



# Fungi

**CLS 212: Medical Microbiology**



# Introduction

- ***Mycology***
- All fungi are **Eukaryotic** organisms living everywhere on earth.
- Fungi are **Heterotrophic** **i.e.** depend on other organism for food and are different from plants which are ***“Autotrophic”***

# General Characteristics of Fungi

◆ Heterotrophic organisms are 3 kinds:

A) Saprophytic

B) Symbiotic

C) Parasitic

# General Characteristics of Fungi

- Beneficial fungi are important in the production of cheeses and other foods .
- fungi are important in the production of antibiotics **e.g.** Penicillin.
- fungi causing deterioration of leather , plastic and spoilage of jams and pickles.

# Plant vs. fungi

- They are not plants ( page 75 )

	PLANT	FUNGUS
<b>FOOD</b>	Autotrophic	Heterotrophic
<b>PIGMENTS</b>		
<b>CELL WALL</b>		

# Classification of Fungi

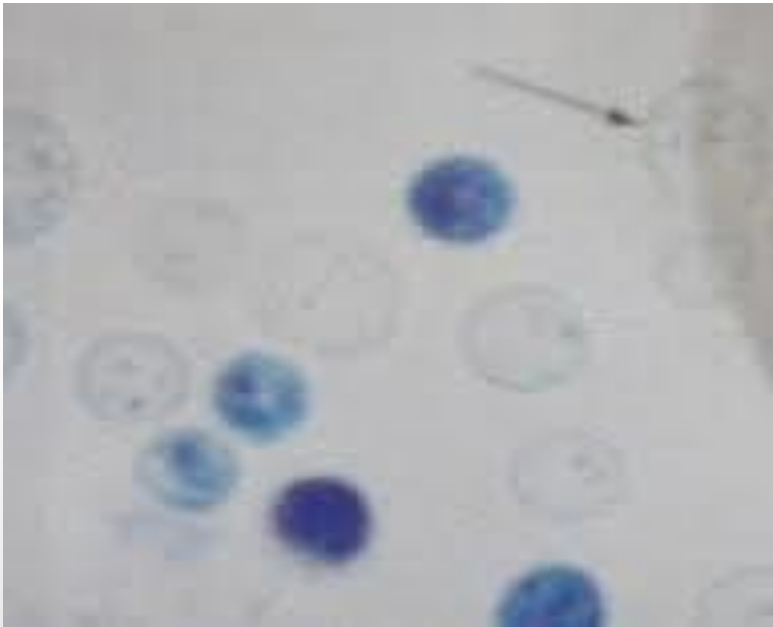
<i>Life's 5 Kingdoms</i>				
<b>Monera</b>	Prokaryotic	one-celled	some move	some make own food, others get food from other organisms
<b>Protist</b>	Eukaryotic	one celled many celled	some move	some make own food, others get food from other organisms
<b>Plant</b>	Eukaryotic	many-celled	don't move	make own food
<b>Fungi</b>	Eukaryotic	one celled many celled	don't move	get food from other organisms
<b>Animal</b>	Eukaryotic	many celled	move	eat plants or other animals
	<b>Cell Type</b>	<b>Structure</b>	<b>Movement</b>	<b>Nutrition</b>

# Structure of Fungi

Fungi can be

Unicellular = Yeasts

Multicellular = Molds




# Reproduction

- Depending on the species :

- budding

- Hyphal extension

- Spore formation >>>> a- sexual spores  
b- asexual spores  
(conidia)



