

Fungi



Introduction

- Fungi (sing., fungus) are belong to Fungi kingdom.
- **Mycology:**
Study of fungi
- **Mycologist:**
A person who studies fungi

Characteristics of Fungi

- They are eucaryotic organisms, include: yeasts (unicellular), molds and mushrooms (multicellular).
- They are living everywhere on earth:
 - a) Some are living on dead organic matter (**Saprophytic fungi**)
 - b) Some are living on and in other organism and they are harmful to it (**Parasitic fungi**)
 - c) Some are living together with other organism (**Symbiotic fungi**)

Characteristics of Fungi

- Some fungi are beneficial:
 - a) Important in production of some foods, ex: cheeses, bread.
 - b) Important in production of some antibiotics, ex: penicillin
- Some fungi are harmful, they cause deterioration of leather, plastic and spoilage of jams, pickles, and many other foods.
- Fungi are static organism (don't move).

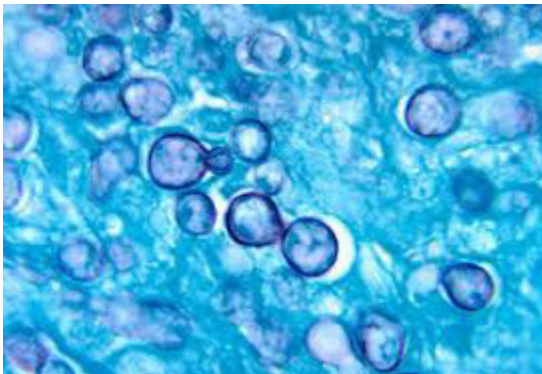
Plants vs. fungi

| Plants | Fungi |
|---|--|
| Autotrophic | Heterotrophic |
| Have chlorophyll (photosynthetic pigments) | don't have |
| Have cellulose (polysaccharide) in the cell wall | Have chitin (polysaccharide) in the cell wall |

