

# Poisonous and Venomous Animals

Refer lecturer for course updated notes.

Students are obliged to follow the courses for evaluation process and presented notes are preliminary drafts for the whole evaluation process.

- Poisons are compounds produced in nonspecialized tissues as secondary products of metabolism that accumulate in the host animal or that accumulate in predators following ingestion of prey.
- Exposure- oral/dermal
- venoms are produced in specialized tissues or glands, and venomous animals have developed a variety of venom apparatuses (stingers, teeth, etc.) to deliver their venom to target animals—a process termed envenomation
- not composed of a single chemical substance but, rather, are mixtures of a variety of chemical compounds: peptides, amines, serotonin, quinones, polypeptides, and enzyme

# Arthropoda

- Araneae: Spiders
- 30,000 species of spiders are distributed throughout the world
- have eight segmented legs and bisegmented bodies composed of head/ thorax (prosoma or cephalothorax) and abdomen

# Widow Spiders (*Latrodectus* spp.)

- *L. mactans*, *L. geometricus*, *L. hesperus*, *L. Variolus*
- females toxic
- red or orange hourglass mark on the ventral abdomen
- contains  $\alpha$ -latrotoxin, a potent neurotoxin; opens cation-selective channels at the presynaptic nerve terminal;
- Massive release of acetylcholine and norepinephrine, which causes sustained muscular spasms.
- Hypertension and tachycardia, bronchorrhea, hypersalivation, hyperesthesia, lymph node tenderness
- Antivenin (Lyovac [*Latrodectus*], equine origin)—1 vial mixed with 100 mL crystalloid solution IV given slowly
- Benzodiazepines, Intractable hypertension—sodium nitroprusside.

# Brown Recluse- Violin Spiders

- *Loxosceles* spp.
- induce necrotic arachnidism, an indolent dermatonecrotic lesion mediated by the venom enzyme sphingomyelinase D, direct hemolysis of erythrocytes, platelet aggregation, renal failure, coagulopathy, and death
- Classic target lesion—ischemic area with a dark central eschar on an uneven erythematous background
- No available antivenom
- responds to cool compresses as sphingomyelinase D activity is temperaturedependent.
- Debridement of necrotic tissue
- Supportive therapy, Dapsone (1 mg/kg q8h for 10 days); for dermatonecrotic lesions; leukocyte inhibitor
- Do not use heat—exacerbates condition.

# Hobo Spiders (*Tegenaria agrestis*)

- Males are more venomous than females and are more likely to bite
- ruptures and there is a serous discharge from the wound-long time to heal
- The signs may progress to vomiting (often intractable), watery diarrhea, and bone marrow destruction resulting in anemia, pancytopenia, and thrombocytopenia.
- Fatalities are rare
- Supportive/Symptomatic

# Tarantulas

- Theraphosidae
- urticating hairs on their abdomen that possess spines and barbs that can penetrate skin- tarantulas can stroke their abdomen and flick the urticating hairs at their attacker- inflammation of the skin, eyes, mouth, and respiratory tract.
- no toxin associated with the hairs.
- Urticaria, edema, and vasodilation may occur in the skin.
- Eyes, swelling of the lids and corneal abrasions

# check

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## Venomous Spiders of Turkey (Araneae)

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### Abstract

Over 50.000 species have been described on the world. Among them about 100 species are dangerous for human. Members of *Latrodectus* and *Loxosceles* share the habitats of human beings. Chemically, spider venom is heterogeneous, and contains poly peptide, poly amine, nucleic acid, free amino acid, monoamine, neurotoxin, enzyme and inorganic elements. In enzymes, proteases, hyaluronidase, sphingo-myelinase, phospholipase and isomerase form necrosis. Venom is neurotoxic, and it causes paralysis. In Turkey, some species of *Latrodectus*, *Steatoda*, *Loxosceles*, *Cheiracanthium*, *Segestria*, *Agelena*, *Tegenaria*, *Araneus* and *Argiope* are venomous. The specimens that collected from different habitats and localities of Turkey were examined under stereo microscope. They were identified as species level, and the venom organs of some spiders were investigated morphologically with the light and electron microscope.

**Key words:** Spider, Venom, Turkey, Araneae.

(Walckenaer, 1806) are dangerous. They can be seen in many places in Turkey.



