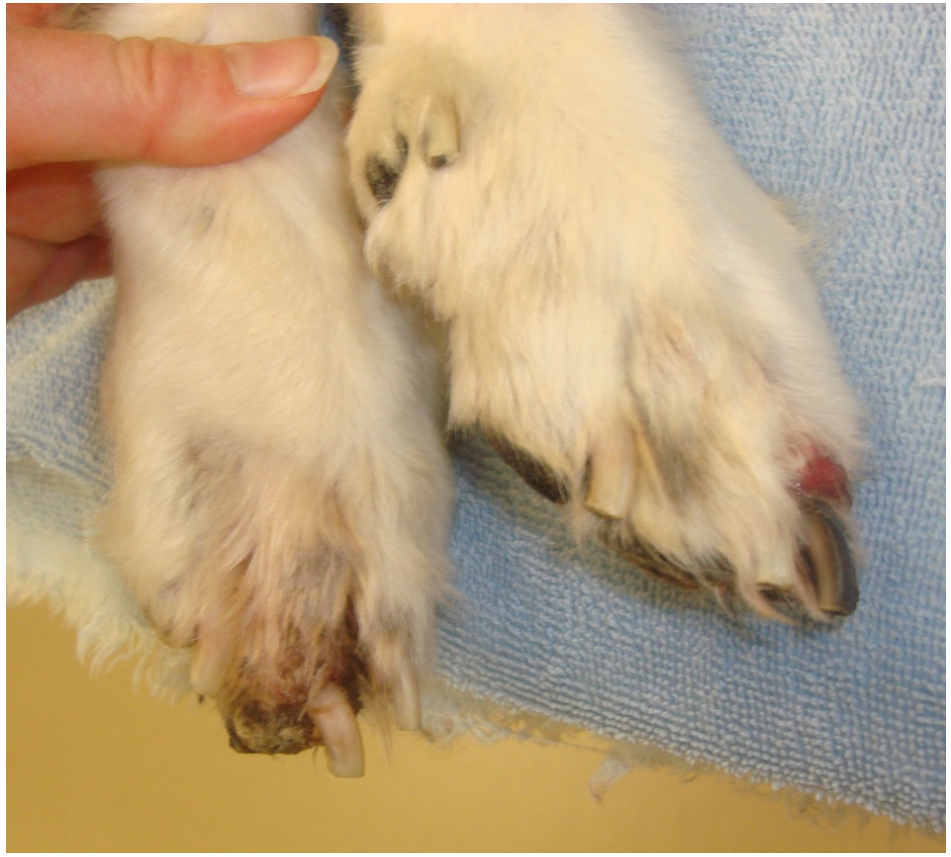
Hepatocutaneous Syndrome





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Hepatocutaneous Syndrome

- Treatment
  - Treat secondary infections
  - Glucagonoma: surgery
  - Consider liver protectants
  - Oral amino acids
    - S-adenosylmethionine
    - Ursodiol
    - Vitamin E

- Oral amino acid's
  - Egg yolk (1/4.5kg) or cooked egg whites
  - Amino acid supplements
- Fatty Acids
- Zinc methionine
  - 2mg/kg/day
- Liver supportive diet

https://www.hillspet.com/dog-food/pd-ld-canine-dry

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Hepatocutaneous Syndrome

- Treatment
  - Intravenous Amino Acids
    - Based on an amino acid profile if available
    - Aminosyn 10% Crystalline Amino Acid Solution, Abbott Laboratories
      - 25mg/kg IV over approximately 8 hours
      - Central line
      - Repeat q 7-10 days if minimal to no response
      - Possible to worsen hepatic encephalopathy, although rarely seen with this disease
      - Definitive studies on efficacy lacking
    - ProcalAmine a 3% amino acid and electrolyte solution
      - Same dosing

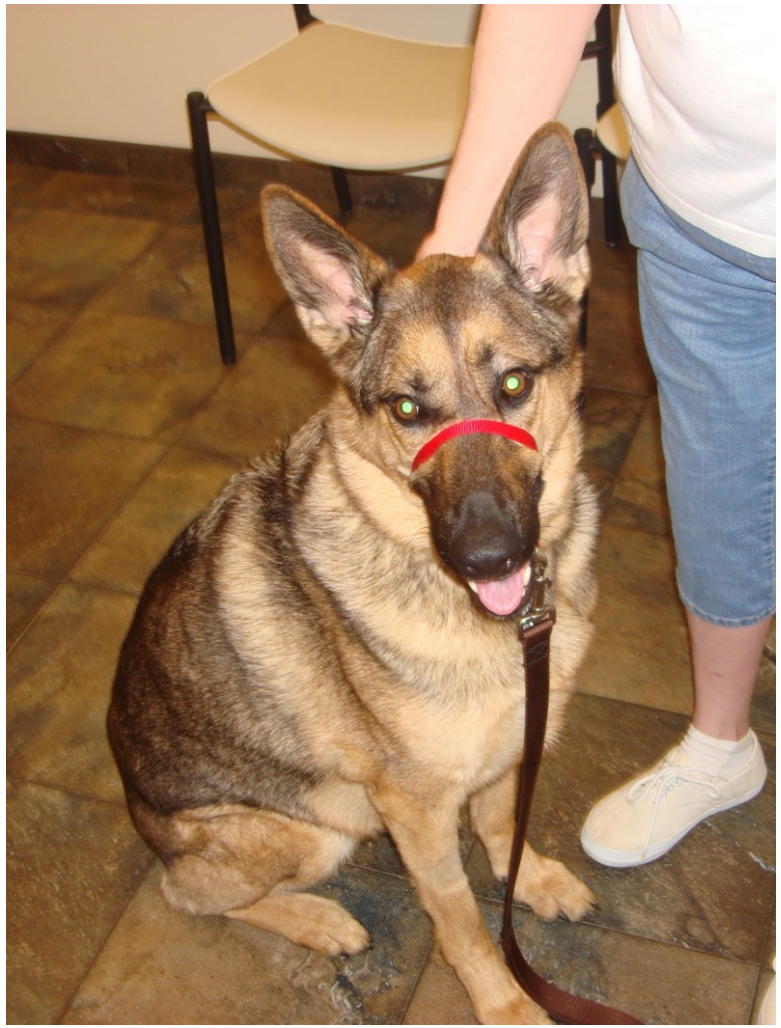
Hepatocutaneous Syndrome

- Adipose tissue-derived mesenchymal stem cells Nam et al. (2017)
  - 10 year M(N) Maltese
  - Allogenic tissue derived stem cells given 46 times over 30 months
    - Into liver parenchyma
    - Into peripheral veins
  - Along with this given antioxidants, liver protectants, IV amino acids
  - Survived 32 months post diagnosis

Hepatocutaneous Syndrome

- Treatment
  - Steroids: may temporarily help skin lesions but could lead to diabetes or worsen liver disease
  - Remove phenobarbital: lesions may not resolve
  - Prognosis is poor: from the onset of skin lesions often less than 6 months