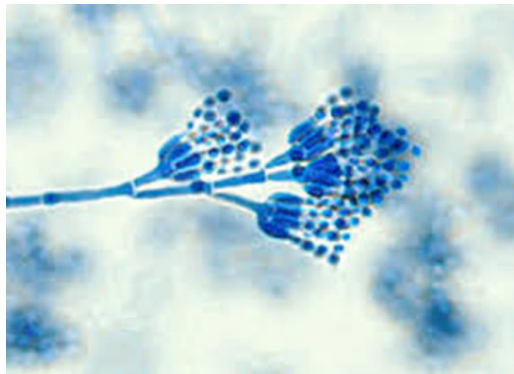
Classification of Fungi

Fungi

Yeasts



Molds



Fleshy Fungi

Yeasts

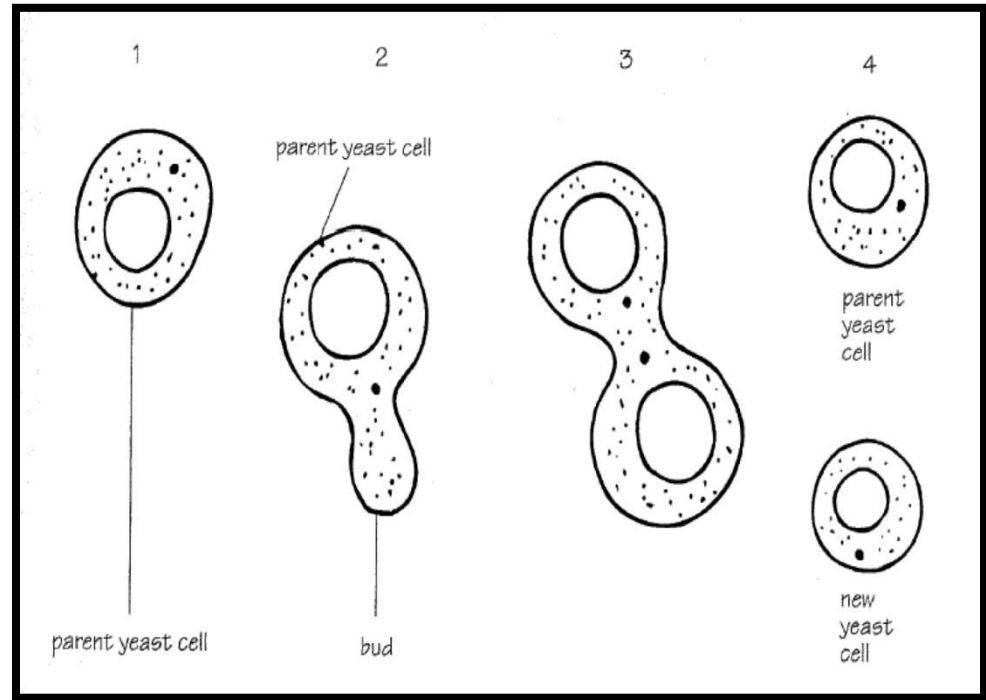
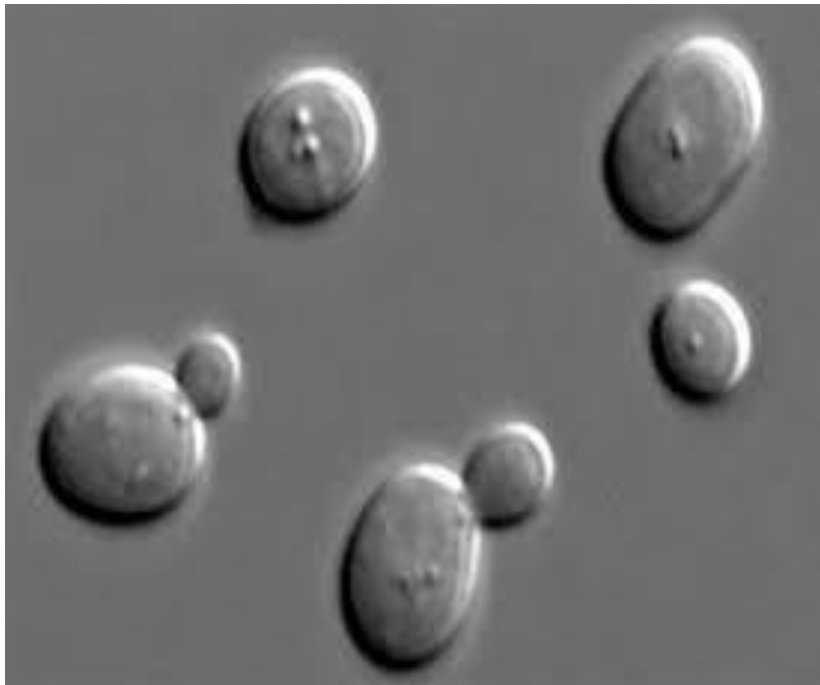
- Yeasts are eucaryotic, unicellular micro-organisms.
- They are found in soil, water and on the skin of many fruits vegetables.

Reproduction of Yeasts:

Usually yeasts reproduce by **Budding** but some by **Spore formation**.

Yeasts

Budding yeasts



Yeasts

Yeast Structure:

- A. True yeasts:** unicellular, spherical (or oval) in shape.
- B. Psuedohyphae:** buds that fails to detach from the mother cell and form elongated filament (look like hyphae) called psuedohyphae.

Yeasts

Yeast shape

Yeast (Unicellular) 酵母 (單細胞)



Pseudohyphae 擬菌絲



Hyphae 菌絲



Yeasts

Uses and Effects of Yeasts:

➤ Some yeasts produce many vitamins and proteins which are a good source of nutrients.

➤ *Saccharomyces cerevisiae*, which live on the skin of grapes and other fruits, is responsible for the fermentation process of these fruits.

It is also used in baking and bread production, so it's called “**Baker's Yeast**”

➤ *Candida albicans* and *Cryptococcus neoformans* are human pathogens yeast.

