

Factors contributing to scale formation

- Increased keratinocyte proliferation
- Disorders of keratinization
- Disorders affecting lipid bilayers (stratum corneum)
- Disorders affecting cell cohesion





Classification of Keratinization Disorders



- Primary = Hereditary
 - Signs develop early in life
 - Majority are autosomal recessive (parents phenotypically normal)
 - Genetic testing available for some disorders
- Secondary = acquired
 - Increased scaling is associated with almost every disorder involving the skin



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Seborrhea Oleosa of Persians and Himalyans



- Severe seborrhea may be present within first 2-3 days of life
- Autosomal recessive
- Mild cases may be managed with shaving and bathing
- Severely affected often euthanized

Feline Primary Seborrhea



- Other breeds may also be affected

 Exotic shorthair
- Affected cats have "dirty appearance"

Feline Primary Seborrhea





Canine Ichthyosis

- Clinical signs
 - Abundant scales
 - Keratinous projections
 - Erythroderma
- Two forms in dogs
 - Epidermolytic
 - Non-epidermolytic





Epidermolytic Canine Ichthyosis



- Norfolk Terriers
 - Defect in keratin 10 formation
- Rhodesian ridgeback
- Labrador retriever
- Norfolk terrier
- Cavalier King Charles spaniels

British Journal of Dermatology 2005; 153:51–58

Defects in keratin formation I. Blistering diseases(Mc Lean et al 1995) Point mutation in K5 X14 Weeken the frament bundle orchared 1s desminance & heroide orchared 1s desminance & Cytolysis in st. spinosum Lindergo cytolysis Blistering of oral mucosa Hyperproinferation of basel cells (as feedback) EPIDERMOLYSIS BILLOSA SLIMPLEX FEIDERMOLYTIC HYPERERATIOSIS

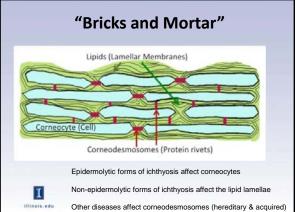
Cavalier King Charles Spaniel Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatosis (CKCSID)



- KCS & frizzy coat
- Dorsal scaling, deformed claws
- 8% of UK CKC carriers
- Autosomal recessive
- FAM83H gene (mutation Exon 5 c.1016delC)
- Antagene (France) genetic test

Hartley et al: Vet Ophthal 2012; 15:315-326





Non-Epidermolytic Canine Ichthyosis • Defect in intercellular lipids, cornified envelop, or desmosomes From Vet Pathol 45:2, 2008 Golden retriever with ichthyosis

Non-Epidermolytic Canine Ichthyosis



Breeds affected

- Jack Russell terrier (Parson Russell)
 - Low transglutaminase
- Australian terrier
- Cairn terrier
- Norfolk terrier
- American bulldog
- Golden retriever

American Bulldog Ichthyosis









American Bulldog Ichthyosis







Golden Retriever Ichthyosis • Puppies may exhibit rough



http://www.antagene.com/en

Pupples may exhibit rough
 haircoat with hyperpigmentation

- Truncal lesions may not be obvious until adults or older
- Autosomal recessive inheritance
- ICT-A = Ichthyosis genetic test (Antagene Laboratory, France) blood + cheek swabs



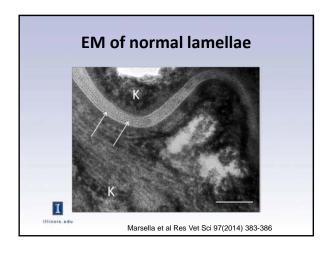


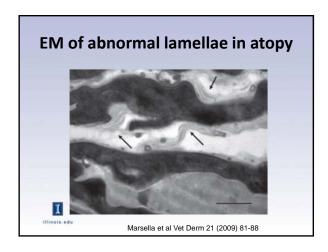
Conditions associated with abnormalities in lipid lamellae

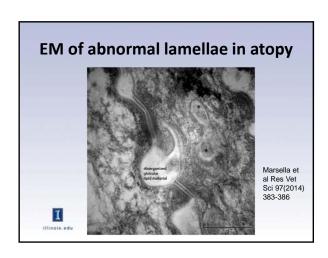
- Some forms of ichthyosis
 - Autosomal recessive congenital ichthyosis
 - Defects in 12R-lipoxygenase, eLOX-3, transglutaminase 1
 - Harlequin ichthyosis
 - Defect in ABCA12 gene (transporter protein for epidermal lipids)
- EFA deficiency (dietary or maldigestion/malabsorption)
- Atopic Dermatitis (humans, dogs, horses)













