Toxic Envenomation

Snakebites

DR. Tawfiq Almezeiny

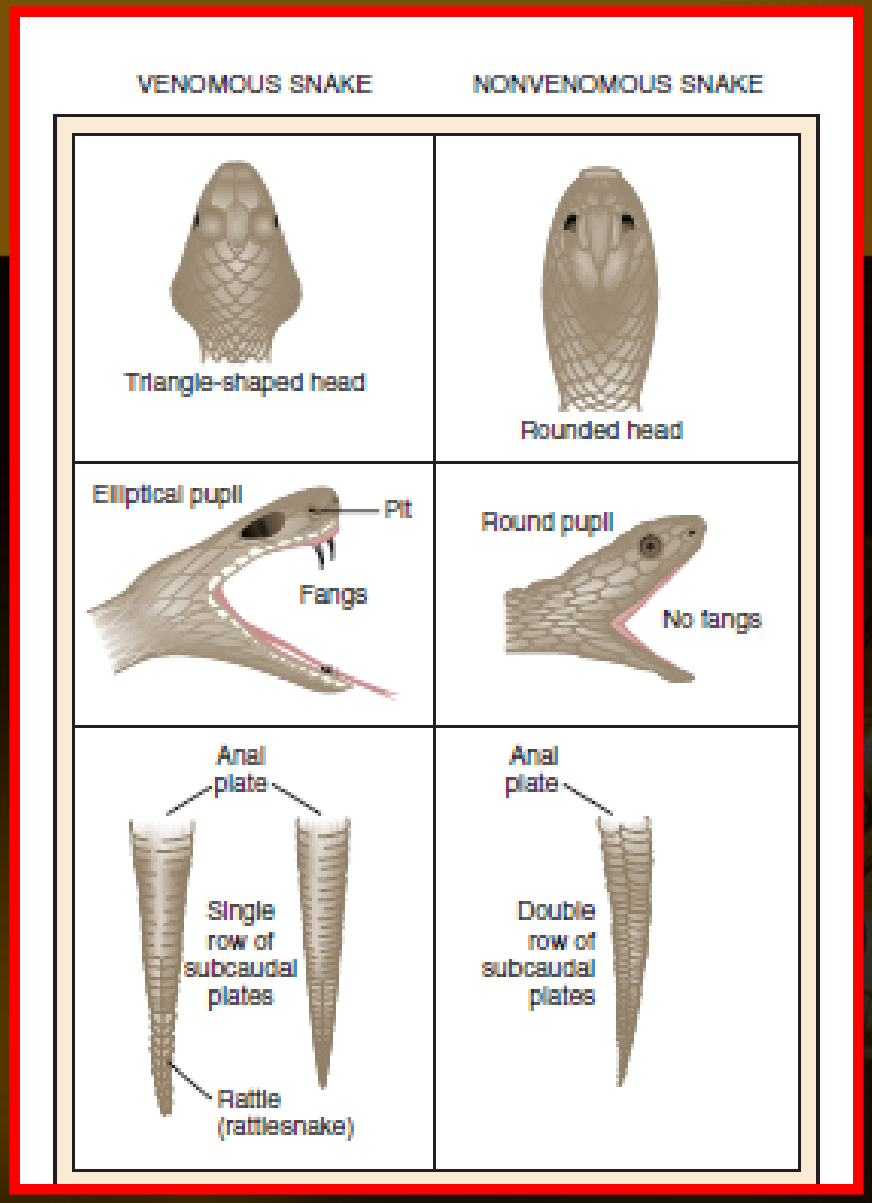
MBBS, FRCPC (CCM)

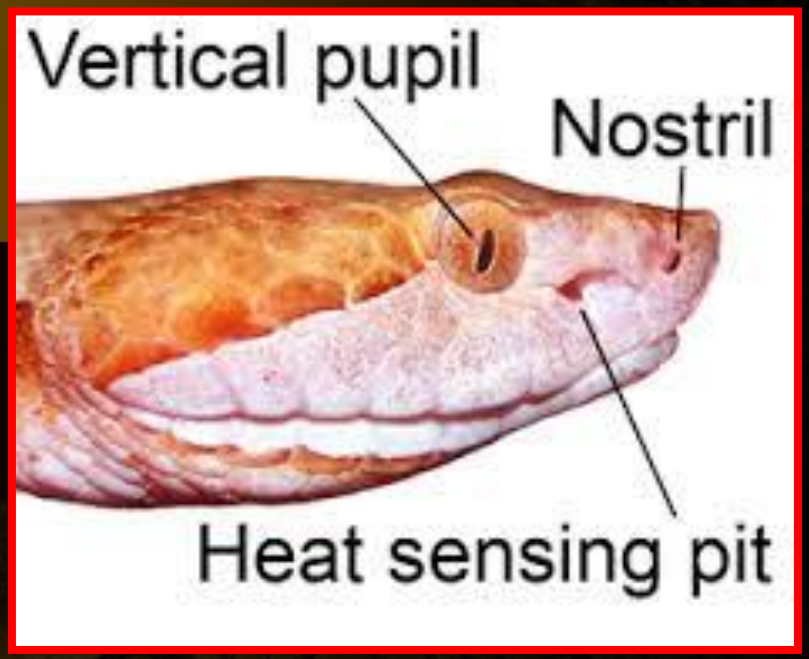
Epidemiology

- 2.5 million venomous bites annually
- 125,000 deaths
- India, Far East, Brazil and Central Africa
- 3000 species
- Only 15% are venomous