Perianal Fistulas



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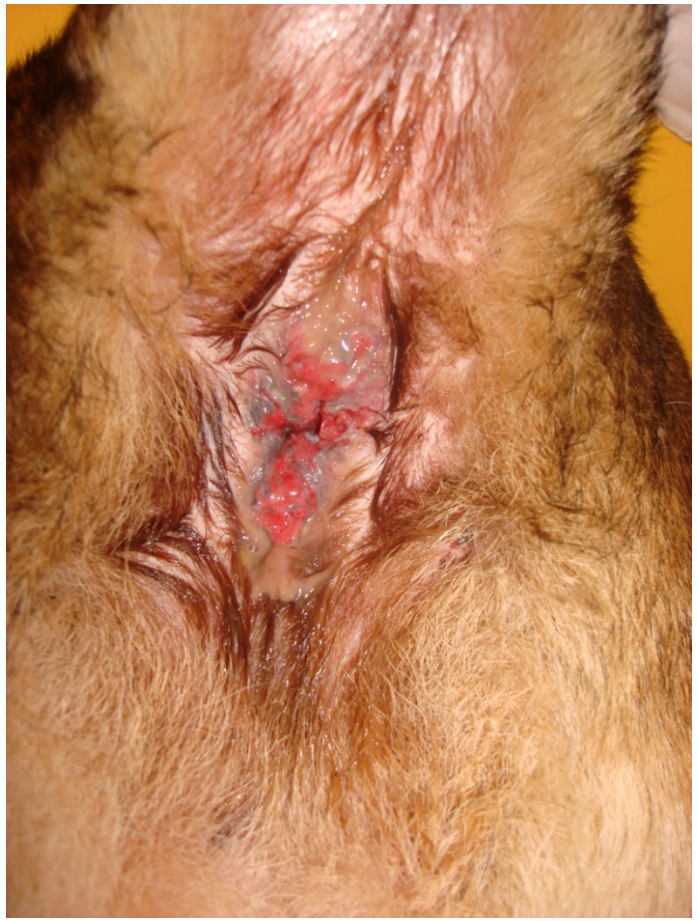
Perianal Fistulas

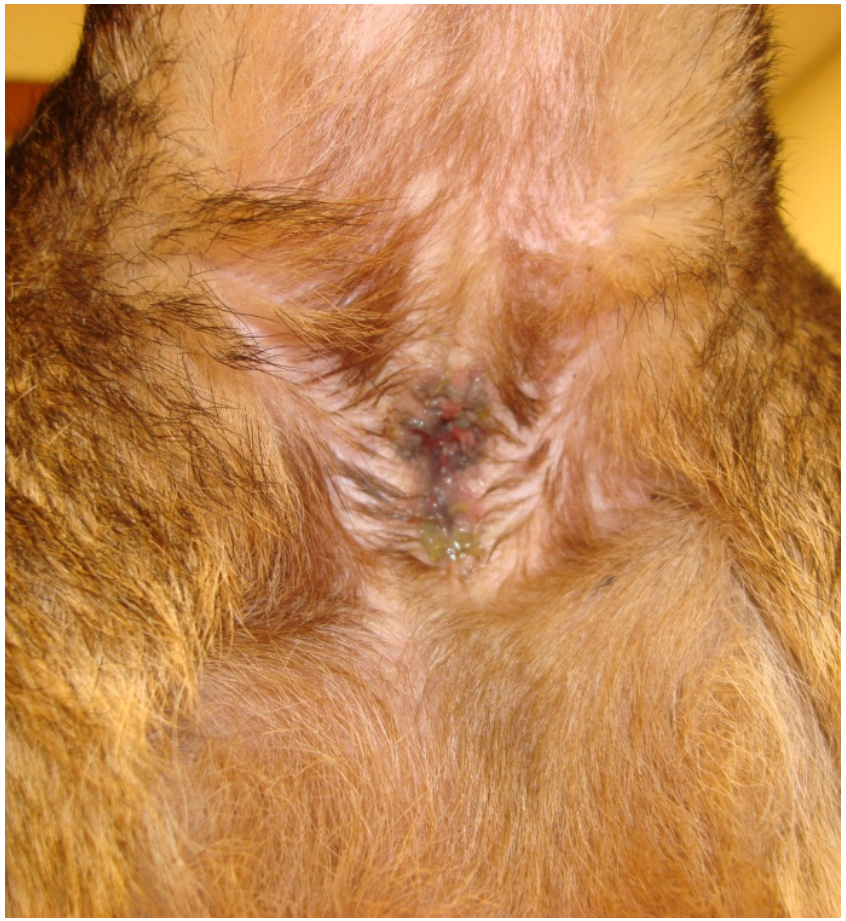
- Anal furunculosis
- A chronic, progressive disease where fistulae develop in the rectocutaneous area and perianal tissues ulcerate
- Cause unknown, immune-mediated suspected
  - Local T-cell mediated inflammation
    - Study has found cytokines associated with a TH-1 T-cell response in perianal tissue samples (House et al., 2003)
  - Possible impaired wound healing
    - Abnormal macrophage activation
  - Food allergy been considered
  - Similarities to Crohn's in people
- Signalment:
  - Most often middle-aged German Shepherd Dogs

Perianal Fistulas

- Clinical Signs
  - Tenesmus, constipation, and mucopurulent discharge from the perineum
  - Perianal lesions typically painful (sedation?)
  - Small and pinpoint fistulous tracts to deep ulcerations
  - Anal sacs not typically involved
  - Possible weight loss and lethargy
  - Can develop strictures
  - Could have concurrent inflammatory bowel disease

Perianal Fistulas





Perianal Fistulas

- Diagnosis
  - Clinical signs and signalment
  - Dermatohistopathology
    - Especially consider if palpation suspicious for tumor development
      - Could be fibrosis
    - Inflammation with hidradenitis, necrosis of epithelium at the infundibulum of the follicle, perivascular lymphoid nodules

Perianal Fistulas

- Treatment
  - Food trial with veterinary prescription diet
  - Antibiotics
    - Cephalexin and Metronidazole
    - Clindamycin
  - Steroids
    - Short-term usage
      - 0.5mg/kg BID and wean over time

https://www.hillspet.com/dog-food/pd-dd-canine-potato-and-venison-formula-dry

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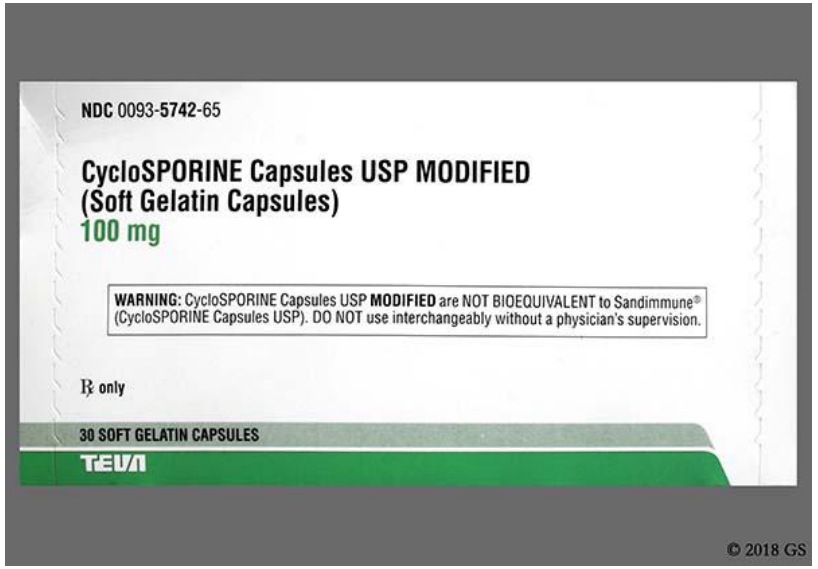
Perianal Fistulas

