Dermatology disorders of reptiles

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Reptile ownership represents one of the fastest growing population of pets in the United States. Among these reptiles, dermatologic diseases are common, and often may have multiple causes. In one study, boa constrictors and *Python* species were especially predisposed to present with dermatologic lesions.

An important, maybe the *most* important factor in dealing with skin problems in reptiles is to recognize that 1) husbandry is very important and 2)husbandry is quite variable between reptile species. Husbandry includes:

Cage or enclosure
    Size, temperature, humidity, substrate, misuse of heating rocks/stones
Food
    Balanced diet, problems with live prey, sufficient or too much water
Populations
    Problems with conspecifics, mates, different species all in same enclosure

Common Skin Diseases

Dysecdysis is the term given to abnormal shedding of the skin. It is important to remember that dysecdysis is not a disease per se; rather it is be a sign of other problems including poor husbandry, ectoparasitism (such as the snake mite, *Ophionyssus natricis)*, systemic disease, too cold an ambient temperature, improper humidity, poor nutrition, and attempts to pull off the shedding skin by well-meaning but misinformed owners. Retained skin around the digits of lizards can lead to ischemia with subsequent necrosis, necessitating amputation of the digits. In pythons, arenavirus is thought to be the causal agent of 'inclusion body disease' that is associated with dysecdysis in pythons. See Table 1 for a list of reptilian viral diseases with skin manifestations.

Ophionyssus natricis, the snake mite, is a common parasite of snakes and lizards, and in one study was found on 26% of the squamata presented to two veterinary teaching hosptials. Pruritus, dysecdysis, snakes staying in water are typical signs. The mites may be seen most easily with a hand lens; usually on the head or by the cloaca in snakes, and in the axilla, groin and ear drum in lizards. This mite may serve as a vector of

Aeromonas. Previously reported treatments are: ivermectin (0.2 mg/kg at 2 week intervals), ivermectin spray (5mg/l) on animals and environment weekly for 5 times. Remember ivermectin is TOXIC to chelonians. Moxidectin has also been recommended. Another method to treat snakes is to spray a towel with fipronil spray (Frontline®) then wipe the snake with the towel. Pyrethroids and organophosphates should be avoided. Cages should be disinfected with bleach diluted 1/20 with water, then rinsed well. A recent report describes successful treatment of this mite with afoxalaner at 2mg/kg orally, once.

This mite should be searched for and the infestation treated on reptiles introduced in the collection as well as on fomites such as branches. Quarantine and treatment of new animals should be followed. The parasite can be difficult to completely eliminate from collections. Transmission of the mite to humans has been reported. Similar mites, in the same genus (ex: *Ophionyssus lacertinus*) are found in lizards.

The *Chrysosporium* anamorph of *Nannizziopsis vriesii* [CANV] ('yellow-fungus disease') is devastating reptile collections (primarily lizards) all over the world. CANV often may be misdiagnosed as a *Trichophyton* species. Bearded dragons and chameleons predominated early reports. Infection of green iguanas (and bearded dragons here at UCD) with a closely related organism (*Chrysosporium guarroi*) has recently been reported. Demonstrating the organism on both culture and histopathology, plus (ideally) by DNA sequencing, may be limited by owner finances or difficulties in identification or isolation. Itraconazole is occasionally effective; posaconazole and voriconazole are probably more effective. Terbinafine has also been suggested as a treatment: it is possible that combining this drug with an azole may be more effective than either alone. This disease often becomes systemic. There are a number of fungi in the *Chrysosporium* genus that can adversely affect reptiles and other animals, including people.

Bacterial infections: As poikilotherms ('cold blooded'), reptiles' immune systems are 'slower' to respond to infections. This is especially obvious in abscesses, which are very common, and in the long length of time some reptiles need to be on antibiotics (months). Abscesses are often best treated by removal, rather than lancing and draining, as in reptiles they are not liquid but rather granulomatous in consistency. Many bacteria excreted from digestive tract of reptiles normally may act as opportunistic pathogens (Pseudomonas, Aeromonas, Salmonella, etc.). In regards to antibiotics different species have different dosage regimens (see Table 2, and Mitchell reference). Petechiae, especially in chelonians, may signify sepsis, as may a ventral 'flush' in snakes. *Dermatophilus congolensis* has been reported in bearded dragons and is zoonotic.

