

Envenomations

Envenomations – Arthropod Bites and Stings

Introduction

- Envenomation refers to the injection of venom into a person through a bite or sting by venomous arthropods.
- In clinical toxicology, envenomation is classified as a toxic exposure, due to the bioactive compounds in venom that interfere with various physiological systems.

Common Arthropods Involved:

- **Insects** (e.g., bees, wasps, hornets, ants)
- **Arachnids** (e.g., spiders, scorpions, ticks)
- **Myriapods** (e.g., centipedes)

Venom Components:

- Neurotoxins
- Cytotoxins
- Hemotoxins
- Enzymes (e.g., phospholipases, hyaluronidase)
- Biogenic amines (e.g., histamine, serotonin)
- Peptides and proteins that disrupt cellular and immune functions

Pathophysiology of Envenomation

The clinical manifestations of arthropod envenomations are driven by the type and concentration of toxins in the venom.

A. Neurotoxins

- Affect ion channels (sodium, potassium, calcium)
- Interfere with neurotransmitter release
- Cause muscle paralysis, tremors, or excessive stimulation

B. Cytotoxins

- Cause cellular damage and necrosis
- Lead to local tissue injury and ulceration

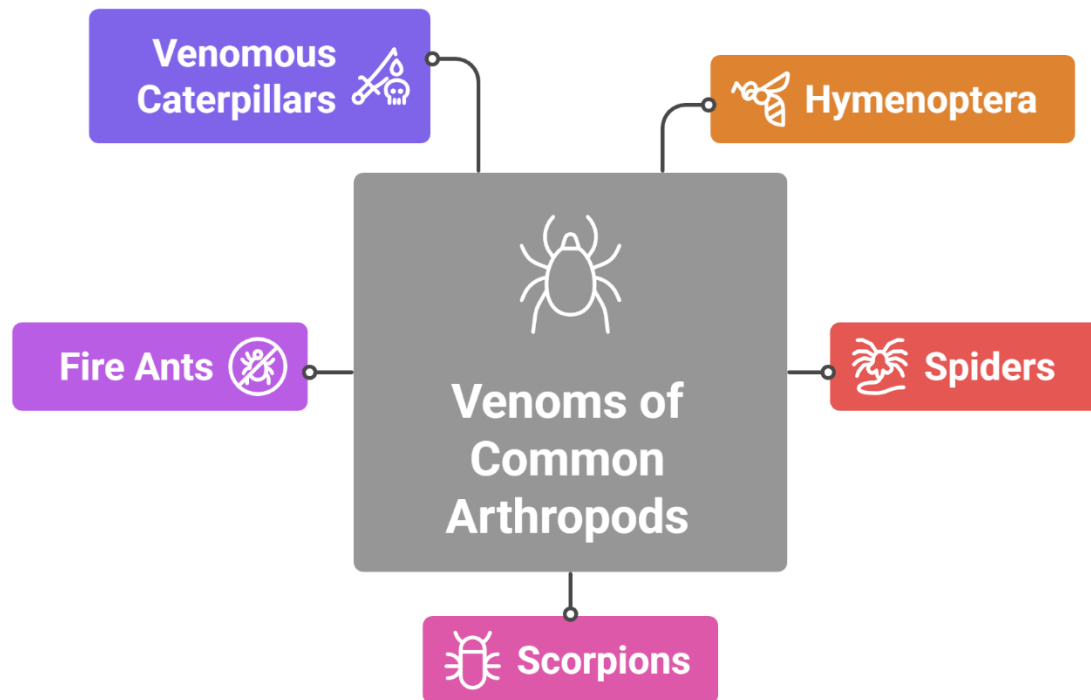
C. Hemotoxins

- Disrupt blood clotting mechanisms
- Cause hemolysis, thrombocytopenia, or disseminated intravascular coagulation (DIC)

D. Immunologic Responses

- Immediate hypersensitivity (anaphylaxis)
- Delayed hypersensitivity (serum sickness-like reactions)
- Systemic inflammatory responses

Venoms of Common Arthropods



1. Hymenoptera (Bees, Wasps, Hornets, Ants)

Venom Components:

- Melittin (bees): disrupts cell membranes
- Phospholipase A2: causes cellular lysis
- Hyaluronidase: promotes venom spread
- Histamine and serotonin: mediate pain and inflammation
- Mast cell degranulating peptides: contribute to allergic reactions

Clinical Presentations:

1. **Local reactions:** pain, swelling, erythema, pruritus
2. **Large local reactions:** edema >10 cm, lasting over 24 hours
3. **Systemic toxic reactions** (especially after multiple stings):
 - Rhabdomyolysis
 - Hemolysis
 - Acute renal failure
 - Liver injury

4. Anaphylaxis (IgE-mediated):

- Urticaria
- Angioedema
- Wheezing, bronchospasm
- Hypotension, cardiovascular collapse

Toxicological Importance:

- A high number of stings (e.g., >50–100) can cause direct toxic effects, even in non-allergic individuals.

2. Spiders

Key Toxic Species:

- **Latrodectus spp.** (Black widow spiders)
- **Loxosceles spp.** (Brown recluse spiders)

Latrodectism (Black Widow Envenomation)

- Venom contains **α-latrotoxin**
- Induces massive neurotransmitter release
- Clinical effects:
 - Severe muscle cramps
 - Abdominal rigidity (may mimic surgical abdomen)
 - Hypertension, tachycardia
 - Agitation, sweating

Loxoscelism (Brown Recluse Envenomation)

- Venom contains **sphingomyelinase D**, a cytotoxic enzyme
- Causes:
 - Local necrosis and ulceration
 - Rarely, systemic effects such as hemolysis, DIC, acute renal failure

Toxicology Note:

- Antivenom is available for black widow bites but not commonly used due to rarity of severe cases.
- Brown recluse bites are managed supportively; early surgical intervention is generally avoided.

3. Scorpions

Medically Important Genera:

- **Centruroides spp.** (notably in the Americas)
- **Androctonus spp., Leiurus spp.** (Middle East, North Africa)

Venom Effects:

- Contains neurotoxins affecting sodium and potassium channels
- Induces autonomic nervous system hyperactivity

Clinical Syndrome (Scorpionism):

- Excessive sympathetic and parasympathetic stimulation:
 - Hypersalivation
 - Sweating
 - Lacrimation
 - Tachycardia, hypertension
 - Restlessness, muscle twitching
 - Respiratory distress (especially in children)

Toxicology Note:

- Antivenom (e.g., Anascorp) is effective in severe envenomation
- Supportive care and benzodiazepines are mainstays of treatment

4. Fire Ants (*Solenopsis* spp.)

Venom:

- Contains alkaloids (mainly piperidine derivatives)
- Acts as a cytotoxin and allergen

Clinical Features:

- Burning pain, followed by formation of sterile pustules
- Localized inflammatory response
- Risk of anaphylaxis in sensitized individuals

Toxicology Note:

- Repeated exposure increases risk of allergic sensitization

5. Caterpillars and Lepidoptera Larvae

Notable Species:

- *Lonomia obliqua* (South America)

Venom Effects:

- Hemorrhagic syndrome

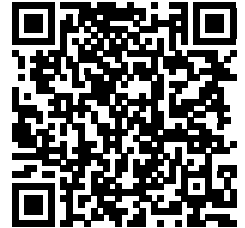


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