

Eukaryotic Microorganisms and Parasites

Lecture# 4

Pharmaceutical Microbiology

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العلاقة بين Parasites و ال Host cell
Parasite ← Host cell
Parasite ← Host cell
Parasite ← Host cell

Introduction

It is capable to cause disease

Organism, their life depends on other organism

- A **parasite** is an organism that lives at the expense of another organism, called the **host**.

Parasites may cause moderate to severe damage. Parasites that cause disease are called **pathogens**.

ال Parasites التي بسبب Disease يسمى Pathogen
لأنه عايش في حساب ال Host cell
يعني يكون في نقص وهو تسبب مرض

- **Parasitology** is the study of parasites.

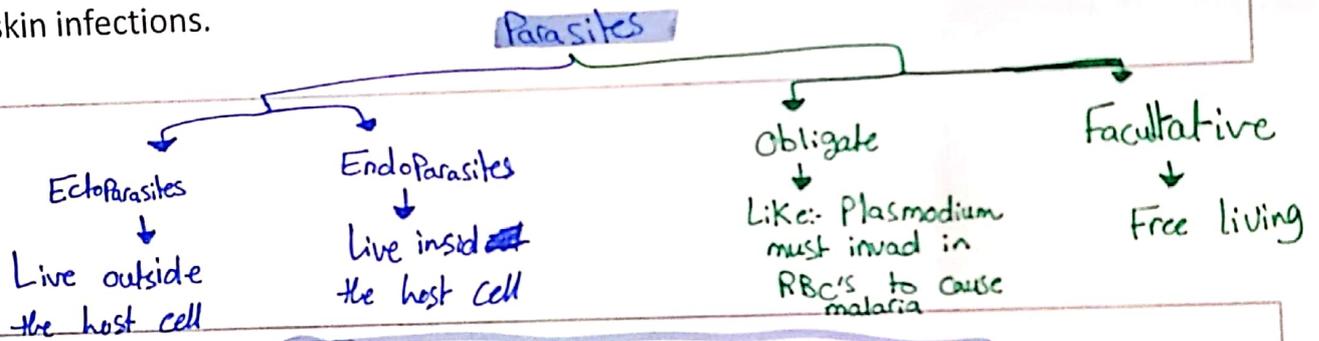
It is ~~science~~ science

Parasites in Relation to Their Hosts

Are divided to:

- 1) **Ectoparasites**; such as ticks and lice, which live on the surface of other organisms. *Live outside the host*
- 2) **Endoparasites**; as some protozoa and worms, which live within the bodies of other organisms. *Live inside the host*
- **obligate parasites**: They must spend at least some of their life cycle in or on a host as causes malaria (Plasmodium) must invade red blood cells
- **facultative parasites**: They normally are free-living, such as some soil fungi, but they can obtain nutrients from a host, as many fungi do when they cause skin infections.

الجهاز العصبي
cell
الحيوانية
العيش
مع أو بدون
الhost



Parasites in Relation to Their Hosts

According to the duration of their association with their hosts:

- **Permanent parasites**: remain in or on a host once they have invaded it as tapeworms. *For long time*
- **Temporary parasites**: feed on and then leave their hosts such as many biting insects. *بلافة حاجبة ثم يتحرك (مثل ذبابة ناصوت)*
- **Accidental parasites**: invade an organism other than their normal host. Such as Ticks that ordinarily attach to dogs or to wild animals sometimes attach to humans. *ليس Permanent ولا temporary*

They have more than one host

في ذن انواع البقعة (ticks) تستعمل في حيوان حيوان او في حيوان
لانسانه Accidentally في تicks تستعمل في كلب لكلب
كلب لانسانه

