



Pet Hospital of Peñasquitos

Champions for Excellent Care - We are an AAHA-accredited
That means we hold ourselves to a higher standard

Tortoise Care (Rev 11/24)

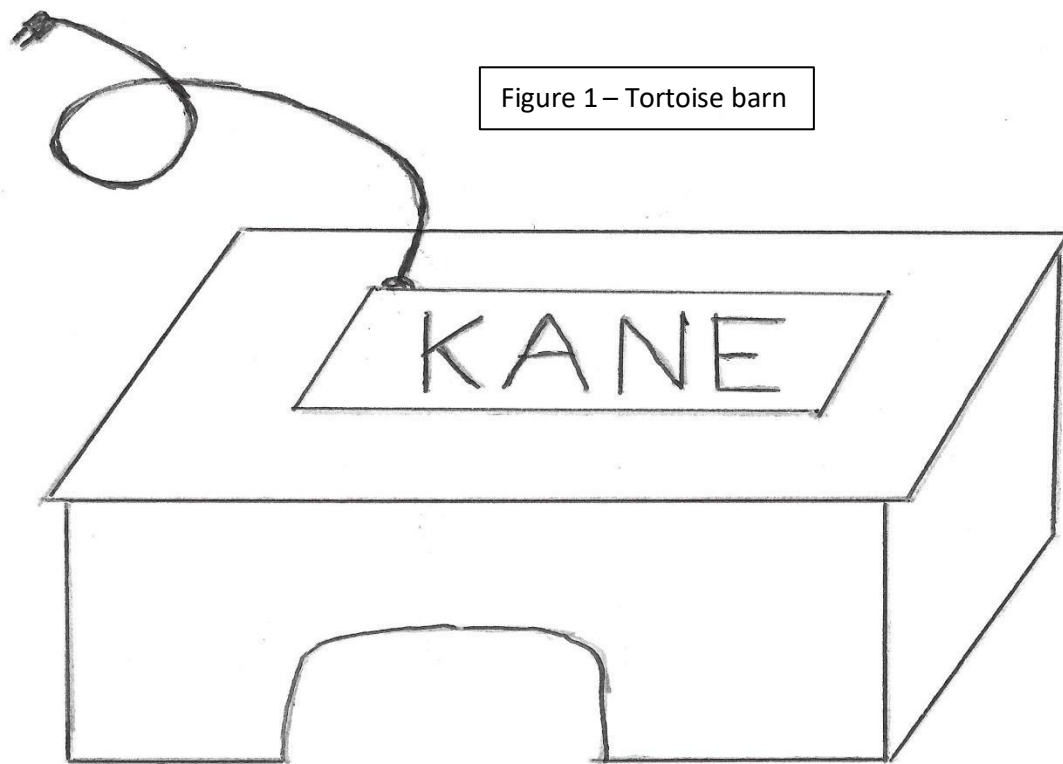
Thomas H. Boyer, DVM, DABVP, Reptile and Amphibian Practice
9888-F Carmel Mountain Road, San Diego, CA, 92129 858-484-3490
www.pethospitalpq.com—www.facebook.com/pethospitalpq

Taxonomy - The true tortoises are all members of the family Testudinidae, which encompasses 15 genera with 49 living species. Common temperate (hibernating) species include desert tortoises (*Gopherus agassizii*), gopher tortoises (*G. polyphemus*), Texas tortoises (*Gopherus berlandieri*), Hermann's tortoises (*Testudo hermanni*), Russian tortoises (*Agrionemys* [*Testudo*] *horsfieldi*), marginated tortoises (*T. marginata*) and Greek tortoises (*T. graeca*). Common tropical (non-hibernating) species include red-footed tortoises (*Chelonoidis carbonarius*), Sulcata tortoises (*Centrochelys sulcata*), leopard tortoises (*Stigmochelys pardalis*), radiated tortoises (*Astrochelys radiata*) and hinged, or hinged-backed tortoises (*Kinixys* spp.). Any review of tortoise care for such a diverse family is overly simplistic, and fraught with multiple exceptions, none the less here are some general guidelines for keeping tortoises healthy in San Diego, CA.

Outdoor housing - Whenever possible, tortoises should be kept outdoors, year-round. This allows them space to exercise, graze, and bask in the sun, which is important for vitamin D synthesis, important for calcium absorption. All tortoises should have a heated outdoor barn (see following), especially at night. Well acclimated adult tropical tortoises can be housed outdoors when morning temperatures are above 65° F and midday temperatures exceed 75° F. Adult temperate species tolerated temperatures down to 60 ° F, if warmed up to 75° F during the day. For small juveniles, temperatures should always be above 70° F (see neonatal care later).

