

General Arthropodology

MEDICAL IMPORTANCE OF ARTHROPODS

■ Indirect Impacts

■ Transmit of Vector-Borne Diseases

A) Mechanical Vector

- Transmit by biting
- Transmit by contact

B) Biological Vector

- Transmit by biting (blood feeding)
- Transmit by swallowed vector

MEDICAL IMPORTANCE OF ARTHROPODS

- Transmit of vector-borne diseases.
 - Some arthropods transmit bacteria, virus, protozoa, helminthes and fungus to humans and animals
 - There are many arthropod borne diseases.
 - Blood feeding arthropods.
- Vector
 - A) Mechanical Vector
 - B) Biological Vector

Mechanical Vector

- A vector that conveys pathogens to a susceptible individual without essential biological development of the pathogens in the vector.
- No developmental processes
- No production
- There are two type mechanical vectors.
 - Transmit by biting
 - Transmit by contact

Mechanical Vector

Transmit by biting

- Blood feeding arthropods.
 - Transmission occur during blood feeding
 - For example;
 - *Tabanus- Trypanasama evansi*
 - 24 hours is important

Mechanical Vector

Transmit by contact

- No blood-feeding
- Transmission occur by contact
- Carried by foot, wing, mouth parts.
 - House flies
 - Cockroaches

Biological Vector

- An arthropod vector in whose body the infecting organisms develops or multiplies before becoming infective to the recipient individual.
- There are two type.
 - Transmit by biting (blood feeding)
 - Transmit by swallowed vector

Biological Vector

Transmit by biting (blood feeding)

- Blood-feeding arthropods
- Vectors
 - Producer
 - The organism replicates in the vector, but does not change shape.
 - For example; Plague-flea
 - Developer
 - The number does not increase, but the shape changes.
 - Elephantiasis (*Wuchereria bancrofti*)- mosquitoes
 - Both producer and developer
 - Both the organism replicates in the vector and the shape changes.
 - *Plasmodium*- *Anopheles*
 - *Trypanosoma*- *Glossina*

Biological Vector

Transmit by swallowed vector

- Transmission occurs by swallowed arthropod vectors.
 - *Hepatozoon canis*-*Rhipicephalus sanguineus*
 - *Diphilidium caninum* and *Hymenalepis diminuta*-flea

Transmission routes

- Salivarian transmission
- Stercorarian transmission
- Regurgitation transmission
- Swallowing transmission
- Contact transmission

Other medical fields which arthropods are used

- Honey-bee products (Honey, pollen, propolis) is used in treatment of many diseases.
- Maggot therapy
 - Unhealed wounds (eg. diabetes)
 - *Lucilia serricata*
- Forensic Entomology
 - Determining the time of death.

ARTHROPOD-HOST RELATIONSHIP

- A part of arthropods have evolved as completely parasitic life.
- Some have evolved as completely non-parasitic life.
- Infestation?
- Host?
- Arthropod-Arthropod parasite
 - *Varroa destructor*-honey bee
 - Super parasitism
 - Mite (*Macrocheles muscadomestica*)-Black fly

ARTHROPOD-HOST RELATIONSHIP

■ Obligate parasitism

- An obligate parasite is a parasitic organism that cannot complete its life-cycle without exploiting a suitable host.
 - Ticks,
 - Fleas
 - Mosquitoes
 - Lice
 - Scabies mites

ARTHROPOD-HOST RELATIONSHIP

- Permanent obligate parasitism
 - Scabies mite
 - Lice
- Temporary obligate parasitism
 - Flea
 - Tick
 - Mosquito

ARTHROPOD-HOST RELATIONSHIP

■ Facultative parasitism

- An organism that lives independent of a host but may occasionally be parasitic under certain conditions.
- Wound myiasis
 - *Sarcophoga* larvae
 - *Wohlfahrtia* larvae

ARTHROPOD-HOST RELATIONSHIP

- Only larval stage parasitism
 - *Oestrus ovis*
 - *Gastrophilus*
 - *Hypoderma*
- Only adult stage parasitism
 - Mosquitoes
 - Fleas