Disease Targeting Sebaceous Glands: Sebaceous Adenitis



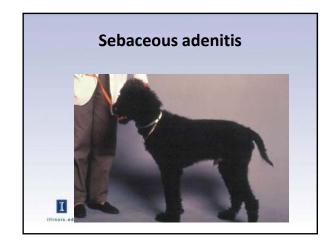
- Breeds
 - Standard poodle (autosomal recessive)
 - Akita
 - Vizsla
 - Samoyed
 - other
- Age
 - young to middle-aged

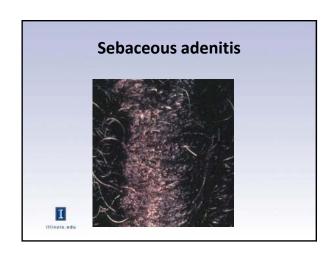
Sebaceous Adenitis

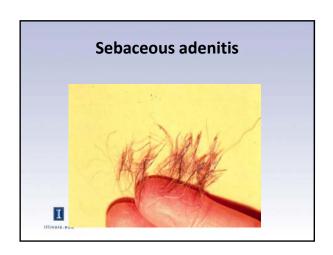
- Long-coated dogs
 - symmetrical alopecia, scaling, dry coat on dorsum, nose, tail, pinnae, truck
 - later follicular casts and matting
- Short-coated dogs
 - "moth-eaten" alopecia
 - secondary pyoderma

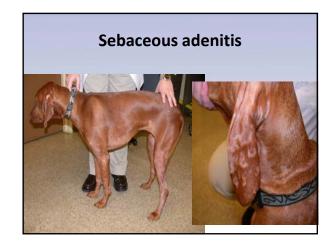


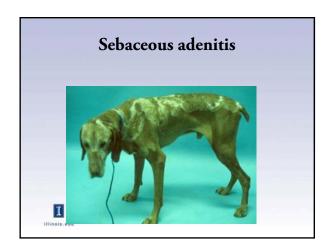


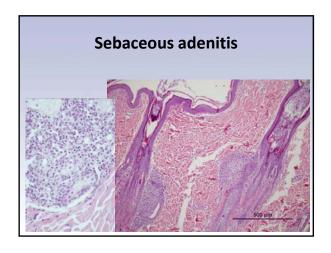












Sebaceous adenitis: treatment

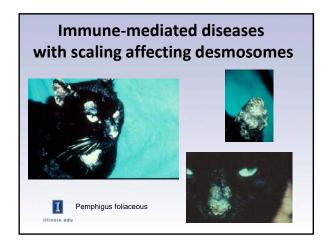


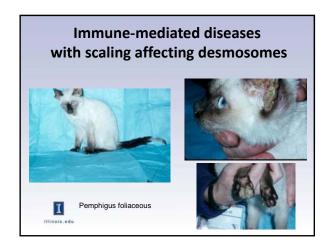
- Follicle flushing shampoos (Ethyl lactate)
- Moisturizers ("intensive oil treatment")
- Isotretinoin (1 mg/kg)
- Vitamin A (1000 IU/kg)
- Tetracycline + Niacinamide
- Cyclosporine 5 mg/kg
- Treat secondary infections
- Client Education: goal is to minimize symptoms, no cure, is hereditary

