



Venomous bites and stings (snakes and arthropods)

David A. Warrell
University of Oxford
RCPath 6th April 2017 (40 minutes)



Patients with venomous bites and stings in UK: different scenarios

Bitten/stung by:

- An indigenous wild animal (e.g. adder, wasp, bee)
- An exotic animal kept in captivity (zoos, research institutes, private homes)
- An exotic animal abroad (in a returning traveller or someone calling from overseas for advice)
- An intentionally- or inadvertently- imported animal (e.g. “banana spider”)
- An animal or injected with venom as an act of self-harm (“Cleopatra syndrome”) or homicide (“Speckled band syndrome”)

Venomous bites and stings in UK: role of pathologists

- Laboratory assessment of systemic envenoming (e.g. blood biochemistry, haematological picture, blood coagulation, RAST, plasma mast cell tryptase....)
- Identification of venomous animal responsible (morphology, immunodiagnosis)
- Culture of bacteria from secondarily-infected wound
- Forensic investigation of victim (autopsy, immunodiagnosis)
- Directing inexperienced clinicians to seek help (Toxbase's panel of consultants)



“A walk by the seaside”

39-year-old housewife

- While walking back from the sea, took one step off the path onto grass verge
- Felt sting on L foot
- Immediately felt dizzy, nauseated, dry mouth
- “I had to lie down; my throat was closing up; I couldn’t swallow or breathe”

39F

- +5 min: lost consciousness
- Husband rushed away to call ambulance
- Returned to find two strangers performing CPR
- His wife was looking very pale, vomiting, doubly incontinent
- Two cardio-respiratory arrests
- +30 min: ambulance arrived
- R_x adrenaline IM x 2, O₂ assisted ventilation via mask

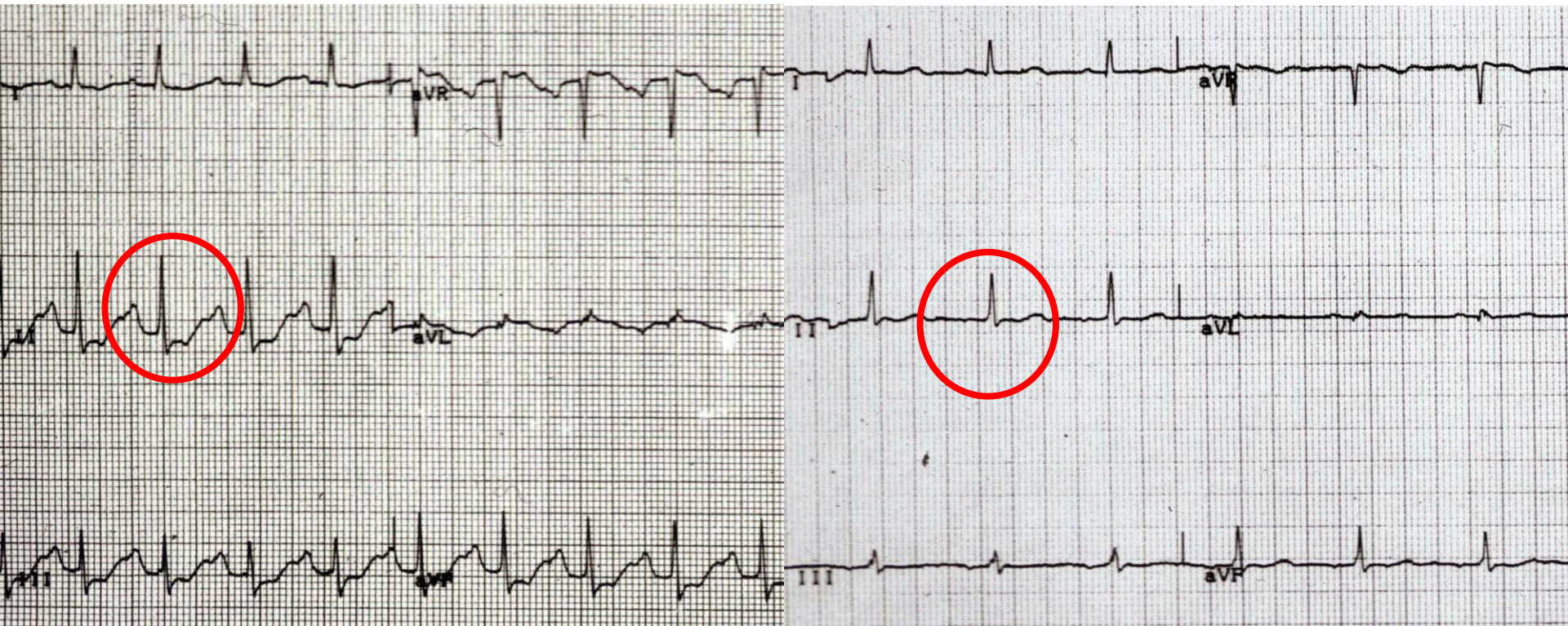
39F

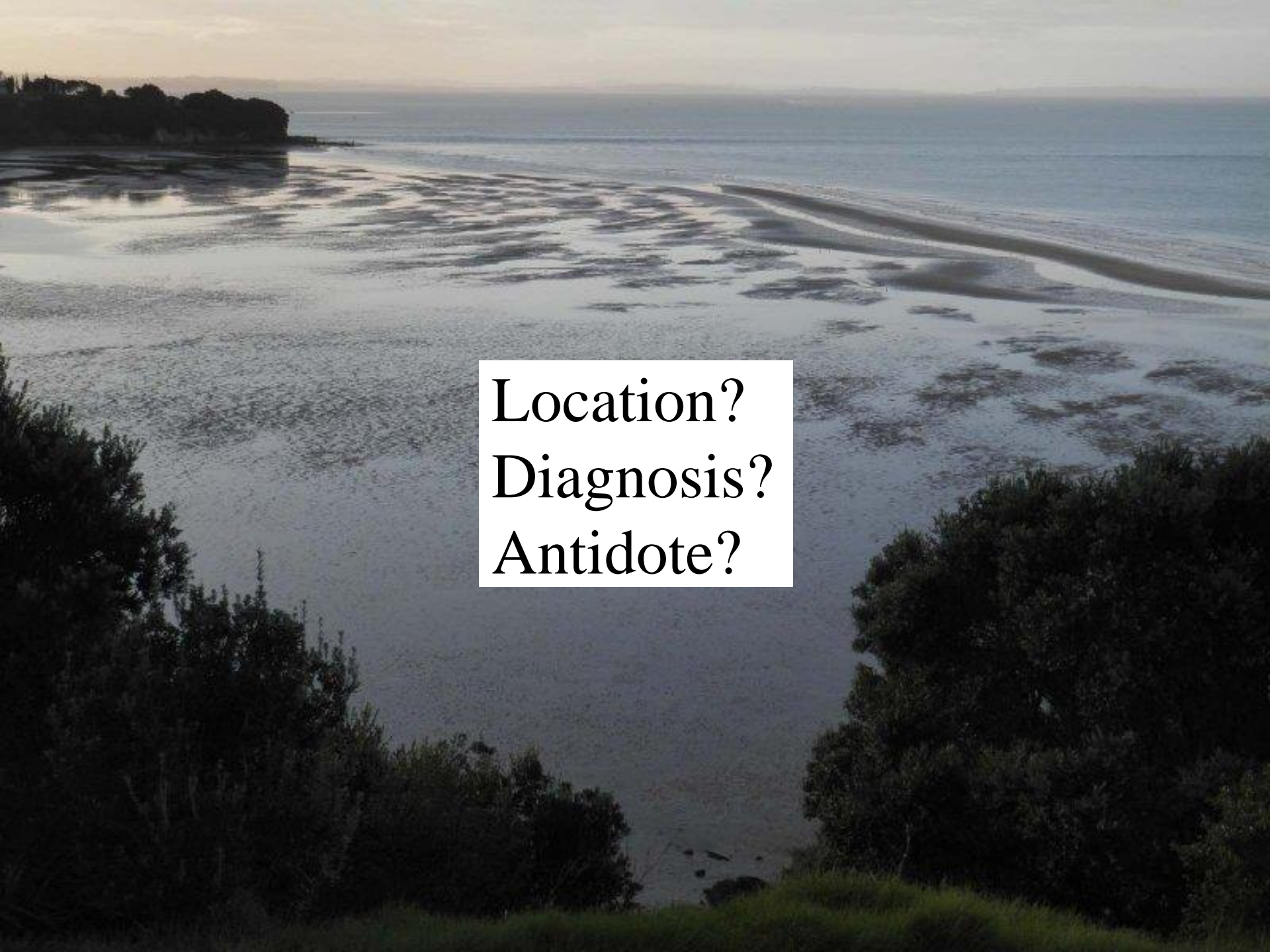
- + 50 min: arrived at casualty department of local hospital
- GCS 11/15, blood pressure 86/60 mmHg, pulse 138/min
- Swelling and bruising up to mid calf with 2 puncture marks 6 mm apart on L foot
- WBCs $15.3 \times 10^9/l$ (neutrophilia)
- INR 1.65, prothrombin time 19.1 (14.0)
- platelets $150 \times 10^9/l$