Five Major venomous families

- Colubridea (70%)
- Hydrophiidae (Sea snakes)
- Elapidae (Cobra, kraits,mambas,coral snakes)
- Viperidae (True !Russel viper, Saw-scaled viper,Gaboon viper)
- Crotalidae (pit vipers) e.g. rattlesnake


VENOMOUS SNAKE
NONVENOMOUS SNAKE
Triangle-shaped head
Rounded head
Elliptical pupil
Pit
Fangs
Round pupil
No fangs
Anal plate
Single row of subcaudal plates
Rattle (rattlesnake)
Anal plate
Double row of subcaudal plates


Vertical pupil
Nostril
Heat sensing pit

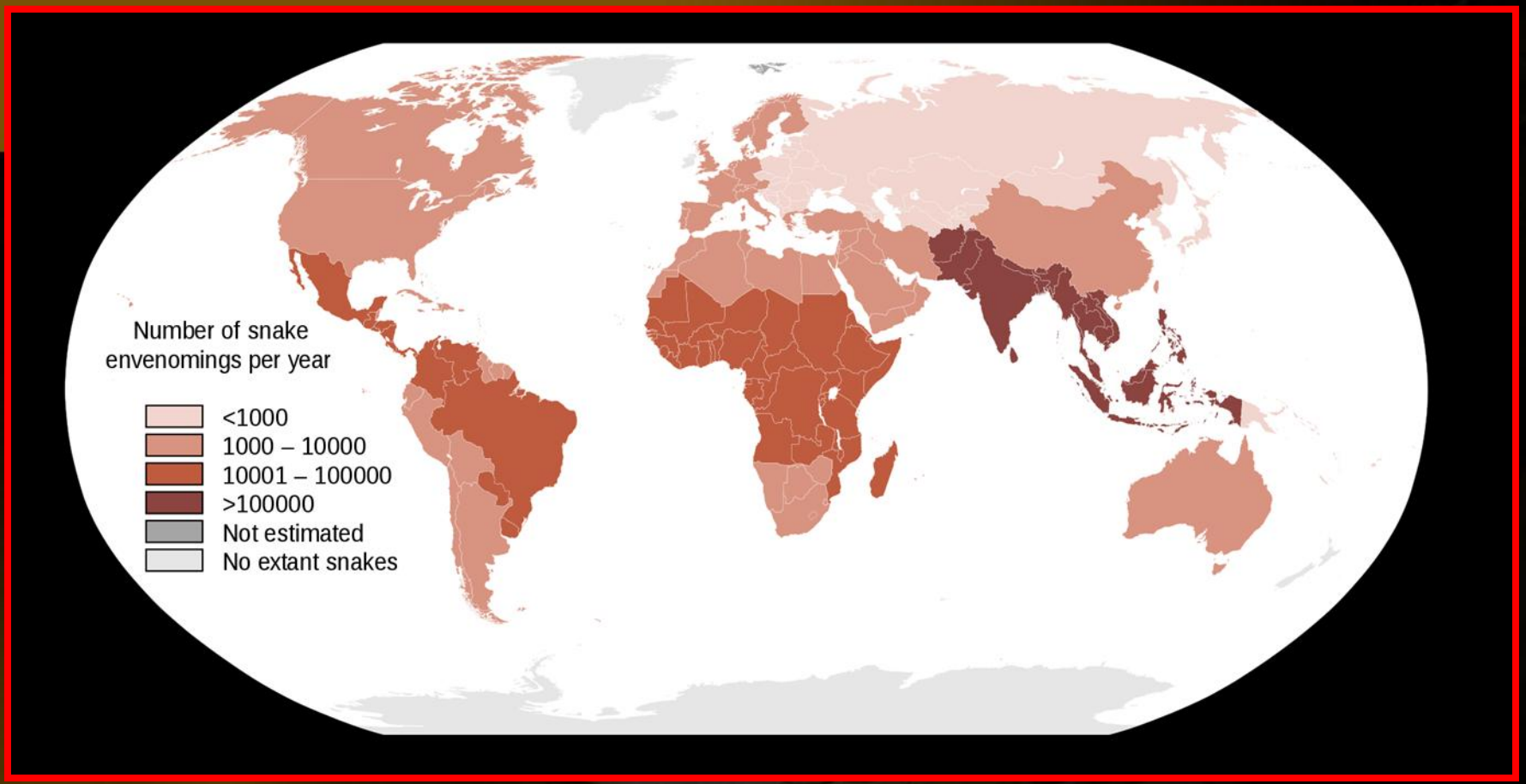

Number of snake envenomings per year
<1000
1000 – 10000
10001 – 100000
>100000
Not estimated
No extant snakes