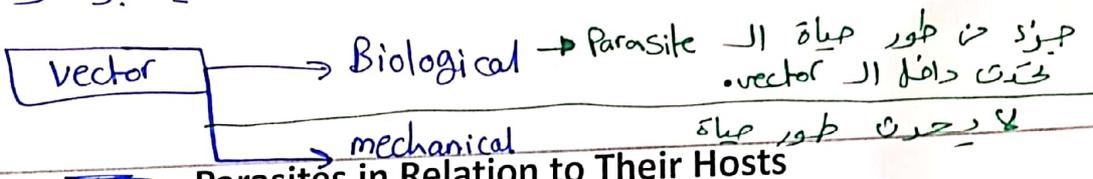
malaria is commonly happen in Africa

Parasites in Relation to Their Hosts

Parasite Carry a Parasite

Hyperparasitism refers to a parasite itself having parasites. Some mosquitoes, which are temporary parasites, harbor the malaria parasite or other parasites. *Plasmodium of malaria* Parasite *mosquitoes* *نعتبر* *هي* *تعتبر* *Hyperparasitism*

- An organism that transfers a parasite to a new host is a **vector**. *Carrier ال ال Parasites ال نقل ال*
- biological vector**: A vector in which the parasite goes through part of its life cycle as **The malaria mosquito** is both a host and a biological vector.
- A **mechanical vector** is a vector in which the parasite does not go through any part of its life cycle during transit. E.g Flies that carry parasite eggs, bacteria, or viruses from feces to human food are mechanical vectors. *فرضاً* *نقل* *بسته* *نقلت* *حشرة* *من* *عليها* *لكن* *لو* *الحشرة* *فاصل* *الها* *طور* *بالبيسة* *تتكون* *البيسة* *mechanical*
- These insects** serve as **vectors of many human parasitic diseases** *مثلاً* *ال* *mosquito* *لو* *نقلت* *Plasmodium of malaria* *هي* *تعتبر* *تعتبر* *vector*



Parasites in Relation to Their Hosts

Host classification

- definitive hosts** if they harbor a parasite while it reproduces sexually. *اذا* *حدث* *طور* *الكائن* *داخل* *ال* *Host*
E.g The mosquito is the definitive host for the malaria parasite.
- intermediate hosts** if they harbor the parasite during some other developmental stages *اذا* *صار* *ال* *جزء* *من* *طور* *الحياة* *مع* *ال* *جزء* *الذي* *داخل* *ال* *Host* *ما* *غير* *Sexual reproduction*
E.g: The mosquito is the definitive host for the malaria parasite because that parasite reproduces sexually in the mosquito; the human is an intermediate host.
- Reservoir hosts** are **infected organisms that** make parasites available for transmission to other hosts. e.g. wild or domestic animals acting as reservoir hosts for human parasitic diseases. *بعض* *infection* *من* *Host* *لا* *يخذ*
→ *Infected* *by* *microorganism* *&* *responsible* *to* *cause* *its* *transmission* *to* *other* *host*
- Host specificity**: refers to the range of different hosts in which a parasite can mature. Some parasites are quite host specific-they mature in only one host *one* *Parasite* *for* *one* *host*

- Biological & mechanical → For vector Classification
 - Definitive & intermediate & reservoir & Specificity → For host Classification

Protists

Characteristics of Protists-they share:

- eukaryotic organisms and most are unicellular
- Although most protists are microscopic, they vary in diameter from 5 μm to 5 mm.

Classification:

Animal-like protists (protozoa)

Plant like protists (algae)

Fungus like protists (slime molds and water molds)

يعتبروا
Parasites

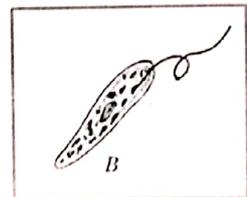
Protozoa

- Mostly unicellular organisms, but a few form colonies.
- Some are commensals, which live in or on other organisms without harming them, other are parasites.
- Classified on the basis of their means of locomotion:

Classified regarded to locomotion

1. Mastigophorans have flagella

- Trypanosomes cause African sleeping sickness.
- leishmanias cause skin lesions or systemic disease with fever
- Giardias cause diarrhea.
- Trichomonads cause vaginal inflammation