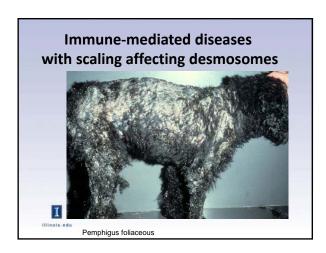


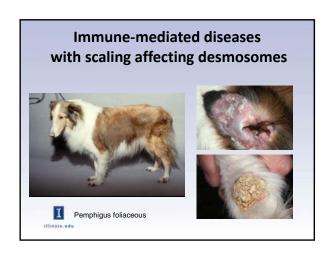
illinois.edu

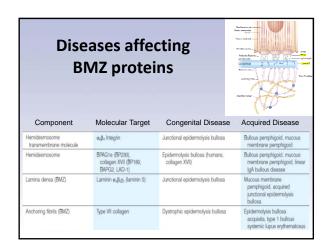
Diseases affecting desmosomes Component Molecular Target Congenital Disease Acquired Disease Intermediate filaments K5/K14 Ocular cicatricial pemphigoid Epidermolysis bullosa simplex Desmosomes Desmoglein 1, Pemphigus vulgaris, pemphigus foliaceous desmoglein 3 Plakoglobin, Desmosomes Ectodermal dysplasias, skin Paraneoplastic pemphigus desmoplakins

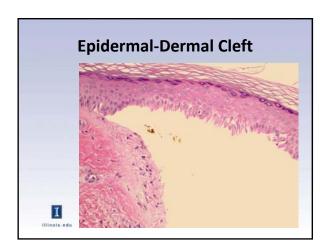


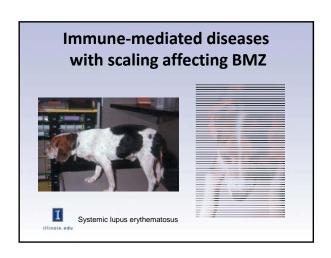






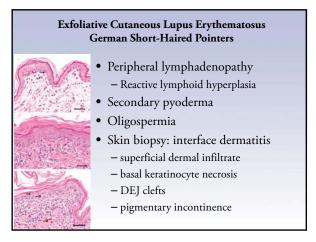




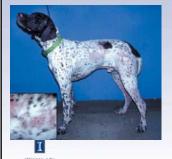


Immune-mediated diseases with scaling affecting BMZ

Exfoliative Cutaneous Lupus Erythematosus German Short-Haired Pointers • Autosomal recessive - Single nucleotide polymorphism on Chromosome 18 • Lesions start 6 mo-3 yrs • Scaling on face, ears, dorsum→generalized • Painful & prurutic • May wax & wane, usually progressive with lameness, hunched back & lethargy



Exfoliative Cutaneous Lupus Erythematosus German Short-Haired Pointers





Exfoliative Cutaneous Lupus Erythematosus German Short-Haired Pointers



- Antiseborrheic therapy
- Tx 2° pyoderma
- Hydrochloroquine 5-10 mg/kg once daily may slow clinical progression in some
- Cyclosporine decreases erythema and arthralgia but did not slow overall progression

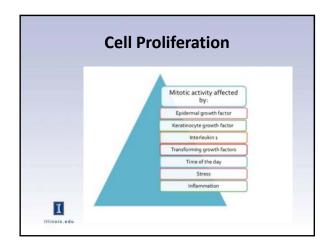




Exfoliative Cutaneous Lupus Erythematosus German Short-Haired Pointers

- Prognosis is guarded
- Bathe q 4-7 days with moisturizers
- Omega 3 fatty acids
- Carprofen 2.2 mg/kg q 12 hr OR deracoxib 1-2 mg/kg q 24 hr for control of pain
- Most are euthanized



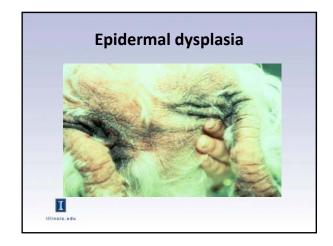


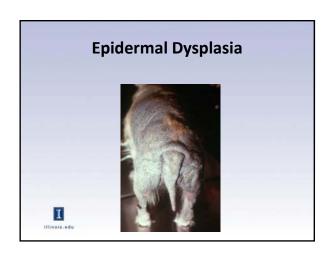
Epidermal Dysplasia

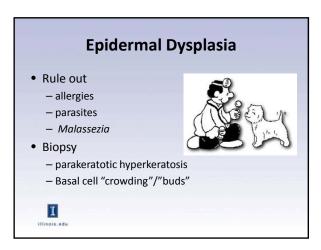
- Breed
 - West Highland White Terrier
- Lesions
 - by one year erythema and pruritus
 - "amardillo skin"
- Skin colonized with *Malasezzia*—the dysplasia maybe reaction to yeast

