

ULTRAVIOLET LIGHT

Maximum UV Index of 2.9-7.4 in basking area). Zone 3 reptiles are the more sun exposed reptiles such as the bearded dragon, black-and-white tegu, leopard tortoise, red-eared slider, and savannah monitor. These animals bask frequently and they often bask in direct sunlight for longer periods of time.

Zone 4 ("Mid-day" open sun basking reptiles) - require the highest level of UV exposure. (Broad coverage UV index gradient of 2.6-3.5; Maximum UV Index of 4.5-8.0 in basking area). Zone 4 reptiles are the most sun-exposed reptiles such as the uromastyx, green iguana, sulcata tortoise, and chuckwalla. These animals spend the majority of the day basking in direct sunlight.

How to Set Up UV Lighting

Location of the bulb – UV bulbs should be placed where a reptile will most likely spend time basking. If using a separate heating and UV source, it would be beneficial to place them in the same side of the enclosure. This encourages your reptile to spend time under the UV light while it is basking and absorbing the heat. This also mimics the natural actions of the sun to provide both heat and UV lighting at once. Providing UV lighting across the entire enclosure, like what can be accomplished with most tube fluorescent bulbs, is also a good delivery system as it allows for good UV lighting over the entire temperature gradient provided. It is important to allow reptiles to have a gradient of UV exposure (similar to a temperature gradient). Provide options for shade away from the basking area to allow reptiles to self regulate UV exposure.

Distance from the bulb to your reptile's basking spot –

UV lighting gets less intense as the distance from the bulb increases. For this reason, keeping the light at an appropriate height from your reptile's basking site is very important. One way to adjust UV intensity is to adjust the height of the bulb. Instructional charts, provided by companies such as ZooMed™, help define the appropriate distance from the basking site to the bulb. These charts take into account the species of reptile, Ferguson zone, and the strength of the bulb. However, in general, the UV bulb should be 12-18 inches (30-45 cm) from the basking spot.

Fluorescent bulb fixtures – Light fixtures can directly affect the amount of UV that is produced. UVB wavelengths only pass through certain special plastics, so if there is a clear plastic lens covering the bulb, it should be removed unless it can be confirmed that the plastic allows passage of UVB. Additionally, metal reflectors within the fixture can double the UV output of a fluorescent bulb.

Light Cycle

– Many reptiles require a consistent day and night cycle. This helps to maintain normal sleep-wake cycles, to encourage normal behaviors, and to stimulate reproductive cycles, to name a few. In general UV light should be on for 10-14 hours during the day. Attach your UV light to a timer to make this light cycle consistent. The light cycle can be adjusted to be longer in summer months and shorter in winter months to mimic natural day lengths that your reptile would experience in the wild. Adjusting these light cycles is important if you plan on breeding your reptile.

When Should I Replace My UV Light?

It is very important to know that many UV lights will still provide white visible light long after they stop producing UVA and UVB light. It is known that the UV output of a bulb deteriorates over time and with

use. Therefore, after a while, your reptile is not receiving the UV lighting that is crucial for his health and happiness. Some bulbs will emit UV light for 6 months while other may emit UV light for up to 12 months or more. Ideally, use a digital UV meter every 1-2 months to track the UV output of your bulb. Once the UV output is diminished, then the bulb should be replaced. If the UV output of your bulb is not being monitored with a UV meter, then the UV bulb needs to be replaced every 6 months to ensure adequate UV light is being produced.

What to Know About UV Lighting and Reptiles?

- All reptiles need UVA and UVB light to be healthy and to thrive in captivity.
- Lack of UVB light can lead to metabolic diseases such as Nutritional Secondary Hyperparathyroidism (NSHP).
- Providing appropriate UVB light is a critical part of preventing NSHP.
- Choose the best UV light based on your reptile's Ferguson zone.
- Make sure the UV light is properly located to optimize its usefulness to your reptile. Research and know what intensity of UV lighting your reptile needs.
- UV bulbs should be **replaced every 6 months** if UV output is not monitored to make sure enough UV light is being provided.
- Consult your experienced reptile veterinarian about the proper UV lighting requirements for your reptile.

References/Additional Reading:

Baines, F.M., & Cusack, L.M. (2019). Environmental lighting. In *Mader's reptile and amphibian medicine and surgery* (3rd ed., pp. 131–138). St. Louis, MO: Elsevier.

Baines F et al. (2016). How much UV-B does my reptile need? The UV-Tool, a guide to the selection of UV lighting for reptiles and amphibians in captivity. *Journal of Zoo and Aquarium Research* 4(1): 42 - 63. (<http://www.jzar.org/jzar/article/view/150>. *Journal of Zoo and Aquarium Research*. 4, 42 - 63.)