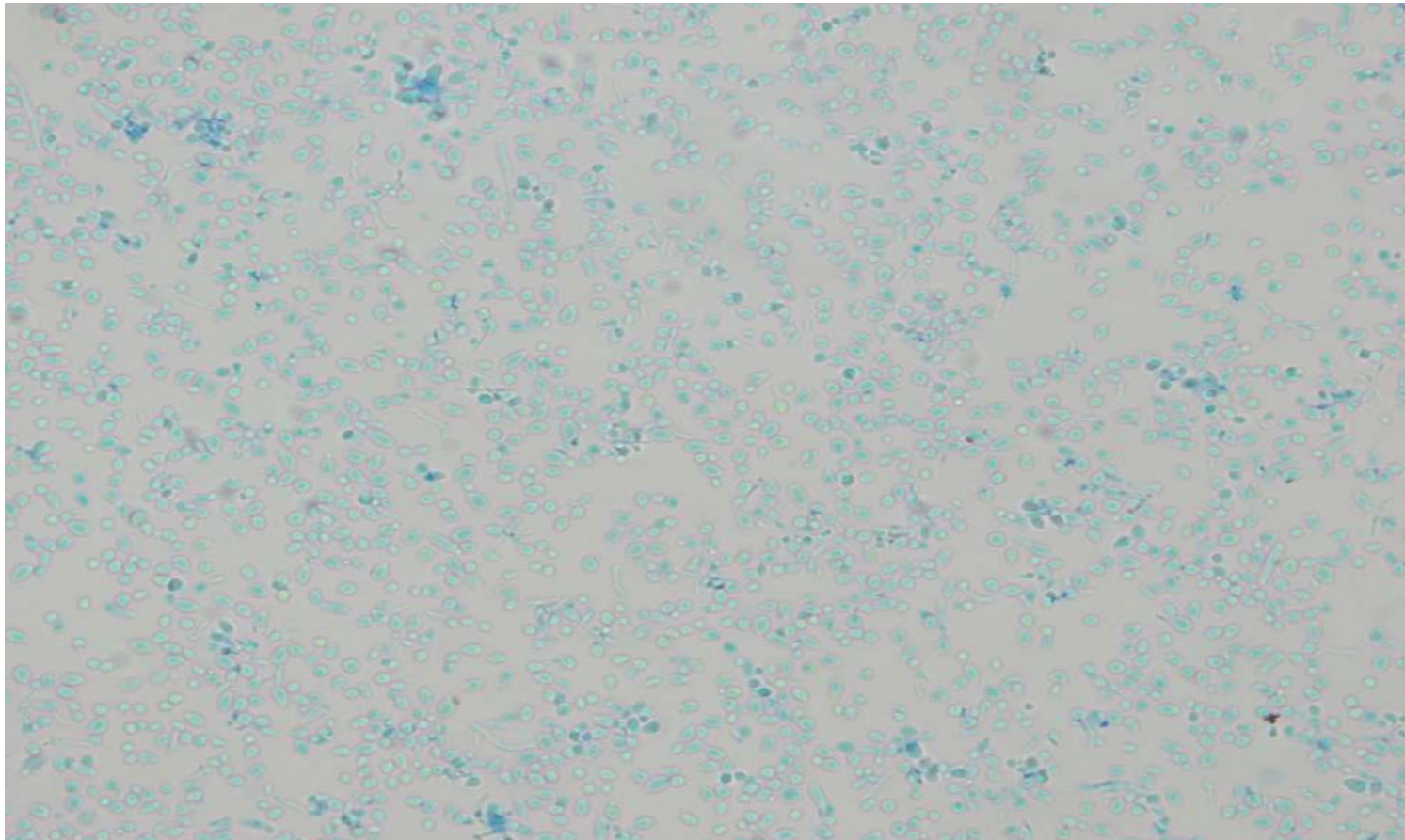
Yeasts

Yeast in culture media



Yeasts

Yeasts under microscope

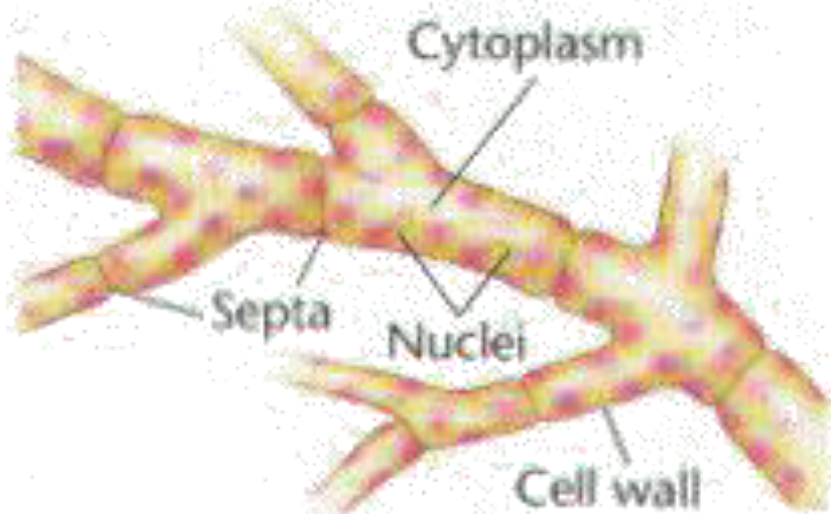


Molds

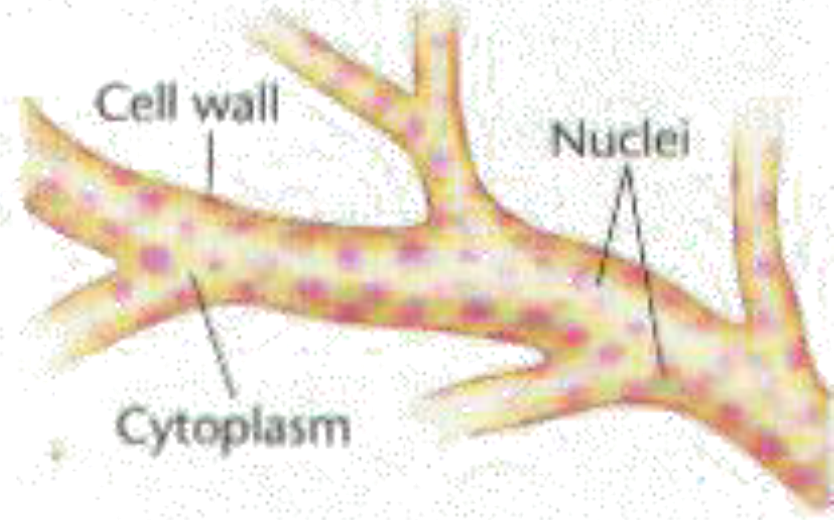
- Molds are multicellular fungi which are more complex than yeasts.
- They are found in water, soil, and on food.
- The molds are made up of microscopic filaments called **hyphae** (sing., **hypha**) that contain cytoplasm & nuclei.
- **This hyphae can be:**
 - *Septate hyphae*
 - *Non-septate hyphae (aseptate hyphae)*