1. *Latrodectus mactans*



**Violin Spiders** (Loxoscelidae): *Loxosceles rufescens* (Dufour, 1820) (Fig. 4). It is dangerous. It likes cellars huts; workshops etc., and go into shoes, boots and jump suit. Also, it is hided under cardboards, panels and pictures on walls. In North America, more than 80 percent of the spider bites are because of this species. The venom forms a button first. The swelling recedes and turns a reddish reaction area (lesion). Then it transforms a necrosis (gangrene, Fig. 5). This species was seen in Mardin, Muğla, Hatay and Elbistan (Kahramanmaraş). *L. reclusa* Gertsch & Mulaik, 1940 that distributed in North and South America, the Pacific Islands, Africa and some Mediterranean countries is more dangerous. Besides of necrosis its venom can cause haemolysis, disorder ness in coagulation and death. Dispersion of *L. rufescens* from the South America and Africa to the northern is by planes and ships.



Figure 4. *Loxosceles rufescens*

**Foliage Spiders** (Clubionidae): These spiders are mostly found in fallen foliage in gardens and fields. However, the most dangerous species *Cheiracanthium punctiorium* (Willers, 1789) and *C. mildei* Koch L., 1864 (Fig. 6) live in or around houses. Like *L. rufescens* this species prefers cellars and workshops. It is attractive. Epidemiology of cheiracanthism looks like that



# Scorpions

- arachnids with two body divisions: the combined head and thorax
- neurotoxins : block voltage-sensitive sodium and potassium channels in nerves
- $\alpha$ -scorpion toxin - Androctonus, Leiurus, and Buthus spp. and
- $\beta$ -scorpion toxin - Centruroides spp.
- Both toxins - Tityus spp.
- Symptomatic treatment: control of hypertension, heart rate changes, and neurologic signs.
- antivenom

- In Turkey, *A. crassicauda*, *L. quinquestriatus*, *M. gibbosus*, and *M. eupeus* have been considered dangerous to humans

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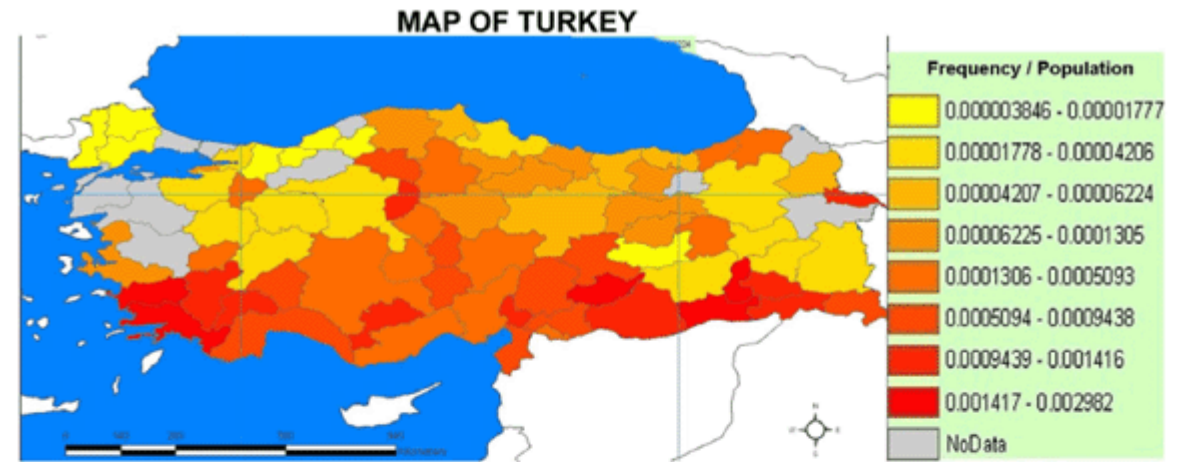


Figure 1. Distribution of scorpion stings according to the provinces of Turkey. The risk of scorpionism was assessed based on the sting frequency/population ratio.

