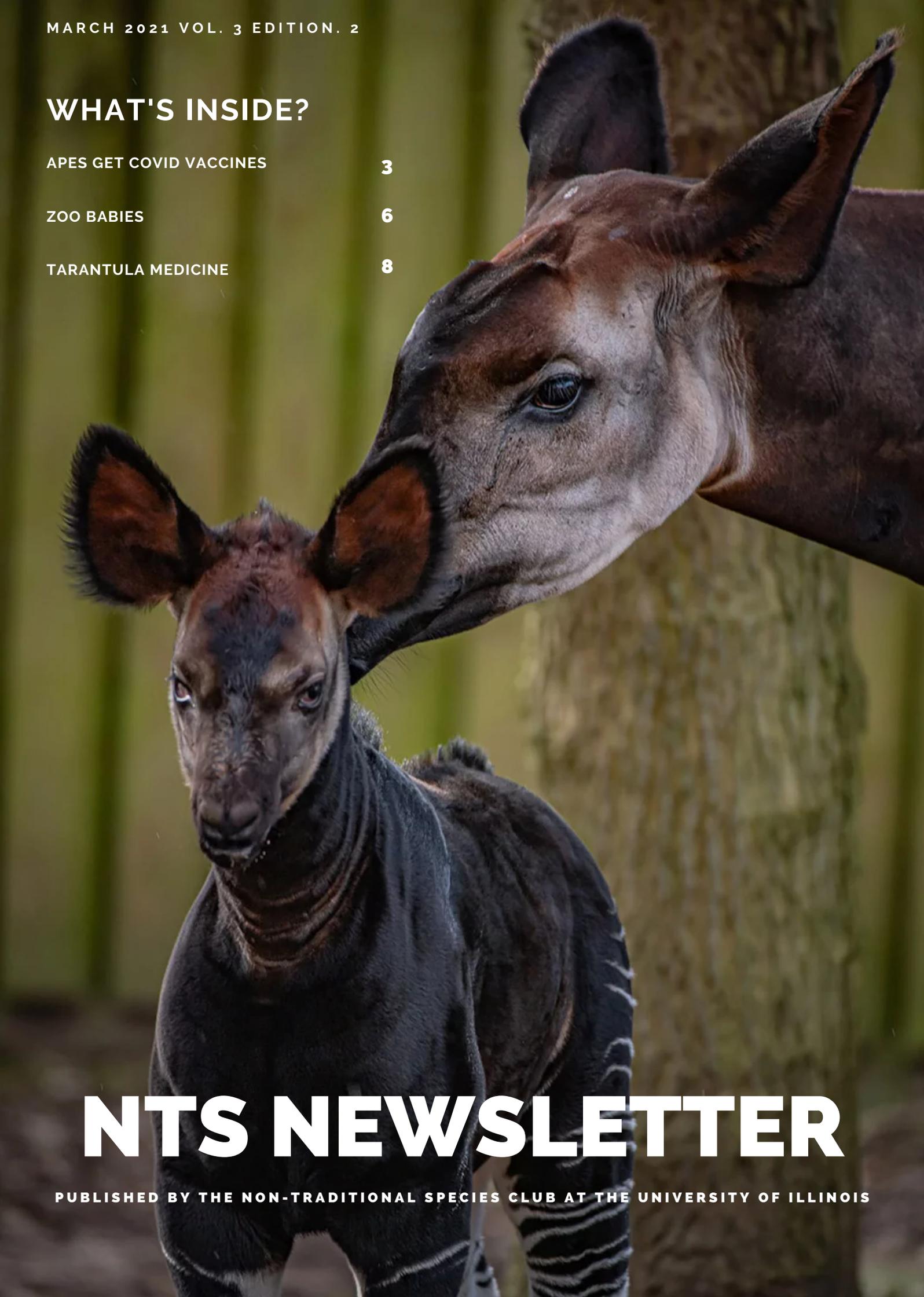


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# NTS NEWSLETTER

# WHALE SHARK FAQ

BY ALEC COLOSI

As a whale shark fanatic, I like to pride myself on knowing quite a bit about the world's largest (and coolest) fish. One day I thought to myself, "I wonder what other people would like to know about these incredible animals. So, I took it upon myself to survey a few non-sharky friends and answer their burning questions. Without further ado, here is my very own Whale Shark FAQ:

Are whale sharks whales or sharks?

- They are sharks! It is a very common misconception that they are whales. Whale sharks are fish and whales are marine mammals.

Do whale sharks show sexual dimorphism?

- They sure do! Every species of shark shows sexual dimorphism. Males have structures called claspers behind their pelvic fins that help them deposit sperm into the female. Females do not have claspers.

Why do whale sharks have their cool color patterns?

