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BrewYour Own®

MAY-JUNE 2004, VOL.10, NO.3

THE HOW-TO HOMEBREW BEER MAGAZINE

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MAY-JUNE 2004
Volume 10 Number 3

BrewYour Own

Departments

Features

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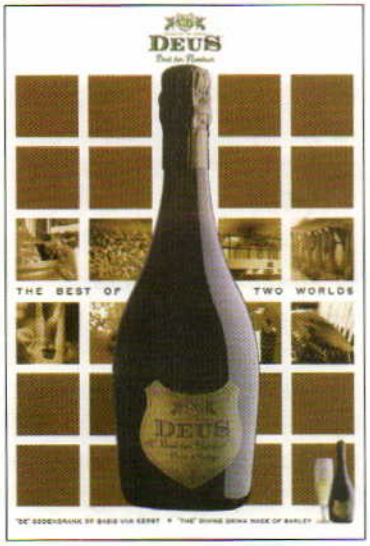

26 RYE

Where to find it

COVER PHOTOGRAPHY: Charles A. Parker

We Gave You Amber. . .

They Gave Us Silver.

You Be The Judge.

Silver Medallion Winner, Great American Beer Festival.

Brew Your Own

THE HOW-TO HOMEBREW BEER MAGAZINE

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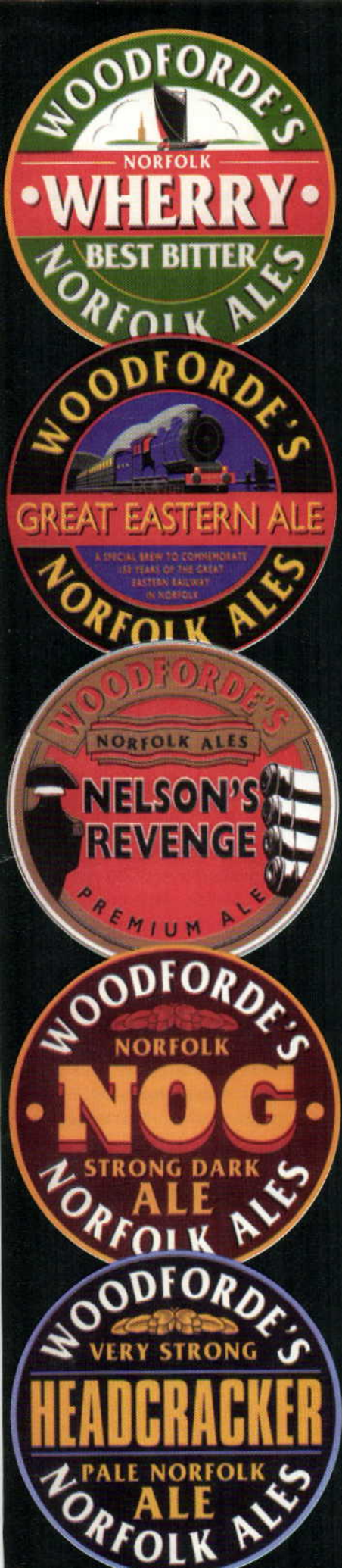

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Carefully formulated by Woodfordes Brewery and Muntons, this range of beerkits brings you a taste which is so close to the original even expert brewers cannot tell them apart.

RECIPE INDEX

BYO RECIPE STANDARDIZATION

Extract efficiency: 65%
(i.e. — 1 pound of 2-row malt, which has a potential extract value of 1.037 in one gallon of water, would yield a wort of 1.024.)

Extract values for malt extract:
liquid malt extract (LME) = 1.037
dried malt extract (DME) = 1.045

Potential extract for grains:
2-row base malts = 1.037
wheat malt = 1.037
6-row base malts = 1.035
Munich malt = 1.035
Vienna malt = 1.035
crystal malts = 1.033-1.035
chocolate malts = 1.034
dark roasted grains = 1.024-1.026
flaked maize and rice = 1.037-1.038

Hops:
We calculate IBU's based on 25% hop utilization for a one hour boil of hop pellets at specific gravities less than 1.050.

Contributors

Denny Conn's wife, Paula, bought him his first homebrew kit six years ago for his birthday. If she had known the lengths to which he'd eventually go, it might never have happened. Fortunately, the first batch he produced was a hoppy pale ale they both loved, and so a brewer was born. Denny soon moved to all-grain brewing, and, with encouragement from his local homebrew shop owner, started entering competitions. He developed his Rye IPA recipe to satisfy his wife's love of hoppy beers and so he could keep brewing Belgian styles for himself. Denny steadfastly maintains a "hands-on" brewing attitude, eschewing fancy systems in favor of his "Cheap 'n' Easy" system, saying "I prefer to brew like I cook." He also has absolutely no desire to become a professional brewer. "It's such a good hobby, why ruin it?" For the past 5 years Denny has hosted Big Brew and Teach a Friend to Brew sites at his home in the mountains outside Noti, Oregon. Once a year, he and brewbuddy Kevin McGraw brew a 10-gallon (38-L) batch of their American-style barleywine, "Old Stoner," which took first place at the Oregon State Fair last year. Denny also recently passed the BJCP test at the National level. He can usually be found hanging out in online beer discussions such as the "Brews and Views" forum (www.hbd.org/forums), the Tastybrew website (www.tastybrew.com) or the newsgroup rec.crafts.brewing.

Mike Parker and Miki Johnson have spent months scouring the internet and dusty back rooms of ***Brew Your Own's*** editorial archives to uncover the people, clubs, recipes and projects found in the Homebrew Nation department each issue. Whether it was homebrewing monks, clubs made up of former roller derby pros or insane amounts of stainless steel welded into brewing systems, our two editorial interns uncovered some great and always interesting beery gems. Mike is a sophomore English major at Kenyon College in Ohio and has logged time sleuthing out reader stories for ***BYO*** since last summer. Miki is a junior journalism major at Northwestern University in Illinois and is wrapping up a three-month internship. Both vow to continue their studies in beer when they return to their respective campuses in a few weeks.

Amy Chamberlain is chef/owner of The Perfect Wife Restaurant and Tavern in Manchester Center, Vermont. She lends her culinary expertise as judge for our "Beer & BBQ" story appearing on page 42. Schooled at the New England Culinary Institute, Amy's freestyle cooking has been featured repeatedly on The Food Network including two victories on the show "Ready, Set, Cook!" She and her husband Geoff first appeared in ***BYO*** as cover models for the April 2001 issue. Her restaurant's wonderful beer selection specializing in Belgians and regional micros earned the award "Best Small Restaurant Beer Menu" in 2002 given by Vanberg & DeWulf/Brewery Ommegang. Check out Amy's restaurant at www.perfectwife.com.

A Little Off the Top, Please

I have questions regarding the skimming of top cropping yeasts. In Dr. White's story, "Yeast Strains" (March-April 2004 *BYO*), he identifies several strains known for their top cropping behavior and suggests experiments with skimming the yeast for pitching into subsequent batches. First, how much yeast should be skimmed and how do you measure that? If too much is taken, wouldn't that affect the ongoing fermentation by robbing it of proper yeast saturation? Secondly, once collected, does the yeast have to be stepped up again or can you pitch directly into another batch? I'm intrigued with the concept of skimming yeast, but would like to know more before trying it.

Thom Tash
McCall, Idaho

To collect yeast from a top cropping strain, sanitize a glass measuring cup. Be sure to sanitize both the inside and the outside of the cup as the outside will come in contact with your wort. Skim the yeast from the creamy kraeusen floating on top of the beer. For ales, a cup of yeast solids is enough to pitch to a 5-gallon (19-L) batch. (For lagers, even though most lagers can't be top cropped, you would need 2 cups.) Taking either of these amounts should not affect the fermentation of a 5-gallon (19-L) batch of beer. If possible, you should use the yeast immediately. If this is not possible, you can store the yeast in a sanitized canning jar (or other container) under a cover of water. Boil and cool 2-4 cups of water for this purpose. Yeast will be usable for about a week in this state if refrigerated. If you store it longer, make a yeast starter before you brew.

Sidestep the "Phy-step?"

In the "Bohemian Pilsner" article (March-April 2004 *BYO*), the procedure states to rest the mash at 100 °F to acidify the mash and then move on to a rest at 120 °F and so on. Is the first rest just to acidify the mash or is it part of the step mash to promote beta-glucanase activity? If it was only used to acidify the mash, could one use lactic acid and start the mash at 120 °F? An hour is a long time to spend just to get the correct pH. I really want to make more Pils this year.

Bob Perkov
via email

The one-hour rest at 100 °F (38 °C) is meant to activate the enzyme phytase and lower mash pH. Many homebrewers prefer to follow traditional brewing practices when brewing classic beer styles and this is a traditional, Reinheitsgebot-compliant step in brewing German lagers such as Bohemian Pilsners.

If you want to save time, however, you can skip this step and simply adjust your mash pH with acid, as you suggest. In that case, just dough in at a temperature in the 113–122 °F (45–50 °C) range and rest for 20–30 minutes before proceeding.

HERMS and Decoction Mashing

I just read Mr. Wizard's response in the March-April 2004 issue regarding HERMS in which he recommended a conservative heating approach in a HERMS or RIMS systems to prevent enzymes from becoming denatured. However, if recirculating wort through a 180 °F (82 °C) heat exchanger could cause denaturing, then how do you explain returning boiling mash to the tun in decoction mashing?

Russell Homsy
Boston, Massachusetts

The key difference here is that only a portion of the mash, usually 33–40% is boiled during a decoction. The enzymes in the decocotion do get denatured, but those in the remaining portion are not affected by the boiling. (And typcially, the decoction is rested in the saccharification range before boiling.) In a RIMS or HERMS, all the mash liquid eventually gets heated.

HERMS Heating Help

In response to Craig Jones's question, Mr. Wizard responds "A pot of hot water with a coil carrying wort is a lousy heat exchanger. This is true because the water is not moving." This statement is, of course, completely correct. For this reason, I incorporated a stirrer in my HERMS like system, which in my experience, simply and completely solves that problem. This picture, and others, are available on my web site http://home.comcast.net/~verhulst/RIMS.

Tony Verhulst
Tewksbury, Massachusetts

Carbonation Conundrum

After building the keg lid carbonator (Projetcs, March-April 2004 *BYO*), what pressure should I use and for how long? Also do I leave the carbonating stone in the keg the entire time I'm dispensing or do I take it out after

the level of carbonation has been achieved?

Joey Long
via email

Projects author Thom Cannell responds: "Starting with the last question, you may leave the stone in the beer as long as you wish. The whole purpose of the project was to quickly carbonate beer and remove the carbonation stone, then reuse it. That way you can do several beers in quick succession. Carbonate, remove the modified lid, exchange the modified lid with a normal lid and repressurize. But if you want to leave the carbonator lid on, that's fine too.

"The 'what pressure and how long' question is dependent on inlet pressure, the beer temperature, and the style. The colder the beer, the more carbonation it will hold. As a beer warms, the CO_2 tries to escape the solution. So you need a temperature vs. pressure chart, which can be found in most homebrewing books. For a quick and dirty approach, set the regulator for 14 PSI and put the beer and CO_2 tank into a refrigerator. Be certain you have no leaks or you'll empty the CO2 tank! Approximately 36–48 hours later, perhaps sooner, remove the modified lid and put on a new one. "Burp" the keg several times to push out any oxygen that entered and repressurize to 12 psi at 45 °F (7.2 °C)."

Seafood Stout for Sale

After reading your Last Call article on brewing oyster stout (January-February 2004 *BYO*), I wanted to make you aware of a commercially available example brewed here in the United States. Yards Brewing Company in Philadelphia, Pennsylvania has been brewing Love Stout — an oyster stout — since 1998. Yards brews Love Stout with a bushel of whole oysters in each 60-barrel batch. The oysters are bound so that they don't open and are boiled in the wort for 20 minutes. After each brew they remove the cheese cloth sack of oysters from the wort, clean off the hop residue and chow down.

Deane Browne
Philadelphia, Pennsylvania

Oyster stout in the City of "Brew"therly love? Sounds great!

A Brother's Beer from Belgium

My brew partner and I have been experimenting with rye beer. I saw your article about Brother Gabriel Hodges (Homebrew Nation, March-April 2004 *BYO*) and noted that he brews a Belgian rye. Is that the recipe on page 9? If not, is it possible to get his recipe? Please let me know as I am intrigued by the idea of a Belgium Rye.

Scott A. Smith
via email

The recipe on page 9 of the March-April 2004 issue, July Ryes, is Brother Hodge's recipe. For more rye recipes, see page 29 of this issue of BYO.

brewer PROFILE

John Collis • Syosset, New York

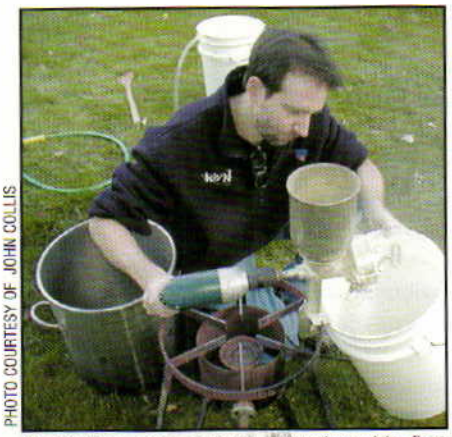

PHOTO COURTESY OF JOHN COLLIS

Collis has come a long way since his first brew — a spruce that ended up a Pine-Sol.

Brewing has always been a kind of meditative soul therapy for me. I often brew by myself, cracking grains in my yard at dusk, mashing and boiling into the night, listening to classical music (okay, sometimes Led Zeppelin) and savoring a homebrew. Heaven is never so close as when I am lost in the magic of a brewing session.

I conjured up my first batch of homebrew in December 1988. Being the rebel that I am, I made beer from the not-so-new growth of a spruce tree in my yard. I also decided to use molasses instead of corn sugar at bottling time. The result was a rather absurd, under-carbonated, porter-like beverage with an oily mouthfeel and hints of Pine-Sol in the finish. But it was *mine* I tell you!

Since then I've become a considerably better homebrewer and have acquired a few stories along the way. One time I invited my bandmates Nancy and Jack to help me brew a spiced Christmas ale. We sang Christmas carols through most of the boil and during the last fifteen minutes each of us added a different spice to the brewpot and chanted absurdities.

Unfortunately, I neglected to stress to either of them the importance of sanitation. I used no sparge screen and accidentally overfilled the carboy a few ounces. When I turned around to grab the sanitized airlock and stopper, I saw Jack snatching hop flowers from the outside of the carboy with his fingers and stuffing them back into the top of the vessel. I blurted out a frenzied "Jaaaack!" startling him and Nancy. He stopped dead, looked at me, looked at the carboy, looked at me, and, sounding like a scolded child, asked "I really shouldn't have done that, should I?"

Well, I went ahead with the fermentation — bottled it up and all — only to throw the beer out because of its annoying sourness. We deemed that batch, "Jackie's Stinky Finger Ale."

Then there was the camping trip when we passed around a hollowed-out pumpkin filled with my own Joe Pumpkinhead's Harvest Ale. I will always cherish that memory of standing around a campfire in mid-October with close friends, sipping a spiced pumpkin ale as its three-inch frothy head tickled my nose.

And who could forget the time my friend Larry bolted into the shower after a pouch of Wyeast accidentally burst onto the crotch of his jeans, scared he would wind up with a yeast infection. Is it just me, or are these the moments we homebrewers live for?

My band, The Scoldees' latest CD "Nightcap World," has earned us sponsorship from the Victory Brewing Company, makers of three band favorites: HopDevil IPA, Golden Monkey Tripel and Storm King Stout. The band even has its own version of a black and tan. Half fill a pint glass with Golden Monkey, top it off with Guinness Stout and you have a Charred Monkey. When most musicians book a gig, they want to know the location or the pay, but anyone in the band is more likely to ask, "So, what do they got on tap?"

reader RECIPE: John Collis

Moosie's Blackberry Wheat Beer

(5 gallons/ 19 L, partial mash)
OG = 1.044
FG = 1.011
IBU = 16 SRM = 4 ABV = 4.3%

Ingredients

3.3 lbs. (1.5 kg) Muntons Wheat dried malt extract
2.0 lbs. (0.90 kg) 2-row pale malt (American)
1.0 lb. (0.45 kg) torrefied wheat malt
6 oz. (177 mL) blackberry extract
4.4 AAU Hallertau hops (bittering) (1 oz./28 g of 4.4% alpha acids)
Wyeast 3056 (Bavarian Wheat) yeast
0.75 cups corn sugar (for priming)

Step by Step

I used the step infusion method for mashing the grains, with a 30-minute rest at 122 °F (50 °C) and a 45-minute rest at 158 °F (70 °C) followed by a mash out to 168 °F (76 °C). Sparge with 1.25 gallons (4.7 L) of 170 °F (77 °C) water. Stir the dried malt extract into the partial mash wort and add water to make as much wort as you can handle without boiling over. Heat the wort to a boil and boil for 60 minutes. The hops get added for the complete boil.

Cool the wort, transfer it to your fermenter, top up with water (if needed) and pitch the yeast. Ferment at 68 °F (20 °C) for 7–10 days.

The blackberry extract gets added to the finished beer along with the priming sugar at bottling time.

If you do it right, you should end up with a very light, quenching ale with a subtle fruit flavor and a terrific nose. Serve well-chilled. Cheers!

beer BASICS

BREWER'S DICTIONARY

K is for ...

kegging: drawing beer from the fermenter to the keg.

kettle: a large vessel used to heat wort.

kraeusen: the fluffy head of foam that forms on the surface of wort during the first few days of fermentation. At its peak it is called "high kraeusen."

kraeusening: adding a small amount of wort at high kraeusen to fully fermented lager to create a secondary fermentation and natural carbonation.

