

Do substrates cause impaction in reptiles?

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Do Bio Dude Substrates Cause Impaction in Reptiles?

What is impaction? Impaction is more or less a fancy word for constipation. Constipation, as you probably already know, is a condition in which an animal has difficulty with passing stool or passes stool infrequently. Impaction occurs when constipation is caused by a blockage in the digestive tract.

Substrate impaction occurs when the impaction is perceived to be caused by ingested substrate particles that are blocking the digestive tract. Substrate impaction is a major concern in the reptile community. If you browse a reptile forum or a Facebook group, it doesn't take long at all to see the topic being discussed. For this reason, the use of loose substrates (most notably sand) is considered taboo in many bearded dragon, leopard gecko, and other subsets of the reptile community.

This has presented a significant obstacle to the argument that any reptile can be kept on a bioactive substrate, and that doing so is superior to other substrate options.

Recent findings are presenting a compelling argument that substrate impaction is NOT caused by the type of substrate being used — instead, the impaction is a symptom of larger husbandry problems.

Causes of Impaction

Dehydration

If you're familiar with the nature of constipation in humans, then you probably know that dehydration is the most common culprit in that regard. As it turns out, dehydration causes digestive trouble for reptiles as well — and most other animals, for that matter.

When a reptile is dehydrated, a urate plug can form, blocking the passage of feces and any ingested substrate. Captive reptiles are notoriously chronically dehydrated — particularly “desert” species like bearded dragons and leopard geckos. This is because people think that “desert” means a bone-dry environment with no water at all. Add a good dose of paranoia about respiratory infections to the mix, and you get extremely dry enclosures and dangerously dehydrated reptiles. This is one of the reasons why you see more cases of impaction reported with bearded dragons and leopard geckos, and not so much Indonesian blue tongue skinks or crested geckos.

[According to Dr. Brad Lock, DVM](#), dehydration is one of the most common causes of impaction.

Inadequate UVB or Vitamin D Supplementation

UVB is a wonderful tool for improving the quality of care that we provide for our pet reptiles, but to be fair, it can be confusing and a little difficult to use for beginners. To sidestep this difficulty, some people choose to use vitamin D supplementation as a replacement. While this should work in theory, the truth is that UVB is more than just a source of vitamin D for reptiles, and no one actually knows exactly how much vitamin D each species needs at every stage of life — so D supplementation is just a bunch of guesswork, and it's frighteningly easy to potentially under- or over-dose. However, the amount of UVB needed for commonly-kept reptiles IS known, and [correctly providing UVB](#) enables reptiles to get the perfect amount of vitamin D that they need.

When animals don't get enough vitamin D (whether from inadequate UVB or supplementation), their bodies can't function correctly. One of the functions that typically gets affected is digestion. In [a 2019 study on humans](#), for example, lower levels of vitamin D were linked to reduced intestinal movement and chronic constipation.

Yes, that was a human study, not a reptile study. However, this problem affects most (if not all) vertebrates, including reptiles. When there's not enough vitamin D in an animal's body, digestive

function is compromised and the animal becomes more likely to become constipated or impacted.

Underheating

As most reptile keepers well know, reptiles depend heavily on the temperatures in the environment in order to survive and stay healthy. That is because the energy that they get from external heat sources is vital to “powering” the many physiological processes that keep their bodies working properly.

When reptiles don't have access to temperatures high enough to allow them to achieve their preferred body temperature, then their bodies don't have the energy to work properly. And when that happens, one of the results is that digestion slows down and becomes less effective. This is one of the reasons why brumating a reptile with a full stomach is so dangerous — without heat to power the digestive tract, food gets stuck and starts to rot inside the reptile's body, poisoning them.

When there's enough heat energy for the reptile to eat and move, but not enough for it to digest properly, the risk of impaction is increased.

Other Causes

Some other potential causes or contributors to impaction are **lack of exercise** and **illness**.

If you've ever taken a dog for a walk, you take a plastic bag along with you because you know you're going to have to clean up poo. The same goes for reptiles — when they don't move very much (which can be caused by things like low basking temperatures, obesity, and small or unenriched enclosures), intestinal motility is reduced and there's more opportunity for things to get stuck.

Similarly, when reptiles get sick, their bodies aren't working properly. Some of the causes of illness have already been addressed (vitamin D deficiency, low basking temps, dehydration), but there are other causes like cancer, endoparasites, and calcium deficiency. According to [a 2017 study](#) on over 500 sick bearded dragons, it was found that illness seems to be a contributing factor to the development of impaction.

In Other Words, Substrate is Unlikely to Cause Impaction

Saying that substrate causes impaction is like saying that vaccines cause autism. Just because a kid got diagnosed with autism a month after receiving routine vaccinations doesn't mean that the vaccinations caused the autism. Mistaking correlation for causation is one of the biggest mistakes in the book.

Loose substrates are part of reptiles' natural habitats.

“Loose substrates” are naturally present in most, if not all, reptiles’ natural habitats. If we assume that loose substrate kills reptiles via impaction, then they wouldn’t exist in the wild. They’d all be extinct from eating sand.