39F ECGs

+50 min: global ischaemia +24 h: normal
 R_x specific antidote





Location?
Diagnosis?
Antidote?



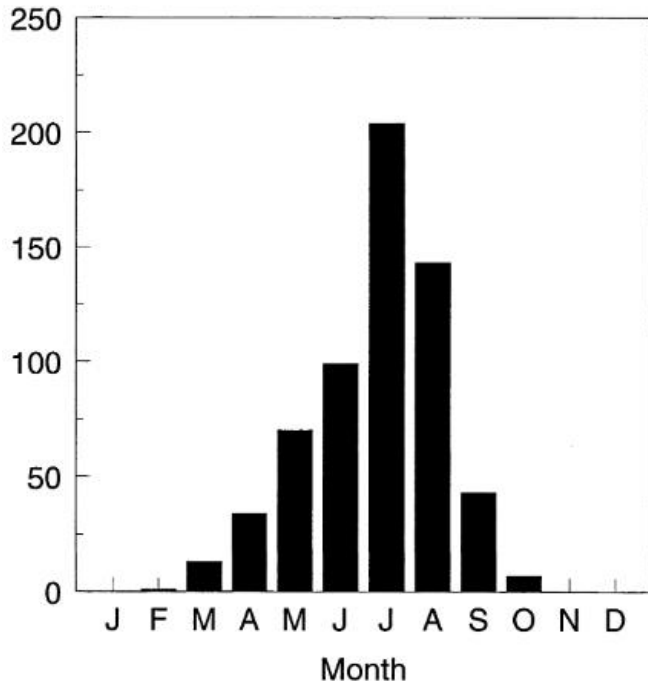
Vipera berus

Adder-bite Chelmsford Essex

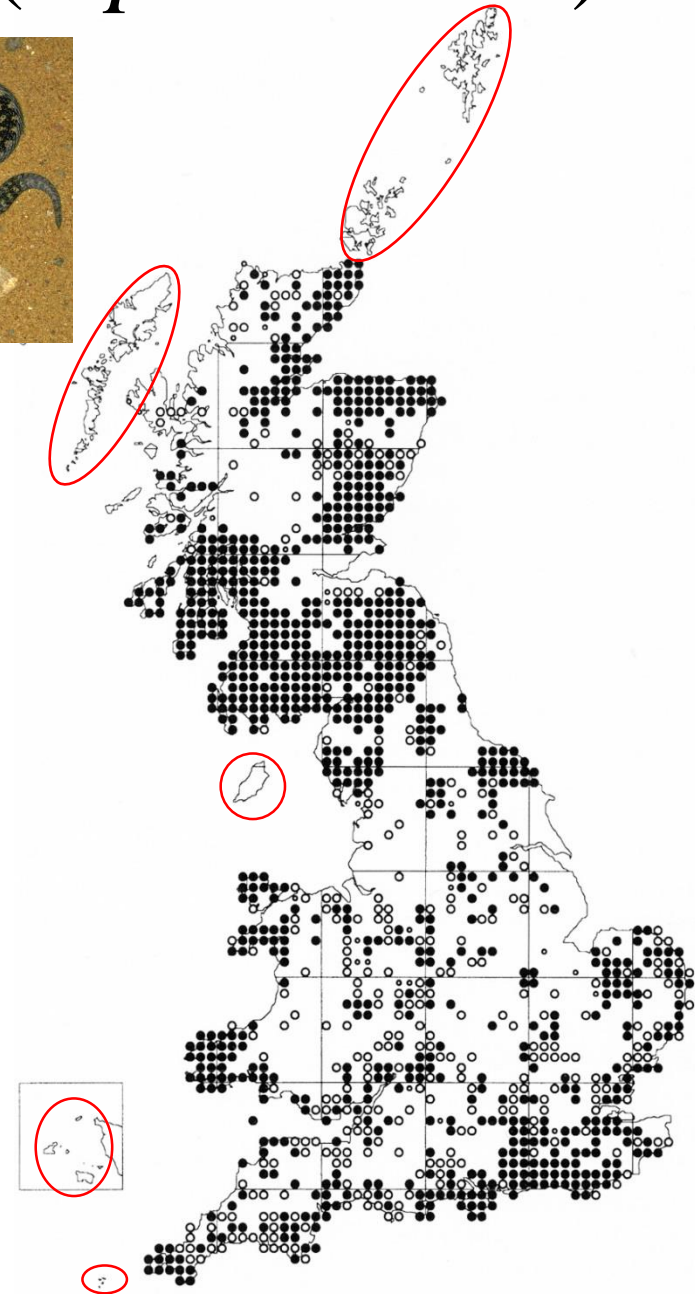
- Had it not been for the CPR-trained passers-by, she would have been the first snake-bite death in UK since 1975
- “Specific antidote” was antivenom

Common adder or viper (*Vipera berus*)

- Commonest snake in UK
- Only snake in Scotland
- ~80 hospitalised bites/year



- 13 (+1) deaths in 20th Century (last in 1975)



Adder (*V. berus*) bite: clinical features

- Local: pain, tingling, swelling, bruising, blistering, inflammation, lymphangitis, lymphadenopathy
- Systemic: early anaphylaxis, vomiting, colic, diarrhoea, angio-oedema, urticaria, bronchospasm, syncope, shock
- Cardiac abnormalities: arrhythmias, A-V block, ST/T wave abnormalities



Adder (*Vipera berus*) bite: severe features

- Systemic bleeding, coagulopathy
- Acute kidney injury
- Coma, seizures, cerebral oedema
- ARDS
- Gastric dilatation, paralytic ileus, acute pancreatitis