→ All of these have flagella

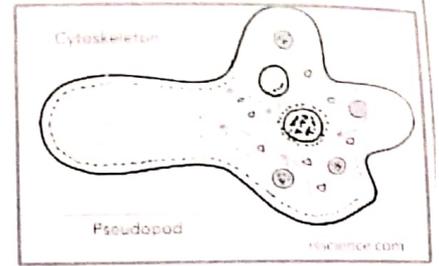
Commensals relationship
يعتبر البعض النوع ال Protozoa لا يعتبر Parasite و بعضه
يعني واحد مسند والثاني لا ينشر ولا يسمم

Protozoa

2. **Amebozoa** move by means of **pseudopodia**.

The more commonly observed genera:

- **Entamoeba, Dientamoeba, and Iodamoeba**—
cause amoebic dysenteries of varying degrees of severity.
- **Entamoeba gingivalis** is found in the mouth



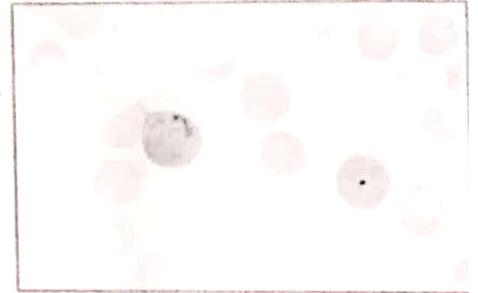
3. **Apicomplexans.**

ما لها لا ايدين ولا رجلين
ولا سوط للحركة

- They are **immobile** parasites which have **enzymes in groups or complexes of organelles at the tips (apices) of their cells to digest their way into host cells**

e.g; **Plasmodium** causes malaria

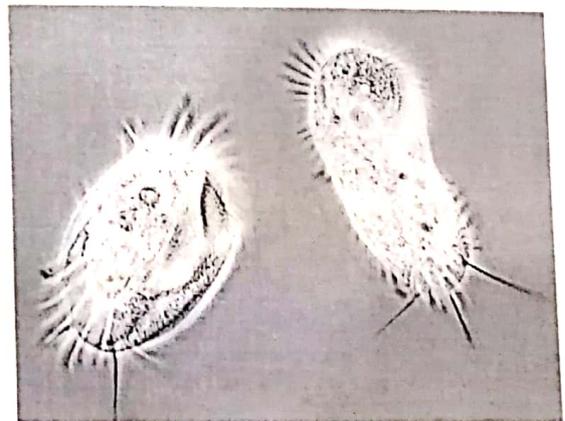
e. g **Toxoplasma gondii** causes toxoplasmosis



Protozoa

4. **Ciliates.**

- **The largest group of protozoans**
have cilia over most of their surfaces

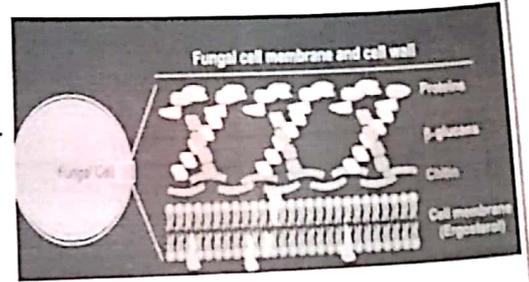


Fungi

fungi (yeasts and molds) are eukaryotic organism

• fungal cell structures are important medically:

1. The fungal cell wall consists primarily of chitin.
2. Chitin is a polysaccharide composed of long chains of N-acetylglucosamine. The fungal cell wall contains other polysaccharides as well, the most important of which is β -glucan, a long polymer of d-glucose.
3. The fungal cell membrane contains ergosterol, in contrast to the human cell membrane, which contains cholesterol.