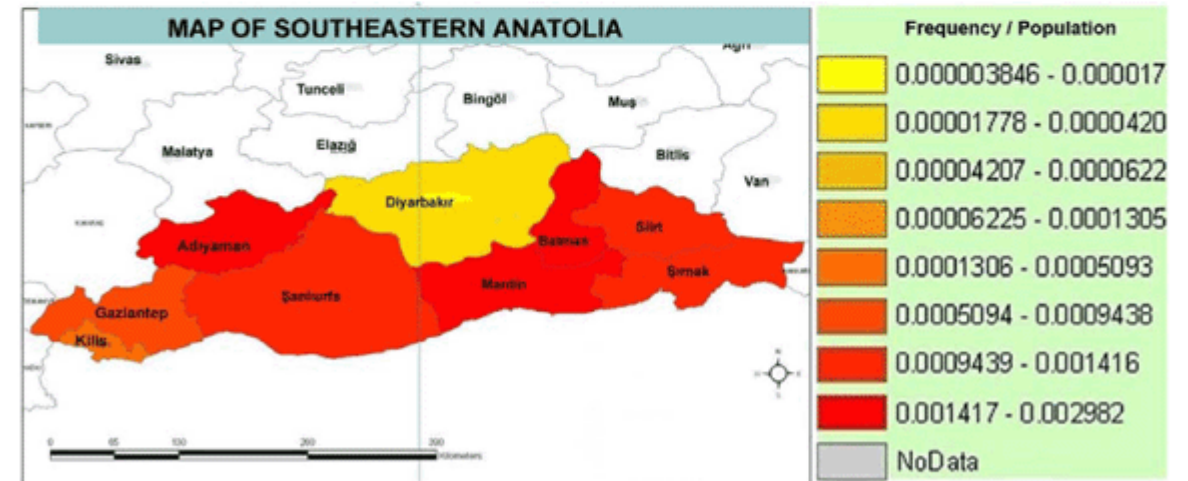


Figure 2. The Southeastern Anatolia region with its provinces according to occurrence of the highest morbidity ratios.

# Leiurus abduallahbayrami

A newly described scorpion species, *Leiurus abduallahbayrami* (Scorpion: Buthidae), and the lethal potency and in vivo effects of its venom

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- hyperexcitability, agitation, aggressive behavior, squeaking and fighting, tachypnea, weakness, convulsions, and death due to cardiac and respiratory failure



# Scorpion antivenom production in Turkey

Turk Hij Den Biyol Derg. 2008; 65(2): 97-108

## Scorpion Antivenom Production

Özcan Özkan

Refik Saydam Hifzısıhha Merkez Başkanlığı, Ankara

Scorpions do not harbor agents of disease but, they cause envenomations by stinging humans and animals, most of the time to protect themselves. Scorpion antivenom treatment is still the only method used for therapy of scorpionism cases. Antivenom is produced by injecting a small amount of the venom into an animal such as horse, sheep, goat, or camel. These animals develop an immune response against the venom's active molecule. Antibodies produced in animal's blood were taken in regular intervals. Plasma was separated from collected blood. It purified by different chemical process and used to treat of scorpion stings. In Turkey, scorpion antivenom has been produced in Refik Saydam Hygiene Center since 1942. The protocol of scorpion antivenom production was explained in this study.

**Keywords:** Scorpion, antivenom, production, protocol

# Toad Venom Toxicosis

- Colorado River toad (*Rhinella alvarius*) and marine or cane toad (*R. marina*); marine toad more toxic
- indole alkyl amines (similar to the street drug LSD), cardiac glycosides, and noncardiac sterols
- Decontamination, maintain airway, atropine (0.04 mg/kg IM, esmolol/propranolol, Digoxin-specific Fab fragment

# Myriapoda: Centipedes and Millipedes

- long, flat, multisegmented body with one (centipede) or two (millipede) legs emerging from each body segment.
- Larger centipedes - painful bites -local swelling, erythema, and lymphangitis.
- Scolopendra spp- legs tipped with sharp claws - penetrate skin, and
- toxin produced at the attachment point of each leg may drop into these wounds, causing inflammation and irritation due to mast cell degranulation
- phospholipase A2, metalloproteases, and hyaluronidase, serotonin, a  $\beta$ -pore-forming compound, a hemolysin ( $\gamma$ -glutamyl transpeptidase), and histamine

- Reptila- Squamata
- Lizards- Heloderma suspectum and Heloderma cinctum

Component	Effects
Gilatoxin	"Lethal factor," kallikrein-like activity, pain, hypotension
Helodermin	Vasodilation, hypotension
Helospectin I and II	Vasodilation, hypotension
Helothermine	Lethargy, paresis, hypothermia
Hyaluronidase	"Spreading factor," degrades connective tissue
Phospholipase A <sub>2</sub>	Inhibition of platelet aggregations