- Treatment
  - Cyclosporine: immunosuppressive agent inhibits T-cell activation and suppresses cell-mediated immune responses
    - 5mg/kg q 12-24h until in remission, then lower dosage
    - Atopica or generic modified Neoral™ equivalent
  - Azathioprine: affects rapidly proliferating cells
    - Effects cell-mediated immunity and T-lymphocyte dependent antibody synthesis
    - 1.5mg/kg q 24 hours to start



https://www.goodrx.com/cyclosporine-modified

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Perianal Fistulas

- Treatment
  - Tacrolimus, 0.1% q 12 hours, then taper when lesions resolve
    - Usually an adjunctive treatment
  - Surgery to debride: laser, excisional, cryosurgery
  - Typically multiple therapies

https://www.goodrx.com/tacrolimus

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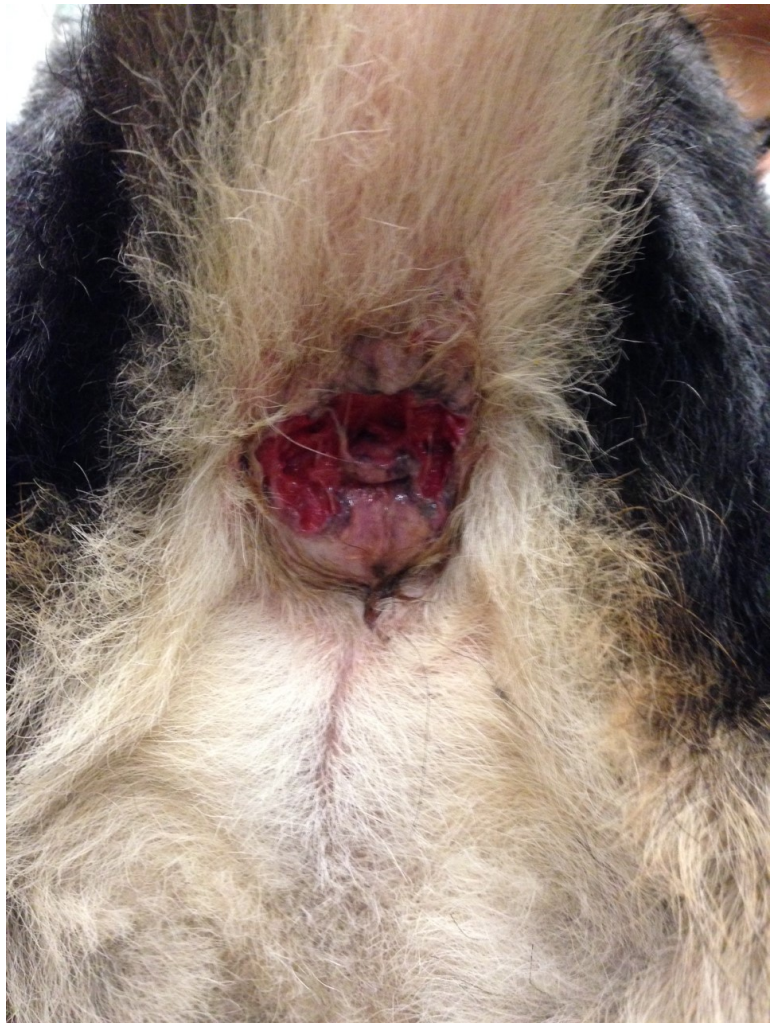
Perianal Fistulas

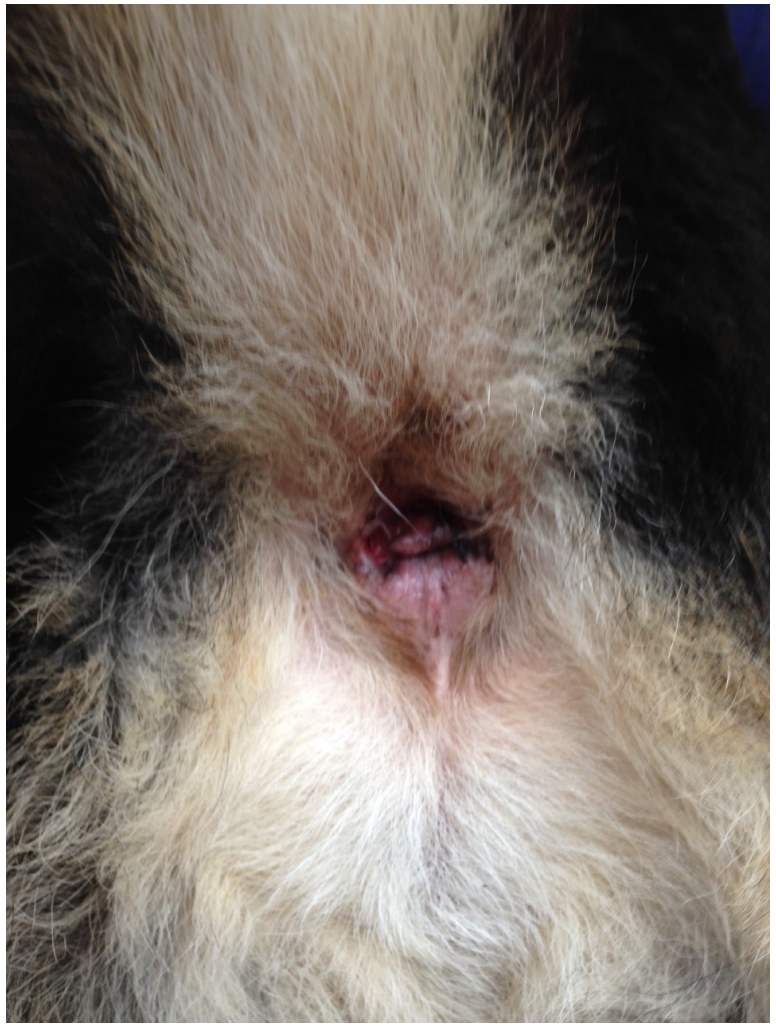
- Treatment
  - Fluorescent light energy (FLE)
    - Promotes wound healing
    - Blue light emitting diode device and topical photoconverter gel
    - Marchegiani et al. 2020; 4 dogs treated with FLE
      - 6-13 weekly treatments
      - On prescription food trial, no other treatments
      - Improved by 90% size of perianal lesions
      - Resolution of dsychezia, tenesmus, vocalization
      - No evidence of lesion recurrence after 6 months