Mader, D. R., & Divers, S.J. (2014). *Current therapy in reptile medicine & surgery*. St. Louis, MO: Elsevier

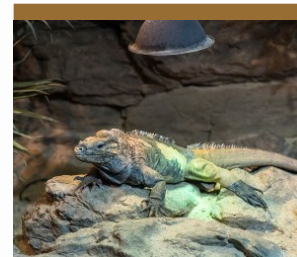
<http://www.reptilesmagazine.com/An-In-Depth-Look-At-UV-Light-And-Its-Proper-Use-With-Reptiles/>

Regular visits to your reptile veterinarian should be scheduled to check for parasites and other early signs of disease and to promote a long, satisfying relationship with your reptile or amphibian. For help in finding a reptile/amphibian veterinarian in your area, contact the Association of Reptile and Amphibian Veterinarians (www.ARAV.org) or contact the American Board of Veterinary Practitioners (www.ABVP.com/diplomate)

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Contributors
You Na Jeon, DVM, Louisa M Asseo, DVM, DABVP,
Anneliese Strunk, DVM, DABVP



WHAT ARE UV LIGHTS AND WHY DO REPTILES NEED THEM?

Ultraviolet (UV) light consists of the wavelengths of light that exist beyond the violet extent of the human visible light spectrum. Humans cannot see ultraviolet light, but reptiles and other animals are able to see some wavelengths of the UV portion of the light spectrum. In regard to reptiles, there are two major forms of Ultraviolet light that are important: ultraviolet light-A (UVA) and ultraviolet light-B (UVB). Ultraviolet light plays an important role in a reptile's ability to regulate temperature and hormones. Ultraviolet light is critical to proper absorption of nutrients from food and promotion of normal behaviors. In this brochure, we will review the importance of ultraviolet lights in captive reptiles.

Ultraviolet Light-A (UVA)

UVA light has beneficial effects on reptile behavior. The UVA wavelengths are visible to reptiles. Providing UVA light during the day can act as a source of enrichment and will promote expression of natural behaviors, for even nocturnal and carnivorous reptiles. UVA light can also affect temperature regulation, improve immune system function, and normalize reproductive cycles.

Ultraviolet Light-B (UVB)

UVB is important for reptiles to produce Vitamin D3, a critical vitamin for all animals. When UVB rays are absorbed by the skin, it causes vitamin D3 to be formed and activated. Active vitamin D3 promotes absorption of dietary calcium from the intestinal tract and promotes conserving calcium from elimination through the kidneys. Without proper UVB lighting, reptiles are unable to absorb calcium from the diet and may become very low in whole body stores of calcium, which leads to a severely debilitating medical condition called nutritional secondary hyperparathyroidism, more commonly known as "metabolic bone disease." This condition is more common in herbivorous, insectivorous, and omnivorous reptiles than in carnivorous reptiles that eat whole prey items, such as rodents.

Nutritional Secondary Hyperparathyroidism (NSHP)

Nutritional secondary hyperparathyroidism (NSHP) is the most common cause of "metabolic bone disease" in reptiles. This condition most commonly affects young reptiles, rapidly growing reptiles, and reproductively active female reptiles. However, reptiles of any age and sex can be affected. NSHP is a chronic medical condition resulting from hypocalcemia, or low levels of blood calcium. Hypocalcemia can occur when a reptile's diet is too low in calcium or too high in phosphorous or oxalates. The body must maintain an appropriate ratio of Calcium to Phosphorous in the blood stream (1.5:1-2:1). When too much phosphorous is provided in the diet without adequate calcium absorption, the body will pull calcium from bones and muscle to correct the ratio. Oxalates are a mineral present in spinach and some other dark greens to lesser quantities. Oxalates bind calcium present in the meal, making it unavailable for absorption from the gastrointestinal tract. In order for any calcium to be absorbed from the intestinal tract, the body needs active vitamin D3. Most reptiles make their own vitamin D3 when exposed to adequate levels of UVB lighting, while other reptiles get a