- Aves-New Guinea, Pitohui ("rubbish bird") and Ifrita, ("bitter bird") have poisonous secretions on their feathers, most likely as means of defense against predators

# Snakes

- 600 known venomous snakes belong to the following four families: Atractaspidae, Colubridae, Elapidae, and Viperidae.
- The Crotalidae is a subfamily of Viperidae and includes pit vipers, the moccasins, and rattlesnakes, while coral snakes belong to the Elapidae.
- Snakes are cold-blooded, carnivorous vertebrates that possess no mandibular joint, thereby permitting them to swallow their prey whole. Their teeth are curved backward, allowing them to pull food into the throat without its being chewed.

## *Crotalidae* (Pit vipers)

Rattlesnakes

Copperhead

Water moccasin

## *Elapidae* (the elapids)

Cobra

Coral snake

Krait

Tiger snake

Mamba

## *Hydrophidae*

Sea snake

## *Viperidae*

Russel viper

Puff adder

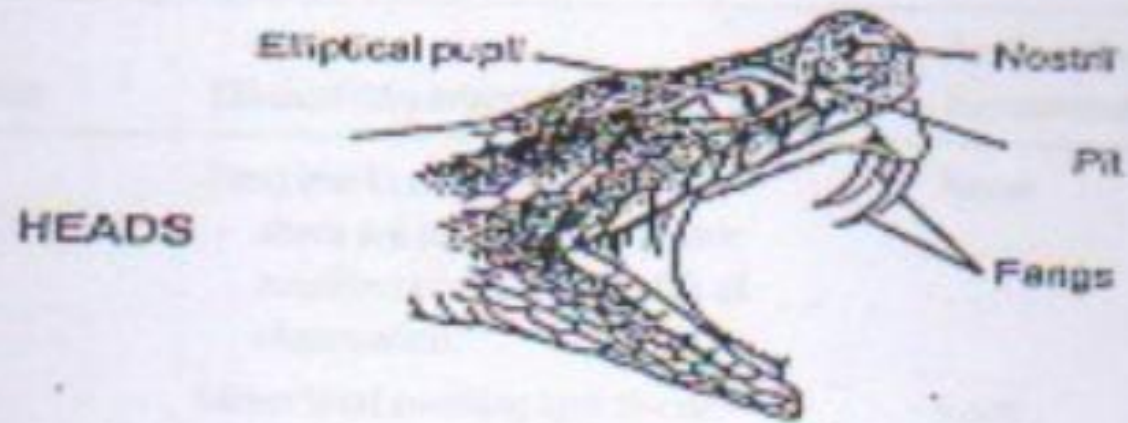
## *Columbridae*

Boomslang

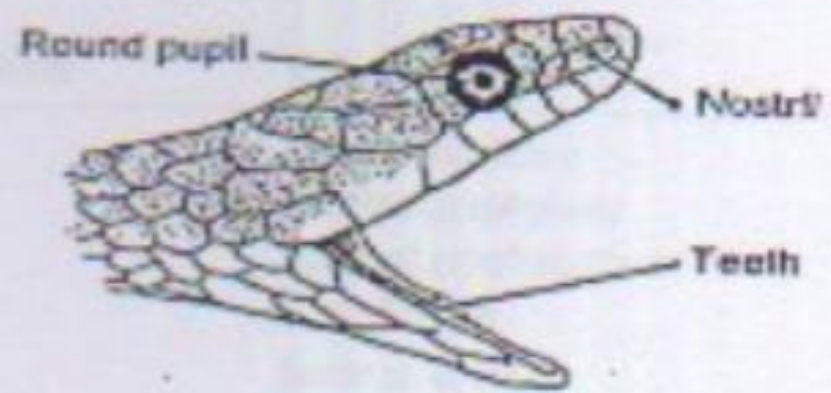
Mangrove



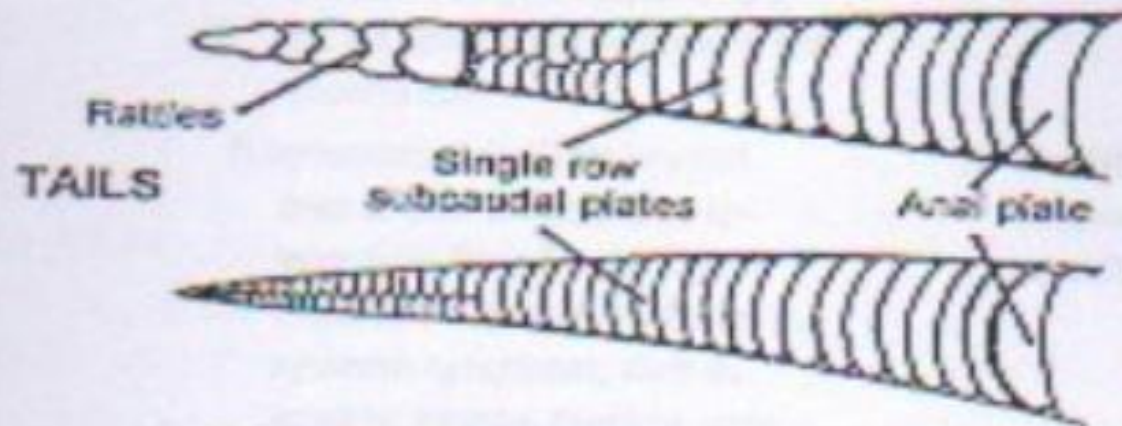
**POISONOUS  
(pit vipers)**



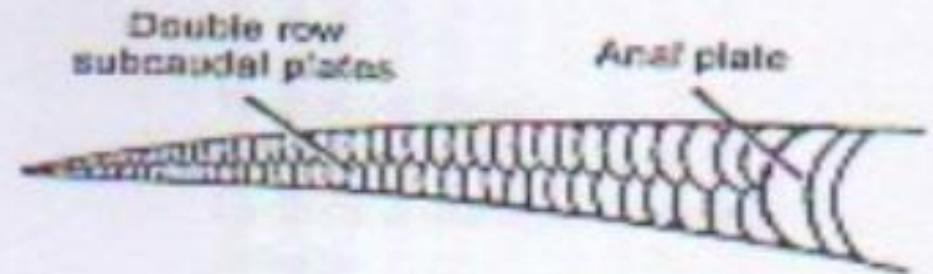
**HARMLESS**



**RATTLESNAKES**



**COPPERHEADS AND COTTONMOUTHS**



# Snakes

- Snake venom contains biologically active ingredients with cytotoxic, neurotoxic, and coagulant effects.
- Phosphodiesterases that lower blood pressure and phospholipase A2 that causes hemolysis are most significant.
- Snake venoms are complex mixtures, chiefly proteins, many having enzymatic activity.
- Although the enzymes contribute to the deleterious effects of the venom, the lethal property and some other toxic effects may be due to certain of the relatively small polypeptides.