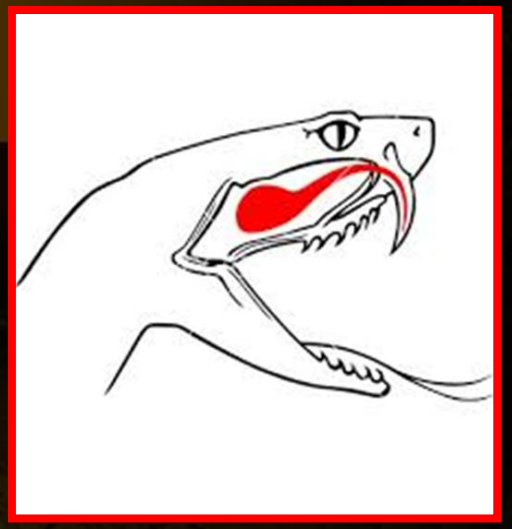
Table 59-1 Venomous Animal Fatalities in the United States, 1950–1969

ANIMAL	FATALITIES
Hymenoptera	
Bees	175
Wasps	127
Yellow jackets	33
Hornets	12
Ants	5
Ticks	3
Spiders	92
Unidentified insects	53
Coelenterata	2
Stingray	1
Snakes	
Rattlesnakes	159
Water moccasins	9
Copperheads	2
Coral	3
Cobra	3
Unidentified	67
Animal, not coded	44
Total	790

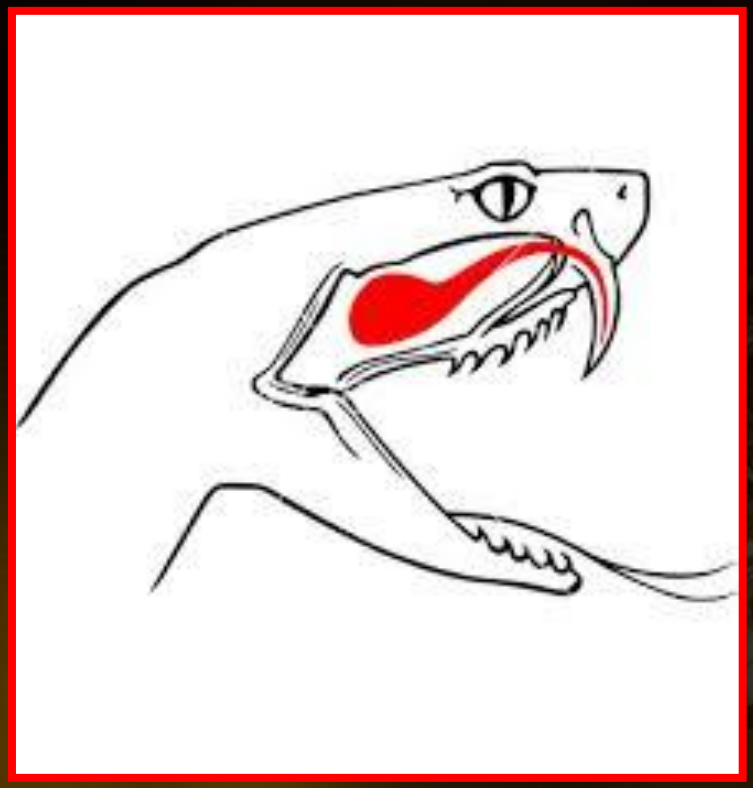
Table 59-2 Venomous Animal Injuries and Deaths, 1983–2006

ANIMAL	ENVENOMATIONS	DEATHS
Coelenterates	13,846	0
Fish	23,866	0
Ants	45,019	0
Bees/wasps/hornets	327,268	22
Caterpillars/centipedes	40,768	0
Other arthropods	234,147	2
Copperheads	10,720	1
Rattlesnakes	17,382	23
Water moccasins	1,887	0
Coral snakes	1,055	0
Exotic snakes	1,994	3
Nonvenomous snakes	34,385	0
Unknown snakes	35,695	2
Black widow spiders	50,968	0
Brown recluse spiders	37,811	7
Other/unknown spiders	238,447	1
Scorpions	210,675	3

