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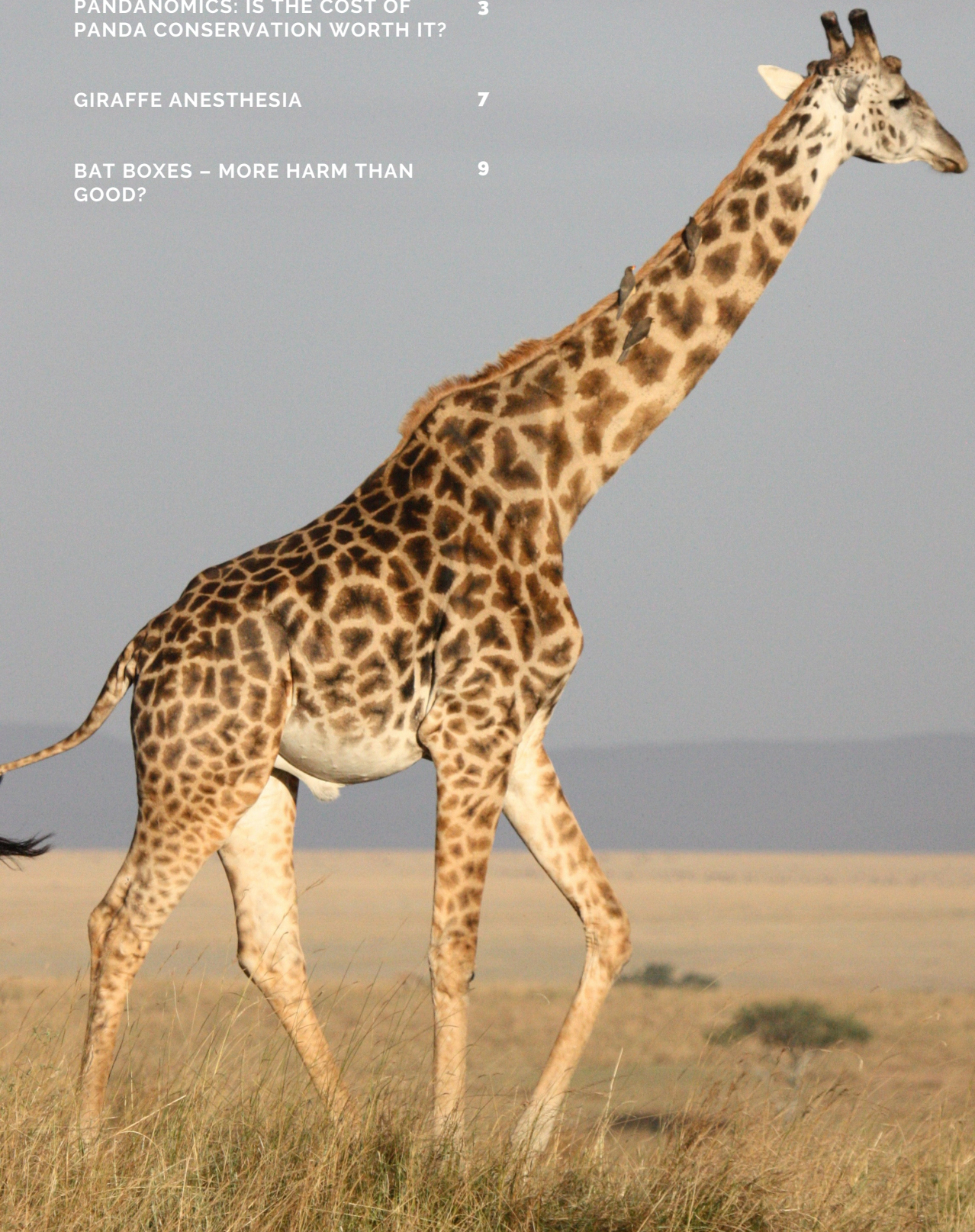
WHAT'S INSIDE?



PAIN CONTROL IN AVIAN PATIENTS

BY KAYLA LADEZ

Traditional avian analgesics embrace opioids and non-steroidal anti-inflammatories, but rare research and anecdotal evidence suggest other options may be useful in some feathered patients. This article summarizes just a few current alternatives in bird pain control to encourage you to consider all available treatment strategies for your patients. All references will be linked in the reference section of the newsletter if you are interested in reading the research cited here.

