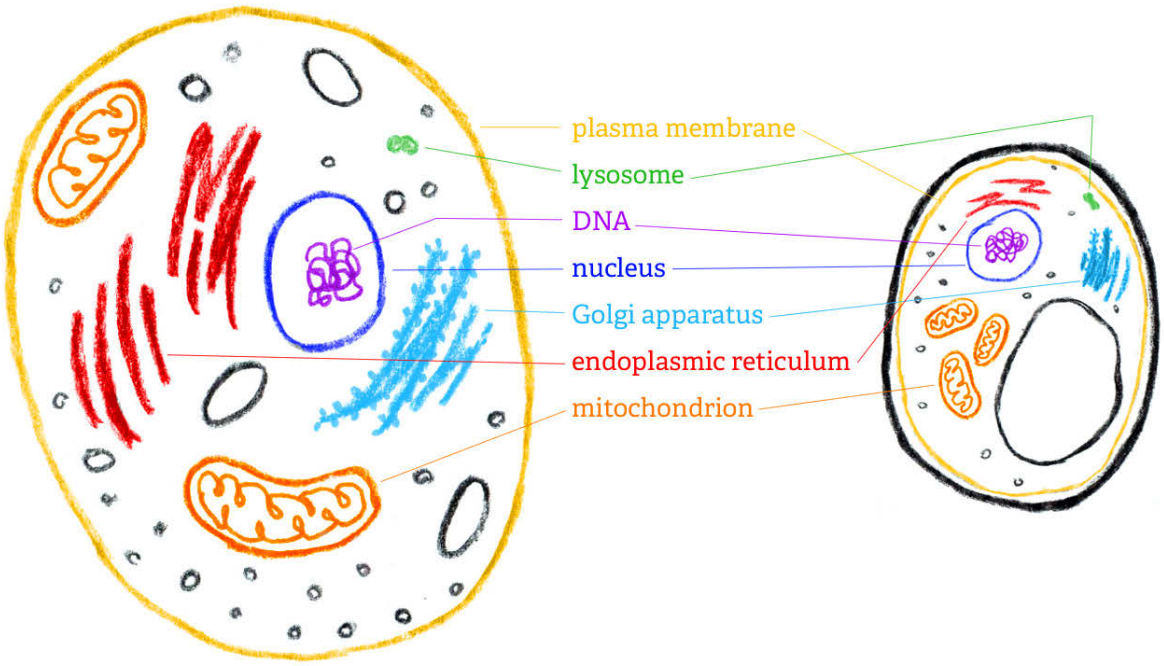
Teacher Tune-up

Quick Content Refresher for Busy Professionals

Why do biologists study yeast?

At first glance, yeast may seem a bizarre organism to attract attention from biologists. Most of us are familiar with baker's yeast, the small granules that we add to bread to make it rise. Of all the organisms in the world, why focus on the tiny bread-maker? Perhaps surprisingly, the tiny yeast has contributed to some of the most important discoveries in biology, and is considered a "model" cell for investigations. Yeast therefore finds itself in the company of other scientific celebrity model organisms such as *E. coli*, *C. elegans*, *Drosophila* (fruit flies), and mice.

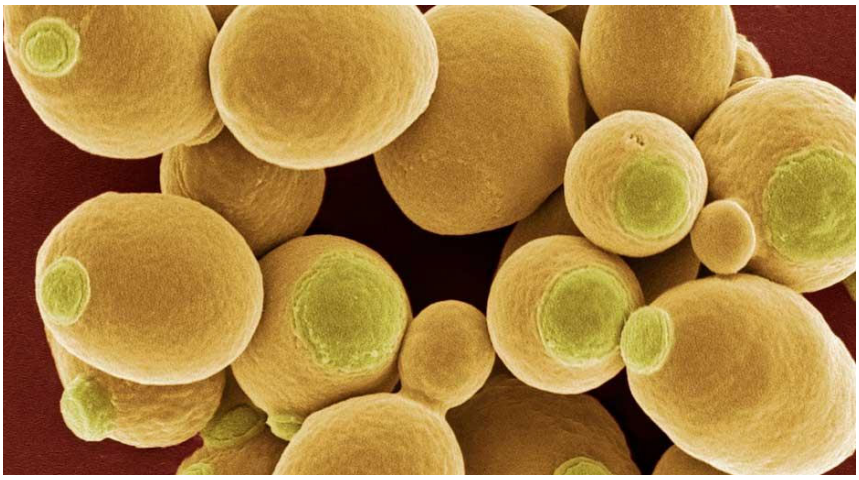
Yeast is a unicellular organism, but it shares a remarkable number of characteristics with a human cell. Both kinds of cells are eukaryotes, which means they contain a nucleus that holds their DNA. Yeast and humans share many of their genes, particularly those involved in metabolism (chemical reactions critical to cell survival) and cell division. In fact, about half of the genes found in yeast are found in humans. While we may look and function differently, yeast and human cells have a lot in common.



These commonalities make yeast a strong candidate for biological and medical research. Scientists have figured out the code for the entire genome (all the genes) in baker's yeast, as well as in many other species of yeast. Using this knowledge, they can run experiments examining what happens when one of these genes has been mutated or eliminated, and they can use yeast to test the effects of drugs on different genes. Yeast has also been an important species in studying cancer, because the genes involved in cell division are very similar in yeast and humans, and errors in these genes often cause out-of-control, cancerous cell growth.

Finally, yeast is a convenient species for work in the laboratory. Yeast cells divide quickly, in about two hours, which is much faster than human cells. Most yeast species are safe to use, can tolerate a wide range of environmental conditions, and are cheap and easy to grow. Yeast is such a handy species that, since 2001, five different Nobel Prizes have been awarded involving research based on yeast. That's a lot of prizes for a bread-maker!

What exactly is yeast?



When you open a packet of yeast from the grocery store, the little granules inside do not seem particularly impressive at first glance—they aren't moving or growing or showing any form of activity. Each of the granules, however, contains many live cells of an organism called *Saccharomyces cerevisiae*, commonly known as baker's yeast. A layer of dead cells creates a coat around a packet of dehydrated live cells. Adding a little bit of warm water and some form of fuel, such as sugar or starch from flour, will "activate" these cells. Soon, they begin to take in materials, get energy from food, and produce waste in the form of carbon dioxide and ethyl alcohol. The bubbles of carbon dioxide gas are what cause bread to rise. Students sometimes think that a single granule is a cell, but yeast cells are much, much smaller than that. In fact, a single gram of yeast contains 20–25 billion (25,000,000,000) yeast cells!

Baker's yeast is just one of about 1,500 known species of yeast, which are a kind of fungi. Fungi is a kingdom which includes mushrooms, molds, and mildew. Many years ago, scientists classified fungi as a kind of plant, because fungi don't have ways to move on their own, and their cells have outer cell walls like plants do. Unlike plants, however, fungi don't undergo photosynthesis to get energy from the sun. We now know that fungi get their nutrients by absorption, and are actually similar to animals in terms of how their metabolism works. While yeast is a unicellular organism, some fungi are multicellular and easily spotted with the eye, such as mushrooms on a forest floor. Fungi can grow even larger. In fact, the largest organism on Earth is considered to be a honey fungus in the Blue Mountains of Oregon. This collection of many billions of genetically identical cells that communicate with one another spans about 2.4 miles (4 km) in width! The cells of fungi all do the same things that cells of other organisms do: they take in materials, produce waste, use energy, and reproduce through cell division.