- Short answer is: no one knows! Each whale shark has its very own pattern of spots all over its dorsum, like a fingerprint, and scientists aren't quite sure why they have them.

How fast can whale sharks swim?

- Due to their massive size, these giants can only go about 3 miles per hour at most. There's a lot to move!

What do whale sharks eat?

- Although they are the largest fish in the world, whale sharks eat some of the smallest animals in the world. They mainly feed on plankton and small fishes by opening their mouth wide, sucking in water, and filtering out the water with their gills.

Are they solitary, or do they live in groups?

- Whale sharks are mainly solitary but like to congregate in large groups when there is a plankton bloom or when it is time to mate.

Why do whale sharks always have suckerfish on them in pictures?

- These suckerfish are called remoras, or shark suckers. These fishes have suction cups on their heads that allow them to attach to larger animals so they can hitch a ride and feed off anything that might float by.

Are whale sharks gentle giants?

- Absolutely! Like I said before, they only feed on small organisms, so there's no need for big sharp teeth. Whale sharks have never been documenting showing any aggression to humans. And they can't swim very fast, so you'd probably beat them in a race.

How do whale sharks live?

- Whale sharks inhabit a broad range of oceans, preferring tropical or temperate waters. They have been found in both deep and shallow areas, but seem to prefer warmer surface temperatures. They also feed at the surface, so it makes sense that they'd like to hang out where the buffet is! As mentioned before, whale sharks like to hang out in groups when they are feeding and mating but will break off by themselves often, very unlike a pod of whales.

Where do whale sharks migrate to?

- Whale sharks swim thousands of kilometers every year, staying in the temperate/tropical waters they prefer. They like to move closer to the equator from cooler waters to mate during the winter months.

How many babies do whale sharks have?

- Whale sharks have about 300 offspring every time they mate. They are ovoviviparous, meaning the babies develop in eggs inside the mother. When the eggs hatch, the mother gives birth to live young.

What are whale sharks' roles in the marine ecosystem?

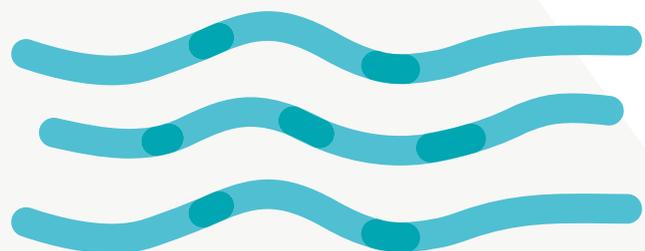
- Though they only eat small animals, whale sharks are technically top predators because nothing feeds on them. A whale shark's job is to keep the population of plankton in check. Whale sharks eat zooplankton, which are microscopic animals. Zooplankton like to eat phytoplankton, which are microscopic photosynthesizing organisms that supply 50-90% of the oxygen in Earth's atmosphere. So, by keeping the population of zooplankton down, they're kind of making sure the rest of us can breathe!

How does ecotourism affect whale sharks?

- Ecotourism is a great alternative to other harmful practices in many cases for many countries. Done improperly, though, it can have its disadvantages. Swimming with whale sharks is a huge attraction around the world. If the people swimming with the sharks don't follow proper "hands-off" protocols, they can sometimes scratch the shark's skin, but this doesn't cause much damage. Unfortunately, tour boats tend to congregate where whale sharks are feeding, and the boats can hit and injure the sharks. It has also been speculated that the stress of boat noise during tourist activities can adversely affect them. If you ever get the chance to do these activities, make sure your tour providers have safe practices and that you follow every rule in place to protect these animals!

BONUS: What is their favorite Shrek movie?

- I have yet to meet a whale shark who has seen any movie, but based on my current knowledge of these animals I would say they would most likely enjoy Shrek 2 the most. Mainly because that's the one where they sail the ocean.



# GREAT APES AT SAN DIEGO ZOO RECEIVE COVID-19 VACCINE

BY GABRIELLE DONNELLY

The San Diego Zoo was unfortunately home to the first non-human primate COVID-19 cases, but they are now the first attempting to combat the disease with vaccinations. In January, nine gorillas at the zoo tested positive for coronavirus and showed mild to moderate symptoms like runny nose, coughing, lethargy, and anorexia. It has been hypothesized that the first case came from a positive zoo employee.

With the gorillas and other primates being housed closely, and the concern of human-animal spread; San Diego's chief conservation and wildlife health officer, Dr. Nadine Lamberski, decided to move forward with experimentally vaccinating the at-risk animals. The vaccine was designed by Zoetis and is currently only successfully tested in cats and dogs. It uses the same synthetic spike proteins to trigger an immune response as the human vaccine but has a different adjuvant geared towards animals.



