

20 VENOMOUS AND POISONOUS ANIMALS

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ATTACKS BY LARGE ANIMALS

Large animals, wild and domestic, should be treated with respect; they may not be as tame as they appear. Lions, leopards, hyenas, domestic dogs, jackals, wolves, elephants, rhinos, hippopotamuses, buffaloes, domestic cattle, domestic and wild pigs, ostriches and even rams have been responsible for occasional human deaths. In recent months, two campers in Kenya have been seized by the head and severely mauled by hyenas while sleeping in the open. Sharks kill about 50 people each year. Crocodiles (Figure 20.1) claim many human lives but in Africa hippopotamuses are thought to kill even more people. Recently in Kenya a man swimming to retrieve a duck he had shot was killed by a hippopotamus. It is extremely foolhardy for



Figure 20.1 *The Nile crocodile Crocodylus niloticus – a threat to human lives*
(D. A. Warrell)

travellers to bathe in rivers regarded as dangerous by the local inhabitants. A Peace Corps worker in Ethiopia did this in 1967 and was promptly killed and eaten by the resident crocodile. More recently, two British girls were killed by crocodiles in Tanzania and Kenya.

VENOMOUS ANIMALS

Travellers in tropical countries usually have an exaggerated fear of snakes, scorpions and other venomous animals. Most parts of the world, especially the tropical regions, harbour animals with potentially lethal venoms, but local farmers and children, rather than travellers, suffer. Thus snake bite is a major cause of death among some tribes of the Ecuadorian, Venezuelan and Brazilian jungles, and among the inhabitants of some parts of India, Burma, Nigeria and Sri Lanka; and many children die of scorpion stings in parts of Mexico and north Africa. Yet the author knows of no recent case of a European traveller being killed by a venomous bite or sting.

Before travelling to a tropical country it is worth finding out about local venomous species and trying to discover if there is a national centre for antivenom production, supply and treatment. The use of antivenom (also called antivenin, antivenene or anti-snake-bite serum) requires medical training. If an expedition is going to an extremely remote and snake-infested area it might be wise to collect some antivenom from the regional centre and to ensure that there is someone in the party who has been trained to use it safely. Otherwise, rely on local medical services but enquire about them in advance. Before buying antivenoms manufactured in Europe, seek expert advice about their effectiveness against the venoms of the species that are important causes of bites or stings in the area of your expedition.

Snake bite

Prevention

Snakes never attack humans without provocation and so the risk of snake bite can be reduced as follows. Avoid snakes and snake charmers. Do not disturb, corner or attack snakes and never handle them, even if they are said to be harmless or appear to be dead. Even a severed head can bite. If you corner a snake by mistake, keep absolutely still until it has slithered away (this demands enormous *sang froid*), because snakes strike only at moving objects. Never walk in undergrowth or deep sand without boots, socks and long trousers; and at night always carry a light. Never collect firewood or dislodge logs and boulders with your bare hands and never put your hand or push sticks into burrows or holes. Avoid climbing trees or rocks that are covered with dense foliage, and do not put your hands on sunbaked ledges you cannot see when climbing. Never swim in rivers matted with vegetation or in muddy estuaries where there are likely to be sea snakes. If you have to sleep on the ground, use a tent with sewn-in ground sheet, or tuck the mosquito net under your sleeping bag.

Otherwise use a hammock or raised camp bed. The danger is rolling over in your sleep and trapping a snake that has been attracted to the campsite by its natural prey, such as a small rodent.

Treatment of snake bite

First aid treatment of snake bite should be applied by the victim or other people who are on the spot.

TABLE 20.1 TREATMENT OF SNAKE BITE

1. Reassure the bitten patient
2. Cover the bite with a clean dressing but do not interfere with it in any way
3. Immobilise the bitten limb and encourage the patient to remain as still as possible
4. Treat pain with paracetamol or codeine tablets (not aspirin!)
5. Transport patient immediately to hospital but minimise the amount of movement
6. DO NOT attempt to catch or kill the snake
7. Avoid all traditional and “quack” remedies

First, reassure the patient, who may be terrified by the thought of sudden death. The grounds for reassurance are that only a small minority of snake species are dangerously venomous to humans and even the most notorious species, such as cobras, often bite without injecting enough venom to be harmful. The risk and rapidity of death from snake bite has been greatly exaggerated. Lethal doses of venom usually take hours (cobras, mambas, sea snakes and so on) or days (vipers, rattlesnakes and other pit vipers, and so on) to kill a human, not seconds or minutes as is commonly believed. *Correct treatment is very effective.*

Second, cover the site of the bite with a clean dressing.