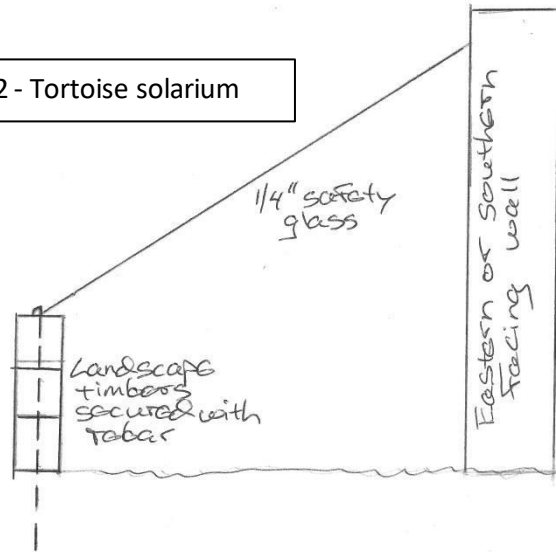
Tethering a tortoise by a leg or through a hole in the shell is not acceptable and is potentially harmful. When planning outdoor enclosures, several factors should be considered. Desert species can tolerate higher temperatures and drier enclosures than tropical rainforest species. Outdoor enclosures can be modified to suit the needs of species. For tropical forest forms, such as red and yellow foots, forest tortoises (*Manouria* spp.), and hinged backs, densely planted enclosures are ideal. For grassland, or desert species, such as *Gopherus* and *Testudo* spp., Sulcatas, leopards and radiated tortoises, enclosures can be more sparsely planted with shrubs and grasses. In either type of enclosure, shelters should be provided for retreat from the elements as well as shade. Desert and gopher tortoises and Sulcatas will sometimes dig burrows facing south or west, make sure the burrows can't flood in the winter, or the tortoise may drown. Tortoises dig burrows down but not back to the surface so don't worry about them escaping. Burrows are a necessity in very hot areas to prevent overheating. For more information on burrow construction see Arizona's Fish & Game site, http://www.azgfd.gov/w_c/tortoise/burrow.shtml. In San Diego, most burrowing tortoises construct their own burrows. Do not let Sulcatas excavate near foundations as they can destabilize the foundation.

Tortoise Barn - In most of San Diego (except out in the desert) it is too cold for tortoises without supplemental heat. All tortoises should have heated barns (see figure 1) fashioned from $\frac{3}{4}$ inch AC plywood with a hinged, sloped, insulated, slightly overhanging and heated roof. The corners are secured with inner L braces and caulked, the floor is open to the dirt to boost humidity and ease cleaning. Hinging the roof also makes it easier to clean; waterproofing the plywood will extend its lifespan. A 12 x 36 inch Kane pig blanket (Kane MKG, Inc., Des Moines, IA), or waterproof radiant heat panel, suspended loosely from the solid inner roof insulation warms the barn. A dusk to dawn timer will keep heat on at night and off on warmer days or it can be run continuously. In the winter, the doorway should be covered with slit plastic, or a felted waterproof tablecloth can cover the barn with a slit trimmed entryway. The doorway should be just large enough for tortoises to fit through. Make sure the tortoises are in their barn every night when it is cold.



Solarium - Another way to boost heat is to make a solarium with $\frac{1}{4}$ inch safety glass secured on one side by screwed in quarter round on top of two to three stacked 4 x 4 inch landscape timbers, drilled through and secured with rebar running through them and into the ground, with the glass leaning up against an eastern or southern exposure wall at 45° angle and open at both ends. This allows the tortoises to thermoregulate on their own, see figure 2.

Figure 2 - Tortoise solarium



Outdoor enclosures should have secure perimeters. Tortoises generally pace at the perimeters and constantly try to get through perimeters they can see through. Therefore, solid barriers, such as wooden fencing or smooth concrete, at tortoise eye level are preferable to open fencing. Open fencing should be small enough that tortoises cannot entrap a leg or neck in it. Chicken wire, for instance, can entrap and cut tortoise legs and is thus not advisable. Fencing should be staked down to the ground and lean inward slightly to discourage climbing. Russian tortoises are particularly good at climbing.

Outdoor hazards - Predators, especially dogs, are fond of chewing on tortoises and can wreak havoc in no time at all. Small chelonians can be devoured without a trace. Be careful that a neighbor's dog that smells, sees and hears your tortoise doesn't dig under a fence to get it. Never trust a dog alone with a small tortoise. Raccoons and opossums enter yards at night to prey on tortoises. In the southern United States fire ants (*Solenopsis* spp.) can attack and kill small tortoises.

Another potential threat is pesticide spraying. Do not spray tortoise enclosures with pesticides. Ask your neighbors to inform you when they apply pesticides so that you can move your tortoises away from the area.