Poisonous Vs Venomous



Venoms



Venoms

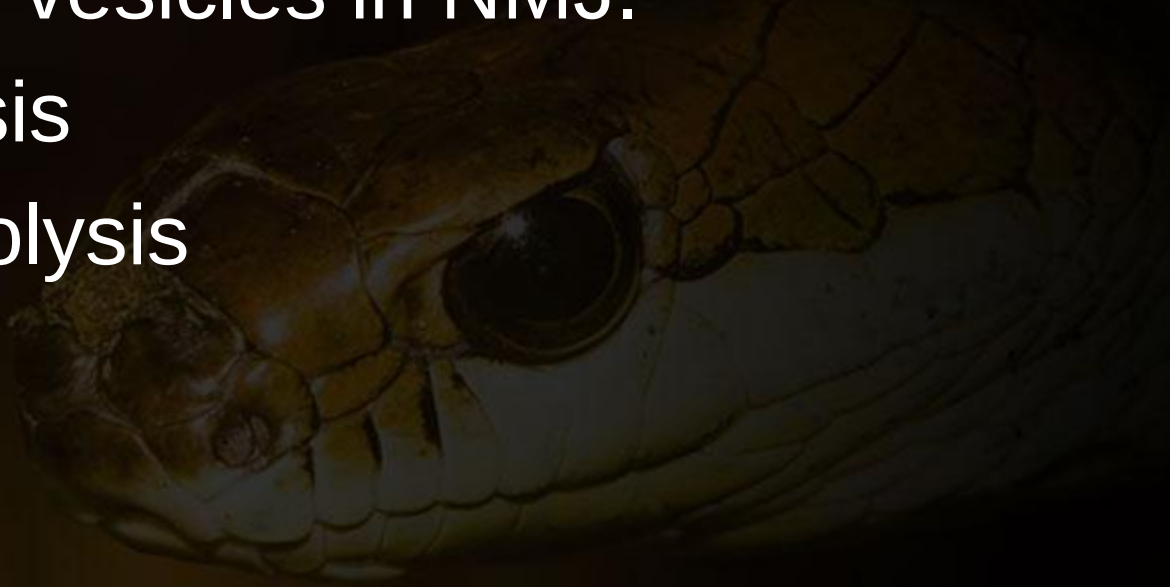
- Enzymes , Polypeptides , Proteins
- Proteins or Nonprotein
- Proteins : 90% composition (Toxic)
- Mixed Clinical effects on victim
- Neurotoxic - Hematotoxic - Cardiotoxic

Venoms

- Symptoms: Local or Systemic
- Enzymes: Coagulation , Anticoagulation, cell lysis, Hemorrhage and intracellular destruction.
- Polypeptides: rapid absorption , attack NMJ
- Phospholipase A : in all species

Phospholipase A2

- Hydrolyse phospholipids in nerve axons
- Attack Ach vesicles in NMJ.
- Myonecrosis
- RBC Hemolysis



Neurotoxicity

- Direct Neurotoxicity
- Indirect Neurotoxicity

Snake type	Toxin	Species	Type of toxin	Neurotoxic effects	References
Cobra (*Naja* spp.)	Alpha-cobratoxin	*N. kaouthia; N. siamensis*	Long-chain alpha-neurotoxin (3FTX)	1) Bind to post-synaptic muscle nAChRs—produce reversible, non-depolarising block; 2) Bind to neuronal α7 nAChRs	[136,137,234]
	Cobrotoxin	*N. atra*	Short-chain alpha-neurotoxin (3FTX)	Post-synaptic non-depolarising block	[138,139]
	Cardiotoxin	*N. atra*	3FTX	Blocks axonal conduction, cytotoxicity	[138,139]
	Toxin-alpha	*N. nigricollis*	Short-chain alpha-neurotoxin (3FTX)	Post-synaptic non-depolarising block	[136]
	"Weak toxin," WTX	*N. kaouthia*	Non-conventional alpha-neurotoxin (3FTX)	1) Bind to post-synaptic muscle nAChRs—produce irreversible, non-depolarising block; 2) Bind to neuronal α7 nAChRs	[136,235]
Krait (*Bungarus* spp.)	Alpha-bungarotoxin	*B. multicinctus*	Long-chain alpha-neurotoxin (3FTX)	Bind to post-synaptic muscle nAChRs—produce irreversible, non-depolarising block	[106,136]
	Beta- bungarotoxin	*Bungarus* spp.	Phospholipase A2	Pre-synaptic block	[108,109,117]
	Kappa-bungarotoxin	*B. multicinctus*	Kappa-neurotoxin (3FTx)	Block neuronal nAChRs in autonomic ganglia	[137,149,150,236,237]
	Candoxin	*B. candidus*	Non-conventional alpha-neurotoxin (3FTX)	1) Bind to post-synaptic muscle nAChRs—produce reversible, non-depolarising block; 2) Bind to neuronal α7 nAChRs	[134–136]
Russell's viper (*Daboia* spp.)	Phospholipase A2 activity	*D. russelii*	Phospholipase A2	Pre-synaptic block	[147,148]
	Daboia Neurotoxin-1 (DNX-1)	*D. russelii*	Short-chain neurotoxin	Post-synaptic block	[146]
	Viperotoxin-F	*D. russelii*	Phospholipase A2	Pre-synaptic block	[113,238]
Mamba (*Dendroaspis* spp.)	Dendrotoxins—alpha, delta, I, K	*D. angusticeps, D. polylepis*	3FTX	Block neuronal voltage-gated potassium channels—pre-synaptic +/−post-synaptic effects	[141,200]
	Fasciculins	*D. angusticeps, D. polylepis*	3FTX	Inhibit AChE	[143,144]
	Muscarinic toxins	*D. angusticeps*	3FTX	Muscarinic effects by binding to muscarinic AChRs	[136,142,204]
	Calciseptine	*D. polylepis*		Inhibit voltage-gated calcium channels	[239]
Rattlesnake (*Crotalus* spp.)	Crotoxin	*C. durissus*	Phospholipase A2	1) Pre-synaptic block; 2) Post-synaptic effect by desensitization of nAChR	[116,228,233,240,241]
	Mojave toxin	*C. scutulatus*	Phospholipase A2	Pre-synaptic ion channel blocker	[116,170,242]

