EXOTIC ANIMAL DERMATOLOGY

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Reptiles

Reptile skin has serves many different functions compared to the typical mammalian integument—it is important for water conservation and plays a role in social interaction (color change). The stratum corneum is comprised of two types of keratin:

- **Beta-keratin**: hard, less permeable – forms the scale
- **Alpha-keratin**: soft, pliable – forms the suture lines between the scales

Osteoderms are boney plates found in the dermis in chelonians and crocodilians. The carapace (upper shell) and plastron (lower shell) of chelonians are formed by osteoderms that are fused with the vertebrae, ribs, and sternum. Coloration of the reptile integument is due to chromatophores and melanocytes. Stacking of these cells on top of one another is present in species that display color change (i.e. chameleons). Their skin relatively aglandular, but there are species specific glands including:

- **Scent glands** at the vent of snakes and most lizards
- **Prefemoral glands** in many lizard species – pores of these glands are larger in males
- **Mental glands**, "chin glands" in *Gopherus* chelonians – California Desert tortoises
- **Labial pits** in snakes – senses heat for hunting live prey

Ecdysis is the term for shedding of the skin, which is 10-14 days per cycle on average for most snakes and lizards. Two patterns of shedding exist, complete (snakes, some lizards), and partial (most lizards, chelonians, and crocodilians). This process is controlled by thyroid hormones, and there are two primary phases: resting (normal appearance of skin) and renewal.

Difficulty shedding is termed **dysecdysis**, which is a multifactorial disease. Husbandry deficits are the most common predisposing cause, and includes improper ambient temperature, humidity, or lack of cage furniture. Certain diseases can also predispose reptiles to dysecdysis including ectoparasites, malnutrition, dermatitis, and dermal trauma. Treatment includes frequent soaking, and most importantly, correcting the underlying problem.

Thermal burns are often secondary to heating implements in the enclosure such as "hot rocks," or exposed heat/UVB bulbs. It is still unknown why reptiles will not respond to a noxious thermal stimulus in the same way as a mammal, and thus prevent thermal injury. A grading scale for reptile thermal burns exists, and is modeled after human burn scores. Treatment of thermal burns is dependent on severity of lesions, keeping in mind that lesions will likely get worse before improvement is noted. Analgesia is of utmost importance, and there are several recent studies which have proven acceptable analgesics in chelonian and lizard species. Topical therapies and bandaging can be challenging, especially in snakes. If there are severe burns, parenteral antibiotics (ideally based on a culture and sensitivity) can be prescribed. Maintaining a clean environment and

minimizing substrate in the enclosure is also of utmost importance. Certain burns may cause permanent scale damage, even after subsequent sheds, which can lead to future dysecdysis.

Many reptile species are affected by fungal dermatitis, both captive and wild. ***Nannizziopsis guarroi*** (formally called "CANV" (*Chrysosporium* anamorph of *Nannizziopsis vriesii*) is a newly emerged fungal pathogen of reptiles. Originally this disease was referred to as "Yellow fungus disease" of bearded dragons, due to the yellow discoloration of the scales in many affected animals. ***Ophidiomyces ophiodiicola*** is an important cause of morbidity and mortality in mainly wild snakes, and is also called "Snake fungal disease." Clinical signs of *N. guarroi* infection are dermal erosions, ulcerations, and/or crust formation. One cannot visually differentiate bacterial from fungal dermatitis. Crusts or dermal biopsies can be submitted for culture, but this fungus is challenging to grow in vitro, as it requires lower temperatures. Histopathology and PCR techniques are also available. Parenteral antifungal medications are often required for severe infections, and voriconazole is preferred over itraconazole due to less systemic side effects. Successful treatment often requires long treatment periods (> 60 days).

Ophionyssus natricis, often called the snake mite, is the most common mite of reptile species, and it can infect a variety of snakes and lizards. These mites have been documented to transmit several bacteria and viruses. Clinical signs of infection include pruritus/excessive rubbing, dermatitis, dysecdysis. Severe infestations, especially in smaller reptiles, can lead to severe anemia. The mite has a long lifecycle (approximately 40 days), and a significant portion of that is spent off the host in the environment. Therefore, the duration of treatment must be *at least* 40 days. Insecticides (all potentially neurotoxic) including ivermectin parenterally and/or topical sprays for the environment (NOT in chelonians), or topical fipronil have been used for treatment. In addition, predatory mites (*Cheyletus eruditus*) have also been successfully employed for treatment in a variety of species. This mite is considered a zoonotic disease, and proper precautions should be taken by anyone who handles the infected reptile or its environment.

