

## REPTILES: MANAGING HUSBANDRY RELATED DISORDERS

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Incorrect husbandry accounts for the majority of diseases encountered in captive reptiles. Knowledge about the natural history and unique environmental and nutritional requirements is important for veterinarians to diagnosis and treat husbandry related disorders. This lecture will discuss the common husbandry-related disorders and provide information on their treatment and prevention. Reptile patients have specific environmental and nutritional requirements in order to remain healthy. Due to the variety of reptile species maintained in captivity, veterinarians treating reptiles should be familiar with the basic concepts of reptile husbandry, as well as the specific needs of commonly kept reptile species.

### **Environmental temperature**

Reptiles are ectothermic and therefore the body temperature is directly affected by the environmental temperature. In their natural environment reptiles regulate their body temperature, by behaviors such as basking (increasing body temperature) or hiding under cover, in order to maintain their body temperature within their preferred optimal temperature zone (POTZ). Most physiological processes, such as immune function, growth, and digestion, are directly affected by body temperature. In captivity, the lack of an appropriate temperature gradient within an enclosure often prevents reptiles from regulating their body temperature. For most species, a focal basking light should be positioned at one end of the enclosure, resulting in an area with the highest environmental temperature. If sufficient ventilation is provided, the opposite end of the enclosure will remain cooler. Hence a temperature gradient is created, allowing the reptile to choose the correct temperature zone, in order to modify its body temperature as needed for various physiological processes (e.g. digestion, etc). In addition, a day-night temperature change is important. Night time temperatures should be lower than daytime temperatures in most species. The author prefers to use bright light emitting bulbs as heat source for the basking spot, since in the wild radiant heat is associated with visible sunlight. The use of ceramic

heaters or red infrared bulbs as the primary heat source for basking spots is therefore discouraged. Other heat elements (e.g. under tank heat mats, tape or cables) can be used to modify the environmental temperature accordingly, but in most cases are not necessary. Species-specific shelter should be provided at various temperature areas within the enclosure. In their natural environment, hiding spots are usually cooler, since they are not exposed to sunlight), and therefore care should be taken to provide shelter at the cool end of the enclosure.

Chronic exposure to high environmental temperatures without the availability of a temperature gradient will lead to various health problems, including chronic dehydration, kidney disease, bladder stones in certain lizards and tortoises, and problems shedding.

### **UVB light exposure**

Insufficient exposure to UV-B radiation (280-315nm) is well known to lead to secondary nutritional hyperparathyroidism and metabolic bone disease in many reptile species, in particular herbivorous ones. The biologically active form of vitamin D<sub>3</sub> is 1,25-dihydroxycholecalciferol (syn. calcitriol). This regulates calcium metabolism by increasing calcium and phosphorus absorption from the intestine, mobilizing calcium resorption from by bone. UV-B is necessary to activate the cholecalciferol pathway in species which rely not on dietary vitamin D<sub>3</sub> intake, which is the case in herbivorous reptiles. Whether vitamin D<sub>3</sub> is predominately of dietary origin or endogenously synthesized differs between reptile species based on their nutritional (carnivorous, omnivorous, herbivorous) strategy and natural behavior (e.g. nocturnal, vs. diurnal) and natural habitat. In omnivorous and carnivorous reptiles, the need to provide artificial UV-B radiation in captivity remains controversial. In most reptile species evaluated, exposure to UV-B radiation will lead to increased plasma vitamin D levels. Exposure to artificial UV-B in panther chameleons (*Furcifer pardalis*) had a significant effect on plasma 25-hydroxycholecalciferol. Red-eared sliders (*Trachemys scripta elegans*) had significantly higher plasma 25-hydroxycholecalciferol concentrations if the turtles were exposed to artificial UV-B radiation for 4 weeks. In corn snakes, exposure to artificial UV-B radiation for 4 weeks significantly increased plasma 25-hydroxycholecalciferol levels. In contrast, exposing ball pythons (*Python regius*) to artificial UV-B radiation for 70 days had no significant effect on 25-hydroxycholecalciferol or ionized calcium levels. As a nocturnal species, ball pythons might not need to utilize UV-B radiation for synthesis of cholecalciferol as compared to diurnal species. In addition, dietary intake of vitamin D<sub>3</sub> affects basking behavior and therefore exposure to UV-B radiation. Panther chameleons adapt their basking behavior and exposure to UV-B radiation based on their dietary vitamin D<sub>3</sub> intake. Chameleons with less dietary vitamin D<sub>3</sub> intake chameleons spend more