Neurotoxicity

Key Learning Points

1. Snake venoms are complex mixtures of different toxins, and each neurotoxin has diverse neurotoxic effects.
2. There is considerable geographical, interspecies, intraspecies, as well as possibly ontogenetic variation in neurotoxicity with snake envenoming.
3. Accurate identification of envenoming snakes and uniform case definitions are needed to improve comparability of different reports of neurotoxic envenoming.
4. There are many interesting acute and delayed neurotoxic manifestations other than neuromuscular weakness, and these may reveal valuable information that may lead to a better understanding of other neurological diseases.
5. The evidence for antivenom and AChEIs in treatment of neurotoxic envenoming is not strong, and large randomized trials are urgently needed.

Penisula Snakes الجزيرة العربية

- 55 Types (land and Sea)
- Only 23 : venomous (40%)

Saudi Arabian Snakes

- ثعبان الصل الاسود ***Walterinnesia aegyptia***

103. الأسم العربي: الكوبرا العربية (سام جداً)
الأسم الإنجليزي: Arabian Cobra
الأسم العلمي:Naja haje arabicus

118. الأسم العربي: أفعى الطفي منشارية الحراشف (سام جداً)

الأسم الإنجليزي: Saw-scaled Vipers

الأسم العلمي: *Echis carinatus*

119. الأسم العربي: أفعى السجاد الشرقي (سام جداً)

الأسم الإنجليزي: Palestine Saw-scaled Viper

الأسم العلمي: *Echis coloratus*

114. الأسم العربي: الأفعى النفاثة (سام جداً)

الأسم الإنجليزي: Puff Adder

الأسم العلمي: *Bitis arietans*

116. الأسم العربي: الأفعى المقرنة العربية (سام جداً)

الأسم الإنجليزي: Arabian Horned Viper

الأسم العلمي: *Cerastes gasperettii*

115. الأسم العربي: الأفعى الصحراوية المقرنة (ام جنيب) (سام جداً)

الأسم الإنجليزي: Horned viper

الأسم العلمي: *Cerastes cerastes*

121. الأسم العربي: أفعى مقرنة كاذبة فارسية (سام جداً)

الأسم الإنجليزي: Persian Horned Viper

الأسم العلمي: *Pseudocerastes persicus fieldi*

123. الأسم العربي: أفعى السجاد العمانية (سام جداً)