L is for ...

lactic acid: an acid produced by bacteria during mashing or (more frequently) during fermentation and aging via contamination.

lager: (n.) any beer produced by bottom fermentation. (v.) Aging beer at cold-storage temperatures.

lambic: a Belgian wheat beer traditionally brewed in winter that uses wild airborne yeast and bacteria to ferment the wort.

lauter: to separate the wort produced during mashing from the spent grains (husks and coagulated protein).

lauter tun: a large, perforated, false-bottomed vessel used to strain the sweet wort from the spent grains after mashing. Sometimes the mash tun is used for both mashing and lautering.

Lovibond: the scale often used to evaluate malt, wort and beer color.

lupulones: the bitter resins found in the lupulin glands of hops, also knows as beta acids. There are three forms of lupolone: co-lupulone, lupulone and adlupulone.

homebrew CLUB

Rolling Beers

Hasselby, Sweden

Anders Andrae and Calle Norman founded rolling beers in April 1996 in a Swedish town called Hasselby. Both men were highly interested in learning to brew beer and both are disabled in wheelchairs. These two qualities influenced the name Andrea and Norman chose for their club as well as their logo, which is derived from the Swedish handicap symbol for disabled people. Rolling beers became an official club in 1997 and now consists of several members (both handicapped and not) who love getting together to brew.

The club's most important assets are, of course, its two breweries. The small, mobile brewery has an 8-gallon (30-L) combo mash/lauter tun and a 13-gallon (50-L) wort boiler that is equiped with a 2000-watt electric element — all small enough to throw in the car and brew wherever electricity flows. The larger brewery has the same area but twice the volume. Five times a year all of the members meet to brew porters, English ales and Belgian ales to name a few. Many of the beers have won awards at local competitions. The club also sells reasonably priced hops and malt to other homebrewers.

Every month club members gather for serious tasting sessions of homebrew, the latest commericial products or the occasional rare bottle brought home from an obscure trip to the Czech Republic. Tastings correspond to the evening's topic, be it lagers, lambics or English ales. Members rate the evening's beers and keep the data on record. We also distribute a member bi-monthly newsletter with information on festivals and upcoming brew sessions as well as the latest beer gossip from here and abroad.

Rolling Beers also arranges a trip to local breweries once a year and has traveled abroad on beer trips to Finland, Belgium and England so far. They are also planning to visit Germany in the near future and the Stockholm Beer and Whiskey Festival in September. So, if you happen to be a pub owner in Stockholm, watch out for Rolling Beers. When the club invades a pub, its members have been known to rate more than its food and beer — they like to grade their wheelchair accomodation as well!

Rolling Beers founders Anders Andrae and Calle Norman (below) designed a club logo (top left) that resembles the Swedish handicap symbol for disabled people.

replicator

by **Steve Bader**

Dear Replicator,

My husband and I were recently on a weekend trip to Boston where we sampled as many local brews as we could in a 24 hour period. My favorite by far was the Cambridge Amber at the Cambridge Brewing Company. The brewmaster, unfortunately, was not working the 2 (or maybe 3 or 4) times we visited, so I was not able to properly beg for the recipe. Could you by any chance help me out?

Amy Zorn
Austin, Texas

As many beers in 24 hours as you could? Wow! Now that is a worthy goal for any homebrewer and beer lover.

I spoke to Will Meyers, brewer at Cambridge, about their Amber ale. Will, who has been brewing at Cambridge for 11 years, described the ale as a "well balanced American amber, with a nice malt-to-hop balance." Since Cambridge uses crystal, chocolate and black patent malt in this beer, it has a nice complex maltiness, with a hop level that is complimentary, not overpowering like many ambers.

Will uses a yeast strain with a neutral flavor and good attenuation and flocculation. He cold conditions the beer for two weeks at 40 °F (4.4 °C) to let it settle out, then coarse filters it to give the beer a nice finish without removing any flavors.

It is unusual for an amber beer to use both chocolate and black patent malts. Will uses small amounts of both to get a bit of color and just a hint of the grains' malt flavor. This also produces the complex maltiness. For more information visit www.cambrew.com or call (617) 494-1994.

Cambridge Brewing Company's Cambridge Amber

(5 gallon, extract with grains)

OG = 1.048 FG = 1.012
IBU = 24 SRM = 19 ABV = 4.7%

Ingredients

3.3 lbs. (1.5 kg) Coopers light malt extract syrup
1.85 lbs. (0.83 kg) Coopers dried malt extract
1.0 lb. (0.45 kg) British crystal malt (45 °L)
0.5 lbs. (0.23 kg) US crystal malt (40 °L)
1.33 oz. (37 g) chocolate malt
0.66 oz. (16 g) black patent malt
1 tsp. Irish moss
4.5 AAU Willamette hops (bittering hop) (1.0 oz./28 g of 4.5% alpha acid)
2.25 AAU Willamette hops (bittering hop) (0.5 oz./14 g of 4.5% alpha acid)
4.7 AAU Yakima Goldings hops (aroma) (1.0 oz./28 g of 4.7% alpha acid)
2.25 AAU Willamette hops (aroma) (0.5 oz./14 g of 4.5% alpha acid)
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) yeast
0.75 cups corn sugar (for priming)

Step by Step

Steep four crushed grains in 3 gallons (11 L) water at 152 °F (67 °C) for 30 minutes. Remove grains from wort, add Willamette hops, malt syrup and powder, and bring to a boil. Add Irish moss and boil for 60 minutes. Add second addition of Willamette hops with 45 minutes left in the boil. Add Yakima Goldings and last of the Willamette hops at the end of the boil and let steep for 5 minutes.

Now add wort to 2 gallons (7.6 L) cool water in a sanitary fermenter, and top off with cool water to 5.5 gallons (21 L). Cool wort to 75 °F (24 °C), aerate the beer and pitch your yeast. Allow beer to cool over next few hours to 68 °F (20 °C), and hold at this temperature until the yeast has finished fermentation. Then bottle your beer, carbonate and enjoy!

All-grain option:

For this single-infusion mash, substitute 8.5 lbs. (3.9 kg) 2-row malt for liquid and dry extract malts in your grain bill. Mash grains at 152 °F (67 °C) for 60 minutes. Collect enough wort (~ 7 gallons/26 L) to yield 5.5 gallons (21 L) after a 90-minute boil. To account for a full boil's higher extraction ratio, decrease first addition of Willamette boiling hops to 0.75 oz. Follow rest of the extract recipe.

homebrew calendar

May 14-15
22nd Annual Heart of the Valley Homebrew and Microbrew festival
Corvallis, Oregon

The festival, held on May 15, features microbrews, food vendors, live music and a raffle. Admission: $8. Homebrew contest deadline: May 1. Entry fee: $6 . See www.hotv.org or contact Derek Whiteside at derek@whitesides.biz or (541) 754-6655 for more information.

May 15
1st Annual Austin ZEALOTS Homebrew Inquisition
Austin, Texas

Got a house beer that's awesome, but not "to style?" Enter it in the Austin ZEALOTS Homebrew Inquisition — a new type of homebrew contest. For Inquisition information, visit www.txbrewersfestival.com. Entries are due May 1st.

May 22
8th Annual Celtic Brew-Off
Bedford, Texas

The Knights of the Brown Bottle in Arlington, Texas have organized another Celtic Brew-Off, which coincides with the Texas Scottish Festival and Highland Games. Entry deadline: May 14. Entry fee: $6. Contact Richard Graham at (817) 545-5818 or rggraham@flash.net.

June 17-19
AHA National Homebrewers Conference
Las Vegas, Nevada

This year, the AHA's National Homebrew Conference is dubbed "Beer and Loafing in Las Vegas." For more information, call 888-U-CAN-BREW or see the website at www.beerandloafing.org.

homebrew SYSTEMS that make you DROOL

Ron Weaver • Gulf Breeze, Florida

The system (top) leaves room between kegs for future upgrades. Weaver says he loves his RIMS return (above) and homemade male quick disconnect (below).

At the 1997 AHA convention, I studied the Sabco BrewMagic system and was convinced I could build a cheaper one for my needs. I've spent almost $2,000 and achieved most of my design goals, but I sometimes think it would have been better to just buy the BrewMagic.

I wanted a stainless steel setup with three kegs at the same height (so I could see into them), space between the mash and boil kettles for future gadgets, a RIMS-style mash system and plumbing with only a few valves. I also wanted my system to drain directly from the boil kettle into carboys and to be somewhat transportable. My final goal was to always work on the system while enjoying a homebrew.

I bought two Sabco kettles for the boil and mash. The sparge keg is a converted keg with ½-inch stainless nipples welded through the wall. Although I used copper for the drain, I will probably replace it with stainless because the tubing is corroding. For the RIMS return, I connected a male quick disconnect to a ½-inch top nipple on the inside of the keg so I can easily remove the manifold I made. I luckily found a homebrewing welder who did my sparge keg, counterflow chiller bracket, and mash keg nipple — all for $80.

The system's burners are replacement burners for my Bayou Cooker, which are rated at 135,000 BTU and cost only $9.50 each. My pumps are rated for 275 °F (135 °C), so I can use them to circulate boiling water for sanitation and cleaning. The pump clamps are electrical conduit clamps coated in red plastic "dip-it" (the kind on tool handles). I also added a couple of spare neon lights to the switch box. They're not really necessary, but I also like chrome bumpers. I had already exceeded my earlier cost estimates so I chose high-temperature silicon food-grade tubing rated for 275 °F (135 °C) instead of stainless quick disconnects. They work great, and I couldn't survive without them.

When brewing I connect the mash pump output to the RIMS return and drape the sparge pump output hose over the sight glass. During the sparge, I move the mash pump output hose to the inlet of the boil keg and connect the sparge pump output to the RIMS return. Then when I have enough in the boil keg, I connect the boil keg output to the chiller.

These burners are meant for outdoor cooking, but they heat wort just as well.

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Wide World of Wheat

Don't be fooled by the rumors over this grain

by Thomas J. Miller

Brewer: Steven Pauwels has been the head brewer at Boulevard Brewing Company in Kansas City, Missouri for the last five years. He studied brewing in Belgium and was the head brewer at Domus Brewery in Leuven, Belgium for seven years.

Haze is a quality desired in most wheat beers. Wheat has quite a lot of gluten, but this fact alone does not promote haze. I think it is a common misunderstanding that gluten is a haze producer. On the contrary, gluten is the exact opposite and actually counteracts the formation of haze.

To optimize haze formation, the best wheat dosing level is 10–15% of the total grist. Germans, of course, are known for using 50 percent or more wheat, but this is not what contributes to the haze in their beers. These beers get haze from over-pasteurization. Holding beer at high temperatures for a long period of time denatures (i.e. overheats) the proteins, which in turn causes them to fall into solution.

A step infusion mash is critical to making good wheat beer. This becomes more evident when you recognize the importance of resting the mash at the proper temperatures. The most critical of these, again for aiding in haze formation, is a protein rest at 122 °F (50 °C) for 30 minutes. During this step, the proteins with high molecular weight will break down and the resulting lower molecular weight provides a better haze.

Head retention is also protein-related. Certain ranges of molecular weights are associated with good head retention and wheat malt happens to fall within this range. If you're only looking to improve head retention in a beer, I suggest you only use about five percent of wheat in your grist.

We did trials with different wheat grains to determine what characteristics (such as flavor) each would contribute to the beer. We experimented with soft red wheat and hard white wheat (cracker wheat), and were not able to differentiate the grains in flavor.

Brewers have a choice between raw wheat and malted wheat. Malted wheat has a high diastatic power. This means that if you use malted wheat and take long rests at 145 °F (63 °C) and 158 °F (70 °C), you are going to end up with a dry beer.

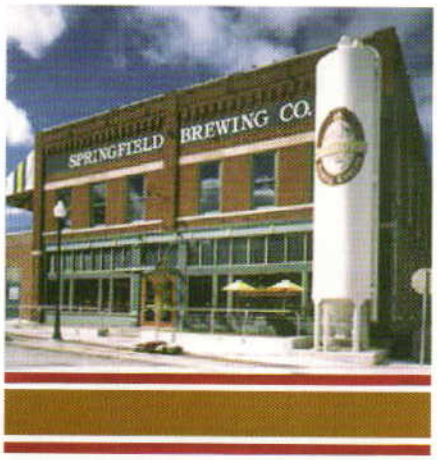
Raw wheat does not add enzymes to your beer. All the enzymes in your brew will therefore come from your pale malt. If you use raw wheat you will want to mash longer in order to extract the sugars and cut down the amount of starch. Remember, when using raw wheat, the pale malt enzymes are responsible for all of the conversion work and it will take them longer to get the job done.

I recommend malted wheat to homebrewers — it simply makes the brew easier. There are plenty of enzymes and many of the proteins are already broken down. Brewers can use up to 50 percent malted wheat in their grist if they choose. When using raw wheat, enzymes will be lost in the mash and it is best for homebrewers to add some malted wheat to the mash to make up for the enzyme depletion. I personally would not go above 15 percent raw wheat in the grist.

When it comes to lautering with wheat, the problems associated with this grain all come down to the husks that make the filter bed. More wheat equals less husks and it is the lack of husks that makes lautering so difficult. I know brewers who use rice husks and this helps the process, but I think temperature plays a very significant role as well.

The target temperature should be 169–172 °F (76–78 °C). This keeps the viscosity as low as possible, which aids the wort flowing through the grain bed. Higher temperatures lower the viscosity more but they also wash out starch and polyphenols. Lower temperatures (probably a common problem among homebrewers) make the wort so viscous that it can't flow well during lautering.

When it comes to wheat beers, the use of too many spices is not recommended (like in a Belgian wit). Spices can end up very bitter in beer and this particular bitterness is not favorable when using wheat or any other grain for that matter. Particular spices to use with caution are coriander and orange peel. I would recommend that homebrewers making 5 gallons (19 L) do not use over 5 g of each spice in the brew — that comes to a maximum of 1 g of each spice per gallon (0.27 g/L).



Ashton Lewis works for Paul Mueller Company and is the Master Brewer at Springfield Brewing Company in Springfield, Missouri, also owned and operated by Mueller. In his "spare" time, he is the technical editor of *BYO*.

I love brewing with wheat because I enjoy the flavors it gives to beer. I like the appearance of a cloudy, unfiltered wheat beer and appreciate the foam on a properly dispensed glass. Although I personally have never had a problem using either raw or malted wheat, I commonly hear about the headaches associated with using wheat. The most common complaint is that wheat leads to the dreaded stuck mash. I have had severe problems with flaked barley, roasted barley and rye malt, but not wheat.

Like rice and corn, wheat has no husk and this fact needs to be considered when formulating a recipe. I know from talking to fellow wheat brewers that 50% wheat can be used without having to add husk substitutes such as rice hulls to the mash.

At Springfield Brewing, our best selling beer is the American-style Unfiltered Wheat. This beer starts out with an original gravity of 1.045 (11.25 °P) made from a mash containing 40% malted wheat, 10% raw wheat and 50% malted barley. The crisp, slightly tart taste from the wheat and the bread-like aromas coming from the combination of yeast and wheat make this beer style appealing to a wide range of beer drinkers. The critics appreciate wheat beer because it has more complexity than your average lighter beer.

We use a step mash beginning at 122 °F (50 °C) for a 20-minute beta-glucanase rest. We quickly and gently heat the mash from 122–140 °F (50–60 °C) for a 30-minute beta-amylase rest. The beer finishes at 1.8 °P (1.007) and the beta-amylase rest is important for producing highly fermentable wort. The next rest is at 154 °F (68 °C) for 30 minutes for complete starch conversion and we mash-off at 169 °F (76 °C) before pumping the mash to our lauter tun. The key to dealing with wheat is using a step mash. Brewers who use a step mash should stir during the heating steps and the teig (the gray "dough" that forms during mashing) should be uniformly distributed. This practice alleviates many problems commonly associated with wheat.

Big Bam Beano

Methodical mashing, lager scheduling and more

What ales my lager

After reading your response to using Beano to resume fermentation in a halted wort, I found myself with a carboy of half fermented wort that started at 1.048 and stopped at 1.028. I used a two liter yeast starter and aerated thoroughly. The Beano reduced the gravity to 1.008, exactly what I wanted. However, after several weeks of lagering the finished beer resembled an ale more than a lager. I am wondering if the temperature I subjected the wort to with the Beano was too high at about 65 °F (18 °C). The lager yeast was held at 55 °F (13 °C). I purposely increased the temperature after reading your article that suggested the temperature should be higher when using Beano than the original fermentation temperature. Besides the normal grain, I used 1.5 pounds of sugar (turbinado style). Could this have affected the results?

Rick Tomlinson
Bakersfield, California

The fact that the Beano was so effective to reduce your beer gravity suggests to me that the wort had poor fermentability to begin with. I make this point to remind brewers adding enzymes to a "hanging fermentation" only works if the yeast is healthy and ready to ferment, which it clearly was in this brew.

I think the ale flavor of your lager and your fermentation temperature may be related. If I read this correctly, the fermentation was carried out at 55 °F (13 °C), which is a little on the high side for lagers. This warmish lager fermentation sometimes produces a fruitier lager than cooler temperatures, for example 50 °F (10 °C). The practice of warming a lager after the primary fermentation is complete is used by many brewers for accelerated diacetyl reduction and typically has no affect on aroma compounds related to fermentation (as fermentation is complete when the temperature is increased). In your brew, 50 percent of the drop in specific gravity occurred at 55 °F (13 °C) and 50 percent occurred at 65 °F (18 °C).