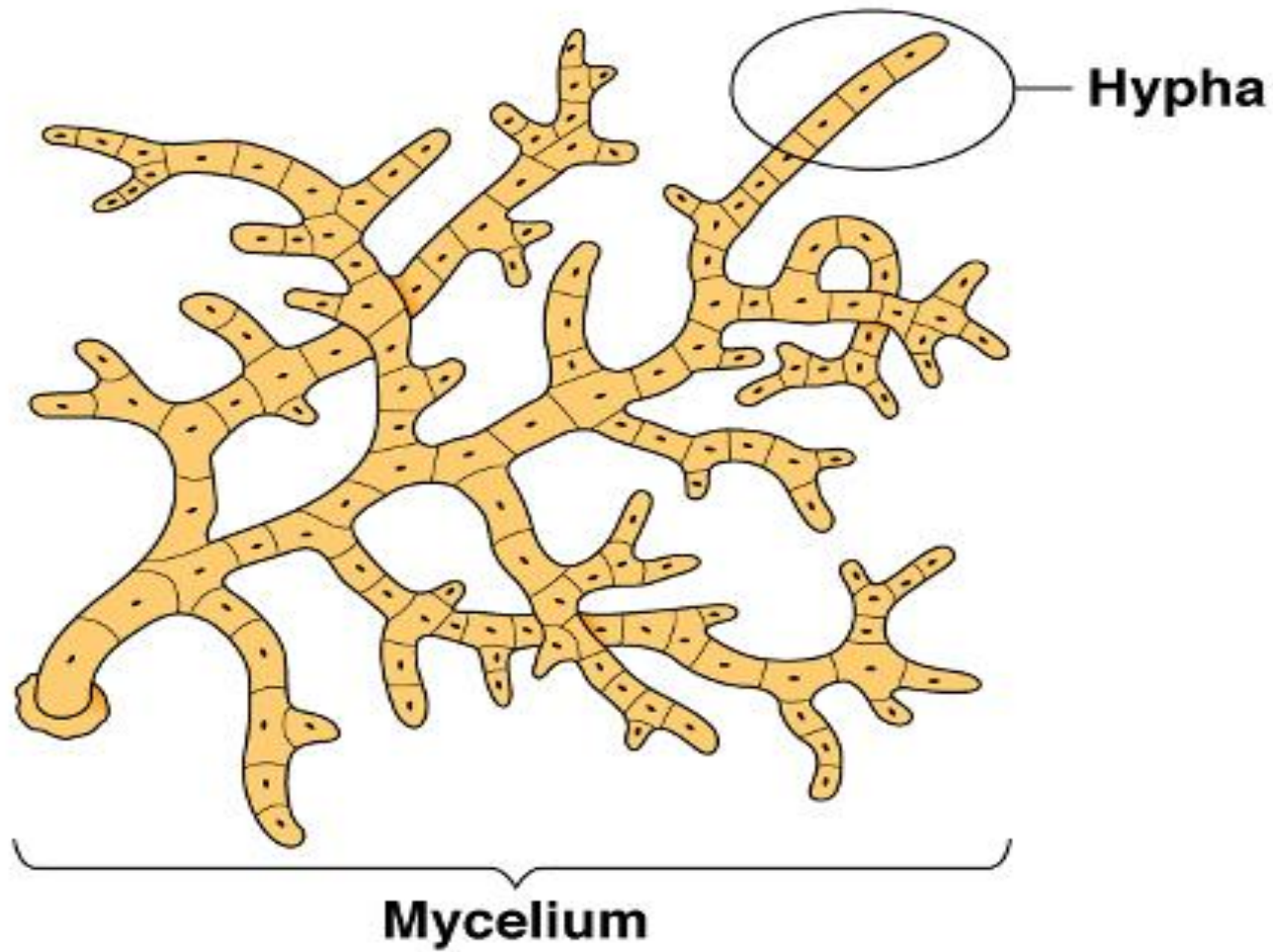
Some fungi  
produce both  
sexual and  
asexual spores



# Mold

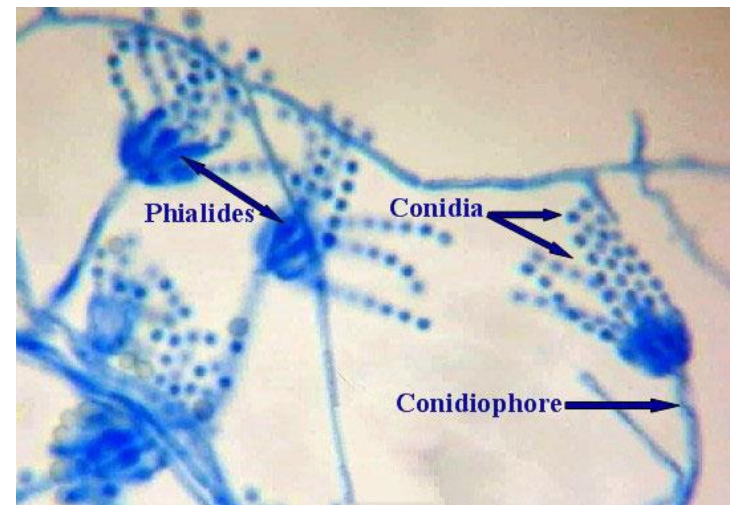
◆ Important term : ( page 75)

