

General Information on Pet Turtles

- Most pet turtles can be broadly classified into one of two types: aquatic turtles or terrestrial turtles, which are also called tortoises. The most common pet turtle species is likely the Red-Eared Slider (*Trachemys scripta elegans*), which is an aquatic species, as are Map Turtles (*Graptemys* spp.), Snapping Turtles (*Chelydra serpentina*) and Soft-Shell Turtles (*Apalone* spp., *Trionyx* spp.). Despite their popularity, aquatic turtles are one of the most difficult reptiles to care for properly. Terrestrial turtle species include the Eastern Box Turtle (*Terrapene carolina carolina*), Three-Toed Box Turtle (*Terrapene carolina triungius*), Gulf Coast Box Turtle (*Terrapene carolina major*), and Ornate Box Turtle (*Terrapene carolina ornate*). Both types are popular and many different species are available.
- Husbandry and environmental factors play a key role not only in the well being of a pet turtle, but also in its ability to fight disease and its tendency to shed potentially pathogenic bacteria. Particularly in turtles from pet stores, stress and suboptimal management result in most turtles either carrying or being infected with one or more bacterial or protozoal pathogens at the time of purchase. Turtles are commonly carriers of *Salmonella* spp., zoonotic transmission of which is a well recognized phenomenon, and results in significant human disease.
- A well-cared for turtle can live for over 50 years in captivity, and some adults can grow to be over 30 cm long.
- Turtles can be fascinating, enjoyable pets for many people if a few simple guidelines are followed to reduce the risk of disease transmission from pet to owner.

Obtaining a Turtle

- In 1975, the US Food and Drug Administration (FDA) banned the sale of pet turtles with a carapace (shell) length of less than four inches, except for educational or exhibitional purposes. This was done due to high rates of turtle-associated salmonellosis among children, who were more likely to extensively handle these smaller turtles. This law is not in effect in Canada, however in the same year Agriculture Canada banned the importation of turtles into the country in a similar attempt to decrease turtle-associated salmonellosis in people. Importation of embryonated turtle eggs, however, was still allowed.
- Some pet stores no longer carry turtles because they tend to be impulse purchases of people who do not understand what is required to properly take care of a turtle, nor the health risks associated with them.
- The number of households with reptiles, including turtles, in the United States doubled between 1991 and 2001, with a parallel increase in isolation of reptile-associated *Salmonella* serotypes from humans.
- Many people find turtles in the wild and take them home as pets, but this should be strongly discouraged as wild turtles often do not adjust well to living in captivity. Turtles should never be released into the wild, or moved to a new area, as the turtle will attempt to find its original home, rather than make a new one.

Turtle Management

Feeding

- Aquatic turtles eat primarily whole animals, such as mice, slugs, worms, very small fish, and a variety of insects, but as they get older they also eat vegetables and some fruit. Box turtles should be fed more of an even balance between plants and meat/insects. Commercial pelleted turtle feed is available, but this should only be used to make up a small portion of the animal's diet. Young turtles should be fed daily, but older animals may only need to be fed 1-2 times per week.



Aquarium/Terrarium:

- As cold-blooded animals, turtles rely on their environment to regulate their body temperature. It is critical to keep a turtle's enclosure – be it a large glass aquarium, a rubber storage container, or even an outdoor enclosure – the proper temperature, and to provide a temperature gradient (i.e. a heated basking area and a cooler area).
- Turtles also need special full-spectrum UV lights if they are kept inside where they are not exposed to sunlight, in order to metabolize vitamin D3 and maintain normal calcium homeostasis.
- Many different materials can be used to cover the bottom of the terrarium of a box turtle, including indoor-outdoor carpeting, newspaper, straw, hay, medium-to-large wood chips mixed with peat moss, or alfalfa pellets. Substrates such as gravel, sand, wood shavings, kitty litter and potting soil should be avoided, as these materials may be ingested by the turtle and cause intestinal obstruction.
- Aquatic turtles need an area to swim (some species even need to be fed in the water). A plastic wading pool with blocks or rocks for islands often works well. Terrestrial turtles also need a large shallow dish of water both to drink from and to soak in.



Handling Turtles

The best way to hold a small turtle is to grasp it on either side of the shell, midway between the fore and hind legs. Aggressive turtles should be held more caudally. Handling should be minimized at all times so as to limit the opportunity for disease transmission, and so the animal does not become stressed, as this can also lead to illness. Snapping turtles and soft shell turtles are known to be more aggressive than other types of turtles, so be sure to use extra caution when handling these. Some larger turtles may require chemical sedation for certain procedures.



Turtle Bites

All turtles may bite. Many of the opportunistic pathogens found in the turtle's intestine are also found in the mouth. Bite wounds should be vigorously cleaned immediately with large volumes of soap and water, and monitored closely for signs of infection.