Molds

Hyphae with cross-walls



Hyphae without cross-walls

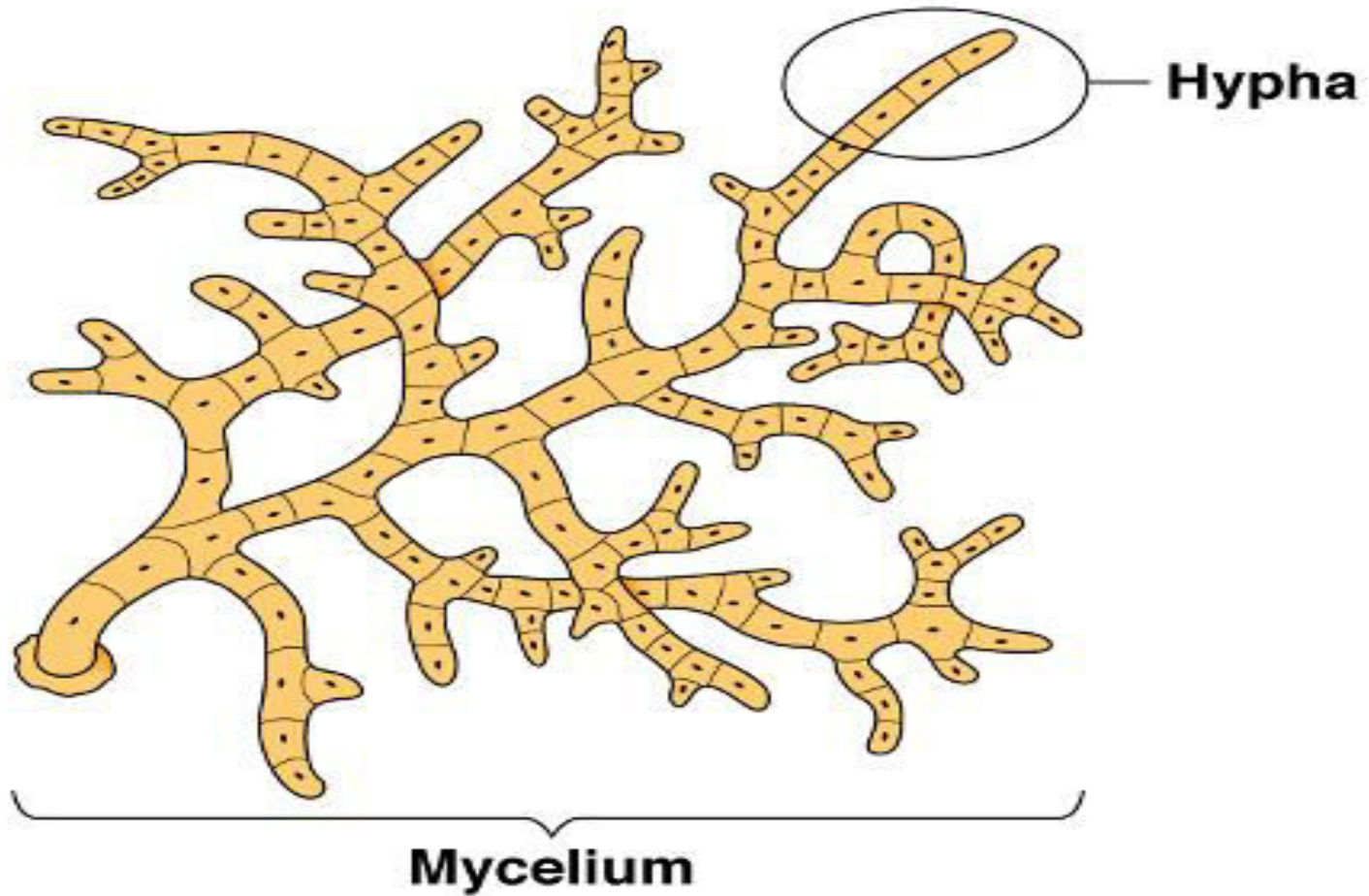


Molds

Important terms:

- **Hyphae:** Microscopic filaments formed by fungi.
- **Septate hyphae:** The cytoplasm within the hyphae is divided into cells by cross-walls or septa.
- **Aseptate hyphae:** The cytoplasm within the hyphae is not divided into cells; no septa
- **Mycelium:** A network of hyphae

Molds



Molds

Reproduction of Molds:

- Molds reproduce by **spore formation**, either sexually or asexually
- Some molds reproduce by **hyphal extension**

Uses of Molds:

- *Penicillium* used to produce the antibiotic penicillin.
- Some molds are used to produce some enzymes and acids.
- The flavor of cheeses results from grow of molds in them, ex: Blue cheese.

