

Episode 4



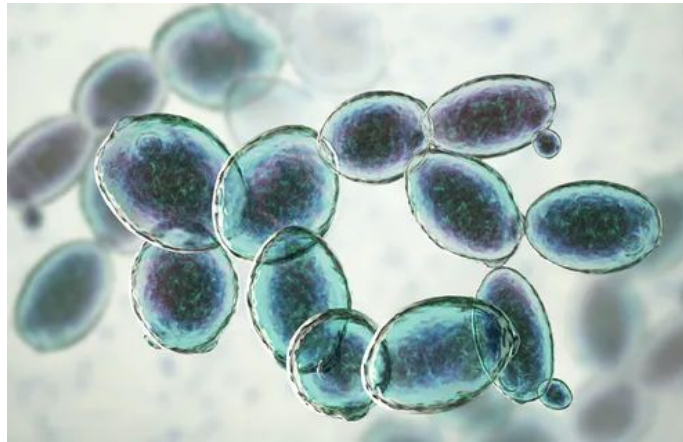
Kitchen Chemistry

Any questions?
Reach out
svcamp@engr.uvic.ca

Dough Making & Baking



Yeasts are single celled microorganisms that live in a wide variety of environments, from the ocean to the stomachs of bees to the skins of fruits to human digestive tracts. Yeasts are **eukaryotes**, and belong to the same kingdom as fungus and mushrooms. One of the most commonly used yeasts is *Saccharomyces cerevisiae* (microscopic image below), and it is arguably the most well studied because it is used as a model organism in cell biology to study eukaryotic cells. Different strains of *S. cerevisiae* are used for baking and brewing, but natural yeasts strains (those present on the whatever was initially fermented) are also used.



Yeast is useful for brewing and baking because of its biological properties. Yeasts use water and sugar to produce energy, and excrete carbon dioxide and ethanol as by products of the process of fermentation. Yeasts are added to baking (along with sugar and water) to give bread rise. As the yeasts produce carbon dioxide, it forms bubbles in the dough. Once baked, the dough solidifies, which traps the CO₂ bubbles within the bread. For brewing the yeast is fed so that it produces CO₂ (carbonation) and ethanol.

Bread has existed for thousands of years, so how was it made before people were able to obtain yeast? Or before microbes were discovered? This is where sourdough bread comes in. Yeast grows on wheat plants, and remains after the wheat is ground into flour. The yeast present in flour is mostly inert (think of it like sleeping), but when water is added to flour the yeast is able to ferment sugar and begin to replicate. Other bacteria also exist in the flour and are able to grow, specifically **lactic acid bacteria** (LAB, genus *Bacillus*), and to ferment the sugars present in flour along with yeasts. When left at room temperature, the yeast and LAB ferment the sugars present in flour to form what is called a **levain** or sourdough “**starter**” -- this is what is used to “start” the rise in sourdough bread, without actually adding yeast to the mixture.

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Materials:

For making the dough & baking the bread:

- 454g starter
- 687g flour
 - Can use all purpose flour, whole wheat flour, or a blend
 - Could probably also use rye flour, but as before I would blend it with other flours
- 397g room temperature water
- 2.5 tsp salt
- Large mixing bowl
- Smaller bowl
 - Use the size of bowl that you would like the bread loaf to be (approximately) -- it's what you will use to shape your loaf during the final rise
- Kitchen towel
- Measuring cups or kitchen scale
- A metal tray or cast iron pan (to hold water during baking to produce steam)
- A metal tray or dutch oven (to bake the bread on)
- Parchment paper
- A sharp knife



Safety Considerations:

- Be careful using sharp knives -- no one wants to cut themselves while shaping their loaf
- Be careful when baking your bread/adding water to your oven, possibility of burns -- oven mitts are your friend!