هذا مع عند شبيهة
الأدوية يكون ال target
تأثير الدواء هو ergosterol

Human body لا يؤثر على Fungal cell

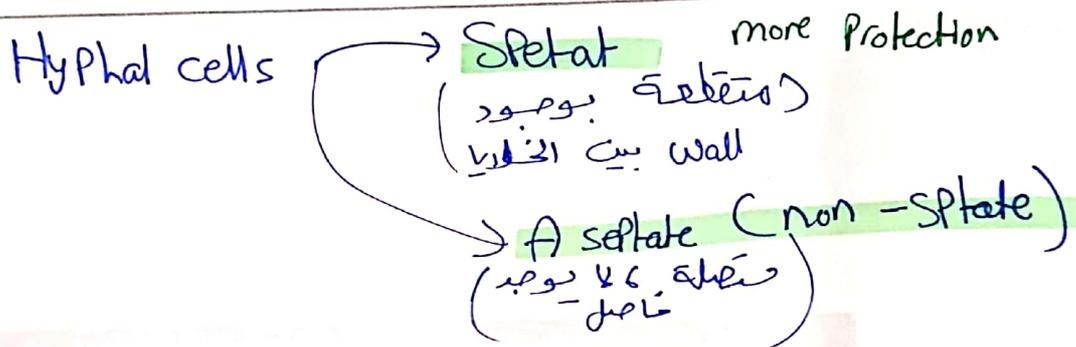
Fungi

Characteristics of fungi:

- Fungi are heterotrophs *• they living depends on digest organic matter*
- Many are saprophytes (digest dead organic matter and organic wastes)
- Some are parasites that obtain nutrients from the tissues of other organisms – Parasitic fungi can be destructive when they invade other organisms.

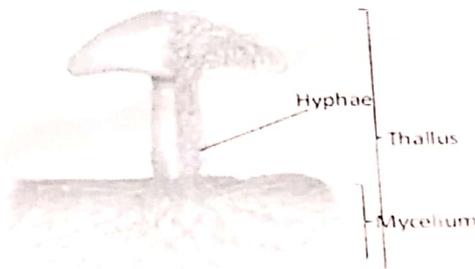
Fungi

- ☁ The body of a fungus is called a **thallus**. The thallus of most multicellular fungi consists of a **mycelium**. A mycelium is a network of fungal threads or hyphae
- ☁ The **mycelium** can be **embedded** in decaying organic matter, soil, or tissues of a living organism .
- ☁ Mycelial cells **release enzymes to digest** the surfaces of invaded matter and **absorb small nutrient molecules**.
- ☁ Hyphal cells are separated by cross walls called septa



Hyphae

- The vegetative bodies of most fungi is called thallus which constructed of tiny filaments called hypahe
- Tubular in shape
- Hyphae grow from their tips
- Branched (rarely unbranched)
- Multinucleate



جسم ال **Mold** كامل يسمى **thallus**
 ثالوس يتكون من وحدات تربية (فطرية) يسمى **Hyphae**
 ثالوس
 جسم ال **Hyphae** بجمل شبكة تسمى **Mycelium**
 لكن هي التفاصيل لكن المهم نعرف اننا
 مكنانا قوة ↑
 Hyphal → **septate** (سبقة) →
 → **A septate** (سبقة)

Fungi-Morphology

1. Mold

- Multicellular, hyphae, septate & nonseptate, hyaline & dematiaceous, diameter 4-20 μm
- Sexual and asexual reproduction



Hyaline aseptate hyphae



Hyaline septate hyphae

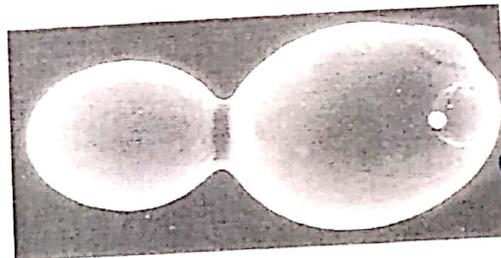
Fungi-Morphology

2. Yeast

- Unicellular, round or oval.
- Method of reproduction: budding, binary fission, sexual spores)



