



University of Jordan
Faculty of Medicine



Medical Committee
The University of Jordan

Introduction to
Microbiology

Title :

..... Introduction Medical Mycology

Professor:

..... Dr. Asem Al-Shehabi

: ...29.....

Slides

Handout

Sheet

Done by: ..Danah Moaath.....



Price:

Designed by:
Wassem Kamal

M.D. Class of 2018

groups/Doctor2012
http://medstudygroup.weebly.com



Introduction Medical Mycology

❖ Mycology is the study of fungi and fungus-caused disease
(mycology >> mycous in Greek language which means roots)

❖ fungi are

- widely distributed in the nature
- eukaryotic
- constitute a large, diverse group of heterotrophic organisms
- all types of fungi are considered as aerobic
- chemoheterotrophic (organisms that require organic compounds for both carbon and energy source)
- fungi degrade a wide variety of organic substrates(complex molecules) into soluble nutrients (small molecules) which are then absorbed by other cells like plant cells .
- the majority of fungi can be cultured in vitro on special culture medium
- In the past they used to think that the fungi is a part of the plant kingdom
- do not respond to antibacterial drugs
- There is 100,000 types of fungi
- 100 type >> have clinical importance
- 10-15 type >> are associated with the majority of the clinical infection
- Can't be infected by any type of bacteriophages

❖ Fungi can be divided into two major group:

1. yeasts : Unicellular fungi , oval or spherical in shape
- 2.molds : (filamentous fungi) originated from a single spore

▪ Yeast:

Morphological features of yeast cell:

- Cell wall (more related to prokaryotic cell)
special cell wall composed mainly of polysaccharides
- 1-chitin: compose 60%-70% of cell wall (aminoglucose is basic structure of chitin)
- 2- glucan
- 3- mannan
- *all types of fungi have the same polysaccharides but with different concentrations

- cell membrane:
similar to the eukaryotic cells, but it contains special cholesterol called Ergosterol

- nucleus, is exactly like the eukaryotic cells nuclei which surrounded by nuclear membrane .

- The Cytoplasm contains special substances within vacuoles; special storage vacuole like lipid ,phosphate as well as glycogen vacuoles .

- Mitochondria

- Part of the complex cell

- Produce energy

- supporting metabolic activity

- The carry a small genome (tRNA / rRNA)>> produce specific type of amino acids and proteins

- One or more

✓ Replication process of yeast cell :

Budding process(bud means daughter cells)it is asexual process there are steps of budding :

1-developing of bud (bud, represents a bulge within the cell wall, cell membrane and cytoplasm) then the bud enlarges

2-the nucleus becomes elongated, Mitosis takes place, forming of double copies of nuclear DNA which will be carried out to the newly formed cells (bud or daughter cell)

3- Separation of the daughter cell (bud) which will result in the creation of a new cell which is identical to the parent cell.

Notes:

A) Each cell might be associated with more than one bud, generally (one to four) buds might be developed.

B) Not all yeast cells replicate by budding

Budding can produce

1) Germ tube >> Can be recognized in vitro - in laboratory test - in association with certain pathogenic yeast but in other yeast will not be able to recognize this stage (in vivo not recognized)

2) Hyphae >> tubes branched from the cell.

- The second major group of fungi **Molds**:
Multicellular filamentous fungi

Ex . Penicillium: can be easily recognized on bread ,cheese....ect,

*filaments of two types:

1) Horizontal filaments which may have regular cross-walls (septa) or not.

2) vertical filaments :there are 2 types

a) Aerial Mycelium which grow over the surface of the culture media

b) Vegetative Mycelium which grow inside the media and can't be recognized (like the roots of plants) responsible of absorption of nutrition's from the source of food

vertical filaments >> on the top of these filaments -by the presence of O₂- we have branching filaments (main branches and side branches) and depending on the type of fungi we might have a single branch or double or triple

then it starts to produce fragmentation within the cell which means producing spores

and these spores will be in different colors which will allow us to do laboratory identification

✓ Lab identification of fungi : -

It is relay on the morphological features NOT like bacteria which relay on the biochemical and serological tests , so according to the color , type and numbers of filaments , septated and not septated ,we identify the type of fungi

*in vitro we can recognize the presence of aerial mycelium

-We can recognize the growth under aerobic conditions

-So if a fungi manage to enter our tissue it will produce filaments but can't produce Aerial Mycelium because the lack of O₂

-In histopatholgy if we took a sample from the lung for example they will report the presence of filaments only

-Where as in the yeast we can do certain biochemical tests especially on certain types of sugars

-Most of the fungi produce similar immunoresponse so we can't use antibodies to differentiate between different types

Yeast >>

Baker's yeast/ *Saccharomyces cerevisiae* which used in baking in order to make bread mature by producing alcohol and CO₂ (fermentation)

It can be used in pharmacological industry(Bioengineering) because that some yeast cells have certain genes that can be used in order to produce certain amount of vitamins or insulin or other types of drugs

Mold >>

- Mushrooms are widely spread in the nature and it is an important nutritional food contain a lot of minerals and some rare types like celinum

-Mushrooms are like plants they have a projected part over a surface of the culture media like the soil and roots-like filaments which is responsible for absorption of the nutritions

-If we open a mushroom we will see condense filaments called aerial mycelium

-These filaments are the basic structure of the fungi

-Mushroom can be toxic or non-toxic

*amineta mushrooms >> very toxic>> found in Jordan

*any type of mushroom contain 2 colors with spots >>> toxic

*and only 5g of the toxic mushroom will kill a child and 10g-15g to kill an adult

-mushrooms can be quickly damaged

so if starts to be sticky (not hard) >> it is damaged (filaments) >> we shouldn't use it or it will cause gastrointestinal disturbance like abdominal pain , diarrhea , ...etc .

✓ There are special antifungal drugs that affect fungi:

You have to know that All antifungal have only one mechanism ,they interact with ergosterol in the cell membrane and form a complex ,this complex produce damage in the cell membrane then cause inhibition of the growth of fungi cells .

*The difference between antifungal drugs is the pharmacokinetics

*Most of them are toxic to some extent

*Examples :

1) Nystatin >> topical

2) Fluconazol >> topical / injected / oral

3) Amphotericin B >> one of the most used antifungal drugs for systemic infection (meningitis or sepsis) but it's very toxic; may cause kidney failure or liver cirrhosis

4) Casbofungin .

* There is 20 types of antifungal drugs but they are only from 3 important families

*In relation to yeast

Yeast is recognized as budding yeast

Some of these yeast might in vitro demonstrated by using human serum so we will recognize which we call germ tubes and these tubes start to produce filaments but not true filaments >> pseudohyphae (pseudofilaments)

*An important example of yeast is *Cryptococcus neoformans*>> have a large capsule and polysaccharides
It's the **only obligate type of yeast** found in clinical specimens

✓ Keep in mind

*Contamination with yeast and molds is very common

*Yeast can be part of our human flora (skin, oral, intestinal,...etc)

* So presence of yeast and filaments do not mean clinical infection but if there was some skin lesions or irritations in the vagina , or presence of large number of filaments which cover the tongue , this means infection .

sorry for any mistake ^-^

Done by : Danah Alsmady

" To do a great right do a little wrong "

William Shakespeare