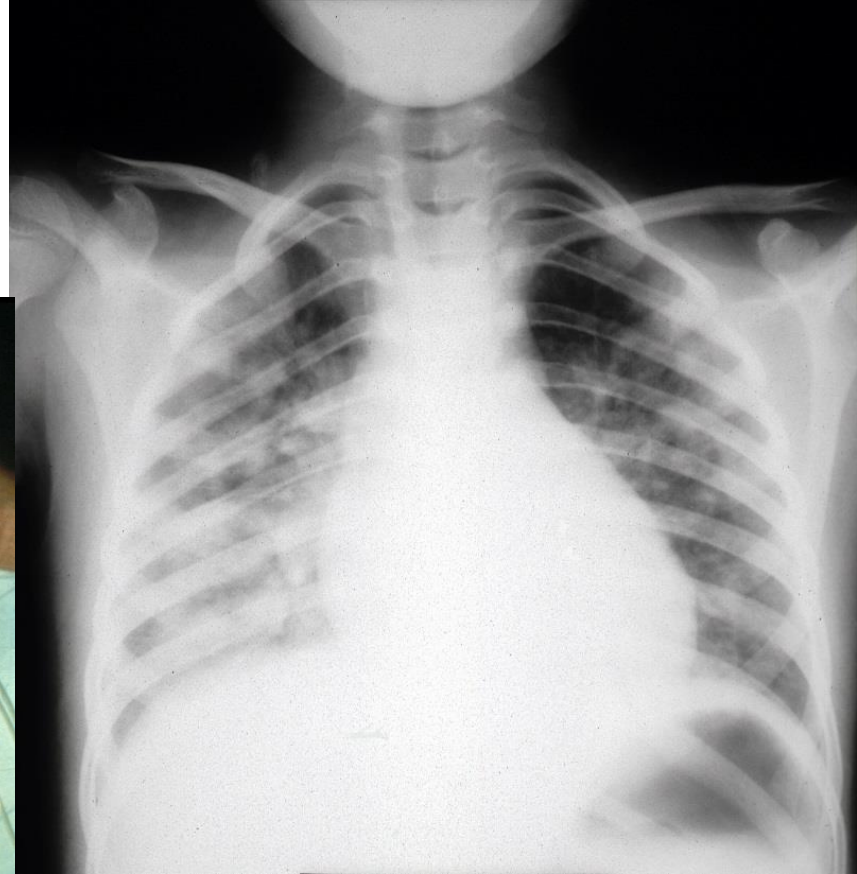
Severe *Vipera berus* envenoming

4F: Pleural effusion, ascites, paralytic ileus

9F: haematuria, pulmonary haemorrhages



Hans Persson



Adder (*Vipera berus*) bite: investigations

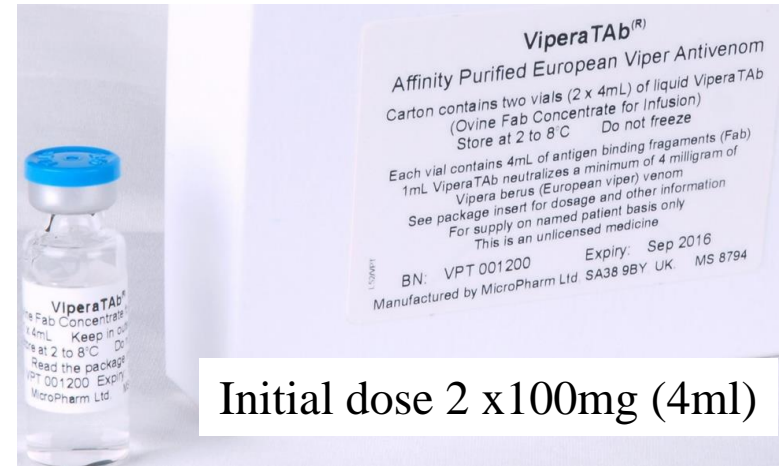
- Neutrophil leucocytosis
- Anaemia
- Creatine kinase, transaminases ↑
- Thrombocytopenia, coagulopathy, FDP/D-dimer
- Metabolic acidosis
- Emerging acute kidney injury
- ECG

Adder bite: indications for antivenom

“The adder bite itself may be less dangerous than the so-called specific snake bite antiserum which is therefore not recommended” British National Formulary Sept 1981

Systemic envenoming:

- Hypotension
- Other signs of systemic envenoming
- ECG abnormalities
- Leucocytosis ($>15 \times 10^9/l$), creatine kinase, metabolic acidosis



Initial dose 2 x 100mg (4ml)

Local envenoming:

- Swelling $>$ half the limb within 48 hr
- (Adults) swelling beyond wrist/ankle in 4 hr



Exotic snake species in the UK

Daily Mail, Thursday, April 17, 1997

Page 21

RSPCA SEIZES COLLECTION OF SOME OF THE WORLD'S DEADLIEST SNAKES

In a suburban garage, killers by the dozen

Daily Mail Reporter

RSPCA inspectors risked their lives when they raided the home of a snake collector keeping some of the world's deadliest specimens, a court heard yesterday.

In the garage of his suburban house, Ian Ramsden had 58 highly poisonous snakes, including spitting cobras, rattlesnakes, African vipers and anacondas.

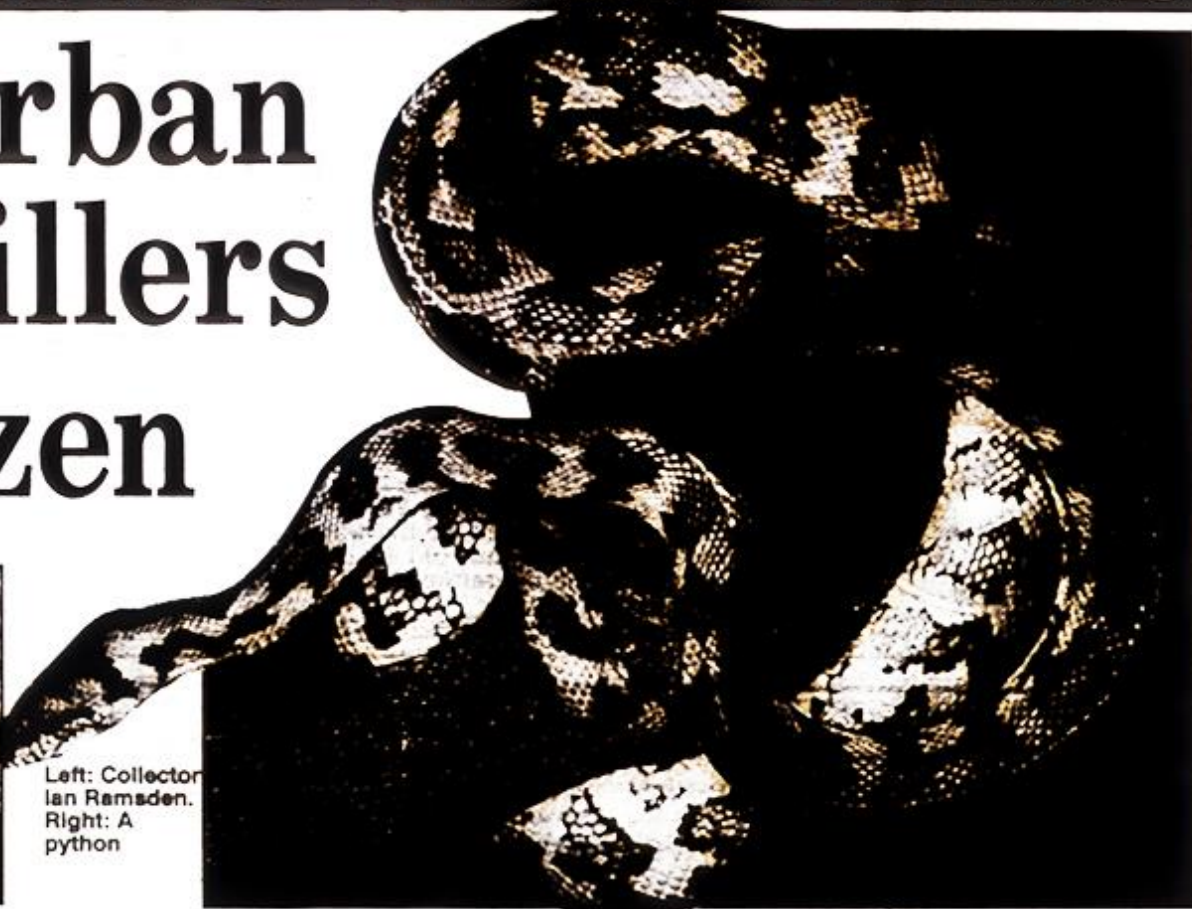
In preparing for the raid, officers found that they were not sure whether antidotes would even be available if they were bitten,' said Mark Love, prosecuting at Sutton magistrates' court in Surrey.

