Lecture 1: Introduction to Helminthes
General characters of helminthes

- Helminthes are macroscopic & multicellular.
- Bilaterally symmetrical.
- Have special adaptations for the parasitic mode of life & for survival.
- Like the complete absence of the Digestive tract or greatly reduced consist of mouth & blind sac only this is because of their location in the host intestine or tissue where predigested nutrient are abundant.
In Trematodes the Digestive system is partially loss. In Cestodes there is no Digestive system.

**While in Nematodes** the Digestive system is complete. -There is special adaptation in Trematode & Cestode, presence of a coat of microvilli on the outer surface of the **tegument** for nutrient absorption. -Internal parasite possesses all sorts of adaptation like hooks, suckers, boring apparatus, etc........
Reproductive system is very well developed. (Self-fertilization, cross fertilization may take place. They are monocious or diecious).

- **Eggs** are produced in large numbers or few of them survive & manage to infect a suitable host.  
- **Helminthes do not multiply** in human body so the number of individuals in a worm population living within a given host does not exceed the number of infective eggs or larvae that enter from the external environment.

- **However** reproduction by autoinfection to increase parasite population occur e.g. **pin worm** by ingestion eggs through contaminated fingers.
- Helminthes (adult worm, their eggs, larvae) can be distributed in various organs & tissues of the body.
- Most of the infected people with helminthes are **symptomatic carriers**, and the diseased individual among the infected groups are those with heaviest worm burden.
- The terms **Light, moderate, heavy** applied to worm burden are relative & differ for various **species of helminthes** and in people of different **age & physical status**.
- The number of eggs or larvae eliminated in feces, urine, sputum is roughly proportional to the number of worms generating them.
- In heavy infection (crowded worms) the collective egg output is great but egg output/worm is low.
- The coexistence of several species of helminthes in the same individual is widely prevalent, we called it Polyhelminthism.

- Many worms may be quite restricted in distribution. Since they require certain environmental conditions (temp, humidity, nature of soil, etc…) also presence of intermediate host. (e.g. Schistosomes) require certain species of snails as intermediate host which in turn require specific environments for survival. Hook worms as e.g. during their phase in soil require proper conditions of temp., moisture & soil texture in order to survive & continue their life cycle.
-The life cycle of the helminths is either Direct or simple involving only one host species, or indirect or complex involving more than one host.
-Certain helminthes include in their life cycle special kind of transmission called Paratenesis involving paratenic host which provide the parasite with protection, support & availability to its final host.
Helminths are **transmitted** through contaminated water, soil, food. And the modes of infection are:-

a) **Oral ingestion:**
Most of the worm transmitted through ingestion of infective stage (either egg, larva through intermediate infective host)

b) **Skin penetration:** (e.g. Schistosome)

b) **Inhalation:** Very rare (pin worm)

d) **Insect bites:** (e.g. in Filariasis).

- The portal of exit depend on the habitat or localization of the adult worm, if it is in the intestine (eggs in feces), in the urinary tract (eggs in urine), in the Respiratory system (eggs in sputum).
Pathogenesis of parasitic infection

The effects produced by parasitic worm depend on:

1) The organs or tissues occupied or unusual site for their occurrence
2) Number of adult worm harbored (severity or intensity of infection).
3) Species of helminth parasite. (some are potentially dangerous)
4) Re infection (repeated exposure)
5) Immunity of the host

Immunological responses are of great importance in parasitic diseases. Since they present a large number of antigens to their hosts. So in this case the host may elaborate specific antibodies to counteract the antigen produced as may wall off the pathogen or its products cellular infiltration, proliferation & differentiation. Some helminths parasite have special mechanism for evasion the immune response (e.g. Schistosomes adsorb host proteins on their surfaces)
Pathogenic effects of parasite
- Physical trauma, or destruction of cells, tissues, organs by mechanical or chemical means.
- The parasite cause damage externally on the skin at the site of invasion (e.g. hook worm, Schistosome cercaria) or internally (attachment of hook worm, taeniasis).
- Irritation of tissues by extruding their eggs into them (e.g. Schistosome) or by movement & migration of adult & larvae cause initiation of intestinal wall (e.g. Taenia solium).
- Mechanical pressure by the growing & developing of cestodes larvae (e.g. hydatid cyst) causing atrophy of the neighboring organ.
- Intestinal obstruction: Due the size & number (e.g. Ascaris “worm ball”)
- Intestinal perforation (e.g. Ascaris, Strongyloides)
- Production of anemia. Due to sucking blood (e.g. Hook worm) or due to vit. B12 depletion (e.g. Fish tape worm).
Reaction
- All worms that live or migrate in blood or tissue sensitize the body to their section or execution or to parasite surface glycoprotein & polysaccharides causing allergic reaction.

- A characteristic feature of an allergic reaction is an increase in the number of eosinophils so eosinophilia is a general sign of helminthic infections.

- Besides eosinophilia, common signal of occult helminthic infection are hepatomegaly, pneumonitis, brouchial asthma, urticaria, sub cutaneous cysts, neurologic disturbance & deviations in behaviour.

- So must of the pathological features of helminthic infection not due to direct action of the parasitic on tissue but on host’s response to the product of parasite eggs, larvae & soluble antigens.