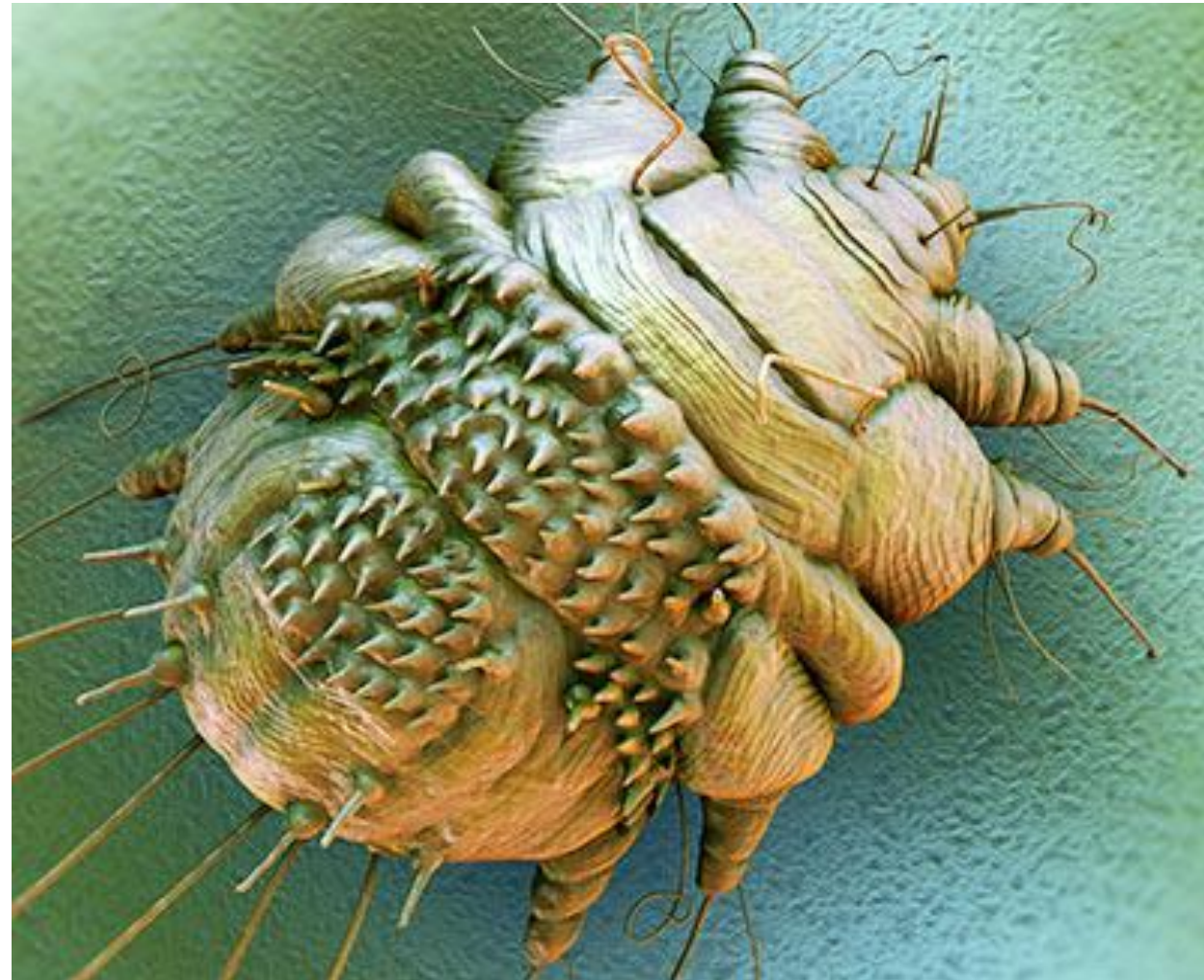




Advanced Parasitology

(ZOO 510)





LECTURE (2)