RSPCA officers and police raided Ramsden's home in Tonfield Road, Sutton, on May 21 last year after a tip-off, the court was told.

Herpetologist Paul Rowley, of the Liverpool School of Tropical Medicine, described one snake found in the garage, the saw scale



Left: Collector Ian Ramsden. Right: A python



viper, as the 'most dangerous to man'.

Close behind it was a collets tiger snake from Australia, which without anti-venom can cause death within 12 hours.

Another of the snakes found was the Asian spitting cobra, so called because it spits venom into a victim's eye, causing temporary blindness. 'It can then bite them as they stagger around,' said Mr

Rowley. 'It is another very nasty snake.'

It is alleged that many of the snakes and lizards in the menagerie were ill-treated and just a fraction of their normal weight.

'In a cage was a spiny-tailed iguana which appeared to be in a thin and poor bodily condition,' said Mr Love. 'There appeared to be very little muscle coverage and the spine and vertical column

could be seen and felt.' A baby South American anaconda — which would spend much of its time in water in its natural habitat — was left with only a bowl of water which had been allowed to dry out.

'It should certainly not have been kept in these bone-dry desert conditions,' said Mr Love. 'It is equivalent to keeping a penguin without water.' Officers put

the snakes into the care of various zoos, the identity of which have been kept secret to deter thieves.

Ramsden, 34, denies 13 charges of causing animals unnecessary suffering.

He also faces 53 charges of keeping dangerous reptiles without a licence, to which no plea has yet been entered.

The trial continues.

Exotic snake-bite in the UK

1970-7 (8 years):

- 32 bites in 17 people, no deaths*
- rattlesnakes 10; puff adders 5
- 2 cases life-threatening; 6 developed local necrosis

(Reid BMJ 1978;I:1598-1600.)

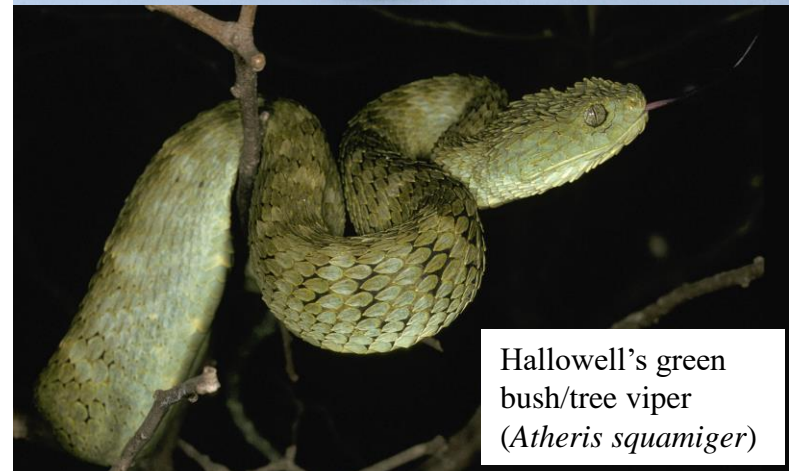
1986-2017: <10 bites/year, one death

(Warrell Q J Med 2009; 102:593–601)

- Many different species



Western diamond
back (*Crotalus atrox*)



Hallowell's green
bush/tree viper
(*Atheris squamiger*)



Cantil (*Agkistrodon bilineatus*)

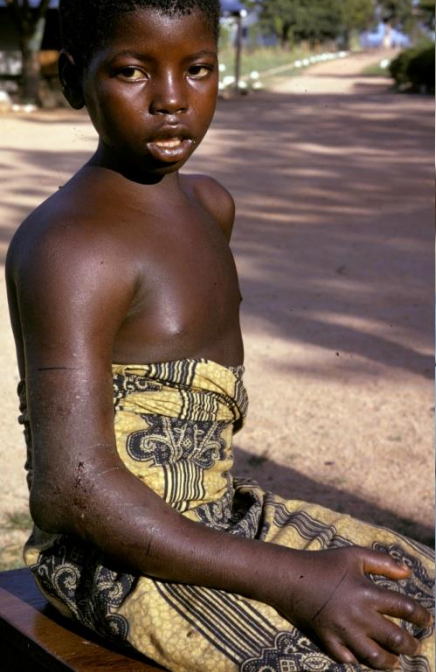
Exotic snake-bites: envenoming syndromes

Classic elapid descending paralysis Thailand



Malayan krait
(*Bungarus candidus*)