large amount of their vitamin D3 from consuming whole prey items. Therefore, inadequate dietary vitamin D3 consumption or, more typically, inadequate exposure to UVB lighting results in low blood vitamin D3 levels which prevents calcium absorption, thus resulting in hypocalcemia. Hypocalcemia triggers the body to produce too much of a hormone from the parathyroid glands (parathyroid hormone). This hormone is responsible for regulating whole body calcium stores. When hypocalcemia is present, this parathyroid hormone leaches calcium from bones to keep blood levels of calcium within a normal range. If this parathyroid hormone is activated for too long, boney stores of calcium get depleted which leaves bones soft and fragile. When boney stores are depleted, and the calcium imbalance is still present, the body leaches calcium from other body systems, such as nerves, muscles, heart, and intestinal tract, leaving these organs calcium deficient. Calcium is important for most body systems including nerve function, muscle function, intestinal tract motility, reproductive success, heart function, and brain function. Diseases affecting all of these organ systems are commonly seen with hypocalcemia and NSHP. Signs of NSHP include soft bones, fractures, bone and joint deformities, stunted growth, general weakness, decreased running, climbing, and hunting behaviors, decreased appetite, constipation or obstipation, cloacal prolapse, egg stasis, muscle twitching, and seizures. This condition is serious and life-threatening. Diligent and comprehensive changes to your reptile's care under the direction of an experienced reptile veterinarian can help to treat this condition. However, the best method to treat this condition is to prevent it from starting. NSHP can be avoided with proper diet, calcium supplementation, and adequate exposure to UVB light.

How Can We Provide UV Light?

Direct, natural, sunlight is a great source of both UVB and UVA light, and outdoor enclosures are encouraged for reptiles, when safe to do so. Outdoor enclosures must be secure to prevent escape and predator attacks, and be appropriate for the reptile's natural temperature and humidity requirements. For the majority of captive reptiles, outdoor habitats are not safe or feasible. Housing your reptile near windows in your house does not allow adequate exposure to the sun's UV light since glass and most plastics filter out all, or most, of the sun's ultraviolet rays. Therefore, UVB and UVA light must be provided artificially for your reptile with commercial bulbs.

How Do I Know What Strength of Bulb to Provide?

In 2010, Ferguson zones were described to help to categorize species of reptiles into a classification scheme based on the species' UV lighting requirements. These zones take into account the species' natural habitat, natural diet, natural behaviors, and whether they are more active during the day or during the night. There are four Ferguson zones, each with an increasing need for UV exposure. While some species may fall between Ferguson zones, using the general classifications can help you to provide excellent UV lighting to your captive reptile.

In the following list, the UV index is listed in two parts: broad coverage is provided with fluorescent bulbs; the maximum UV index in a basking area is provided with mercury vapor; UVB-emitting metal halide, or T8-HO Fluorescent bulbs.

Deciphering the Types of UV Bulbs

FLUORESCENT

There are many forms of fluorescent bulbs. Long tube bulbs are available in two diameters (8 cm (T8) and 5 cm (T5)), and can be housed in fixtures with and without reflectors, which impacts the area within an enclosure exposed to UV light. T5 high output (HO) bulbs produce a very high level of UVB light. Compact fluorescent bulbs (with coil shape) produce less UVB, and are useful to provide low levels of UV light over a broad area (suitable for smaller vivaria or at the top of an enclosure for arboreal species). UVB levels are extremely high close to compact fluorescent bulbs, so care should be taken to prevent reptiles from getting too close.



MERCURY VAPOR

These bulbs provide high UV output, heat, and light (although the quality of visible light they produce is not optimal). Caution should be used with mercury vapor bulbs as they can create focal "hot spots". There are two main forms of mercury vapor bulbs. Flood-type bulbs have a coating that allows for a more broad output of UV and heat. Uncoated Spot-type bulbs produce a very narrow beam of intense (and dangerous) heat and UV light.



UVB-EMITTING METAL HALIDE

These are full-spectrum bulbs providing UVA, UVB, and heat. Like the compact fluorescent bulbs and mercury vapor bulbs, these bulbs also generally produce a narrow basking zone, although wide flood versions are available.



Zone 1 (Crepuscular or Shade dwelling reptiles) - require the lowest UV exposure (Broad coverage UV index gradient of 0-0.7). Zone 1 reptiles are typically shade dwelling reptiles or more nocturnal reptiles, such as the leopard gecko, crested gecko, green tree python, corn snake, and milk snake. These animals spend very little time basking and are rarely found in direct sunlight.

Zone 2 (Partial sun or Occasional basking reptiles) - require a moderate level of UV exposure (Broad coverage UV index gradient of 0.7-1.0; Maximum UV Index of 1.1-3.0 in basking area). Zone 2 reptiles are typically the more forested species such as the ornate box turtle, red foot tortoise, Chinese water dragon, green anole, and boa constrictor. These animals spend some time basking but typically they are not in direct sunlight for long periods of time.

Zone 3 (Open or Partial sun basking reptiles) - require a high level of UV exposure (Broad coverage UV index gradient of 1.0-2.6;