

## Snake bites and avoidance

### Advice for travellers on prevention and management of snake bites



### Key Messages

The snakebite risk for most travellers is low and can be minimised by sensible precautions.
If a snake is encountered, advice is to remain calm, remain still, do not threaten the snake and if possible back off slowly.
Overall, 50 percent of bites do not result in envenomation (i.e. actual injection of venom).
If envenomed, death is unlikely with prompt treatment, splint the bitten limb and evacuate to hospital as a chair/stretcher case.
Antivenom is an effective treatment if given in time, however, it may produce a significant allergic reaction so must be used only where medical facilities are capable of managing this.

### Overview

Travellers are visiting ever more exotic destinations and participating more than ever in adventurous pursuits. This may result in increased inadvertent contact with local wildlife including snakes, scorpions, spiders, jellyfish, and stinging fish. Of these, globally, venomous land snakes are the most important medically [1].

Many animals and flora are poisonous when ingested or inhaled so the term venomous is used when referring to snakes as they actively inject their poison (venom).

### Venom

Venom is a very complex substance produced by modified salivary glands and delivered through the bite of a fang which is a modified tooth. Venom contains many proteins, typically proteases, and toxins which simultaneously affect many body systems. Each snake species has a specific mix of venom components though many snakes have a tendency towards one or more of neurotoxic (affecting the nervous system), haemotoxic (affecting blood or vascular system) or myotoxic (damage to muscles) effects.

Neurotoxic venoms produce muscle weakness often first visible as ptosis (drooping eyelids) but progressing to paralysis including paralysis of respiratory muscles.

Haemotoxic venom induces a clotting disorder resulting in bleeding locally from the bite wound and generally at distant sites including internal organs.

Additionally some venoms are necrotic, that is, they produce swelling and tissue damage and tissue death. This is

often seen first at the site of the bite but swelling can be significant and affect the whole limb. Some snakebites are very painful others not.

There are about 3,000 species of snake of which approximately 600 are venomous. Snakes are cold blooded and classified into about 20 families of which the most medically important are described below:

### Elapidae

The 'elapids' have rounded heads which blend into the body with often no distinct neck. Pupils are round and the body is thin with a tapering tail. Fangs are small with fixed position and non retractile. All are venomous, with a usually, but not exclusively, neurotoxic venom. Examples include cobras, mambas, kraits and coral snakes. Sea snakes (Hydrophidae) are now classified as part of the elapid family.

### Viperidae

The vipers have diamond shaped heads distinct from the body which is stocky with rapid tapering of the tail. In rattlesnakes the tail forms into a series of scales and the distinctive rattle. Pupils are elliptical. All are venomous with a usually, but not exclusively, haematotoxic venom. The family is divided into typical vipers – viperinae, and the pit vipers- crotalinae which have a small pit on the face containing an infra-red sensor.

### Colubridae

The majority of remaining snakes, approximately 1900 species. They include the 'back fanged' snakes where fangs are towards the rear of the mouth. Some are venomous such as boomslangs.

### Atractaspidinae

A subfamily of snakes found in Africa and the Middle East. Some are harmful to humans particularly the burrowing asps or stilleto snakes which have fangs that point out through an almost closed mouth to the side and rearwards. This means they can bite sideways and backwards. Venom is necrotoxic.

### Boae and Pythonae

The Boas and Pythons, are large non venomous snakes which wrap their muscular coils around prey and kill by constriction preventing breathing and causing crushing.

### Snake Sensory Perception

A snake has poor hearing but is able to track prey by a number of senses including the ability to detect small vibrations in the ground along its underbelly surface. All snakes 'sample' the air by tasting molecules from the environment to detect prey and its forked tongue gives this a directional aspect. Tongue sampling is also effective in water. It is a myth that all snakes have poor vision. This may be so for subsurface dwelling snakes which may only have light/dark perception but some surface snakes have good eyesight especially for motion sensing and some snakes even have binocular vision. Additionally the pit vipers, pythons and some boas have infrared receptors in pits either side of the front of the head and can thus track heat from warm blooded creatures.

## Risk to the traveller

Snakes are found in all environments except for a few islands, the Antarctic and permanently frozen areas of the Arctic. They live in desert, rainforest, swamps, grasslands, water, temperate climates and even up to 4,800m in the Asian Himalaya [2]. Snakebite risk is highest where human and snake habitat or activities overlap and predominantly affects the rural working poor such as farmers and hunters and their children. An example would be a barefoot rural farmer tending rice in a paddy field. Risk is particularly high at times of flooding as land snakes share a smaller amount of land with humans [3]. As snakes are cold blooded and thus unable to generate heat internally they tend to seek out warm environments which may attract them into the human home especially if this is also a source of food such as rodents.

Worldwide, snakes cause considerable mortality and morbidity but as there are no international mandatory reporting schemes and healthcare infrastructure varies between countries, the actual numbers affected are not known. Estimates vary widely from 1.2 to 5.5 million bites per year, and 20 thousand to 125 thousand deaths yearly, predominantly in South Asia, Southeast Asia and Sub-Saharan Africa [4].

Travellers are much less likely to come into contact with snakes but may do so if staying in basic accommodation where food stuffs are stored and attract rodents, or by undertaking activities in snake areas such as trekking or swimming. Data on snakebite incidence in travellers is not readily available but actual deaths after bites are rare due to the ability of relatively wealthy travellers to access prompt modern health care.

## Before travel

If undertaking activities which might result in snake encounters, travellers should research the species of snakes in the destination environment and their main characteristics. They should also ascertain availability of and transit time to local healthcare facilities with antivenom appropriate to the local species. The World Health Organisation Blood Products Website lists [medically important snakes by geographical region and sources of antivenom](#) [5].