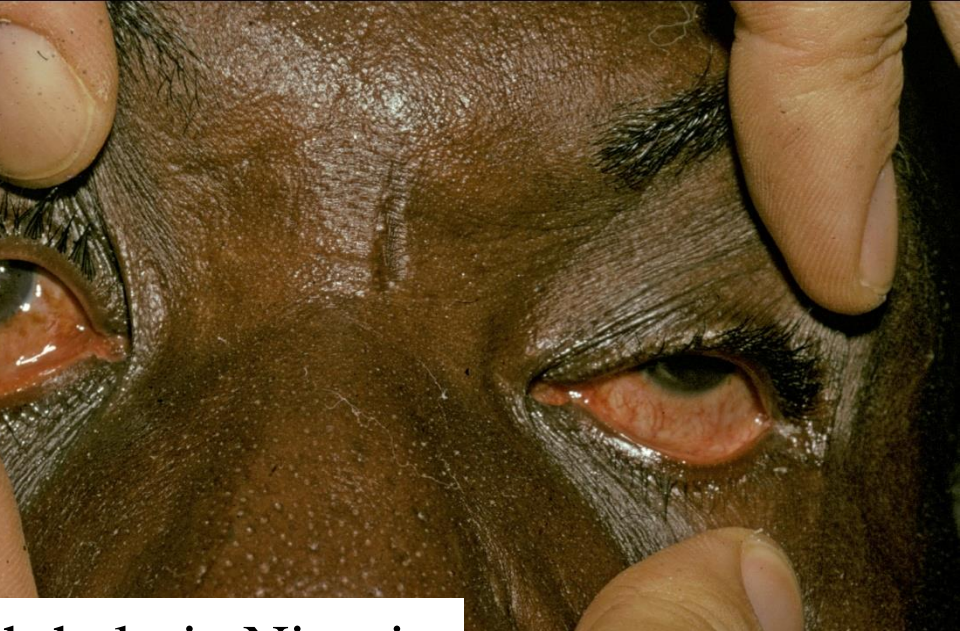


Spitting cobra
local necrosis
Nigeria

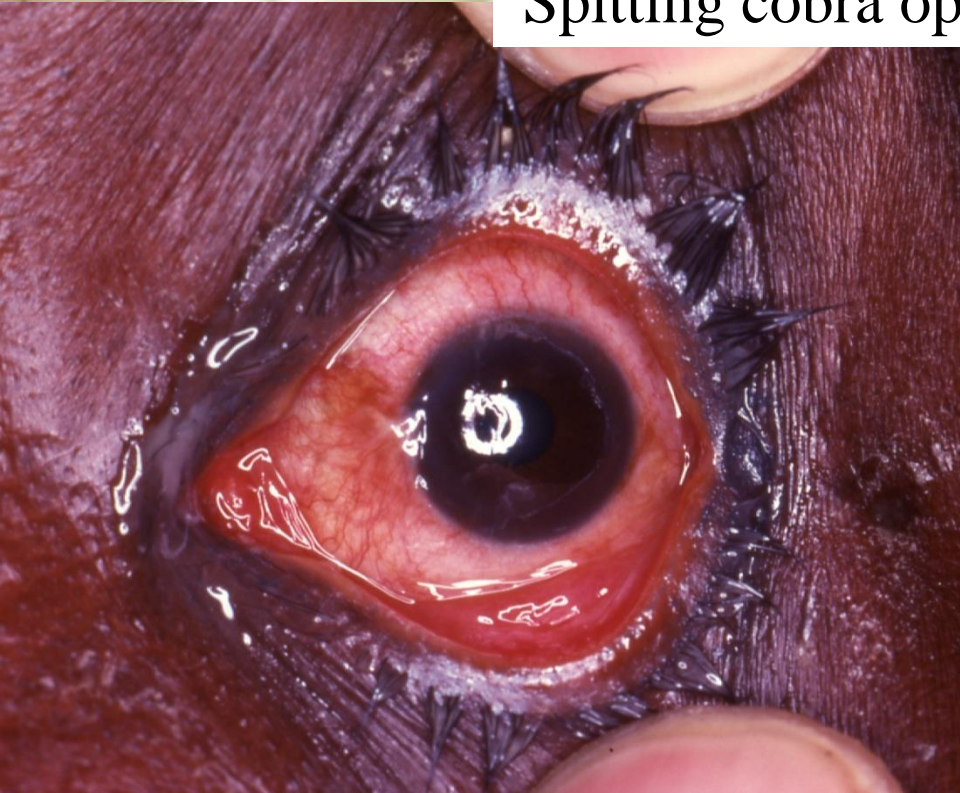


Black-necked spitting cobra (*Naja nigricollis*)





Spitting cobra ophthalmia Nigeria



Australian/Oceanian elapid paralysis and haemorrhage Papua New Guinea



Papuan taipan (*Oxyuranus scutellatus*)



Classic viper/pit-viper local necrosis and haemorrhage South America



Lance-headed pit-vipers (*Bothrops*)



Treatment of exotic snake-bites

- Resuscitate and assess patient
- Get details of the snake responsible (expert identification of snake or i-phone image)
- Contact Toxbase for advice
- Decide whether antivenom is needed and order for urgent delivery (Movianto)