Devriesea agamarum (a Gram-positive bacterium) is the causative agent of devrieseasis, characterized by chronic proliferative dermatitis and septicemia (especially in desert-dwelling and dry land lizard species), and subcutaneous abscesses in tropical species. Treatment is adequate basking temperatures (43-48.5 degrees C), systemic antibiotics (ceftiofur but NOT fluoroquinolones [resistant]), keeping vivarium dry and clean all crusts/debris that form from lesions. This bacterium can survive for prolonged periods in a moist, low temperature environment.

Burns: Reptiles do not seem to be able to realize when a focal source of heat (example: a 'heat rock' or a lamp) is so hot that they will be burned. The reason for this is unknown, but heat rocks should *not* be used. Other sources of burns are incandescent lights, contact with any hot substrate, or temperatures above 50°C. Clinically, burns appear as areas of erythema, (± edema), exudation, crusts ,and ultimately as necrosis with sloughing of the skin. Secondary bacterial infection is very common. Treatment consists of placing the patient in a container without sand or any substrate (so as to avoid these sticking to the wound areas or topical treatments) antibiotic(silversulfadiazine) cream, and (per Dr. Patrick Bourdeau's recommendation) topical vitamin A ointment. Turtles should be bathed only 3-4 times weekly (except soft-shelled species) and most importantly change the responsible heating device to a safer one.

Wounds: These may be caused by conspecifics in the enclosure, other pets, lawnmowers (especially in 'free range' tortoises) and are often complicated by secondary infections.

Shell problems in chelonians: these often relate to 1) too high a humidity for tortoises 2) bacterial or occasionally fungal infections, causing (a) shell necrosis (b) ulcerative shell disease (Vibrionaceae: *Beneckea chitinivora*) (c) Septicemic Cutaneous Ulcerative Disease (SCUD - *Citrobacter freundii*) 3) poor nutrition (low-calcium diet)

Treatment depends on causation. Antibiotics, both topical and systemic, cleaning of enclosure, and balancing the diet may all be indicated.

An emerging pathogen in chelonians is *Emydomyces testavorans,* a newly described keratinophilic fungal organism which is associated with ulcerative skin and shell disease and may be underdiagnosed. Keratin inclusion cysts are a common feature of infection. In the Pacific pond turtle [*Actinemys marmarota*], savanna side-necked turtle [*Podocnemis* vogli] and others the infection causes discoloration, flaking and textural change, erosion, ulceration, and osteonecrosis. In the juvenile alligator snapping turtles [*Macrochelys temminckii*] the infection causes rhinitis, paronychia, nail loss, cutaneous ulceration, plastron ulceration, excessive shedding, and death.

Blister disease in snakes and lizards: As in the shell problems in chelonians, this disease (really, a presentation) may have several etiologies. The most frequent are inappropriate humidity (for example, green tree pythons may need as > 95% relative humidity, whereas sand boas need <40%), various secondary bacterial and fungal pathogens, and concurrent systemic disease. Vesicles and pustules, which evolve into ulcers and necrosis, are found primarily on the ventrum. Treatment depends on the underlying disease process, but generally includes lancing the blister, applying antibiotic ointment and/or chlorhexidine to the affected areas, and removing the reptile to another terrarium without contaminated substrate.

Nutritional skin diseases: besides imbalances in calcium, deficiencies of vitamin A (usually young chelonians – *palpebral edema,* aural abscesses, sometimes dyskeratosis), vitamin C (chelonians and snakes - stomatitis), iodine (perhaps caused by ingestion of certain plants, affects chelonians and lizards, presents as goiters) have been reported. Steatitis in snakes, is

caused by a diet too high in fats (fish, obese rats) which leads to unsaturated fatty acid oxidation and a secondary vitamin E deficiency. This presents as a yellowish color of the skin, nodules, inflammation, and eventually secondary bacterial infections and sloughing.

In addition to these deficiencies, reptiles may also get hypervitaminosis A, sometimes caused by iatrogenic administration, which can cause sloughing of the skin. In addition, the excess vitamin A causes dry, exudative, thickened skin.

