

FEEDING CARNIVOROUS AND OMNIVOROUS REPTILES

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Abstract: Recommendations for feeding reptiles can be difficult due to the diversity in the more than 6,500 species and the limited nutritional research. The clinician must be able to identify the species of reptile presented and then research the reptile's natural history in order to give appropriate advice (Obst, *et al*, 1988; Frye, 1991). Typically, dietary recommendations are based on natural diets, clinical history, and comparative feeding strategies.

Nutritional disorders in reptiles are often related to inappropriate husbandry. It is imperative to obtain a thorough history on housing, heating and lighting, as well as diet and feeding protocols. The clinician may need to counsel on proper husbandry and management along with dietary specifics to successfully help the patient (Frye, 1991; Stahl and Donoghue, 2000).

Generally, reptiles are grouped into three categories for feeding strategies: herbivores, carnivores, and omnivores. This talk will focus on the feeding recommendations for carnivorous and omnivorous reptiles, including snakes, lizards, and chelonians.

The exogenous energy sources for carnivorous reptiles are primarily from fat and protein. Carbohydrates, including fiber, are not a major fuel source for carnivorous reptiles. Common nutritional related disorders in carnivorous and omnivorous reptiles include deficiencies of calcium and vitamin A from feeding poorly supplemented invertebrates and muscle meat, and vitamin E and thiamin deficiencies from feeding fish that contain high levels of polyunsaturated fatty acids or thiaminases. In addition, feeding diets that have excessive levels of certain nutrients such as calcium +/- vitamin D, and vitamin A can result in nutrition related problems (Donoghue and Langenberg, 1996; Stahl and Donoghue, 2000).

Snakes

All snakes are carnivorous. Most snakes seen in practice including boids (pythons and boas), rat, corn, gopher, bull and pine snakes, eat warm-blooded prey, such as rodents. Food for these snakes include freshly killed or frozen/thawed mice, rats, gerbils, rabbits and young chicks. These prey items should be fed a high quality complete ration prior to feeding them to the snakes. Generally, supplementation is not necessary when feeding whole vertebrate prey.

Other snakes feed on ectotherms, such as amphibians, fish, crayfish, and other reptiles. Snakes that eat this diet include king snakes, indigo snakes, water snakes, garter snakes, and hog-nosed snakes. Often these snakes can be taught to eat rodents that have been scented with a more familiar prey item. Freezing ectotherm prey items for a minimum of three days may reduce exposure to some parasites such as nematodes but will not eliminate exposure to protozoa or bacteria.

Insect eating snakes may also be seen in clinical practice. They include green snakes, worm snakes, ring-necked snakes, and other fossorial snakes. A variety of insects, such as crickets, mealworms, earthworms, and wax-moth larvae can be fed. These insects should be fed a complete diet before offering them to the snakes. They may also need to be dusted with a calcium and vitamin and mineral supplement weekly.

Lizards

Carnivorous lizards include monitor lizards, tegus, Gila monsters, and beaded lizards. These lizards eat whole prey items such as dead or frozen/thawed rodents such as mice, rats, gerbils, and young chicks. These prey items should be fed a high quality complete ration prior to offering them to the snakes. Generally, supplementation is not necessary when feeding whole vertebrate prey. These lizards may also accept cooked meat, eggs, and commercial pet foods.

Insectivorous lizards include geckos, Old World chameleons, water dragons, anoles, skinks, swifts, ameivas, lacertas, basilisks, monitors, and collared lizards. These lizards should be offered a variety of insects, including crickets, mealworms, cockroaches, fruit flies (juveniles), earthworms, and wax-moth larvae. These insects should be fed a complete diet to "gut load" them before feeding them to the lizards and should be dusted with both a calcium and vitamin and mineral supplement. Generally, calcium supplementation for insects can be provided daily for young growing reptiles, and three or four times weekly for adults. Multivitamin supplements should be used less frequently - generally once or twice weekly for juveniles and every other week in mature lizards.

Omnivorous lizards include bearded dragons, blue- and pink-tongue skinks, water dragons, and plated lizards. These lizards often eat insects and other meat protein as juveniles, but accept more vegetable protein as adults. Meat protein sources can include insects and small rodents as described above and some commercial foods such as low fat dog food and monkey biscuits; for blue- and pink-tongue skinks supplement with some cat food. For these omnivorous lizards, adding produce such as fresh leafy greens, carrots, green beans, yellow squash, and alfalfa sprouts completes the diet. Fruit such as melon, papaya, berries, oranges, and bananas are also often well accepted.

Chelonians

Carnivorous aquatic turtles include snapping turtles, alligator snapping turtles, and mata mata turtles. Aquatic turtles generally feed only when in the water. These turtles can be fed a primary diet of commercial turtle or fish food. Feeder fish from pet stores can also be fed, but fish such as smelt, mackerel, and other oily fish should be fed in limited amounts to avoid vitamin E deficiencies and steatitis. Insects, such earthworms, crickets, mealworms, wax-moth larvae, and grasshoppers, can also be fed. Occasionally, small rodents can be offered. Vitamin and mineral supplementation is not usually necessary if commercial foods are being fed as part of the diet.

Omnivorous aquatic turtles that are seen clinically include red-eared sliders, painted turtles, Reeve's turtles, map turtles, and river coolers. These turtles are generally carnivorous as juveniles but accept more vegetable protein as they mature. The diet is similar to that described for carnivorous turtles above and *will* make up the majority of the diet in juvenile turtles and about half the diet for adults. Vegetables that float such as collared greens, romaine lettuce, endive, Swiss chard, and kale are well accepted and round out the diet. Supplementation with vitamins and minerals is usually not necessary if the diet includes some commercial food.

Box Turtles

Box turtles are primarily omnivorous and include the eastern box turtle, ornate box turtle, three-toed box turtle, and the Asian box turtles. Some box turtles, such as the Asian box turtle and the three-toed box turtle, tend to be more carnivorous. Juvenile box turtles also tend to be more carnivorous accepting more plant protein as they mature. The carnivorous portion of the diet is similar to what is described for the carnivorous aquatic turtles and can include commercial meat protein-based foods such as box turtle food, low-fat dog food, trout food, primate chow, and small amounts of cat food. Cooked meat can be offered along with a wide variety of "gut-loaded" and dusted invertebrates such as earthworms, crickets, mealworms, wax-worms, and slugs.

Vegetables and fruit should also be offered to both juveniles and adults and can include greens and fruits as described above for omnivorous lizards. Box turtles tend to readily accept foods that are red, yellow, and orange thus tomatoes, strawberries, raspberries, squash, papaya, cantaloupe, and oranges can be used to entice them to eat other foods.

Key words: reptiles, nutrition, feeding, carnivores, omnivores, snakes, lizards, tortoises, turtles, nutritional disorders.

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