Molds



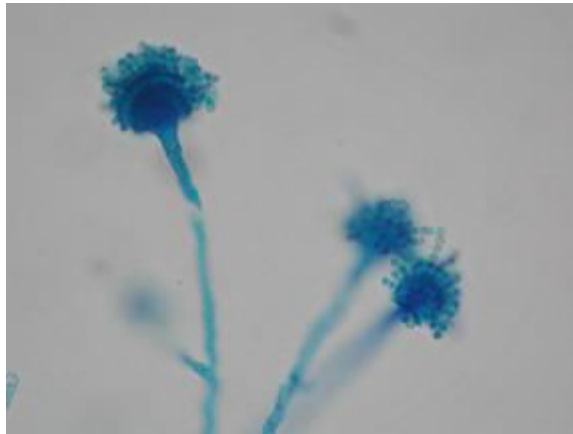
Molds

Molds in culture media



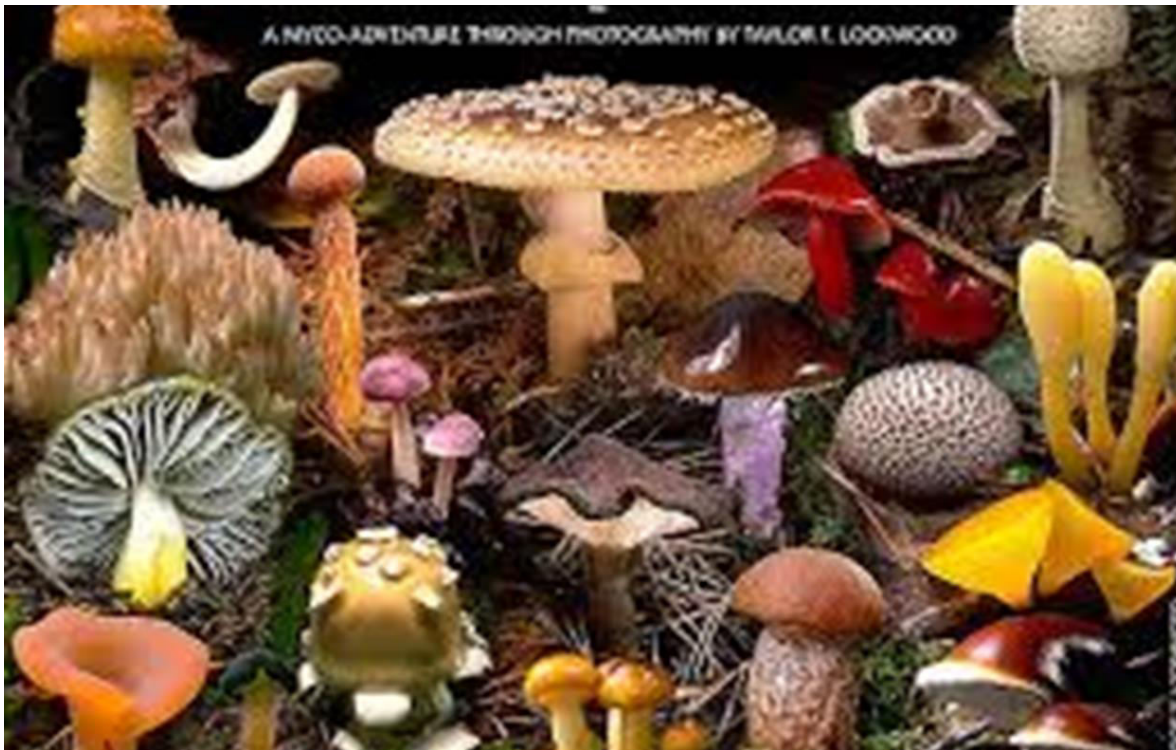
Molds

Molds under microscope



Fleshy Fungi

Large fungi (not microorganisms), ex: Mushrooms



Reproduction of Fungi

Fungi can be classified according to their reproduction to:

- Sexual reproduction fungi and
- Asexual reproduction fungi

Reproduction of Fungi

Asexual reproduction include:

- i. Budding >>> Blastoconidia
- ii. Hyphal extension
- iii. Formation of spores >>> Conidia

Sexual reproduction include:

- i. Formation of spores >>> ascospores, basidiospores, zygospores.

Reproduction of Fungi

Sexual reproduction fungi can be classified according to their mode of reproduction to:

➤ **Lower fungi**

➤ **Higher fungi**

➤ **Deuteromycetes:**

- Fungi that having no mode of sexual reproduction or their mode of sexual reproduction is not known, so they called **Imperfect Fungi**.
- Their asexual form of reproduction is not known.

Note

Fungi can be:

Monomorphic:

Fungi that has only one shape or morphology.

e.g. *Aspergillus fumigatus*

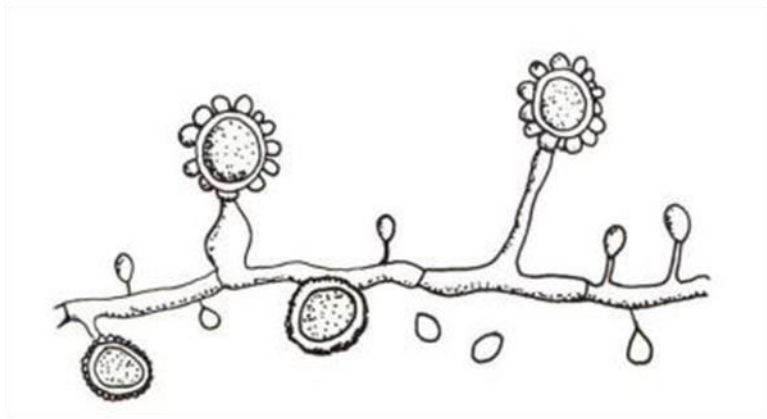
Dimorphic:

- Fungi which can have two different morphologies depending on the environmental factors e.g. Temperature.
- Many dimorphic fungi are pathogenic but not all the pathogenic fungi are dimorphic.