Third, immobilise the bitten limb with a splint or sling and arrange immediate transport to a hospital, a dispensary or to the expedition medical officer. The patient must keep as still as possible and avoid exercising any part of the body, especially the bitten limb.

Do not attempt to catch or kill the snake, but if it has been killed already take it with you; it is useful clinical evidence. *However, it must not be handled with bare hands even if it appears to be dead.*

Avoid traditional remedies (incisions, suction, tourniquets, electric shock, snake stone and so on) which do more harm than good. For example:

- Do not apply a tourniquet (ligature or tight band). However, if the snake is one whose venom contains a dangerous neurotoxin (for example, cobra, krait, mamba, sea snake, Australian tiger snake, taipan, etc.) use the pressure-immobilisation (P-I) method. Bind the whole of the bitten limb as tightly as you would a sprained ankle, starting around the fingers or toes, using a long stretchy crepe bandage (10cm wide, 4.5m long) and incorporating a splint (Figure 20.2). This method should not be used after bites by snakes whose venoms cause a lot of local swelling and gangrene (for example, most vipers and some cobras).



Figure 20.2 *Compression/immobilisation method for the treatment of snake bite on the leg or arm (Courtesy of Australian Venom Research Unit, University of Melbourne)*

- Do not suck at the wound with your mouth or a vacuum extractor apparatus, cut it with a razor blade, introduce potassium permanganate crystals, apply ice or electric shocks, or interfere in any other way.
- Do not give aspirin, which may cause bleeding.
- Do not give antivenom which can be dangerous and should be administered only by a doctor, nurse or dispenser who has emergency drugs (adrenaline/epinephrine, antihistamine and corticosteroid) to deal with antivenom reactions should they occur. If you have your own supply of antivenom take it with you to hospital where the doctor or other trained staff can administer it.

Advice for the expedition medical officer

Absence of local swelling 4 hours after a bite by a viper, rattlesnake or other pit viper suggests that no venom was injected and that no further treatment is necessary. However, bites by some snakes with neurotoxic venoms (mambas, kraits, cobras and so on) may not cause any local swelling, but may lead to serious systemic effects.

Indications for antivenom treatment

1. Bleeding from gums, nose, gastrointestinal tract or any other site distant from the bite itself, which started spontaneously after the bite, and persistent bleeding from wounds (such as venepuncture sites).
2. Failure of the patient's blood to clot if placed in a new, clean, dry, glass tube and left undisturbed for 20 minutes.
3. Signs of nervous system involvement such as drooping eyelids, difficulty in swallowing and breathing, pain, stiffness and paralysis of skeletal muscles, and extreme drowsiness or unconsciousness.
4. Passage of dark red, brown or black urine (haemoglobinuria or myoglobinuria).
5. Signs of heart involvement such as low or falling blood pressure, unusually slow pulse rate or irregular rhythm.
6. Swelling of more than half the bitten limb, swelling after bites on the fingers and toes, or swelling after bites by snakes whose venom is known to cause gangrene (for example, most vipers and rattlesnakes, some cobras).

Note: antivenom should never be given unless at least one of these six signs is definitely present.

Slight local swelling alone is not an indication for antivenom. Never give antivenom unless you have adrenaline (epinephrine) available to treat severe reactions to the antivenom. The adult dose of adrenaline is 0.5ml of a 1 in 1,000 solution (1mg/ml) given intramuscularly.

Choice of appropriate antivenom

Before giving antivenom make sure that its range of specificity includes the snake that has bitten your patient. Some knowledge of Latin scientific names is useful, for example: *Naja*, cobra; *Dendroaspis*, mamba; *Bungarus*, krait; *Micrurus*, coral snake; *Bitis*, African puff adder and relatives; *Echis*, saw-scaled or carpet viper; *Bothrops*, fer de lance; *Trimeresurus*, green pit vipers; *Crotalus*, rattlesnake. It may have been possible to identify the biting snake or its venom may have produced a diagnostic clinical sign, such as incoagulable blood caused by the saw-scaled viper in the northern third of Africa. Otherwise, a polyspecific antivenom with activity against the principal venomous species of the region is used.

