

# North American Snake Envenomation



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## KEYWORDS

• Crotalid • Elapid • Rattlesnake • Copperhead • Cottonmouth • Coral snake

## KEY POINTS

- Native North American venomous snakes fall into 3 categories: crotalids, elapids, and colubrids.
- Crotalids include the rattlesnakes, copperheads, and cottonmouths, and their envenomations are characterized primarily by local tissue destruction and hematologic toxicity.
- All native North American members of the elapid family are coral snakes and their envenomation can be characterized by neuromuscular blockade and subsequent muscular weakness.
- Colubrids are generally considered medically inconsequential.
- Treatment of envenomation of all types of snakes includes good supportive care with antivenom administration when indicated.

## INTRODUCTION

It is important to have a general understanding of snake taxonomy to help organize venomous snake species and to some extent predict clinical effects. All life is categorized taxonomically under 7 increasingly specific categories. These categories include, in descending order; kingdom, phylum, class, order, family, genus, and species. In addition to these 7 main groups there are subdivisions and superdivisions between them. With regard to snakes and their medical significance, this further classification is most important as it relates to superfamilies and subfamilies. Snakes fall under the order Ophidia or Serpentes. Most modern snakes fall under the superfamily Colubridae, which includes all venomous snakes of medical significance.<sup>1</sup> Within this superfamily, medically significant North American snakes can be classified into 2 main families and to a lesser clinically significant third family. The 2 main families are Viperidae and Elapidae. The third less significant family from a medical standpoint is the Colubridae family.<sup>2,3</sup>

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Disclosures: The authors have no financial or commercial affiliations to disclose.  
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Emerg Med Clin N Am 35 (2017) 339–354  
<http://dx.doi.org/10.1016/j.emc.2016.12.003>

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A majority of venomous North American snakes belong to the subfamily Crotalinae (often referred to as crotalids), which falls under the Viperidae family. These snakes include the rattlesnakes (genus *Crotalus* and *Sistrurus*) as well as the cottonmouths and copperheads (genus *Agkistrodon*). These snakes are also referred to as pit vipers due to heat-sensing pits behind their nostrils and can be differentiated from nonvenomous native US snakes by their triangular heads and elliptical pupils.<sup>4,5</sup> An exception is the coral snake (discussed later). In addition, this rule does not necessarily hold true outside the United States.<sup>4</sup> Rattlesnakes geographically cover much of the contiguous United States; however, a majority of the bites occur in Southwestern states, such as California, Arizona, New Mexico, and Texas, although there are a significant number reported in Florida as well.<sup>4,6</sup> Copperheads and cottonmouths are found primarily in the Eastern and Southern United States, with a majority of envenomations occurring in the South.<sup>4,6</sup> An average of 4735 native US venomous snakebites are reported every year and approximately half of these are from crotalids (the true fraction is likely higher given several unidentified snakes in this study).<sup>6</sup> A majority of individuals bitten are male and older than 19 years of age but this is not specific for crotalid envenomations and is true across all US native venomous species.<sup>6</sup> Deaths are rare, with an average of 5 to 6 reported a year, and usually occur in children, the elderly, or those with some delay in antivenom treatment.<sup>5</sup> Deaths are almost always from crotalid envenomation and usually from a rattlesnake.<sup>6</sup>

Elapidae snakes are frequently referred to as elapids. Two genera and 3 species of coral snakes make up the North American elapid population: the Arizona or Sonoran coral snake (*Micruroides euryxanthus*), the eastern coral snake (*Micrurus fulvius*), and the Texas coral snake (*Micrurus tener*).<sup>7,8</sup> The eastern coral snake can be found in much of the South whereas the Texas coral snake resides west of the Mississippi river in Louisiana, Arkansas, and Texas. The Arizona coral snake can be found in Arizona and New Mexico.<sup>7</sup> Despite this multistate distribution, 344 of 399 identified coral snake bites from 2001 to 2005 occurred in Florida and Texas.<sup>6</sup> Coral snake bites comprise only approximately 2% of all US venomous snake bites annually, and up until 2006 no deaths had been reported to the American Association of Poison Control Centers since 1983.<sup>6,7</sup> Coral snakes do not have elliptical pupils, triangular heads, or heat-sensing pits like the crotalids but are venomous. US coral snakes can be identified by their circumferential red, yellow, and black banding with red bands abutting yellow bands.<sup>4</sup> This distinction is important to differentiate coral snakes from other similar appearing nonvenomous US snake species with noncircumferential banding (the shovel-nosed snake) or red bands abutting black bands (the king snake). These rules do not necessarily hold true outside the United States.<sup>4</sup>

The oft-ignored Colubridae family of snakes, often referred to as colubrids, are generally not considered poisonous. This is in contrast to being venomous because all snakes produce venom but snakes considered poisonous (such as the crotalids and elapids) are able to puncture human skin and deliver enough venom to produce a clinically significant envenomation. Colubrid snakes are rear-fanged and lack an efficient venom delivery system. If specialized venom glands are present, they do not have significant associated musculature to forcefully expel venom.<sup>1</sup> Clinically significant envenomations from these snakes have been reported, but they are generally mild and of such little clinical significance that this family is not discussed further.<sup>3</sup>

## PATIENT EVALUATION OVERVIEW

### **Crotalid Envenomation**

Crotalid venom is a complex mixture of multiple proteins, other macromolecules, and metals with diverse activity (Box 1).<sup>9</sup> More than 50 components have been identified.<sup>10</sup>

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