So far, four orangutans and five bonobos received both doses of this animal version of the COVID-19 vaccine, with no adverse reactions. Once 90 days post-infection, the nine recovered gorillas will also receive their vaccines. The gorillas were successfully treated with monoclonal antibodies (laboratory-made proteins that mimic the immune system's ability to fight off foreign antigens), and will hopefully gain immunity from the vaccine. The zoo plans on performing antibody testing in order to confirm successful antibody production.

The San Diego Zoo will also consider vaccinating their big cats, amidst news of positive COVID-19 cases in other species. Domestic dogs and cats in Hong Kong, minks in Denmark, and lions and tigers at the Bronx Zoo have all tested positive for the virus, although we are still lacking data on the zoonotic spread. For now, zoos are focusing on keeping their animals and staff safe by vaccinating staff and requiring the use of personal protective equipment.



# Test Your Trivia Knowledge!

BY: RYAN PATTERSON

## 1. Which of these elephant facts are false?

- a. Elephants have brachydont dentition
- b. There are over 100,000 muscle units in an elephant's trunk
- c. Elephant herds have a matriarchal structure
- d. There are 3 species of elephant; African savannah elephant, African forest elephant, and Asian elephant

## 3. What is the gland called that is responsible for the oil that makes duck's feathers waterproof?

- a. Sebaceous gland
- b. Uropygial gland
- c. Zeis gland
- d. Meibomian gland

## 4. What is the largest rodent in North America?

- a. Capybara
- b. Beaver
- c. Groundhog
- d. Crested Porcupine

## 2. What is a baby wolverine called?

- a. Pup
- b. Kit
- c. Whelp
- d. Calf

## 5. What is the name for a group of bears?

- a. Romp
- b. Dray
- c. Wisdom
- d. Sleuth

(answers on p.12)

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## CECAL OR FECAL MATTER - RABBITS AND CECOTROPHY

BY FAYTH KIM

Some rabbit owners may be concerned about finding soft, mucus-covered droppings in an enclosure. After all, a rabbit's droppings can provide information on overall gastrointestinal health. These types of droppings are normal and actually play a beneficial role in rabbit nutrition. In comparison with normal hard feces, cecotropes often appear smaller, softer, clumped in clusters, and may smell more pungent. Many owners may not even recognize cecotrophy as rabbits often consume the cecotropes directly from the anus. Rabbits normally produce both types of stool. The cecum is a highly developed pouch, at the junction of the small and large intestine and contains necessary populations of bacteria and yeast. These bacterial and yeast populations break down otherwise indigestible fibers in grasses or hay. The cecotropes are formed in the proximal colon and cecum and coated in mucous before being excreted. The formation of these is under adrenal control. The mucous that covers the cecotropes protects them from the low pH in the stomach when eaten whole so they can be reabsorbed in the small intestine. Cecotrophy allows for the reabsorption of nutrients, including short-chain fatty acids, bacterial fermentation products, Vitamin K, Vitamin B, water, and nitrogen.

Rabbits that do not form normal cecotropes are missing out on a necessary part of their nutrition and are at risk of shifting their cecal flora. Shifts in cecal flora can cause cecal dysbiosis, where there is a disruption in the delicate balance of microorganisms in the gastrointestinal tract. It could be that the current diet is too rich in simple sugars and starches. Decreased fiber can cause cecocolic hypomotility, resulting in longer exposure to carbohydrates and excessive fermentation. There is then a shift in the bacterial flora populations, which can be life-threatening. If the rabbit is obese, it may also not be benefitting from cecotrophy, as it is not able to reach the droppings and they may become smeared on its bottom. Cecotrophy is an essential part of rabbit health.



**Left: cecotropes**  
**Right: hard feces**

# IS THAT AN ALBINO?

BY COLLEEN ELZINGA

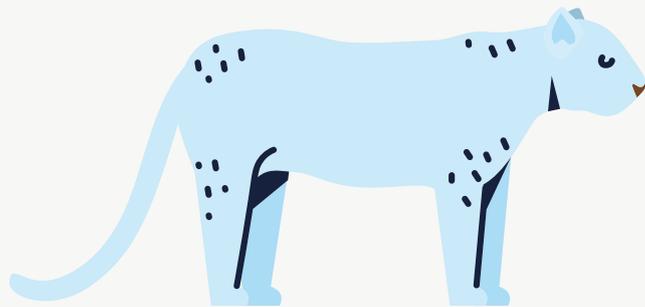
Albinism is a condition that affects many species, including mammals, birds, fish, amphibians, and reptiles. An albino animal has a genetic mutation that makes them unable to produce melanin. Melanin is what gives pigmentation to the body, so animals that lack melanin will have white skin as well as white hair, scales, or feathers. Albinistic animals also have red or pink eyes because without melanin in the body, the only color in the eyes comes from the blood vessels behind them. Albino animals display this overall white appearance and red eyes from birth and retain it for the rest of their lives.