Perianal Fistulas

- Treatment
  - Mesenchymal stem cell injections
    - Decrease the activation and proliferation of T cells and dendritic cells and promote production of regulatory T cells
    - Ferrer et al. 2016, 6 dogs received 1 injection of human embryonic stem cell–derived mesenchymal stem cells within perianal lesions
      - Patients failed to completely close or relapsed on cyclosporine
      - All dogs resolution of sinus tracts and ulcers at 3 months
      - 2 relapsed at 6 months
- Prognosis – considered variable

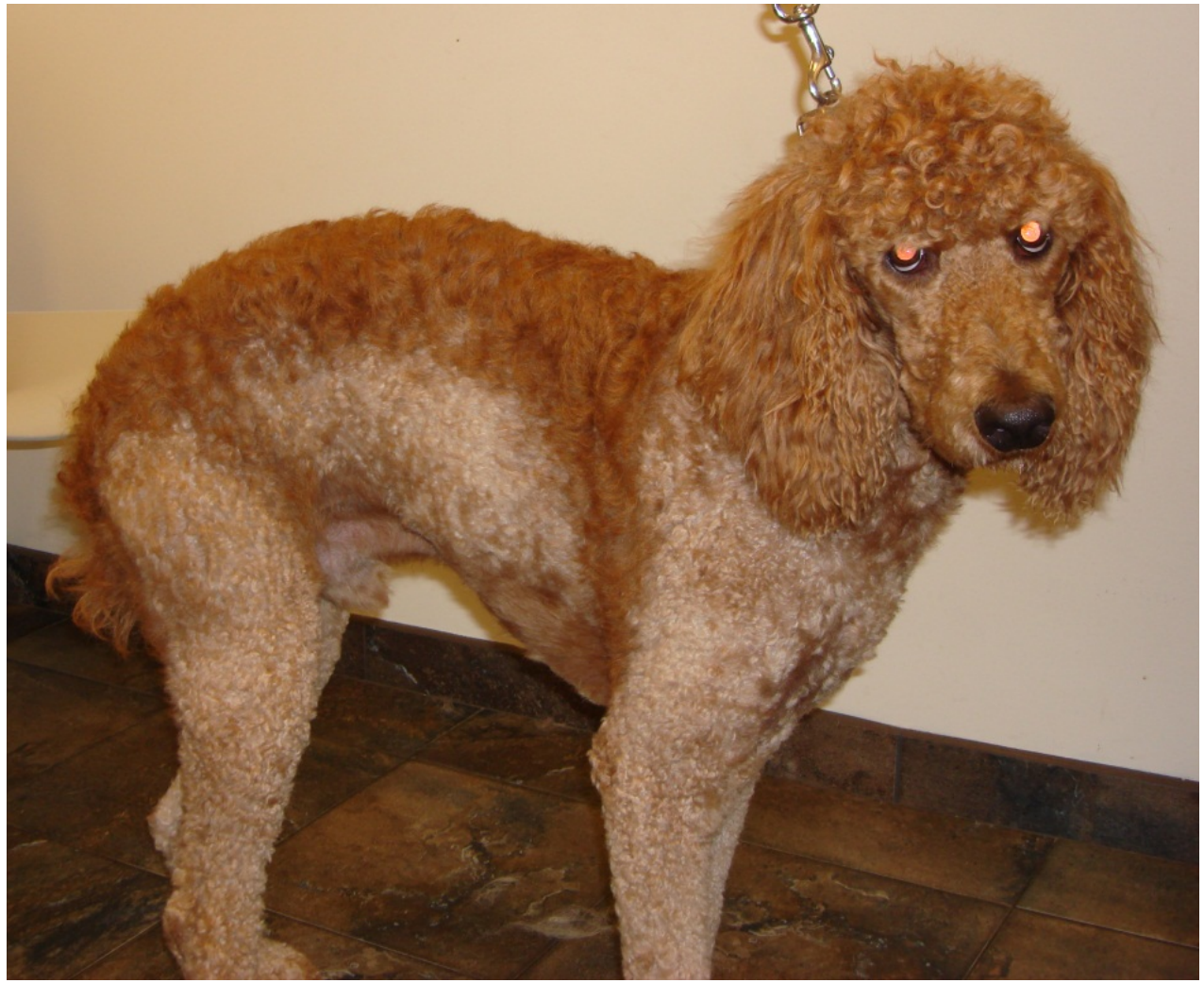
Perianal Fistulas





Sebaceous Adenitis

- Inflammatory disease of sebaceous glands
  - Glands destroyed
- Signalment
  - Standard Poodle, Vizsla, Akitas, Samoyed, English Springer Spaniel, Havanese, Lhasa Apso
  - Young to middle-aged
  - Very rare in cats