Caution: do not give antivenom that is opaque. The change from a clear to cloudy solution indicates loss of activity and increased danger of reactions. Expiry dates can be ignored provided that the solution is crystal clear. Manufacturers' instructions included in packs of antivenom may be misleading.

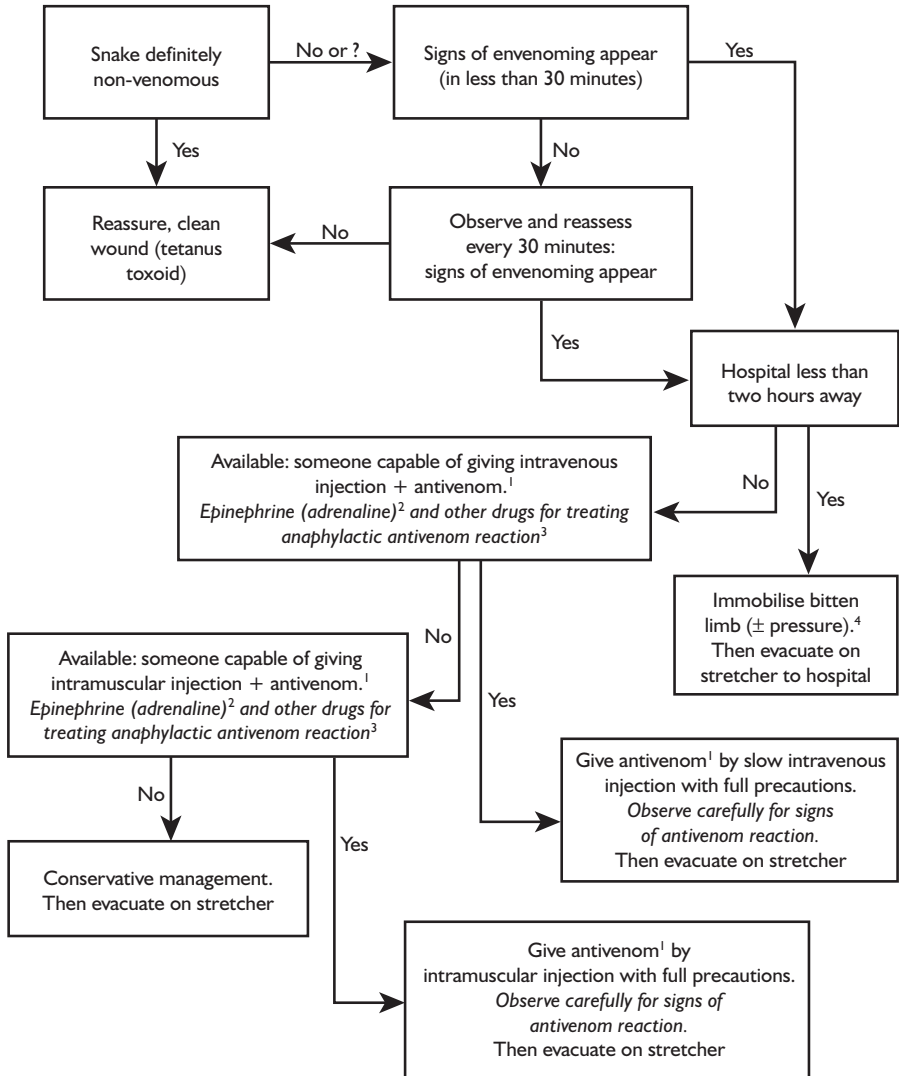
How to give antivenom

For maximum effect, antivenom should be given directly into a vein, by slow intravenous injection (2ml per minute) or slow intravenous infusion of antivenom diluted approximately 50:50 in sterile isotonic saline. The initial dose depends on the type of antivenom, species of snake involved and severity of symptoms, but a typical starting dose is four to five 10ml ampoules. This is repeated after a few hours if a life-threatening condition such as bleeding or weakness of the breathing muscles is not cured, or if the blood is again incoagulable after 6 hours. The patient should be watched for signs of an antivenom reaction, namely fever, itching, rash, vomiting, breathlessness and wheezing, increase in pulse rate and fall in blood pressure. If this happens, give a 0.5ml injection of 1 in 1,000 adrenaline solution intramuscularly; this can be repeated after 10 minutes if it is not effective. Reactions are likely to be severe in those who suffer from asthma, eczema and other allergic disorders.