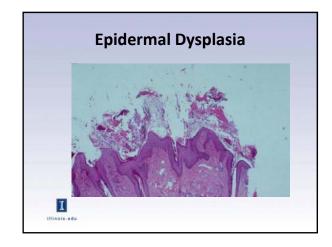


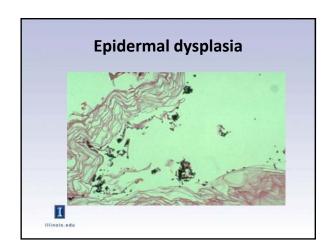
Epidermal dysplasia Wilhola.edu











Epidermal Dysplasia • Management — Treat secondary infections — Vitamin A 1000 IU/kg — Retinoids • Retin-A topical • Acitretin — Antiseborrheic shampoos

Inflammation → Epidermal Hyperplasia

- Ectoparasites
- Allergies
- Infections
- Environmental



Parasites as causes of scaling

• Cheyletiella = "walking dandruff"











Cheyletiella – Clinical Signs

- Dorsal distribution
- Scale
- Variable pruritus (possible hypersensitivity in severely pruritic animals)
- Exfoliative erythema
- Miliary dermatitis or "fur mowing" in cats







Cheyletiella - Diagnosis

- Visualization of parasite:
 - Larger than sarcoptes
 - Prominent mouth hooks
- Visualization of eggs:
 - Small and attached to hair by fine strands (vs large louse nits firmly cemented





Cheyletiella





Cheyletiella - Diagnosis

- Methods of parasite visualization:
 - Direct examination of "walking dandruff" (naked eye or hand lens)
 - Superficial skin scrape
 - Acetate tape preparation
 - Fecal floatation
 - Flea combing
 - Vacuum test

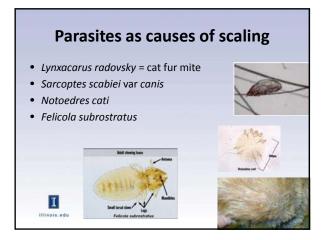


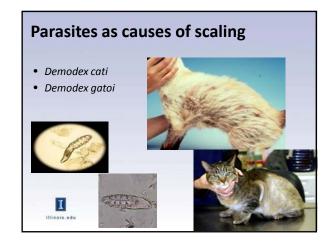


Cheyletiella • Treatment - All in-contact animals - Minimum of 6 weeks (ideally 2-4 weeks past clinical cure) - Treat environment (pyrethrin spray) - Keratolytic shampoo

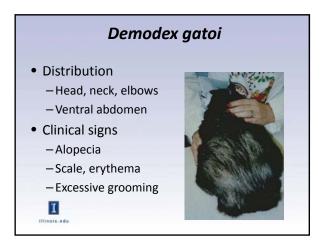


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Pound in the stratum corneum Contagious Pruritic May find mites on skin scrapings or fecal flotation

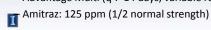


Demodex gatoi



Therapy

- Stop any glucocorticoid or progesterone tx
- Treat all in-contact animals
- Lime sulfur is treatment of choice
 - improve in 3 weeks
 - treat for 4-6 weeks minimum
- Ivermectin: 300 mcg/kg once weekly, variable response
- Advantage Multi (q 7-14 days, variable response)



Demodex cati

Localized follicular

demodicosis

- Rare condition
- Eyelids, periocular, head, neck
- Differential for feline
- Usually responsive to lime sulfur or other mild parasiticides
- Often self-limiting





Demodex cati



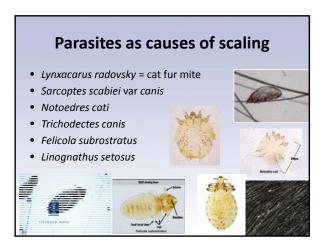
Generalized follicular demodicosis

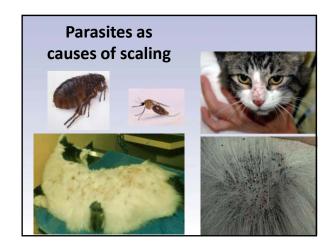
- -Very rare
- -Siamese and Burmese at risk
- -Usually have an underlying condition
 - FIV, FeLV, Diabetes Mellitus, Bowen's disease