One way to improve upon common pain management protocols is by adding drugs that are often used in other species. Gabapentin is a calcium channel inhibitor that was developed to mimic the neurotransmitter GABA, but is best used as an analgesic. In case reports involving a Prairie falcon and a Senegal parrot, gabapentin was part of a successful multi-drug treatment to control self-mutilation (4,5). Therapeutic ranges are based on human studies, but pharmacokinetic studies have been completed in Hispaniolan Amazon Parrots, great horned owls, and Caribbean flamingos (1-3).

Acupuncture is a portion of traditional Chinese medicine that has been shown to release endorphins and reduce cytokines associated with pain and inflammation in humans. Acupuncture points have been extrapolated for many species, including birds (7). In a case report of raptors with torticollis, a muscular condition, 2 of 5 raptors received acupuncture as part of their treatment plan and were eventually released after resolution of their clinical signs (6). Clinical trials involving avian acupuncture are needed to fully assess the effectiveness of this treatment.

Cannabidiol (CBD), has become a popular therapy for humans and animals alike. More studies are needed to determine the effectiveness in birds, however, a study in budgerigars suggests that birds have cannabidiol receptors that may have functions affecting memory, the visual system, reproductive behaviors, and motor function (8). A study in Hispaniolan Amazon parrots found CBD was well tolerated by the birds at a much higher dose than commonly used in dogs. Even with the high doses, combined low plasma levels and a short half-life suggest further research must be done to fully determine its effectiveness in birds (9).

Other alternative therapies like range of motion, massage, thermal treatments, and laser therapy have also been explored by various forms of research. Further investigation is needed for these and other alternatives treatments in numerous species of birds. Staying up to date on current research is one way we can continue to provide the highest level of care to our patients.

TOPICAL FLEA PRODUCTS AND THEIR RISK TO AQUATIC ENVIRONMENTS

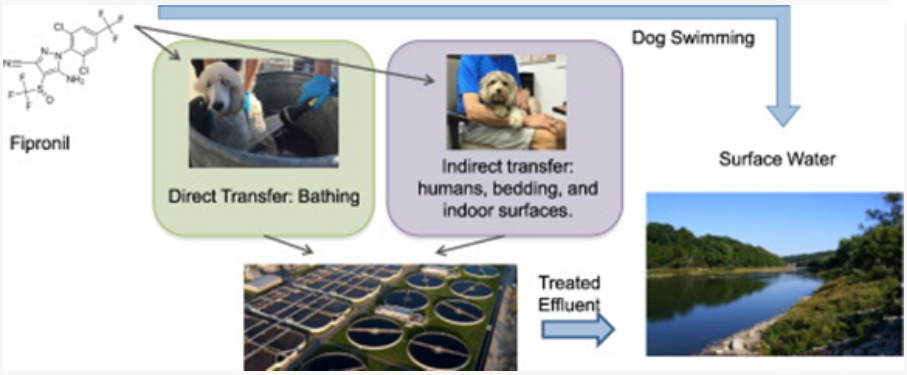
BY SIOBHAN MEADOWS

Topical flea products are a popular anti-parasitic in companion animals and are readily available to owners either through their veterinarian or over the counter. While considered to be a safe and relatively effective method of flea control, the use of topical products may be causing unforeseen contamination of aquatic environments.

Aquatic species can be particularly susceptible to insecticides, only needing to be exposed to parts-per-trillion concentrations to cause toxicity. After examining samples taken from 2012-2014, the USGS and EPA found fipronil and imidacloprid in 38 streams in the US. A study by the UK Environment Agency published this year found fipronil and imidacloprid in 20 rivers, with the mean fipronil concentration at all sites exceeding 5 times the set chronic toxicity level. Studies have been finding that these concentrations may not be related to the use of agricultural pesticides.

Fipronil and imidacloprid are neurotoxic pesticides and are common ingredients in topical flea products. While many topicals include instructions not to bathe a treated pet for hours to days after treatment to ensure efficacy, subsequent bathing or swimming after this specified timeframe still results in the contamination of water with insecticide residues. Contaminates can also result from washing objects coming into contact with treated pets, such as pet bedding. One study found that dogs bathed 28 days after the application of a fipronil topical resulted in bathwater with fipronil and fipronil-sulfide contaminate in concentrations of milligrams. They determined that if only 25% of the enrolled dogs had been washed within a week of treatment, the fipronil contamination would entirely account for the levels found at local wastewater treatment plants.

Fipronil and imidacloprid are currently banned in several countries and may not be used in certain agricultural practices in others. However, the use of both insecticides in companion animal topical flea treatments has not been restricted and suggestions have been made to reevaluate their role in ectoparasite management and the resulting environmental impact.