England



National Capital

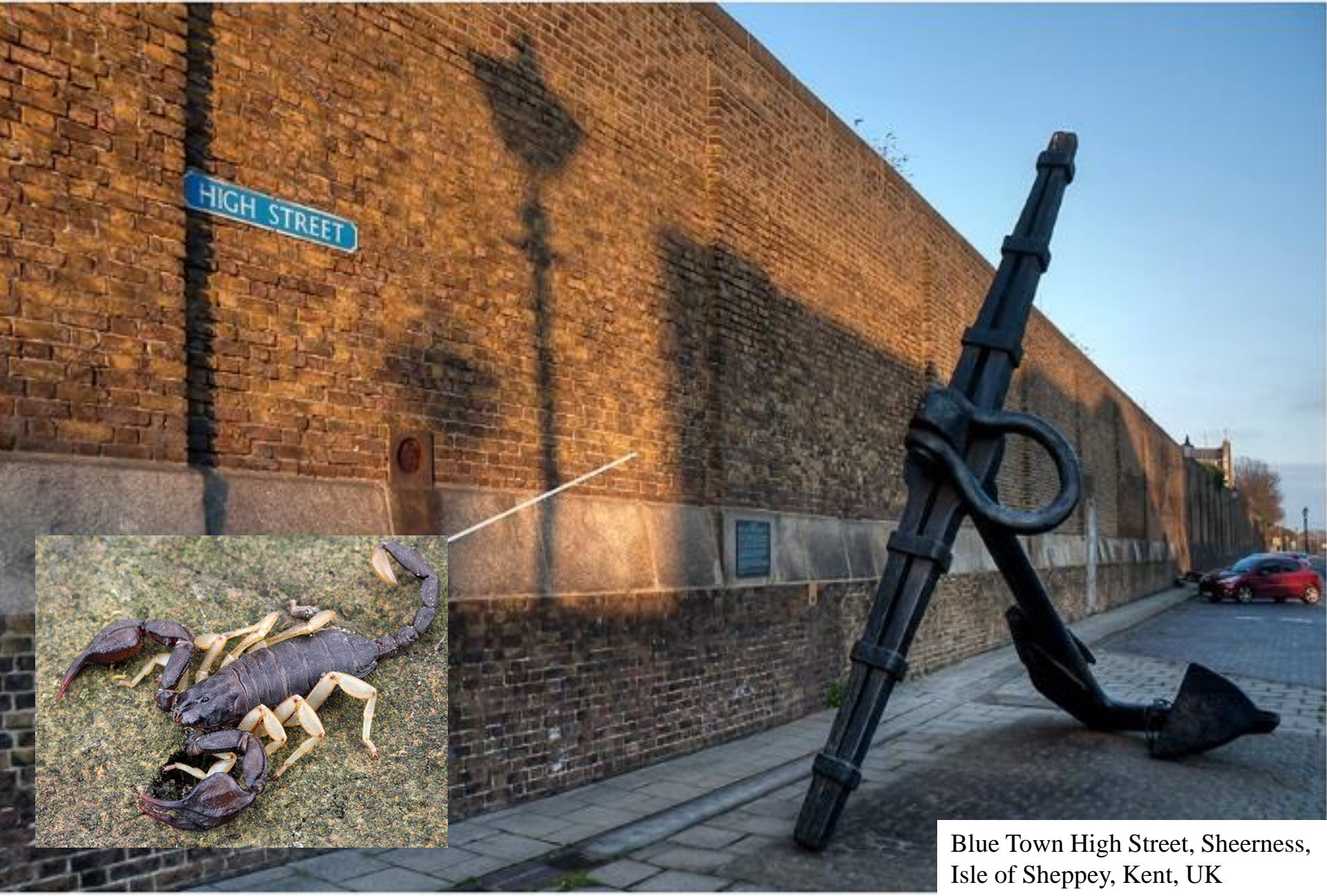


International Boundary



Provincial Boundary

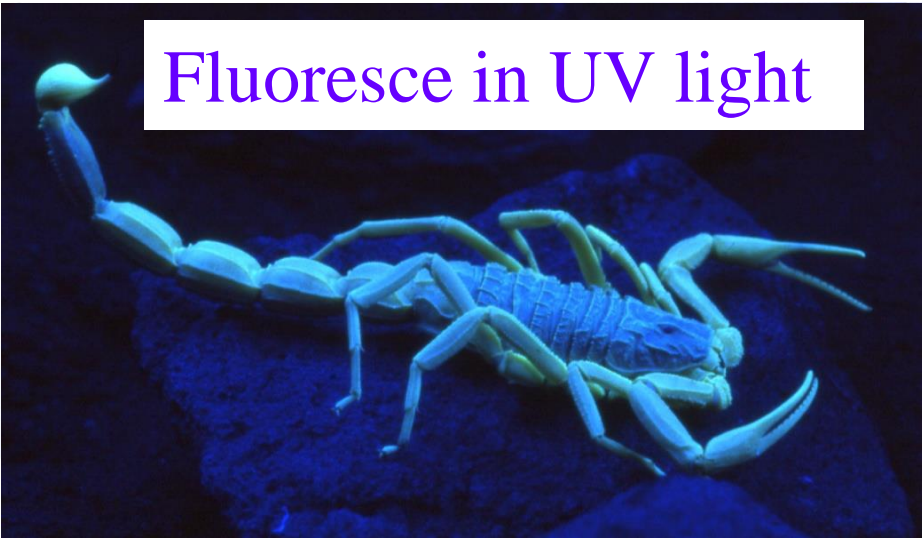
North Sea



Blue Town High Street, Sheerness,
Isle of Sheppey, Kent, UK

Scorpion stings: global hot spots

Fluoresce in UV light



Agadez desert, Niger



Konkan, India



Middle East, North Africa,
South Africa

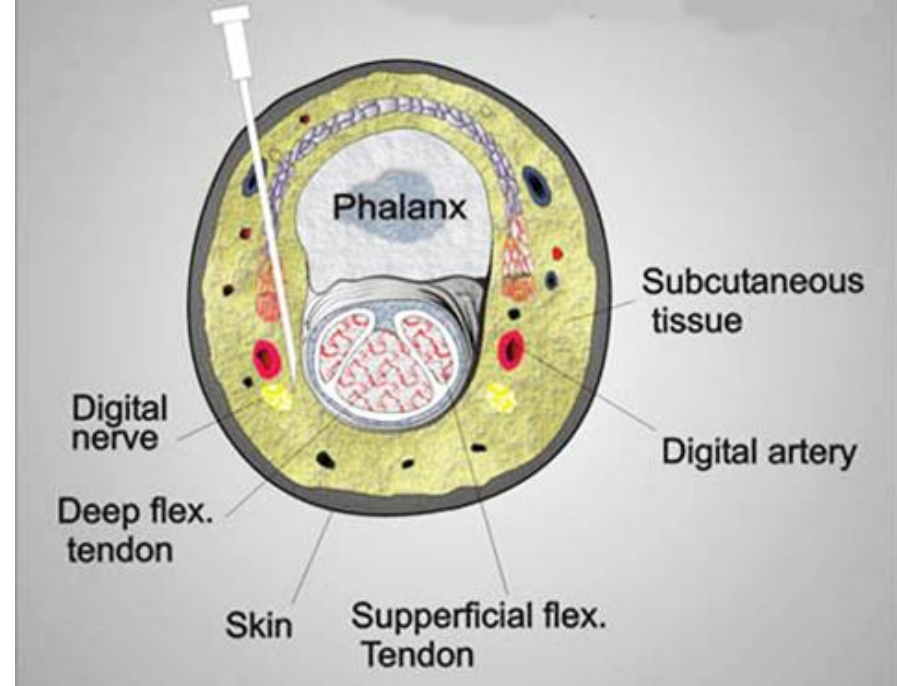
India

Southern USA (Arizona), Mexico,
Latin America and Trinidad

Scorpion sting:

Excruciating local pain!

- infiltration/ digital block
1% lignocaine
- peripheral nerve block
(0.25% bupivacaine)
- Bier's block (0.5%
lignocaine)
- topical tetracaine/
amethocaine 4% gel
- systemic analgesics



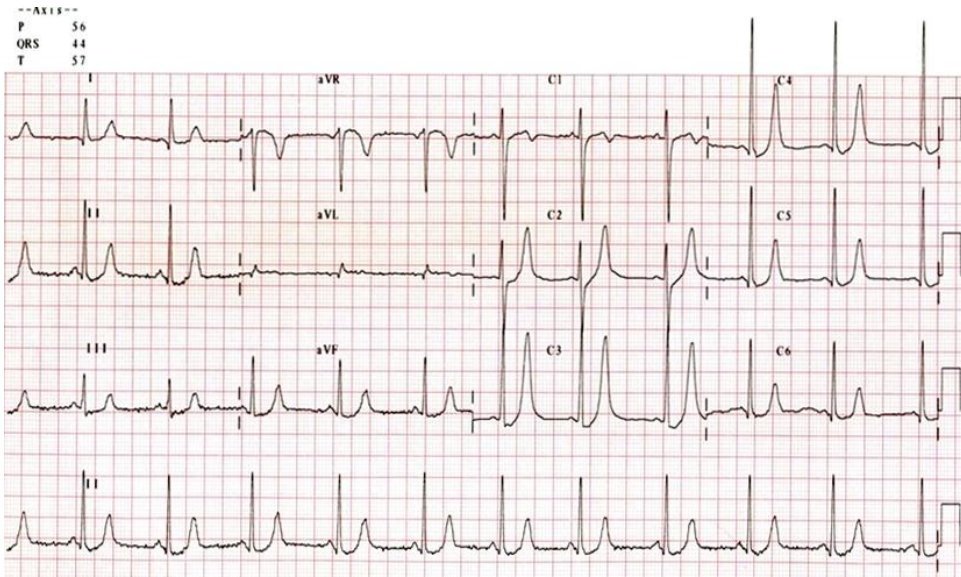
Scorpion stings: systemic envenoming

Autonomic storm: sympathetic and parasympathetic overactivity causing cardiovascular and gastrointestinal effects

Neurotoxicity: fasciculations, muscle spasms, paralysis

Treatment: antivenom + cardiovascular support

Indian red scorpion



“False black widow spider”
Steatoda nobilis



Spider bites in UK

- Almost all spiders can deliver a venomous bite
- Only one genus of immigrant spiders in UK can cause unpleasant symptoms
- *Steatoda* (Theridiidae) false black widow or cupboard spiders
- Landed on South coast before 1879, moving North

Steatoda nobilis



Steatoda grossa



Confirmed *Steatoda nobilis* bites

- Rapidly increasing local pain (burning, scalding, stabbing) over ~ 10 minutes, radiating from bite site (chest, arm) to axilla and down arm
- Local raised, tender, inflamed area with sweating and gooseflesh
- Facial flushing, “flu-like” aches, fatigue, sweating, fever, chills, shaking, nausea, giddiness, disorientation resolving after a few hours
- R_x reassurance, analgesia
In an exceptionally severe case (e.g. young child) consider black widow (*Latrodectus*) antivenom



Neurotoxic araneism

Sweating and painful muscle spasms



fang marks



Local sweating and goose flesh

Latin American banana (“armed”, “wandering”) spiders - *Phoneutria*



Times 30/4/67
Has anyone seen our missing deadly spider?