Zoonotic Diseases Of Turtles

The greatest public health concern with regard to pet turtles is their potential to carry and transmit *Salmonella* spp. Please refer to the information sheet on salmonellosis for more details about this specific disease.

- It has been estimated that 90% of all reptiles carry and shed *Salmonella* in their feces. In the majority of cases these animals are subclinically infected because the bacteria are often part of the commensal flora of the gastrointestinal tract.
- Fecal shedding can be intermittent, therefore a negative fecal culture does not rule out *Salmonella* carriage. There is in fact **no reliable method by which a turtle can be guaranteed to be free of *Salmonella***.
- *Salmonella* serotypes that have been isolated from turtles include, but are not limited to, S. Pomona, S. Java, S. Jangwani, S. Stanley, S. Poona, S. Muenchen, and S. Newport. The most common serotypes isolated from human salmonellosis cases, S. Enteritidis and S. Typhimurium, are also found in reptiles.
- Between 3-6% of sporadic human salmonellosis cases may be the result of exposure to exotic pets, including reptiles. It has therefore been recommended by the Centers for Disease Control and Prevention (CDC) that households with children less than five years old, pregnant women, and elderly or immunocompromised individuals should not keep any reptiles, including turtles, as pets.
- *Mycobacterium* spp. are also known to be carried by turtles, and should be considered in cases of enteritis that are not responsive to antimicrobials
- Turtles often carry many potential pathogens, other than *Salmonella*, as part of their commensal gastrointestinal flora, including *Escherichia coli*, *Klebsiella* spp., *Citrobacter* spp., *Pasturella* spp., *Aeromonas* spp., *Pseudomonas* spp., *Clostridium* spp., *Enterococcus* spp., *Corynebacterium* spp., *Streptococcus* spp. and *Staphylococcus* spp.
- Gastrointestinal parasites are also very common in turtles, including *Cryptosporidium* spp., roundworms and tapeworms, but there is no evidence that these parasites are zoonotic.

Recognizing Illness In Turtles

- Signs of illness in turtles include abnormal discharge in the mouth or from the nose and eyes, changes in skin or shell colour, rough or whitish areas on the skin, swellings on the legs or head (especially the eyelids, or behind the ears), "shell rot", loosening of the scutes of the shell, foul odour and diarrhea. Anorexia and lethargy are often indicators of illness, but can also occur with hibernation in some species.
- If the behaviour or appearance of a pet turtle becomes abnormal, the owner should be encouraged to seek veterinary advice. Some owners may avoid taking a turtle to a veterinarian due to the cost of veterinary care relative to the value of the animal. Many times turtles become sick due to metabolic problems secondary to an inadequate or inappropriate diet or environment, but it is very important to rule out infectious disease.
- Ask the owner to provide a fresh fecal sample from the turtle's enclosure. Fecal floatation (for both parasite eggs and protozoal cysts) and bacterial culture should both be performed if gastrointestinal disease is suspected. Be cautious when interpreting fecal culture results in light of the nature of a turtle's normal fecal flora. A heavy culture of a particular microbe in the feces of a turtle with enteritis is most likely to be significant.

Certain stresses can increase the active shedding of *Salmonella* in turtles, even if they do not become sick. This may occur if a turtle's environment is not properly maintained in terms of temperature, humidity, or cleanliness, if the turtle does not have adequate food and clean water, or if the turtle is handled excessively. This increased shedding can increase the risk of both the turtle and its owner developing clinical salmonellosis.



Infection Control

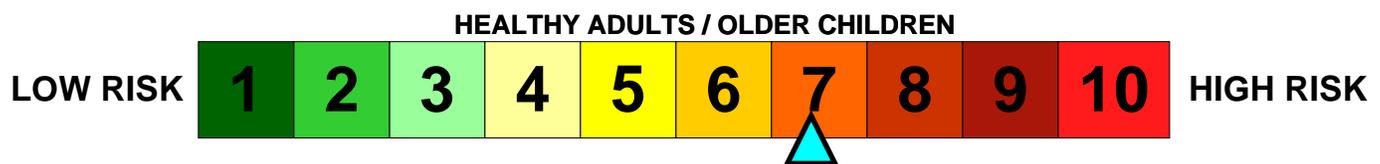
- **Hand Hygiene:** Hands should be thoroughly washed with soap and running water after handling a turtle, cleaning the turtle's terrarium/aquarium, or coming into contact with turtle bedding, feces or urine. It is important that a person not touch any parts of his/her own face, other people, objects or surfaces prior to washing his/her hands as this can result in contamination and spread of *Salmonella*.
- **Cleaning The Aquarium/Terrarium:** Keeping a turtle's environment clean is essential for disease prevention and control. Fecal pellets should be removed from the turtle enclosure with a scoop on a daily basis. Turtles tend to defecate in water, so frequent changing of the water is important to prevent environmental amplification of bacteria shed by the turtle. Once a month, the entire turtle enclosure should be completely emptied and thoroughly cleaned with warm soapy water, followed by disinfection with a 10% solution of household bleach, allowing at least ten minutes of contact time on all surfaces. Neither a turtle nor any objects that have come in contact with a turtle should ever be washed in the kitchen or anywhere where food might be kept or prepared. If a bathtub is used for cleaning, it should also be disinfected (using 10% bleach) afterwards. Turtles can be kept in large 40-50 gallon rubber storage containers, which can be easily hosed out and then disinfected outside.
- **Environmental Contamination:** Any object or any surface that has come in contact with a turtle should also be treated as potentially contaminated with *Salmonella*, and disinfected accordingly with an appropriate product such as 10% household bleach. It is also important not to allow a turtle to roam in any area of a house. Touching contaminated objects or surfaces constitutes indirect contact with the turtle, and can result in transmission and infection with *Salmonella*, particularly in high-risk individuals.
- **Public Education:** Education of the public regarding the risk of *Salmonella* transmission from reptiles, including turtles, has been shown to decrease the number of reptile-associated salmonellosis cases. The Centers for Disease Control and Prevention (CDC) has recommended for years that pet stores, healthcare providers and veterinarians alike provide information regarding the risk of transmission of *Salmonella* from reptiles to owners and to individuals considering purchasing such an animal.

