Laboratory Exercise # 16: Yeasts and Molds

Purpose:

The purpose of this laboratory exercise is to introduce the student to some common molds and yeasts that are used commercially or that can be considered pathogenic to man.

Introduction:

The classification of fungi includes both yeasts and molds. Both of these groups have useful microorganisms and pathogenic microorganisms within them.

Yeast have the following characteristics:

- Single celled fungi
- Spherical to oval in shape
- Reproduce by process of budding

In this exercise two different yeasts, *Saccharomyces cerevisiae* or (Baker’s yeast used in bread and wine production) and *Candida albicans* (normal flora of man, but can also be an opportunistic pathogen, taking advantage of a change in homeostasis and causing disease) will be studied.

Molds have the following characteristics:

- Filamentous fungi
- **Hyphae**, a single filament grows into multiple filaments called **mycelium**
- Hyphae develop from fungal spores that can produce either sexually or asexually
- Fungi are decomposers their hyphae release enzymes that break down nutrients in their environment which then are absorbed
- Likes a slightly moist environment, can grow in temperatures ranging from -6° C to 50° C

In this exercise three fungi *Aspergillus, Rhizopus stolonifer, and Penicillium notatum*, will be studied. *Aspergillus* is commonly found in soil and hay, but when the spores are inhaled they can cause a respiratory disease called **Aspergillosis**. Also this fungus can produce an **Aflatoxin** (when it infects peanuts) that is a potent carcinogen. *Rhizopus stolonifer* is also known as “Black Bread Mold.” **Penicillium notatum** is a blue gray mold that is used to produce the chemotherapeutic agent Penicillin.
Materials:

Prepared slides of:

   Aspergillus condia
   Penicillium condia
   Rhizopus condia

Sabouraud dextrose agar plates of:

   Candida albicans
   Saccharomyces cerevisiae

Purchased plates of:

   Penicillium notatum
   Aspergillus
   Rhizopus

Rabbit plasma cultures of:

   Candida albicans
   Saccharomyces cerevisiae

Procedure:

This laboratory is a demonstration laboratory. The student is responsible for observing all of the different cultures and slides on display. **PLEASE DO NOT REMOVE THE LIDS OF THE MOLD PETRI DISHES!!** The spores of the mold are easily dispersed by simple air flow and they then can contaminate the lab room.

1. Observe *Candida albicans* and *Saccharomyces cerevisiae* on Sabouraud Dextrose agar. Describe the colonial morphology of each yeast on the data page.

2. Make gram stains of *Candida albicans* and *Saccharomyces cerevisiae*. Record observations on the data sheet.

3. Observe the slides of rabbit plasma containing *Candida albicans* and *Saccharomyces cerevisiae*. These three hour cultures are used to promote the production of germ tubes. Make a sketch of both slides on the data sheet.

4. Using a dissecting microscope, observe the plates of *Penicillium*, *Aspergillus*, and *Rhizopus*. **REMEMBER DO NOT OPEN THE LIDS!!** Note the colony pigmentation and record the appearance (rhizoidal for *Rhizopus* and filamentous for *Aspergillus* and *Penicillium*).
5. Observe the prepared slides of the above three molds using 10X magnification. Note the sporulating structures. Record your observations on the data sheet.

**Data:**

1. Describe the colonial morphology of *Candida albicans* and *Saccharomyces cerevisiae* on Sabouraud dextrose agar.

   **Candida albicans**
   _______________________________________________________
   **Saccharomyces cerevisiae**
   _______________________________________________________

2. Sketch the gram stains of the two yeasts.

   ![C. albicans](image1.png)  ![S. cerevisiae](image2.png)

   *C. albicans*  *S. cerevisiae*

   Is there any difference in the gram stain of these two yeasts?
   _______________________________________________________

3. Make a sketch of your observations of *Candida albicans* and *Saccharomyces cerevisiae* in rabbit plasma. Which of the two cultures forms a germ tube?

   ![S. cerevisiae](image3.png)  ![C. albicans](image4.png)

   *S. cerevisiae*  *C. albicans*

4. How would you be able to determine definitely which of these two yeast you were dealing with?

   _______________________________________________________

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5. Describe the colonial morphology of each mold and make a drawing of your microscopic observations of each of the molds.

**Penicillium** Colonial morphology: Pigment: ________________________
Form: ________________________

Microscopic Observations of Sporulating Structures (Prepared slide)

**Aspergillus** Colonial morphology: Pigment: ________________________
Form: ________________________

Microscopic Observations of Sporulating Structures (Prepared slide)

**Rhizopus** Colonial Morphology: Pigment: ________________________
Form: ________________________

Microscopic Observations of Sporulating Structures (Prepared slide)

Asexual Reproduction

Sexually Reproduction
Questions:

1. Which of the two genera of yeast studied in lab is used commercially?

2. What sense can you easily use to determine if yeast is present on the culture plate?

3. How can you tell the difference between Saccharomyces and Candida since their gram stains look identical?

4. Which of the molds you observed in lab has the ability to put “roots” down into the agar.

5. Describe in words the sporulating structures of Aspergillus, Penicillium and Rhizopus.