

GUIDE TO VENOMOUS REPTILES IN VETERINARY PRACTICE

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Abstract

Venomous reptiles are common in zoo, research, and private collections. These animals will require veterinary care at some time during their captivity, and treating venomous reptiles can be both challenging and rewarding. Extensive training and experience in handling venomous reptiles, particularly snakes, is required before making the important decision on whether to add these patients to one's practice. Veterinarians who have a desire to treat venomous reptiles should be familiar with proper equipment, handling techniques, and special considerations required for these species. Veterinarians should also be prepared in the event of an emergency and aware of specific medical conditions affecting these species. Copyright 2014 Elsevier Inc. All rights reserved.

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Venomous reptiles continue to remain popular in both zoo and research collections and in the pet trade. Veterinarians who treat reptiles will likely be asked to treat venomous species. This article is intended to serve as an overview of current, preferred methods of venomous reptile handling and transport and to demonstrate how implementing these techniques allows for proper veterinary care of these patients. Although one may be familiarized with these methods, there is no replacement for proper training and education. Experience can be gained by mentorship from experienced private collectors or zookeepers, through training courses offered by veterinary or zookeeper symposia, or through the Association of Reptilian and Amphibian Veterinarians. Keeping nonvenomous species that mimic behaviors of venomous species is an excellent way to gain experience (Fig. 1). Veterinarians cannot rely on the client for proper restraint and handling of venomous species in the examination room. Before a venomous reptile is brought into a veterinary hospital, the veterinary personnel must be experienced with proper handling techniques, have all necessary equipment, and also have an emergency plan in place in the event of a bite. Laws and regulations vary by state, county, and city; therefore, the veterinarian must be familiar with local, state, and federal laws associated with maintaining venomous reptiles in captivity. It is also recommended that the veterinary practice's insurance carrier be contacted regarding the treatment of these animals.

The primary function of venom is to immobilize or kill prey and secondarily to aid in digestion.¹⁻³ Venom is a complex mixture of amino acids forming polypeptides and proteins, some of which have enzymatic properties. There are 3 general categories of toxins found in venom: neurotoxins that impair nerve function, myotoxins that damage muscle tissue, and hemotoxins that affect blood.^{1,2} The chemical composition varies between species, and most venoms consist of a combination of

many different compounds that cause multiple effects.^{1,2} The toxicity of a venom is measured by its LD₅₀, which is the minimum dosage of venom required to kill 50% of a group of experimental animals (usually mice or rats). A lower LD₅₀ is correlated to a more potent venom.

Venomous reptiles are found within 1 family of lizards and 4 families of snakes.^{1,2,4,5} There are 2 species of venomous lizards, whereas 15% of approximately 3000 species of snakes are

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FIGURE 1. Practicing with an aggressive nonvenomous species, such as this Vietnamese blue beauty ratsnake (*Orthriophis taeniurus callicyanous*), can provide excellent training to work with venomous species.

venomous.³⁻⁶ It is important to identify what reptile species has been presented to understand the risk involved and its natural behavior and to know what to do in the event of an envenomation.

The only family of venomous lizards is the Helodermatidae. This includes the Gila monsters (*Heloderma suspectum suspectum* and *Heloderma suspectum cinctum*) and the beaded lizards (*Heloderma horridum horridum*, *Heloderma horridum exasperatum*, *Heloderma horridum alvarezii*, and *Heloderma horridum charlesbogerti*).^{1,2,4,7} Helodermatidae are medium to large heavy-bodied lizards native to the desert southwestern United States, Mexico, and Guatemala.^{1,2,4} The venom glands are located on the anterior portion of the lower jaw, and venom is directed to the teeth through multiple ducts that empty along the gumline.^{1,2,4} The teeth are large, sharp, and recurved, and venom is drawn into the wound by capillary action and chewing.^{1,2,4,7} Very few bites have been reported, with most being from captive specimens.¹ These venomous lizards can inflict a serious bite with their powerful jaws, and frequent manifestations of envenomation include pain,

edema, erythema, hypotension, tachycardia, nausea, and vomiting.^{1,2,4,7} No antivenom exists for helodermatids; nevertheless no human fatalities have ever been reported.^{1,2}

There are 4 families of venomous snakes. In snakes, the venom gland is located along the maxilla and is a modified salivary gland called Duvernoy's gland.¹⁻⁴ Venom is carried from the gland via a duct whereby it is discharged through a groove in the fang. The exact anatomy varies between the different families of venomous snakes.

Family Colubridae contains the rear-fanged (opisthoglyphic) snakes whereby venom is conducted to enlarged grooved posterior maxillary teeth and discharges into a fold between the lateral teeth and labial scales.^{1-4,8} Many rear-fanged species are not considered dangerous to humans; some are even common in the pet trade (e.g., hognose snakes, *Heterodon* spp.). Species that are considered dangerous are the boomslang (*Dispholidus typus*), twig or bird snakes (*Thelotornis kirtlandi*, *Thelotornis capensis*, and *Thelotornis usambaricus*), the yamakagashi (*Rhabdophis tigrinus*), and the red-backed keelback (*Rhabdophis subminiatus*).^{1,2,4,5,7} The venoms of Colubridae species are primarily hemotoxic and cause adverse local and systemic effects including coagulopathies, hemorrhage, and potentially renal failure.^{1,2,4,7} Antivenom is available for the boomslang and more recently for *Rhabdophis* spp.^{4,7}

The second major family of venomous snakes is the Viperidae, which is comprised of 3 subfamilies: the pit vipers (Crotalinae), the true vipers (Viperinae), and Fea's viper (Azemiopinae).^{1,2,4,5} The Viperids have solenoglyph fangs that are attached to the maxillary bone and are folded at rest.^{1-4,8} The large venom glands are found in the temporal region and are surrounded by a muscular sheath.^{1,2,4} During a strike, the maxillary bone rotates 90°, erecting the fangs, and venom is expelled through the hollow fang, much like a hypodermic needle.^{1,2,4} Pit vipers are distinguished from true vipers by a heat-sensing pit located between the eyes and nares. These pits are extremely sensitive infrared detectors that allow the snake to construct a thermal image of prey for a more accurate strike.^{1,2,4} Pit vipers are located throughout the Americas, Europe, Asia, and Africa and include rattlesnakes (*Crotalus* and *Sistrurus* spp.), copperheads (*Agkistrodon contortrix*), water moccasins (*Agkistrodon piscivorus*), and their relatives, lance-headed pit vipers (*Bothrops* spp.) (fer-de-lance), bushmasters (*Lachesis* spp.), jumping vipers (*Atropoides* spp.), palm vipers

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