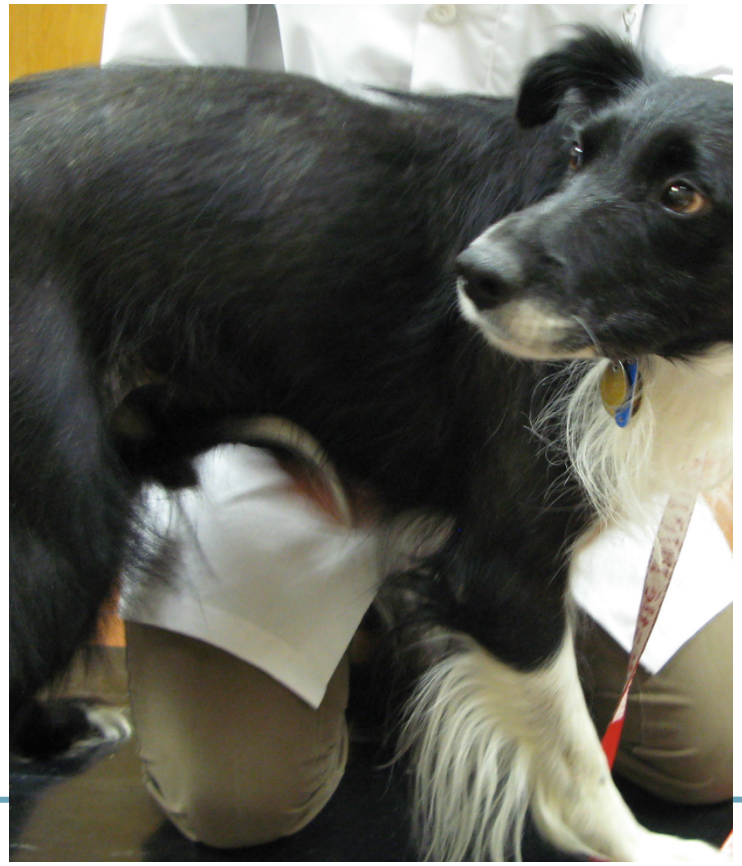
Sebaceous Adenitis

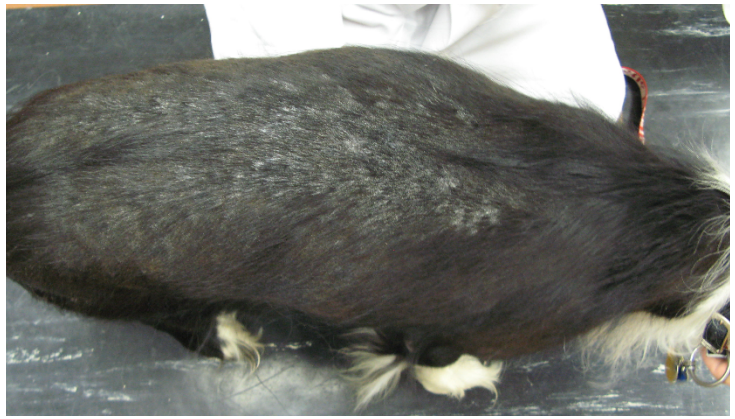
- Cause
  - Developmental and inherited defect
    - Autosomal recessive inheritance in poodles and Akita
      - Sebaceous adenitis entered the breed due to extensive inbreeding in the middle of the twentieth century
      - 50–60 % of an average Standard Poodles ancestry can be traced to a few lines (Pederson et al. 2015).
    - Possibly cell-mediated immunologic reaction against part of sebaceous gland
  - Abnormality in lipid metabolism or inability to store lipid normally

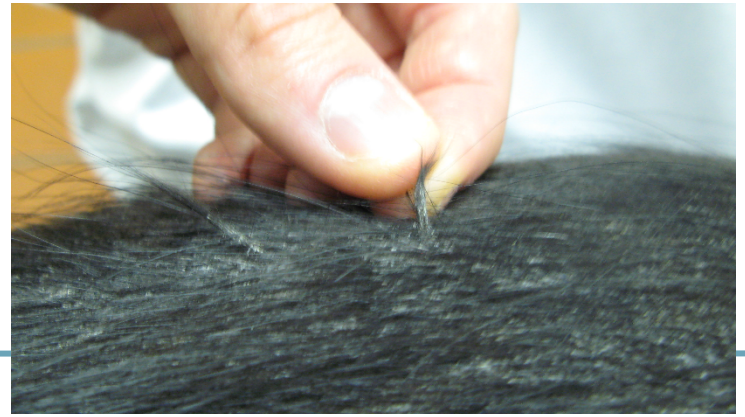
Sebaceous Adenitis

- Clinical Signs
  - Mild to severe scaling of back, neck, top of head, face, ears, and tail
  - Localized to generalized
  - Short-coated dogs: scales often fine and don’t adhere
  - Long-coated dogs: tightly adhere to hairs
    - Hair dry and dull or matted
    - Follicular casts

Sebaceous Adenitis







- Clinical Signs
  - Patchy or diffuse alopecia
    - Long-coated dogs undercoat is lost
  - Possible greasy skin and hair
  - Secondary infection common

Sebaceous Adenitis

- Diagnosis
  - Clinical Signs
  - Trichogram: Prominent casts of keratosebaceous debris along hair shafts
  - Dermatohistopathology
    - Early lesions: Granulomas in areas of sebaceous glands
    - Chronic lesions: No sebaceous glands, fibrosis
      - Keratin in follicles
      - Hyperkeratosis

Sebaceous Adenitis

- Treatment
  - Very mild cases
    - Fatty Acids
    - Topical therapies
      - Antiseborrheic shampoos
      - Emollient rinses

https://www.welactin.com/welactin-canine

https://www.douxo.com/us/dog-skin/dog-dandruff-and-dry-flaky-skin

Sebaceous Adenitis

- Treatment
  - More severe cases
    - Daily 50%-75% propylene glycol in water as spray or rinse
    - Prednisone 2mg/kg q 24 hours tapering once controlled
      - Often unresponsive, sebaceous gland destruction still occurs

https://www.healthypets.com/vetone-propylene-glycol

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Sebaceous Adenitis

- Additional treatments often used in the severe cases
  - Cyclosporine
    - Modified Neoral™ equivalent or Atopica™
      - 5mg/kg q 12-24hrs
      - Better results (decreased alopecia, scaling, inflammation around sebaceous glands) seen at 5mg/kg/day with topicals than without (or topicals by themselves), Lortz, 2010
        - Regeneration of sebaceous glands appeared best achieved by CsA, either alone or with topical treatment

Sebaceous Adenitis

- Additional Treatments
  - Retinoids: isotretinoin or etretinate
    - Anti-inflammatory
    - Aid in normal epithelial differentiation
  - Vitamin A
    - 8,000-10,000 IU/20lb q 24 hours
    - Retrospective (Lam et al. 2011): 24 cases receiving Vitamin A (22/24 also receiving fatty acids, and/or topicals, and/or antibiotics or antifungals)
      - 380 to 2667 IU/kg/day
      - Helped as adjunctive therapy, 15/21 improved
      - 1 dog 3 years later developed KCS
      - 3 had chemistries at 3 months and 2 years: no significant elevations in liver values or cholesterol, no lipemia

Sebaceous Adenitis

- Additional Treatments
  - Doxycycline/Niacinamide
    - <10kg, 250mg of Niacinamide TID, wean over time
    - >10kg, 500mg of Niacminamide, wean over time
    - Doxycycline 5mg/kg BID, wean over time
  - 1:1 bath oil and water soak for 1-2 hours followed by a degreasing bath
  - Address secondary infections
  - Ears: Douxo™ Micellar Solution
  - Variable prognosis, depends on severity
  - Do Not Breed