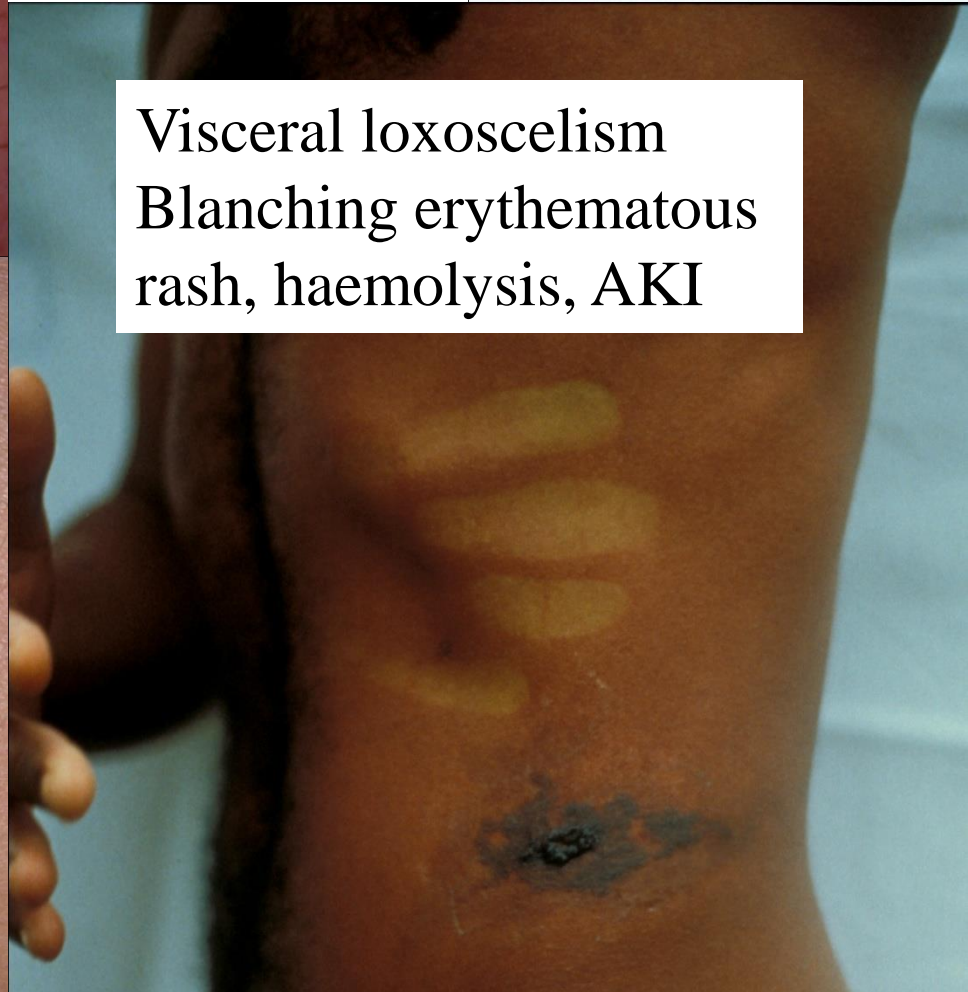
Evolution of necrosis



Necrotic
araneism
(Loxoscelism)



Visceral loxoscelism
Blanching erythematous
rash, haemolysis, AKI



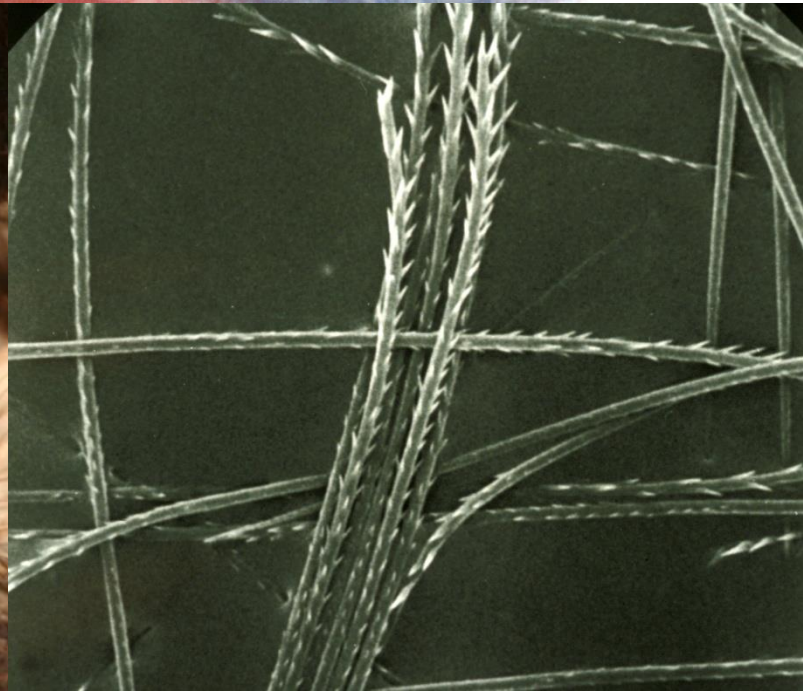
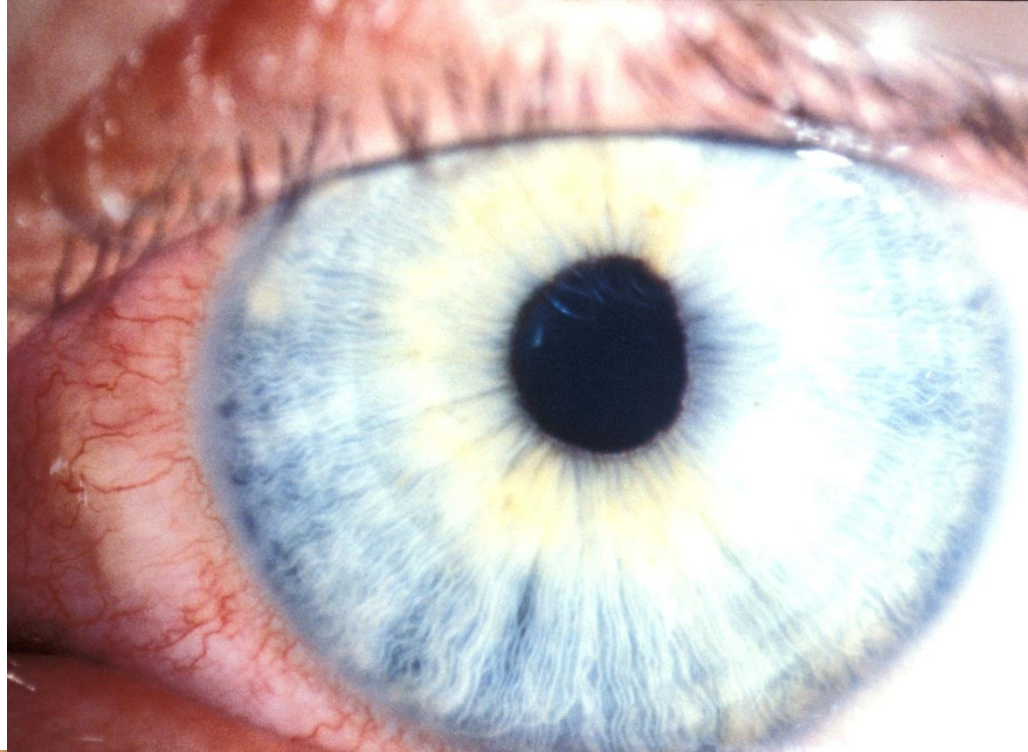


Tarantulas are
popular
children's pets



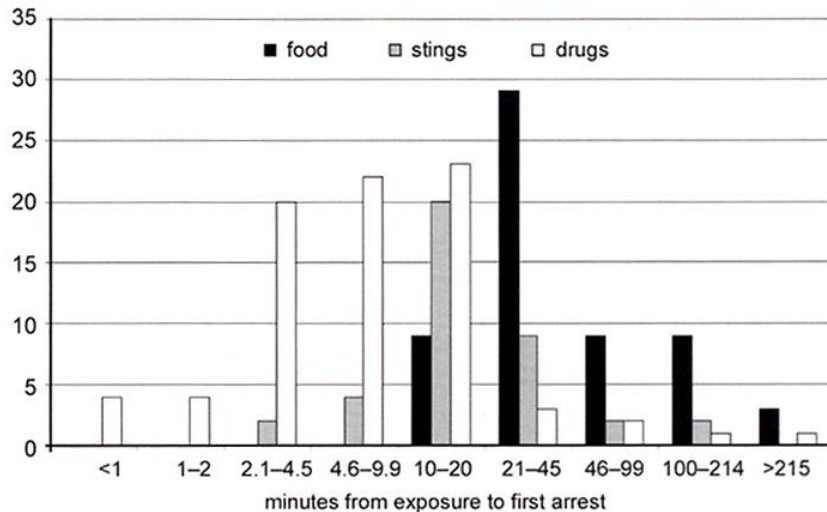
Envenoming by tarantula spiders

New world tarantulas:
traumatic bites
keratitis nodulosa (from
abdominal setae)