Treatment of all of the above diseases obviously depends on correcting the dietary imbalances. Remember that nutrition in reptiles is not monolithic: Different reptiles are omnivores, herbivores, or carnivores. Some switch from one to the other as they mature. All snakes are carnivores. Some recommended dosages: Vitamin C 10-20mg/kg q24h *per os* or subcutaneous; Vitamin A 40 IU/100g bw *per os* for 2-3 weeks

Do NOT feed live prey (unless stunned). I am aware that this is controversial, but this is often a source of trauma, and therefore is to be considered a common mistake. Rats, mice and even crickets have been known to wound reptiles that they were 'fed' to. This is especially a problem with snakes.

Otitis usually presents as otitis media and is most comon in chelonians, rare in lizards. Clinical signs are to nodular lesions (abscesses) on lateral head. Various bacteria are implicated, especially *Proteus morganii*. Treatment is surgical, with lancing and removal of pus, packing with antibiotic cream, and systemic antibiotics. In chelonians aural abscess have been associated with hypovitaminosis A.

In summary, here are a few simple rules to follow:

Rule One: it is always better NOT to mix species in the same enclosure/tank/cage.
Many owners may not be aware of the specific requirements of the various species, as reptiles vary tremendously – even within the three main groups kept as pets (snake, lizards, chelonians) – as far as environment, food, temperament, etc. Also, some species prey on others.

Rule Two: check the environment
A common problem is an enclosure that is too small, or has no place for the reptile to hide. This leads to escape attempts, or bruised face/jaw due to repetitive hits into glass walls. Reptiles often need an environment with a temperature gradient –warmer at one end, cooler at the other. Different species have different requirements for humidity – some need to be sprayed or have access to water baths, others do not. Substrate (soil, rocks, etc) requirements also vary. Again, watch out for sources of excessive heat leading to burns. Do NOT use 'hot rocks' or similar products/

Rule Three: check the diet
Remember, different species have different requirements. Make sure the diet is adequately balanced. Do NOT feed live prey, unless stunned.

Rule Four: do NOT use ivermectin in chelonians.

Rule Five: remember to always determine the husbandry. In one study, dependent on the teaching hospital and reptile group, from 29 to 64% of the cases had underlying husbandry issues.

Rule Six: do not hesitate to refer to an exotic animal specialist.

References

Abarca ML, Castella G, Martorell J, et al. *Chrysosporium guarroi* sp. nov. a new emerging pathogen of pet green iguanas (*Iguana iguana*). *Medical Mycology* 2009; 47:1-8.

Adamovicz L, Allender MC, Gibbons PM. *Vet Clin North Am Exot Anim Pract* 2020;23(2):263-283.

Allam AA, Abo-Eleneen RE, Othman SI. Microstructure of scales in selected lizard species. *Saudi J Biol Sci* 2019;26:129-136.

Avallone B, Tizzano M, Cerciello R Gross anatomy and ultrastructure of Moorish Gecko, *Tarentola mauritanica* skin. *Tissue Cell* 2018; 51:62-67.

British Small Animal Veterinary Association Manual of Reptiles 2019 (Fraser and Girling, eds). Chapter 15 (Dermatology)

Brown JD, Richards JM, Robertson J, et al. Pathology of aural abscesses in free-living eastern box turtles (*Terrapene carolina carolina*). *Journal of Wildlife Diseases* 40.4 (2004): 704-712.

Cooper JE. Dermatology. In: Mader DR, ed. *Reptile Medicine and Surgery*. St Louis: Saunders-Elsevier, 2005: 196-216.

Gámez BAF, Núñez CR, Waisburd GS, et al. Successful treatment of *Ophionyssus natricis* with afoxolaner in two Burmese pythons (*Python molurus bivittatus*). *Vet Dermatol* 2020;31:496-e131.

Harkewicz KA. Dermatology of reptiles: a clinical approach to diagnosis and treatment. Veterinary Clinics of North America, *Exotic Animal Practice* 2001; 4:441-461.

Holthaus KB, Eckhart L, Dalla Valle L, et al. Review: Evolution and diversification of corneous beta-proteins, the characteristic epidermal proteins of reptiles and birds. *J Exp Zool B Mol Dev Evol* 2018 Dec;330(8):438-453 Hoppmann E, Barron HW. Dermatology in reptiles. *Journal of Exotic Pet Medicine*, 2007; 16: 210-24.