Choices of yeast strain can also make a lager smell like an ale. Many lagers have a distinctive sulfur aroma and lack the fruity esters found in many ales — this aroma profile typifies lagers. This is not true of all lager strains however, some have little sulfur in the nose and can be slightly fruity (to the point that they're mistaken for ale). Anchor Steam is a lager fermented in the 65 °F (18 °C) range and is known for its ale-like aroma.

Ingredient selection is another thing that can confuse the yeast strain. For example, if you make a really hoppy wort with "ale hops," such as Cascades, the finished beer may be so dominated by an aroma typically associated with ales that the yeast strain becomes a non-factor. There are many commercially available stouts actually made using lager yeast and the typical consumer would never be the wiser because the dark grains and hopping dominate the flavor. Your choice of turbinado sugar may have added some aromas that remind you of certain ales and trigger you to associate your Beano lager with a brown ale or such. I hope this answers your question!

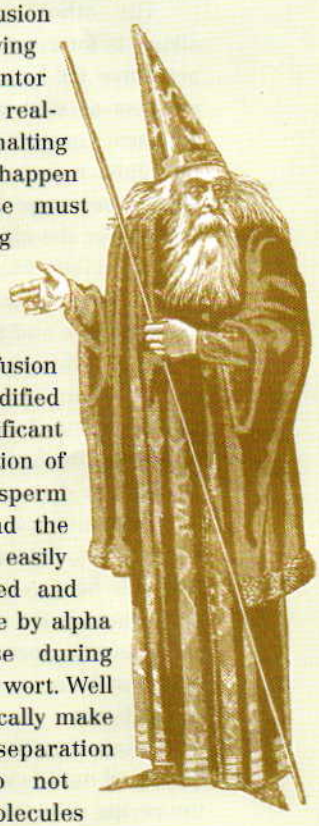
*Mal*tiple mashings

Could you explain the difference between infusion and step mashing. Is it true that step mashing is necessary when you don't use well-modified malts? I am under the assumption that much of today's available 2-row malt is well-modified and as such, only requires infusion mashing. However, in last month's Replicator column, Jim Stinson uses a step mash for Rockyard's Double Eagle Ale clone recipe, which calls for a 2-row base malt. Why would there be a need for a step mash in this brew?

Chris Lanthier
Andover, Massachusetts

Infusion mashing is a traditional method using an unheated mash tun, resulting in a single temperature mash. In reality, the temperature drops slightly over the mash rest and increases during sparging. Step mashing uses a heated mashing vessel, frequently called a mash mixer (or *maisch böttich* in Germany) and incorporates a number of rests. The rests in many step mash profiles coincide with the rest temperatures of decoction mash profiles. Step mashing is really an extension of decoction mashing.

The question you present relates to how these methods are practiced and when you ought to use step mashing rather than infusion mashing. My brewing professor and mentor says that mashing is really an extension of malting — what does not happen in the malt house must be completed during mashing. You are absolutely correct that well modified malt is great for infusion mashing. Well modified malt has had significant enzymatic degradation of the barley endosperm during malting and the starch granules are easily hydrated, gelatinized and broken down in size by alpha and beta amylase during mashing to produce wort. Well modified malts typically make for easy wort separation because they do not contain large molecules that are found in the endosperm of unmalted barley.



Malts that are not well modified are usually called "under-modified" or "poorly modified" malts. This terminology is vague, but the important thing to remember is that the malted grain still retains some of the barley endosperm character. In other words,

the endosperm still contains large molecules of protein and carbohydrate gums that make the endosperm very hard. In extreme cases, poorly modified grains contain a "steely end" that looks like the steely (red-gray color) endosperm of barley. Fully modified grains do not have a steely tip and have a uniform white endosperm color. This is one reason why malt is evaluated by chewing.

Poorly modified malts do not work too well in an infusion mash because these gums make for difficult lautering. Low temperature rests of 118 °F (48 °C) allow the enzyme beta-glucanase to degrade beta-glucan gums (a type of carbohydrate) into smaller pieces. This is important since long beta-glucan chains dramatically increase wort viscosity and make wort separation difficult.

The other thing step mashing allows is for rests at the optimal temperatures for beta amylase and alpha amylase as well as a controlled temperature ramp from the beta rest to the alpha rest. This to me is the real key to step mashing because it gives the brewer the ability to increase wort fermentability. Most highly dry beers have a long rest at 140 °F (60 °C) for beta amylase and then a slow ramp up to 158 °F (70 °C) for the alpha rest. The result is an increase in wort fermentability as compared to infusion mashing at a single temperature.

So why does the Rockyard Double Eagle clone recommend a step mash? For starters, it's important to point out that this beer contains about 20 percent wheat malt. This is an important detail as many brewers feel that a protein rest is necessary when brewing wheat beers.

Another point to consider is the quality of malt being used. In this case the recipe calls for 2-row barley malt. There is no connection between 2-row barley and well-modified malt. While it is true that American and British 2-row malts are typically well-modified (some would argue that traditional UK malts are over-modified), it's also true that traditional "Continental" malts from Europe are the quintessential under-modified malts and just happen to be malted from 2-row barley. Six-row barley is a North American thing, as it is not native to Europe and continues to be grown only in Canada and the United States.

I would wager that your assumption that the 2-row barley malt used at Rockyard is well-modified is right and that almost any 2-row or 6-row pale malt produced in the US or the UK will work well in an infusion mash. But remember, mash choice goes beyond the modification topic when you consider such things as fermentability, other ingredients (such as wheat malt) and ease of wort separation.

Lager rhythm

I would like to brew two separate beers and have them on the same lagering schedule, as I only have one temperature controlled freezer box. Because of time constraints and some other problems, it is impossible to brew both batches on the same day. Is it alright to brew a batch and let it sit a day without pitching the yeast? My plan is to brew the second beer the next day and pitch yeast into both at the same time.

Dave Abendroth
Eureka Springs, Arkansas

This is a question deserving a brief answer! I think you are on the right track wanting to have your lager fermentations timed where you can use the same lagering schedule. I strongly discourage you, however, to delay pitching the first batch for an entire day because that is a recipe for a potential bacterial disaster.

Most lagers have three phases to fermentation: primary fermentation, a diacetyl rest and lagering. Let's assume that primary fermentation takes seven days for both batches at 50 °F (10 °C) and you add another four days at 68 °F (20 °C) for the diacetyl rest before chilling the beers to 32 °F (0 °C) for lagering. It will not hurt the first batch at all if you simply extend the diacetyl rest to five days so that both beers are chilled at the same time. This scheme will solve your timing problems and eliminate the big no-no of delaying yeast pitching. Happy lagering!

Multi-grain formula

After a visit to my homebrew store, I stopped at the health food store and bought two pounds of rye berries, one pound of rolled oats and one pound of red winter wheat berries. I know I can add the rolled oats directly to the mash but is there a better way to prepare the rye and wheat besides simply crushing them? Would soaking in 170 °F (77 °C) water prior to adding to the mash gelatinize these grains and allow for better conversion? I will be doing a multi-step mash and mashing out at 160 °F (71 °C) for a total of 160 minutes in the mash tun. The rest of the recipe is 8 pounds 2-row, ½ pound honey malt and 1 pound rye malt.

Jeff Potter
Dallas, Georgia

I successfully brewed a multi-grain beer a few years ago and think my experience can help you out. My brew had chocolate rye malt, flaked oats, raw wheat, malted wheat, malted barley and some crystal malt for a bit of malt sweetness. The beer turned out very well and was enjoyed by many. The key to brewing these beers is spotting problematic grains before mashing and not adding too much of these.

In general, rye and oats are problematic because they are rich in gums, like beta-glucan, that make wort separation difficult. I learned my lesson with rye the hard way when I decided to brew a roggenbier using 30% rye malt. I figured if Thurn and Taxis in Germany can use 50% rye malt, I should be able to deal with 30%. I must have been using a different type of rye or doing something wrong because the mash was so gummy we were only able to collect 35% of our normal wort volume. Flaked oats will cause similar problems with wort collection. The rye I used in my multi-grain beer was chocolate rye and it only made up 5% of the total grist.

If you use everything listed in your question, I think you will have some problems. You have 24% of the grist bill made up of rye and rye malt. I would reduce the amount of rye berries to 1 lb. (0.45 kg) at the most and may even reduce the rye malt to

½ lb. (0.22kg). The other ingredient proportions do not look bad. You are proposing to use 30% adjunct grains (non malted and no enzymes) and if you take my advice this will drop to 25%. 2-row malts from North America will have plenty of enzymes to deal with the adjunct. If you use malt from Great Britain, be careful with the selection since they are not as enzymatic as malts from North America, especially if the malt is kilned to be a bit darker. I would suggest using North American malt for this beer.

I have seen all sorts of mashing methods described when adjuncts are used. If I brewed this beer, I would mill everything except the flaked oats. The gelatinization temperature of all these grains is low enough that none need to be gelatinized before mashing, like rice and corn. This recipe is almost guaranteed to be a pain during lautering. I would give myself the best chance for success and mash in at 118 °F (48 °C) for a 30-minute beta-glucanase rest. The mash profile you propose supports this and should work well.

Your idea of soaking the grains at 170 °F (77 °C) is a good one. The "double mash," used for making beers with rice and corn, is similar except the adjunct mash contains a little malt and the mash is boiled. The malt in a double mash is added for enzymes and comes into play during a brief rest at 158 °F (70 °C). This prevents the mash from turning into pudding when it is boiled. Your method would work fine without the malt and probably would improve the yield since you would be extracting the starch from the hard adjunct grains prior to mashing.

This method will extract more gums than a normal mash because the temperature never reaches 170 °F (77 °C). In my experience, minimizing beta-glucan extraction during mashing is preferable compared to trying to extract as much as possible prior to mashing and then trying to deal with the gums with an extended rest at 118 °F (48 °C). This type of beer is an experiment and takes a dose of luck to get right the first time. If you are patient, you will be able to fine-tune your technique and brew a great beer!

Premeditated acidulation

I'm trying to lower my water pH and wonder if adding acidulated malt might help. The pH of my tap water is 7.9–8.1. How do you determine the amount of acidulated malt to use? When do I introduce it into the mash and what effect will it have on my water treatment?

William Deiterman
Dallas, Texas

Acidulated malt is a product designed for the easy use of "biological acidification." This practice is a Rheinheitsgbot-approved method of adding organic acids to the mash for the purposes of buffering the pH of the mash. A buffer is a system of weak acids or bases, such as lactic acid or sodium bicarbonate, which resists changes in pH. All buffers can tolerate additions of acids or bases without

substantial swings in pH within the "buffering capacity." This is due to the equilibria between the various species in the buffer, typically called the weak acid and weak base (or proton donor and proton acceptor to chemistry folk).

Biological acidification is another method and brewers can use lactic acid naturally produced by bacteria. The simplest way to do this is to make a sour mash. Lactic acid bacteria are present on malt (both wheat and barley malt) and thrive at temperatures hovering around 122 °F (50 °C). After 24–48 hours at this temperature, a mash will sour and have substantial lactic acid.

Traditional German brewers will make a full mash, for such beers as Pilsners and Helles lagers, containing up to 10% of a biologically acidified or "sour" mash for the purpose of adjusting pH. The sour mash is added to the main mash at mash-in. This requires special equipment and takes time.

Acidulated malt makes this method easier to use as the biological acidification occurs in the malt house and the lactic acid is sprinkled over malt in the kiln. The resulting grain is normal pale malt with a coating of lactic acid produced by a Rheinheitsgbot-approved method. When this grain is chewed, one gets the sensation of eating a SweetTart. The sweet comes from the malt and the tart comes from the lactic acid. The Weyermann malting company produces an acidulated malt and it is called sauer malz or "sour malt" in their literature.

The key thing to understand here is that the goal is adjusting mash pH, not water pH. Mashes comprised of very pale malts and soft brewing water may have higher-than-ideal pHs and require some sort of acidification. Many brewers prefer the addition of either calcium sulfate or calcium chloride to lower mash pH and others opt for the addition of biologically produced lactic acid. Both have merit and focus on the adjustment of mash pH.

I use sour malt in a Kölsch that we brew as a seasonal and it comprises about 5% of the total malt bill. The sour malt is milled with the rest of the malts and goes into the mash at mash-in. Many brewers argue that lactic acid softens the palate of beers when added in small amounts to adjust mash pH. Personally, I think that the important thing is adjusting the mash pH to between 5.2–5.4 and to avoid collecting last runnings with high pH (above 5.8–6.0) and low gravity. This is where you begin to run into problems with astringency.

If you have a pH meter, use it to tune in on how much sour malt you need. If you are making really pale beers with water containing carbonates and little calcium you will need more of the lactic acid from the malt than you will if your water is very low in carbonates, or if you are using dark malt. If you are adding calcium to lower mash pH, you probably will want to cut back on the amount. ■

Roggenbier

Thinking outside of the bread box

by Horst D. Dornbusch

For thousands of years, until roughly five centuries ago, man used to brew with whatever grain grew best where he lived. In many parts of the world, especially in the more northern latitudes, that meant adding rye (*Secale cereale*), or *roggen* in German, to the grain bill. In modern times, however, rye has largely fallen out of favor as a brewing grain. In Europe, I am aware of only three commercial rye ales: the Paulaner Roggenbier, made by the Munich brewing conglomerate by the same name; the Schremser Roggenbier, made by the Privat-brauerei Karl Theodor Trojan in Austria; and the Wolnzacher Roggenbier, made by the Bürgerbräu AG of Bavaria.

In the United States, it seems that rye ale has caught on as an experimental or seasonal specialty for brewpubs and craft breweries — there are several examples of the style. At the 2003 Great American Beer Festival, there were 16 entries vying for medals in the rye beer category. The Bethesda, Maryland Rock Bottom Brewery took the gold for its Right On Rye. The silver went to the Blind Tiger Brewery and Restaurant of Topeka, Kansas for Tailwind Rye and the bronze to the Rocky Mountain Rye of the Smugglers Brewpub in Telluride, Colorado. Perhaps the most available rye nationwide is Sunrye by Redhook.

A shady, shifty style

Rye ales declined in the Middle Ages in large part because the absolute rulers of the day decided that certain grains, such as rye and wheat, ought to be reserved for making solid, rather than liquid, bread. Especially in years with a poor harvest, the lords reasoned that the people might be foolish enough to prefer imbibing and starving to eating and abstaining.

This logic was also one of the hidden motives behind the now much-hailed Bavarian Beer Purity Law of 1516, which legislated the exclusive use of barley in beermaking. Barley was chosen not just because it was deemed better suited for beer-making, but because it was deemed ill-suited for bread-making. In the traditional feudal system of social stratification, therefore, rye was eventually restricted to being a dependable bread grain and barley a dependable beer grain for the unwashed masses. The noteable grain known as wheat became the luxury bread and beer choice of the high and mighty.

As is often the case with old beer styles that have disappeared for a few centuries, definitions are just about as murky as their past. Style specifications expressed in modern units of measurement are more a matter of guesswork than firm knowledge. Therefore, we can describe the rye ale style only in broad strokes. If you want to emulate the original you have a great deal of freedom, but as a general rule, one should adhere to the following three guidelines:

One — In the grain department, compose half or more of your grain bill of barley malts and the rest of any combination of rye and wheat malts.

Two — In the hops department, pretend the rye ale is a mild Bavarian lager, such as a helles.

Three — In the yeast department, pretend it is a hefeweizen.

The recipe in this article is a little more specific, but it too is only one interpretation of the style. I composed the recipe in this story mostly from my experience with the Paulaner and Schremser modern-day revivals of the style.

RYE ALE by the numbers

OG	1.048 (12 °P)
FG	1.007–1.008 (1.75–2 °P)
SRM	8.5–12
IBU	20
ABV	5.2–5.3%

RECIPE

Wry Rye Ale

(5 gallons/19L, all-grain)
OG = 1.048 FG = 1.007–1.008
IBU = 20 SRM = 8.5–12
ABV = 5.2–5.3%

Ingredients

5.2 lbs. (2.35 kg) Weyermann or Briess Pils malt (1.5–2.1 °L)
2.6 lbs. (1.18 kg) Weyermann or Briess rye malt (2.8–4.3 °L)
2.5 lbs. (1.13 kg) Weyermann Pale Wheat Malt (1.7–2.4 °L)
1.7 oz. (48 g) Weyermann Carafa Special Type II (375–450 °L)
1 tsp Irish moss
4.5 AAU Hallertauer, Mt. Hood, or Tettnanger hops (bittering) (1.0 oz./28 g of 4.5% alpha acid)
1 oz. (28 g) Tettnanger hops (flavor and aroma)
1 package German-style Weizen yeast such as Wyeast 2068 (Weihenstephan Weizen) or White Labs WLP380 (Hefeweizen IV) yeast
1 cup dried malt extract or corn sugar (for bottling)

Note that the total (rounded) grain bill of 10.33 lbs. (approximately 4.68 kg) for the all-grain roggenbier is based on a nominal extract efficiency of your brew system of 65 percent. If your setup is better or worse than this value, adjust the grain quantities accordingly.

Step by Step

Mix the milled grains and dough in with about 2.7 gallons (10.2 L) of water to a starting mash temperature of roughly 110 °F (43 °C). Wait 20 minutes. This rest serves two functions: It aids in

continued on page 20

Rye Ale recipes continued

continued from page 21

grain hydration for better saccharification, and it aids in degrading glucans in the rye that could slow down the run-off during lautering.