The mutation for the typical oculocutaneous albinism is inherited in an autosomal recessive pattern. Thus, the parents of an albino individual must each carry at least one copy of the mutated gene, but they may only be carriers that do not show signs or symptoms of the condition. In humans, there is genetic testing available for this genetic mutation, but we usually just rely on physical and biological presentation to identify albinism in animals. The lack of melanin can actually result in increased susceptibility to certain medical conditions. Namely, eye issues are common because the animal may become more sensitive to light and have poor vision. In addition to that, the lack of protective melanin makes the animal more sensitive to getting sunburn, which can be very damaging to their skin and progress to more serious issues. Adding to that, wild animals displaying the lighter coloring may have a harder time hiding, so they become easy targets for predators. An albino may even be shunned or killed by members of its own species because it is seen as an outsider. Thus, many do not survive into adulthood in the wild. For this reason, zoos and other sanctuaries will take in albino animals to protect them and allow them to live a longer life than they would have in the wild.

What about leucism? Not all white animals are albino. Some might actually have leucism, which is another condition characterized by reduced pigmentation, but it affects all pigments instead of just melanin. Leucism refers to an abnormality in the deposition of pigment. Leucistic animals will have similar white coloring to albinos, but retain a normal or blue eye color. They also may show a patchy display of color change, rather than an overall white appearance. Like albinism, leucism is an inherited trait that can be passed onto offspring.



**Snowflake, an albino Alligator at Brookfield Zoo**



# ZOO BABIES! AND SPECIES SURVIVAL PLANS

BY CARLY CLARK

The stork has been busy! Many zoos around the AZA and their conservation partners have recently welcomed new members into their collections (see below). Successful reproductive programs are a key part of many captive species Species Survival Plans. Species Survival Plans are facilitated by the cooperation of many different zoos to create Breeding and Transfer Plans to ensure that captive populations are healthy, genetically diverse, and prepared for reintroduction into wild populations if necessary. A recent example of a Species Survival Plan success story is Chanua, an 8-year-old female Black Rhino from the Chester Zoo that is scheduled to be released into a wild rhino herd in Tanzania. With black rhinos being classified as critically endangered, her successful release, as well as the birth of the two babies listed below, add to the diversity of this very small gene pool, and highlight another important role that zoos play in conservation.

**Female Sitatunga  
@ Maryland Zoo**



**North American River Otters  
@ Brookfield Zoo and Potter Park Zoo**



**Black Rhino  
(M) @ Lee Richardson Zoo  
(F) @ Taronga Zoo (NSW)**



**Female Okapi  
@ Chester Zoo (UK)**



# THE STUNNING TEXAS COLD-STUN EVENT

BY: SIOBHAN MEADOWS

The February storm that left parts of Texas with burst pipes, power-outages, and winter weather they were unprepared for, also left thousands of sea turtles cold-stunned. As ectotherms, sea turtles are dependent on the ambient sea temperatures and sun-basking to maintain their body temperature. The rapid temperature shifts to 20-degree weather and continued cold front afterward forced sea turtles around the entire Texan coast into a hypothermic, catatonic state.

Cold-stunning occurs when water temperatures rapidly drop below 50 degrees and are maintained for an extended period of time. Sea turtles experiencing these temperature extremes may try to surface so as to sun-bask, or will try to migrate quickly to warmer water. With the persistent cold front in Texas, sunning was not enough to counterbalance air and water temperatures and many turtles were not able to migrate in time to avoid hypothermia. As their core temperature fell, heart rate and circulation decreased as well, causing a catatonic state where the turtles may float to the surface of the water or wash up on the shore. Cold-stunning makes them highly susceptible to injuries like boat strikes as well as pneumonia, cloacal prolapse, and more.



During the Texas event, 12,155 turtles were reported as cold-stunned. With so many sea turtles affected, some organizations had to get creative with space. Sea Turtle Inc., a non-profit organization, ended up using the South Padre Convention Center as a place to layout turtles to allow them to slowly warm-up and recover. Since the event, about 4,300 sea turtles have been released back into the Gulf of Mexico, with some still being rehabilitated.