Avian

True glands, including sweat glands, are absent throughout most of the avian integument. The uropygial (preen) gland is the main sebaceous gland at base of tail, but it is not present in all species. Feathers grow from a follicle in the dermis, and the dermal papilla provides blood and nervous supply. One of the main differences between a feather and a mammalian hair is that the feather follicle contains a vascular core of dermis as well as epidermis. This is why a feather may bleed profusely when plucked out and why blood feathers should not be cut when wing clipping.

Feather terminology:

- **Calamus**: quill, contains axillary artery and vein during development
- **Rachis**: main shaft of the feather
- **Vanes**: portions extending laterally from the rachis
- **Pterylae**: feather tracts along body
- **Apteria**: areas of skin *between* the tracts

There are four basic types of feathers:

1. **Contour**: outermost, "main" feathers
   • Remiges: flight feathers on wings
   • Retrices: tail feathers
2. **Semiplume**: used for insuluation
   • **Filoplumes**: highly innervated, found near each follicle, equivalent to a mammalian whisker
3. **Bristle**: stiff rachis, no barbs, found around the eyes
4. **Down:** lack barbules, used for insulation

A molt is the replacement and shedding of old feathers. Avian species molt at different times and frequencies during the year. It usually follows a symmetric and distinct pattern:

Primary flight feathers → secondary flight feathers → body feathers

Some species have what is called a catastrophic molt, where all flight feathers lost at once, and they are flightless for a period of time. Molt is triggered by many factors, including thyroid hormones, photoperiod, and temperature.

Feather destructive behavior (FDB) is self-inflicted feather loss, damage, or destruction regardless of the underlying etiology. It is a multifactorial disease that can have medical (renal disease, endocrinopathies, viral diseases, fungal diseases), environmental (allergies [topical, inhaled], and/or behavioral causes. This should be considered a clinical disease presentation and NOT a definitive diagnosis. This syndrome affects an estimated 10-15% of captive psittacines. Feather damaging includes all types of mutilation of feathers by the beak (chewing, biting, plucking). This can progress to self-mutilation, in which the actual skin is damaged by the bird, usually by biting and tearing with the beak. Cockatoos are overrepresented in this subset of behaviors. Medical consequences of FDB include hypothermia, secondary infections, and hemorrhage—all of which can be life threatening depending on location of damage. The feather destructive bird often requires an extensive husbandry/environmental review, medical workup, and complete behavioral assessment. Thus, it also requires a very dedicated owner. Medical causes are considered more likely if:

- Dermatitis is present in addition to feather loss
- There is localized feather loss (i.e. over kidneys, joint)
- The animal is pruritic
- Feather loss occurs on the head (if housed alone)

Behavioral reasons are suspected to be most common cause of FDB. Predisposing factors are thought to include hand-rearing, inadequate cage size, inadequate husbandry (light/dark cycles, diet, etc), lack of foraging (i.e. boredom), lack of exercise, and inappropriate relationship with the owner.

Pododermatitis affects many different avian species including psittacines, waterfowl, birds of prey, and poultry. Causes include trauma, inappropriate perch size/type, malnutrition, and anything that would cause an unequal weight bearing (lameness). There are several proposed grading systems, and the author uses the following:

- **Grade I**: mild, localized. Epithelium thin and flattened
- **Grade II**: infected (pain, swelling, inflamed)
- **Grade III**: involves tendons and bones – poor prognosis

Successful treatment first relies on correction of the underlying etiology. Ideally pressure would be removed from BOTH feet with items such as padded bandages. A variety of antibiotics and analgesics have been utilized, and if severe, surgical debridement often necessary due to the caseous nature of avian abscesses.

Knemidokoptes pilae is also called the scaly leg mite, and the cause of "tassel foot" in canaries. Clinical signs of infection include hyperkeratosis and crusting of the cere, beak, legs, and feet. Clinical signs are considered pathognomonic, but skin scraping can be performed for definitive diagnosis. The most common treatment is ivermectin, either applied topically, orally, or parenterally for 1-3 treatments.