الأسم الإنجليزي: Oman Carpet Viper

الأسم العلمي: *Echis omanesis*

منقول

2-الأفعى النفاثة :-

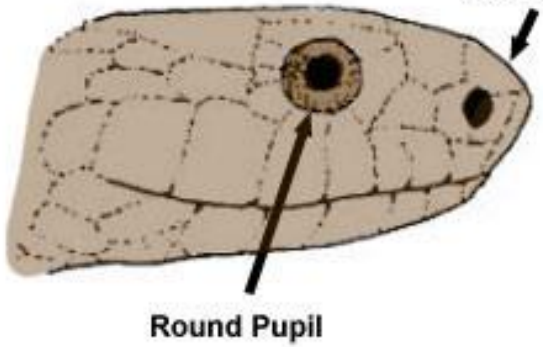
الاسم العلمي : Bitis arietans arietans

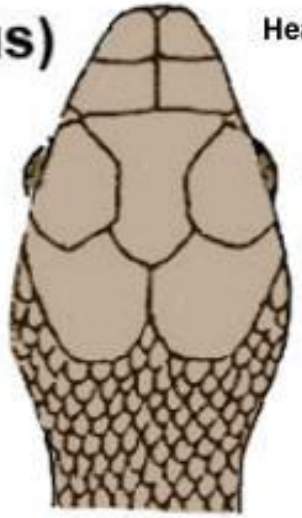
We are Saudi : Strong & Brave

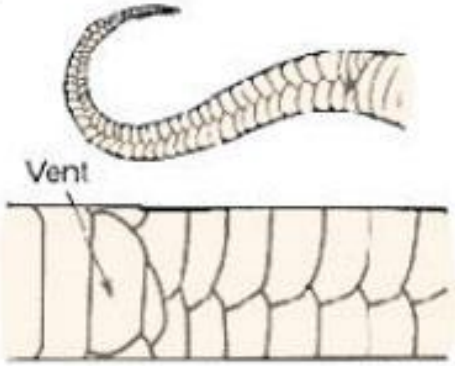
دفء الأجواء أجبرها على الخروج من الجحور

ثعبان الكوبرا يخرج في براري بيشة

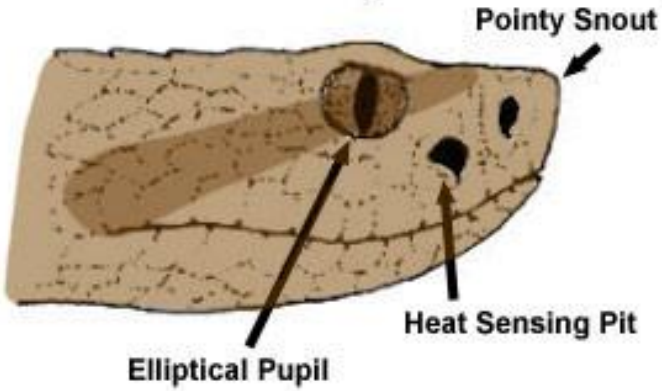
Watersnake (Non-venomous)

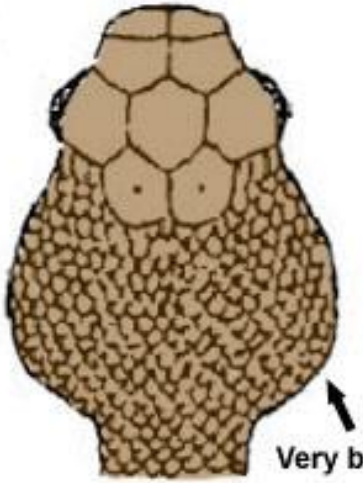


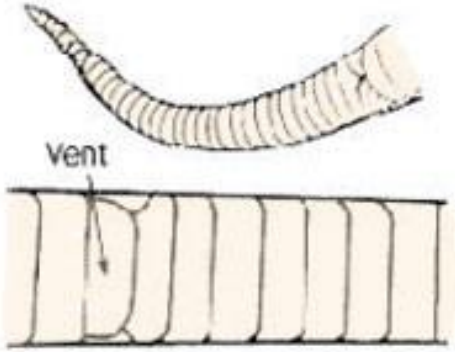




Cottonmouth (Venomous)