Only in an extreme emergency should medically unqualified people give antivenom; for example, when the victim is many hours away from medical care, has signs of severe envenoming (see above) and seems to be getting worse. Deep intramuscular injections at multiple sites into the front and side of the thighs (not the buttocks) can then be used. The sites should be massaged to increase absorption of antivenom and firm pressure then applied to injection sites to prevent bleeding (Figure 20.3).

Treatment of complications

1. Massive external bleeding or leakage of blood and tissue fluid into a swollen limb may leave the patient with an inadequate circulating volume so that the



Notes:

- 1 "antivenom" means appropriate specific antivenom for the species of snake involved
- 2 "epinephrine (adrenaline)" means 0.1% (1:1000) adrenaline for intramuscular injection (adult dose 0.3–0.5ml)
- 3 "other drugs for treating anaphylactic antivenom reaction" means antihistamine and hydrocortisone for intravenous injection
- 4 "immobilise bitten limb (±pressure)" means immobilisation of the bitten limb with a splint or sling. "Pressure" means use of the pressure immobilisation method (Figure 20.2) using a long crepe bandage. This should only be used in the case of neurotoxic elapid snakes, *not* for viper bites

Figure 20.3 Management of snake bite in remote locations

blood pressure falls. Transfusion with blood products or plasma expanders may be needed.

2. Respiratory paralysis may require mouth-to-mouth or more sophisticated forms of artificial ventilation. Neurotoxic envenoming by some species (such as cobras and Australasian death adders) responds dramatically to anticholinesterase drugs such as edrophonium, neostigmine or physostigmine. The test dose is 10mg edrophonium (Tensilon) by slow intravenous injection after 0.6mg atropine (*adult doses*). If there is an improvement in muscle power within the next 20 minutes, continue treatment with subcutaneous neostigmine.
3. Secondary infection may be introduced by the snake's fangs or local surgery at the bite site. Patients with infected wounds and those with local gangrene should be treated with antibiotics and a tetanus toxoid booster. Gangrenous tissue should be excised surgically and the skin defect covered immediately with split skin grafts.

Note on spitting cobras

In Africa and parts of south-east Asia there are populations of cobras that can spray their venom forward from the fang tips for a distance of more than a metre towards the glint of the eyes of an aggressor. This is a defensive reaction. Venom entering the eyes or landing on other mucous membranes causes severe local pain and watering and can result in ulceration of the cornea. Treatment is the same as for any chemical injury to the eye. The eye should be irrigated with generous volumes of any bland fluid available (water, milk or even urine). Pain-killing drugs such as paracetamol can be given by mouth and 1% adrenaline eye drops are said to relieve pain dramatically. Ideally, the eye should be examined by a doctor for evidence of corneal abrasion. If in doubt, antibiotics such as chloramphenicol or tetracycline eye ointment should be applied for several days.

VENOMOUS MARINE ANIMALS

Sea snakes

These are encountered mainly by fishermen in the tropical waters of the Indo-Pacific region. The principal symptoms of envenoming are drooping eyelids, lockjaw, pains, stiffness, tenderness and paralysis of skeletal muscles, passing of dark (Coca-Cola-coloured) urine (myoglobinuria) and cardiac complications related to hyperkalaemia. Treatment is as described above.

Venomous fish

Many species of marine and freshwater fish have venomous spines on their gills, fins or tail. Stings occur when the fish are handled by fishermen or are trodden on or

touched by bathers. Some species attack swimmers and scuba divers around coral reefs. There is immediate excruciating pain and swelling at the site of the sting. Severe systemic effects may follow. These include vomiting, diarrhoea, sweating, irregular heart beat, fall in blood pressure, spasm or paralysis of muscles including respiratory muscles, and fits.

Treatment

Forewarned is forearmed. If your expedition has an extensive programme, say on coral reefs, try to get maximum information about dangerous species locally. The venomous spine of stingrays, which is often barbed, should be removed. Local symptoms are rapidly relieved by immersing the stung limb in hot but not scalding water. Test the temperature with your elbow. If you have a thermometer, the temperature should not exceed 45°C. Alternatively, 1% lignocaine (lidocaine) or some other local anaesthetic can be injected, for example, as a ring block in the case of stung digits. Specific antivenom for some of the most dangerous species (such as stone fish, genus *Synanceja*) is available in some parts of the world. Patients may require mouth-to-mouth respiration and external cardiac massage. Atropine (0.6mg by subcutaneous injection for adults) should be given if there is a very slow pulse rate and low blood pressure.

