

# Yeast, Molds and Mushroom

## Segment I

Hello, my name is Basem Jaber and I am an assistant professor of Biology at the University of Jordan.

My question for you today is

Do you consider Fungus friend or foe?

I am sure that many of you will immediately say foes. In one respect I agree that fungi can be very harmful to us. However, there is bright side the fungi story that we should know about. This bright side shows numerous many good things fungi can do for human.

In this module we are going to learn about the beneficial aspect of this very important group of organisms and perhaps by the end of this module I can convince you that molds are not always bad.

## Segment II

First of all let's learn few things about fungi related to what they are and their role in nature.

Fungi are members of the kingdom Fungi. Some types of fungi are microscopic and inhabit a space smaller than the abdomen of an ant, while other species found underground can grow larger than a soccer field! Even though fungi have cell walls like plants, they are not plants because they do not have roots, leaves, stems or chlorophyll. They are not animals either, although they do share some characteristics with animals. Both fungi and animals are unable to make their own food thus called heterotrophs. But unlike animals, fungi digest their food before they eat it. Fungi and other organisms called decomposers play an important role on Earth. By breaking down dead and decaying organisms, they serve as nature's recyclers, returning important organic nutrients to the soil for future use by plants.

Your teacher will introduce you to the general structure of different Fungi.

## Segment III

Now you know that yeast, molds and mushrooms although they belong to the same kingdom, they look very different form each other.

With respect to human, some types of fungi can be very beneficial. They either can be utilized as a food source, or assist us in making certain kinds of food such as cheese and bread. Moreover fungi can be exploited for production of several types of drugs and medications.

The most well known yeast that is used for making being *Saccharomyces cerevisiae*, the common baker's and brewer's yeast... A strain of *Saccharomyces* is what you get when you buy a package of dried yeast at a grocery store. I should tell you that these yeast cells do not know that they are helping us making bread; they just want to live and multiply. To do that, they must utilize food (usually sugar) as a fuel source. Some yeast cell can burn the fuel in the absence of oxygen a process called anaerobic cell respiration or more commonly known as fermentation. One of the by-products of fermentation is carbon dioxide gas. Human also release (exhales) CO<sub>2</sub> as result of fuel burning except we burn our fuel in the presence of oxygen (aerobic respiration). Today we will show you an interesting experiment that demonstrates the liberation of CO<sub>2</sub> gas as a result of yeast fermentation. I should draw your attention to the point that the released CO<sub>2</sub> is what causes the bread doe to rise.

Now, we will do 2 experiments, the first one shows that yeast can release gas/CO<sub>2</sub> as by-product of fermentation which I will demonstrate to you and the second one, you will do with your teacher and will show how CO<sub>2</sub> causes the bread doe to raise.

I will let you go now to set up the experiment with your teacher and when I come back I will demonstrate to you how yeast can release CO<sub>2</sub>. See you in 10 min.

See you shortly

### **The teacher's setup is included in teacher's guide**

#### **My experimental setup**

##### Materials and Methods:

Yeast cells

Brown sugar

150 ml beaker or bottle

Stirring rod

10 ml Glass test tube

Deflated balloon

Mix brown sugar, yeast, into water in the 150 ml beaker. Stir the mixture for several minutes. Aliquots the sugar solution in several test tubes and cover the test tube open end with the deflated balloon. Let set at 37°C for 30 min and observe the expansion of the balloon. (This part will be prepared live. Then I will show the one that was prepared before hand)

Can you see the difference between the two balloons?

Now that you have seen the two experiments, I'll let you discuss the results with your teacher.

I am feeling hungry; I guess I can have a piece of bread while you discuss the results with your teacher.

#### **Segment IV**

**Mold** is a general term given to fungi growing as thin cotton-like fibers called hypha (plural mycelium). The hypha is the structures that produce large numbers of conidia (spores). These spores are often brightly colored, giving the mycelium a distinctive appearance that may be useful in identifying the species. Some common mold genera are *Penicillium*, *Aspergillus*, and *Rhizopus*. These fungi exist ubiquitously in the environment surrounding us. You can find it at home, in your bag, in your shoes on your clothes. However they can not be seen because they exist as spores and as soon as they land on organic substrate such as food they will grow and form the visibly cotton—like hyphae with unique colors.

Other types of fungi can be medically important because they can produce antibiotics such as penicillin which can kill bacteria that is harmful to human. One of the first and most famous antibiotics is penicillin. The discovery of penicillin was a coincidence and has an interesting story that I would like to share with you. Alexander Fleming was a medical doctor who was interested in bacteriology. He did many experiments in his attempts to find substances that can kill bacteria. He had so many studies going on in his lab that was often cluttered for many days before he gets the time to clean it up. One day, while he was cleaning his laboratory and before discarding Petri dishes that were full of bacteria, a particular one caught his attention. That Petri dish had molds contamination that had no bacteria going around it. He suspected that the mold maybe produced a substance that killed the bacteria. After taking a sample of the mold, he found that it was from the penicillium family. He named it penicillin and found that it was nontoxic and sufficient in treating many types of bacteria harmful to man.

So you can see that this major discovery that changed the served the entire humanity was just a coincidence.

You can easily grow mold on your own. To do that, bring a piece of bread or an orange and place it in a dark humid area and wait for few days. After that you will notice small spots of green or black color. These spots consist of large number of tiny threads that produces millions and millions of spores like the one I have here (show them an orange and a piece of bread that has mold on them).

I am sure that you've seen this before

I should remind you not to eat the moldy food.

Note: If microscopes are available, teacher can prepare a wet mount and observe mycelia under microscope ( see teacher's guide for instructions)

### **Segment V**

#### **Mushrooms**

For most people, mushrooms are the most commonly encountered and recognized fungi. Many types of mushrooms are edible. You order some mushroom as a topping on your pizza. The part that we eat is basically the one that contains the microscopic spores called basidiospores. The large part of mushroom remains hidden underground and the seen part is the one responsible for propagation.

Mushrooms belong to group Basidiomycetes, which produce the typical stem (stipe), cap (pileus), with gills (lamellae) or pores on the underside.

If you examine the underside part of a mushroom you will notice that gills which are basically folded region or pores which resembles small holes. In both there are millions of spores attached to these gills and pore. These basidiospores eventually will detach and spread by the wind to settle and occupy another location to form a new mushroom.

The stipe of the mushroom, basically consist of many hyphae that have been attached to each other.

Remember, not all mushrooms are edible, some can be poisonous. Do not attempt to eat one before you identify it as edible.

I will let you examine with your instructor the different parts of the mushroom.

### **Segment IV**

At this point we came to a completion of our lesson. I hope you are had a good time learning about a very important group of living organisms. I hope I was able to show you the many good things that fungi can do for us. I really enjoyed teaching this material and I thank you very much for your attention.

Thank you very much.