Host-Parasite Relationship



Lecture contents

1 **Portal of entry into the body**

2 **Host-parasite specificity**

3 **Factors controlling growth of microorganisms inside the host**

4 **Acquiring infectious agents**

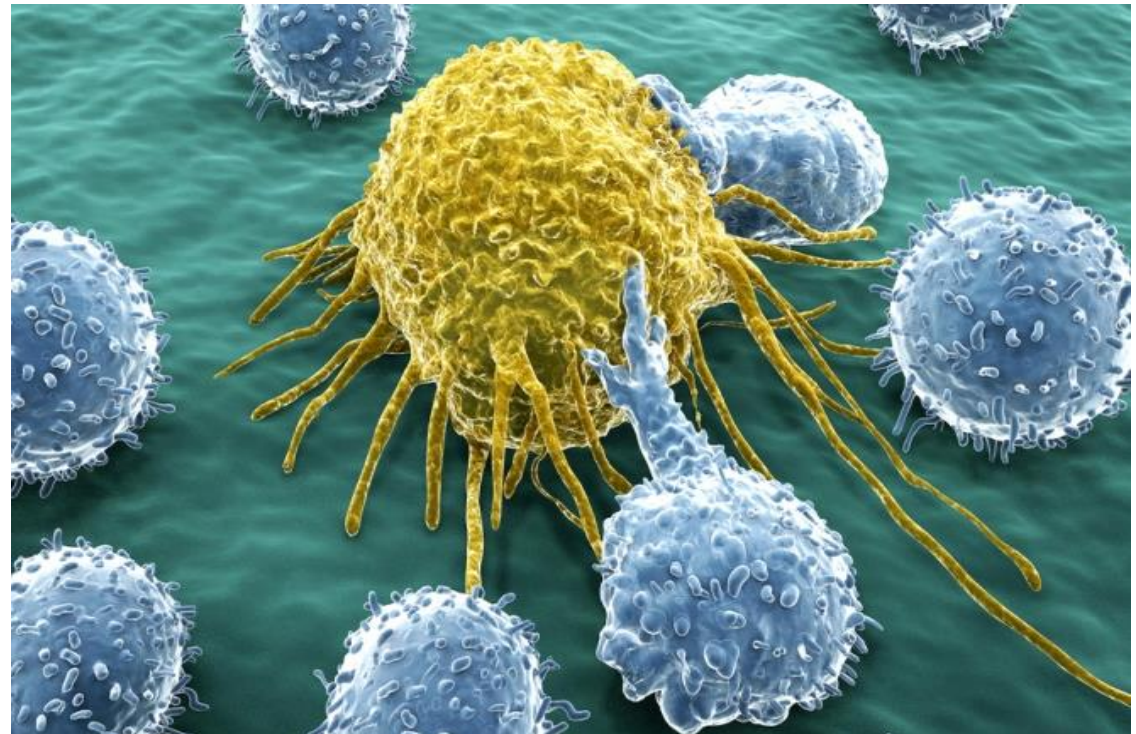
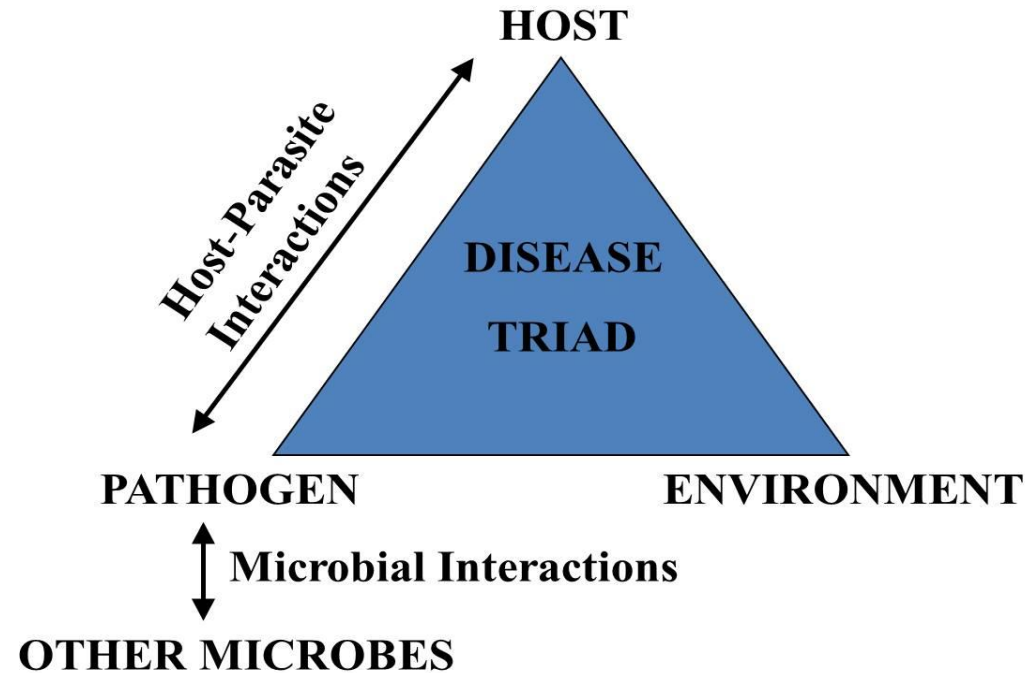
5 **Effect of parasites in their hosts**

