Erasmus+
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ALIVE

Parasites

World of living animals

OUTLINE

- **Symbiosis – definition and types**
- **Parasites (and their hosts)**
- **Parasites and human health**
- **Animal (and livestock) parasites**
- **Parasites in (agricultural) plants**
- **Parasites in applications**

SYMBIOSIS

"Symbiosis is a close and long-term relationship between different species"

Types of symbiosis

- **Mutualism (both species win)**
- **Commensalism (one species benefits – other not affected)**
- **Parasitism (parasite wins – host is harmed)**

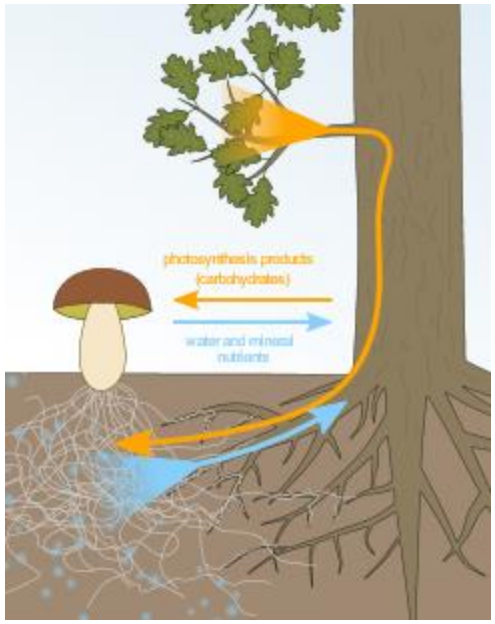
MUTUALISM: EXAMPLES

Flower plants pollinated by bees

- Plants get help to reproduce
- Bees get food

Land plants and fungi in mycorrhizae

- Fungi get constant access to cabrohydrates
- Plants exploit the fungus' high absorptive capacity for water and minerals



COMMENSALISM: EXAMPLES

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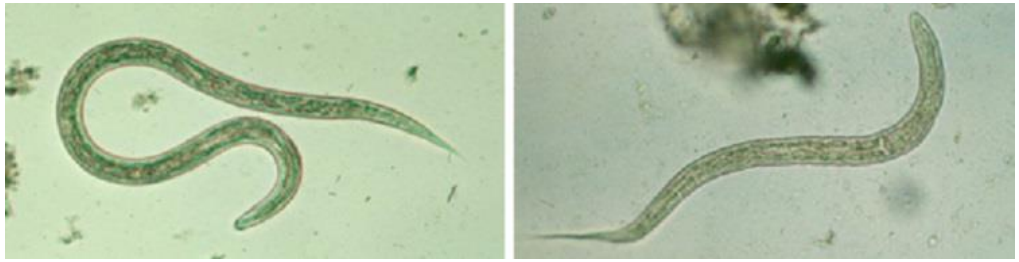
Epiphytic plants grow on trees

Cattle egrets feed on the insects that come out of the field due to the movement of their companion animals

PARASITISM: EXAMPLES

Parasites can live IN their host (endoparasites) or ON the surface of their host (ectoparasites)



Hookworms affect the small intestine and lungs of their host (endoparasites)

Head lice (*Pediculus humanus capitis*) live on the skin of humans on which they feed (ectoparasites)

PARASITISM: EXAMPLES

Parasites can be microbes, fungi, plants, or even animals

Examples

- **Plasmodia (protozoa) cause malaria to mammalian hosts**
- **Phytoplasmas (bacteria) are plant pathogens able to infect a diverse range of agricultural crops**