PANDANOMICS: IS THE COST OF PANDA CONSERVATION WORTH IT?

BY ELLE DONNELLY

We all know that Giant Pandas have been the face of conservation for years; representing endangered species and acting as the mascot for organizations like the World Wildlife Fund. However, since the threat to panda populations has now decreased from "endangered" to "vulnerable," why do zoos and other institutions continue investing exorbitant amounts of money in their care?

In the United States, only three zoos have Giant Panda exhibits due to their high costs. The Memphis Zoo, Zoo Atlanta, and the National Zoo in Washington D.C. must each pay $1,000,000 a year for 10 years to the Chinese government in order to "rent" these bears. Additionally, pandas require $500,000 worth of bamboo for food and high-standard exhibits that cost hundreds of thousands of dollars to design and maintain. If there are any successful births, the Chinese government tacks on an extra $600,000 as a "baby tax."

Most zoos cannot afford to allocate this much of their budget to one species, and therefore do not even attempt to exhibit pandas. The facilities that do own pandas, have rightfully been exasperated by these high costs and made attempts to get the rent lowered. Unfortunately, the government in China bases the costs of the pandas on each country's economic status, and although other countries can rent pandas for as low as $250,000, the U.S. is seen as a place that can handle a higher investment.

Thankfully, the money spent on pandas is not all in vain, as the study "The Value of Ecosystem Services from Giant Panda Reserves" by Dr. Fuwen Wei illustrates. Protected panda reserves (funded by panda renting) provide not only great biodiversity but socioeconomic benefits to locals by providing provisioning services. Provisioning services are amenities from nature, like land for grazing animals and growing crops. The protection also bans poaching and illegal logging – two practices that are extremely detrimental to wildlife.

Additionally, pandas are both a flagship and umbrella species. This means that with their charismatic reputation, their conservation helps improve the conservation for species that live in the same environment. Endangered species like the takin and golden monkey are at risk due to habitat loss, which can be resolved by protecting the land.

It is hard to say whether the cost of housing pandas is worth the money for zoos, especially during hard economic times, but it is clear that getting people to care about a "cuddly" bear in the interest of saving less "cute" species, is an easy way to support endangered populations in the wild.

Test Your Trivia Knowledge!

BY RYAN PATTERSON

1.What species has eyes that change to the color blue during the winter time in order to help see better at lower light?

a.Arctic Fox
b.Reindeer
c.Arctic Wolf
d.Polar Bear

2.What do you call a group of giraffes?

a.Jungle
b.Tower
c.Canopy
d.City

3. How many spiders are there estimated to be per acre of land on Earth?

a.500,000
b.1,000,000
c.5,000,000
d.10,000,000

4. Which animal has the largest eye size in the animal kingdom?

a.Colossal Squid
b.Giant Squid
c.Blue Whale
d.Sperm Whale

5. When was the first "Earth Day"?

a.4.5 billion years ago
b.1962
c.1970
d.1972

Answers: b, b, a, c

BIOCONTROL - DOES IT EVER WORK?

BY CARLY CLARK

Invasive species by definition are any organism non-native to a particular area where they exist and propagate. Invasive species are generally bad news and have the potential to negatively affect the ecology, biodiversity, economy, and disease status of the regions they infiltrate. Even more frustrating is that humans are the primary party responsible for the introduction of invasive species into new territories. Most of these introductions are accidental or careless, like the transmission of a fungus brought in on the back of a hiker's show, or an unruly exotic pet being released into the wild. But in some instances, invasive species are purposefully released as a means of pest control into new areas as an act of biocontrol.

Biocontrol is described as the act of integrated pest control through the use of living organisms. Unsurprisingly, this approach has historically been a disaster. The negative downstream effects are still being felt in Australia from the introduction of Cane Toads in 1935. The poisonous amphibian was introduced in a poorly planned attempt to mitigate the effects Greyback beetles were having on sugar cane crops. What was overlooked in this plan was that Greyback beetles fed at the tops of sugar cane (around 8ft high) so the toads were unable to reach the beetles, cane toads are nocturnal feeders while Greyback beetles are diurnal, and cane toads prefer a wetter climate than the dry Australian sugar cane fields. Being an indiscriminate eater and having no natural predators, the cane toad quickly moved on from the sugar cane fields to wreak havoc across much of northeast Australia while reproducing at an extraordinary rate. The population of cane toads in Australia now numbers several million, and they continue to cause problems for the native wildlife and domestic animals alike.