6 **Host-Resistance and Resistance of parasite to host defenses**

7 **Host-Parasite evolution and Disease terminology**

Host-Parasite Specificity

- Some parasite species (specialists) are highly restricted in kinds of hosts they will infect, whereas others (generalists) may be quite unrestricted, although virtually no parasites are universally infective



Factors controlling growth of microorganisms inside the host



Nutrient availability

Accessibility of a necessary resource, substance or compound providing nourishment to maintain life

Physico/environmental parameters

Water activity [osmotic pressure, Oxygen, Temperature]

Host immune system

Cells and tissues involved in recognizing and attacking foreign substances in the body

Competition

Simultaneous demand by two or more organisms or species for a necessary, common resource or physical space that is in limited or potentially limited supply, resulting in a struggle for survival

Acquiring infectious agents

Portal of entry/exit

Ingestion, Inhalation
Direct penetration

Colonization

Successful occupation of a new habitat by a species not normally found in this niche

Invasion

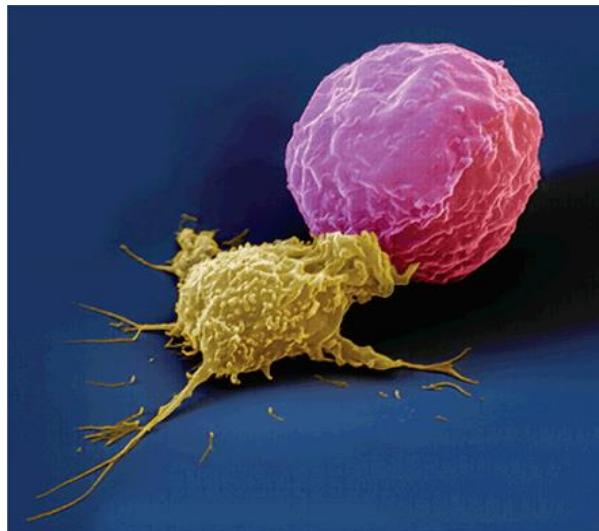
Entry and spread throughout the cells and/or tissues of the host; specific recognition of receptor sites on target cells enhances pathogenic advantage

Multiplication

Ability of a microorganism to reproduce during an infection; influenced by underlying disease, immunologic status, antibiotic treatment, nutrient availability