Then take the temperature up to about 122 °F (50 °C) by infusing the mash with near-boiling water. Stir frequently to avoid hot spots. You can also apply direct heat to speed up the process.

Let rest again for about 20 minutes. At this stage, you are degrading excess proteins from the rye (and possibly wheat). Then, infuse the mash again to take the temperature up to about 149 °F (65 °C). Next, let it rest for about 45 minutes for a thorough starch conversion. At this point the beta-amylase produces fermentable sugars, which is important for a dry beer.

After this first saccharification rest, infuse the mash again with near-boiling water to raise the temperature to 158 °F (70 °C) for a final 20-minute saccharification rest.

Infuse again to 170 °F (77 °C) for the mash-out. Then, recirculate the wort until it runs clear and start sparging. Be sure to maintain the mash-out temperature of 170 °F (77 °C) for the duration of the sparge by adjusting the sparge-water temperature.

Discontinue the sparge at a kettle starting gravity of about 1.044. After evaporation loss at the end of the boil, the kettle gravity should be at or above the OG target of 1.048.

Boil everything for about 90 minutes. Add the bittering hops (Hallertauer, Mt. Hood, or Tettnanger) 30 minutes into the boil. Add the flavor and aroma hops (Tettnanger) and the Irish moss 10 minutes before shut down. Measure the kettle gravity and liquor the wort down, if needed. Let rest for about half an hour after shut-down for proper trub sedimentation.

Heat-exchange to 68 °F (20 °C), pitch the yeast and aerate. Allow five to seven days for primary fermentation. Then pull the temperature down over several days to about 45 °F (7 °C), if you have the facility to do so. (If not, omit this step.)

Keep the beer at this low temperature for two or three days. This helps to precipitate cold break and dead yeast. Now rack the brew and let it warm up to room temperature.

Keep it there for another week. Rack again, prime and package. The beer will be ready to drink after approximately two weeks of conditioning.

Wry Rye Ale

(5 gallons/19 L, extract with grains)
OG = 1.048 FG = 1.007–1.008
SRM = 8.5–12 IBU = 20
ABV = 5.2–5.3%

Ingredients

3.4 lbs. (1.54 kg) Weyermann Bavarian Pilsner LME
1.7 lbs. (0.77 kg) Weyermann Bavarian Hefeweizen LME
2.6 lbs. (1.18 kg) Weyermann Rye Malt (2.8–4.3 °L)
1.7 oz. (48 g) Weyermann Carafa Special Type II (375–450 °L)
1 teaspoon Irish moss
4.5 AAU Hallertauer, Mt. Hood, or Tettnanger (bittering) (1 oz./28 g of 4.5% alpha acid)
1 oz. (28 g) Tettnanger (flavor and aroma)
1 package German-style Weizen yeast such as Wyeast 2068 Weihenstephan Weizen or White Lab WLP380 Hefeweizen IV
1 cup DME or corn sugar

Step by Step

If you don't own a malt mill, use a wine bottle or a pastry roller to crush the rye malt and the small amount of de-husked Carafa roasted malt. Pour the grain loose into about 2 to 3 gallons of 170 °F (77 °C) water. Place the steeping pot on the stove or burner so you can give it a boost of thermal energy periodically to keep the temperature steady. Keep the grain in the water for about an hour.

Then carefully strain the grain out of the liquid using a household sieve. Avoid splashing as much as possible to prevent hot-side aeration. Transfer the flavored and colored liquid into the brew kettle. Stir the two LMEs into the kettle. Fill the kettle to the standard volume. Stir to distribute the LME evenly. Commence the 90-minute boil and follow the all-grain instructions.

The revivial of rye ales

The first rye beers brewed commercially in modern times come from central Europe, the same place where they disappeared in the early 16th century. The oldest "new" rye ale dates from 1988. This is when a subsidiary of Thurn and Taxis Brewery of Regensburg, Bavaria revived the fossil brew. Initially it was called Schierlinger Roggen after the village of Schierling, where it was brewed. In the early 1990s, the brew was relabeled "Thurn und Taxis Roggen," a name under which it was known until 1997, when the Paulaner brewing conglomerate of Munich purchased the Thurn and Taxis operations. The current Paulaner Roggenbier lists an alcohol content of 5.3% by volume on its bottle label. Not as dry as its counterparts, the Paulaner leaves you with just a hint of residual sweetness in your mouth.

The Wolnzacher Roggenbier has 5.5% ABV. It is brewed with an unusually large portion of rye malt (60%) plus a combination of pilsner, dark Munich and acidified malts. The rye flavor in this ale is so dominant that it completely overpowers the Hallertau aroma hops, which is listed on the label. The beer is bottle-conditioned, effervescent and exceptionally dry. It is yeast-turbid to the point of murkiness and so rich in proteins that you literally have to scrub the lacy film from an emptied glass. The dishwasher will not remove it.

The other contemporary European rye ale, the Schremser Roggenbier from Austria, discloses a starting gravity of 11.9 °P (approximate OG of 1.048) and an ABV of 5.2%. This beer finishes rather dry with a final gravity in the vicinity of 1.007–1.008.

Rye beers, like all old-style beers, are ales — a characteristic they have in common with Weissbiers. In the three modern European Roggenbiers I had, there is a faint whiff of earthyness in the nose that is reminiscent of rye bread. The up-front sensation of these ales is one of mild fruitiness. There is a slight to extreme yeastiness and breadiness in the middle and an almost smoky, faintly sour finish — clearly the effects of the rye malt. Effervescence ranges from medium in the Paulaner to spritzy in the Schremser to almost excessive in the Wolnzacher. In all versions the body is substantial, reminiscent of a bock. The Paulaner has a pleasant, rich, off-white head.

Most of the New World rye ales that I have tried tend to be more alcoholic and hoppier than the European versions. They also tend to be lighter in color and far less murky than the Wolnzacher. My guess is that they contain a larger proportion of rye than the Paulaner or the Schremser, but not as much as the Wolnzacher. The Redhook Sunrye for instance, is a slightly yellowish and tangy, tart brew with a pronounced hop accent. It comes across mostly as a pleasing and refreshing summer quaffing beer.

To learn more about the original rye ales, I not only tasted the contemporary European brands, I also discussed the style with several Bavarian and Austrian brewers, beer writers and maltsters. Here is the educated consensus that emerged from this investigation. It is this profile that I used when drawing up the recipes for this story:

The alcohol content of a typical Roggenbier ought to be slightly above 5% by volume, generated by a gravity drop from an OG around 1.048–1.052 (12–13 °P) to a final gravity of around 1.010–1.007 (2.5–1.75 °P). The beer should finish dry. The bitterness ought to be comparable to a Bavarian lager, that is, not higher than 20 IBUs. The color of the Paulaner and Schremser is deep red-amber, very much like that of a darker Oktoberfest. The color of the Wolnzacher is indeterminate because of its vast turbidity.

About brewing with rye

Rye, like wheat and unlike the best brewing barley, is always planted in the fall and harvested the following summer. Top-quality rye demands top-quality soils, but it tends to be less finicky than wheat so that it can generate at least some yield even in poorer and more acidic soils, where wheat would not grow. Historically, therefore, rye was the only grain that could be counted on, from the North Sea to the Ural Mountains, to ripen in the short and often rainy summers of central Europe. Rye has been planted with particular success in such countries as Austria, the Czech Republic, Germany, Poland and Slovakia. Coincidently, these are the places where rye beers were once prominent.

Because rye is always planted for purposes other than beer making — there simply is not enough demand for brewing rye to warrant the development of special brewing strains of rye — the rye's malting and brewing characteristics, especially its enzymatic strength and protein content, are unpredictable and vary with the climatic and agronomic conditions of each crop's locale. The protein level of rye malt, for instance, can vary from 9–13%. The protein content of top-quality brewing barley by contrast is always in a narrow range between 10 and 11%. Like wheat but unlike barley, rye has no husks and thus absorbs water comparatively quickly. This means the maltster must take extra care not to over-steep the rye at the beginning of the malting process. The elongated shape of rye kernels, compared to the rounder shape of barley kernels, results in poorer flow characteristics and greater compaction in the germination chamber, especially if the rye is too soggy coming out of the steeping vat. This turns aeration into a challenge and can lower the germination rate.

Always use rye in combination with pale barley malt, which is known

for its diastatic power. Because of the smaller diameter and the hardness of rye kernels compared to barley kernels, mill your rye separately and at a tighter mill setting.

Rye has a relatively high beta-glucan content and as such, you should allow extra time for lautering. The runoff can be as agonizingly slow as the brew day is long. If you get a stuck mash during lautering, carefully slice into your grain bed with a spatula to loosen it. Always employ a multi-step mash that allows for the enzymatic degradation of as many of the unconverted beta-glucans and proteins as possible. Beta-glucan reducing enzymes (beta-glucanase) reach their peak activity at roughly 113 °F (45 °C). Protein-reducing enzymes (protease) reach their peak activity at roughly 122 °F (50 °C). For these reasons, mash in, at or near the lower of these two temperatures and allow the mash to rest at or near each of them. To make the beer fairly dry as desired, we should allow the mash to take a saccharification rest near the peak range of beta-amylase activity, at around 149 °F (65 °C), when beta-amylase produce simple, fermentable sugars.

The practice of filtration is optional in a rye ale. The Wolnzacher has an almost milky cloudiness, while the Paulaner is labeled "naturtrüb," meaning naturally turbid. The Schremser, on the other hand, is filtered. I find the brew tastes best if left unfiltered, like a h efeweizen. Serving the beer in a yeast-turbid state is also more authentic considering that Roggenbier is an old style and was around long before beer filtration was invented in 1878.

Rye malt extract is being manufactured in both Europe and North America, but only as a commercial product for the food industry. For homebrewers rye malt extract is virtually unavailable. There is no extract-only brew for this beer style. Instead, you will have to steep plenty of rye grain in your brewing water to obtain the needed rye flavor. For instructions, see the recipe on page 20. ■

Horst Dornbusch writes "Style Profile" in every issue of BYO.

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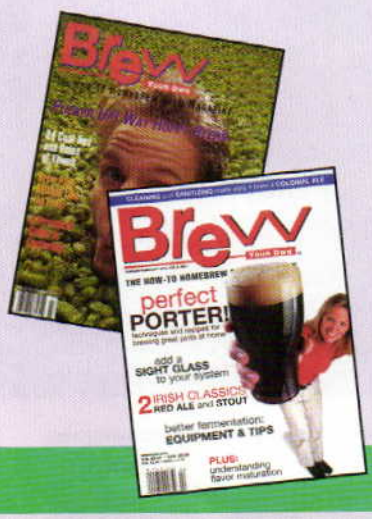

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by **Denny Conn**

GIVE RYE a try

pump up your beer with this pumpernickel grain

illustration by DON MARTIN

RYE

Why Rye?

At my house, we try to keep a super hoppy Pacific Northwest-style IPA on tap almost all the time. As much character as that beer has, I found that after several months of having it around, it started to get a little tame.

One night several years ago, my wife and I were having dinner at a local brewpub. One of the beers on tap was a rye porter. Never having had anything like that before, I was intrigued and had to order a pint. The porter part was great, as expected, but what was unexpected was the big, full mouthfeel the beer had and the earthy spiciness that underlaid the roasty, chocolately porter. I was instantly hooked. As I sat there enjoying my pint, I started using my "taste imagination" to think about how rye might add to my IPA. The next weekend, I brewed up a batch, substituting some rye for some of the pale malt. It worked so well that I decided it needed even more rye! After several test batches, I finally ended up with a recipe that's 18% rye, had huge hop character and a big mouthfeel with glorious head production and retention. And do you know what? It's such an interesting beer that it's been the staple beer at my house ever since!

Which Rye?

Rye, the common name for an annual cereal grain of the grass family, is allied to wheat and barley. Rye is native to temperate Eurasia where it is mostly used as a bread grain (mixed with other grains) and as a livestock feed. It is less important as a grain crop in other parts of the world. Rye is also used as hay and straw; its straw, tougher than that of other cereals, is valued for making straw plaits.

Several varieties of rye have been developed. All are hardier in winter than other cereals. The most extensively cultivated varieties, specifically called winter ryes, are adapted for sowing in autumn, whereas others are sown in the spring. Rye was first cultivated rather late in human history, perhaps as recently as 2,000 to 3,000 years ago. It is still grown extensively in northern Europe and Asia. It lacks the proteins that make wheat suitable for leavening, and rye bread is denser and usually darker than wheat bread. So-called black bread or pumpernickel, popular in Germany, is made from rye. Rye infested with a fungus called ergot was responsible for several epidemics in medieval times.

Rye is an interesting cereal grain because it can be grown in areas that are generally not suitable for other cereal crops. It has low soil and fertilization requirements as well as relatively good overwintering ability.

Types of Brewing Rye

The two main forms in which you'll find rye available for brewing are rye

Rye Wit
by Denny Conn and Matt Jarvis
(5 gallons/19 L, all-grain)
OG = 1.049 FG = 1.010–1.012
IBU = 23.5 SRM = 4.2 ABV = 4.9–5.1%

Ingredients
2.75 lbs. (1.25 kg) 2-row pale malt
2.25 lbs. (1.02 kg) rye malt
2.25 lbs. (1.02 kg) flaked soft white wheat
2.75 lbs. (1.25 kg) wheat malt
(or 2.75 lb. (1.25 kg) unmalted wheat)
3.15 AAU Sterling hops (60 min)
(0.5 oz./14 g of 6.3% alpha acids)
3.15 AAU Sterling hops (30 min)
(0.5 oz./14 g of 6.3% alpha acids)
0.5 oz. (14 g) coriander seed (5 min)
0.9 oz. (25 g) bitter orange peel (15 min)
1 tbsp. grains of paradise (5 min)
2 tbsp. white flour (5 min)
1 oz. (28 g) dried chamomile flowers
(2 min, optional)
Wyeast 3944 (Belgian Witbier) yeast

Step by Step
Single infusion mash at 1.3 qts. water per pound of grain (2.7 L/kg) at 153 °F (67 °C) for 60 min. Ferment at 68 °F (20 °C). Keg or bottle. No secondary fermentation necessary.

Coriander Rye Ale
by Bob Girolamo
(5 gallons/19 L, all-grain)
OG = 1.057 FG = 1.012–1.014
IBU = 24.2 SRM = 6.4 ABV = 5.7–5.9%

Ingredients
7.8 lbs. (3.53 kg) Pilsener malt
3.3 lbs. (1.50 kg) rye malt
1.0 lb. (0.45 kg) rice or barley hulls
1.1 lb. (0.50 kg) crystal malt (20 °L)
0.55 lbs. (0.25 kg) Carapils dextrin malt
8.0 AAU Magnum whole hops (90 min)
(0.5 oz/14 g of 16.0% alpha acids)
1.0 oz. (28 g) crushed coriander (30 min)
1.0 oz. (28 g) crushed coriander (2 min)
White Labs WLP001 (California Ale) or
Wyeast 1056 (American Ale) yeast

Step by Step
Single infusion mash at 1.3 qt./lb. (2.7 L/kg) at 152 °F (67 °C) for 90 minutes. Ferment at 65 °F (18 °C).

Rye Pilsner by Doug Pescatore
(5 gallons/19 L, all-grain)
OG = 1.046 FG = 1.008
IBU = 47 SRM = 3.6 ABV = 5%

Ingredients
7.7 lbs. (3.49 kg) German Pilsner malt
2.2 lbs. (1.00 kg) rye malt
8.6 AAU Saaz whole hops (60 mins)
(2.0 oz./57 g of 4.3% alpha acids)
8.6 AAU Saaz whole hops (30 mins)
(2.0 oz./57 g of 4.3% alpha acids)
8.6 AAU Saaz whole hops (10 mins)
(2.0 oz./57 g of 4.3% alpha acids)
Saflager S-23 yeast

Step by Step
Single infusion mash for 60 minutes at 149 °F (65 °C). Two weeks primary fermentation at 50 °F (10 °C). Two weeks secondary fermentation at 45–50 °F (7.2–10 °C). Four weeks lagering at 40 °F (4.4 °C).

Orange Rye Porter
by Robin Chitwood
(5 gallons/19 L, all-grain)
OG = 1.056 FG = 1.012–1.014
IBU = 37.2 SRM = 49.7 ABV = 5.5–5.8%

Ingredients
8.5 lbs. (3.86 kg) 2-row pale malt
1.0 lbs. (0.45 kg) crystal malt (55 °L)
13 oz. (0.37 kg) chocolate malt
8.5 oz. (0.24 kg) black patent malt
14 oz. (0.40 kg) rye malt
10 AAU Wye Target whole hops (60 min)
(1.0 oz./28 g of 10.0% alpha acids)
2.4 AAU East Kent Goldings whole
hops (15 min)
(0.5 oz./14 g of 4.75 % alpha acids)
0.75 oz. sweet orange peel (15 min)
White Labs WLP005 (British Ale) yeast

Step by Step
Mash at 155 °F (68 °C) for 60 minutes. Ferment at 65 °F (18 °C).

Rye Hefeweizen
by Gunnar Emilsson
(5 gallons/19 L, all-grain)
OG = 1.055 FG = 1.017
IBU = 32.5 SRM = 4.3 ABV = 5%

Ingredients
5.5 lbs. (2.49 kg) Pilsner malt
3.3 lbs. (1.49 kg) rye malt
2.75 lbs. (1.25 kg) wheat malt
7.9 AAU Tettnanger hops (60 mins)
(1.75 oz./50 g of 4.5% alpha acids)
0.5 oz. (14 g) Tettnanger hops (15 min)
Wyeast 1338 (European Ale) yeast

Step by Step
Multi-step mash. 105 °F (41 °C) for 30 minutes, 140 °F (60 °C) for 30 minutes, 152 °F (67 °C) for 60 minutes. Ferment at 62 °F (17 °C). Use a German wheat yeast for a Bavarian hefeweizen style beer.

