

Food Preferences, Feeding Practices and Nutritional Problems of Captive Reptiles

G.V. Kollias, D.V.M., Ph.D., Edward J. Gentz, M.S., D.V.M.*

College of Veterinary Medicine, Cornell University, Ithaca, NY 14853, USA

- I. General
 - A. Characteristics of Reptiles
 1. evolved from Anthracosaurian amphibians
 2. have an amniotic egg
 3. oviparous, ovoviviparous, viviparous
 4. lack feathers or hair
 5. keratinized skin
 6. four present-day orders
 - B. Reptilian classification
 1. Chelonia - turtles & tortoises
 2. Crocodilia - alligators, crocodiles, caiman, gharial
 3. Rhynchocephalia - tuatara - 1 species
 4. Squamata - lizards
 5. Ophidia - snakes
- II. Reptile Feeding Strategies and Food Preferences
 - A. Feeding strategies
 1. herbivores
 2. omnivores
 3. carnivores
 4. insectivores
 - B. Chelonians - turtles & tortoises
 1. 13 families, 75 genera, 244 species
 2. mostly herbivores with some opportunistic omnivores
 3. Family Testudinidae
 - a. *Testudo gigantea*, Aldabra tortoise
 - b. herbivores
 - c. will feed opportunistically on a wide range of fruits, veggies
 - d. sea turtles
 - e. box turtles
 - f. freshwater turtles
 - C. Squamata: Saurians - lizards
 1. 16 families, 383 genera, 3751 species
 2. predominantly predators of carnivores
 3. Varanidae - *Varanus salvator*, water monitor
 - a. strictly carnivores
 - b. feeding on a wide range of small mammals, bird and reptile eggs, insects & carrion
 - c. marine species also eat a range of fish & marine invertebrates

4. Helodermatidae - *Heloderma suspectum*, Gila monster
 - a. mainly insectivores
 - b. will feed opportunistically on birds, their eggs & even small mammals
5. Gekkonidae - leopard geckos
 - a. all geckos are insectivores
 - b. in captivity imbalanced diets like crickets can lead to metabolic bone disease
6. Iguanidae - Bahamian iguana
 - a. the Iguanians are comprised of 3 families: Agamidae, Chamaeleontidae and Iguanidae
 - (1) most are insectivores, especially as juveniles
 - (2) Agamidae & Chamaeleontidae large adults add eggs and small birds and mammals to their diets
 - (3) Iguanid adults become almost totally herbivorous
 - b. Chuckwalla - *Sauromalus ater*
 - (1) of the Southwestern USA
 - (2) feeds largely on creosote shrub and has special physiological adaptations for dealing with the plant's chemicals
7. Chamaeleontidae - *Chamaeleo jacksonii*, Jackson's chameleon
 - a. a popular captive species but difficult to maintain
 - b. all chameleons are wide-range feeders
 - c. insects, spiders & scorpions comprise most of their diet
- D. Squamata: Ophidians - snakes
 1. 11 families, 417 genera, 2389 species
 2. strictly carnivorous feeding on a wide range as a group - insects, arthropods, birds, mammals, reptiles, eggs, some are cannibalistic
 3. each species however has a fairly narrow dietary range.
 4. specialized feeders
 - a. Viperidae - *Bitis nasicornis*, Rhino viper
 - (1) skilled predators using venom to immobilize birds, small mammals and lizards
 - (2) snake eating lizards
 - (3) Elapidae - *Naja* sp. - snake eating snakes
- E. Crocodilians - alligators, caimans, crocodiles, gharials.
 1. 3 families, 8 genera, 22 species
 2. strictly predatory carnivores
 3. although a few species will opportunistically feed on carrion
- III. Reptile feeding is an ART - Not yet a science.
- IV. Prevention of Nutritional Diseases and Problems
 - A. Nutrition - including food source and storage
 - B. How is water offered and how often?
 - C. Defecation - frequency and appearance of feces is important in assessing overall health
 - D. Arthropods & insects comprise much of the diet of small snakes and lizards and even juvenile crocodilians
 1. Feeding the prey item appropriately is important

