

# YEAST STARTER KIT INSTRUCTIONS

## The Yeast Starter Kit contains:

- 1000 or 2000 mL Pyrex flask
- #8 or #9 drilled stopper
- Airlock
- 1 pound light dry malt extract

Pitching billions of healthy yeast cells into your wort reduces lag phases, off-flavors, and the risk of infection.

## Your beer will thank you!

## Yeast basics

Brewer's yeast (*Saccharomyces cerevisiae* and *S. carlsbergensis*) is a single-cellular fungus that consumes simple sugars in the wort and converts them to alcohol and carbon dioxide; many strains of brewer's yeast also produce small amounts of other compounds collectively known as fermentation byproducts. Fermentation byproducts like esters, diacetyl, phenols, etc, can be an important part of the flavor and aroma of ales, but a defining characteristic of lagers is the minimalization or absence of fermentation byproducts.

There is always a delay between when yeast is pitched into wort and active fermentation. During the lag phase, the yeast cells build reserves of glycogen and amino acids absorbed from the wort; these compounds will be the cells' energy source during reproduction. Following the lag phase but before fermentation proper, the cells go through the growth or respiration phase as they absorb dissolved oxygen and reproduce by cell division. Many fermentation byproducts are created during the growth phase. There is a direct correlation between the duration of the lag and growth phases and the number of cells that are pitched - the more cells, the less reproduction needs to occur and the faster fermentation begins.

Theoretically, you could pitch just one yeast cell into a fermenter full of wort and the cell would keep dividing until there were enough cells present to ferment the beer. Unfortunately, this wouldn't work in practice because it's not possible to completely sterilize a batch of wort or fermenting equipment - there will always be a few microbes present. Given enough cells, brewer's yeast will outcompete other microbes, but outnumbered or weak brewer's yeast may not be able to stop bacteria or wild yeast from gaining a foothold and spoiling the wort.

Modern commercial breweries aim for a pitching rate of 10 to 20 million yeast cells per milliliter of wort - applying this pitching rate to a five gallon batch of homebrew requires 200 to 400 billion yeast cells. One package of liquid yeast for homebrewing typically contains 45 to 60 billion cells.

	50 mL smack pack	125mL XL smack pack	Pitchable tube	Yeast starter
Approx. cell count (billions)	15-18	45-60	30-60	200

## Goals when making a yeast starter

**INCREASE CELL COUNT.** Having a high pitching rate makes better beer.

**INCREASE CELL VIABILITY.** Healthy yeast cells ferment quickly, produce minimal fermentation byproducts, attenuate fully (ferment to a proper final gravity), can ferment high-gravity worts, and have more tolerance for high concentrations of alcohol. Stressed yeast cells ferment sluggishly, produce higher levels of fermentation byproducts, and leave wort underattenuated, especially in high-gravity fermentations.

**DECREASE RISK OF WORT CONTAMINATION.** During fermentation, the pH of the wort drops (acidifies) and alcohol content increases - this is an inhospitable environment for bacteria and wild yeast cells. However, an unfermented wort - basically just a carboy full of simple sugars - is the ideal medium for bacteria and wild yeast to inoculate and spoil. The sooner fermentation can begin, the shorter the window of opportunity for infection of the wort by these uninvited but unavoidable microorganisms.

**REACH FULL ATTENUATION.** An insufficient amount of cells may ferment sluggishly or incompletely, especially in a high-gravity or lager wort.

**SHORTEN LAG AND GROWTH/RESPIRATION PHASES.** Reducing the duration of these phases minimizes the opportunity for wort contamination and the formation of fermentation byproducts.

**IMPROVE BEER FLAVOR AND AROMA.** Underpitching creates stress - too much work for too few cells. Stressed cells are more likely to create off-flavors or aromas in the finished beer by secreting unpleasantly high concentrations of compounds like diacetyl or phenols.

## Making a starter

The following instructions are for making a one pint starter in a 1000 mL flask using a Wyeast XL pack. Refer to the note below for making a larger starter in a 2000 mL flask.

- Break the inner pouch to activate the yeast; ideally, the yeast would be allowed to incubate for 6 to 8 hours, but it can be pitched immediately.
- In a small saucepan or kettle on a stove burner, heat 650 mL of water. When the water is hot, dissolve dry malt extract - use 1/2 cup for standard-gravity beers, or 3/4 cup for high-gravity beers or lagers. Gently boil the wort for 15 minutes.
- While the wort boils, sanitize the flask.
- Carefully pour the wort into the flask and cover tightly with aluminum foil. Using a hot pad or potholder, move the flask to a cold-water bath. Add ice or cold water periodically to speed cooling.

- While the wort cools, sanitize the stopper and airlock, the yeast pack, and a pair of scissors
- When the flask is cool to the touch, remove the aluminum foil and pitch the yeast. Attach stopper and airlock. Shake the flask to aerate the wort.
- Allow the yeast starter to ferment for at least 12 hours. Keep the starter at the same temperature at which the beer will be fermented. During yeast starter fermentation the airlock will bubble, but often the amount of foam on the surface will be small or nonexistent. The best indication of yeast activity is a layer of white sediment on the bottom of the flask. Note: It's best to use the starter when it is visibly active or immediately thereafter; if the starter finishes fermenting days before it will be pitched into the main batch, add more boiled, cooled wort.
- To pitch the starter into the main batch, swirl the flask to pick up the sediment at the bottom, and pour it into the fermenter - this is the best method to use if the starter is still actively fermenting. Alternately, you may wish to decant the spent wort from the flask and add only the thick yeast slurry at the bottom. To decant the spent wort - chill the flask for several hours to cause the yeast cells to settle out of suspension. Remove the stopper and airlock and carefully pour out and discard the liquid portion, leaving as much thick slurry as possible in the flask. Before pitching, add 100-200 ml of boiled and cooled water or wort to the flask and swirl vigorously to dislodge the slurry.

## **2000 mL starters**

Follow the above procedure, but use the following quantities:

- 1300 mL of water
- 1 cup of dry malt extract for standard-gravity beers, 1.5 cups for high-gravity beers or lagers.

## **“Building up” twice**

To increase pitching rates even more for very strong beers or larger batches, allow the starter to ferment completely. Chill the flask to cause the yeast to settle, then decant the spent wort and add a greater quantity of boiled and cooled wort. Remember to follow strict sanitation procedures!