Rye Not?
(Rye Kölsch) by John Weerts
(5 gallons/19 L, all-grain)
OG = 1.045 FG = 1.011
IBU = 19 SRM = 9 ABV = 4.3%

Ingredients
6.0 lbs. (2.7 kg) 2-row pale malt
(American)
3.0 lbs. (1.4 kg) Briess rye malt
1.0 lbs. (0.45 kg) Carapils malt
5.0 AAU Hallertau hops
(1.25 oz/35 g of 4.0% alpha acids)
Wyeast 2656 (Kölsch) yeast.

Step by Step
Mash at 152 °F (67 °C) for 60 minutes. Ferment for two weeks at 65 °F (18 °C) then bottle or keg. Let set for one week to carbonate, then chill for one month in the fridge to allow for crisp clean flavor to show nicely, or enjoy at will.

My Rye by Dennis Elrod
(5 gallons/19 L, all-grain)
OG = 1.053 FG = 1.013
IBU = 25 SRM = 28 ABV 5.2%

Ingredients
6.25 lbs. (2.83 kg) US 2-row malt
3.75 lbs. (1.7 kg) rye malt
0.33 lbs. (0.15 kg) flaked barley
0.33 lbs. (0.15 kg) Carapils malt
0.33 lbs. (0.15 kg) crystal malt (40 °L)
0.33 lbs. (0.15 kg) caraVienne
0.33 lbs. (0.15 kg) special roast
5.25 AAU Cluster hops (60 mins)
(0.75 oz./21 g of 7.0% alpha acids)
4.0 AAU Liberty hops (15 mins)
(1.0 oz./28 g of 4.0% alpha acids)
2.0 AAU Liberty hops (2 mins)
(0.5 oz./14 g of 4.0% alpha acids)
1 tabet whirlfloc (15 mins)
Wyeast 1272 (American Ale II) yeast

Step by Step
Needs about a month in the keg or bottle to be at its best. I like to use 2 or 3 lbs. of rye, depending on my mood.

Goldschmidt's Hopeful Märzen
(Rauchroggenmärzen) by Chris Colby
(5 gallons/19 L, all-grain)
OG = 1.060 FG = 1.015
IBU = 19 SRM = 19 ABV = 5.8%

Ingredients
4.25 lbs. (1.9 kg) Briess Less Modified
Pilsner malt
4.25 lbs. (1.9 kg) Weyermann rauchmalz
2.33 lbs. (1.1 kg) Munich malt (10 °L)
1.25 lbs. (0.57 kg) Briess rye malt
(lightly smoked with hickory)
0.5 lbs. (0.23 kg) crystal malt (40 °L)
1 tsp Irish moss (15 min)
5.25 AAU Northern Brewer hops (60 min)
(0.75 oz./28 g of 7% alpha acids)
Wyeast 2206 (Bavarian Lager) or WLP820
(Octoberfest/Märzen) yeast
(1 gallon/4 L starter)

Step by Step
Lightly smoke rye malt with hickory three days prior to brewing. Dough in to 122 °F (50 °C) with 3.1 gallons (12 L) of water in your brew kettle. Immediately pull a 1 gallon (3.8 L) decoction and add a pinch of gypsum. Heat decoction to 154 °F (68 °C) and hold for 5 minutes then bring decoction to a boil for 5 minutes. (Stir decoction constantly while heating) Return decoction to main mash, add 3 quarts (3 L) of boiling water and heat to raise temperature to 154 °F (68 °C). Hold for 45 minutes. Transfer mash to lauter tun and add boiling water to heat mash to 168 °F (76 °C). Rest for 5 minutes. Recirculate for 20 minutes. Heat sparge water to 170 °F (77 °C) and collect 7.0 gallons (26 L) of wort. Boil vigorously for 90 minutes. Chill wort to 63 °F (17 °C), aerate and pitch yeast from starter. Ferment at 53 °F (12 °C), perform a diacetyl rest at 60 °F (16 °C) for two days after primary fermentation is finished, then lager below 40 °F (4.4 °C) for six weeks.

[**NOTE:** Grain amounts were scaled proportionally from original recipes to match *BYO*'s standard assumptions (page 6).]

malt and flaked rye. Rye flour can also be used (with the caveat that it will likely be extremely difficult to lauter) since rye has a starch gelatinization temperature even lower than wheat. Weyermann also makes caramel rye malt (like a rye crystal malt, 30–40 °L, recommended usage up to 15%), and chocolate (roasted) rye malt (190–300 °L, recommended usage 1–5%). Briess and Thomas Fawcett are other maltsters producing rye malt. As a matter of fact, it was the chocolate rye malt that I liked so much in the porter that I first tried. My experience is that the rye malt has a slightly more earthy spiciness to it than flaked rye. Either can add an orange hue to your beer, as well as a big, full, slightly slick mouthfeel and big head production and retention.

Milling Rye

Rye malt will need to be milled, of course. Because the kernels are smaller than the average barley kernel, you may need to mill the rye separately using a smaller gap on your mill. But if you're like me, and already have a very narrow gap set, rye can be successfully milled right along with your other grist.

Rye Must be Mashed

One other thing to be aware of is that rye malt must be mashed with other malt that contains enough enzymes to convert the rye starches to fermentable sugars. The diastatic power of Briess rye malt (one of the most readily available rye malts in the US), for example, is only 20–50 degrees Linter, compared to Briess' 2-row Brewer's malt, which is listed at 110-130. This means that while rye malt might convert itself in a mash, it's better to be safe and mash it with some pale malt to provide the enzymes necessary to ensure conversion.

For Extract Brewers

Extract brewers who normally steep specialty grains must do a mini-mash in order to use rye. To brew an extract version of any of the recipes here, take the rye malt and add one half this amount of 2-row pale malt. Subtract that amount from the pale malt in the all-grain recipe and replace the remaining pale malt with 0.53 times as much light dried malt extract.

For example, if a recipe calls for 8 lbs. of pale malt and 3 lbs. of rye malt, take the rye malt and half this amount (1.5 lbs.) of pale malt for the partial mash. Subtract the pale malt for the partial mash (1.5 lbs.) from the previous total (8 lbs.), and multiply this amount (6.5 lbs.) by 0.53 for the amount of dried malt extract (3.4 lbs.) to swap for the pale malt.

"Steep" the crushed pale malt, rye malt and specialty grains at 152 °F (66 °C) for 45 minutes. Use 1.5 quarts of water per pound of grain for the "steep," which is really a small mash.

Using Rye

There are a few caveats and techniques when using rye that you need to be aware of. Most of these relate to the fact that like wheat malt, rye malt has no husk and can contribute to or cause a stuck runoff. Here are a few ideas.

Carefully consider your lautering system. If you've had stuck runoffs in past mashes, you want to be especially careful. Using a stainless steel hose braid in my mash tun ("Cheap and Easy Batch Sparging" January-February 2004 *BYO*), I've never had any problem lautering rye. If you use a similar system, you just might never experience a problem. As an example, when Matt Jarvis and I test brewed the Rye Wit recipe, we mashed in Matt's cooler, which uses a CPVC manifold system. This normally works perfectly for him, even on beers that contain a fair amount of wheat. The rye wit runoff stuck tight as soon as we began the runoff, and no amount of cutting or stirring the mash or blowing back up the runoff tubing could clear it. We finally transferred the mash to a tun with the SS hose braid and the lautering proceeded smoothly from there.

Just be aware of your system's capabilities and any problems you might have.

Add ½ pound or so of rice or barley hulls to the mash to aid in lautering. If you do this, it's a good idea to soak them in water first so that they don't absorb too much of your mash water. Then just stir them into the mash with the rest of your grist.

Some people have reported good luck using a beta glucan rest (in the 98–113 °F/37–45 °C range) in their mash. This is the "gum breaking" range and can aid lautering substantially if you have had any problems.

Go (Pretty) Big or Go Home!

Up to a point, the more rye, the better. As with anything that involves taste, this is subjective, but in general if you use less than 10% rye in your grist, the effect will be barely noticeable. I prefer more in the 15–20% range. The common wisdom is to avoid more than 30% rye in a beer, but that's totally up to your tastebuds. I would, however, recommend that you brew these recipes as they are first so that you can see what the rye will do to the flavor of your beer. Then adjust to your taste. Although these beers might be delicious, they might not do very well in a competition. That's because when you add rye to any existing beer style, you throw it out of style. But don't let that stop you from enjoying a delicious addition to your homebrew. Try rye!

DC's Rye IPA

by Denny Conn
(5 gallons/19 L, all-grain)
OG = 1.073 FG = 1.012–1.015
IBU = 75.1 SRM = 12.2 ABV = 7.7–8%

Ingredients

11.0 lbs. (5.0 kg) 2-row pale malt
3.0 lbs. (1.4 kg) rye malt
1.25 lbs. (0.57 kg) crystal malt (60 °L)
0.5 lbs. (0.23 kg) cara-Pils dextrine malt
0.5 lbs. (0.23 kg) wheat malt
4.9 AAU Mt. Hood whole hops (FWH) (1.0 oz./28 g of 4.9% alpha acids)
17.8 AAU Columbus whole hops (60 min) (1.0 oz/28 g of 17.8% alpha acids)
2.45 AAU Mt. Hood whole hops (30 min) (0.5 oz./14 g of 4.9% alpha acis)
7.35 AAU Mt. Hood whole hops (0 min) (1.5 oz./43 g of 4.9% alpha acids).
1.0 oz. (28 g) Columbus whole hops (dry hop)
1.0 tsp Irish moss
1.0 tsp gypsum (add to boil, to accentuate hop bitterness)
BrewTek CL-50 (California Pub Brewery Ale) or Wyeast 1272 (American Ale II) yeast

Step by Step

Single infusion mash at 1.3 qt./lb. at 153 °F (67 °C) for 60 min. Boil 10 minutes for hot break to form, then start hop schedule. Ferment at 65 °F (18 °C), rack to secondary and dry hop for two weeks. For an added hop blast, add 1 oz. (28 g) Columbus hops to keg. ■

Denny Conn wrote about batch sparging in the Jan-Feb issue of BYO.

Deus: Brut des Flandres

the nectar named after god

by **Horst Dornbusch**

There's a new kind of beer on the loose. It's five years old and unlike any other brew on the market. It's really a Champagne-like beverage made from wort instead of must (grape juice to be fermented into wine). Perhaps not surprisingly, it comes from Belgium, the land of great brew experimentation; but it also spends part of its cellaring life and undergoes final packaging in neighboring France. The name of this roaming brew is DeuS, Brut des Flandres. (Yes, the brewery spells it with a capital "S.") The word "deus" is, of course, Latin for God! DeuS is made by the Bosteels Brewery of Bruggenhout, in the Flemish part of Belgium, and it is not cheap. Expect to pay at least $20 for a 750 mL (1 pint 9.4 fl. oz.) bottle.

Bosteels is exceptionally secretive about its DeuS, but the brewery does publicize a few tantalizing hints about its production techniques. The beer is brewed as a strong, blond ale in Belgium and then shipped to the Champagne region of France for bottle-conditioning and packing in accordance with the traditional Champagne-making method, the *méthode*

champenoise. When applied to beverages other than true Champagne, this process is called *méthode traditionelle*.

We also learn in the scant product literature that the beer is made entirely from "summer barley, following a unique recipe," using "techniques developed over centuries of brewing," and that it is fermented with "specially selected yeast" and aged "on yeast, in the bottle, for months." The rest of what is knowable about this beer is entirely derived from a much more subjective, but nonetheless equally cryptic source: my taste buds.

The Profile of a Beer Enigma

DeuS has been on the market since 1999. Like a top champagne, it comes in a heavy, solid-looking bottle and should be drunk out of Champagne flutes. The brewery recommends a chilly serving temperature of 2–4 °C (35–39 °F). When poured, it behaves much like great bubbly — brilliantly straw-blond, with a quick-gushing and slowly-receding head.

It has a prickly-pearly, *petillant* effervescence and — true to its appellation of Brut des Flandres — a very tart and dry, almost sour finish. The beer's alcohol level of 11.5% ABV is entirely masked by its complex flavor. Like a vintage Champagne, this beer is dated. Recently, I've sampled the "Cuvée Prestige 2002".

The brew's bouquet is mildly perfumed and faintly malty; its body is light, but not thin. Up front, the palate is stimulated by enticing citrusy notes that are hard to identify on the first sip. The hop notes are gentle and subdued throughout — sharp rather than aromatic, but barely above the taste threshold. There is a second undercurrent of spiciness, which no doubt stems from a small addition of coriander in the kettle.

Not having a brewer's confession to go by, and not being able to conduct covert industrial espionage, the following is a case of reverse engineering based on the product literature, tasting notes and a few educated guesses.

Grains for the Base Beer

It is a safe bet that the base malt of this Belgian ale is a top-quality 2-row Belgian-style ale malt. A good choice for the clone brewer, therefore, is the pale ale malt from Malteries Franco-Belges, made from barley varieties such as Prisma that grow well in Belgium, Holland and northern France. This barley imparts a slightly malt-aromatic bouquet and produces a highly modified brewer's grist. If you cannot find the Franco-Belges malt, substitute it with Weyermann Pale Ale Malt, which is also used by many commercial brewers in Belgium.

Because DeuS has a fairly tart, Champagne-like finish, the remaining 10% of the grain bill should consist of an acidified pale malt, such as Weyermann Acidulated Malt.

Some who have tasted this beer believe there is wheat in the grist. So, as an option, you can replace 20% of the grain bill with malted wheat.

Lightly Hopped

The bittering hops is probably a relatively low-alpha, German-style, noble variety such as Tettnanger, or perhaps Perle. The bittering level at the beginning of fermentation is probably around 10 IBU, but the perceived bitterness of the finished beer is much lower because the alpha-acids deteriorate during the brew's long aging process. There are no aroma hops.

A Trio of Yeast Strains

In the *méthode traditionelle*, the beverage undergoes three separate fermentations. Each is probably best served by a different yeast strain. Bosteels may have its own secret fermentation regimen, but this is my method of achieving the same end.

For primary fermentation, use a relatively clean-fermenting Belgian ale yeast, such as Wyeast 1388 (Belgian Strong Ale) or White Labs WLP570 (Belgian Golden Ale) yeast. For secondary fermentation, use a fairly alcohol-tolerant, crisp-fermenting, well-attenuating and well-flocculating strain, such as Wyeast 3021 (Pasteur Champagne Pris de Mousse) yeast. This will achieve the high alcohol plateau and produce the dry finish we want. For bottle conditioning, use Wyeast 3347 (Eau de Vie), which can tolerate alcohol levels of up to 21% and thus still do its job under the stresses and pressures of a Champagne-like environment.

Mash for a Dry Outcome

The dryness of this beer — along with the line in their product literature about "techniques developed over centuries of brewing" — suggest a multi-step mash, as I've outlined in the recipe. However, all these steps may not be necessary given the base malts used. For brewers looking to speed their brewday along, a 30-minute rest at 140 °F (60 °C) can substitute for all the low temperature rests listed in the recipe and still produce a very fermentable wort. For enhanced dryness, the saccharification rest should take place at 149 °F (65 °C) for peak beta-amylase activity. Rest for 30 minutes. Finally, raise the temperature to 172 °F (78 °C) for lautering.

Boiling for Clarity and Spice

Sparge to a kettle gravity of approximately 1.054 (13.5 °P). Boil for 75 minutes. After evaporation losses, the gravity should be around 1.060 (15 °P). Add a single hop loading about 15 minutes into the boil. Add two teaspoons of Irish moss right before and 0.5 oz (15 g) of whole-kernel coriander right after shut down. Let the brew stand for about 30 minutes for better trub sedimentation.

recipe

GOD'S BREW OF FLANDERS

(5 gallons/19 L, all-grain)

Virtual OG = 1.102 FG = 1.012–1.014
IBU = 8 SRM = 5–6 ABV = 11.3–11.6%

Ingredients

11.0 lbs. (5.0 kg) Malterie Franco-Belge Pale Ale Malt
1.1 lbs. (0.50 kg) Weyermann Acidulated Malt
5.0 lbs. (2.27 kg) dextrose (corn sugar) or light Belgian candi sugar
2.25 AAU Tettnanger hops (bittering) (0.5 oz./14 g of 4.5% alpha acid)
0.5 oz (15 g) whole-kernel coriander
2 tsp Irish moss
0.35 oz. (10.5 grams) bentonite
Wyeast 1388 (Belgian Strong Ale) or White Labs WLP570 (Belgian Golden Ale) yeast
Wyeast 3021 (Pasteur Champagne Pris de Mousse) yeast
Wyeast 3347 (Eau de Vie) yeast
1.0 lb. (0.45 kg) corn sugar (for priming)
1.5 lbs. (0.68 kg) light DME (for dosage)

Step by Step

Multi-step mash base malts for 60 minutes at 100 °F (38 °C), 15 minutes at 113 °F (45 °C), 30 minutes at 122 °F (50 °C) and 30 minutes at 149 °F (65 °C). Mash out to 172 °F (78 °C). Sparge with 170 °F (77 °C) water and collect 4.5 gallons (17 L) of wort. Boil for 75 minutes, adding bittering hops with 60 minutes remianing in boil. Cool wort, aerate and pitch Belgian beer yeast. Ferment at 70 °F (21 °C), then fine with bentonite. **Secondary fermentation:** Make sugar solution (as described in article) and mix into wort with Champagne yeast. Fine with bentonite when secondary fermentation is complete. **Tertiary fermentation:** Make second sugar solution with 1.0 lb. (0.45 kg) sugar and stir into beer with Eau de Vie yeast; siphon into Champagne bottles. Age beer for 2 months. **Packaging:** Proceed with riddling and disgorgement (as described in article) or skip this step and simply bottle condition the beer. Serve at 36–39 °F (2–4 °C) in a Champagne flute.