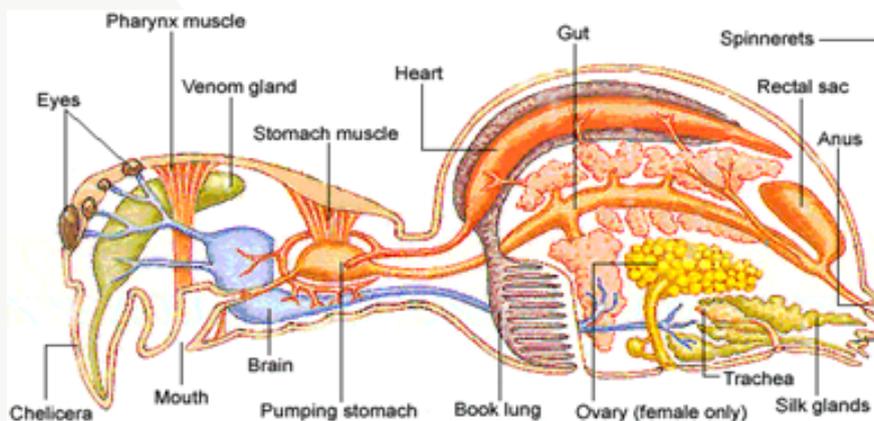
Take a listen to this NPR podcast on this record-breaking historical event:  
<https://www.npr.org/player/embed/976105783/976809369>

# TARANTULA MEDICINE

BY RACHEL ANGLES

Tarantulas are the most commonly kept family of spiders. They are extremely popular in zoological collections and have been gaining popularity in the pet industry as well. As such, it would be a good idea for any vet who is interested in working with zoo/exotic species to familiarize themselves with the basics of husbandry and medicine for this unique invertebrate species.

**Anatomy:** Tarantulas have 4 pairs of legs, 1 pair of pedipalps, and 1 pair of chelicerae (which contain the fangs). They have two body segments: a prosoma (cephalothorax) and opisthosoma (abdomen). The prosoma contains the esophagus and stomach, paired venom glands, central nervous system, and musculature for controlling the limbs. The opisthosoma contains more of the gut, the heart, the book lungs and trachea, the reproductive organs, the spinning glands, and the Malpighian tubules (excretory organs). Some species of tarantula (New World Tarantulas) will have urticating hairs on the top of the opisthosoma which can be ejected as a defense mechanism. Tarantulas also have an open circulatory system with hemolymph instead of blood.



**Husbandry:** Tarantulas are a **solitary** species and should not be housed together. The enclosure should be tall for arboreal species and wide for terrestrial species; deep substrate should be provided for burrowing species. Common substrates include vermiculite, soil, and peat. Substrate should be free of chemicals and parasites. Hiding places should be provided (logs, clay pots turned on the side, artificial plants, etc.). Flat rocks can be provided as long as they are not high enough that the tarantula could fall and stable enough so as not to crush the spider. Tarantulas are more likely to cover their enclosure with webbing if they are less stressed. Tarantulas do well at room temperature; supplemental heat may be provided during winter months in the form of a heating pad (as they tend to avoid light). Water should be provided in a shallow dish and can also be spritzed onto webbing. Food should consist of invertebrates like crickets, roaches, wax worms, mealworms, and flightless fruit flies. Tarantulas will make “casts” of undigestible materials, similar to a bird of prey.

These should be removed promptly, and the water dish should be cleaned frequently to prevent bacterial and fungal growth. The entire enclosure should be cleaned at least once a year, but not too often or the tarantula may get overly stressed. Food should consist of invertebrates like crickets, roaches, wax worms, mealworms, and flightless fruit flies. Tarantulas will make “casts” of undigestible materials, similar to a bird of prey. These should be removed promptly, and the water dish should be cleaned frequently to prevent bacterial and fungal growth. The entire enclosure should be cleaned at least once a year, but not too often or the tarantula may get overly stressed.





**Safe Handling and Physical Exam:** Whenever doing a physical exam on a tarantula it is a good idea to be as hands-off as possible. Typically, you can place a clear plastic cup over the animal and slide a piece of cardboard under it to remove it from the enclosure and get a better look. Magnification may also be a useful tool to assist in your exam. If the spider must be handled, gloves and eye protection are recommended to protect against the venom and urticating hairs, which can cause an inflammatory reaction and potentially anaphylaxis. There is also risk for the tarantula itself – handling tends to be stressful for them and they are also at risk of being dropped and hurting themselves (they should not fall from a height higher than the length of their leg). Anesthesia is recommended for a more thorough examination. Things to look for include missing appendages, hemorrhage/open wounds, alopecia, ectoparasites, discoloration of the skin, discharges or parasites near the mouth, and overall body condition. The gait of the non anesthetized spider should also be appreciated for hypermetria or ataxia.

**Anesthesia:** Studies on anesthesia in tarantula species have shown that isoflurane and sevoflurane are effective for induction and maintenance. A mammalian anesthesia mask is typically used as an induction chamber for the spider. The opisthosoma (which contains the respiratory system) should remain in the mask to maintain anesthetic depth. Other effective protocols include injectables such as alfaxalone. The righting reflex is commonly used to monitor anesthetic depth, and in a private practice setting a doppler on the dorsal opisthosoma can be used to monitor heart rate (normal 30-70 bpm for large spiders).



