Evidence-Based Reptile Housing and Nutrition

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KEYWORDS

• Reptiles • Vitamin D • Ultraviolet light • Nutrition • Welfare • Enrichment

KEY POINTS

- Meeting the husbandry requirements of a reptile should be done on a species-specific basis.
- Field data on diets and microclimate provide an indication on husbandry requirements.
- Providing ultraviolet light via suitable lamps seems beneficial for most species.
- Providing a varied diet seems beneficial for most species.
- Providing several microclimates per enclosure seems beneficial for most species.

INTRODUCTION

The class of reptiles contains approximately 10,000 extant species.[1] Whereas large differences in ecology occur, there are also communalities. This article aims to describe these communalities and translate these to general guidelines for housing and feeding reptiles based on peer-reviewed publications. Species-specific guidelines are beyond the scope of this article owing to the aforementioned ecological diversity. It is important that species-specific information is gathered for the proper care of a species.

HOUSING AND LIGHTING

Visible light (400–700 nm) has several effects on reptile behavior. First, light intensity is used as an indication of temperature; higher intensities are associated with higher temperatures. This has been shown for basking species, such as anoles and turtles, but also in the nocturnal tokay gecko.[2–5] Light during the night can, however, suppress activity, as was shown in adult prairie rattlesnakes.[6]

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Many reptile species have a circadian rhythm (measured as melatonin level).[7] Photoperiod differences affect phase, amplitude, and duration of this rhythm. In Hermann's tortoises, annual changes in melatonin rhythms occur under natural conditions, with maximal amplitude in summer and their complete disappearance in winter.[8] Although timing of daily activity is often coupled to photoperiod,[9] the link to the reproduction cycle in reptiles is unclear. In fence lizards, ambient temperatures drive the reproductive cycle, not changes in photoperiod.[10] Effects of photoperiodic changes on the well-being of reptiles in captivity warrant further investigations.

Whereas humans can only see visible light, some reptiles are able to also see within the ultraviolet range (290–400 nm).[11–13] The femoral gland secretions of desert iguanas absorb ultraviolet A (UVA) light, which allows detection by conspecifics.[13] Furthermore, in that species and in Yarrow's spiny lizards, social interactions increase when a source of ultraviolet light is provided.[14] This suggests that these species have visual sensitivity within the UVA range. Similarly, red-eared sliders, 2 gecko species, and several chameleon and anole species have UV receptors and, therefore, see within the UVA range.[15,16] The anoles use this for intraspecific communication via dewlap recognition.[12,17] This suggests that, for reptiles, the presence of UVA has an effect on social interactions.

The relevance of ultraviolet B (UVB) light (290–320 nm) for the health and welfare of a variety of reptile species has received much attention. UVB facilitates the conversion of 7-dehydrocholesterol in the skin to vitamin D. Vitamin D is best known as a regulator of Ca and P metabolism in vertebrates, but can exert many more actions.[18] Vitamin D deficiency is frequently encountered in captive reptiles and leads to a complex of diseases, collectively called metabolic bone disease.[19,20] Maternal vitamin D deficiency can lead to hatching failure of fully developed embryos.[21] Vitamin D–deficient specimens may not show clinical signs of deficiency such as tetany.[22] Especially in nocturnal and crepuscular species clinical signs of vitamin D deficiency are rare. However, a lack of clinical deficiency symptoms does not exclude effects on health and welfare. Therefore, further studies are needed to evaluate the effect of vitamin D level on parameters, such as mortality, welfare, and reproduction. Vitamin D status is best evaluated based on vitamin D metabolite (25OHD) levels. It can take several weeks of UVB exposure before metabolite levels increase,[23] whereas these remain stable for several months without UVB exposure in adult, nonproductive, bearded dragons.[24] Similarly, Komodo dragons exposed to direct sun for 150 days per year can maintain a stable vitamin D status throughout the year.[25] Dietary provision of vitamin D in high dosages is effective in some species,[26] but in bearded dragons, Komodo dragons, and panther chameleons, exposure to UVB seems to be the primary method to attain a sufficient vitamin D status.[21,22,27] A variety of snakes, lizards, tortoises, and turtles, including crepuscular and nocturnal species, synthesize vitamin D via UVB exposure.[22,26–37] Certain species (panther chameleons and Jamaican anoles) increase their UVB exposure when they have a low dietary vitamin D intake.[38,39] Similarly, vitamin D–deficient bearded dragons actively bask when provided with a light source emitting UV radiation.[23] Whether this means that UVB is detected visually, or that the behavior is due to UVA is unknown. There are indications that nocturnal and crepuscular species synthesize vitamin D more efficiently than diurnal species.[31] This, together with the fact that it is not uncommon to come across nocturnal species during the daytime, might mean that minimal UVB exposure provides them with sufficient vitamin D.[40] Therefore, the required UV intensity differs between species owing to their ecology. Recently, a selection of snake and lizard species was allocated to 1 of 4 UV zones based on their ecology.[41,42] These zones correspond with a range within the UV index, which is a scale for the potency of UV radiation. It provides a guideline regarding which