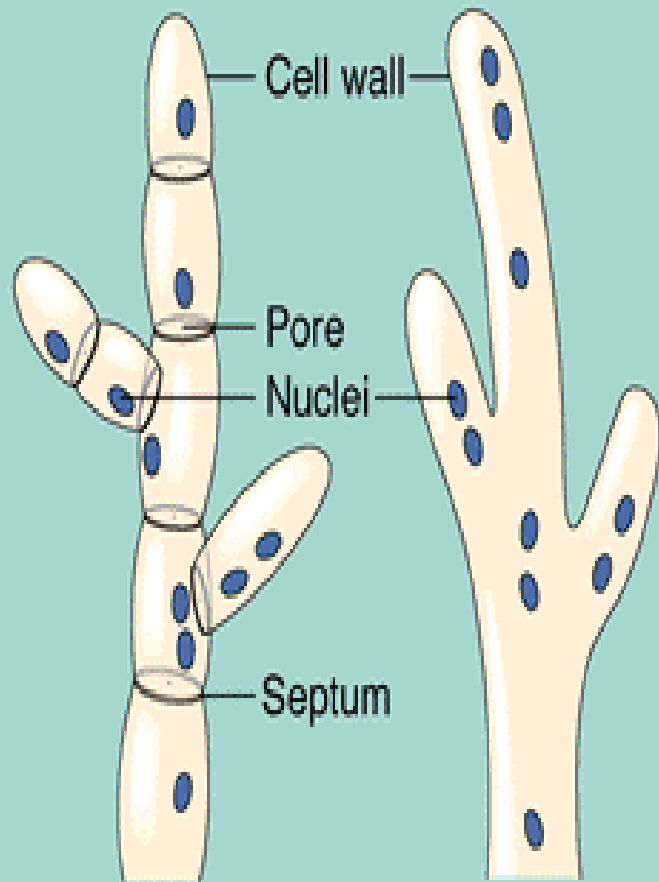
- Hypha
- Hyphae
- Septate hyphae
- Aseptate hyphae
- Mycelium



# Molds

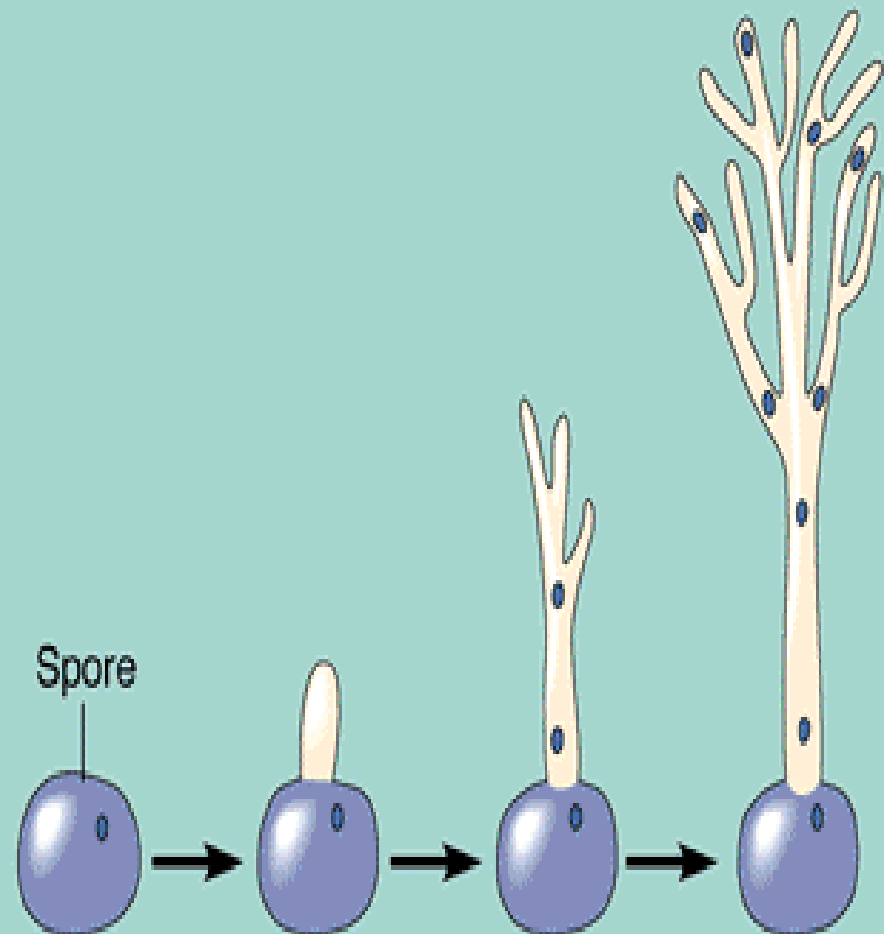
- Molds are multicellular fungi which are more complex than yeasts.
- The fungus form microscopic tubes or filaments called **hyphae** that contain cytoplasm & nuclei.
- **Hyphae can be:**
  - Septate hyphae
  - Non-septate hyphae





