



GETTING TECHNICAL WITH BEER

By John Lundy

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The Fundamentals of Fermentation

Fermentation is the conversion of sugars into carbon dioxide and alcohol using yeast. Without a doubt, fermentation is the most important process in making beer, but it often doesn't get the attention it deserves.

Choosing the Yeast

High quality brewing yeast is easy to find. Both Wyeast (www.wyeast.com) and White Labs (www.whitelabs.com) offer wonderful, high quality liquid yeast. Quality dry yeasts are becoming more readily available as technology advances. Fermentis, for example, (www.fermentis.com) offers quality dry yeast.

Contact your local homebrew shop to see what brand of yeast they carry and follow-up with a quick email to the manufacturer for a yeast strain product poster to hang on your wall. These posters are great for choosing the best yeast strain and temperature requirements for the job at a quick glance.

The Proper Amount of Yeast

Unlike White Labs vials, Wyeast activator packs require extra time before use, so follow instructions on the pack for proper activation. Yeast starters are necessary to step up yeast cell count to proper pitching rates. The benefits are twofold; we get the correct amount of yeast necessary along with a strong, active fermentation start. The recommended pitching rate on the manufacturer's label is usually not enough. Follow the guidelines below, and make sure yeast is at room temperature when ready to use a starter.

(1) Preparing a Liquid Yeast: Yeast starters should have a specific gravity around 1.035, which can be achieved by adding one cup of DME to an Erlenmeyer flask and adding water to reach 2000ml. Mix well and place the flask directly on the stove burner. Boil for 15 minutes and cover the top with

aluminum foil. Cool to 75°F in an ice bath, pitch the yeast, and add an airlock. One White Labs vial or one large 125ml Wyeast pack with a 2000ml starter is ideal for a five-gallon batch of ale with an OG of 1.056. Lagers will require two vials or packs with a 4000ml starter. Higher gravity beers require even more. Aerate the starter well, and use a stir plate for even better yeast growth.

(2) Preparing Dry Yeast: Dry yeast should be rehydrated in one cup of 95°F pre-boiled water per 11.5gram dry yeast packet to make a 5-gallon batch of ale with an OG of 1.056. Lagers will require two packets in two cups of water. Higher gravity beers require even more. Sprinkle the yeast on top of the water and cover. Do not stir the water, and allow the yeast to settle naturally for 15 minutes. After 15 minutes has passed, swirl yeast to mix and let sit another 15 minutes before yeast is ready to use.

It is important to prevent yeast shock by pitching a starter that is within 5-10°F of the chilled wort in the fermenter after brewing. This can be done by slowly cooling the starter temperature in the same refrigerator that is going to be used for fermentation. It is best to time the starter at high kraeusen when time to pitch, so make the starter the day before.

Oxygenation

Always start with proper oxygenation of wort just after a yeast starter is pitched into the fermenter. It is vital to introduce 8-15ppm of dissolved oxygen for proper fermentation. If you haven't had the chance to read my article, *The Fundamentals of Oxygen in Brewing*, I suggest you read this article for a better understanding.



Liquid Yeast

Wyeast

www.wyeast.com

White Labs

www.whitelabs.com

Dry Yeast

Fermentis

www.fermentis.com



About the Author

John Lundy has been home brewing for 15 years. He is 2006 president of the Treasure Coast BrewMasters (www.tcbrewmasters.org) and manages Home Brew Unlimited, a Web site chronicling his home brew experience and rating breweries and brew pubs around the country. Log on to www.homebrewunlimited.com.





The Fundamentals of Fermentation—Continued

Temperature Control

Avoid fluctuations in temperature since temperature control is vital for proper fermentation. If you don't ferment in a controlled environment, it will be difficult to make great, consistent beer. External thermostat controllers can be purchased to modify any chest freezer or refrigerator into the perfect environment for beer fermentation.

Fermentation Procedures

Temperature is key for proper fermentation esters and other byproducts associated with yeast. Follow the yeast manufacturer's suggested fermentation range. Choosing a midrange temperature is usually a good starting point until you become more familiar with that yeast strain. Lower temperatures keep ester production to a minimum, while warmer temperatures will increase ester production.

(1) Ales: Ales can benefit from a wide range of temperatures to produce specific esters and flavors that create the complexity found in ales. Read the data for each yeast strain to create the flavor attributes you want by controlling the fermentation temperature. It is not uncommon to see temperature ranges of 63°F to more than 80°F. Ales typically take 7–14 days to complete fermentation.

(2) Lagers: Ester production is usually considered a flaw, so lagers are more conservative and require lower, tighter temperatures to keep ester production to a minimum. It is important to read the data for each yeast strain to create the flavor attributes you want by controlling the fermentation temperature. Typical lager temperatures range from 46°F to 58°F. An exception, however, is California Lager yeast which is 58°F to 65°F. The most common problem associated with lagers is the production of buttery, butterscotch flavors of diacetyl. A diacetyl rest can be performed after post kraeusen and when the airlock slows to around two bubbles per minute. The temperature should be raised to 60°F for 2-3 days to reinvigorate the yeast to remove the remaining diacetyl in solution. After the diacetyl rest, slowly lower the temperature 3°F per day until the temperature drops to 40°F. Rack the beer to a secondary lager vessel and slowly lower temperature 3°F per day until the temperature drops to 35°F. Lager beer at 35°F for at minimum of four weeks.

Fermentation is more than simply throwing yeast in the fermenter. It requires preparation, time, and control for true success. Now, let's get brewing!

- *Yeast starters are necessary to step up yeast cell count to proper pitching rates.*
- *Always start with proper oxygenation of wort just after a yeast starter is pitched into the fermenter.*
- *Avoid fluctuations in temperature since temperature control is vital for proper fermentation.*
- *Temperature is key for proper fermentation esters and other byproducts associated with yeast.*

For More Information

To learn more about getting technical with beer, read John's other articles including *The Fundamentals of Wort Boiling*, *The Fundamentals of Oxygen in Brewing*, and *The Fundamentals of pH in Brewing*.