time basking. It needs to be remembered that most forms of artificial UV-B radiation provided in captivity are only an inadequate supplement for the natural sunlight that most reptiles are exposed to in their natural habitat. Hermann's tortoises (*Testudo hermanni*) exposed for 35 days to either mercury or fluorescent UV-B radiation emitting light bulbs had significantly lower 25-hydroxycholecalciferol plasma levels compared to days 0. While tortoises exposed to natural sunlight maintained their plasma 25-hydroxycholecalciferol levels. In bearded dragons (*Pogona vitticeps*) dietary supplementation of vitamin D3, even at high doses, was insufficient to maintain plasma 25-hydroxycholecalciferol levels, compared to bearded dragons exposed to artificial UV-B radiation.

Direct unfiltered sunlight is preferred over artificial UV-B radiation sources, whenever possible, but challenging to accomplish in most captive housing situation. A variety of UV-B emitting light bulbs are available, which vary in intensity of the emitted UV-B rays as well as heat emission (i.e. mercury vapor vs. fluorescent bulbs). It is important to note that UV-B rays are completely blocked by most glass and plexiglas products and can be significantly reduced by fine metal mesh. It is important to follow manufacturer guidelines in regards to optimal distance between the light bulb and the animal, since with increasing distance the amount of UV-B reaching the animal is progressively reduced.

Insufficient exposure to UV-B radiation leads to well-reported clinical signs associated with nutritional secondary hyperparathyroidism (NSHP). Lethargy, reduced appetite, constipation, dystocia or preovulatory stasis can be seen in animals with calcium deficiencies. However, these clinical signs are non-specific and other disease process or husbandry problems should be ruled out. Skeletal deformities or fractures due to demineralization of the bones are common in reptiles suffering from calcium deficiencies. Fractures of the limbs and ribs are most commonly seen in lizards. Once total body calcium stores are depleted enough, so that blood calcium levels cannot be maintained at adequate levels, muscle twitching, tremors, paresis and neurological signs can be seen. This is a hypocalcemic crisis, and is considered to be an acute decompensation of chronic NSPH.

## **Humidity**

Reptiles originate from a variety of natural environments with highly different degrees of relative humidity. In addition, within each natural environment humidity can vary greatly; it is usually higher in hiding spots not exposed to sunlight as well as in areas with organic materials (e.g. soil, moss, etc.) In captivity, the humidity in reptile enclosures is affected by several factors, including heat, ventilation and presence of organic material. Regular misting or fogging can aid in keeping humidity at the desired higher levels of tropical and subtropical species.

Insufficient humidity can lead to a variety of health problems in reptiles, and in particular to problems shedding (dysecdysis). If humidity cannot be maintained at sufficient levels in the entire enclosure, then hiding boxes filled with damp newspaper, coconut fiber or other absorbent materials should be offered. Snakes and lizards will frequently use these “shedding boxes” during the shedding period and the risk of dysecdysis is reduced.

### **Substrate**

A variety of substrates can be used in reptile enclosures. Newspaper or paper sheets offer the most hygienic option for substrate, as they allow for easy cleaning and monitoring. However, in species which require higher environmental humidity or like to dig in their substrate, paper is not suitable for long-term use. Potting soil, mulch and coconut fiber can be used as substrate, but often will retain a lot of moisture and the risk for mold overgrowth is increased. Sand is sometimes used for desert species and usually does not cause problems. However, accidental ingestion of sand (or any other substrate) can lead to GI impaction and obstruction. Therefore, food items should never be offered directly on the substrate, but in a flat bowl or stone; this reduces the risk of accidental substrate ingestion. Some reptiles will purposely ingest substrate (pica), which is frequently seen in lizards and chelonians. In such cases the substrate should be replaced with a material which cannot be ingested. In addition, underlying causes for pica should be investigated.