In smaller enclosures tortoises will consume all the vegetation growing in their enclosure. Toxic plants are rarely a concern (oleanders and rhododendrons are exceptions) even though extensively discussed. Most grasses, clovers, perennial legumes, ice plants, and dandelions are excellent free forage. Tortoises will also eat anything that falls into their enclosure. Enclosures should be regularly examined for scraps of metal, staples, wires, nails, tacks, twist ties, or any other type of metal, pieces of plastic or rubber, plastic bags, twine, or any other trash that blows in. Tortoises will also consume small rocks, gravel, decomposed granite, pumice, pebbles (especially if they don't have enough calcium in their diet) and sand. Never house tortoises on small rocks, gravel, pebbles or sand or life threatening colonic impactions will occur.

Indoor Housing – In colder areas of the country indoor housing is usually mandatory for a good portion of the year. Tortoises require more space than most reptiles. The New York Turtle and Tortoise Society recommends that the combined shell size of all tortoises present should not exceed a quarter of the floor surface area available to the tortoises. Aquariums, plastic or metal livestock troughs, concrete mixing containers, or plastic sweater boxes can be used for small tortoises. Cages can be constructed for larger tortoises with $\frac{1}{2}$ -to $\frac{3}{4}$ -inch plywood on the bottom and 2 by 12 inch planks stacked on one another or plywood along the sides. The inner cage surfaces should be caulked

and sealed with an undercoat of water sealant and two to three coats of polyurethane, or one can use melamine. Melamine tends to warp if it gets wet. Sealing exposed wood surfaces facilitates cleaning. Allow the cage to air out thoroughly (usually about a week) before placing any tortoises in it. To prevent chilling, the cage bottom should not be in direct contact with cold concrete; a gap of several inches is advisable, such as on resting on 2 x 4's. An alternative to building a cage is to convert a garage or unfinished room into a tortoise pen. Ambient indoor temperature should be 70 to 90° F, depending on the species. Rooms can be heated with thermostatically controlled space heaters. A thermogradient should be provided with basking lights and/or heating pads.

Substrates - Juveniles are often maintained indoors on alfalfa pellets and as they graduate to larger cages, a mixture of medium to large conifer bark nuggets and peat moss or coconut coir. Acceptable alternative substrates include newspaper, indoor-outdoor carpeting (be sure to avoid frayed edges), or corrugated cardboard. Remove fecal material from the enclosure several times per week and replace the substrate several times per year. For very large enclosures and large species, smooth cement, clean soil (baseball infield soil or soil with a high clay content), can be used, provided the room stays warm. Avoid sand, gravel, cat litter, and crushed corncob or walnut shells. Many tortoises are reclusive animals. As with outdoor enclosures, a tortoise barn or hide box should be provided.

Water - Water should be regularly available for indoor and outdoor tortoises. Shallow plastic plant saucers work well for tortoises. Make sure the water is no more than chin deep or the tortoise may accidentally overturn and drown. Tortoises often defecate in their water; thus, water bowls should be changed daily, every other day, or whenever dirty. Tortoises outdoors will also drink from standing water, particularly desert tortoises. An alternative to water bowls is to soak the tortoises in chin-deep water several times per week.

Feeding - Diets for captive tortoises are an area of considerable uncertainty, variability and continues to evolve. Wild tortoises often utilize forage of a relatively low nutritional value. In captivity, diets tend to have too much protein and fat, and not enough fiber or calcium, which is unhealthy. The majority of the diet should be commercial tortoise chows and chopped hay. Commercial tortoise diets, such as Mazuri's Tortoise Diet and Tortoise LS High Fiber and ZooMed's Natural Grassland Tortoise Food and Natural Forest Tortoise Food, and hays, tend to have nutrient profiles similar to what desert tortoises naturally consume. Backyard grasses or grass hays (Bermuda, Timothy, Kentucky bluegrass, Buffalo, Brome, Tall fescue, Orchard grass but not Alfalfa hay, which is a little high in protein) are also very good (good hays available through the House Rabbit Society). Getting tortoises to eat hay and pellets can be tough. Chopping the hay with scissors, or a food processor, and sprinkling or spraying the hay with water, to moisten it, helps. Mixing greens with the chopped hay also helps. Pellets can be soaked until just soft, in water, or water that dried hibiscus flowers have been soaked in and mixed into the salad. Be patient and persistent and tortoises will slowly switch over to hay and commercial pellets. Sulcatas grow so large you have to get them eating hay eventually. Back yard weeds (esp. dandelions, clover, burclovers, purslane, spurge, crabgrass, cheese weed, creeping wood sorrel and others), spineless prickly pear cactus pads & fruits (*Opuntia ficus-indica*), flowers (roses, nasturtiums, hibiscus, carnations, geraniums, primroses, iceplant and cactus flowers), leaves (Mulberry, grape, hibiscus, squash) can also be fed. One can also plant plants naturally eaten by desert tortoises, see the Arizona Fish & Game site (http://www.azgfd.gov/w_c/documents/NativePlantsforDesertTortoises_2008.pdf) and California Turtle & Tortoise Society site (<http://www.tortoise.org/general/wildplan.html>) for good ideas.