Another biocontrol disaster took place in New England. In 1981, a plague of tiny invasive gypsy moths from Europe were eating the endangered native Luna moths out of town. Introduced in the late 1800's the invasive gypsy moth's populations had steadily been increasing despite all methods of varying strategy to slow them down. This is where biocontrol comes into play. After an extremely destructive year of gypsy moths, scientists introduced *compsilura concinnata,* a tiny parasitic fly species and natural predator of the gypsy moth in Europe in hopes of slowing the spread of gypsy moths and saving the Luna moth species. Things did not go according to plan. Instead of attacking only the gypsy moths, these tiny flies preyed indiscriminately on a variety of insect species causes more peril to the already struggling endangered moth species. Luckily, this story has a happy ending. In 1989, researchers discovered that the fungus *Entomophaga maimaiga* only effects the larvae of gypsy moths. In the years since the fungus's introduction, the damage from gypsy moth feeding has been held to a minimum proving that not every biocontrol attempt ends in disaster. While its important to note that biocontrol does have a place in conservation and preservation of wild spaces, the previous two stories serve to remind us just how delicate the balance between organisms in an ecosystem is and how easily the balance can be unintentionally disrupted without us (humans) even realizing it.

MATCH THE RABBIT BREED!

BY KATE VANDERSLICE

There are 51 breeds of rabbits recognized by the American Rabbit Breeders Association and more than 300 breeds worldwide! Can you match the rabbit breed name to their picture?

___ English angora

___ Dutch

___ English lop

___ Tan

___ Blanc de hotot

___ Netherland dwarf

___ Giant chinchilla

___ Giant angora

___ Dwarf papillon

___ Flemish giant

A

F

B

G

C

H

D

I

E

J

Answers: A. Flemish giant, B. Blanc de hotot, C. English lop, D. English angora, E. Dutch, F. Giant chinchilla, G. Giant angora, H. Netherland dwarf, I. Tan, J. Dwarf papillon

GIRAFFE ANESTHESIA

BY RACHEL ANGLES

Owing to their unique anatomy and physiology, medical procedures involving anesthetic immobilization can be extremely risky for giraffes. Some of the concerns to be aware of are as follows:

- Limited ability to control and manipulate the animal during induction and recovery due to their large size and long neck. Self-induced injury from slipping during induction/recovery is common
- The neck can present a physical danger to the animal or the staff, and if positioned incorrectly can lead to airway obstruction or muscle spasms which can cause fatality
- A tendency towards vomiting/regurgitation can lead to fatal aspiration pneumonia. The larynx is positioned very posteriorly in the pharynx which interferes with the draining of any fluid
- Prolonged induction/recovery often leads to hyperthermia, myopathy, and secondary trauma
- Giraffes have elevated systolic blood pressure, small respiratory tidal volume with a large dead space and relatively small cardiac output during anesthesia

For minimally invasive procedures such as blood draws, rectal or reproductive exams, minor hoof trimming, joint taps, and TB testing, physical restraint +/- mild sedation is often used to avoid the risks that come with full anesthetic mobilization. This involves a restraint facility such as a chute, movable wall, or squeeze cage. Giraffes should participate in regular training and conditioning to ensure that the animal and the staff is comfortable with restraint procedures. Enhanced restraint using sedation often involves a combination of azaperone and detomidine given IM. Sedation in adult animals can be enhanced with IV butorphanol.

For anesthetic immobilization, the patient should be fasted for 48 to 72 hr and water withheld for 24 to 48 hr to minimize the risk of regurgitation. An ET tube is typically not helpful in reducing aspiration pneumonia, because most vomiting/regurgitation occurs when the animal initially falls, before a tube can be placed. ET tube placement is also difficult because of the position of the larynx and difficulty to visualize. Stimulation of the pharyngeal area during intubation has also been known to cause vomiting.

Size of the animal is a major factor in the success rate for anesthetic procedures in giraffes, with smaller animals typically faring better than larger. This may be due to many factors including ease of handling and lower drug dosages.

The procedure site should have smooth solid walls and sound footing. A catwalk allowing access to the animal's head during the procedure is ideal. Once in lateral recumbency, the neck of the giraffe should be extended to ensure a patent airway. The neck should be supported with the head above the rumen and the nose pointed down, to facilitate gravity-assisted drainage of any fluids. The patient should be blindfolded, and earplugs should be used. The angle of the neck should also be altered every 10-15 min to minimize muscle spasms.