Zoonotic Disease Risk

For **healthy adults and older children**, the risk of acquiring *Salmonella* from a pet turtle is always present, but can be reduced by:

- Handling the animal as little as possible
- Restricting the turtle to its enclosure and not letting it roam
- Keeping the turtle and its enclosure clean
- Using proper hand hygiene to decrease the transmission of bacteria

For this group, turtles are:



Individuals with Compromised Immune Systems:

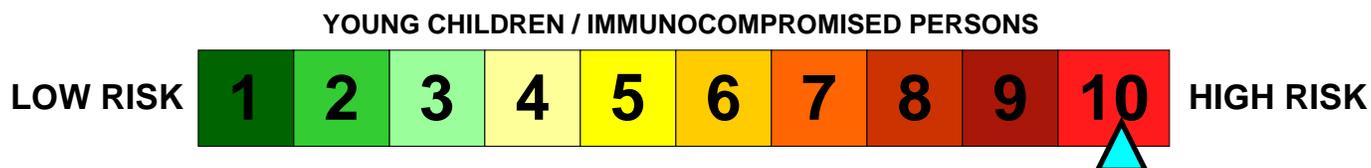
- Immunosuppressed or immunocompromised individuals are more susceptible to many kinds of infections, including those which may be transmitted by pets. Some pets are much higher risk than others. It can be safe and even beneficial for such a person to have a pet, if extra precautions are taken to prevent disease transmission.
- Unfortunately, due to the very high carriage rate of *Salmonella* among turtles and other reptiles, as well as the severity of the infection these bacteria can cause, these animals are **NOT** suitable pets for persons in this group, and should not be kept in the same household.
- If an immunocompromised person comes into direct or indirect contact with a reptile, he/she should immediately and thoroughly wash his/her hands with soap and running water. Any clothing that may have become contaminated should also be removed and laundered separately as soon as possible. Similar precautions can be applied to elderly individuals.



Infants and Young Children:

- Young children are more likely than adults to extensively handle animals if given the opportunity. This was part of the reason for the FDA ban of the sale of smaller turtles in particular, as these animals are easily picked up and handled much like toys, and children may even put them in their mouths.
- Children are also more likely to touch their faces or mouths, and are less likely to wash their hands after handling any kind of animal. Although children tend not to “snuggle” with an animal such as a turtle, small turtles, especially, are quite attractive due to their brightly coloured shells and slow, non-threatening demeanor.
- Due to the high risk of transmission of *Salmonella* from turtles and other reptiles, these animals should not be kept in the same household as any child under five years of age, even if the child is not allowed to have direct contact.
- Expectant mothers, although perhaps not at any significantly increased risk of acquiring salmonellosis compared to other adults, should ensure that any reptiles are removed from the home prior to arrival of the baby.

For these groups, turtles are:



Additional Reading

- Centers for Disease Control and Prevention (CDC). Multistate outbreak of human *Salmonella* infections associated with exposure to turtles - United States, 2007-2008. MMWR Morb Mortal Wkly Rep. 2008;57:69-72.
- Mader DR. Reptile Medicine and Surgery. 2nd ed. St. Louis, MO: Saunders Elsevier, 2006.
- Mermin J, Hutwagner L, Vugia D, et al. Reptiles, amphibians, and human *Salmonella* infection: a population-based, case-control study. Clin Infect Dis. 2004;38:s253-261.
- Wappel SM, Schulte MS. Turtle care and husbandry. Vet Clin North Am Exot Anim Pract. 2004;7:447-472.