INTRODUCTION TO MEDICAL MYCOLOGY

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Definitions

Mycologists--scientists who study fungi

Mycology--scientific discipline dealing with fungi

Mycoses--diseases caused in animals by fungi

Mykos = mycete = fungus

What is mycology?

Mycology is the study of fungi. The disease caused by fungi is called *MYCOSES.*

What are fungi?

Eukaryotic, spore-bearing, heterotrophic organisms that produce extracellular enzymes and absorb their nutrition.

General information's about FUNGI:

Fungi are not plants or animals, they form a separate group of higher organisms, distinct from both plants and animals, which differ from other groups of organisms in several major respects:

First:

Fungal cells are encased within a rigid cell wall, mostly composed of chitin and glucan. These features contrast with animals, which have no cell walls, and plants, which have cellulose as the major cell wall component.

Some basic terms:

- Fungi (fungus)

Hyphae (hypha) = cellular thread
Septate = hyphae with cross walls
non-septate = hyphae without cross walls
Mycelium = complex of hyphae
The term mould is generally used to describe a fungus which produces hyphae.
The term yeast is generally used to describe a fungus which reproduces by budding.

Conidium: a spore produced externally on a specialized hypae called conidiophore, the conidium (plural conidia) becomes detached when it mature.

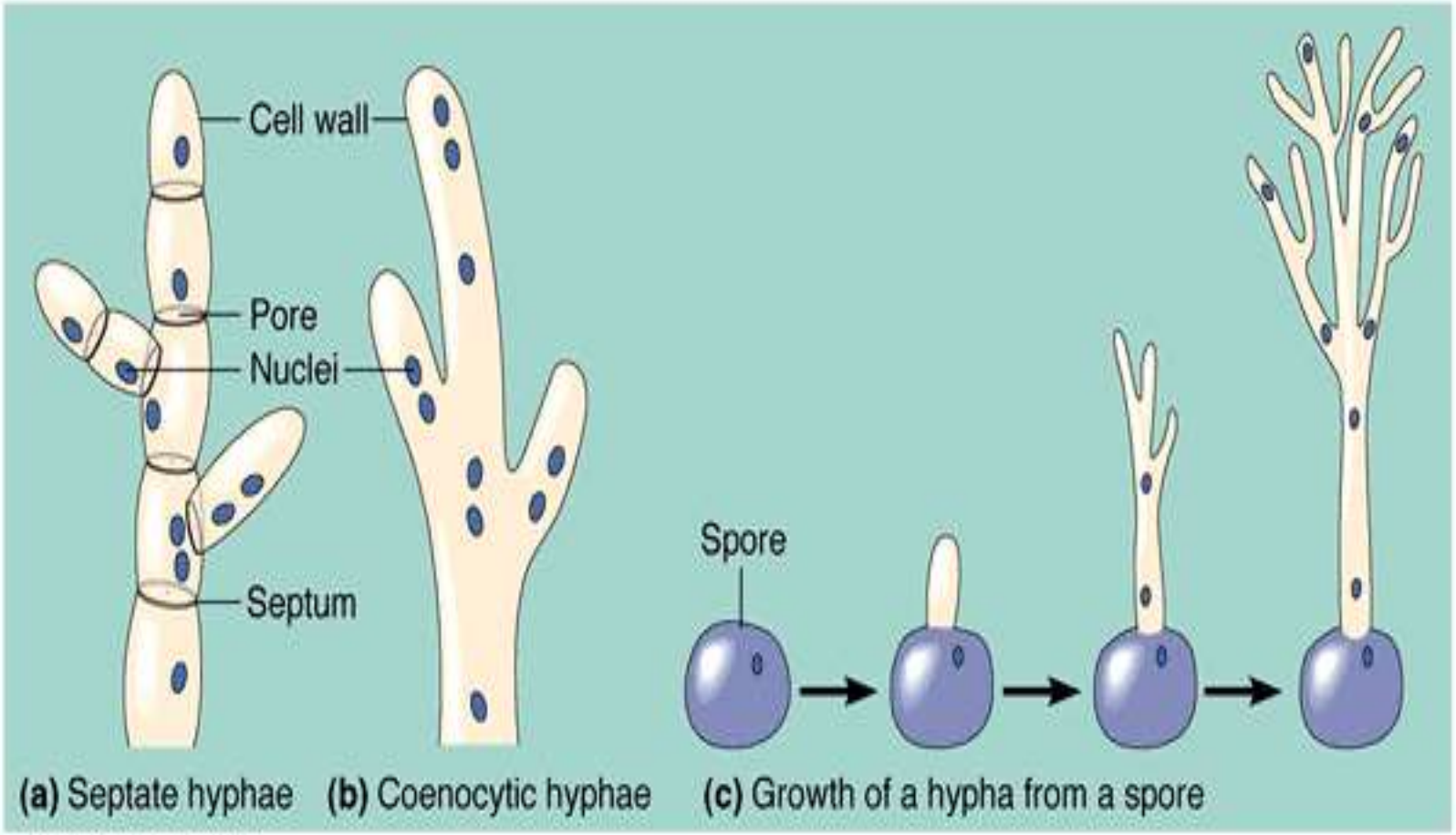
Sporangiospore: a spore produced within a swollen spherical cell (sporangium) at the end of specialized hyphae called a sporangiophore.