The Northern fowl mite (***Ornithonyssus sylvarium***) is most common in chickens, especially in colder climates. This mite spends its entire lifecycle on the bird. Clinical signs include soiled feathers around vent, tail, and rear legs. The adult mites are dark red/black in color, and these mites are often transferred via fomites. The chicken mite or red mite (***Dermanyssus gallinae***) is another common poultry mite, which feeds on birds at night, and then remains in the environment during the day. This species of mite can live off the bird for 2-3 weeks, which makes it much more challenging to treat. Environmental + host treatment are imperative for treatment success. Provision of dust baths (with *any* material) lead to reduction of ectoparasites by 80-100% after one week compared with control group in a previously published study in poultry. Diatomaceous earth, kaolin clay, sand are commonly used in backyard poultry. Additional treatments include ivermectin, and/or permethrin (Sevin dust); however, these are not approved for use in poultry in the US, and egg withdrawal times are unknown.

Small mammal

Adrenocortical disease is the most common cause of alopecia in ferrets in the US. This disease is distinct from adrenal gland disease (Cushing's disease) in dogs and cats, in that in ferrets the zona reticularis is primarily affected, which leads to production of excessive sex hormones. This disease commonly affects middle-aged to older ferrets. Clinical signs include progressive, symmetric alopecia in both sexes, and vulvar enlargement in females. Alopecia can begin as normal seasonal alopecia and progress over 1-2 years. >90% of ferrets with adrenal disease have alopecia, which often begins on the tail and caudal portion of the body. Pruritus is also common (greater than one-third of cases). Diagnosis is usually based off a plasma ferret adrenal hormone panel, and abdominal ultrasound, or both. There are several historic treatments for this disease, but the overwhelming treatment currently recommended is a deslorelin acetate implant. These are GnRH agonist implants, which are FDA approved for use in ferrets for adrenal gland disease in the United States. They are typically effective at managing clinical signs in ferrets for 8-12 months.

Pododermatitis, or sore hocks, is a chronic, granulomatous ulcerative dermatitis that commonly affects the plantar metatarsal region in rabbits. Rabbits lack plantar foot pads, and instead have thick fur covering this area. The skin is thin, and firmly attached to underlying tissues.
ANY condition that compromises locomotion or alters weight-bearing can lead to increase pressure, causing ischemia, and eventual avascular necrosis of this area. Radiographs are recommended if end-stage disease and osteolmyelitis is suspected clinically. Treatment is dependent on stage of

disease at presentation, and a variety of topical therapies and bandages have been implemented. Analgesia is also of the utmost importance, and the author commonly prescribes meloxicam in this species (0.5mg/kg PO BID, if no renal impairment).

Cheyletiella parasitovorax, or the "walking dandruff" mite is a common ectoparasite in pet rabbits. Clinical signs include a mild pruritus, alopecia, or uncommonly, oily dermatitis. Young, obese, and immunosuppressed rabbits are predisposed. It is important to note that this mite can also infect domestic dogs and cats, which can complicate treatment. Diagnosis is based on tape preparation and microscopy. The mite life cycle is 21-28 days; therefore, it is recommended to treat rabbits for at least 4 weeks. Ivermectin or selamectin are common treatments, and the environment and bedding should be changed frequently. This mite is also zoonotic, and the owners should be notified to take proper precautions.

Dermatophytosis in guinea pigs is most commonly caused by ***Trichophyton mentagrophytes***. Clinical signs include patchy hair loss usually *without* pruritus, and circular lesions on the face and head. The diagnosis and treatment is similar to that in other domestic species. The zoonotic nature of this infection should also be made clear to the owners or anyone who handles affected animals.

Guinea pigs can be affected by several different species of mites including ***Trixacarus caviae***, *Sarcoptes scabiei, Cheyletiella parasitovorax,* and others. Of those, *T. caviae* is the most commonly diagnosed (with the same methods as used in other mammals). Affected animals often have intense pruritus, which can be mistaken for seizures. Infections are more common in younger animals. A recent paper compared topical selamectin vs injectable ivermectin for treatment of 17 guinea pigs infected with *T. caviae.* Either a single topical dose of selamectin (15mg/kg) or ivermectin (400µg/kg SQ every 10 days for 4 injections) were administered to the animals. Periodic skin scrapings were evaluated for both groups for 60 days. The authors found no differences in efficacy between the two treatments; therefore, topical administration of selamectin is the most common treatment for this condition in guinea pigs.

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