- E. Mealworms - a common diet source for captive reptiles
 - 1. age of the prey item often important - affects nutritional content
- F. Rodents are often reared to feed captive reptiles. How they are managed and what they are exposed to may affect the health of the reptile once consumed.
- G. Diet's effect on growth
 - 1. Puff adder litter mates display dramatic size differences when fed different amounts of food.
- H. Growth curve for chelonians showing constant positive logarithmic growth. This type of information is lacking for many species of reptiles.
- V. Difficult feeders: behavioral considerations
 - A. Albino manacle cobra (*Naja sp.*)
 - B. Far Side cartoon: "Jiggle the rat" - it's not always what you eat - sometimes it's the presentation.
 - C. Sometimes your food bites you back; a python displaying bite wound sepsis and skin necrosis from a rat bite! This can be fatal.
 - D. Young turtle rearing pen showing alfalfa pellets as a living substrate.
 - 1. separating young tortoises may be necessary to determine what they are eating; frequent weighing is important
 - E. A radiated tortoise shown on alfalfa pellet bedding.
 - 1. contamination of this food by waste, insects or just aging and staleness of food may make this a poor idea
 - 2. Sometimes food is in the eye (or nose) of the beholder!
 - a. Gulf Hammock Rat Snake showing golf balls in the GI tract
 - F. Leopard tortoises (*Testudo pardalis*) - the effects of social facilitation are often overlooked in reptiles.
 - G. Appropriate diet for an Aldabra tortoise
 - 1. But how can you tell what is being eaten?
 - 2. This is also a problem in complex exhibits.
- VI. Environmental Considerations
 - A. Temperature
 - B. Humidity
 - C. Photoperiod
 - D. Reptilian temperature relationships
 - E. Turtle cartoon ' "heating system" - how heat is presented to reptiles is often as important as heat itself.
 - F. Reptilian Anorexia - etiology
 - 1. environmental
 - a. low temperatures
 - b. low humidity
 - c. photoperiod upsets
 - d. water deprivation or malpresentation
 - 2. behavioral
 - a. food recognition
 - b. lack of hiding places
 - c. conspecific incompatibility
 - d. isolation of social species
 - 3. concurrent disease
 - 4. general stress
 - G. Regurgitation - causes and prevention

VII. Nutritional Problems and Diseases

- A. Inanition/Maladaptation Syndrome
 - 1. blood python (*Python curtus*) - normal
 - 2. blood python - severe inanition
 - 3. juvenile turtle eating iceberg lettuce - poor diet; protein, vitamin/mineral/energy deficiency
 - a. California desert tortoise at 5 yrs. - hypoproteinemia - poorly formed bony shell
- B. Metabolic Bone Disease
 - 1. general characteristics
 - a. etiology: diets with inverse Ca:P ratios
 - b. clinical signs:
 - (1) axial deformities
 - (2) abnormal growth of teeth
 - c. pathologic changes:
 - (1) secondary hyperparathyroidism
 - (a) rickets
 - (b) fibrous osteodystrophy
 - d. treatment: improve the diet & supplement with calcium and/or vitamin D₃
 - e. fibrous osteodystrophy in common iguana
 - 2. iguana - fibrous osteodystrophy - humerus
 - 3. radiographs of an iguana with metabolic bone disease
 - 4. red-eared slider turtles with metabolic bone disease
- C. Vitamin A deficiency (hypovitaminosis A)
 - 1. red-eared slider turtle with swollen eyelids secondary to vitamin A deficiency
 - 2. diagram showing pathogenesis of Hardarian gland changes in a turtle associated with vitamin A deficiency
- D. Vitamin B deficiency, thiamin deficiency (hypothiaminosis)
 - 1. garter snake with thiamin deficiency
- E. Steatitis (a.k.a. brown fat disease)
 - 1. general characteristics
 - a. brown fat disease
 - b. etiology: rancidification of unsaturated fatty acids in diet; particularly from decomposing fish
 - c. signs: often subclinical up to the time of death
 - d. pathology: ceroid deposition in fat cells, macrophages, and reticuloendothelial cells, with necrosis and brown discoloration of fat.
 - e. treatment: nothing may reverse the lesions. However, vitamin E supplementation in the diet has been recommended.
 - 2. ceroid fat deposits in an alligator
- F. Vitamin D toxicity (hypervitaminosis D)
 - 1. arterial mineralization in a common iguana due to hypervitaminosis D
 - 2. aortic mineralization in a common iguana
- G. Overfeeding/Obesity
 - 1. obese hamster - you are what you eat.
 - 2. aortic mineralization in a Western diamondback rattlesnake

Finale: There are unlimited growth possibilities in reptiles with proper nutrition!