**Diagnostic Testing:** Cytology can be good for analyzing examine skin surfaces, discharges, and feces for evidence of parasites, fungal, and bacterial infections. Techniques used for skin scrapings/swabs are similar to those used in mammals. Bacterial and fungal cultures can also be useful if cytology is supportive of bacterial or fungal infection. Hemolymph analysis this is not a good diagnostic indicator due to the current lack of hemolymph anticoagulants and reference values.



**Disorders and Treatment:** Dehydration is one of the most common issues of tarantulas. In a tarantula dehydration causes the legs to begin to curl under, and it has difficulty moving. If the spider still has some ability to move, it will be able to hydrate orally. It can be placed over a shallow dish of water or hydrated with a syringe. For more severe dehydration, fluids may be injected into the heart or intracoelomically using a 27-G needle and insulin syringe. Normal saline or lactated Ringer's solution may be used (administer 2% to 4% of the spider's body weight). Tissue glue should be applied after injection.

Dysecdysis is another presentation. In order for a tarantula to grow, it must undergo a molting process called ecdysis. Most tarantulas molt on their back, and the process can take up to 24 hours. If an owner is unfamiliar with this process it can appear that the tarantula is dying. However, this is normal and requires no treatment. Minimal handling is recommended as it can result in death or deformities of the tarantula. If an excessive time has passed and the animal has not molted, attempts can be made to remove retained exoskeleton by moistening it with mild detergent solutions or triple antibiotic ointment, taking care to avoid the book lungs. The exoskeleton may also be carefully trimmed with fine scissors.



Some tarantulas may present for alopecia. The most common cause of this is a source of stress-causing the New World tarantula to eject urticating hairs, leaving a bald patch on the opisthosoma. Stress is often due to excessive enclosure disinfecting or too-frequent handling. Owner education is the best way to prevent this.

Parasites may also be a problem with tarantulas, especially those that are wild-caught. Many small mites will not cause problems but can be removed with a fine-tipped paintbrush or be trapped in petroleum jelly.

Oral nematodes are also problematic and cause anorexia and abnormal posture. The most successful treatment has been found to be manual removal and flushing of parasites from the mouth while the spider is anesthetized. Anti-parasitic drugs will not work on tarantulas as they can harm the spider.

Trauma is another common presentation. A leg may be torn or lost, or wounds in the exoskeleton may be hemorrhaging. Hemorrhage can be stopped with gentle pressure and the application of tissue, followed by fluid therapy as needed. Limbs may be amputated if necessary, and the resultant wound sealed with tissue glue; the limb will grow back over time. Suture is not appropriate because it is ineffective and damaging.



Tarantulas may present for an odd gait or ataxia. This is often referred to as “dyskinetic syndrome (DKS).” The exact cause is unknown, but it has been proposed to be due to toxic exposure. The environment of the tarantula should be carefully examined, and supportive care should be administered. However, DKS is usually fatal.

**Euthanasia:** The recommended method of euthanasia is injecting an overdose of pentobarbital or similar agent intracoelomically and using inhalant or injectable anesthesia if necessary.

# PARROT FACTS: Q & A

BY KAYLA LADEZ

Test your parrot knowledge with a series of questions ranging from basic anatomy to clinical signs and diagnoses!

**Q: How many chambers are in a bird's heart?**

- Four

**Q: What clinical signs are associated with heart disease in parrots?**

- Exercise intolerance
- Ascites
- Dyspnea
- Hepatic congestion
- Heart murmur or arrhythmia

**Q: What predisposes cockatoos to cloacal prolapse?**

- Hand rearing
- Delayed weaning
- Bonding to one human/ reinforcement of display behaviors such as begging for food, regurgitating, or masturbating
- Tendency to hold feces for a prolonged period of time (associated with potty training)



**Q: What is the name for the digital arrangement of parrot feet?**

- Zygodactyl

**Q: What are the clinical signs associated with damage to the supracoracoid tendon?**

- The bird cannot lift its wing or fly

**Q: What diseases are lorikeets (and toucans) prone to developing? (Bonus: What vitamin should be limited in these birds and why?)**

- Iron storage disease
- Vitamin C facilitates the absorption of iron in the body

**Q: What common diseases produce anorexia and green urates in birds?**

- *Chlamydia psittaci*
- *Escherichia coli*
- Lead toxicosis
- Viral hepatitis
- Liver disease

**Q: What parasite has been known to cause feather picking in cockatiels?**

- Giardia, which affects the GI tract of many small birds resulting in decreased nutrient absorption. Other clinical signs often seen are loose droppings, anorexia, dry skin, and pruritis.