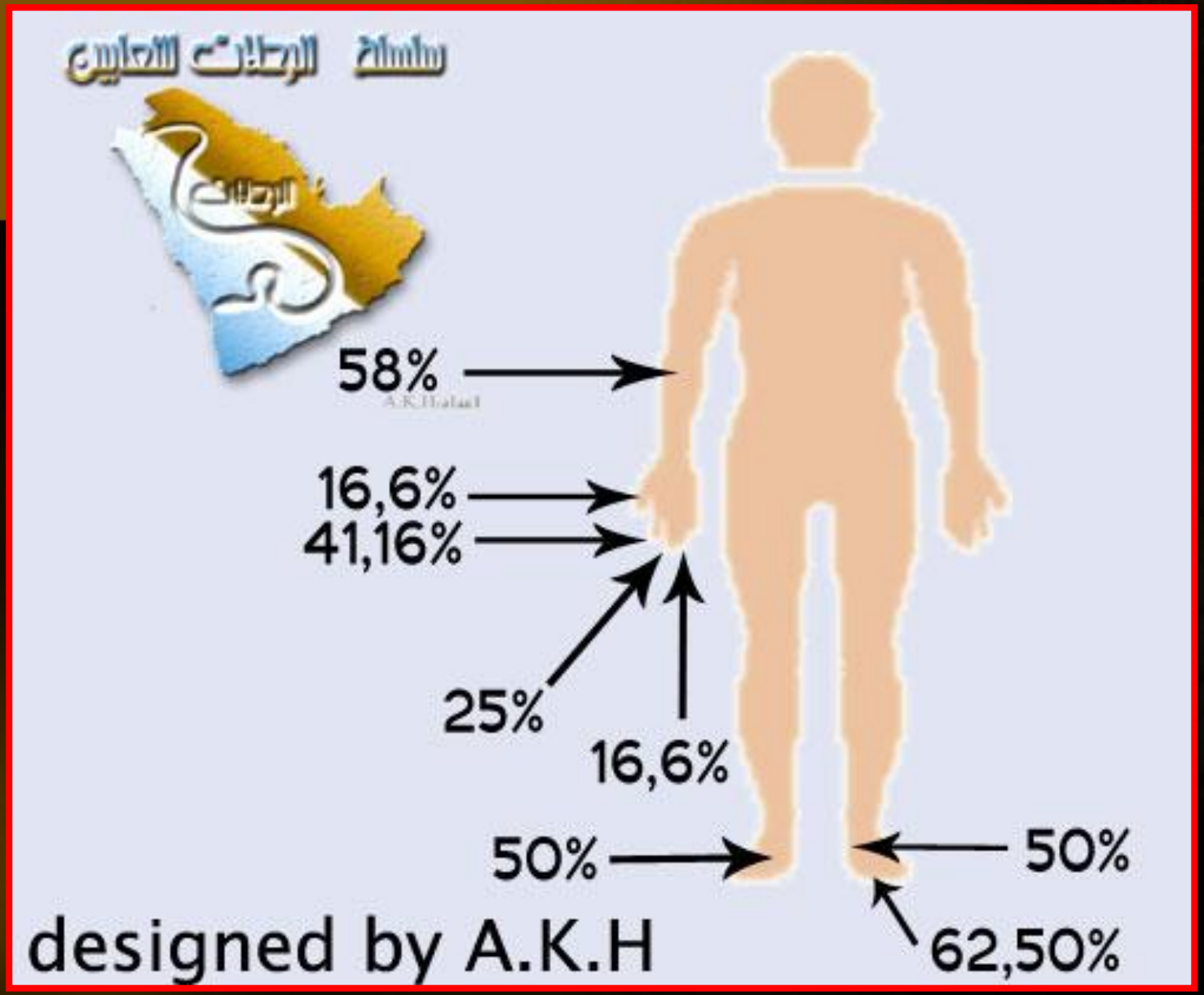







2013
www.shutterstock.com · 113952523


Happy New Year!
蛇


سلسلة الرحلات التعليمية
58%
16,6%
41,16%
25%
16,6%
50%
50%
62,50%
designed by A.K.H

Snakebite Factors

- Age, health and size of the snake
- Toxicity of the venom
- Condition of the fangs
- Injured or fed

Victim Factors

- Size
- Age
- Medical problems
- Anatomic location of the bite. (intravenous bites are almost fatal)
- Prior exposure (IgE)

Stage Zero

- Fang marks maybe present !
- Pain is minimal
- Mild Erythema
- No Systemic symptoms
- Labs: Normal

Stage ONE

- Minimal envenomation
- Fang marks
- Pain : significant
- Edema and Erythema (1- 5 inches)
- NO systemic symptoms
- Labs: normal

Stage TWO

- Severe pain !
- Local Symptoms: significant erythema and edema
- Petechiae ,echymosis or vesicles
- Nausea and Vomiting
- Temperature: mildly
- elevated

Stage THREE (Severe)

- Severe local symptoms and signs
- Tachycardia and Hypotension !
- Labs: High WBC, High CPK
- Coagulopathy : High PT , PTT and Bleeding time
- High D-dimer ,Low Plts , Low Fibrinogen
- Hematuria, Myoglobinuria
- Hepatic and renal impairment

Stage FOUR(Severe & critical)

- Severe local syptoms and signs
- Siginificat Systemic symptoms:

within 15 min

(weakness, N/V,vertigo,numbness,tingling of lips and face,cramps,fasciculation)