**(a) Septate hyphae**

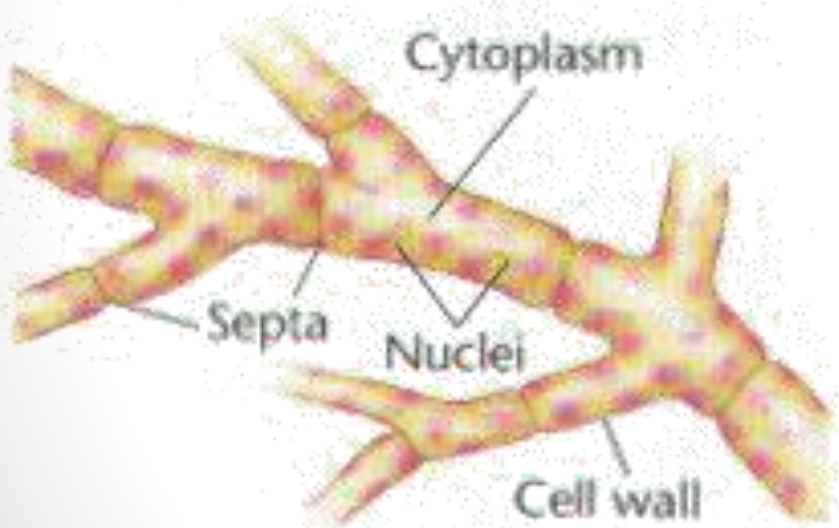
**(b) Coenocytic hyphae**



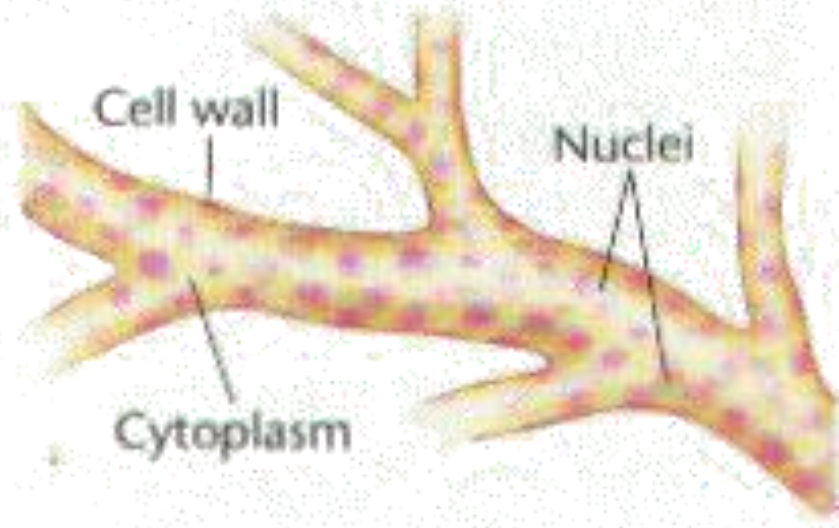
**(c) Growth of a hypha from a spore**

# Hyphae

**Hyphae with cross-walls**



**Hyphae without cross-walls**



# Molds

## Reproduction of Molds

Molds reproduce by **spore formation**, either sexually or asexually.

## Uses of Molds

- **Penicillium** used to produce the antibiotic penicillin.
- Some molds are used to produce enzymes and organic acids.
- For the production of different cheeses **e.g.** Blue cheese,



# yeast

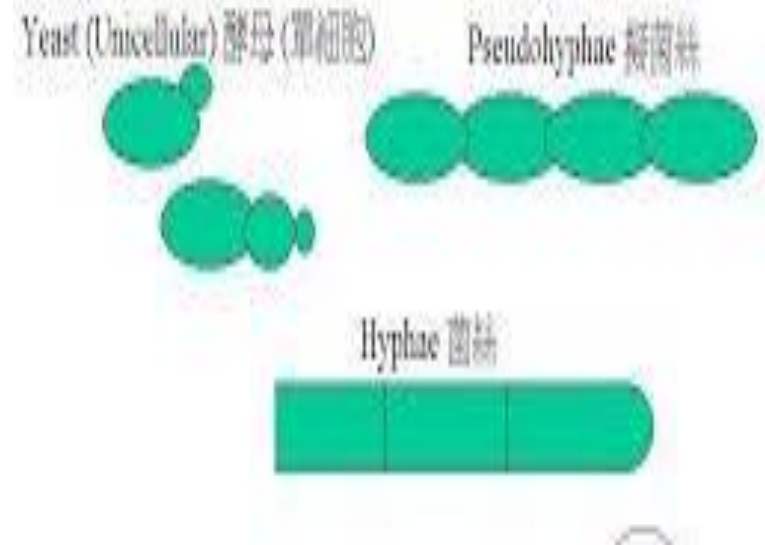
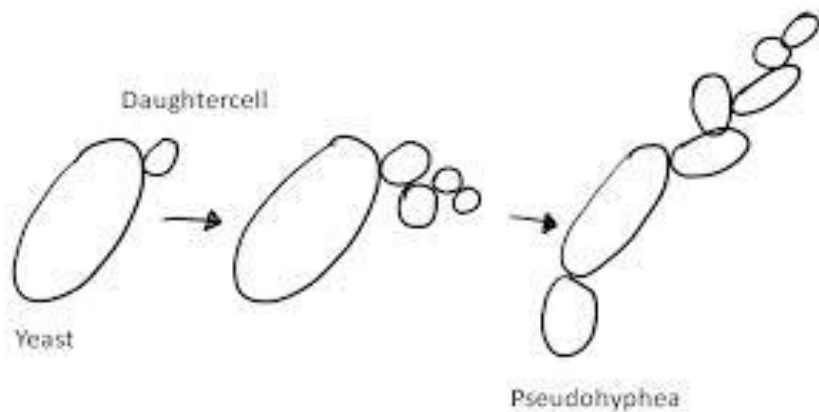
- Yeasts are single-celled fungi (**unicellular**) that can only be seen under microscope .
- Yeast are found in soil ,  
water and on the skin of many fruits .