**Q: How many synovial joints are involved with the prokinetic motion of the upper beak of parrots?**

- 15

**Q: What species of parrot does not have a uropygial gland (also known as the preen gland)?**

- Amazon parrots



## March Madness Trivia Answers

**1. Which of these elephant facts are false?**

**a. Elephants have brachydont dentition**

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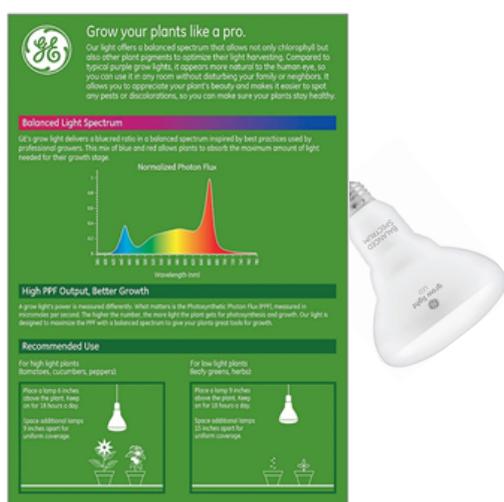
- a. Romp
- b. Dray
- c. Wisdom
- d. Sleuth**

# BIOACTIVE ENCLOSURES, PART 3: LIGHTING

BY EMILY GRZEDA

We've made it to part 3! This might not be the most exciting topic, but they are arguably the **most important** part of any reptile enclosure, and especially a bioactive. This veers into the world of all reptile keeping, **so even if you don't have a bioactive, this is still for you!** In part 1 of this series I talked about the benefits of bioactive enclosures, and in part 2 I showed you how to make your "build" for the enclosure; the skeleton, if you will.

The full electromagnetic spectrum is as follows: Radio waves, microwaves, infrared light, visible light, ultraviolet light, x-rays, and gamma rays. However, sunlight doesn't emit all of these – instead, we get roughly 8% UV, 44% visible, 32% infrared-A, 14% infrared-B, and 2% infrared-C. Do we need to somehow incorporate all of these?



**Not an ad, but these are what I use.**

**For your plants:** Grow lights are required to keep plants alive, growing, and thriving. Outdoor plants get the full spectrum of light from the sun (obviously). This falls under the category of "visible light," defined by humans, which is in the spectrum of 400-700nm. I say "humans" because reptiles can see a wider spectrum of light, but I'll get into that later. The exact colors we can see are measured in Kelvin, associated with the light's brightness/intensity. Artificial lights typically range from 1900K (dim) – 10,000K (very bright and blue). For your plants, 6500-7500K is typically an accepted number for optimal plant growth. These can come as either fluorescent bulbs or LED lights. These are not required for reptiles themselves; just the plants of a vivarium.

**For your animals: This gets more complicated and is relevant regardless of whether you have a bioactive vivarium. We're interested in infrared (heat+), visible light (daylight), and ultraviolet light (both UVA and UVB).**

**Infrared:** This is the lowest wavelength on the electromagnetic spectrum. It's broken down into IR-A, IR-B, and IR-C. IR-A is what's most strongly penetrative from the sun. When you step outside on a sunny day and think "ahhh, that's nice," that's IR-A at work. IR-B is also emitted, but not as strongly. IR-C isn't emitted by the sun.

**More than heat:** Infrared emits heat, but there are also curative properties associated with it, most of which aren't fully understood. Heat (in general) speeds up a reptile's metabolism and regulates their circadian cycles, but infrared also seems to have properties that help with mild wound healing and parasite management. If your reptile doesn't require heat, infrared light isn't necessary; heat is its primary function. However, it may be something to try in a veterinary setting if faced with a difficult case.

"Ok, what do I need?" If your reptile needs more heat than room temperature, you'll need a heat bulb. Heat mats won't work, because you've got 4" of dirt on top of the gravel in your tank, so all of that energy is lost before it reaches your reptile. Infrared can be used by installing a halogen or mercury vapor bulb. Mercury vapor bulbs also emit UV light. These bulb types also emit visible light, so they cannot be used at night. Ceramic heat emitters are your other option; these emit IR-C heat that is not visible to humans or reptiles, so they do not interfere with the animal's day/night cycle.

*What about red night bulbs?* Long story short: don't. It was thought that reptiles can't see red light, but there is increasing evidence that they can. These lights also emit visible light (you can see that they're on), so they will still mess with your animal's day/night cycles. They can be used during the day if you only need a very low wattage bulb, but a ceramic heat emitted is better for night heat.

*If the hot spot is too hot:* Light dimmers can be purchased. They work for heat as well as visible light! I recommend buying a temperature gun to determine exactly how hot that spot is so you can determine what's needed.