https://kerilotion.com/products/keri-shower-bath-body-lotion/

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Zinc Responsive Dermatosis

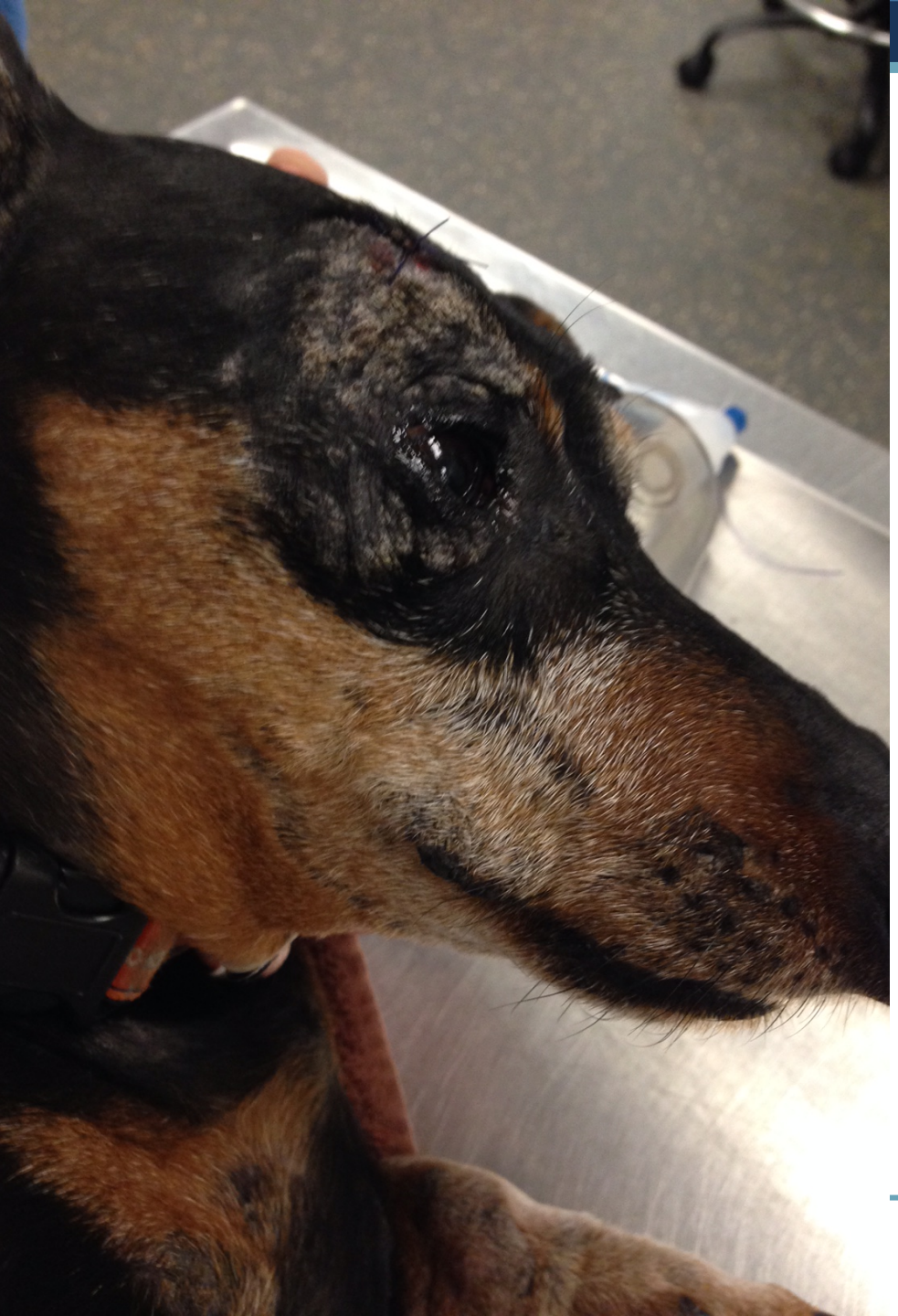
- Cause
  - Skin dermatosis due to zinc deficiency that causes disorder of keratinization
  - Cofactor for RNA and DNA polymerases
  - Needed for biosynthesis of fatty acids
  - Possible role of zinc in protecting skin against free-radical oxidative damage
  - 2 Syndromes
    - Syndrome I
      - Inherited impairment in absorption and metabolism of zinc
    - Syndrome II
      - Rapidly growing puppies that consume a high phytate diet, zinc-deficient diet, or over-supplemented diets (minerals and vitamins)
      - Rare, especially with good quality diets available

Zinc Responsive Dermatosis

- Syndrome I
  - Signalment
    - All ages, but primarily young adult
    - Northern breeds
    - Bull terriers and other breeds
    - Clinical Signs
      - Erythema, alopecia, crusting, scaling
      - Mouth, chin, periocular area, and ears
      - Other body areas possibly affected
        - Genitals
        - Pressure points
        - Paw pads

Zinc Responsive Dermatosis

- Syndrome II
  - Signalment
    - Growing puppies, young adult dogs
    - Great Danes, Doberman pinschers, Beagles, German shepherds, German shorthair pointers, Labrador retrievers, Rhodesian ridgebacks, Standard poodles
    - Related Pharaoh Hound puppies, Campbell and Crow, J Vet Diagn Invest., 2010
  - Clinical Signs
      - Clinical features similar to Syndrome I, but can be more severe
      - Can have other signs: Stunted growth, depressed, anorectic, lymphadenopathy



Zinc Responsive Dermatosis

- Syndrome I
  - Clinical Signs
    - Thick crusts on pressure points
    - Secondary infections
    - Chronic cases: hyperpigmentation
    - > ½ have lesional pruritus
    - May begin unilaterally and progress to symmetric lesions
    - Footpads may be hyperkeratotic

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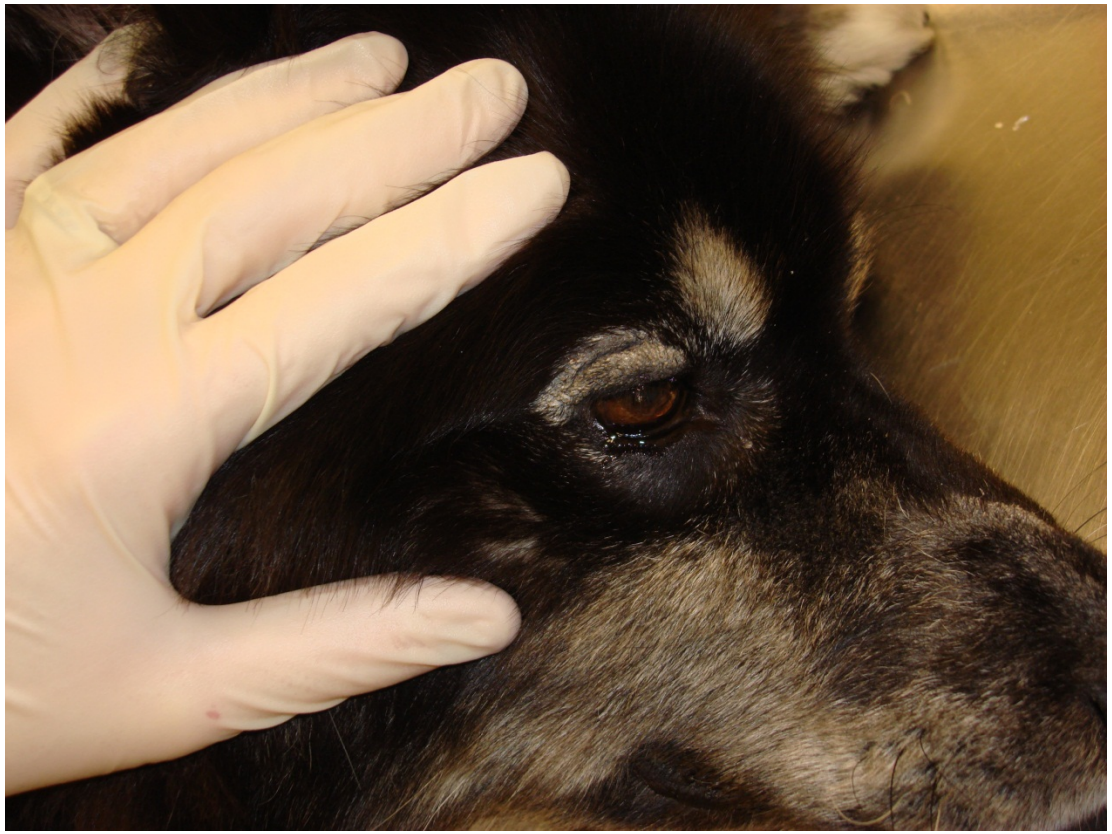
Zinc Responsive Dermatosis