Extract option

Extract brewers can replace the pale ale and acidulated malt with 8.3 lbs. (3.76 kg) of liquid malt extract or 6.75 lbs. (3.06 kg) of dry malt extract. Skip the mashing process outlined above, dissolve the malt extract in water and begin brewing at the boiling stage.

Fermentation for a Clean Base

Heat exchange to around 70 °F (21 °C). Pitch the Belgian ale yeast and aerate the wort thoroughly. Ferment the brew to the finish. Dissolve about 0.2 oz. (6 g) of bentonite (a clay-based fining agent, used in wine production) in about 1 cup of sterile, cold water and add to the beer. Allow the bentonite and debris to settle, then rack the beer very carefully off this sediment (lees, in winemaking terms).

Secondary Fermentation

In order to boost the beer another 5.5% in ABV to reach the target of 11.5%, we need to add 5.0 lbs. (2.27 kg) of fully fermentable sugar to our sparkling beer. We'll also add Champagne yeast, which is both alcohol tolerant and accustomed to a diet of simple sugars.

To do this, mix 2 qts. (~2 L) of water and 2.5 oz. (~70 g) of corn sugar (dextrose) or light Belgian candi sugar. Boil to sterilize and then cool. Add the Champagne yeast and ¼ teaspoon of yeast nutrients. Aerate vigorously. Agitate often to continue aeration over several hours.

Within a day, this starter should be fermenting. Now add twice the amount of sugar (5 oz./140 g), but without aeration. Wait a day and double the sugar addition again, to 10 ounces or 280 grams. Wait another day and add the starter as well as the remaining 3.9 lbs. (1.7 kg) sugar to the brew. Within another day the brew ought to show signs of fermentation. After another two weeks, add a new bentonite mixture — this time with 0.1 oz. (3 g) of the clay. When the brew is still and sedimented, rack it a final time.

Bottling Conditioning

Make a new 2-qt. (2-L) starter solution, only this time with 1 lb. (0.45 kg) of sugar. Add the Eau de Vie yeast, a pinch of yeast nutrients, aerate and wait for signs of fermentation. Let it ferment for one day to give the yeast a good start. Stir the starter into the brew. If necessary, top the brew up with water to about 5 gallons (19 L). Then siphon the beer into about two dozen clean champagne bottles and seal with plastic champagne stoppers and wire cages.

Finally, place the bottles with the beer-cuvée neck down into wine cartons, at around 15 °C (59 °F), for an almost four-month aging period called *prise de mousse* ("taking up foam"). This conditioning is responsible for the all-important bubbles, the sedimentation of the lees into the bottle neck, and the development of the typical *méthode traditionelle* bouquet that comes from both aging and yeast autolysis. During autolysis, proteolytic enzymes break down dead yeast cells. This aging *sur lie* (on the lees) enriches the brew with amino acids as well as esters and fatty acids. These trace elements add flavor, bouquet, complexity, and depth to the brew. They also improve CO_2 retention and reduce bubble size.

Do the Twist

After two months of the *prise de mousse*, start riddling the brew (*remuage*). This involves twisting each bottle sharply one-quarter turn with the flick of the wrist once each day for two weeks. This helps to lodge all the sediment in the neck. Then leave the brew undisturbed for another month.

Yeast Out, Dosage In

Now comes the trickiest part of the *méthode traditionelle* operation, the removal of the sediment, which is usually accompanied by a loss in beer volume — perhaps as much as 50–100 mL (1.7–3.4 fl. oz.) per 750 mL bottle. So the first thing to prepare on the day of *dégorgement* (disgorgement) is the replenishment, called the dosage.

Champagne makers usually dissolve about 600 g of sugar in one liter of dosage to make a syrup. We will boil some light dried malt extract (DME) in water instead. You might need about 2.4 L (82 fl. oz.) of dosage and thus

1.5 lbs. (0.68 kg) of DME. Chill the dosage before using. Next, place the inverted bottles into your freezer. Keep them in their cartons if possible. Carefully monitor the freezing progress. The neck sections will freeze first, but do not let the entire bottles freeze as they will burst!

The next step is messy and best done outside. While holding the frozen bottle upside-down, remove the wire cage and let the bottle pressure slowly push out the plastic stopper, at which point the sediment will pop out, too. Now quickly (very quickly!) close the bottle with your thumb and turn it right side up. Top the bottle off with the dosage and close it with a fresh plastic champagne stopper and wire cage.

In a commercial facility, nowadays, the necks are flash-frozen in a solution of glycol at -11.2 °F (-24 °C) and the *dégorgement* is accomplished with the bottles standing right side up.

The beer called "God" should be ready for your palate after the ordeal of the *dégorgement* process after a month of calming down in your cool, dark basement.

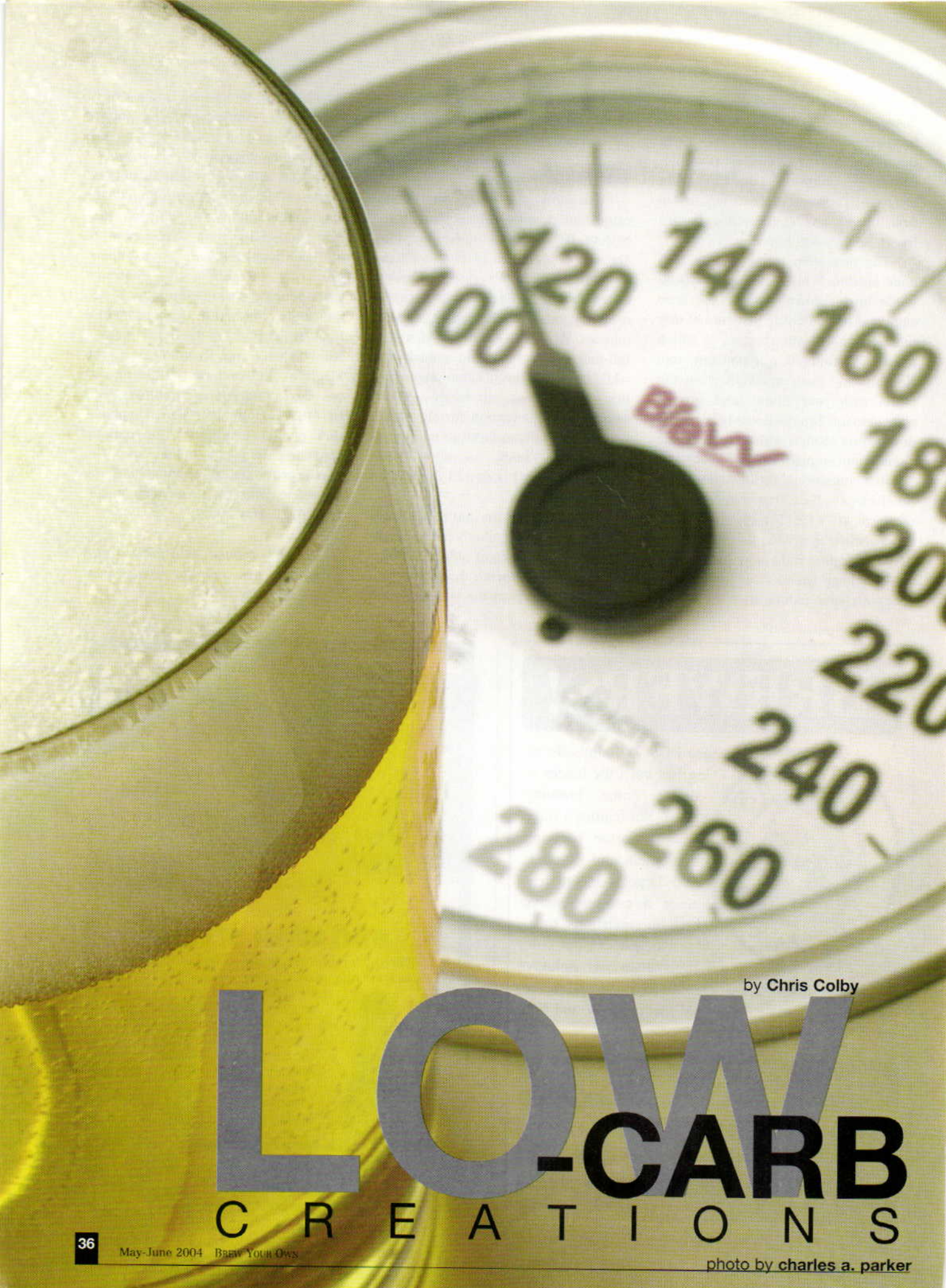
WARNING!

Use only genuine Champagne-rated bottles with a deep punt in the bottom. If you are not sure that yours are real Champagne bottles, don't use them. At up to 100 PSI pressure inside, an exploding bottle is like a shrapnel grenade and can cause serious injuries. Always wear thick gloves, a full-face safety mask and a thick coat while handling closed Champagne bottles. This is not an overly-cautious safety recommendation for the timid; you are virtually assured to be injured — probably badly — if a bottle explodes in your hands and you are not properly protected.

You may skip the entire *dégorgement*, of course, by simply bottle conditioning the brew right side up. When you are ready to drink it, simply open it carefully and pour the entire content slowly, but in one swoop into a row of champagne flutes, leaving about 0.5–2 inches (1.3–5 cm) of sediment behind to be discarded.

In this article, I present an adapted version of the *méthode traditionelle* for making this beer. For a highly informative and well-written explanation of the traditional *méthode champenoise*, see "A Review of Méthode Champenoise Production" by Bruce Zoecklein, Associate Professor and Enology Specialist of the Department of Food Science and Technology at the Virginia Polytechnic Institute, at www.ext.vt.edu/pubs/viticulture/463-017/463-017.html. For a good explanation of the techniques for making sparkling wine at home, see Tim Vandergrift's article "Making Sparkling Wine from Kits" in *WineMaker* magazine (April–May 2002).

Horst Dornbusch is a former craft brewery owner, and the regular beer style columnist of BYO.



by **Chris Colby**

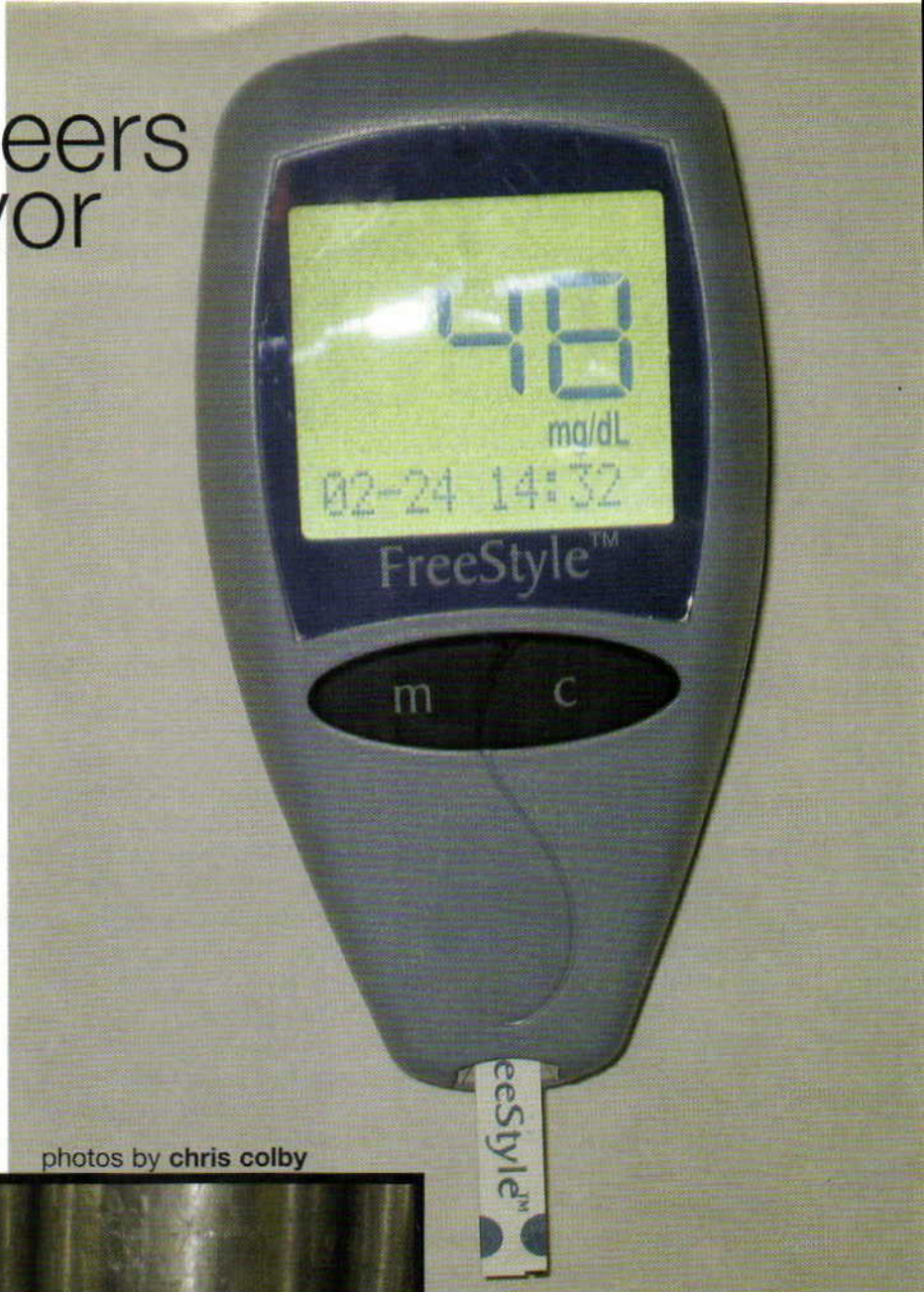
LOW-CARB CREATIONS

photo by **charles a. parker**

Low-carb beers with big flavor

Carbohydrates are a major component of many of the foods we enjoy. Sugars are carbohydrates. So is starch. Carbs put the dandy in candy and make a lot of foods — from bread to pasta to potatoes — taste the way they do. And of course, carbohydrates are a large part of what makes beer taste so damn good. So, who doesn't love carbs?

Well, some guy named Atkins for starters. In 1972, he developed a diet program that advocated switching from the high carb/low fat diet recommended by doctors and nutritionists to a low-carb/high protein diet. And recently, tens of thousands of Americans have jumped on the bandwagon. One side effect of this is that fast food joints are now serving bun-less hamburgers and pizza-in-a-cup. Another side effect is that my email inbox is suddenly jammed full of messages requesting recipes for low-carb homebrew.



photos by **chris colby**

TOP: Can a blood glucose meter, used by diabetics, measure carbohydrates in beer? Not very well as it turns out. See the table on page 39 for my tests on commercial beers with published carbohydrate content.

LEFT: "Why are American beers like making love in a canoe?" asked Eric Idle in an old Monty Python routine. "They're f#@$ing close to water," was the answer. Turns out he was right — two of the low-carb beers here are actually lighter than water. But, does low carb mean low flavor? You might be surprised where dry stouts rank on the carbohydrate scale.

LOW-CARB beer recipes

The first set of numbers for FG, ABV and carbs are the pre-Beano numbers. Numbers in brackets are for "Beanoed" beers. Carbs values are estimates from the recipe; actual values will vary depending on how the beer is brewed.

FUDA stout

(5-gallons/19 L, all-grain)

OG = 1.038 FG = 1.009 [1.003-1.004]
IBU = 25 SRM = 39
ABV = 3.7% [4.4-4.5%]
Carbs (g/12 oz.) = 9.5 [3.6-4.5]

Ingredients

6.33 lbs. (2.9 kg) 2-row pale malt
1.0 lb. (0.45 kg) roasted barley (500 °L)
1.0 lb. (0.45 kg) flaked barley
6.7 AAU East Kent Goldings hops (1.33 oz./38 g of 5% alpha acids)
¼ tsp yeast nutrient
White Labs WLP007 (Dry English Ale) yeast (0.75 qt./750 mL starter)
450 GALU Beano or alpha-galactosidase enzyme tablets (3 tablets or 15 drops)
1.0 cup Splenda (optional)
0.75 cups corn sugar (for priming)

Step by step

Heat 2.6 gallons (9.9 L) of strike water to 160 °F (71 °C) and stir into grains. Mash at 148 °F (64 °C) for 50 minutes. Stir in boiling water to boost temperature to 162 °F (72 °C) and hold for 10 minutes. Recirculate for 5 minutes or until wort is clear. Run off wort and sparge with 170 °F (76 °C) water. Collect 4 gallons (15 L) of wort over 75 minutes, then add 2.5 gallons (9.5 L) of water (to make 6.5 gallons/25 L). Boil for 90 minutes, adding bittering hops with 60 minutes left. Cool and aerate wort, and pitch the yeast. Ferment at 70 °F (21 °C) until fermentation stops or slows greatly. Add the enzyme tablets then rack beer to secondary fermenter the next day. (You should see the fermentation pick up when you add the enzyme.) Let beer ferment to completion. Bottle with corn sugar. If kegged, push with nitrogen, if possible. (Option: add Splenda to beer when bottling or kegging.) Serve at 45–55 °F (7.2–13 °C) in a pint glass.