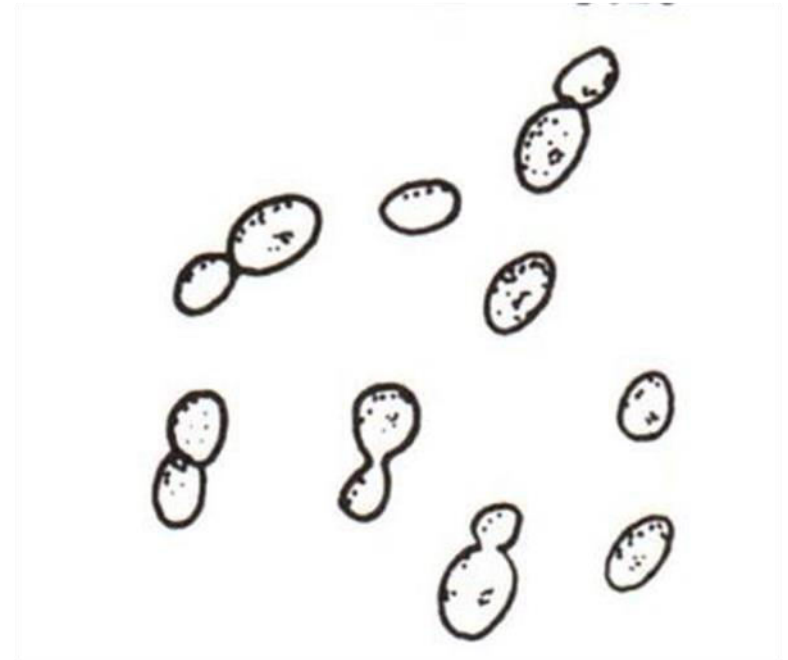
e.g. *Histoplasma*

Histoplasma

At room temperature (25C)



At 37C



Fungal infections

- Infections caused by fungi called **mycoses**
- **Fungi can cause:**
 1. Superficial mycosis.
 2. Coetaneous mycosis (Dermatophytoses).
 3. Subcutaneous mycosis.
 4. Systemic mycosis.
 5. Opportunistic mycosis.

Fungal infections

1. Superficial mycosis:

- Fungal infections effect the outermost areas of human body: outermost dead layers of skin (epidermis), hair, nails.
- Examples of superficial mycosis:
 - **Pityriasis versicolor**
 - **White Piedra**

White Piedra

- Soft nodules around hair shaft
- White to yellowish cream in color.

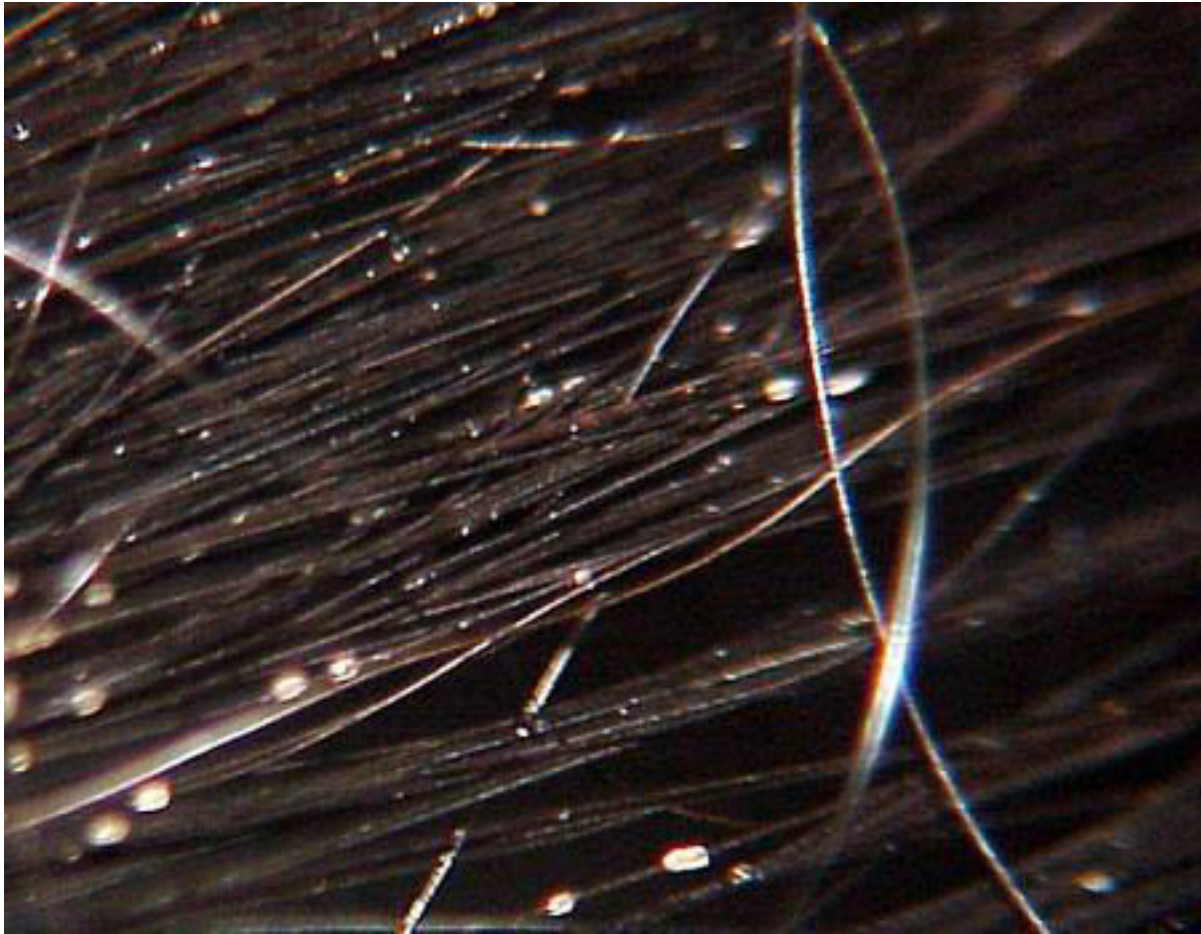
Etiological agent: *Trichosporon beigelii*.