ARTHROPOD-HOST RELATIONSHIP

- Monoxen parasites-Only one host
 - Scabies mite
 - Lice
- Heteroxene parasites- More than one host
 - Ticks
 - One-host ticks (*Rhipicephalus annulatus*)
 - Two-host ticks (*Hyalomma marginatum*)
 - Three-host ticks (*Ixodes ricinus*)

ARTHROPOD-HOST RELATIONSHIP

- Some parasitic arthropods are specific to one host.
 - *Gastrophilus*- Equidae,
 - *Hypoderma bovis* -Cattle
 - *Oestrus ovis* -Sheep
- Some do not prefer specific host and use many host.
 - Flea
 - Some ticks
 - e.g. *Ixodes ricinus* can feed from more than 200 hosts.

STRUGGLE WITH ARTHROPODS

- The ways to fight against parasites have been standardized by WHO (World Health Organization)
- To control arthropods;
 - to remove breeding and feeding places
 - Or to eliminate certain life stages of parasites
- The following types of methods are used to fight arthropods.
 - Cultural struggle
 - Mechanical physical struggle
 - Biological struggle
 - Chemical struggle

Cultural struggle

- Environmental cleaning
- Appropriate reconstruction
- Infrastructure and drainage
- Regular removal of feces
- Trash cleaning

Mechanical physical struggle

- This method is mostly respectful to the environment.
 - Grooming of animals
 - Removing or collecting of few amount of parasites
 - Fly lines
 - Fan (ventilator)
- For example; For argasid ticks, to use of nylon or tin to walls
 - Argasids can not climb to the flat

Biological struggle

- This method is also respectful to the environment
- Can be carried out in various forms
 - Sterilizing of arthropods
 - Use of radiation
 - Stop the developmental stages of arthropods
 - Inhibit of chitinizations
 - Use of natural predators!
 - *Bacillus thuringiensis*
 - Some fish for mosquito larvae
 - Removal of suitable hosts

Chemical struggle

- **Pest:** Pest are living organisms that occur where they are not wanted or that cause damage to crops or humans or other animals.
 - Weed
 - Arthropod
 - Mice etc.
- **Pesticide:** A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling, or mitigation any pest.
 - Used pesticide:
 - 75% in agriculture
 - 15% in farming
 - 10% in humans

Chemical struggle

- Chemicals must be preferred as a last resort for eliminate of arthropods and must be used in obligatory situations.
- Must be used in a conscious way,
- Otherwise, It must not be forgotten that the unconscious use of chemicals may result in irreversible damage in short or long term.
- Most of Pesticides;
 - Teratogen
 - Mutagen
 - Carcinogenic
- Can also remove beneficial arthropods in nature.
- Resistance is also important issue.

Classification of Pesticides

■ -cide

- Insecticide: for insects
- Acaricide: for mite (acar)
- Fungicide: for fungus
- Avicide: for birds
- Herbicide: for weed (wild herb)

Classification of Pesticides

According to the effect way

- Respiratory poisons
- Contact poisons
- Systemic poisons
- Repellents
- Stomach poisons

Classification of Pesticides

According to life stage of arthropods

- Ovicide: Effective for eggs
- Larvaecide: Effective for larvae.
- Pupicide: Effective for pupa
- Adulticide: Effective for adults

Classification of Pesticides

According to the application methods

- Pour-on
- Spot-on
- Powder
- Bath
- Spray
- Ear tag or leash
- Feed additive

Classification of Pesticides

According to the chemical structure

- **Synthetic Organic Matters:** Organic phosphorus, karbomat, Organic chlorinated, tiasianat, nitrofol, formamidin (amitraz) etc.
- **Inorganic Matters:** As, Pb, Hg, etc.
- **Herbal Procusts and synthetics:** Pyrethrin, Pyrethroids, rotenon etc.
- **Microbial:** Avermectins (ivermectin, doramectin etc.)
 - *Bacillus thurungiensis* *israiliensis* and *Bacillus sphericus*

THE CLASSIFICATION TERMS OF ARTHROPODS

- Phylum Spesific name.
- Subphylum Spesific name.
- Class: “ea”
- Order: “ida”
- Suborder “ina”
- Upper-family “dea”
- Family “idae”
- Sup-family “inae”
- Genus Spesific name. *Hylomma*
- Species Spesific name. *Hylomma marginatum*