Lord Shrinkingbottom's Fuggling Awesome Bitter

(5-gallons/19 L, extract with grains)

OG = 1.036 FG = 1.007 [1.003]
IBU = 32 SRM = 8 ABV = 3.7% [4.3%]
Carbs (g/12 oz.) = 7.2 [3.6]

Ingredients

1.0 lb. (0.45 kg) Muntons Light dried malt extract
2.1 lbs. (0.95 kg) Muntons Light liquid malt extract
1.0 lb. (0.45 kg) cane sugar
0.5 lb. (0.22 kg) crystal malt (60 °L)
11.25 AAU Fuggles hops (2.25 oz./64 g of 5% alpha acids)
1 tsp. Irish moss
¼ tsp yeast nutrient
White Labs WLP002 (English Ale) or Wyeast 1968 (London ESB) yeast (0.5 qt./500 mL starter)
450 GALU Beano tablets or drops (3 tablets or 15 drops)
1.5 cups Splenda (optional, at bottling)
0.66 cups corn sugar (for priming)

Step by Step

Place crushed crystal malt in a steeping bag and steep in 1 qt. (~1 L) of water in a soup pot. Keep temperature at 130–170 °F (54–76 °C) and steep for 30 minutes. While steeping, heat 2.5 gallons (9.5 L) of water to a boil in your brewpot. After steep, add "grain tea," sugar and dried malt extract to your brewpot. Heat to a boil then add 1.0 oz. (28 g) of hops. Boil for 60 minutes, adding remaining hops in 0.5 oz. (14 g) increments at 50, 40, 30, 20 and 10 minutes left in the boil. At 15 minutes left in the boil, add Irish moss, yeast nutrients and liquid malt extract. (Stir well for 1–2 full minutes to prevent scorching.) Cool wort, siphon to fermenter and add water to make 5 gallons (19 L). Aerate and pitch yeast starter. Add enzyme in secondary. Serve at 45–55 °F (7.2–13 °C) in a tulip pint glass.

Sour Cherry Honey Wheat

(5-gallons/19 L, extract only)

Virtual OG = 1.041 FG = 1.007 [1.003]
IBU = 9 SRM = 4 ABV = 4.4% [4.9%]
Carbs (g/12 oz.) = 7.3 [3.7]

Ingredients

3.25 lbs. (1.5 kg) dried wheat malt extract
1.25 lbs. (0.57 kg) orange blossom honey
49 oz. (1.4 kg) Oregon Fruit Products cherry puree
2.5 AAU Hallertau Hersbrücker hops (0.75 oz./21 g of 3.3% alpha acids)
Wyeast 1056 (American Ale) or White Labs WLP001 (California Ale) yeast (1 qt./1 L starter)
Wyeast 4335 (Lactobaccilus delbrückii) and Wyeast 4733 (Pediococcus cerevisiae) bacteria
300 GALU Beano tablets or drops (2 tablets or 10 drops)
1.0 cups corn sugar (for priming)

Step by Step

Heat 2–3 gallons (7.6–11 L) of water to a boil, then shut off the heat. Stir in malt extract and resume heating. Boil for 60 minutes, adding hops after initial foaming subsides. Add ¼ tsp. yeast nutrient with 15 minutes left in the boil. Cool wort and transfer to a bucket fermenter. Add water to make 4 gallons (15 L) of wort, aerate and pitch yeast. Ferment at 70 °F (21 °C) until fermentation stops or slows greatly. Dissolve honey in 64 oz. (1.9 L) of water at 95 °F (35 °C). Open the bucket and add cherries, honey and ⅛ tsp. yeast nutrient, bringing the volume to 5 gallons (19 L). (Practice sanitary brewing techniques, but don't worry about sterilizing the cherries and honey as you will be intentionally adding bacteria to your beer.) Stir quietly with a sanitized spoon to dissolve honey and disperse cherries, but don't splash or otherwise aerate the wort. Add roughly half of each tube of bacteria before resealing bucket. Once honey and cherry fermentation ceases, add the enzyme, a pinch of yeast nutrient and the remaining bacteria. Let beer ferment to completion then condition at 70–80 °F (21–27 °C) for a minimum of three months but preferably six months. (Sourness increases with aging.) Leave beer in your primary bucket fermenter for conditioning. Bottle with corn sugar or keg. Serve ice cold in a Pilsner glass.

Carbs in Beer

Beer is the king of alcoholic beverages, at least as far as carbohydrate content is concerned. They don't call it liquid bread for nothing. Most average-strength beers clock in around 12–15 grams of carbs per 12-oz. (355-mL) serving. By contrast, wine has around 4–5 grams of carbs and liquor has none (the carbs are lost in distilling).

Interestingly, one of the first low-carb beers, DAB's Diät Pils, wasn't designed for dieters. Brewers at Germany's DAB Brewery originally formulated this beer for diabetics. Given the perception of low-carb beers as tasteless fizzwaters, homebrewers may feel that they need to sacrifice flavor to brew a low-carb beer. If you think so, grab a Guinness and let's talk.

My Goodness, My Guinness

"Guinness?" you're likely asking. Yes, Guinness. Draught Guinness is brewed with a starting gravity of 9–9.5 °Plato (SG 1.036–1.038) and fermented dry. At 10 grams of carbs per 12 oz. serving, Guinness is lower in carbs than most American Pilsners and at least one light American Pilsner. Knowing that "big G" is on the low end of the beer carbohydrate scale tells us that low-carb doesn't necessarily mean low flavor. We can make beer with fewer carbs but plenty of roasty flavor.

You might wonder what other beer flavors could be present in a low-carb beer. Sweet and malty are out, of course — as are any flavors that need to be balanced with some sweetness or malt; but there are a few traditional beer flavors we can use in a low-carb beer. Dry lambics have always been low-carb beers, although most of the highly-sweetened versions imported to the United States aren't. The lactic acid bacteria and wild yeasts in lambics finish off most of the carbohydrates that brewers yeast can't metabolize. Also, it should go without saying that hops can dominate a beer's profile and still be appealing to most homebrewers.

Brewing Low-carb Beers

For the purpose of this article, I'll call beers with between 6 and 10 grams of carbs per 12-oz. (355-mL) serving "limited carb beers." This range covers most U.S. light beers. We'll call beers with 0–5 grams of carbs "low carb beers." This is the range Michelob Ultra and some US light beers fall into. I'll show you how to use "normal" brewing techniques to yield a limited-carb beer and a trick to make a low-carb beer.

Carbs Come From Grain

The carbohydrates present in wort come from the grain, malt extract or adjunct in the beer's recipe. The carbs present in finished beer are the residual carbohydrates not fermented by the brewers yeast. There are a number of things you can do to lower the overall amount of carbs in your beer.

You can lighten the carbohydrate content of any beer by cutting down on the amount of specialty grains, such as crystal malts, in the recipe. These grains contain more unfermentable carbohydrates than base grains. An exception to the rule is the darkest, roasted grains. In these, most of the carbohydrates have been degraded by the roasting process. Replacing some of the base malt in the recipe with adjunct will also lower the carbohydrate content of your beer.

All-grain brewers can mash for a higher fermentability. A step mash with a 15-minute rest in the 140 °F (60 °C) region will increase the RDF (real degree of fermentability) of your beer (Bud Light spends about two hours at this temperature). Likewise, resting in the low end of the saccharification range (148–150 °F/64–66 °C) during mashing will yield a more fermentable wort.

Using yeast strains with higher attenuation ratings will yield a lower carb beer. More importantly, pitching an adequate amount of yeast and aerating your wort well will result in maximal attenuation for your yeast strain.

Low FG Equals Low Carbs

Although the modifications above can contribute to a small decrease in your beer's carbohydrate content, to really lower the carbs you need to make your beer starting from a low original gravity (OG). Using an all-malt recipe and normal homebrewing procedures, beers with an original gravity of 1.023–1.042 will likely yield a beer with 6–10 grams of carbs per 12 oz. (in our "limited carb" range). Beers with an OG below 1.022 will yield low-carb beers. Several classic beer styles — including Irish dry stouts, British bitters and some Belgian lambics — fall into the limited carb category without any modification.

You can brew higher-alcohol, but still limited-carb beers by adding sugar or adjunct "on top of" the malt required to reach these low starting gravities. The sugar will be completely converted to carbon dioxide, alcohol

THE CARBOHYDRATE COMPARISON

	carbs(g/12 oz.)	ABV	FG	"blood sugar"
Michelob Ultra	2.6	4.2	0.9975	0.162
Miller Lite	3.2	4.5	0.9980	0.284
Water	0	0	1.0000	*
Coors Light	5	4.2	1.0005	0.625
Bud Light	6.6	4.2	1.0020	0.490
Draught Guinness	10	4.0	1.0060	0.522
Michelob Light	11.7	4.5	1.0075	0.760
Sierra Nevada Pale Ale	12	5.6	1.0115	1.125
Sierra Nevada Bigfoot	24.6	9.6	1.0225	2.412

Carbs and ABV are reported by the brewery. FG (final specific gravity) and "blood sugar" (converted from mg/dL to g/12 oz) were measured twice by the author from decarbonated beer and averaged. "Blood sugar" measurements made with a Freestyle diabetic monitoring device. Water measured "LO" (too low to measure) on meter.

and heat during fermentation. So, ironically, refined sugar is your friend when brewing low-carb beers.

Enter the Bean-Buster

After you've fermented your beer, there are still carbohydrates in it. Yeast can only ferment simple sugars and will not utilize "complex carbs" such as polysacharrides (or dextrins). If, however, you could break up the unfermentable carbs into simple sugars, the yeast would consume them and you would have a low carb beer. This is how commercial brewers make their light and low-carb beers. Brewers use the enzyme amyloglucosidase (AMG) to break up the complex carbs. Homebrewers can use a similar enzyme, alpha-galactosidase, found in a common drugstore product — Beano.

Beano is sold in tablets or drops. Each tablets delivers 150 units (called a GALU) of enzyme. Each drop delivers one-fifth this amount (30 GALU). For 5 gallons (19 L) of beer, 450 GALU — 3 enzyme tablets or 15 drops — should be enough to transform a low to moderate gravity beer into a low-carb beer.

Beano can be added to the wort at the same time you pitch your yeast. Alternately, you can add it to your beer immediately after primary fermentation. I like the second method because you can take your pre-enzyme specific gravity, then see how much Beano lowers your final gravity. You can also see the fermentation "wake up" briefly and know that it is working.

The use of Beano in homebrew was first mentioned by Ashton Lewis in the March 2001 issue of *BYO*.

What Beano Takes Away . . .

Adding Beano takes carbohydrates out of your beer and makes it taste thinner. What if there was something you could add to compensate for this? You'd want this thing to not be a carbohydrate, of course — and not fermentable by yeast either. Oddly enough, there is something that fits the bill. Splenda is a somewhat new no-calorie sweetener that is a mixture of maltodextrin and sucralose. The packets of Splenda also have dextrose (glucose) in them. Theoretically, for every

"gravity point" (GP) taken away by Beano, you should be able to add back the equivalent amount with Splenda. (A gravity point is 0.001 units of specific gravity. If a beer dropped from SG 1.008 to 1.004 after Beano addition, it lost 4 GP.) If you were adding sucrose, you would need to add just short of 2 oz. (57 grams) for every gravity point lost in a 5-gallon (19-L) batch.

I decided to try this for myself, but was prepared to hate it. First of all, Splenda is meant to mimic the taste of a simple sugar (sucrose, or table sugar), not the flavor — and mouthfeel — of the complex carbs that Beano takes away. Second, it's an artificial sweetner and most artificial foods are yucky. I tried small amounts of Splenda mixed into some Murphys and Guinness Draught stouts and was very surprised at the results. First off, Splenda tastes pretty close to sugar on it's own. If you put a pinch of it on your tongue, it tastes basically like sugar and doesn't have the wretched chemical aftertaste of saccharine or aspartame (Nutrasweet). Secondly, it did pretty well at replacing both the flavor and the mouthfeel of residual carbs.

Splenda is meant to be swapped for sugar on a per volume basis. A cup of Splenda replaces a cup of sugar in cooking recipes, although Splenda weighs much less. From the box of Splenda I bought, it says that 3.8 oz (110 grams) is the equivalent of 2 lbs. (32 oz./907 grams) of sugar. Thus, if you needed 2 oz. (56 grams) of cane sugar to replace 1 GP in 5 gallons (19 L), you would need 0.238 oz. (6.7 grams) of Splenda to do the same thing. I measured this amount out and found out it was equal to a volume of just over 4 fl. oz. (118 mL). In most beers, the Beano addition drops the FG 3–4 points, thus you would need to add 12–16 oz. (355–473 mL) to compensate. In the recipes on page 38, I give Splenda additions as an option. Enough is added to keep the beer from tasting bone dry, but not enough to add any appreciable sweetness.

Carbonation and Mouthfeel

Low-carb or limited-carb beers can taste rather thin if carbonated normally. To compensate for this, many low-carb Pilsners are highly carbonated. Many limited-carb beers take the exact opposite tack. Draught Guinness is lightly carbonated and pushed by nitrogen, whether from a keg or by the widgets in the can or bottles. Many believe British bitters are best served pulled from a beer engine, which also yields a lightly carbonated beer. Interestingly, lambics vary in carbonation from explosively effervescent to nearly flat. When making a low-carb beer, it pays to think about how the level of carbonation effects the mouthfeel of the beer. For more lightly-flavored beers, a lot of carbonation does well. For highly-flavored beers, less carbonation may be more appropriate.

Measuring Carbs

It would be nice if there were a simple test for carbs in finished beer. Some winemakers use Clinitest tablets, used to test for reducing sugars in the blood of diabetics, to test for residual sugars in wine. These tablets are getting harder to find as cheap blood glucose meters become more prevalent and I wondered if my meter (that I bought for my diabetic cat, Arnold) would work.

I measured the "blood sugar" of several beers and the results were not encouraging. The meter returned values a little less than 1/10 of the reported levels of carbs in these beers. I interpreted this to mean that the meter could not detect the bulk of the carbs in beer. This makes sense since the residual beer carbs probably have chemical properties different enough from the simple sugars in blood (or wine) that they escaped detection.

Diet Fads

Many in the food and beverage industry are panicked over the low-carb diet trend. Of course, most diet fads are — like the weight loss they produce — fleeting. In all likelihood, low-carb diets will be dead in a few years and who knows what will come next? I actually heard on CNN a few days ago that a strict all-carb also resulted in significant weight loss. So, who's ready for the doppelbock diet? ■

and the WINNERS ARE.....

Beer & Barbeque

When the worlds of beer and food collide, the results can be enough to make your mouth water. With the keen eye of Amy Chamberlain, chef/owner of Manchester, Vermont's Perfect Wife Restaurant and Tavern, we managed to select the following winning recipes sent in to us by *BYO* readers for our first annual Beer & BBQ Recipe Contest. We encourage you to enjoy the weather, get out and brew up some of this great BBQ cuisine!

photo by charles a. parker/images plus

FIRST PLACE

Jack Castro
Fort Collins, Colorado

Rauch's Smoke on the Water Beer-B-Que Sauce

6 oz. homebrewed rauchbier
24 oz. ketchup
¼ cup brown sugar
¼ cup honey
⅛ molasses
1.5 tbsp. Worcestershire sauce
1 bay leaf
½ tsp. black pepper
½ tsp. salt
1 clove garlic, minced
⅛ cup soy sauce
¼ tsp. ginger
3 tbsp. pineapple juice

Step-by-step:

1. Combine all ingredients into a sauce pan. Cook on medium heat for 30–45 minutes. Sauce should be well blended.
2. Let cool for 20 minutes. Ladle into a bowl and cover with plastic wrap.
3. Use with your favorite meat and try it as a dip. Pour the rest of your rauchbier into a glass and enjoy!

SECOND PLACE

Tony Simmons
Pagosa Springs, Colorado

Thai-Style Beer Marinade

We have enjoyed this marinade recipe many times. The combination of the honey, beer, and spices makes it a local favorite. Best of all, it is easy to prepare and cooks in a flash.

Ingredients

⅓ cup peanut oil
½ cup honey
½ cup dark soy sauce
¼ cup pilsner
(or you can use a darker beer for more a malty flavor)
2 tbs. sugar
3 cloves garlic
1 tsp. Thai chilies (dried)
(or use crushed red pepper flakes — or more if you dare!)
½ tsp. freshly grated ginger
½ tsp. freshly ground black pepper
1½ tsp. dark toasted sesame oil
12 pre-soaked bamboo (or metal skewers)
1½ lbs. favorite meat (elk in the Rockies)

Step-by-step

1. Cut meat into thin strips (easier if meat is partially frozen).
2. Soak meat in marinade (we like using a 1-gallon zip-close bag and marinating overnight).
3. Skewer the strips.
4. Grill over high heat.
Baste and turn after 1-2 minutes (metal skewers will reduce cooking time)
5. Serve with Thai salad or noodles.