Travel insurance should cover planned activities. Appropriate clothing and footwear such as boots should be packed (see below).

## During travel

Snakes are often hidden or camouflaged so although present, may largely be unnoticed by the unfamiliar traveller. Using a local guide may improve detection and avoidance of snakes.

Humans are not prey and snakes tend to detect them by the mechanisms above and will mostly move out of the way if possible. If one is cornered however or inadvertently trodden on or rolled on in sleep it may bite defensively. Some snakes such as mambas (Africa) or fer-de-lance (Central America) have reputations for being more aggressive and prone to attack.

If a snake is encountered, the advice is to remain calm, remain still, do not threaten the snake and if possible back off slowly. 90 percent of bites are on the limbs particularly the legs down at ankle/lower leg level. The following advice may be helpful for travellers:

## Avoiding Snakebite

### Do:

- Be aware of the presence and behaviour of snakes in the destination area
- Be cautious especially around rivers, streams and lakes
- Avoid snake charmers- the snake isn't always under control
- Wear stout footwear such as walking boots when trekking in brush, rainforests grassland or through sand (some snakes bury themselves with just their heads above sand level awaiting prey and may easily be trodden on)
- Probe the base of bushes and trees with a stick before sitting down
- Shake out boots before putting them on to ensure no creatures like snakes/scorpions have taken up residence
- Similarly shake out sleeping bags and clothes before using
- Use a torch at night. Snakes tend to hunt at night or may be more numerous above ground after rain
- Ensure trails to latrines in forests are well marked and clear underfoot
- Sleep off the ground in forest areas and huts. Rolling onto a snake whilst sleeping is a common cause of envenomation where sleepers sleep on the ground Sleep under a mosquito net tucked-in under the mattress
- Areas under hammocks should be cleared to bare earth to avoid stepping onto foliage and anything hidden within it
- Hang rucksacks off the ground and buckle up tightly to deter snakes entering
- Take care with wood piles which may harbour snakes and scorpions, wear gardening gloves when collecting wood
- Take care near water courses which may attract snakes
- When walking in snake territory, step up onto logs, look over then step over (avoid blindly stepping over)
- Ensure hand placements are visible when rock climbing as snakes may be basking on rock ledges
- Store rubbish away from habitation areas as it will attract rodents and thus snake predators

### Don't:

- Walk barefoot or in sandals in snake areas including soft sand
- Put hands in holes or cracks or poke holes with sticks as this may disturb snake residents
- Put hands blindly down into rucksacks, rather, empty out contents and visually inspect
- Climb trees as these may hide snakes especially if camouflaged
- Shake trees as this may dislodge animals in the foliage
- Swim in water covered with leaf litter and organic matter which might be hiding snakes
- Disturb or interfere with any snake encountered and definitely do not try to pick it up
- If a snake is killed then do not handle it as the bite reflex remains viable for some time after death and envenoming can still occur

## If Bitten

Remain Calm! About 50 percent of snakebites overall do not contain any venom and if the wound is envenomed then immediate death is very unlikely usually taking 12- 48 hours. Prompt treatment is very effective.

**Do:**

- Move the casualty away from the snake.
  - Reassure the casualty of the above.
  - But treat any bite as an envenomed bite until proven otherwise.
  - Lay the casualty down. They need to remain calm and minimise movement.
  - Remove rings and wristbands from the affected limb in case of swelling.
  - Apply a dry dressing to the wound and (see reference for technique [6])
    - either a local pressure pad
    - or whole limb compression bandage if available and sufficient knowledge on technique (see important note below). This slows distribution of the venom. The compression bandage needs to be about as tight as for a sprained ankle but starts from toes or fingertips and extends all the way up the limb to the groin/armpit. Toetips and fingertips are left free to observe nailbed colour to ensure circulation remains intact. (Watch for limb swelling cutting off circulation)
- Note: There is some disagreement regarding use of compression bandaging. It is predominantly used in Australia where snakes are elapids (neurotoxic) but not used in USA where snakes are predominantly viperidae (haemotoxic) [7]. Unless the species is known with certainty (unlikely) then compression bandaging is recommended [8].
- Splint the limb so that it cannot be moved
  - Evacuate the casualty to hospital. The casualty must move their muscles as little as possible as this promotes venom distribution so they must not walk. A stretcher is ideal.

**Don't:**

- Don't try to capture or kill the snake as this may result in further bites
- Don't interfere with the bite wound in any way.
- Don't wash the wound in Australia where swabs of the venom are used for identifying the snake and antivenom required.
- Do NOT use a tourniquet!
- Don't use suction devices on the wound/electric shocks/ wound cutting/snake stones or other 'traditional' remedies.
- Don't give aspirin or other anti-inflammatory type painkillers (NSAID) as these can worsen bleeding
- Don't use antivenom unless there are facilities and expertise to manage the likely anaphylactic shock (severe allergic reaction).

**Spitting Cobras**

Can project a jet of venom about 1m, usually aimed to the eyes. This produces a painful conjunctivitis with spasm of the eyelids and intense eye watering. Treatment should initially be irrigation with plenty of clean water and evacuation to hospital.

**Resources**

- [Snake bite infographic](#)

- [Who Guidelines for Management of Snakebite in South and SouthEast Asia](#)
- [WHO Guidelines for Clinical Management Snakebite in Africa](#)
- [Australian Venom Research Unit Compression Bandaging Technique](#)

## REFERENCES

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