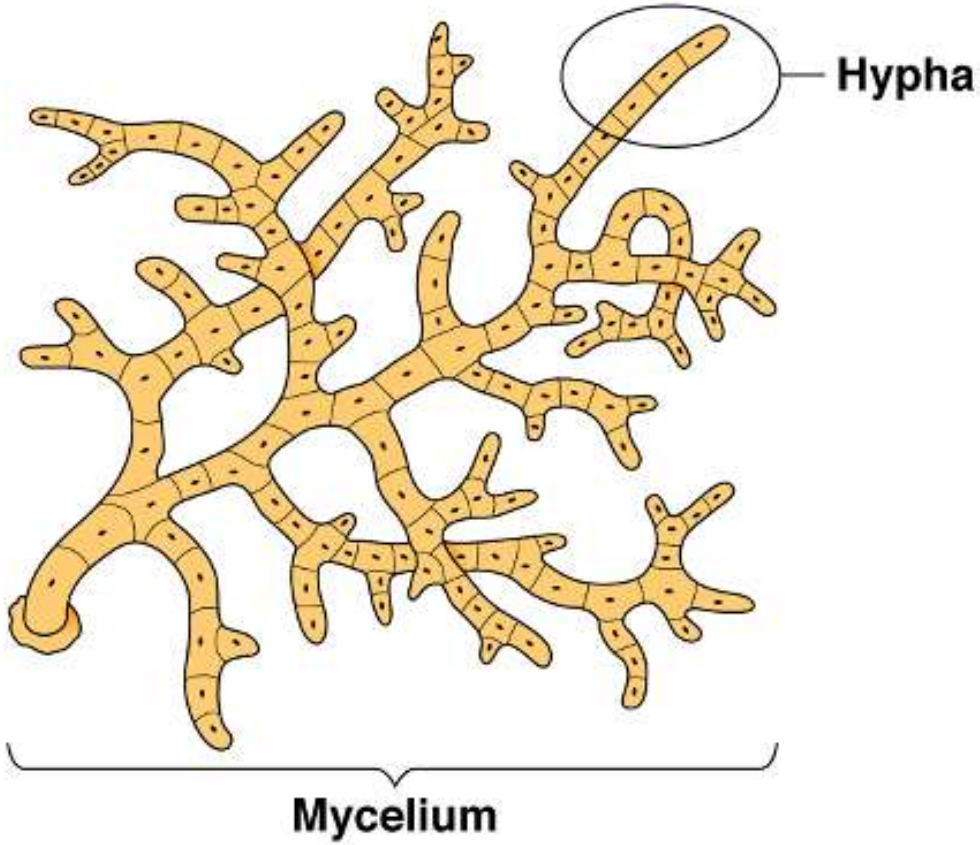
General knowledge of the fungi

Both sexual and asexual spore may be produced

Store their food as glycogen (plant; starch)

Fungi are heterotrophic organisms, lack of chlorophyll (plant; autotrophic)





Fungal Classification

Four groups of true fungi

Zygomycetes (common bread mold—*Rhizopus*)

Basidiomycetes (puffballs & common mushrooms)

Ascomycetes (Dutch elm disease/rye smut)

Deuteromycetes (fungi imperfection)

Laboratory to diagnosis of fungal infection

Specimen collection and transport

Specimen processing

Direct examination

Selection and inoculation of culture media

Identification

Specimen processing

specimen should be examined as soon as possible

direct examination :

KOH mount

India ink

culture media

Initial observations in the study of fungus isolates

1.Appearance of the growth

2. Rate of growth

3. Colony pigmentation

4. Growth on media containing antifungal agents

5.Dimorphic fungi

Laboratory Examination

1. Direct examination:

The clinical specimens especially the tissue scrapings should be cleared with 10 % KOH and are observed under the microscope.

2. **Isolation and identification**: Media and incubation condition as described earlier will serve the purpose. However, it is the most common fungal contaminant in the laboratory and it is routinely isolated from respiratory tract of healthy animals. So repeated isolation from the clinical specimen is required, along with correlation with the history, clinical signs and histopathological observations for proper diagnosis of clinical aspergillosis.