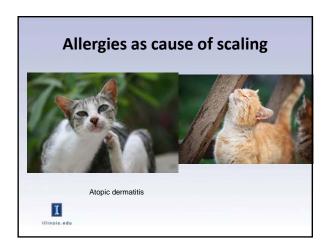
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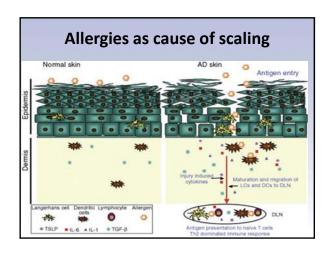
Treatment: generally much easier than K9 - Manage pyoderma - Lime sulfur dip weekly - Ivermectin 300 mcg/kg wkly + Lime sulfur dips - Amitraz at 125 ppm (1/2 strength)





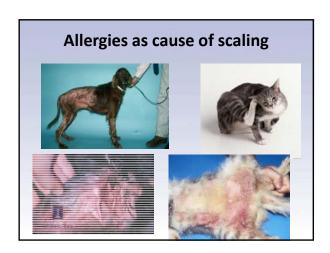


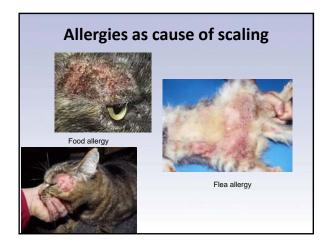












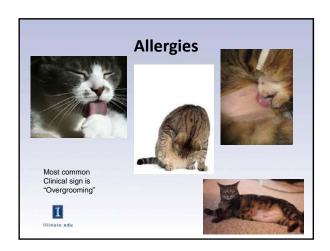
Allergies in Cats • Common manifestations

- Pruritus +/- crusts/scales
- Feline Miliary Dermatitis
- Eosinophilic Granuloma Complex
- Feline Symmetrical Alopecia



include





Allergies in Cats

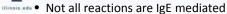
- Atopic Dermatitis--Diagnosis
 - R/O ectoparasites
 - R/O food allergies
 - R/O infections
 - Investigate for "offending" allergens
 - Serum IgE testing
 - Intradermal testing





Pitfalls which Limit Usefulness of Serum IgE testing

- Poor reproducibility
- Poor specificity for IgE
- Many false positives - non-specific binding
- Little distinction between positive tests in normal and allergic cats
- Great seasonal variability
- half-life of serum IgE = 2.5 days



Intradermal allergy testing

- Evaluates antigen-specific IgE and/or IgGd bound to mast cells in skin but not a perfect test (still have false + and false -)
- · Cat reactions can be more difficult to read





Treatment Options for Feline Atopy

- Control secondary infections
- Eliminate ectoparasites
- Allergen-specific immunotherapy
 - Subcutaneous
 - oral



- Skin barrier repair
- Omega 3 fatty acids
- Antihistamines
- Corticosteroids
- Cyclosporine
- Oclacitinib?

Diagnosis of Food Allergy

 Neither in vitro nor intradermal testing for food ingredients are accurate predictors of food allergies



» differences in antigens of test proteins versus by-products in pet foods

- » changes in proteins during digestion
- » Many adverse food reactions are not IgE mediated

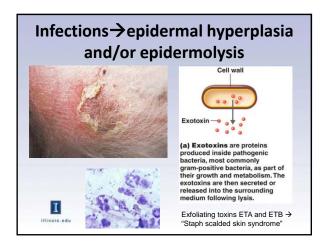
Definitive Diagnosis of Food Allergy

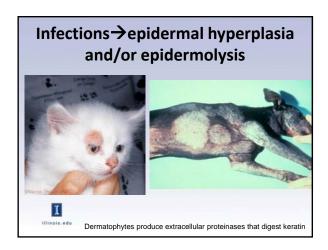
- Symptoms resolve with dietary change
- Symptoms recur with provocation

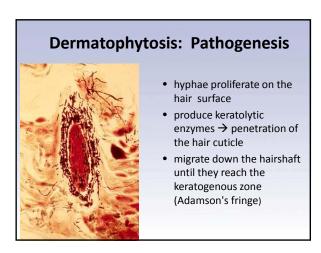




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Dermatophytosis: Cause

- Microsporum canis
 - zoophilic *CATS*
 - most common cause of dermatophytosis in cats and dogs
- Microsporum gypseum
 - geophilic normally found in the soil
- Trichophyton mentagrophytes
 - zoophilic *RODENTS*