## Shape of Yeasts

- True yeasts:** Cells retain individually.
- Pseudohyphae:** Elongated yeast cells attach to each other side by side forming a structure that looks like hyphae.

# Shape of yeast





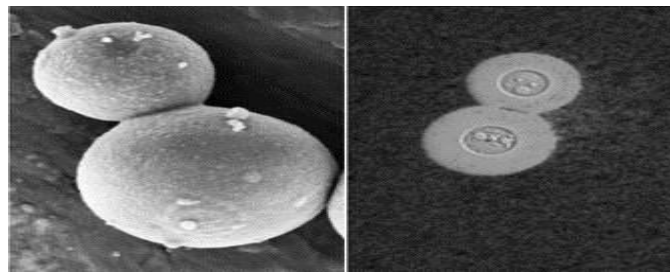
# yeast

## Reproduction of Yeasts

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

## Examples of Yeasts

- *Saccharomyces cerevisiae* live on the skin of grapes and other fruits are responsible for the fermentation process of these fruits. This fungi is also used as “**Baker’s Yeast**” in baking and bread production.
- *Candida albicans* and *Cryptococcus neoformans* are human pathogens.



# Fungi can be:

## 1. Monomorphic

Fungi that has only one shape or morphology.

e.g. *Cladosporium bantianum*  
*Aspergillus fumigatus*

## 2. Dimorphic (Diphasic) ( see page 81)

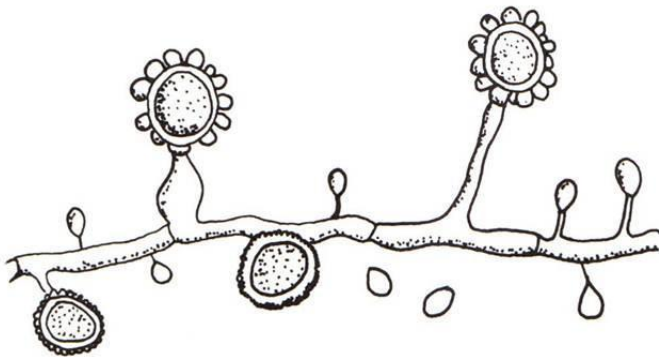
➤ *Many dimorphic fungi are pathogenic but not all the pathogenic fungi are dimorphic.*

e.g. *Histoplasma*  
*Blastomyces*

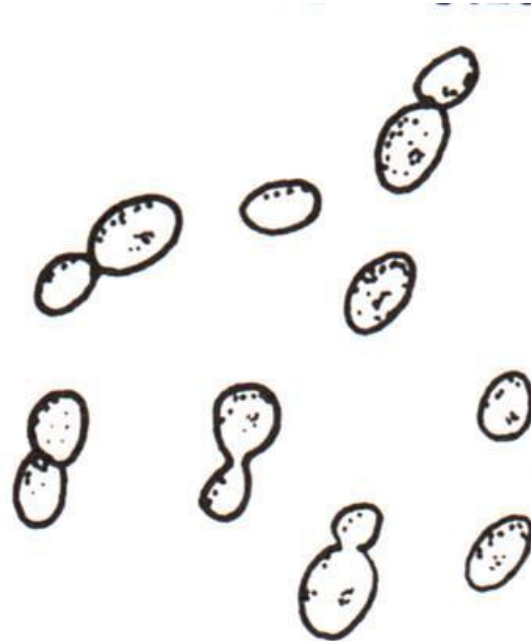
\*Not : *Fleshy fungi?* ( page 79 )