Stingrays

The stingray attacks only when frightened and usually only when trodden upon. If it is known that there are stingrays about, it is wise to shuffle your feet or prod the ocean floor with a stick to make your presence known. Spines may be large enough to cause serious mechanical injury and are often left embedded in the wound together with the covering membrane. These foreign bodies are bound to cause infection if they are not removed. The stingray produces a heat-labile venom so immersion of the stung part in hot but not scolding water (not more than 45°C) will destroy the toxin and relieve the pain. (*Warning: there are stingrays in muddy tributaries of the Amazon. They sting people who step on them while fording rivers, usually in the dry season.*)

Jellyfish, Portuguese man o'war and other cnidarians (coelenterates)

Contact with the tentacles produces lines of very painful blisters. The venom of some species, such as the notorious box jellyfish (*Chironex*, *Chiropsalmus*) of tropical waters, can cause severe systemic effects, including cardiorespiratory arrest.

Treatment

Adherent fragments of tentacles must be removed (but *not* with your fingers) before more of their venomous nematocysts can discharge. Vinegar or dilute acetic acid effectively inactivates the nematocyst of box jellyfish, but many of the remedies that

have been recommended in the past, such as methylated spirits, other alcohols and sunburn lotions, will stimulate massive discharge of nematocysts embedded in the patient. Antivenom is available in some of the worst-affected areas such as northern Australia. Severe cases may require mouth-to-mouth respiration and cardiac massage.

Sea urchins

The venomous spines and grapples of some sea urchins may become deeply embedded in the skin, usually of the sole of the foot when the animal has been trodden upon. Soften the skin with salicylic acid ointment and then pare down the epidermis to a depth at which the spines can be removed with forceps. Ordinary sea urchin prickles are absorbed quite rapidly provided they are broken into small pieces in the skin. Only if they have penetrated into a joint or if there is evidence of infection is surgical removal necessary.

Molluscs: octopuses and cone shells

Several species of small blue-ringed octopuses of the Indo-Australasian region can cause fatal envenoming by biting. There are many species of beautiful cone shells in tropical waters. These sting by harpooning and implanting a venom-charged arrowhead. Beware of handling these attractive animals. Deaths have occurred but no antivenoms are available.

Poisoning from ingestion of fish and shellfish

Extensive feelings of pins and needles, paralysis, itching, diarrhoea, vomiting and shock can follow a few minutes or hours after eating various molluscs and fish. A large number of species in many parts of the world can cause these symptoms at various seasons of the year. Famous examples are pufferfish, red snapper, barracuda, tuna and mackerel. Treatment attempts to eliminate the toxic materials from the gut by promoting vomiting and diarrhoea with emetics and purges. Symptoms of “scrombroid” (e.g. tuna) poisoning respond to antihistamine drugs and bronchodilators, but, in severe cases of paralytic poisoning, assisted ventilation will be required until paralysis of the breathing muscles has worn off. Prevent these poisonings by taking local advice. “Red tides” may warn of shellfish poisoning. Avoid eating very large reef fish (ciguatera poisoning), any parts of the fish other than the flesh (muscle) and some notorious species (such as Moray eels – ciguatera poisoning – and puffer fish – tetrodotoxic poisoning).

VENOMOUS ARTHROPODS

Stings by bees, wasps and hornets (*Hymenoptera*)

In normal people many stings, probably hundreds, would be required to introduce

enough venom to kill. A man in Zimbabwe survived more than 2,000 stings. But a small number of people have acquired hypersensitivity and could be killed by a single sting. Systemic symptoms suggest hypersensitivity: generalised tingling with rashes (urticaria, weals, nettle rash or hives), swelling of the lips, tongue and throat, flushing, dizziness, collapse, wheezing, loss of control of bowels and bladder, and unconsciousness within minutes of the sting.

Prevention and treatment

It is possible to confirm hypersensitivity by blood or skin tests and to desensitise the patient using purified venom, but this takes time. People who know or suspect that they are hypersensitive should be taught how to give themselves a subcutaneous injection of 0.3ml or 0.5ml of 1 in 1,000 or 0.1% adrenaline (adult dose) and should carry this with them on the expedition (EpiPen, Anapen or Min-I-Jet self-injectable adrenaline kits with a ¼-inch long 25-gauge needle). They should wear a MedicAlert tag in case they are found unconscious (MedicAlert Foundation International, 12 Bridge Wharf, 156 Caledonian Road, London N1 9UU, tel. +44 20 7833 3034).