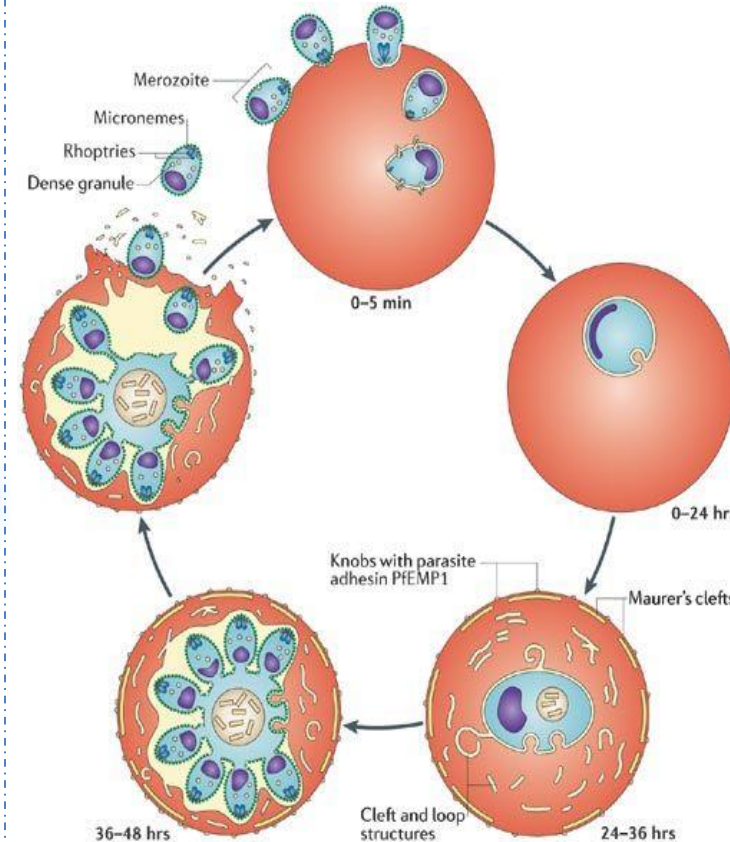
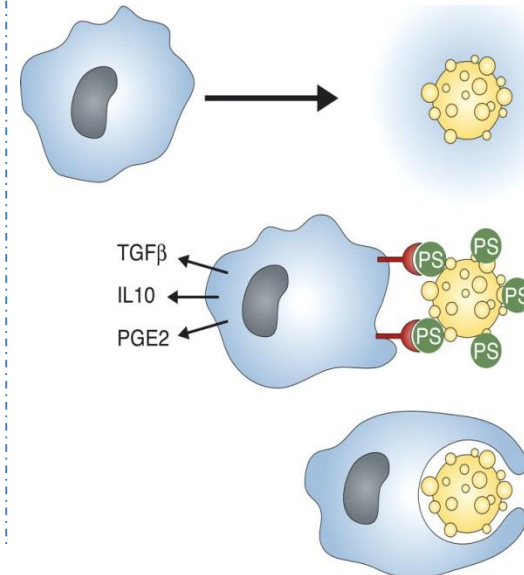
Adherence (attachment)

Close association of pathogens cells and host cells



Adhesion

Macromolecule located on the surface of cell that **facilitates adhesion** to another cell; site of attachment is often a **specific receptor**



EFFECT OF PARASITES ON THEIR HOSTS

❑ **Several parasites species** are relatively harmless; many others produce pathological changes which may lead to severe ill health or death of the host.

❑ **The parasite may compete with the host for food and may cause:**

- 1- reduced appetite
- 2- decreased synthesis of protein for skeletal muscles
- 3- changes in the **absorptive surfaces** of intestine

❑ **Blood sucking** parasites destruct the host tissues and may cause :

- 1- increase developing migrating larvae
- 2- increase in size of parasite (hydatid cyst) pressure
- 3- blocking of blood vessels produce infarction; lymph vessels to produce oedema; or intestinal tract to produce necrosis and rupture

Host resistance

The degree to which a host can limit the effects of an infection, ranging from:

- ◆ **Tolerance** in which symptoms are suppressed or unusually large doses of a drug are able to be endured
- ◆ **Hypersensitivity** in which only a few cells surrounding the infected cell(s) are affected or an increased susceptibility to an antigen, such as an allergic reaction to a previous exposure to an antigen
- ◆ **Immunity** in which the microorganisms do not multiply due to any one or a combination of host immune factors by which a body is capable of resisting or overcoming an infection or disease

Resistance of parasite to host defenses

Encapsulation and Antigenic mimicry

Capsule, glycocalyx or slime layer

Polysachharide capsules *Streptococcus pneumoniae*, *Neisseria meningitidis*,
Haemophilus influenzae, etc.