In giraffes, respiratory failure is usually the first sign of any problem, followed by cardiovascular depression and death. Respiration should be monitored, and the amount of air moved on exhalation should be felt to estimate the tidal volume. A capnograph can be used but may be less accurate due to the large respiratory dead space and tachypnea. Auscultation of the chest and palpation of the auricular or mandibular artery can be used to monitor cardiac function. Additionally, pulse oximetry can be used and blood pressure can be taken using a blood pressure cuff above the carpus. An increase in heart rate or any physical movement is indicative of inadequate anesthetic depth. Rectal temperature is also monitored because hyperthermia can be a problem.

Several anesthetic protocols have been documented for use in giraffes, including xylazine and etorphine (M99) or carfentanil +/- atropine to prevent xylazine-induced bradycardia. Other protocols involve the use of fentanyl citrate, azaperone and scopolamine or medetomidine and ketamine. Supportive therapy often consists of NSAIDs and muscle relaxants (commonly 5% glyceral glycolate). During induction, the animal should be confined to a squeeze cage or chute to prevent the sedated giraffe from putting excess pressure on the trachea. Signs of sedation include stargazing, ataxia and protrusion of the tongue with salivation. The narcotic agen should then be administered to induce recumbency. A halter Is used to help control the animal's head and assist as the animal begins to go down. The giraffe can be brought completely down by casting.

After the procedure, antagonist drugs are administered, and the head of the giraffe is supported in an elevated position with the nose pointed downward. Support is necessary on the head and neck to prevent the animal from rising before it is fully recovered. The earplugs are removed, and once the animal begins to respond the blindfold is also removed. A rope held by three or more people is held over the animal's shoulders to prevent it from trying to stand up too early. Once the giraffe is recovered and resisting head restraint, the head is elevated manually using a rope and the giraffe is pulled into a sternal position and allowed to stand on its own.

BAT BOXES – MORE HARM THAN GOOD?

BY FAYTH KIM

Bats serve an important role in a functioning ecosystem, including pest control, seed dispersal, and pollination. There are at least 40 species of bats in the U.S. that are insectivorous. The USGS estimates that by eating insects, bats save U.S. agriculture over $3.7 billion per year. Other bat species consume fruit, nectar, and pollen. In many regions, bats are the key pollinators as they fly from plant to plant in search of food. The Illinois Department of Public Health identifies 13 species (all insectivorous) commonly found in Illinois, with the big brown bat, little brown bat, eastern red bat, and silver-haired bat being the most frequently encountered. They are active during the warmer months and will roost in attics, trees, caves, or under bridges while raising pups. Being nocturnal, they will roost during the day in small cracks or crevices. Habitat destruction has resulted in bats seeking alternative housing, often increasing potential encounters with humans. Bats find environments with openings greater than ¼ inch (abandoned buildings, attics, etc.) well suited for raising their pups.

Many well-intentioned individuals want to be proactive in helping bats and may decide to get a bat box. Bat boxes/bat houses/artificial roosts have become an increasingly popular way for people to provide shelter to these fuzzy creatures. There are various DIY resources and commercial ones available to choose from. Common designs include small, flat-panel box with vertical slats to create chambers (Figure 1). Joy O'Keefe, an assistant professor in the Department of Natural Resources and Environmental Sciences at Illinois, and Reed Crawford, University of Illinois researcher, have compiled current data to increase awareness of potential risks and encourage change in the education, design, and marketing of bat boxes. A large risk that O'Keefe and Crawford identified is the likelihood of overheating and death due to poor design or inappropriate placement location. Various resources advise bat boxes to be placed in areas that receive at least six hours of daily sun exposure. However, many bat boxes are painted dark colors which can heat quickly and cause serious injury or death to bats. Researchers have recorded temperatures as high as 142 degrees Fahrenheit in bat boxes. In natural roosts, bats may move to avoid temperatures that are above 97 degrees Fahrenheit. O'Keefe and Crawford concluded that darker-painted boxes tended to be 41-43 degrees hotter than white boxes.

Figure 1: Common design of a bat box

Figure 2: 4-sided bat box

The color of the bat box is not the only factor that can pose risk, as deaths have been observed in unpainted, light wood boxes. Its size should be large enough to allow bats to move around to thermoregulate. If one was going to invest in a bat box, it is recommended to get one with a larger design, such as a 4-sided one (Figure 2). Further research is needed to determine the extent of bat boxes as "ecological traps." In the meantime, bats can be supported by planting wild flora to attract insect prey, providing water sources, and leaving dead trees as natural roosting environments.