Since bearded dragon owners are among the most vocal in perpetuating the myth that loose substrate causes impaction, let’s use bearded dragons as a quick example. Bearded dragons (*Pogona vitticeps*) are native to Central Australia, where most of the “dirt” there isn’t actually dirt — it’s sand. Dr. Jonathan Howard (a.k.a. “The BeardieVet”) [took a sample of this stuff](#) and sent it off to Southern Cross University for lab analysis. Here’s the results:

- 3% gravel
- 9% fine sand (quartz, colored by iron oxide)
- 5% silt
- 3% clay

Definitely not paper towels. And last I checked, the bearded dragons in that area are quite alive and healthy.

Wild reptiles aren’t dying from substrate ingestion.

Using that same logic from the previous point, wild reptiles that die from ingesting substrate, especially the youngsters, wouldn’t live long enough to reproduce — or at least not make as many babies as the ones whose intestines could handle occasional substrate ingestion safely.

Hey, didn’t evolution already take care of that?

Each species of reptile has evolved to thrive in its wild environment. Not survive — THRIVE. In these environments, the substrate is a potential hazard. So their bodies have evolved to be able to pass that ingested substrate so they can live to make as many babies as possible. Wild reptiles are more likely to die from predation, starvation, habitat destruction, or being harvested from their natural habitat for export to the pet trade than they are likely to die from substrate ingestion.

Dissection is a common technique used by herpetologists to determine what a reptile species eats in the wild. They open up the stomach and the rest of the digestive tract to piece together a picture of the species’ typical diet – what it eats, and how much of each type of food comprises total diet. In published research where the reptile was dissected for stomach content analysis, soil and sand are very rarely a noteworthy component of the stomach contents

However, it must be acknowledged that there have been a couple of cases where wild reptiles have been found (dead or alive) with impaction. Most notable is the case of a curly-tailed lizard (*Leiocephalus carinatus*) from earlier this year.

This lizard was found near a pizza parlor in Florida, with such a severe case of impaction that feces made up [80% of its body weight](#). Fecal analysis revealed that the mass was made up of pizza grease, sand, and insect remains — the lizard had been eating insects covered in greasy

sand. Because pizza grease is a saturated fat, it needs to be heated in order to become liquid, and the lizard's body wasn't a consistently hot enough environment for the grease to become liquid and pass. So the grease stayed congealed and created a sticky mass that couldn't be processed by the lizard's digestive tract.

So if you're in the habit of feeding your pet reptile bacon or pizza, loose substrate is not a great choice, but that will be the least of your problems.

Solid Substrate Isn't As Safe As You Think It Is

Some people prefer to avoid sand, bioactive, or any other kind of loose substrate because they don't want to take the "risk".

Well, I've got some bad news for you: Solid substrates aren't as safe as you think they are. They come with their own set of risks, and these risks can't be mitigated as easily as just making sure your husbandry parameters are correct:

- Reptile carpet harbor bacteria and can rip out claws or break toes.
- Paper towels can be shredded and ingested, which may lead to impaction.
- Ink from newsprint contains VOCs (volatile organic compounds) and may also dye the reptile's skin/scales.
- Linoleum and shelf liner off-gas VOCs when heated.
- Slate tile is significantly harder than natural sand or soil, and may cause joint damage.

Avoiding loose, naturalistic substrates in favor of avoiding substrate impaction without actually changing anything else about your husbandry is like putting a Band-Aid on a bullet wound. It might make you feel a bit better, but it's not addressing the actual problem, and the reptile will probably still get sick — just not with impaction.

Not All Loose Substrates Are Safe, Either

Here's the point where I have to come clean: Not all loose substrates are all that safe either. Some are toxic, some are made of unnatural (potentially dangerous) materials, and others are simply too large or sharp to be safely ingested. Here's a quick list for reference:

Safe

- Natural sand
- Organic, untreated topsoil
- Peat moss
- Bioactive mixes

Not Safe

- Aspen shavings

- Cedar/pine shavings
- Bark chips
- Calcium sand
- Ground walnut shell

Might Be Safe

- Coconut fiber
- Hemp fiber
- Small aspen chips
- Orchid bark
- Coconut husk

If the particle size is small enough relative to the reptile (or too large to possibly be ingested), it's probably safe. But the ultimate rule is: If a substrate mimics the reptile's natural environment, it's likely to be safe to use in captivity.

When Shouldn't You Use Loose Substrate?

As great as loose, naturalistic substrates are, there are a few occasions when it's better to keep your reptile in quarantine conditions and/or a solid substrate:

- Sick reptiles
- Reptiles with neurological defects
- Reptiles that deliberately ingest large amounts of substrate

As always, if you notice unnatural or otherwise worrying behavior from your reptile, don't ask the internet for a diagnosis or treatment advice — make an appointment with an experienced reptile vet.

Conclusion: Bio Dude Substrates Are Not Going to Give Your Reptile Impaction

There are a lot of myths and misinformation out there on impaction and what causes it. Substrate impaction is one of the greatest fears among reptile keepers, and because fear is involved, the thinking that goes along with it can get a bit irrational. By understanding the science and facts behind impaction, you can work to prevent it while also giving your pet reptile a better standard of care.

The Dude Abides