Polypeptide capsule of *Bacillus anthracis*

Evasion of phagocytosis and/or Immune clearance

Phagocytosis inhibitors: mechanisms enabling an invading microorganism to resist being engulfed, ingested, and or lysed by phagocytes/ phagolysosomes

HOST-PARASITE EVOLUTION

Parasite

*For example **Influenza virus**.... Immunity determined by two antigens, haemagglunin (HA) and neuroaminidase (NA).

*“Antigenic drift” leads to new strains with different HA or NA antigens, that able to infect people who are resistant to other strains.

Host

In the same way that parasites are constantly evolving to overcome host defenses, Host organisms will be constantly evolving to resist parasitic infection. This will lead to *Frequency dependent selection*, locking hosts and parasites into endless co-evolutionary cycles.



Parasites and host behavior

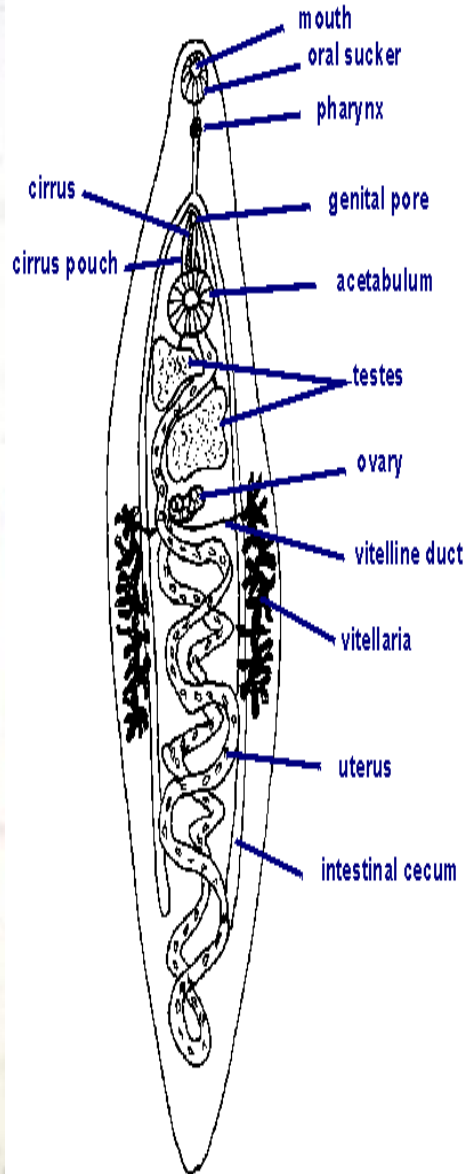
***Parasites** don't just face selection pressure to overcome host defenses.

***Transmission** between hosts is crucial to a parasite's fitness.

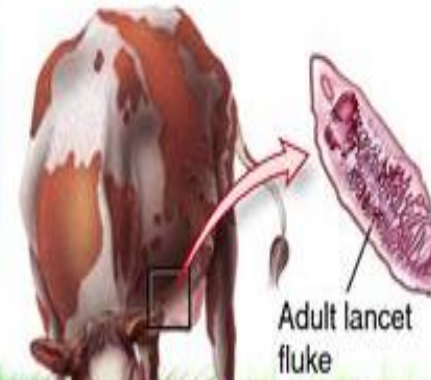
*Some **parasites have complex life-cycles**, infecting more than one host before reaching adulthood.

*In these cases, some parasites seem to change host behavior to enhance their transmission rate.