Dermatophytosis: Feline

- Localized infections
 - One or more annular areas of alopecia
 - May mimic chin acne or "stud tail"
 - Onychomycosis
- Dermatophyte kerion
- Dermatophyte pseudomycetoma





Dermatophytosis: Diagnosis

- Wood's Lamp
 - warm up a few minutes before use
 - infected hairs fluoresce yellow-green
 - noninfected scales and crusts may appear a brighter white color - this is NOT a positive reaction

 - only some strains of dermatophytes glow:
 M. canis, M. audouinii, M. distortum, T. schoenleinii
- Only about 50% of *M. canis* will fluoresce.



Wood's Lamp

Plucked Hairs

- Plucking hairs with hemostats
- Take hairs from periphery of lesions
- Obtain approx 10-20 hairs





Dermatophytosis: Diagnosis

- Microscopic examination of hair
 - Clear the keratin:
 - 10% 20% KOH
 - chlorphenolac
 - Mineral oil can also be used
- fragmented hairs; larger than normal hair diameter; loss of definition between the hair cuticle, cortex and medulla



Diagnosis of Dermatophytes

• M. canis







• M. gypseum





Dermatophytosis: Diagnosis

- Fungal culture
 - MOST REALIABLE test
 - pluck hairs from the periphery of a lesion
 - sterile tooth brush for generalized cases
- DTM = Dermatophyte test medium
 - Dermatophytes utilize the protein in the media first, leading to alkaline metabolites that cause the media to turn red within 10-14 days
 - Saprophytes use carbohydrates first, creating acidic metabolites - then use protein, usually after 10 - 14 days



Dermatophytosis: Diagnosis

- DTM
 - DO NOT RELY ON COLOR CHANGES
 - MUST identify the organism through morphologic and microscopic characteristics
- Rapid Sporulating Media (RSM)
 - encourages rapid sporulation, and organism identification



MacKenzie Collection Technique

- Useful for identifying asymptomatic carriers (cats) and for determining if animal is no longer contagious
- Be sure to brush around face and ears
- Collect hairs from bristles or cut bristles and place them onto media





Monitoring treatment

- Continue treatment until 3 negative cultures
- Toothbrush cultures (also use to screen healthy appearing cats for carrier status)
- Monitor environment through culturing hairs or pads used to wipe floors/walls







Topical Therapy

- Decreases contagion—can kill ectothrix spores
- Little effect on endothrix spores or hyphae within hairs
- Repeat applications q 5-7 days
 - Lime sulfur
 - Miconazole/chlorhexidine
 - Enilconazole





Topical Therapy—Lime Sulfur

- Contains calcium polysulfides → pentathionic acid and hydrogen sulfide after application → fungicidal & bactericidal, also kills many mites and lice
- 1:16 to 1:32 dilutions applied q 4-7 days, do not rinse







Shaving?

- Pro:
 - remove infected hairs
- Con:
 - microtrauma to skin likely to spread infection
 - Infected hairs may be dispersed into environment
- Consider for
 - Generalized infection in longhaired cat





Bathing?

- Insufficient contact time to kill dermatophytes
- May spread infection
- A few studies have shown benefit with use of ketoconazole/miconazole/ chlorhexidine baths in combination with systemic treatment



Illinois.ed



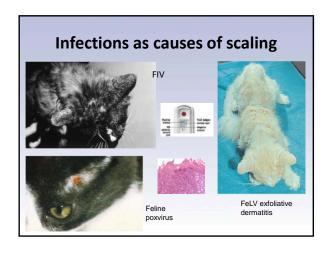
Dermatophytosis: Treatment

- Systemic therapy (hasten resolution)
 - all animals with multifocal lesions
 - all long haired animals
 - cats!
 - animals not responding to 2 4 weeks of topicals
 - Difficult for topicals to penetrate into hair follicles



