General Arthropodology

MEDİCAL 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

MEDİCAL 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 organizm 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 dimunuta*-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 RELATİONSHIP

- 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 RELATİONSHİP

- 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 RELATİONSHİP

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

ARTHROPOD-HOST RELATİONSHİP

- 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 RELATİONSHİP

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

ARTHROPOD-HOST RELATİONSHİP

- 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 RELATİONSHİP

- 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 fed 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
  - Inhabit 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 eleminate 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
  - İnsecticide: for insects
  - Acaricide: for mite (acar)
  - Fungucide: 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*