Dicrocoelium dendriticum

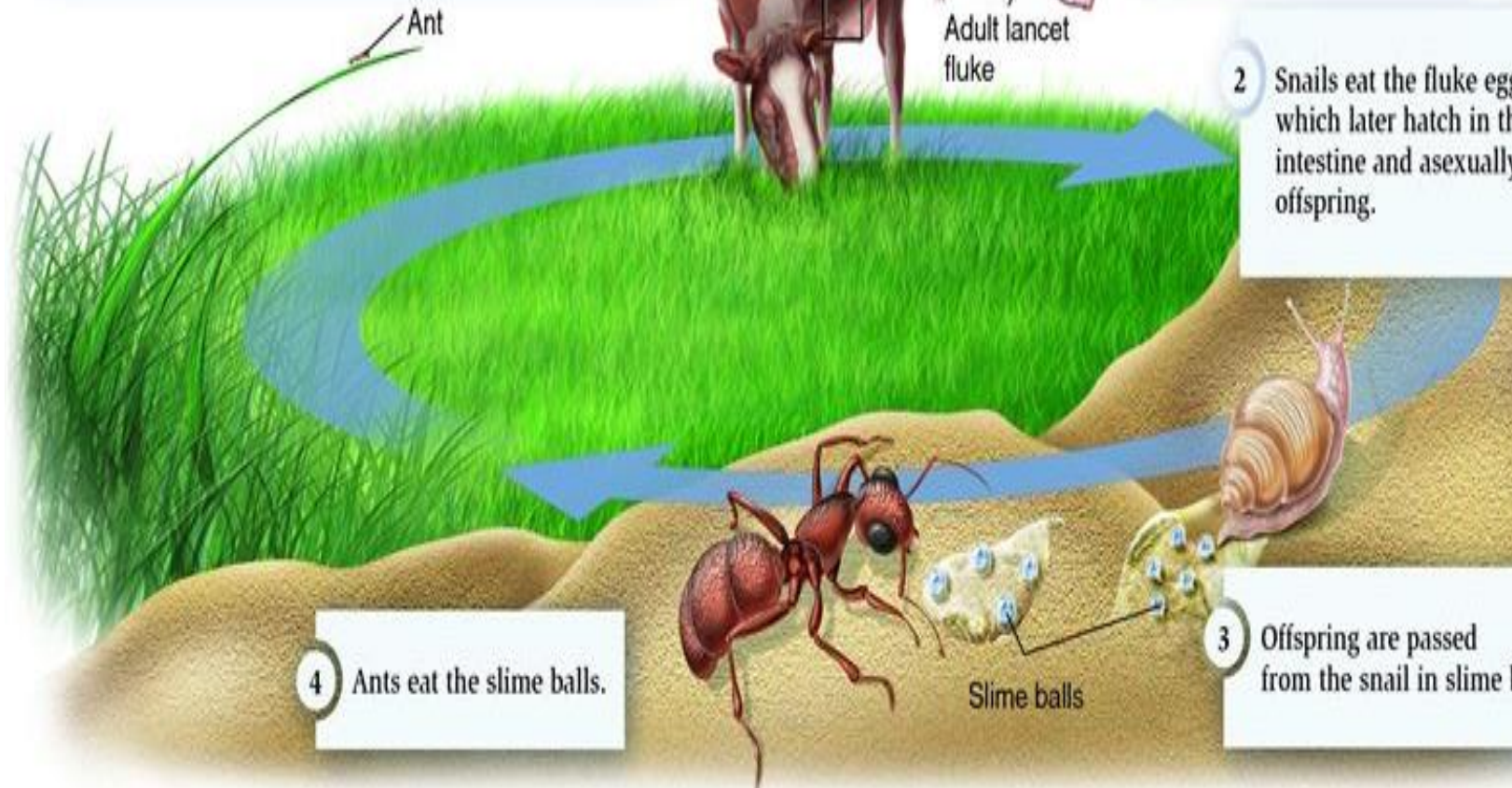


5 Some of the flukes migrate into the ant's brain, causing the ant to climb to the tip of a blade of grass, where it is more likely to be eaten by a cow.



1 Adult flukes produce eggs inside a cow's intestines. The eggs are passed in the cow's feces.

2 Snails eat the fluke eggs, which later hatch in the snail's intestine and asexually produce offspring.



4 Ants eat the slime balls.

3 Offspring are passed from the snail in slime balls.

Slime balls

DISEASE TERMINOLOGY

- ❑ **Prepatency:** infected but parasite presence can not be detected yet.
- ❑ **Patency:** established infection, parasite stages can be detected (malaria parasites in blood smears, worm eggs in feces etc.).
- ❑ **Incubation period:** time between infection and the development of symptoms.
- ❑ **Acute disease** can lead to crisis which can resolve in spontaneous healing
- ❑ **Convalescence:** Period after healing, absence of infectious agents, no symptoms, in certain case immunity to reinfection.

Thank you