Reptile Lighting Information

Information on how natural and artificial lighting affects reptiles.

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To reptiles, sunlight is life. Reptiles are quite literally solar powered; every aspect of their lives is governed by their daily experience of solar light and heat, or the artificial equivalent when they are housed indoors. Careful provision of lighting is essential for a healthy reptile in captivity.

Infrared and Visible Light
The spectrum of sunlight includes infrared, “visible light” (the colors we see in the rainbow) and ultraviolet light, which is subdivided into UVA, UVB and UVC. Very short wavelength light from the sun (UVC and short wavelength UVB) is hazardous to animal skin and eyes, and the atmosphere blocks it. Natural sunlight extends from about 290 to 295 nanometers, which is in the UVB range, to more than 5,000 nanometers, which is in the long-wavelength infrared (heat) range.

Infrared light is the sun’s warmth, and basking reptiles absorb infrared radiation extremely effectively through their skin. This part of the light spectrum is invisible to humans and most reptiles, but some snakes can perceive the longer wavelengths (above 5,000 nanometers) through their facial pit organs. Ceramic heaters and heat mats emit only infrared. Incandescent lamps emit infrared and visible light. Some incandescent red basking lamps are described as “infra-red” lamps, but these also emit red visible light.

Visible light, including UVA, is essential. Many reptiles have extremely good color vision. Humans have three types of retinal cone cells for color vision, and their brains combine the information from these cells and perceive the blend as a certain color. Most reptiles, however, have a fourth cone type, which responds to UVA. These reptiles see a much more colorful rainbow than humans do, which makes providing natural lighting quite a challenge. This extra color perception is especially important to many reptile species in recognizing others of their species and even food items.

Some nocturnal geckos lack the red-sensitive cone, but their green-sensitive cone also responds to red light; they can certainly see it. Studies have even shown that some use their cone types for color vision in light similar to dim moonlight. Thus it is possible that “moonlight blue” or “red night light” lamps, which usually are much brighter than moonlight, alter these animals’ view of the twilight world.

Sunlight also has effects unrelated to conscious vision. A reptile’s eyes, and the parietal eye (third eye) in those species that have one, transmit information to other parts of its brain responsible for setting circadian (daily) and circannual (yearly) rhythms. There are even light-sensitive areas of the reptilian brain that respond directly to sunlight’s glow through the skull. The length of day and night, the sun’s position in the sky, and the intensity and amount of blue in sunlight all give precise information about the time of day and season of the year. In response, a reptile adjusts its activity levels, and daily and seasonal behaviors, such as its reproductive cycle and thermoregulation needs. Even nocturnal species govern their behavior by monitoring day and night from their daytime hiding places.

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This melamine glass-fronted vivarium measuring 4 feet long by 2 feet wide by 2 feet tall shows appropriate lighting for chuckwallas (Sauromalus ater). The main basking area combines light from an 80-watt household PAR38 tungsten flood and a 100-watt Reptile UV MegaRay SB Mercury Vapor Lamp. Another household flood lamp lights the secondary basking site. Four artificial caves provide shelter in different temperature zones.
A reptile uses information such as light’s intensity and color, and the length of day and night to adjust behavior to changing seasons.
As this diagram shows, the full solar spectrum of light is important for reptile health.
Figure 4.No artificial lighting system in the world can provide the full spectrum and intensity of natural sunlight, its subtle changes in color as a day progresses, or the sun’s movement across the sky. For these reasons alone, the more natural daylight a reptile experiences, the better. “Natural daylight” may not always mean full sunlight; a herpkeeper must aim to provide species-appropriate lighting.

See the Difference
Humans have three cone types for color vision. A blue-sensitive cone enables us to see from about 400 nanometers

(purple), and our green- and red-sensitive cones respond to light up to nearly 700 nanometers (red).

Most diurnal lizards, however, have a fourth cone type that responds to UVA. For example, the eyes of a red-eared slider (Trachemys [Pseudemys] scripta elegans) perceive all the colors humans recognize as well as higher-wavelength UVA (from 350 nanometers) and low-wavelength infrared (up to about 750 nanometers). This extra perception almost certainly adds additional colors to the turtle's rainbow.

Some nocturnal geckos, such as Hemidactylus turcicus, lack the red-sensitive cone. Although they may not be able to distinguish red from green, they can certainly see it just like colorblind humans can.

Geckos have superb color vision in other parts of the spectrum. For example, they can distinguish blues from browns in extremely dim light where humans see no color at all. See figure 4.

UVB Light
Ever wondered why basking lizards flatten to increase their surface area, or why tortoises and turtles bask with their neck and legs extended, or why shade dwellers and crepuscular species usually have thinner, more translucent skin that allows deeper penetration of diffused and reflected light? It's because sunlight has direct effects upon reptiles' exposed skin.

UVB in sunlight has a direct effect upon the immune system in skin and may also stimulate production of beta endorphins, giving sunlight its feel-good factor. But this range of the light spectrum is best known for its role in skin synthesis of vitamin D3.

For this to occur, sunlight must contain UVB in wavelengths ranging from 290 nanometers to about 315 nanometers. Most glass and plastics block these wavelengths, and the atmosphere also partially blocks them, so the sun must be fairly high in the sky for significant amounts of UVB to be found in sunlight. However, even at higher latitudes, including northern U.S. states and most of Europe, there is sufficient UVB for vitamin D3 synthesis from midmorning to midafternoon in sunshine from April to September and from early morning until late afternoon in midsummer (mid-May until late July).

Vitamin D3 synthesis in reptiles requires warmth as well as ultraviolet light. UVB converts a cholesterol in the skin to pre-D3, and this is converted into vitamin D3 very rapidly when a reptile is at its optimum temperature. The vitamin is toxic in large amounts, which is one reason giving it as a supplement can be risky (always follow manufacturer instructions regarding supplementation), but reptiles never generate too much D3 in their skin while basking. Natural levels of higher wavelength UVB and UVA prevent overproduction. They convert excess pre-D3 and vitamin D3 into harmless byproducts as soon as they start building up.

Several manufacturers make UVB-emitting bulbs for reptiles. Measuring a reptile lamp's UV intensity at different distances is one way to assess the lamp's value in terms of its ability to help in vitamin D3 synthesis and its safety (excess radiation can be harmful to a reptile's skin and eyes). This UV intensity can be categorized using the UV Index, the same scale weather forecasters use, and accurate meters designed for lamp measurement must be used (the sensors of inexpensive UV Index meters designed to measure sunlight don't register harmful nonterrestrial, short wavelength UVB). Herpkeepers can find UV Index recordings for a wide range of lamps on the UV Guide U.K. website: uvguide.co.uk.

The maximum UV Index appropriate for each species must be determined using knowledge of the microhabitat of the reptile in the wild. Reptiles that stay in shade, or only bask in early-morning or late-evening sunlight require far lower values than species that bask in late-morning tropical sun. Next Page>>