PARASITISM: EXAMPLES

Parasites can be microbes, fungi, plants, or even animals

Examples

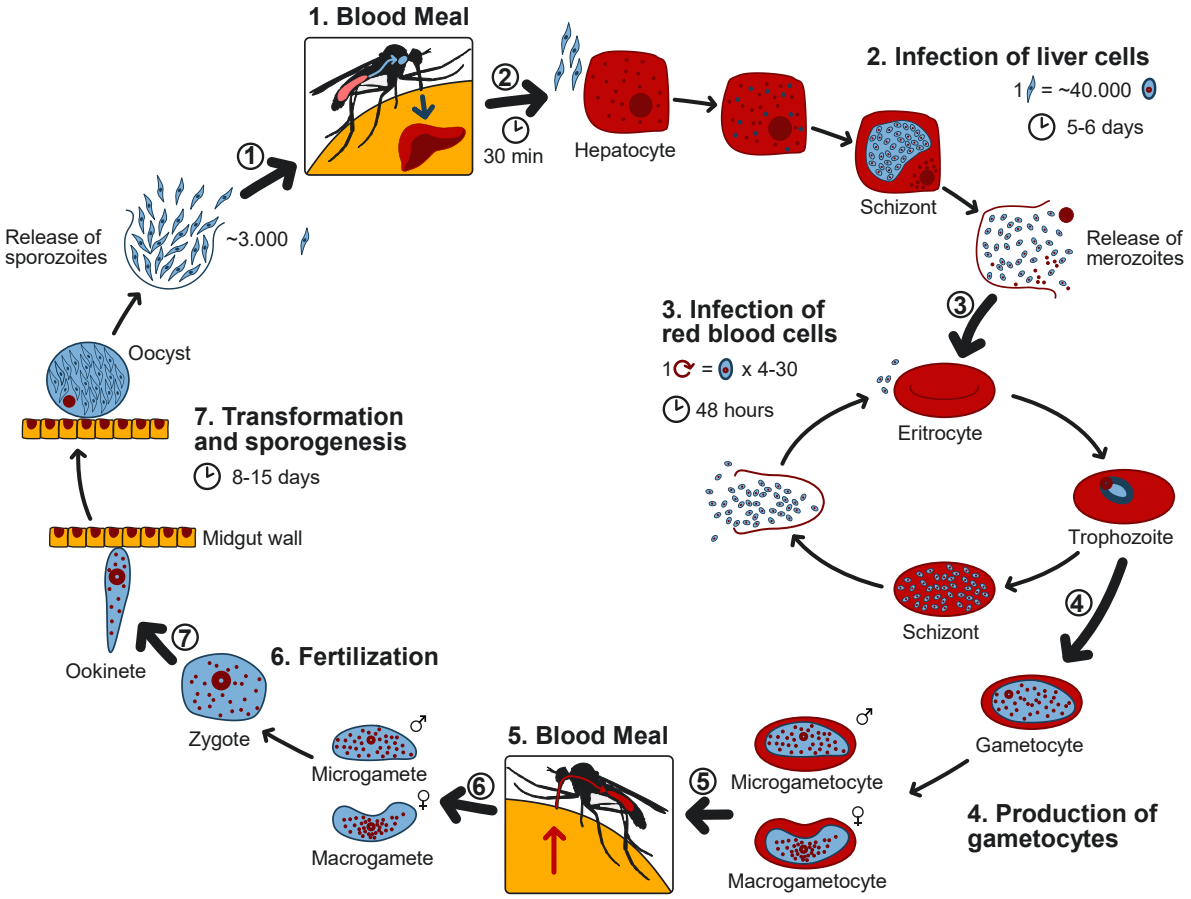
- ***Ophiocordyceps unilateralis*** **(fungus) infects carpenter ants, changing their behaviour**
- ***Rafflesia arnoldii*** **(plant) lacks leaves, stems or roots (and chlorophyl), living on vines of the genus *Tetrastigma*.**

PARASITES AND HUMAN HEALTH (1)

Main classes of parasites that can cause human disease are

Protozoa e.g. *Plasmodium* (malaria), *Giardia* (diarrheal disease), Leishmania (causing skin sores or affecting internal organs)

PARASITES AND HUMAN HEALTH (2)



The *Plasmodium* lifecycle

PARASITES AND HUMAN HEALTH (3)

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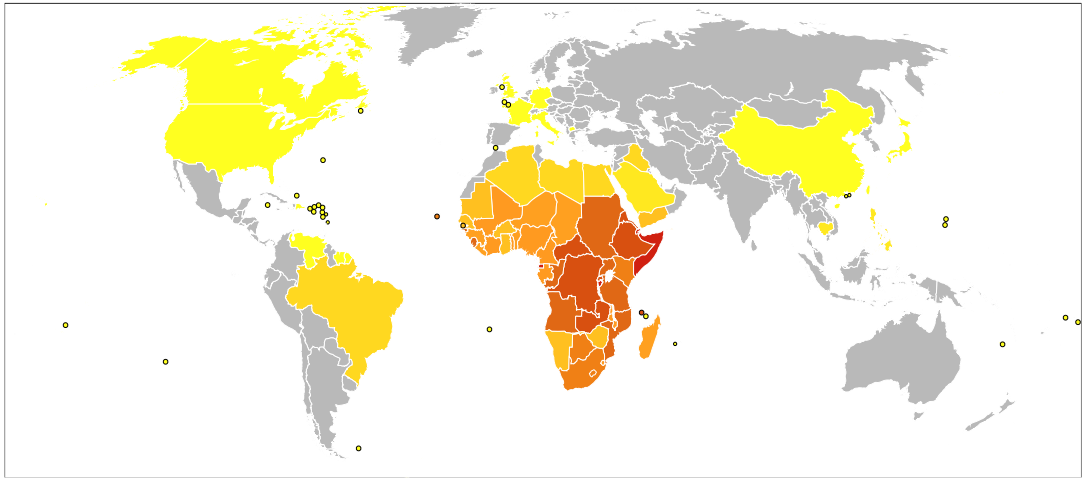
Main classes of parasites that can cause human disease are

