

## Coccidia Parasites Infect Reptiles

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Coccidiosis refers to an infection by one or more of the Coccidia species that infect reptiles. Coccidia are protozoa that are often seen in low numbers in healthy reptiles. Coccidia are single-celled parasites that can cause many different signs of illness and infection in reptiles. Reptiles with an untreated coccidia infection may stop eating and appear listless; these animals will not appear healthy or might begin to have a thin, malnourished appearance.

These parasites can infect both the intestines (intestinal) and the tissues (extra-intestinal) of reptiles. Signs associated with intestinal coccidiosis may include poor growth, weight loss, bloody feces (melena) and diarrhea. Signs of extra-intestinal coccidiosis vary according to the infected tissue, and may include sudden death, sore nose, lack of appetite, depression, and reluctance to move. Often, no signs of a problem are seen, and coccidia are detected during a routine fecal examination.

Coccidia are generally stable in the environment and are passed in the feces by infected reptiles. This is known as a fecal-oral mode of transmission, which is the most common route of infection for coccidia with direct life cycles (this is when the reptile can be infected by the coccidia in cage). For coccidia with indirect life cycles (this means the reptile cannot be directly infected with that coccidia species), definitive hosts are typically infected by ingesting intermediate hosts such as insects.

Three families of coccidia are found in reptiles: *Cryptosporidae* (causes Cryptosporiosis), which is discussed in a separate section; Eimeriidae, of which the genera *Caryospora*, *Eimeria*, and *Isoospora* have been described in reptiles; and *Sarcocystidae*, of which the genera *Besnoitia* and *Sarcocystis* have been described in reptiles. *Eimeria spp.* are the most commonly described coccidian parasites of reptiles. *Eimeria* have direct life cycle and usually are found in the intestines of infected reptiles.

There have been no documented cases of a zoonosis (infecting a human) with a reptile coccidia species.

### Affected Species

Coccidiosis is seen in all species of reptiles that have been investigated. With intestinal Coccidia spp., young and older animals tend to be affected with the heaviest infestations and show the most significant clinical signs. No age association has been found for disease seen with extra-intestinal coccidia and no sex predilection has been noted for any reptile coccidiosis.

Young animals, animals kept in high population density, and animals kept under conditions of poor hygiene are at greatest risk to show disease from coccidiosis. For coccidia with indirect life cycles, mixed species collections are at greater risk.

Coccidia organisms can infect many different reptile species and been found to infect a variety of tissues, examples include:

- Tissue cysts in the kidneys of basilisks (*Basiliscus basiliscus*); intestine, liver, and spleen of ameiva (*Ameiva ameiva*); and heart of wall lizards (*Lacerta dugesii*).
- *Caryospora chelonae*, which has a direct life cycle, is a significant pathogen in green turtles (*Chelonia mydas*), causing primarily intestinal lesions, although lesions may also be in the kidney, thyroid, and brain.
- *Choleoeimeria hirbayah* is a significant pathogen of veiled chameleons (*Chamaeleo calyptratus*).
- Intranuclear coccidiosis is a significant disease of tortoises, causing high mortality:
  - Organisms are found in cell nuclei of numerous organs, including GI tract, liver, kidney, and spleen.
  - In Sulawesi tortoises, this organism has been associated with erosive rhinitis (infection of the nose). The life cycle of this organism is not known.
- *Isospora jaracimrmani* can be a significant pathogen in veiled chameleons (*Chamaeleo calyptratus*), and *I. amphiboluri* is the most common coccidia seen, and can be, a significant pathogen in bearded dragons (*Pogona vitticeps*).
- *Klossiella boae* has been reported from the kidneys of a Boa constrictor.
- Significant intestinal disease has been associated with Sarcocystis in a bull snake (*Pituophis melanoleucus sayi*).

Given the number of different reptile species and groups that have been found infected and diseased by coccidia, it is safe to assume that any reptile can have coccidiosis.

### Diagnosis

Your veterinarian will start by taking a thorough medical history and give a physical examination. Findings in cases of infection with coccidia that is causing disease vary according to the species of coccidia and the host; often, there are no abnormalities. Abnormalities that are commonly seen may include poor growth, weight loss, and depression. Because many diseases other than coccidiosis can cause these signs, your veterinarian may need to perform some additional tests and ask some questions to get a diagnosis that may include a thorough history, taking blood for a complete blood count and plasma chemistry, X-rays, fecal examination or PCR testing. This is critical because the disease significance and approach vary greatly depending on coccidian species, so identifying the coccidia is essential.

Some species of coccidia can be seen on blood smears, so your veterinarian may want to collect blood to have a look. One of the most common ways to identify an infection with coccidia is through the feces and so a fecal floatation test may be done. Your veterinarian will look at the feces under a microscope, then determine the number of oocysts that are on the slide. Your veterinarian will decide if they are in high enough numbers to treat and what medication would work best.

A nested polymerase chain reaction (PCR) test is available for all coccidia from the University of Florida. For this test your veterinarian may need to perform a biopsy or other test to collect the tissue samples needed for PCR or to have a pathologist look under a microscope for a diagnosis.

### Treatment

The goal of treatment varies according to species of coccidia and host. For instance, for species that do not cause a very bad disease, treatment may not be indicated, especially in nonbreeding situations or where parasites have indirect life cycles. For coccidia with direct life cycles, strong hygiene practices are necessary to prevent reinfestation. This is frequently underemphasized, and without this, drug treatments will fail.

For debilitated animals, your veterinarian may want to provide supportive care such as fluid therapy and treating a secondary infection using antibiotics may be indicated. If a coccidia with an indirect life cycle is diagnosed, your veterinarian will discuss how to limit or remove access to intermediate hosts to prevent infection.

Your veterinarian may prescribe an anticoccidial drug for your reptile. Some of the drugs that have been used include: ponazuril (Marquis), toltrazuril (Baycox), nitazoxanide (Navigator), amprolium hydrochloride, sulfadimethoxine, and trimethoprim/sulfamethoxazole.

Enteric coccidia with direct life cycles should have follow-up testing every six months until they have had two years of negative fecal flotation examinations.

### Prevention

Good hygiene is absolutely critical in preventing coccidia infections. Other preventive measures include maintaining a closed group, testing populations, strict quarantine, eliminating access to intermediate hosts, and the best husbandry that you can provide.

Coccidia with a direct life cycle, like those found in bearded dragons, can increase to tremendous numbers in an enclosure. The oocysts, or eggs, can survive for weeks in the environment. Fastidious, daily cleanings are necessary to remove all feces and feces-contaminated food and water. Insects and other food items must be removed on a daily basis because they are another source of contamination and reinfection.

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