**Halogen bulb**



**Mercury vapor bulb**



**Ceramic heat emitter**

**Ultraviolet:** This is invisible to humans and is broken down into UVA (320-400nm), UVB (280-320nm), and UVC (180-280nm).

**UVA:** This is the lowest UV energy. Remember what I said about how reptiles have a wider visible light spectrum than humans? Well, reptiles CAN see UVA. While it isn't as "popular" a topic as UVB, it's critical. Without it, it would be like being partially colorblind. UVA has also been linked to reptiles performing their natural behaviors such as eating, digging, climbing, and breeding. If a reptile isn't doing well for whatever reason, try adding UVA.

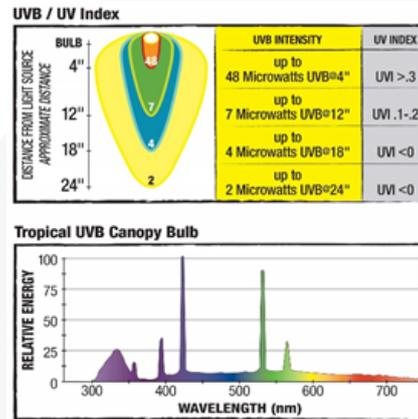
**UVB:** This is a higher UV energy. It's partially filtered by Earth's atmosphere, but with prolonged exposure, it can damage cellular DNA and cause sunburns to us and other animals. For most reptiles, absorbing it is how they synthesize vitamin D3, and without vitamin D3, they cannot absorb calcium. Vitamin D plays a role in the brain, heart, lungs, kidneys, bones, immune system, pigmentation, and digestive tract. A lack of UVB is therefore associated with metabolic bone disease, where their bones lose density. If x-rayed, the animal looks like a ghost.

*"Can I just supplement their food?"* Sorry, no. Vitamin D is toxic in large amounts, and because there is only so much research out there about reptile vitamin requirements, we don't know what level is toxic (kidney damage, calcification of soft tissues) and what level isn't enough, particularly species by species. Cellular vitamin D is self-regulating, so when UVB is provided, it's actually impossible for a reptile to develop vitamin D toxicity. They create the exact amount that they need.

**UVC:** This is the highest strength UV light. It destroys DNA on contact and is completely filtered by our atmosphere. These are not used for anything living; they are only for machine disinfection. Don't.

“OK, but I can see light coming from my UV bulb. You said I can’t see UV light.” I didn’t mess up there, actually. See, owners like to see light coming from a bulb, and this way, when these bulbs are on, the reptile also gets visible light. The problem is that these lights only emit UV for 6-8 months, but the visible light in that bulb will burn for a lot longer. Because of this, the lights must be replaced every 6 months, even if it doesn’t look like they need to be. There are UV meters that can tell you if the UV is still burning, but they are expensive. If you don’t want to have to remember this, and your reptile also requires heat, try a mercury vapor bulb. These lights DO burn out when UV is gone, so you’ll remember to change them.

“Is that it? UV is complicated.” Sorry, not quite. UV lights only penetrate a certain distance before the benefit is negligible. UV will not reach farther than 12-18” from the bulb, so if your reptile is at the bottom of a 20” tall tank, you’re just throwing your money away. Depending on the reptile’s natural behaviors and climbing abilities you can incorporate ledges, branches, or rocks that the animal can get to that is closer to the bulb. Closer = more UV, so if the animal requires high levels of UV (such as a desert basking species like a bearded dragon), they’ll need to be closer than 12”. Choose bulbs with boxes that tell you the exact spectrum of light provided, and some will inform you how strong the bulb is at different distances.



**Label from Zilla’s canopy series UVB/UVA bulbs. Not sponsored, but these are what I use. Based on my UV meter, they have the range and life expectancy that is advertised.**

“Are there any exceptions? Do all reptiles need UV?” Actually, not all of them. Studies have shown that ball pythons get no benefit whatsoever from UVB light. One that had a group of snakes under UV bulbs had the same levels of D3 in their systems as those that did not have UV offered. This makes sense; in their natural habitats, they curl tightly into burrows and do not emerge until the sun is down. This doesn’t mean that all nocturnal species are exempt, however; many have been proven to need UV because they are “cryptic baskers,” putting a piece of their tail or leg outside their hiding spot, camouflaged, but still able to absorb light during the day. When in doubt, offer UV.

That was a long read, but I hope that if nothing else it serves as good reference material for you going forward. Always check boxes for UV spectrums and bulb penetration; a slightly cheaper bulb with an unclear label isn’t worth your animal’s life and wellbeing. Next month I’ll go into more of the fun stuff: plants and bugs!

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