Klinger C, Dengler B, Bauer T, et al. [Successful treatment of a necrotizing, multi-resistant bacterial pyoderma in a python with cold plasma therapy]. *Tierarztl Prax Ausg K Kleintiere Heimtiere*. 2018;46:43-48.

Maas AK 3rd. Vesicular, ulcerative, and necrotic dermatitis of reptiles. *Vet Clin North Am Exot Anim Pract* 2013;16:737-755.

Mader's Reptile and Amphibian Medicine and Surgery 3rd Edition 2018 (Diver and Stahl, ed). Chapters 69 (Dermatology – Skin) and 70 (Dermatology – Shell)

Mitchell MA. Therapeutics. In: Mader DR, ed. Reptile Medicine and Surgery. St Louis: Saunders-Elsevier, 2005; 645-654.

Musgrave KE, Mans C. Retrospective Evaluation of Bacterial Isolates from Clinically Ill Chelonians: 155 Cases. *J Herpetologic Med Surg* 2019; 29: 49-54.

Orós J, López-Yánez M, Rodríguez F, et al. Immunohistochemical staining patterns of alpha-keratins in normal tissues from two reptile species: implications for characterization of squamous cell carcinomas. *BMC Vet Res*;14:219.

Paré JA, Sigler L, Hunter DB, et al. Cutaneous mycoses in chameleons caused by the *Chrysosporium* anamorph of *Nannizziopsis vriesii* (Apinis) Currah. *Journal of Zoo and Wildlife Medicine*1997;28:443-53.

Robinson CD, Gifford ME. Covariation between Thermally Mediated Color and Performance Traits in a Lizard. *Physiol Biochem Zool* 2018;91:1013-1025.

Rosskopf WJ, Woerpel RW. Rat bite injury in a pet snake. *Modern Veterinary Practice* 1981; 62: 871

Rousselet E, De Mello Souza CH, Wellehan JFX Jr, et al. Cutaneous iridophoroma in a Green iguana (Iguana iguana). *Vet Clin Pathol* 2017;46:625-628.

Schmidt-Ukaj S, Loncaric I, Spergser J, et al. Dermatomycosis in three central bearded dragons (*Pogona vitticeps*) associated with *Nannizziopsis chlamydospora*. *J Vet Diagn Invest* 2016; 28:319-322.

Schneider J, Heydel T, Klasen L, et al. Characterization of *Nannizziopsis guarroi* with genomic and proteomic analysis in three lizard species. *Med Mycol* 2018;56:610-620.

Sigler L, Hambleton S, Paré JA. Molecular characterization of reptile pathogens currently known as members of the chrysosporium anamorph of *Nannizziopsis vriesii* complex and relationship with some human-associated isolates. *J Clin Microbiol* 2013; 51:3338-57.

Tamukai K, Tokiwa T, Kobayashi H, et al.Ranavirus in an outbreak of dermatophilosis in captive inland bearded dragons (*Pogona vitticeps*). *Vet Dermatol* 2016;27:99-e28. Epub 2016 Jan 11.

Van Waeyenberghe L, Baert K, Pasmans F, et al Voriconazole, a safe alternative for treating infections caused by the Chrysosporium anamorph of *Nannizziopsis vriesii* in bearded dragons (*Pogona vitticeps*). *Med Mycol* 2010;48:880-5.

White SD, Bourdeau P, Bruet V, Kass PH, Tell L, Hawkins MG. Reptiles with dermatologic lesions: A retrospective study of 301 cases at two university veterinary teaching hospitals (1992-2008). *Vet Dermatol* 2011; 22:150-161.

