

LESSON 15

Investigating Fungi II—Yeast



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What do you think this photo has to do with the topic of this lesson?

INTRODUCTION

In this lesson, you will focus on another member of the Fungi kingdom—yeast. You may have heard of yeast being added to bread or cake dough to make it rise. But did you know that yeast cells are living organisms? In this lesson, you will observe a yeast culture and watch as evidence of an important life process bubbles up before your eyes. You will design an inquiry to investigate substances that affect yeast cell activity. You also will read about the important role that yeast plays in our daily lives.

OBJECTIVES FOR THIS LESSON

Observe evidence of yeast activity.

Design and conduct an inquiry to investigate substances that will or will not promote yeast activity.

Explain how different kinds of yeasts benefit or harm humans.

Update the yeast organism photo card.

INTRODUCING YEAST

There are many species of yeasts. They are divided among three different phyla of the Fungi kingdom. Most yeast species, however, belong to the phylum Ascomycetes. In addition to yeasts, this phylum includes truffles, morels, and mildew. Most fungi are multicellular and relatively large. Yeast cells are unusual because they are unicellular and microscopic. Scientists believe that yeast once had the typical fungi's ability to form hyphae—the tubes that root fungi to the surface of an object—but gradually lost that ability.

Dry granules of yeast contain tiny spore sacs. In a moist, warm environment in which a food source is available, the spores become active; during this period they grow into new yeast organisms and begin to reproduce. Although yeast cells can reproduce sexually, they usually reproduce asexually through a form of cell division called “budding.” In this process, a new cell forms by cell division and produces a small outgrowth on an older cell. Eventually, the smaller cell breaks off and becomes self-sufficient.

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Yeast granules

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When yeast cells become active and feed, they undergo a process called “fermentation.” During this process, sugar is broken down and carbon dioxide and alcohol are formed. In this lesson, you will see and measure evidence of yeast activity as yeast grains are added to different substances.



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Nineteenth-century microbiologist Louis Pasteur first cultivated yeast cells and used them for scientific purposes.

Yeast: Rising to the Occasion

Yeast cells sure do get around. You'd be surprised at all the places you can find them. These tiny, one-celled organisms live all around us—in soil and saltwater, on plant leaves and flowers. Neither plants nor animals, yeast cells are fungi.

Like other fungi, yeast cells are very good at recycling. They stay busy by decomposing, or breaking down, plant and animal matter. As they do this, they grow and reproduce, and in the process, carbon dioxide and alcohol are released. For this reason, yeast cells play an important role in some basic food processes, such as making bread dough rise and fermenting substances to produce wine, beer, and industrial alcohol.

The Yeast Within

Yeast cells not only live all around us, they also live upon us and within us! The oily surfaces of our noses, ears, and scalps are favorite hang-outs. And so are our mouths and intestinal tracts. It may seem weird, but it's all perfectly normal.

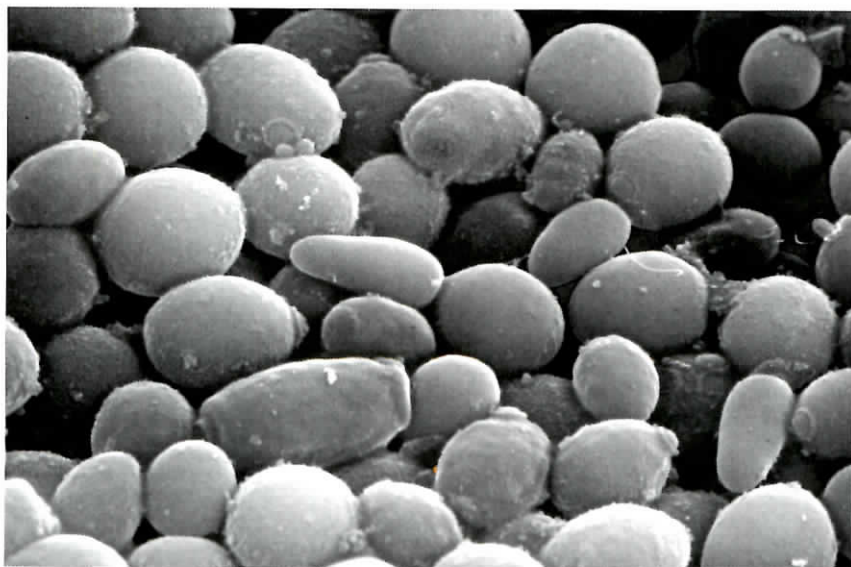
Most of the time, the yeast populations on our bodies are present in numbers that cause no problems. Sometimes, such as when we take certain medications or change our diets, yeast colonies are able to multiply rapidly. This can lead to infections. Too many yeast cells in the lining of our mouths, for example, can cause thrush, a contagious disease found most often among babies and

children. Symptoms of thrush include fever and diarrhea, and small whitish bumps on the mouth, throat, and tongue.

Fermentation

Most of us know yeast best from its role in breadmaking. When the conditions are right, yeast cells make the bread dough rise, or expand. They do so during a chemical process called “fermentation.” Fermentation is the process through which cells get energy by breaking down simple sugars without using oxygen. Many kinds of yeast cells can ferment sugars, and different yeast cells accomplish this in slightly different ways. Brewer's yeast and baker's yeast are important to the food industry because they break down sugars into carbon dioxide and alcohol.