In tropical countries, especially Africa and Mexico, Central and South America, rock climbers and other travellers have occasionally been attacked by large swarms of angry bees, and some fatal falls have resulted. Some of these accidents could have been prevented if local advice had been sought. Thundery weather is known to upset bees. In the face of an attack, the best-tryed methods of evasion seem to be to run very fast or to immerse yourself in water. The climber should appreciate that a fall is probably the greatest danger. After securing him- or herself he or she will have to rely on protection afforded by anorak, rucksack or tent. In South America about 100 people die each year after being attacked by furious swarms of Africanised honey bees. The principal effects of multiple stings in the non-hypersensitive subject are haemolysis, rhabdomyolysis (breakdown of skeletal muscle), bronchospasm, pneumonitis and kidney failure. No antivenom is readily available.

Stings by ants, beetles, moths and caterpillars

These insects, in particular the brightly coloured, hairy caterpillars, can cause severe problems: local pain, inflammation, nettle rash, blistering and arthritis on contact and, in Venezuela and Brazil, systemic bleeding and incoagulable blood.

Spider bites

Dangerous spiders occur mainly in the Americas, southern Africa, the Mediterranean region and Australia. The most notorious genera are *Latrodectus* (black/brown widow spiders), *Phoneutria* (Latin American armed or banana spiders, Figure 20.4), *Atrax* (Sydney funnel web spider) and *Loxosceles* (brown recluse spiders). Venoms of *Latrodectus*, *Phoneutria* and *Atrax* affect the nerves, muscles and heart, producing cramping pains, muscle spasms, weakness, sweating, salivation, gooseflesh, fever,



Figure 20.4 *Brazilian “armed” spider Phoneutria nigriventer in threatening posture* (D. A. Warrell)

nausea, vomiting, alterations in pulse rate and blood pressure, and convulsions. *Loxosceles* bites cause severe local necrosis, a generalised red rash, fever, dark urine (haemoglobinuria), blood clotting disturbances and kidney failure. Deaths are unusual except among children. Bites usually occur when the victim brushes against a spider that has crept into clothes or bedding. Antivenoms are manufactured in countries such as South Africa, Australia and Brazil, where spider bite is an important medical problem.

Scorpion stings

Dangerous scorpions (Figure 20.5) occur particularly in north and south Africa, the Middle East, the United States, Mexico, South America and India. The fatal cases are usually children. Most stings are not life threatening but cause excruciating local pain with little swelling. Symptoms reflect initial release of acetylcholine neurotransmitter (causing vomiting, abdominal pain, bradycardia, sweating, salivation and so on) followed by release of catecholamines (causing hypertension, tachycardia, pulmonary oedema, ECG abnormalities). The severe local pain is treated by injecting local anaesthetic at the site of the sting, e.g. 1–2% lignocaine (lidocaine), but a powerful analgesic such as tramadol injections may be required. Severe systemic symptoms should be treated with appropriate pharmacological agents (such as vasodilator drugs) and antivenom. Atropine, beta-blockers and digoxin are not generally recommended.

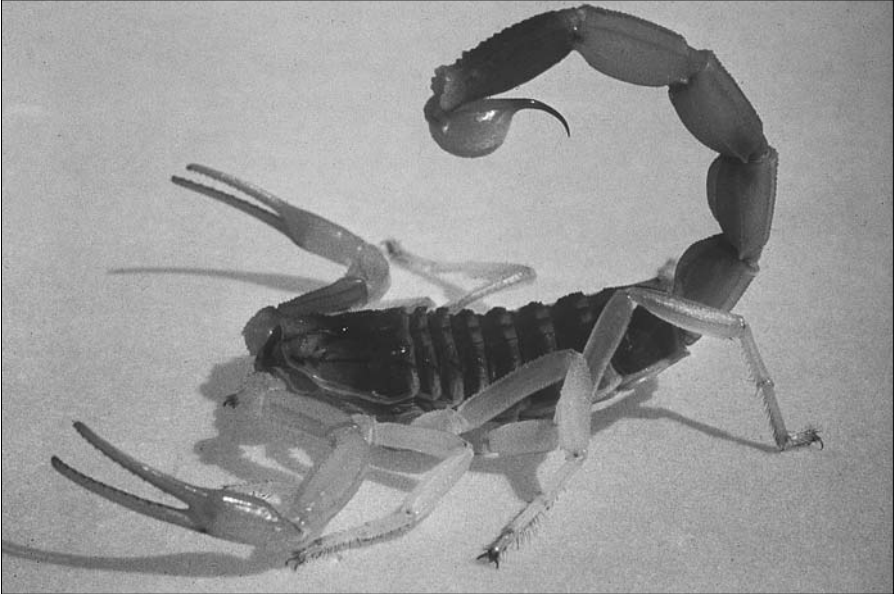


Figure 20.5 *Dangerous scorpion* *Leiurus quinquestriatus* of north Africa and the Middle East