BIOACTIVE ENCLOSURES, PART 4: THE PLANTS

BY EMILY GRZEDA

This month is all about adding the plants to your bioactive enclosures – the fun part! Note: these species are just suggestions, and they may not be appropriate for every animal/bioactive situation. If you are housing an herbivore that may ingest their plants, you'll want to look up each plant individually to see if it is toxic to your specific animal.

Things to think about: If the enclosure is tall, you'll need plants that will grow vertically to reach the top as well as plants that provide coverage at the bottom. Try to arrange plants in a way that best provides enrichment to your animal. Don't just buy one plant type – get a variety that have different colors, shapes, or textures. If the animal cannot climb, make sure there aren't so many plants that their basking spot is blocked. As they continue to grow, you'll need to trim them.

So, without further ado, here are some of the "staple plants" of the bioactive world

Pothos (*Epipremnum aureum*): This is a hardy, green plant that grows big, thick leaves for hiding. It can grow in whichever direction it can best get to light, whether that be horizontal or vertical, so it's great as a plant you know will reach the upper parts of your enclosure.

Bromeliads: These come in a variety of shapes and colors. They can be a great hide for small lizards and geckos.

Syngonium podophyllum: These are also one of my favorites. They grow moderately tall and in dense arrangement, providing great hiding spaces.

Nerve Plants (*Fittonia verschaffeltii*): These are short, but attractive and great for ground coverage/hiding.

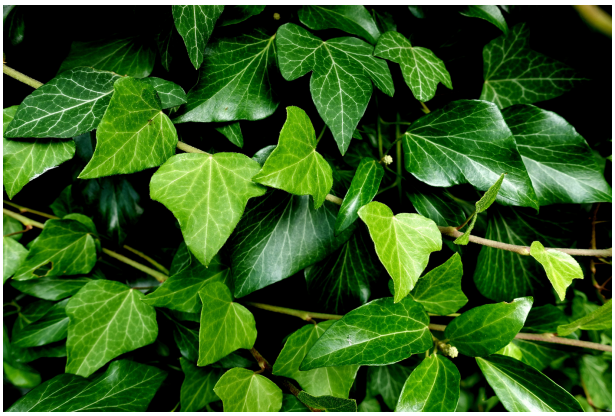
Air Plants: These don't need to be in soil (as their name implies) and are therefore a great option for filling the upper reaches of a vivarium.

Moss: Moss is the "crown jewel" of bioactive enclosures; it's a beautiful staple that people imagine when people look at bioactives, but it can be difficult to keep alive. Moss requires constant moisture and strong light exposure. It works very well on the ground of dart frog enclosures, for example, but does not do as well on the wall of an enclosure. Luckily, dried-out moss can potentially "come back to life," even after years of being dry, so there's no harm in trying!

Arid Setups: These are more difficult, due to the necessity of keeping the ground wet enough for the plant (even arid species) but dry enough on top for the humidity to be appropriate for the animal. There are a couple of options. The first is to pot the plants and bury most of the pot into the substrate. When you water the pot, the moisture remains localized to where you need it. For plants with deeper roots, you can try planting them directly in the sandy soil, but make sure the soil is at least 4" deep, if not more. Having deeper soil means that there is more of a water reservoir in the depths of the enclosure, much more similarly to how it would be in "real ground". The plants can also just be watered individually, but you'll have to pay close attention to how quickly the ground begins to dry up. Go-to arid enclosure plants include aloe, succulents, and air plants

Other miscellaneous plants that can suit a variety of enclosures: Grasses (oat or millet grasses are my favorite, but others can be used!), ivy (poisonous if eaten, but great as a vertical space filler), and ferns are all widely available.

Take care to consider not only how much space your plants will take up when planting them, but also how big your plants will get. Eventually, trimming becomes a necessity (which is normal!), but you don't want to pack your plants in tightly in the beginning and force them to immediately fight for survival. A well-established plant is a happy plant. In that vein, I recommend allowing your plants to take root in the enclosure for at least a month before adding your animal. Our creatures do not typically consider being courteous of their green roommates, and plants are more likely to recover from being trampled if they are well established. In the meantime, fake plants can be added until the real ones provide enough coverage for your animal.



This guide is meant as a start to your venture in finding the right plants. Don't feel bad if something "hardy" doesn't survive – some individuals just don't thrive in certain microenvironments. I recommend joshsfrogs.com as a continued resource for ideas and plant purchases you can't find locally (this is not sponsored, they're just a great company). I hope this gave you a push in the right direction, and I wish you luck!

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