# e.g. *Histoplasma*

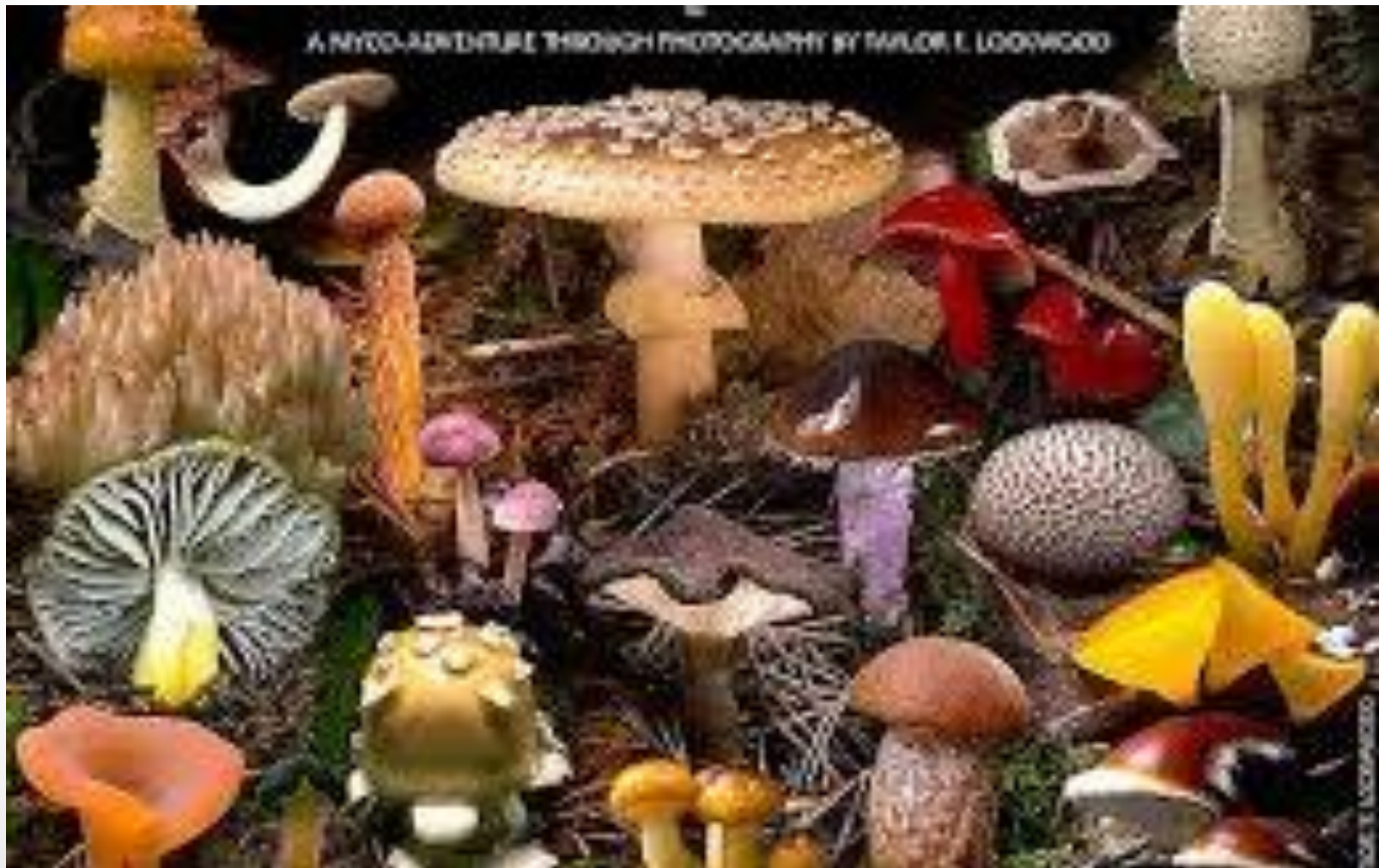
At room temperature ( 25C)



At 37C



**e.g. Mushroom**



# Reproduction of Fungi

Fungi can reproduce by two different ways:

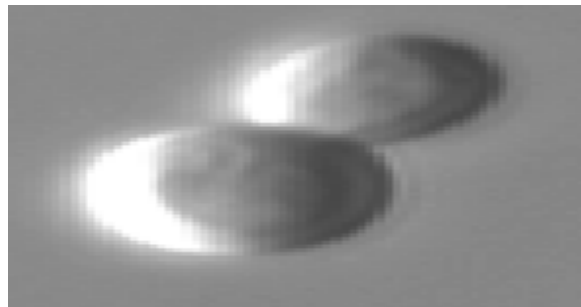
1. Asexual reproduction.