- Crotalid venoms produce changes in capillary walls that can lead to the loss of fluid into tissues, particularly into the envenomated part, but sometimes into various organ systems, followed by the loss of electrolytes and proteins, and finally by the loss of red blood cells into the tissues.
- These phenomena are seen clinically as edema, ecchymosis, hypoproteinemia, and hemoconcentration.

# Snakes

- Disruption of the normal blood clotting pathways is significant. Some prevent clot formation and induce hemorrhagic shock. Other toxins induce clotting, causing stroke and heart attacks by blocking blood flow.
- Cardiotoxins bind to muscle cells causing depolarization and prevention of muscle contraction, thus interfering with the rhythmicity of the heart. Snake bites usually are noted in dogs bitten on the head or neck.

- ***According to the dominant venom:***
- ***-Hemotoxic: Family: viperidae***
- ***e.g. vipers (Cerastus)***
- ***-Neurotoxic: Family: Elapidae***
- ***e.g. cobra (Naja haj haj; Naja nigrocollis)***

- The poison of *Elapidae* is neurotoxic and paralyzes the respiratory centrum.
- The poison of *Viperidae* has a hematotoxic, necrotic and anticoagulant effect.

- The biting with snakes usually occurs in dogs, and may be fatal. In cattle and horse the death occurs only if the bite site is located on the head, neck and dyspnoea is caused by edema.
- Ice pack
- lyophilized polyvalent anti-snake venom
- 5% DNS (Dextrose Normal Saline), Dexamethasone (2 mg/kg), Atropine sulphate 0.04mg/kg i/m