Rapid weak pulse

Convulsion, Coma, Cardiopulm. Arrest

Carpet Viper

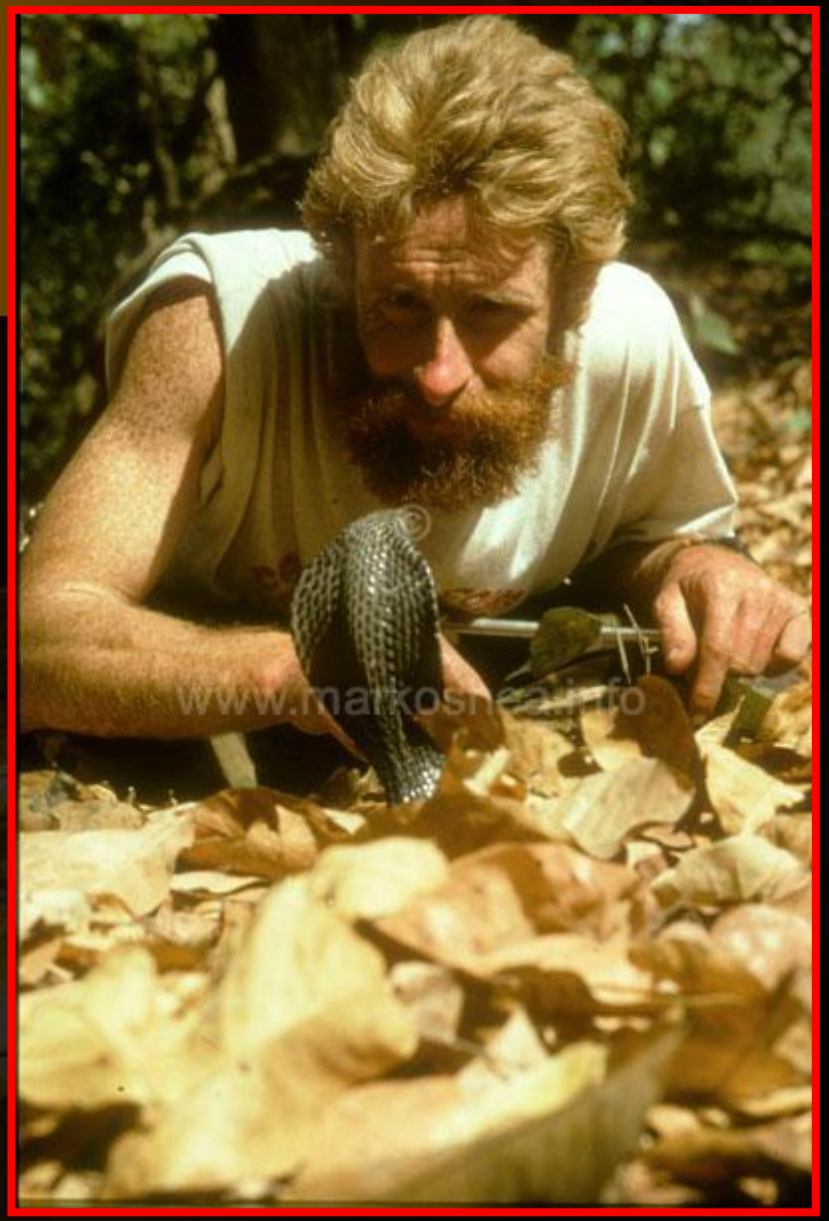
Nigerian Cobra

Puff Adder

Table 1 Presentations and outcomes of 16 patients who had amputations following snakebite

Characteristic	Frequency or value
Median age [range] (years)	12 [2–55]
Gender (male:female)	12:4
Site of bite	
– upper limb [possible compartment syndrome]	10 [3]
– lower limb	6
Responsible snake	
– carpet viper	13
– cobra	2
– puff adder	1
Systemic envenoming	
– non-clotting blood in WBCT20	13
– systemic bleeding	7
– drowsy	1
– none	3
Local envenoming features	
– swelling	16
– gangrene/infections	15
– severe blistering	4
– ischaemia/necrosis	4
Circumstances of bite	
– farming	4
– walking	3
– other	9
Delay before presentation, median [range] (days)	2.5 [0 – 28]
Pre-hospital management	
– traditional medicines	12
– tourniquet	3
– incision (+ black stone)	3
Treatment with antivenom*	
– monospecific EchiTAbG	12
– polyspecific Pan-African	3
Amputated segment	
– digit (finger)	10
– toe (± ray) amputation	4
– above-knee amputation	2
Length of stay, median [range] (days)	23 [4 – 74]
Outcomes	
– further management referral (skin grafting, 2nd wound care)	3
– absconded	2
– near or fully healed wound at discharge	11


MARK O'SHEA'S
REPTILE WORLD


www.markoshea.info

Anaconda

Snake Charmers !

Antivenins

Table 59-3 Antivenin Dosage for Pit Viper Envenomation*

ENVENOMATION	FABAV†	WYETH AV
Moderate	4–6 vials	4–6 vials
Severe	8–12 vials	5–10 vials
Very severe	12–18 vials	10–20+ vials

***** Antivenins *****

- 1)Two Large IV lines
- 2)Premedications
- 3)Initial dose prepared : Adult or Pedia?
- 4)Pregnancy?
- 5)Antivenins at the site?
- 6)Skin test?
- 7) Need for repeated doses?
- 8)Patients with asthma or allergy

Efficacy of Antivenins !

Intervention	Author; year; [reference]	Snake spp.	No. of pts	Method	Outcome
Antivenom	Agarwal et al.; 2005; [94]	mixed	55—needing ventilation	Low-dose vs. high-dose antivenom	No difference between high and low doses
Antivenom	Ha et al.; 2010; [175]	*B. multicinctus*	81	Non-randomized, controlled trial (historical control)	Antivenom effective—reduces duration of weakness, ventilation, and ICU stay
Antivenom vs. edrophonium	Watt et al.; 1989; [30]	*N. philippensis*	8	Randomized, double-blind trial	Antivenom not effective; Edrophonium effective
Antivenom; edrophonium	Phillips et al.; 1988; [69]	*D. russelii*	23	Descriptive case series	Antivenom not effective; Edrophonium not effective
Antivenom and neostigmine	Anil et al.; 2010; [27]	*B. caeruleus*	54	Descriptive case series	Antivenom not effective; Neostigmine not effective
Edrophonium	Watt et al.; 1986; [35]	*N. philippensis*	10	Randomized, placebo-controlled, double-blind, cross-over trial	Edrophonium effective—with improvement in clinical and neurophysiological parameters
Edrophonium and 3,4-DAP	Trevett et al.; 1995; [46]	*O. scutellatus*	50	Placebo-controlled trial	No significant improvement with edrophonium or 3,4-DAP

THANKS