

## Companion Animal Hospital Exotic Animal Care



Aquatic turtles have specialized nutritional needs that must be catered to in captivity to ensure that your pet stays healthy. Different turtle species, and even different age groups in the same species require specific types of diets.

### 1. Pellets and their role in balanced nutrition

A good quality pelleted diet is important to ensure that your turtle is eating good quality protein and a range of vitamins and minerals that may be difficult to balance with whole foods. It is extremely difficult to replace the prey variety that wild turtles encounter, so pellets will help to fill in that gap in nutrition in captive animals. Because pellets are nutritionally more dense than whole foods, they should be offered in limited amounts avoid overfeeding.

There exists many brands of pelleted diets that cater to different life stages and species of turtle. “Growth” formulas tend to have more protein and calcium than “maintenance” or “mature” formulas, meant to imitate a change in dietary preference from animal to plant matter as some turtle species mature (such as in pond sliders, family Emydidae). For species with a more carnivorous diets throughout their lives, they may often be kept growth formulas for their entire life.

Talk to our staff about the food brands that we recommend for your pet turtle. We do not recommend any food that contains dried ant eggs or larvae, shrimp, or mealworms. These diets are very imbalanced, particularly in their calcium content, and are poor contributors to any turtle’s diet.

### 2. Animal matter in the captive diet

Most turtle species need some kind of animal matter in their diet, with some species remaining mostly carnivorous for their entire lives and others transitioning to a mostly plant-based diet as they age.

There are many invertebrates commercially available as fish and turtle food:

- Earthworms: Suitable feeder earthworms include Canadian Nightcrawlers (*Lumbricus terrestris*) and Red Wigglers, sometimes called “compost worms” (*Eisenia foetida*). We recommend using only worms intended for feeding pet reptiles, as bait worms may be contaminated with detergents or other irritants used to collect them from soil.
- Bloodworms are the larvae of chironomid flies (nonbiting midge flies) and are a common frozen food found in pet stores.

- Glass worms are mosquito larvae that can be found seasonally in the frozen fish food section of the pet shop. They are high in fat and should not be fed as a staple prey item, but can be fed occasionally to add variety to the diet.

Fish can contribute to the captive turtle's diet by providing a balanced prey item, and live fish (although ethically questionable) can be a source of environmental enrichment. Not all fish species are suitable as prey. We recommend feeding whole fish wherever possible, as offering only muscle meat is imbalanced.

- Recommended feeder fish species include Guppies (*Poecilia reticulata*), platies and swordtails (*Xiphophorus sp.*).
- Cyprinid fish, such as minnows (various species) and Goldfish (*Carassius auratus*) contain an enzyme called thiaminase that can lead to a vitamin B deficiency when fed in excess.
- Oily fish including tuna, whitefish, sardines, mackerel, herring, etc., contain excessive amounts of unsaturated fatty acids and are deficient in vitamin E. Feeding these fish in excess leads to serious health conditions.

We do not recommend feeding insects in the diet unless they can be gut-loaded with a high-calcium feed just prior to feeding them to your turtle. Most insect species commonly fed as prey (including crickets, mealworms, superworms, and others) have very poor calcium content, and an inverted calcium-to-phosphorus ratio (Ca:P). This is the proportion of calcium and phosphorus in any food, an important value to consider as these two mineral nutrients have a close relationship. The target dietary Ca:P for insectivores is 1.5-2.0:1 (one and a half to twice as much calcium compared to phosphorus). Few commercial insects naturally have this calcium content, so supplements are necessary. Powdered supplements used for land-dwelling reptiles and amphibians are ineffective in an aquatic habitat as they tend to immediately disperse in the water.

We also do not recommend feeding sections of beef or chicken meat, as they are severely deficient in various nutrients. Feeding raw meats lead to unsanitary conditions in the enclosure, and historically may have contributed to turtles carrying *Salmonella* bacteria.

### 3. Plant matter in the captive diet

Many aquatic turtle species have a dietary shift as they age and become primarily plant-eaters. Although live aquatic plants in the enclosure can be a source of some nutrition, they tend to be quite expensive to replace and may not offer a balanced diet. Many fruits and vegetables that are popular in the grocery store produce section are not suitable for feeding reptiles.

There are many naturally-occurring plant chemicals (phytochemicals) that interfere with normal absorption or use of nutrients. In small quantities, these are not harmful, but when anti-nutrient dense foods make up the bulk of an animal's diet there can be serious health consequences. Some notable "anti-nutrient" phytochemicals include the following:

**Glucosinolates:** Several chemicals in this group interfere with the metabolism of dietary iodine, acting as goitrogens. Goitrogens suppress thyroid gland function, and are named for an enlargement of the thyroid gland in some affected species called “goiter.” Glucosinolates are found in particularly high concentrations in many cruciferous vegetables (plants in the genus *Brassica*). Foods that contain significant amounts of glucosinolates include bok-choy (Chinese cabbage), broccoli, Brussels sprouts, cabbage, cauliflower, kale, rutabaga, spinach, and turnip.

**Oxalates:** Oxalates are found in many plants, particularly of the genus *Oxalis*. They bind to dietary calcium, inhibiting it from being absorbed. Foods high in oxalates include beets and beet greens, broccoli, carrot, cilantro, kale, pears, spinach, strawberries, Swiss chard and tomatoes. Note that oxalates found in plants that are commonly considered irritating oral tissue (and toxic to some animals) contain oxalates in a specific structure, called raphide crystals. Some herbivores can eat these plants, however always verify with the veterinary team before introducing plants to your lizard’s enclosure.

**Phytates:** A phosphorus-storing compound in plants, phytates will bind to calcium, zinc, iron and other minerals so that the body cannot use them, and also interferes with protein digestion. Legumes and grains are typically high in phytates.

**Tannins:** These phytochemicals chemicals render protein unusable to the body. Foods containing significant levels of tannins include bananas, carrots, grapes, onions and spinach.

To create a balanced plant-based diet, we separate different fruits and vegetables into functional groups based on what they provide in the diet.

Staple food items that provide important nutrients are marked with an asterisk (\*). Every category of the diet needs at least one staple vegetable (two or three per category is better). Ideally, feed 2-4 items from each category, daily (except fruit).

**Leafy Green Vegetables (66-75%):** Dark, leafy green vegetables that are high in calcium should be the bulk of the diet.

*Arugula, bok choy, \*collard greens, \*dandelion greens, endive, \*escarole (chicory), kale, \*mustard greens, nappa cabbage, parsley, Swiss chard, rapini, romaine lettuce, \*turnip greens, \*water cress.*

**Other vegetables (25-33%):** Other vegetables help round out the nutritional content of the diet. Pick at least one green vegetable and one red, orange or yellow vegetable to feed regularly. These vegetables should be chopped or shredded so that they float to be easily grabbed by your turtle.

*\*Acorn squash, \*butternut squash, \*cassava (yucca root), carrot, \*green beans, \*kabocha squash, parsnip, pumpkin, \*okra, spaghetti squash, \*snap peas, \*snow peas, sweet potato, \*wax beans, zucchini.*

**Fruits:** Fruit availability is often seasonal in the wild, and should not be a large part of

the captive diet. It may be offered rarely as a treat and does not need to be fed daily.

*Apple, bell pepper (any colour), berries, cherries (pitted), kiwi, melon, papaya, pears, plum, prickly pear cactus pads (de-spined and skinned).*