Helminths e.g. hookworms (few causing blood loss leading to anemia), *Schistosoma* (flatworms causing schistosomiasis)



Deaths per million caused by schistosomiasis (WHO, 2012).

PARASITES AND HUMAN HEALTH (4)

Main classes of parasites that can cause human disease are

Ectoparasites, typically ticks, lice etc.

Of higher concern are **vectors,** transmitting deadly pathogens (e.g. mosqiutoes of the genus *Anopheles* transmit *Plasmodium*)

TRANSMISSION OF PARASITIC DISEASES (1)

Infected animals (wild, livestock or pets) can transmit zoonotic diseases, when people:

- accidentally swallow food/water contaminated with feces of an infected animal (e.g. toxoplasmosis)
- consume undercooked/raw infected meat

TRANSMISSION OF PARASITIC DISEASES (2)

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People can get parasites

- by exposure to blood of an infected person (bloodborne)
- (rarely) by blood transfussion-associated exposure (e.g. trypanosomiasis, toxoplasmosis) or organ transplantation
- by drinking/contacting contaminated water (e.g. schistosomiasis)

PREVENTION MEASURES

Depend on parasite and transmission type.

At the national/regional level

- Monitoring and controlling parasites/vectors
- Educating the public

At the individual level

- Personal hygiene measures
- Cook food to the recommended temperature
- Avoid drinking water from questionable sources

ANIMAL (AND LIVESTOCK) PARASITES

- Disease and production loss
- Economic loss
- Impact on animal welfare
- Costly/time consuming control measures
- Possible source to human disease

Depending on the type of parasite different control strategies can be used

PARASITES IN (AGRICULTURAL) PLANTS (1)

- Diverse plant parasites (viruses, fungi, bacteria, roundworms or even other plants, e.g. weeds)
- Parasites may cause severe yield losses (10% - 98%) of total crop

PARASITES IN (AGRICULTURAL) PLANTS (2)

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- 1000's of species of plant-parasitic roundworms or weeds have been described to date,
- Wide variety of host-pathogen interactions
- The annual economic loss only from plant-parasitic roundworm infections was recently estimated at **> $100 billion**.

PARASITE CONTROL (1)

Chemical approaches (e.g. pesticides)

PROS:

- ✓ can be highly effective against the parasite

CONS:

- ✓ pose threats to the environment affecting plants, pollinators
- ✓ can be toxic to humans

PARASITE CONTROL (2)

Biological control agents: an environmentally-friendly alternative:

- Predators, parasitoids, pathogens, competitors target insect parasites
- Seed predators, herbivores, plant pathogens target plant parasites
- Nematophagous fungi and bacteria against roundworms

PARASITE CONTROL (3)

But ...

- Biological control agents pose potential threats to the native ecosystem
- Their ecology and biology needs to be very well known in advance

Alternatives:

- ✓conservation of natural enemies
- ✓Integrated control strategies

PARASITES IN APPLICATIONS (1)

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- **Biological control agents**
- **Forensics "witnesses"**
  - ✓estimates for time of death of people/animals based on parasitic fly larvae age
  - ✓Tracking capture sites of illegally-traded endangered species

PARASITES IN APPLICATIONS (2)

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- **Medical applications**
  - ✓experimental helmithic therapies for autoimmune diseases and immune disorders
  - ✓discovery of useful natural products

SUMMARY

- Symbiotic relationships appear everywhere in the environment
- Parasitism across all life forms
- Various known human parasites
- Animal and plant parasites with ecological and economic impact
- Need for sustainable parasite control
- Yes, useful parasites do exist!

PICTURES – USED SOURCES

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