Here's how it works during breadmaking. Baker's yeast, which looks like little dry granules, actually consists of tiny sacs that are full of spores. When mixed with water and added to



Yeast budding

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The dough used to make the bread in the upper photo had no yeast added. Yeast was added to the dough for the bread in the lower photo.

the warm, moist dough, the yeast cells become active. They begin to reproduce by budding and form new yeast organisms. The small buds break off, forming smaller cells from larger ones.

During this activity, fermentation occurs, releasing carbon dioxide and alcohol. The gas becomes trapped in the sticky dough and can't immediately escape—so it makes the bread dough expand. When you look closely at a piece of bread, you can often see little holes where the carbon dioxide bubbles have been. When the bread is baked, the dough stays in this expanded shape. The heat from the oven causes the alcohol to evaporate. It also kills the yeast organisms.



SCOTT BAUER, AGRICULTURAL RESEARCH SERVICE/UNITED STATES DEPARTMENT OF AGRICULTURE

Brewer's yeast is used to make beer or wine. The bubbles in certain wines, such as champagne, come from carbon dioxide that gets released when grape juice ferments.



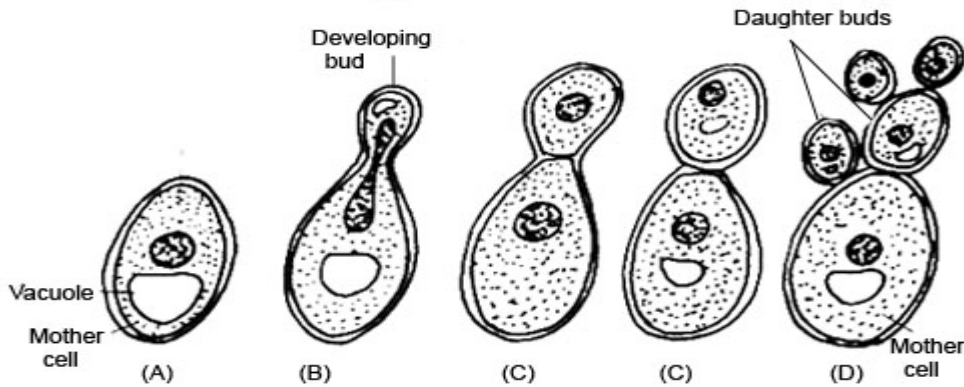
NORTHWIND PICTURE ARCHIVES

Get Around

Breaking down plant and animal matter in our soil and water. Guarding our bodies against harmful microorganisms. Making our wines bubble and our breads rise. Causing illnesses and rashes. There's no doubt about it—yeast cells are extremely busy, often useful, and occasionally irritating, organisms. □

Yeast has been important to wine production for a long time. Before 2000 B.C., the Egyptians knew if they crushed grapes, alcohol would be produced.

Budding



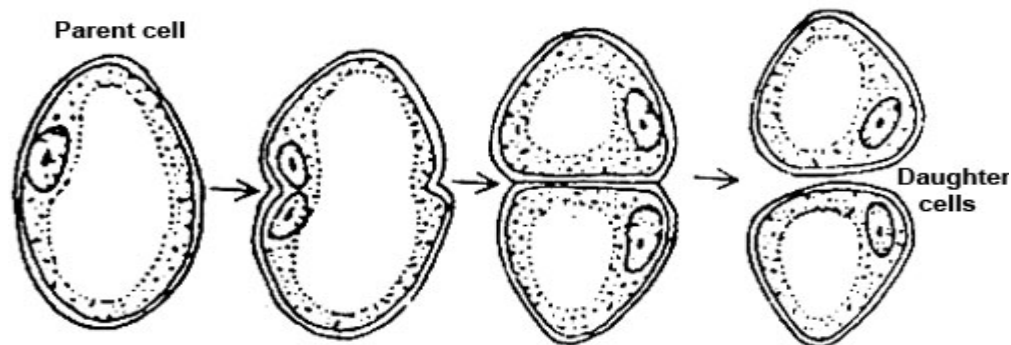
Yeast - Asexual reproduction by budding.

source: www.biologydiscussion.com

Saccharomyces cerevisiae reproduces by budding process in favourable condition. In this process parent cell develops short outgrowth known as bud and nucleus divides into two nuclei. One of them moves towards the bud. When bud enlarges in size there is a constriction between bud and parent cell due to which bud gets detached from parent cell and lives as a new yeast cell.

In most favourable conditions, budding process takes place very fast as a result parent cell develops one bud which again develops another bud without detaching from parent cell and a chain-like structure is formed which is called pseudo mycelium.

Fission



Yeast - Asexual reproduction by fission

source: www.biologydiscussion.com

In *Schizosaccharomyces* fission takes place in a favourable condition. In this process parent cell becomes elongated and transverse wall is formed at centre due to which parent cell divides into daughter cell and each daughter cell lives as a new yeast cell.

Asexual reproduction

It takes place by the formation of endospores during unfavourable conditions. During this

process, the protoplast of the vegetative cells divides into four parts. Each part later becomes surrounded by a thick wall, and act as an endospore. It remains dormant to withstand the adverse conditions. On the return of favourable conditions, the endospores germinate to produce chains of yeast cells.