Prevention is better than cure

When establishing a base camp in a scorpion-infested area, first dig out the scorpions. Their oval-shaped entry holes are usually easily recognisable. A thin twig should be used to guide the digging as the tunnel often changes direction. Always suspect there may be a scorpion under cases, logs and so on. *Always* shake your boots and shoes out before putting them on. *Always* look where you put your bare feet. The RGS Kora 1983 expedition dug out 180 scorpions in the base campsite. The exoskeleton of scorpions fluoresces in ultraviolet light, so use a UV lamp to search your chosen campsite.

OTHER VENOMOUS INVERTEBRATES

Bites by some tropical centipedes can be dangerous as well as painful (e.g. in the Seychelles), and some millipedes can squirt irritating defensive secretions. There is no specific treatment for either of these menaces. Many species of ticks can inject a paralysing toxin while they suck your blood. If a member of your party becomes progressively weak, it is important to search for the tick in hairy areas or inside the ears and to detach it as soon as possible. The symptoms should then subside.

Invasive arthropods

Various tropical arthropods have larvae which invade human tissue or are merely blood sucking.

Congo floor maggot (*Auchmeronyia luteola*)

The larvae live in the floors of huts. They attack humans who sleep on the ground and suck their blood, causing local swelling and itching. Fumigate the hut and treat the bites symptomatically, making sure that no secondary infection is introduced (wipe the skin with tincture of iodine, give systemic antimicrobials if there are signs of infection).

Tumbu fly, putsi fly, ver du cayor (*Cordylobia anthropophaga*)

This fly is common in sub-Saharan Africa. It lays its eggs on damp clothes laid out to dry and, if they are not ironed, the eggs will hatch and burrow into your skin. Do not spread your clothing on the ground to dry. A small boil develops with something moving in the middle; this is the posterior segment with the respiratory spiracles. There is a sensation of movement in these lesions.

Treatment

Cover with paraffin (Vaseline) and grasp the maggot, which will stick out its “head” to get air, or do a proper surgical excision.

Ver macaque, human botfly, Berne, El Torsalo, beefworm (*Dermatobia hominis*)

This fly is widely distributed in Central and South America from Mexico to Argentina and Chile. It lays its eggs on other insects. They hitchhike to the human skin and penetrate quickly. To begin with the maggot is bottle shaped and, although paraffin may cause the creature breathing difficulties, in the early stages you are likely to pull off the “neck” (actually the posterior segment with the spiracles) if you attempt to extract it. Wait until it is further developed, and you may succeed as with the tumbu fly. Otherwise make a cross incision to pull the maggot out, taking care not to cut it. An alternative is to cover the lesion with candle wax. The maggot will burrow its way into the candle wax, and you have got it.

Creeping eruptions (larva migrans)

The track made under the skin is caused by the larvae of animal nematodes, such as *Ancylostoma braziliense*, *Uncinaria stenocephala* and *Ancylostoma caninum*, the hookworms of cats and dogs. The larva moves day by day. The best treatment is thiabendazole applied topically in paraffin ointment.

Jigger fleas (*Tunga penetrans*)

After fertilisation the female of this little flea jumps (feebly) and burrows alongside the nailfold or into the skin of the groin, loses her legs and produces eggs each night. These must be curetted out and iodine applied. Jiggers and other unpleasant creatures can be avoided if you do not walk around barefoot.

Source of antivenom in the UK

Aventis Pasteur MSD Ltd

Tel. +44 1628 785291

Fax: +44 1628 411412

Website: www.aventis-pasteur-msd.com

Advice on venomous bites and stings

National Poisons Centre

Tel. +44 870 600 6266

Website: www.doh.gov.uk/npis.htm

Centre for Tropical Medicine, University of Oxford

Tel. +44 1865 220968

Fax: +44 1865 220984