Dark leafy greens, such as collards, mustards, turnip tops, bok choy, kale, spinach, endive and Romaine lettuce are too high in protein and fat and too low in fiber and calcium and should not make up the majority of the diet, even though widely recommended in the past. Lower protein greens include dandelions, cabbage and clover, as well as most grasses. Kapidolo Farms (www.KapidoloFarms.com) supplies healthy tortoise browse.

Be aware of several widespread misconceptions. Members of the cabbage family (cabbage, kale, mustard greens, bok choy, broccoli, cauliflower, Brussels sprouts) do not cause thyroid problems (goiter) and are harmless in

moderation. Spinach, beets, Swiss chard, purslane and spineless prickly pear pads have oxalates in them. Oxalates

can bind with calcium in the intestinal tract and decrease calcium absorption and theoretically contribute to kidney damage, but this hasn't been borne out by scientific studies. In fact, one scientific study concluded that oxalates in desert tortoises were an incidental finding or non-pathogenic.

Fruits, in general, are mineral poor yet high in sugars and can disrupt the normal gut flora and lead to fatty livers. Fruits are tasty enough that tortoises will consume them preferentially over healthier foods. Therefore, limit fruits to a miniscule portion of the diet, more of an occasional treat than a staple, or don't feed them at all. Apples, apricots, bananas, dates, figs, grapes, kiwis, melons, mangos, peaches, papayas, pears, plums, prunes, raisins, star fruit, strawberries, tomatoes and raspberries are all fine occasionally. Do not over do it! Red and yellow foot tortoises are more frugivorous than other tortoises and should be offered more fruit, but no more than 20% of the entire ration.

Feeding Setup - Put the salad on sheets of newspaper, a flat board, paper plates, or use plastic or metal plates or trays so that the tortoise does not ingest substrates while eating salad. Disposable feeding material, such as newspaper, cuts down on cleaning. Never feed tortoises over sand or they will accidentally ingest it. Feed as much variety as possible! Adults should be fed two to three times per week and hatchlings daily to every other day. Every feeding lightly dust food with calcium carbonate, such as Repashey SuperCal LoD, for indoor animals, or Repashey SuperCal NoD, for outdoor animals. Twice a month lightly dust food with multivitamins only if vitamin-fortified foods commercial pellets are not being consumed.

Reproduction - Female tortoises must be in prime condition prior to egg production. This includes a well-balanced diet with adequate calcium. Small tortoises can be palpated in the inguinal fossa for eggs, but this is much more difficult in larger tortoises. A large African female tortoise can cause excruciating pain to the forefinger foolhardy enough to be caught between her shell and rear leg. Eggs show up well on x-rays. Gravid females feel heavier than normal and tend to be more active, often pacing in the enclosure. For nesting, areas are often selected that get the most sun or late afternoon sun. If the keeper is not present during egg laying, the nest can be easily missed. A definite sign that a female has been digging is dirt packed on her hind feet and rear margins of shell. Some females may excavate several false nests before actually laying eggs. Indoors one must provide a nesting substrate at least as deep as the female's shell length.

Neonatal care - Once the neonate has pipped the eggshell with its caruncle, or eggtooth, it will emerge from the shell within 1 to 4 days. During this time, the neonate's shell begins to unfold, facilitating yolk absorption. As the neonate's shell straightens and the tortoise begins to move, the eggshell breaks further. Once out of the egg, the neonate may still have considerable yolk sac. The hatchling should be transferred to a container, such as a plastic shoe or sweater box, with clean moist paper towels. The yolk sac will be slowly absorbed over the next few days. Once the yolk sac is fully absorbed and the umbilicus sealed, the hatchling can be transferred to a cage with previously mentioned substrates. Hatchlings usually begin feeding within 1 to 14 days of leaving the egg. Hatchlings are prone to dehydration; therefore, shallow water bowls should be regularly available. Make sure the water bowl is shallow, or the hatchling may overturn and drown. Plastic plant saucers work well for water bowls. An alternative is to soak neonates in shallow water once or twice a week. Ultraviolet lights should be provided for 12 hours per day for all tortoises not housed outdoors. A thermal gradient should be provided. Ambient temperature should not get colder than 70°F at night and gradually warm to 85°F during the day. Temperate young tortoises should be given a carefully controlled, shorter hibernation period or not hibernated at all for the first several years. Hatchlings should develop a firm shell well within the first year if they are getting enough calcium. It is common for a clutch of siblings to have different growth rates. Smaller timid individuals may eventually need to be separated to ensure adequate nutrition.

Thanks to Don Boyer for helping write earlier drafts of this care sheet.