- Imperfect yeast cells.
- Grow fast in culture media and produce cream and beige colonies
- Very common in KSA.

Treatment

- 1- Cream: 2% salicylic acid
3% sulfur ointment
- 2- Shampoo: Nizoral which contain ketoconazole.
- 3- Shave or Cut the hair: then clean the scalp with mild fungicidal

White Piedra around hair shaft



Under microscope



Colonies morphology



Fungal infections

2. Coetaneous mycosis (Dermatophytoses):

Fungal infections affect all keratinized tissues in human body: the living layers of skin (dermis), hair, and nail.

Symptoms:

- Skin lesions called Tinea (or Ring worm)
- The lesion is scaly and cause itching.
- The margins are red or gray containing active fungus.
- In the beginning it is mild then it cause toxic reaction of the skin.

Transmission of infection:

- 1-By using personal stuff (e.g. Clothes).
- 2-House pets (cats and dogs).
- 3-Common in livestock animals (horses, sheep, and cows).
- 4-From the soil.

The Clinical Types of Dermatophytoses

Tinea infections are named according to the part of the body that is infected.

- **Tinea capitis (scalp)**
- **Tinea corporis (trunk)**
- **Tinea pedis (Athlete's foot)**
- **Tinea unguium (nails)**



Fungal infections

3. Subcutaneous mycosis:

- Fungal infections affect the dermis and underlying tissues.
- Examples of Subcutaneous mycosis:
 - Madura foot

4. Systemic mycosis:

Fungal infections affect the internal organs of the body.

Note: subcutaneous and systemic mycoses are more severe types of mycoses.

Fungal infections

5. Opportunistic mycosis:

- Fungal infections caused by opportunistic fungi, e.g: *Candida albicans*

- Examples of fungal infections caused by *Candida*:

1. Oral Thrush: Infection of the mouth surface

- Very common in: AIDS patients, young babies, new born, children and very old people.
- **Symptoms:** White patches in the tongue and oral surfaces

Candida oral thrush



2. Diaper or Napkin rash

- Common in babies who their mothers do not change their diaper frequently.
- **Symptoms:** Red color in groin area.
(It may spread by the baby himself from the groin area to the face part)
- It usually goes away by correct conditions.



3- Vaginitis: Infection of vaginal mucosa by candida.

- **Symptoms:** itching, white or yellowish discharges from vaginal surface or pus.
- 60% of the vaginal discharge is caused by candida.
- It is very common in KSA.
- It is more in pregnant and diabetic ladies.