1. Sexual reproduction

# I- Asexual Reproduction

Multiplying “multiple copies of the same organism”  
only by **Mitosis**.

1. **Somatic:**    **in yeasts** reproduce by **Budding**  
                         **in molds** reproduce by **HyphaFragmentation**
2. **Spore Formation:** the end product is spore.

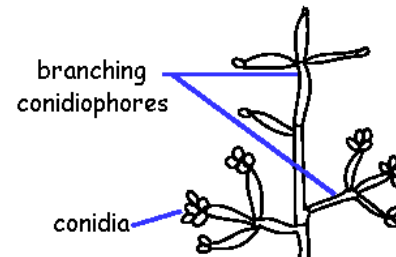
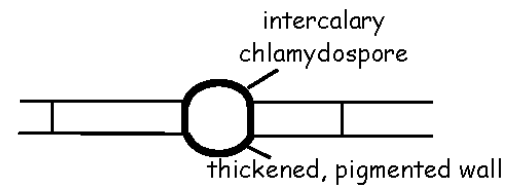
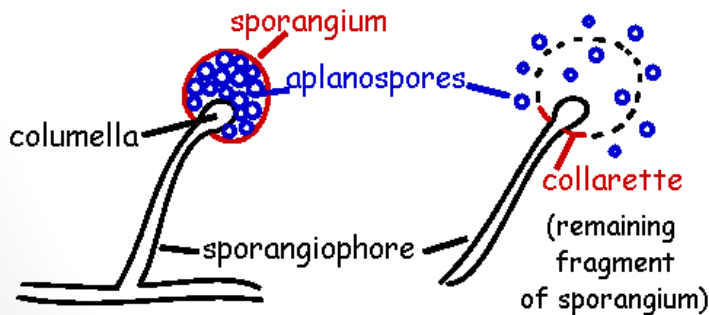


Budding in yeast

# I- Asexual Reproduction

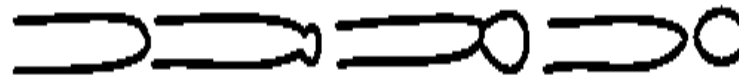
## Types of Asexual Spore Formation:

- a. Sporangiospores in sporangium.
- b. Chlamydospores in or on hyphae  
thick walled, resistant spore, terminal.
- c. Conidia on hypha or on conidiophores



- Conidia have many types:

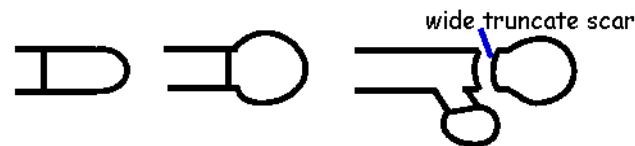
### 1. Blastospore



### 1. Arthrospore



### 1. Aleuriospore





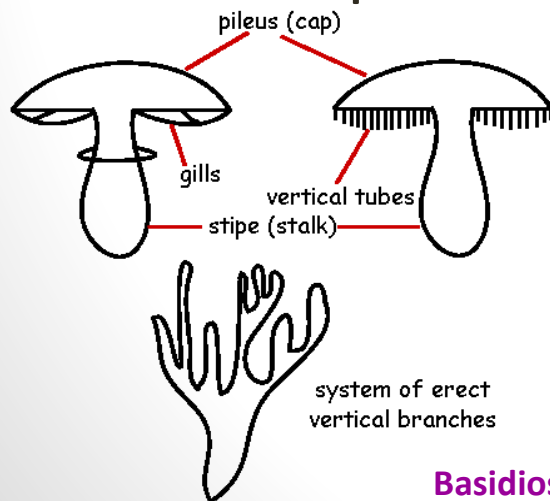
# II- Sexual Reproduction

Sexual Reproduction happen by 3 stages:

1. fusion 2. mitosis 3. miosis

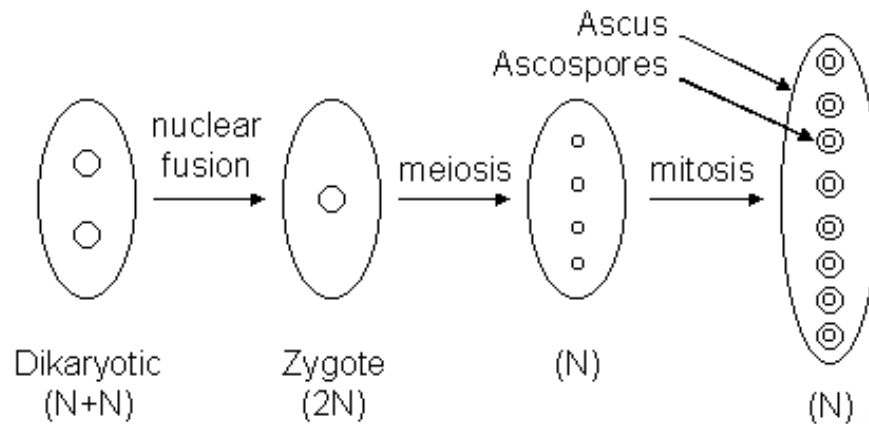
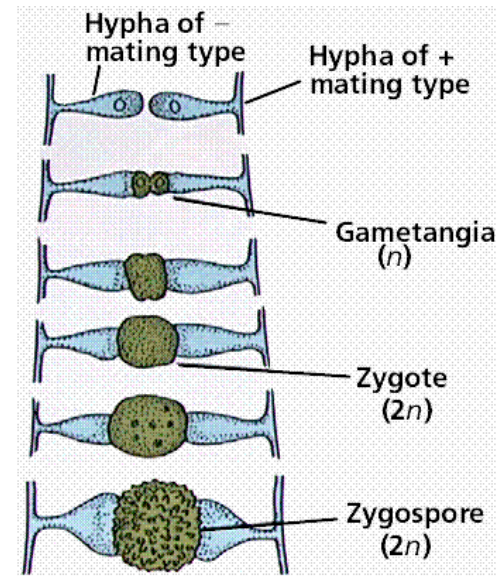
## Types of Sexual Spores:

1. Oospore
2. Zygospor
3. Ascospore
4. Basidioispor



Basidiospor

zygospor



Ascospore

# Deuteromycetes

## (Imperfect Fungi = Fungi Imperfecti)

A phylum of fungi that are without sexual stage in their life cycle , reproducing only by asexual spores. Also called *imperfecti* because their life cycles are imperfect.

# Fungal infections

1. Superficial mycosis: *Piedra*.
2. Coetaneous mycosis: **Dermatophytes**.
3. Subcutaneous mycosis.
4. Systemic mycosis.
5. Opportunistic mycosis: **Candidosis**.

# Superficial Mycosis: *Piedra*

- ◆ Fungal infections of the outer most area in the human body
- ◆ **Effect:** the outer most layer of the skin (epidermis) and Hair shaft .

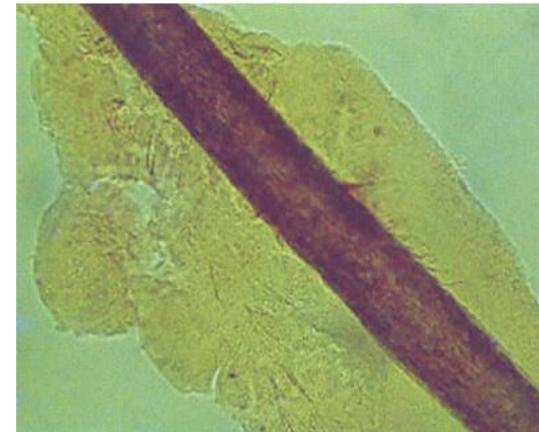
# - *Pityriasis versicolor*

- ◆\* it is a chronic superficial infection infecting the dead tissue of the stratum corneum (skin)
- ◆ Lesions occur on the trunk, shoulders and arms, rarely on the neck and face
- ◆ **Etiological agent is :**  
**Malassezia furfur (yeast)**



# White Piedra

- Soft, less firm nodules around hair shaft
- White to yellowish cream in color.
- **Etiological agent:** *Trichosporon beigelii*.
- Imperfect yeast cells.
- Produce cream and beige colonies.
- Grows fast in culture, 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.

# Coetaneous Mycosis: *Dermatophytes*

- Affect all keratinized tissue: Hair, Nail and Skin.
- Common in children especially school age (2-12years).

## 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 Dermatophytes

Tinea exists in any part of the body depending on the location it is given a different name:

Athlete's foot or *Tinea pedis*



Ringworm of the body or *Tinea corpora*



Scalp ringworm or *Tinea capitis*



Ringworm of the nail, Onychomycosis,  
or *Tinea unguium*





# Opportunistic Mycosis: *Candidosis*

- It is any infection caused by species of the fungus *Candida*.
- It is usually opportunistic but there are some forms are not.

## 1- Oral Thrush

Infection of the mouth surface by candida

### Very common in:

- AIDS patients, young babies, new born, and children.
- Also it can occur in adults and very old people.



**Lesion:** White patches in the tongue and oral surfaces.

## 2- Diaper or Napkin rash

- **Common in:** Babies who their mothers do not change their diaper frequently.
- **Symptoms:** **Red area** 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.