Hymenoptera sting anaphylaxis

- Direct envenoming (mass attacks) -very rare
- Acquired IgE-mediated hypersensitivity – common cause of anaphylaxis with fatalities
- Occupational hazard of bee-keepers
- Diagnosis: history, plasma mast cell tryptase, detection of venom-specific IgE
- Treatment: adrenaline, adrenaline, adrenaline
- Prevention: avoidance, self-injectable adrenaline, desensitisation (evidence-based, very effective)



Vespa crabro

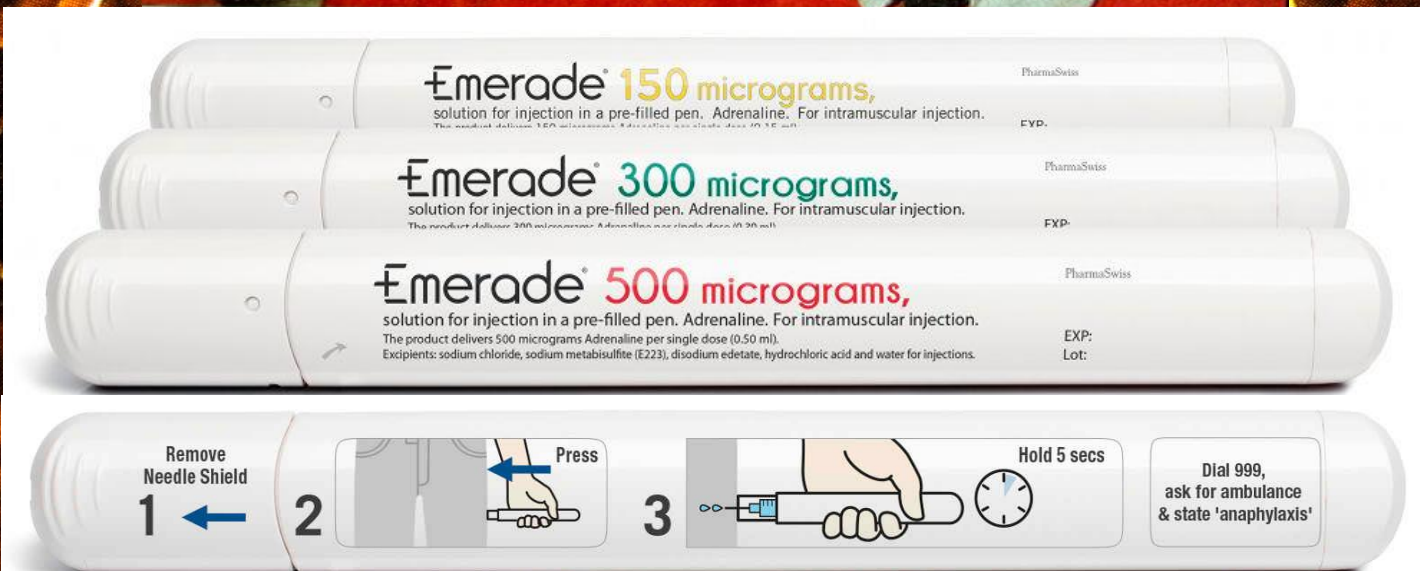


Vespula vulgaris



Apis mellifera

Anaphylaxis!



Hymenoptera sting anaphylaxis: investigations

1-Specific IgE: Radioallergosorbent Test (RAST) (in fact, fluorescence enzyme linked immunoassay) or prick skin testing

2-Plasma Mast Cell Tryptase:

- Potassium EDTA or Serum Separator Tube (SST)
- Samples 1, 3, >24 hours of suspected anaphylactic reaction
- Reference range 2 – 14ug/L (anaphylaxis peak >200ug/ml)

3-Rare wasp sting infection:



Venomous bites and stings (snakes and arthropods): conclusions

- History is paramount, but bite/sting may pass unnoticed (?complicating infection, necrotising fasciitis)
- Seek expert advice (Toxbase)
- Identification of causative animal is crucial
- Distinguish local from systemic envenoming
- Laboratory investigations important
- Some specific antivenoms are available
- Prevention should be emphasised in high-risk people

The screenshot shows the Toxbase website in a web browser. The browser's address bar displays 'https://www.toxbase.org'. The page header includes the 'TOXBASE' logo, contact information for the UK NPIS (0344 892 0111) and Ireland NPIC (01) 809 2566, and the email 'mail@toxbase.org'. A banner on the right states that the service is commissioned by Public Health England (PHE) on behalf of the UK Health Departments. The main content area is titled 'Welcome to TOXBASE®' and describes it as 'The primary clinical toxicology database of the National Poisons Information Service'. It features a login section with fields for 'Username' and 'Password', a 'Sign in' button, and a 'Remember this computer' checkbox. Below the login section, it notes that TOXBASE® is for health professionals only and provides a link to 'Terms and Conditions'. For public members, it lists contact numbers for Wales (0845 4647), England (111), and Scotland (08454 242424 or 111), and advises contacting a local GP or pharmacist during normal hours, with a link to GP services out-of-hours. The right sidebar contains a 'Updated 3rd Apr 2017' notice, a list of links including 'TOXBASE® Information for TOXBASE® subscribers', 'TOXBASE® App', 'About the NPIS', 'Telephone enquiries to the NPIS', 'Laboratory tests and antidotes', and 'Poisoning stats - availability & fees'. It also features the 'uktis' logo and a link to 'About UKTIS' and 'www.uktis.org'. A note at the bottom of the sidebar asks users to register or login to TOXBASE® to access UKTIS pregnancy reviews. The footer states that the information on TOXBASE® requires expert clinical interpretation and that users should complete the TOXBASE® E-Learning modules.

Toxbase Welcome

https://www.toxbase.org

Most Visited Getting Started

TOXBASE
.org

UK NPIS 0344 892 0111
Ireland NPIC (01) 809 2566
mail@toxbase.org

NPIS
National Poisons
Information Service

A service commissioned by
Public Health England (PHE)
on behalf of the UK Health Departments

Welcome to TOXBASE®
The primary clinical toxicology database of the National Poisons
Information Service

Login

If you are already registered with TOXBASE please sign in:
Username and password are case sensitive.

Username Password Sign in

☐ Remember this computer

Not registered yet? [Register now!](#)

TOXBASE® is for health professionals only.
[Terms and Conditions](#) for TOXBASE® users

For members of the public contact:

In Wales (NHS Direct): **0845 4647**
In England (NHS 111): **111**
In Scotland (NHS 24): **08454 242424 or 111**
In Northern Ireland: **contact your local GP or pharmacist during normal hours; click [here](#) for GP services Out-of-Hours.**

Updated 3rd Apr 2017

[TOXBASE® Information for TOXBASE® subscribers](#)
[TOXBASE® App](#)
[About the NPIS](#)
[Telephone enquiries to the NPIS](#)
[Laboratory tests and antidotes](#)
[Poisoning stats - availability & fees](#)

uktis
uk toxicology information service
[About UKTIS](#)
[www.uktis.org](#)

Please register or login to TOXBASE® to access UKTIS pregnancy reviews

The information on TOXBASE® requires expert clinical interpretation (ideally users should complete the TOXBASE® E-Learning modules; click