Aspergillus species

- Second most isolated fungus in the clinical laboratory
- Causes Aspergillosis

o Predisposed: debilitated and immunocompromised patients

o Pathogenesis: inhale conidia ◊ develop sinusitis or bronchopulmonary disease ◊ can invade surrounding blood vessels ◊ becomes systemic (acute and fatal). It is very invasive and has a rapid process for spreading.

o Can also be non-invasive in form of fungal ball and allergic fungal infections

Yeast

Yeasts are **single-celled budding organisms**. They **do not produce mycelia**. The

colonies are usually visible on the plates in 24-48 h. Their soft, moist colonies

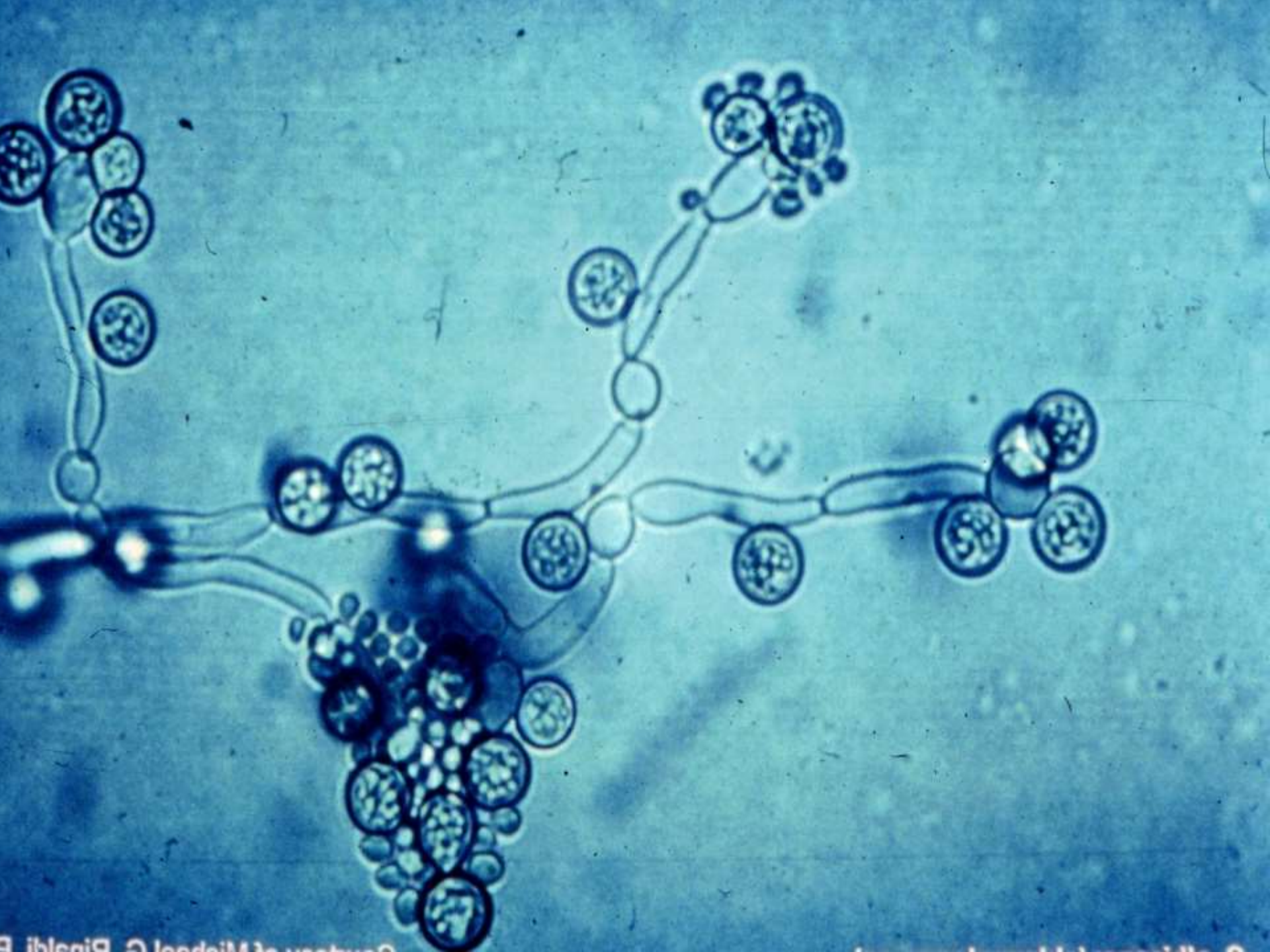
resemble bacterial cultures rather than molds. There are many species of yeasts which

can be pathogenic for humans. We will discuss only the two most significant species:

Candida albicans and *Cryptococcus neoformans.*

CANDIDIASIS (*Candida albicans*)

There are many species of the genus *Candida* that cause disease. The infections caused by all species of *Candida* are called candidiasis. *Candida albicans* is an endogenous organism. It can be found in 40-80% of normal human beings. It is present in the mouth, gut, and vagina. It may be present as a commensal or a pathogenic organism. Infections with *Candida* usually occur when a patient has some alteration in cellular immunity, normal flora or normal physiology.