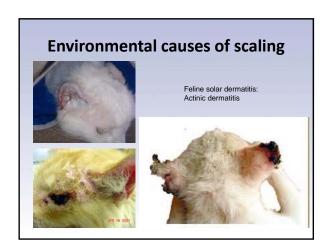
Systemic Antifungal Therapy Highly recommended for all dermatophyte- infected animals Continue treatment until three negative cultures have been obtained (weekly intervals) Drug Mode of Action Griseofulvin Inhibits cell wall synthesis an mitoris (disuppin notice) Ketoconazole Inhibits p52 empres, (imidazole) Litraconazole Inhibits p52 empres, (imidazole) Itraconazole Inhibits p52 empres, other actions Itraconazole Inhibits p52 empres, other actions Itraconazole Inhibits p52 empres, other actions Fisconazole Inhibits p53 empres, blocks 14a demethylase to the actions Fisconazole Inhibits p53 empres, blocks 14a demethylase to the actions Fisconazole Inhibits p53 empres, blocks 14a demethylase to the actions Fisconazole Inhibits p53 empres, blocks 14a demethylase blocks 14a demethyla

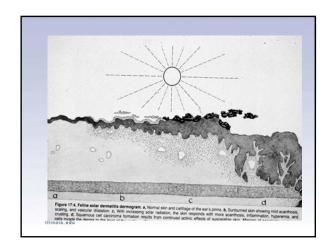




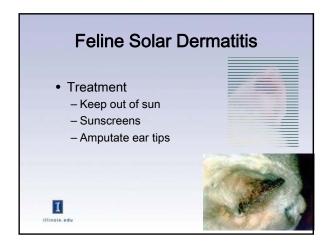




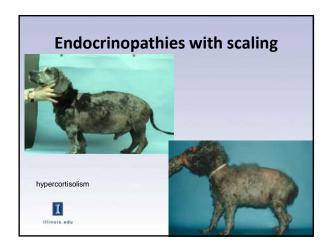


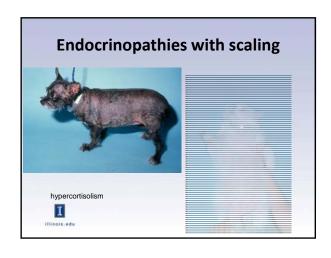


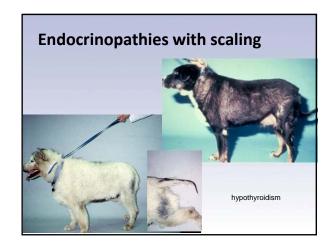




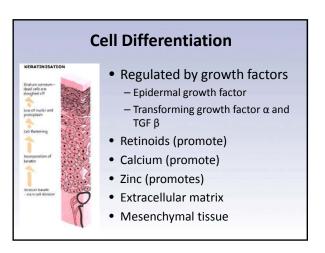


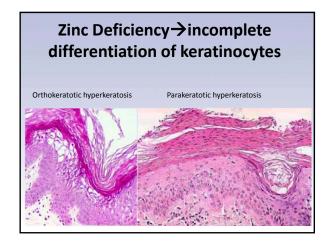












Lethal Acrodermatitis in Bull Terriers



- Growth retardation
- Progressive acrodermatitis
- Chronic pyoderma
- Chronic paronychia
- Diarrhea
- Pneumonia
- Abnormal behavior
- Median survival ~ 7 months



Lethal Acrodermatitis in Bull Terriers



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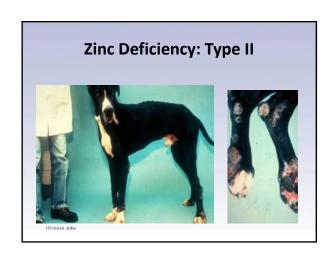
- Usually smallest puppies in litter
- Weak nursing but even more difficulty eating hard foods
- High arched hard palate food impacts in the roof of the mouth
- Splayed toes
- Nails grow fast but distorted

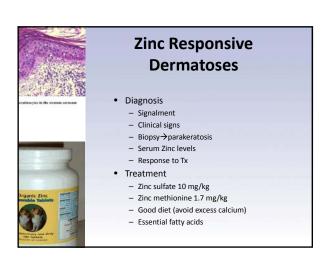
Lethal Acrodermatiis	

Lethal Acrodermatitis in Bull Terriers Autosomal recessive trait Clinical pathology - neutrophilia - hypercholesterolemia - Low SAP, ALP - Low plasma zinc Immunological evaluation: - depressed lymphocyte blastogenesis responses Antagene (France) 2-4 ml blood EDTA—genetic test being developed