Binary fission

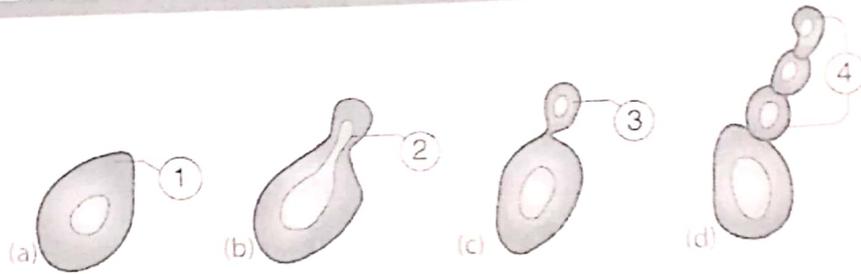


Budding yeasts

زى راعم صغيرة تخرج من
الأم وتنمو ثم لاله بعزل
new yeast cell

REPRODUCTION IN YEAST BY BUDDING

BYJU'S

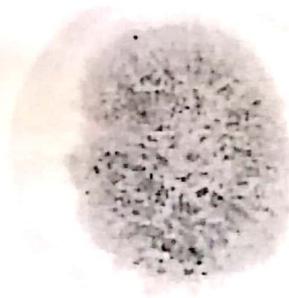


- 1 Yeast Cell 2 Developing Bud 3 New Bud 4 Chain of buds

Differences between Yeasts and Molds



Yeasts



Molds

Comparison of Fungi and Bacteria

Feature	Fungi	Bacteria
Diameter	Approximately 4 μm (<i>Candida</i>)	Approximately 1 μm (<i>Staphylococcus</i>)
Nucleus	Eukaryotic	Prokaryotic
Cytoplasm	Mitochondria and endoplasmic reticulum present	Mitochondria and endoplasmic reticulum absent
Cell membrane	Sterols present	Sterols absent (except <i>Mycoplasma</i>)
Cell wall content	<u>Chitin</u>	<u>Peptidoglycan</u>
Spores	Sexual and asexual spores for reproduction	Endospores for survival, not for reproduction

فطريات
بكتيريا

That's
mean

* we can't use antibacterial agent (cell wall synthesis inhibitor) to kill fungal cell

The Importance of Fungi

- fungi are used in the production of important foods (e.g., bread, cheese, wine, and beer).
- Fungi are also responsible for the spoilage of certain foods.
- Because molds can grow in a drier, more acidic, and higher osmotic pressure environment than bacteria, they tend to be involved in the spoilage of fruits, grains, vegetables, and jams.

زيتون الحلال يكون بيئة حامضية

في صفا العنبر و صفا العنبر

The Importance of Fungi

- Important in health sciences, as facultative parasites -they can obtain nutrients from nonliving organic matter or from living organisms
- Are never obligate parasites because all fungi can obtain nutrients from dead organisms.
- Some fungi produce antibiotics that inhibit the growth of or kill bacteria

PATHOGENESIS

- Parasitic fungi can be destructive when they invade other organisms. These fungi have three requirements for invasion:

(1) proximity to the host.

(2) the ability to penetrate the host

(3) the ability to digest and absorb nutrients from host cells.

Human ال Fungi ال كذا ال يضل ال

① Close to human

② enter to human cells

③ Start using cell

nutrient to multipl

- Human fungal diseases are called mycoses which are often caused by more than one organism

Examples of pathogenic fungi:

Candida, Aspergillus, Cryptococcus and Histoplasma

ANTIFUNGAL THERAPY

- The drugs used to treat bacterial diseases have no effect on fungal diseases. For example, penicillins inhibit the growth of many bacteria but do not affect the growth of fungi.
- This difference is explained by the presence of certain structures in bacteria
- E.g : Amphotericin B disrupts fungal cell membranes at the site of ergosterol and azole drugs inhibit the synthesis of ergosterol, which is an essential component of fungal membranes.