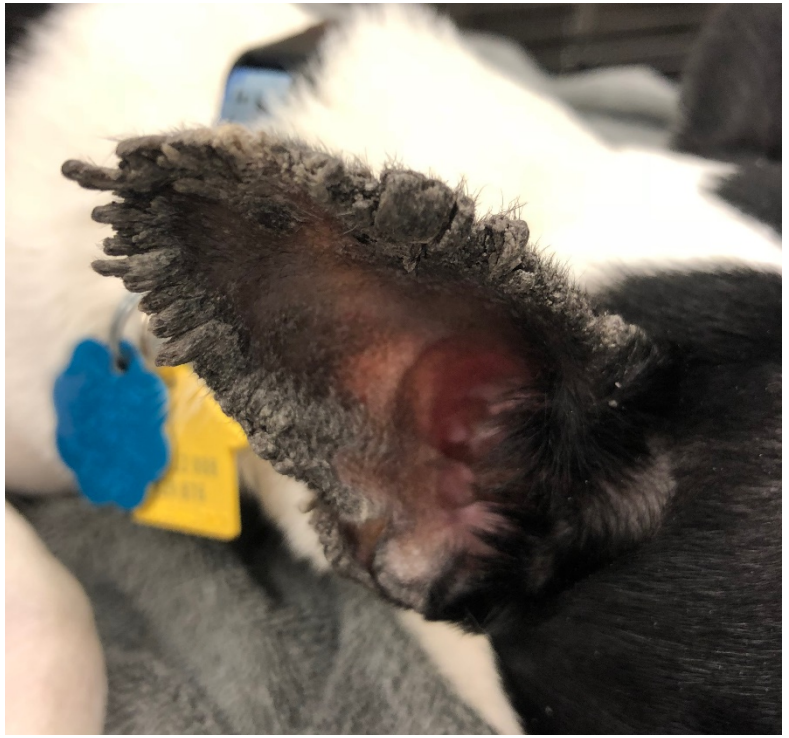
- Diagnosis
  - Consider signalment and clinical signs
  - Dermatohistopathology
    - Epidermal and follicular parakeratosis
    - Superficial perivascular dermatitis
    - Papillomatosis
    - Spongiosis
    - Possible secondary infection
  - Response to zinc therapy
  - Zinc analysis unreliable



Zinc Responsive Dermatosis

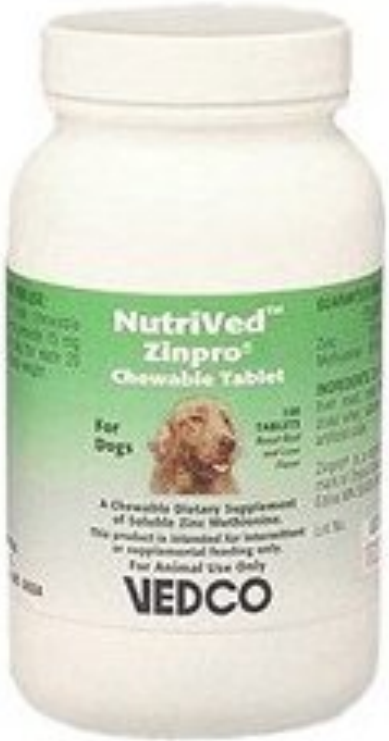
- Boston terrier dogs
  - Parakeratotic hyperkeratosis resembles zinc responsive dermatosis in Artic Breeds
  - Retrospective of 16 Boston terriers (Lee et al. 2016)
    - Mild to severe parakeratotic hyperkeratosis with follicle involvement
    - Zinc levels not significantly different between affected and unaffected
    - 5 received oral zinc
      - 4 had clinical improvement or resolution
  - Other congenital and metabolic diseases characterized by parakeratosis

Zinc Responsive Dermatosis



Zinc Responsive Dermatosis

- Treatment
  - Treat secondary infections
  - With Syndrome II, correct dietary imbalance
  - Zinc supplementation
    - Zinc methionine or zinc sulfate
    - 4-6 weeks to start to see response
    - If no response, consider dosage or type of zinc change
    - Toxicosis: depression, anorexia, vomiting, diarrhea; cutaneous signs look like zinc deficiency

