

# Some interesting websites

- [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)
- [www.eric.ed.gov](http://www.eric.ed.gov)
- [www.who.int/hinari](http://www.who.int/hinari)
- [www.cdc.gov](http://www.cdc.gov)
- [www.thefreedictionary.com](http://www.thefreedictionary.com)

# SYMBIOSIS

**Two different organisms living in close association  
3 types if we consider the degree of association**

| COMMENSALISM   | MUTUALISM   | PARASITISM  |
|--|---|---|
| 'EATING AT THE SAME TABLE'                                 |   |   |
| Association where one benefits but the other is not harmed | Both organisms are dependant of each other and both benefit | Association where one benefits at the expenses of the other |
|  | One does not survive without the other                      |   |
| <i>e.g. Entamoeba gingivalis in man's mouth</i>            | <i>e.g. Flagellates in the guts of termites</i>             | <i>e.g. Ascaris, malaria, etc.</i>                          |
|  | Help to digest ingested wood                                |   |

**All have interest to have a long relationship !**



# The burden of some major parasitic infections

| Parasite   | Diseases  | No. people infected                | Deaths/yr  |
|--|---|------------------------------------|--|
| <i>Plasmodium</i>                                    | malaria   | 273 million                        | 1.12 million   |
| Soil transmitted helminths:                          |   | 2 billion                          | 200,000  |
| • Roundworm ( <i>Ascaris</i> )                       | Pneumonitis, intestinal obstruction                 |                                    |  |
| • Whipworm ( <i>Trichuris</i> )                      | Bloody diarrhoea, rectal prolapse                   |                                    |  |
| • Hookworm ( <i>Ancylostoma</i> and <i>Necator</i> ) | Coughing, wheezing, abdominal pain and anaemia      |                                    |  |
| <i>Schistosoma</i>                                   | Renal tract and intestinal disease                  | 200 – 300 million                  | 15,000   |
| Filariae   | Lymphatic filariasis and elephantiasis              | 120 – 250 million                  | Not fatal but 40 million disfigured or incapacitated |
| <i>Trypanasoma cruzi</i>                             | Chagas disease (cardiovascular)                     | 13 million                         | 14,000   |
| African trypanosomes                                 | African sleeping sickness                           | 0.3 – 0.5 million                  | 48,000   |
| <i>Leishmania</i>                                    | Cutaneous, mucocutaneous and visceral leishmaniasis | 12 million; 2 million new cases/yr | 50,000   |

# Immunology and Parasitic Infections

- Host-parasites interactions
- Hosts are “protected” against parasite infections by 2 kinds of mechanisms:

1) Humoral and tissue reactions of hosts use the host’s ability to distinguish its own cells from foreign cells and material.

In vertebrates, three types of such reactions have been demonstrated: phagocytosis, inflammation and adaptive immunity.

The first two are non-specific tissue reactions, i.e. they are not directed against specific agents, the third is specific to a certain type of foreign material. Immune reactions involve parasite antigens which induce the formation of specific antibodies in the host.

# **Immunology and Parasitic Infections**

**In microparasites immune responses are more effective than in macroparasites.**

**2) Hosts show different degrees of “resistance” to infections which are not due to acquired immunity. For example, some sheep are more “resistant” to roundworms than others, even before they ever had any contact with such roundworms. In age resistance, older individuals are more resistant than young ones.**

# Immunology and Parasitic Infections

## Parasite Evasion Mechanisms:

- Immune suppression (reduce function of macrophages, e.g. Plasmodium)
- Antigenic variation (Variation of surface proteins, e.g. Trypanosomes or Giardia)
- Host mimicry (e.g. Tegument of schistosomes can acquire antigenic molecules from host)
- Intracellular sequestration  
(Trypanosomes/Leishmania proliferate in macrophages and escape host immune response)

# **So what are the characteristics of a successful parasite?**

- **It should encounter its host**
- **It should withstand the unfavorable conditions**
- **It should escape host's defense mechanisms**
- **It should reproduce within the host**
- **Its egg/cysts should leave host easily**
- **It must locate new hosts**
- **AND it must avoid killing its host !**



**Happy parasites!**

# Unhappy host!