Although it most frequently infects the skin and mucosae ,*Candida* can cause pneumonia, septicemia or endocarditis in the immuno-compromised patient. The establishment of infection with *Candida* species appears to be a property of the host - not the organism. The more debilitated the host,the more invasive the disease .

Histoplasma

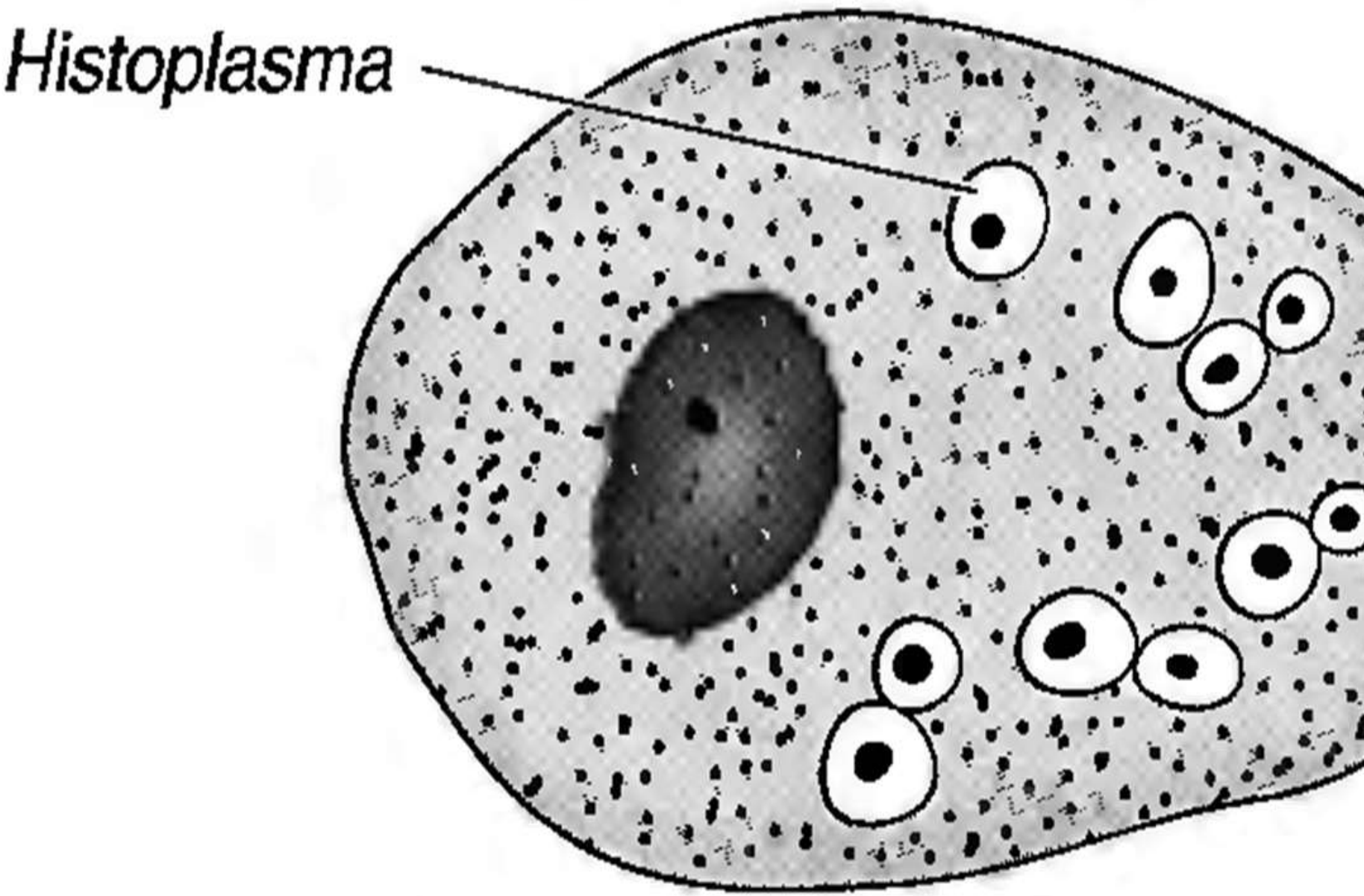
Properties of *Histoplasma*

• *H. capsulatum is a dimorphic fungus that exists as* a mold in soil and as a yeast in tissue.

• It forms two types of asexual spores

(1) tuberculate macroconidia, with typical thick walls and fingerlike projections that are important in laboratory identification,

(2) microconidia, which are smaller, thin, smooth walled spores that, if inhaled, transmit the infection.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