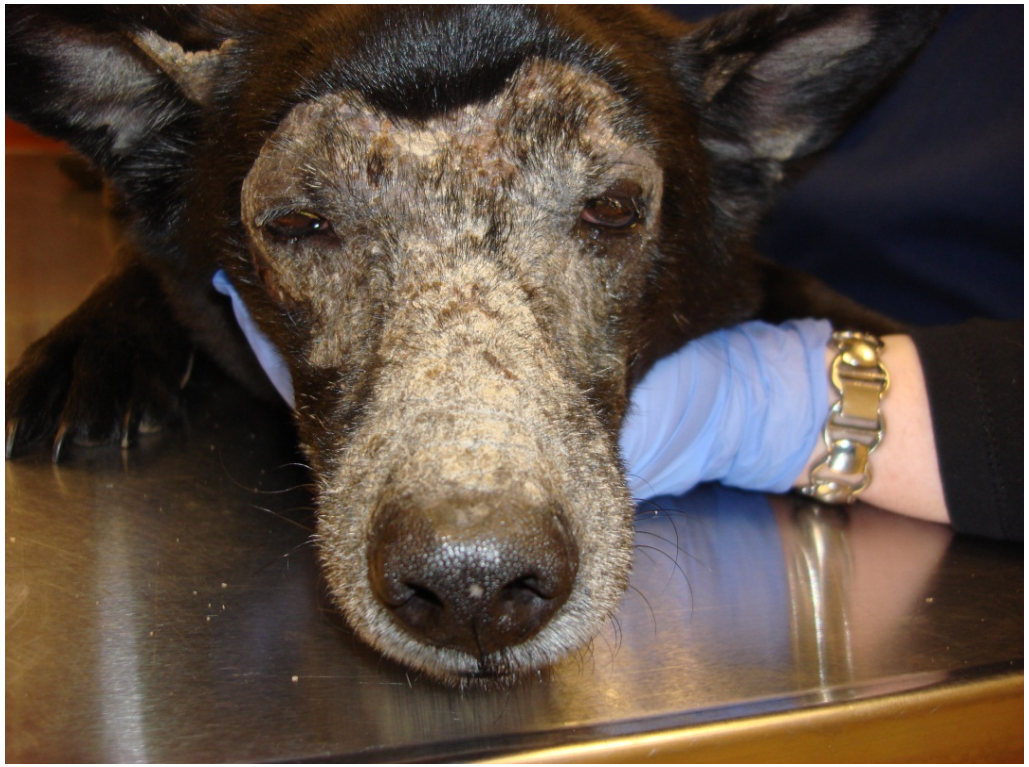


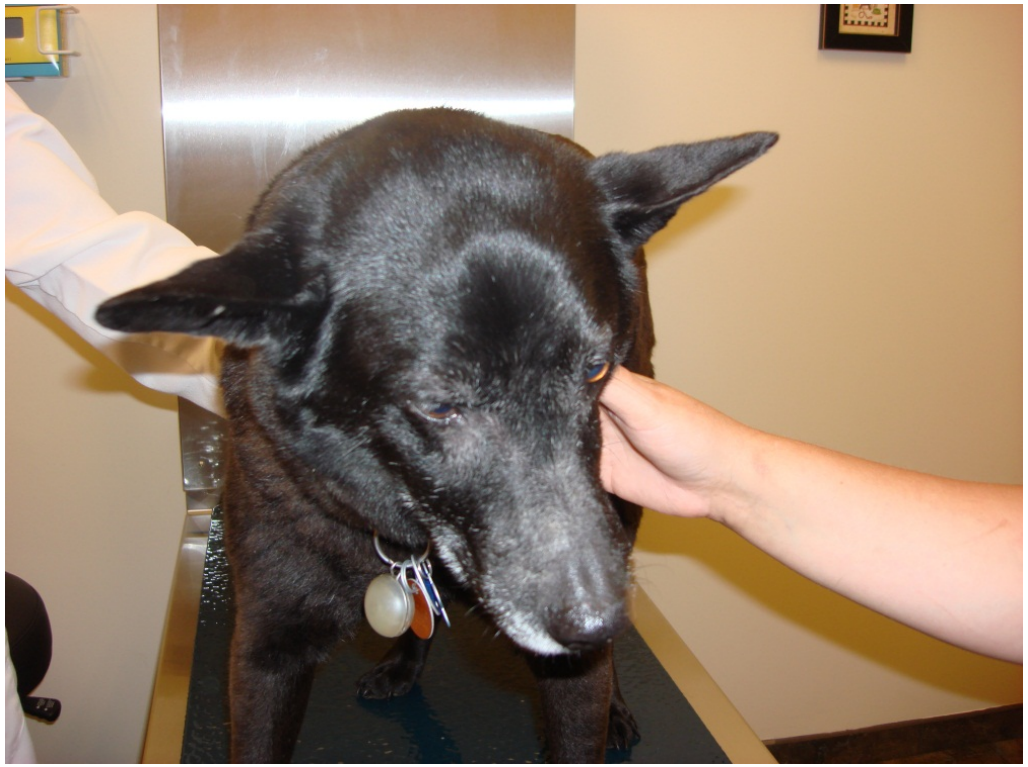
https://www.vedco.com/product-listing/159-vinv-nutr-znpr

Zinc Responsive Dermatosis

- Treatment
  - Essential fatty acids
  - Antiseborrheic therapy
    - Shampoos
    - Spot-ons
  - Steroids
    - When zinc alone doesn’t resolve issue
    - Pruritus present
    - Anti-inflammatory dosing
    - Increase absorption of zinc from gastrointestinal tract
  - Syndrome II: dietary adjustments
  - Overall good prognosis, but life-long therapy

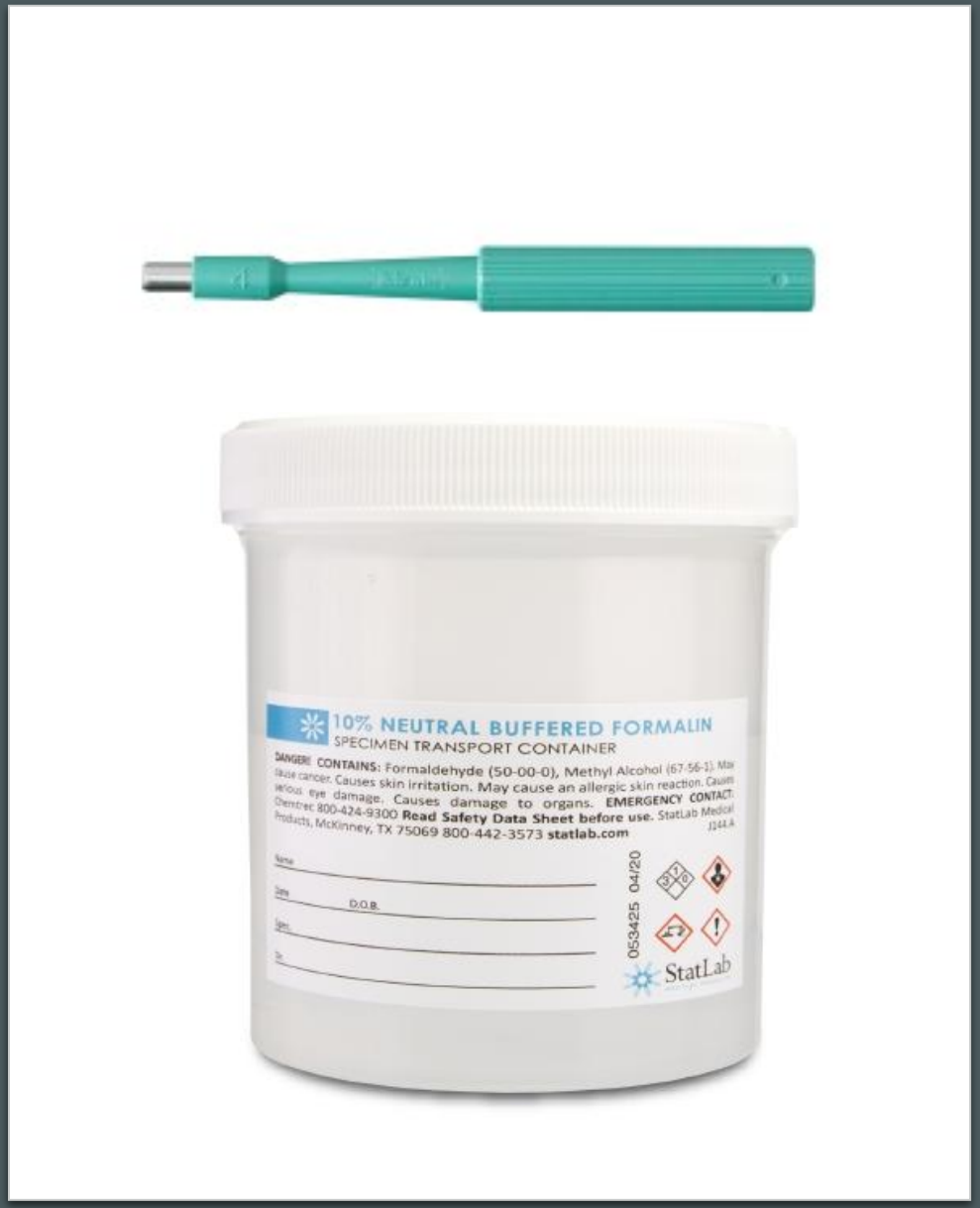
Zinc Responsive Dermatosis





Histopath Suggestions

- Multiple biopsies
- Multiple types of lesions
- 6-8mm biopsies if possible
- Don’t scrub
- Avoid necrotic centers
- Normal skin not necessary
- Dermatopathologist
- Detailed clinical history
- Request microscopic description
- Take pictures
- Call the pathologist



Conclusions

- Closely consider signalment and clinical signs in non-typical dermatologic patient
- Consider biopsy
- Remember histopath tips in attempt to obtain good results

Questions?

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