Table 1

TABLE 69.1 Reptile Viral Diseases That Often Have a Dermatological Manifestation

Virus	Species Affected	Clinical Signs
Poxviridae		
Chelonian poxvirus	Hermann's tortoise (*Testudo hermanni*)	Small, white-yellow papular lesions of the lower eyelids and the rostrum.
Crocodilian poxvirus (CRV)	Caimens, Nile crocodile (*Crocodylus niloticus*), saltwater crocodile (*Crocodylus porosus*), freshwater crocodile (*Crocodylus johnstoni*)	Typically present as brown wartlike lesions that may affect any part of the body. Some crocodilians may develop grey-white patches of skin. An atypical form has been identified in Nile crocodiles, with genetic analysis revealing it may be related to but not identical to CRV.
Tegu poxvirus	Tegu lizard *(Tupinambus teguixin*)	Multiple brown-colored papules distributed over the integument.
Iridoviridae		
Ranavirus	Predominately chelonians, but other species include green pythons (*Morelia viridis*) and occasionally lizards	Lethargy, nasal and ocular discharge, subcutaneous cervical oedema, gastrointestinal disease, granulomatous inflammation of the tail. High morbidity and mortality.
Invertebrate iridoviruses	Frilled lizard (*Chlamydosaurus kingii*), various other lizard species	Poxlike lesions of the skin, sudden death.
Herpesviridae		
"Grey Patch Disease" (ChHV-1)	Green sea turtles (*Chelonia mydas*)	Areas of patchy, gray discoloration of the skin in aquaculture-reared young turtles. Associated with chronic illness and death.
Fibropapillomatosis	Green, loggerhead (*Caretta caretta*), hawksbill (*Eretmochelys imbricata*), and olive ridley (*Lepidochelys olivacea*) sea turtles.	Papillary, arborizing neoplasms on the external surface of the body.
Herpesvirus of crocodiles (CrHV-1, 2 and 3)	Saltwater crocodile, freshwater crocodile	Lymphonodular skin proliferations.
Lacertid lizard papilloma	European green lizard (*Lacerta viridis*)	Papilloma lesions covering the skin with varied distribution associated with sex. No abdominal lesions observed.
Papillomaviridae		
Chelonian papilloma virus (Cc-PV-1, Cm-PV-1)	Bolivian side-neck turtle (*Platemys platycephala*), Russian tortoise (*Testudo horsfieldii*), loggerhead turtle, and green turtle	Circular papular skin lesions with occasional skin necrosis.
Lizard papilloma virus	European green lizard	Benign wartlike neoplasms on the surface of the skin.
Reoviridae		
Lizard reovirus	European green lizard	Papillomatous skin lesions and death.
Flaviviridae		
West Nile Virus	Crocodilians	Neuropathies and death. Lymphohistiocytic proliferative cutaneous lesions in American alligators (*Alligator mississippiensis*).

Adapted from Marschang RE: Viruses infecting reptiles. *Viruses*. 2011;3:2087–2126; Jacobson ER: Viruses and viral diseases of reptiles. In Jacobson ER, editor: *Infectious Diseases and Pathology of Reptiles*, Boca Raton, FL: CRC Press, 2007; and Hernandez-Divers SJ: Reptile viral diseases—summary table. In Mader DR, editor: *Reptile medicine and surgery*, 2nd edition. St. Louis: Saunders Elsevier, 2006.

Table 2 Antibiotics used at the VMTH-UCD
(from White SD, Bourdeau P, Bruet V, et al. *Veterinary Dermatology* 2011; 22:150-161.

Antibiotic	**Species Group**[1]	**Dose range in mg/kg**[2]	**Frequency in hours between doses**[2]	**Number of weeks Treated**[2]	**Route of administration** [3]
enrofloxacin	lizards (25)	5-13 (7)	24	1-9 (4)	75% PO, 25% IM
	snakes (15)	2.5-10 (5)	24	1-3 (2)	30% PO, 70% IM
	chelonians (2)	5-10 (5)	24-48	2-8 (4)	33% PO, 66% IM
ceftazidime	lizards (10)	20	48-72	1-8 (4)	100% IM
	snakes (8)	10-23(20)	72	1-8 (4)	100% IM
	chelonians (4)	20	72	2-7 (3)	100% IM
pipercillin	lizards (11)	58-200 (100)	12-48 (24)	3-8 (4)	20%SQ 80% IM
	snakes (10)	44-128 (79)	24	3-6 (3)	100% IM
	chelonians (3)	82-102 (100)	24	2-4 (2)	100% IM

[1] number of that species treated in parentheses
[2] medians given in parentheses
[3] percentage refers to number of reptiles receiving the antibiotic via that route