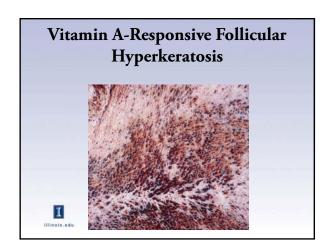


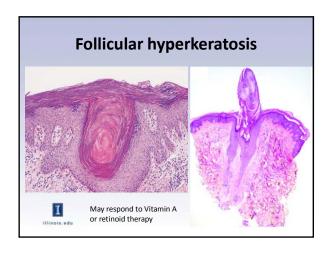
Zinc Deficiency: Type I











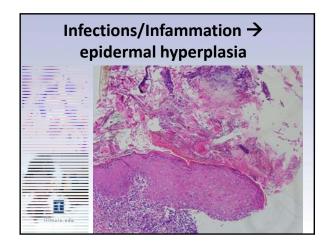
Vitamin A-Responsive Follicular Hyperkeratosis • Diagnosis - Biopsy • Management - Vitamin A 1000 IU/kg/day - Antiseborrheic shampoos

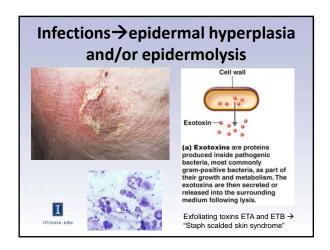






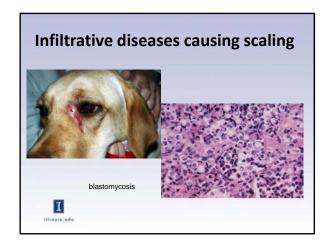




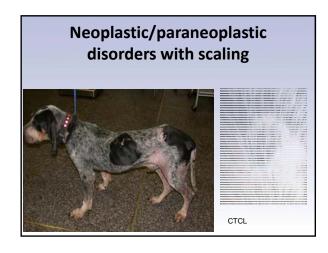






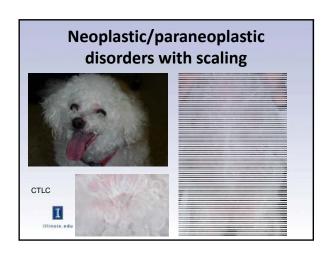










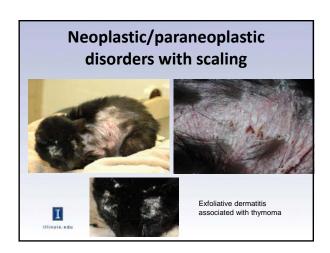


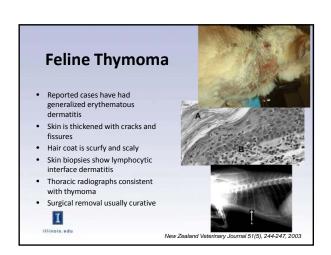












Review pathomechanisms of scaling

- Increased keratinocyte proliferation
 - Hereditary or response to inflammation
- Disorders of keratinization
 - Hereditary, infectious, nutritional or neoplastic
- Disorders affecting lipid bilayers (stratum corneum)
 - Hereditary, nutritional, metabolic or environmental





Review pathomechanisms of scaling

- Disorders affecting desquamation
 - Hereditary, infectious, metabolic or environmental
- Disorders affecting cell cohesion
 - Hereditary, infectious, immune-mediated
- Infiltrative disorders of epidermis
 - Infectious, inflammatory, neoplastic





Key Considerations



- Breed and age
- Littermates or parents affected?
- Predominant symptoms
- Is inflammation present?
 - What is cause?
 - What are contributing factors?
- Evaluate for parasites, infections, allergies, nutritional deficiencies, endocrine/metabolic diseases, neoplastic/paraneoplastic disorders
- Biopsies helpful in many cases



Review of major points

- Cutaneous scaling/crusts are non-specific
- Signalment, history, PE findings, skin scrapings, skin cytology, laboratory findings are helping in prioritizing DDX
- CE is essential
- Symptomatic treatment may help improve skin barrier function, HOWEVER
- Key is identifying and controlling underlying factors



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