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Making the bread:

Steps

1. In the morning (or the night before) of the day that you want to bake your bread, feed your starter like normal (this wakes up the yeast and starts the rising process)
 - a. Once your starter is nice and bubbly (3-4 hours later if your kitchen is warm), you can start measuring the ingredients
2. Add the starter, flour(s), and water to your large bowl and give a good mix so that there are no dry bits of flour remaining
3. Let your flour/water/starter mixture rest for twenty minutes on your counter, loosely covered with a tea towel -- this is called the autolyse step
4. After the dough has rested, add the salt and knead your dough
 - a. Proper kneading is not a speedy process -- I normally knead the dough for a minimum of ten minutes
5. Once fully kneaded, let the dough rise in the large bowl for one hour
6. After the first rise, scoop the dough out of the bowl and return it to the floured surface and fold it like a letter (fold down the top then fold up the bottom). Turn the dough 90° and fold it like a letter again. Return the dough to the bowl and let it rise for another hour.
7. After the second rise, remove the dough from the bowl and divide it into two. Form the dough into two rounds and let it rest for twenty minutes -- this helps the dough form your desired form (the round loaf shape) without overworking it and making it tough
 - a. While the dough is resting, take your two smaller bowls (the ones that are the size that you would like your loaves to be) and line them each with one tea towel. Dust the tea towels liberally with flour (to keep the dough from sticking).
8. Form your dough into two balls and place them each into the floured and clothed bowls. Let the dough rise for 2 - 2 ½ hours.
 - a. To see how to form the dough into a tight ball (a boull!) check out episode 4 of Kitchen Chemistry
9. When your dough has about 20 minutes left in its rise time, preheat the oven to 450° and place the metal dish in the oven that you have chosen to help your dough steam
 - a. It may seem weird to put an empty pan in your oven during the preheating step, but the the initial steaming of adding water to a hot pan helps develop a nice crunchy crust

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Making the bread:

Steps

10. Flip your two dough rounds onto a metal tray (that is either greased or covered in parchment paper to keep the bread from sticking) and score them with a sharp knife
 - a. You can either just slice one long line into the top of your loaves, or you can do fancier patterns -- google has lots of lovely ideas if you want to do something fun!
11. Place the pan with your prepped loaves into the oven, then **carefully** pour water into the preheated pan in the oven
 - a. **The water will steam!!!** I wear oven mitts for this step to protect myself, and I recommend taking off glasses (if you wear them) because they will fog up and you will be left blind with the oven open which is a bad time (believe me)
12. Bake the bread for 35 to 40 minutes, at which point the crust should be hard and golden (maybe darker depending on your flour blend). Pull them out of the oven, then let the loaves cool before slicing (but I never do, so if they are still warm that is okay).



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Tips, tricks, and explanations (aka why I did things the way that I did)

Why does it matter what flour we use? Honestly, you could probably use whatever flour that you want and it would still turn out mostly fine, but this is why I chose to do it the way that I did (after reading A LOT of recipes and articles)

Why start with whole wheat? The point of the starter is to grow a nice colony of healthy yeast and LAB to give rise and flavour to the sourdough bread, starting from the microbes present in the flour when you buy it. Whole wheat flour contains all parts of the wheat kernel -- the bran, endosperm, and the germ-- while white flour only contains the endosperm. White flour is processed more than whole wheat flour in order to separate the endosperm from the germ and bran, which removes a lot of the fibre and nutrients from the flour itself. The loss of nutrients, plus the increased processing, decreases the amount of microbes present in white flour, making it less beneficial to use in a sourdough starter than whole wheat flour.

References

<https://en.wikipedia.org/wiki/Yeast#Ecology>

[https://modernistcuisine.com/mc/sourdough-science/#:~:text=Getting%20Cultured%3A%20Yeast%20and%20Lactic,\(LAB\)%20and%20wild%20yeast.&text=This%20particular%20mix%20of%20yeasts,importantly%2C%20gives%20the%20dough%20rise.](https://modernistcuisine.com/mc/sourdough-science/#:~:text=Getting%20Cultured%3A%20Yeast%20and%20Lactic,(LAB)%20and%20wild%20yeast.&text=This%20particular%20mix%20of%20yeasts,importantly%2C%20gives%20the%20dough%20rise.)

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