THIRD PLACE

Shawn Childress
Marietta, OH

Uncle Catfish's Chipolte Smoked Porter BBQ

Ingredients:

2 gallons ketchup
4 cups distilled vinegar
4 cups apple cider vinegar
5 lbs. light brown sugar
1⅓ cups Worcestershire sauce
5 tbsp. garlic powder
3 tbsp. onion powder
2 tbsp. thyme
2 tbsp. ground mustard
3 dried chipotle peppers (crushed)
6 hot chiles (only slit them and cook them — do not chop)
1 beef bullion cube
1 tbsp. ancho powder
liquid smoke to taste (use concentrate only, not the cheap stuff!)
36 oz. tomato paste
4 cups smoked porter
2 tbsp. kosher salt
3 tsp. anchovy paste

Step-by-step:

1. Add all ingredients together except the beer. Bring to slow simmer as long as possible (48 hours is not too long). Try to caramelize the batch without sticking to the bottom of the pan.
2. Add the beer in the last 5–6 hours of boiling.

This Photo Courtesy of Weber-Stephen Products Co.

3. Bottle into 12-oz. beer bottles and let meld in fridge for one month.

Hot version:

Take 1 can of chipotle peppers in adobo sauce and blend with 2–3 cups of sauce from above.

HONORABLE MENTION WINNERS

John Collier
Winslow, Arizona

Tiger Stout Pork Shoulder Marinade

Ingredients:

1 5–10-lb. pork shoulder w/bone
1 pint of Guinness or preferred stout
6–10 garlic cloves (pressed or minced)
¼ cup Tiger sauce
1 tbsp. seasoning salt
1 tbsp. chipotle pepper sauce

Step-by-step

1. Marinade overnight, pour off liquid and apply a simple dry rub of ¼ cup seasoning salt and ¼ cup turbinado sugar.
2. Cook shoulder 6–8 hours at 175 °F (79 °C), preferably by charcoal grill during the last 1½ hours (with indirect heat).

Steve Barnhart
Evanston, Illinois

Guinness-Battered Onion Rings

Yield: 1 lb. onion rings before cooking

Ingredients:

1 lb. onion, cut into rings
2 oz. flour, all-purpose
½ tsp. baking powder
½ tsp. salt
1 large egg, whole
4 oz. Guinness draught
flour, all-purpose (as needed)

Step-by-step:

1. Preheat a deep fryer to 375 °F (191 °C).
2. Separate the onion into individual rings. Set aside.
3. Sift together the flour, baking powder and salt. Set aside in a bowl.
4. With a whisk, whip the egg in a small bowl until frothy. Add the beer and whip to incorporate.
5. Add the liquid to the dry ingredients and whip to incorporate.
6. Dredge the onion rings in the second all-purpose flour and dust off any excess. Add the onions to the batter and mix well to cover all surfaces.
7. Carefully drop a few at a time in the deep fryer, allowing them to float freely. Fry the onions for 60–90 seconds, depending on the size of the pieces.
8. Remove them from the deep fryer when golden brown and let rest on a platter lined with paper towels.
9. Season with salt and enjoy!

Phil Williams
Lock Haven, Pennsylvania

Takin' Names Baked Beans

Warning: These beans aren't as good for the heart as they are for the soul.

Ingredients:

2 28-oz. cans of store bought baked beans (fat removed)
1 lb. bacon (diced)
½ of a small onion
1½ cups light malt extract
1 bottle of chili sauce
1 cup of brown sugar
3 tbsp. of prepared mustard
1 dash of Worcestershire sauce

Step-by-step:

1. Brown the bacon and onion together and then place it into a medium sized roaster (grease and all).
2. Remove the fat clump from the cans of beans and add to the roaster.
3. Add all other ingredients and make sure that they are well mixed before putting into the oven.
4. Bake for two hours in preheated 350 °F (177 °C) oven and allow to set for one hour before serving.

Kyle Hill
Millersville, Maryland

Hops Smoked Chicken

Ingredients:

1 whole chicken

Mesquite wood smoking chips
1 oz. Cascade hop pellets water
1 tbsp. cumin
1 tbsp. chili powder
1 tsp. dry mustard
1 tbsp. chopped dry rosemary
salt and pepper to taste

Step-by-step

1. Cut chicken into halves. Split the chicken at the back bone and breast.
2. Rub meat, both sides, with the mixture of herbs and spices.
3. Prepare charcoal, light and let coals turn grey before placing smoking pan into grill.
4. Place 2 handfuls of mesquite into smoking pan along with hops. Add enough water to wet the bottom of the wood chips, but not covering wood.
5. If smoking pan has holes or you do not have a smoking pan, one can easily be made from tin foil. Tear 2 sheets about 10 inches wide. Turn up sides 2 inches and crease the corners, allowing liquid to be kept inside. After adding wood, hops, and water, place a sheet on top, fully covering lower half. Poke a few holes in the top, allowing smoke to leave pouch.
6. Place smoking pan on side of coals, allowing it to heat to the point of smoking. This may take up to 10 minutes. The hop pellets will expand with the steam from the water.
7. Place the chicken, skin side down, on the grill. Sear skin side before turning. Allow chicken to cook for about 45 minutes or until thickest part is 160 °F (71 °C) or higher.

Jeff "Mongo" Reamy
Billings, Montana

Stout Marinated Ribs with Honey Stout Glaze

Ingredients:
3 cups of your favorite stout
1 large red onion sliced thin
½ cup soy sauce
½ cup brown sugar
¼ cup sesame oil
4 tbsp.minced garlic
4 lbs. pork spare ribs

For glaze:
1 cup honey
¼ cup stout
2 tbsp. chopped fresh
2 tsp. black pepper

Step-by-step:

1. Mix all ingredients well and prepare grill (medium heat). Remove ribs from marinade and place on grill. Grill until cooked through.
2. About two minutes before ribs are done, brush with glaze and cook one minute on each side. Serve with remaining glaze.
3. Pour yourself a big old stout and enjoy!

Brian Sylvester
Chillicothe, Ohio

Bell's Kalamazoo Stout Teriyaki Steak

Ingredients:
⅔ cup of soy sauce
¼ cup vegetable oil
2 tbsp. molasses
2 tsp. ginger
2 tsp. dry mustard
2 tsp. garlic
¼ cup Bell's Kalamazoo Stout (or similar stout)

Step by step:

1. The key to marinating these delicious beauties is starting out with a choice cut of beef and cutting it into approximately 4" pieces. This recipe makes two to three steaks depending on size.
2. Marinate in a covered bowl overnight, turning steaks once. Grill the following day and enjoy!

Bradley D. Holderman
Pensacola, Florida

Chief's Blizzard BBQ ribs

BBQ'ing is a year round sport, especially if you are in the Army and snowbound overseas. I have traveled around the world on Uncle's dime for about 15 years and have been perfecting this recipe. We always have a "first snow" BBQ when we were stationed in England. The real secret is the smoking method with the mesquite wood and using John Boy and Billy sauce.

The best beer for this is a light (lawnmower) ale or a fresh batch of Cooper's draught. It keeps you going for the long hours of watching your meat cook.

Ingredients:
5 lbs. of baby back pork ribs
1 jar of John boy and Billy's Hot and spicy BBQ sauce
Hungarian paprika rub
Lawry's season salt
freshly cracked peppercorns
garlic powder
Old Bay seasoning salt

Fire:
charcoal is best
mesquite chunks (soak in water 30 minutes prior to cooking)
old soup can full of water

Ribs prep:

1. First thing is to wash the ribs off in cool water and remove the lung lining from the back (Concave) side of the ribs. This will ensure full flavor penetration.
2. Cut the ribs into 4 inch sections (about every two rib bones), lay out on a clean surface and prepare to spice.
3. Sprinkle the paprika on the ribs and hand rub the spice into the meat. Be sure to spice both sides and the ends.
4. Sprinkle Season salt, fresh pepper, garlic and Old Bay to taste on both sides of the ribs and the ends to taste. Set aside and get the fire ready.

Fire prep:

1. Start the charcoal in the left side of a charcoal grill (smoker).
2. After the coals are gray, clear an area in the center of the coals and place the soup tin full of water in it and move coals

next to the tin.

3. Place a couple of mesquite chunks in the fire and let them flame up for a couple of minutes.

4. Place the cooking grates on the grill.

Ribs cooking:

1. Don't let the grill get past 300 °F (149° C) if possible.

2. Place the ribs on the right side of the grill for offset cooking and close the lid and choke the chimney for maximum smoke (about 80% closed).

3. Let the ribs smoke for about one hour and try not to open the lid.

4. After one hour, open the chimney to about 50% and throw another small chunk of mesquite wood on the coals and allow it to flame up.

5. Move the ribs to the left side of the grill for direct cooking and cook until done (lid closed).

6. Brush a generous amount of John Boy and Billy sauce on the ribs and turn them, repeating the process on the other side. Brush once more before you take them off the grill.

7. You will have the best tasting ribs with a nice smoke ring around the outside of the meat. Enjoy with a homebrew and some Texas Toast thrown on the grill after the work is done.

Cleaning tip:

When you are done using your cutting board, spray it off with hot water and use the following method to make it fresh. Pour a few capfuls of lemon juice on the cutting board and sprinkle it with salt. Scrub the board with a fresh sponge and when done, the board should be void of all smells.

Dwayne Boulter
Salida, California

Homebrew B.B.Q. sauce

Ingredients:

12 oz. tomato paste
½ cup vinegar
1 small onion (minced)
½ cup dark karo syrup
12 oz. homebrew of your choice
1 cup brown sugar
1 tbsp. smoke salt
1 tbsp. liquid smoke seasoning
1 tsp. black pepper
4 cloves garlic (minced)
1 tsp. orange peel

Step-by-step:

In a medium saucepan, combine the ingredients, stirring to blend over medium heat and simmer for 45 minutes.

Matthew Lange
South Milwaukee, Wisconsin

Grilled Pound Cake with Beer Butter Sauce

Serves 4

Sauce:

12 oz. bottle of cream ale (I used the Replicator's Wisdom Cream Ale Clone)
¼ tsp. ground cinnamon
⅛ tsp. ground chipotle chile pepper
¾ cup sugar
3 tbsp. butter
3 tsp. corn starch
6 tsp. cold water

On the grill:

2 granny smith apples peeled, cored, and sliced into 16 wedges
2 bananas
8 slices pound cake ¾ inch thick

Vanilla ice cream

For Beer Sauce:

Heat beer, chipotle, and cinnamon in saucepan until hot. Add sugar and stir until dissolved. Stir in butter until melted. Mix corn starch with water, add to sauce, and bring to a simmer until slightly thickened. (Can be made a day ahead and refrigerated. Reheat before serving.)

For the Grill:

Heat grill to medium high heat. Place apples and bananas on grill until roasted but still firm. Remove from grill and slice bananas. Add to sauce. Grill pound cake slices until toasted.

Place two slices toasted pound cake and scoop of ice cream on each of four plates. Spoon apples, bananas and hot beer butter sauce over all. Serve immediately. ■

Barbecued Beer?

Smoking your own malt on your backyard grill

Story & Photos by **Chris Colby**

Most beer drinkers either love or hate smoked beers such as Aecht Schlenkerla Rauchbier, Alaskan Smoked Porter or Rogue Smoke. Either they love the extra dimension the smoke adds or they think it makes the beer smell like a campfire.

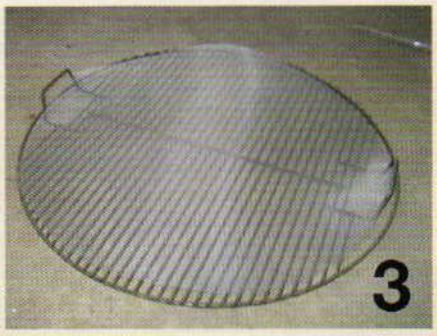
The smoky character comes from malt that has been smoked over a smoldering fire. There are two types of smoked malts available commercially. Weyermann Rauchmalz (smoked malt) is a beechwood-smoked malt that can used for making German rauchbiers, similar to Schlenkerla's smoked Märzen. Peated malt — made by Hugh Baird and other maltsters — is smoked with peat moss. It is most frequently used by homebrewers when making Scottish ales, even though this is not a traditional practice in Scotland, where peated malt is used in Scotch whisky production. Other smoke sources can be incorporated into homebrew if you smoke your own malt.

What you'll need

Different types of wood are used for smoking different types of food, and their smell is often strongly associated with that type of food. For example, hickory is often used to smoke bacon, alder is used to smoke salmon and mesquite is used on BBQ chicken. (Alaskan Smoked Porter is made from alder-smoked grains.) Many other types of wood, including apple, pecan, cherry, oak and grapevine are used on all types of meats (and cheeses).

You can usually find wood for smoking at any store that sells grilling or barbecue equipment. I found hickory, mesquite and oak — that supposedly comes from Jack Daniel's whiskey barrels — at a store near me. For wood you can't find locally, there are also numerous sources on the internet.

Wood for smoking typically comes as pellets, chips or chunks. Chips work well for most applications, but pellets can be used for very short smoking ses-



1. A small amount of heat (here from charcoal burned down to coals) is best.
2. An aluminum foil pouch with a few holes in it holds the wetted wood.
3. Aluminum insect screening, cut to size, fits over the grill surface.
4. Use a spray bottle to wet the malt evenly.
5. Adjust the lid to keep the grain hot enough to dry, but not to scorch.

RECIPE

Alder Smoked Porter
by Corey Martin

(5 gallons/19 L, all-grain)
OG = 1.072 FG = 1.015
IBU = 44 SRM = 54 ABV = 7.3%

Since I've been trying to replicate the Alaskan Smoked Porter, I wanted to add a hint of smoked salmon to my beer. The first year I did this recipe, I smoked the grains after Thanksgiving and my sister had given me about a pound of left-over smoked salmon. While smoking the grains I would throw a few chunks of salmon on the hot coals, but no real flavor came through to the finished beer. This beer did get a bronze metal at the 2003 Bluebonnet and a blue ribbon in the first round of the AHA National Homebrew Contest (south regional).

Recently I smoked some grains for this recipe again, this time placing a whole salmon on a rack just below the grains that I smoked. These grains have not yet been used, but the salmon came out excellent!

Ingredients

8.75 lbs. (4.0 kg) 2-row pale malt
4 lbs. (1.8 kg) alder-smoked Pilsner malt (salmon, optional)
13 oz. (369 g) chocolate malt
12 oz. (340 g) crystal malt (60 °L)
6 oz. (170 g) cara-Pils malt
5 oz. (142 g) black barley
7.4 AAU Northern Brewer hops (60 mins.) (0.75 oz./21 g of 9.8% alpha acids)
4.8 AAU Cascade hops (60 mins.) (0.75 oz/21 g of 6.4% alpha acids)
White Labs WLP001 (California Ale) yeast (750 mL starter)

Step by Step

Mash at 152 °F (67 °C) for 90 minutes. Boil for 60 minutes, adding all hops at the beginning of the boil. Ferment at 70 °F (21 °C).

sions and chunks should be used for extended smoking. (Don't use treated lumber, or wood that has been painted or stained, for smoking as these can give off toxic fumes.) The amount of wood required depends on the how much grain you are smoking and for how long. A large handful of chips is enough to smoke a pound or two of malt, and this is enough to add a definite smoky character to a five gallon (19-L) batch of homebrew.

You'll also need something to hold the wood. This can be as elaborate as specially-made smoker boxes sold at barbecue specialty stores or as simple as a pouch made from heavy duty aluminum foil.

To hold the malt, you'll need a screen. Aluminum insect screening, the type used for screen doors, can be found at any home improvement store and is very cheap. Cut the screen with a utility knife or heavy pair of scissors so it completely covers the grill.

To wet the malt, you'll need a squirt bottle; the type used to spray cleaning fluids or mist plants works well. A bottle with markings on the side is handy because you can see how much water you've sprayed on the malt. You'll need to carbon filter the water or use distilled (or any other type of chlorine-free) water.

The final thing you need, obviously, is the malt itself. Extract brewers can smoke any steepable specialty grains. For example, you could alder smoke 0.5–1.0 lbs. (0.23–0.45 kg) of crystal malt (40 °L) and add it to a porter. All-grain brewers can steep any base malt or specialty grain. Keep in mind that the heat applied to the malt will likely lower it's diastatic power. For this reason, it might be prudent to use a maximum of 40% home-smoked malt in your beer unless you smoked it very gently. The procedure for smoking malt is very simple.

Wet the wood

In order to get the wood to smoke, and not simply catch fire and burn cleanly, you need to wet it. Pellets can be completely wet in a matter of minutes. Chips will need to be soaked for at least a couple hours and chunks should

be smoked for a day or so, to get the wood soaked all the way through. To wet the wood, just put it in a bowl (or Tupperware container or zip-lock bag) and cover it in water.

Wet the malt

In order to get the smoke to stick to the malt, you need to wet it. Smoke molecules will dissolve into the water then remain on the malt once it is dried. How much water you apply to the malt depends on how long you plan to smoke the malt. If you add a small amount of water, the malt will dry quickly and absorb a small amount of smoke flavor. If you add more water, you'll have to smoke the malt longer to get it to dry, but you'll also end up with smokier malt.

To wet the malt, pour it on the screen and spread it out evenly. (Use whole malt, not cracked grain.) The malt can be several layers thick (up to about an inch) and still yield good results. Take the spray bottle and mist the grain just enough to barely get it wet. Next, lift the opposite sides of the screen to gather the malt in a pile in the middle of the screen, then spread it out again. Keep repeating the spraying and spreading of the malt until you have added the amount of water you planned on.

For a quick smoking session, add only around 3–4 oz. of water per pound (198–262 mL/kg) of grain. Use more water for longer smoking sessions designed to produce smokier malt. Keep in mind that, even for smoked beer fans, a little smoke character goes a long way.

Prepare the fire

To make smoke, get a cold fire going. If you grill with charcoal, use a small amount (relative to your grill size) of charcoal briquettes and let them burn and die down to coals. If you have a gas or electric grill, turn it on low and let it heat up. You only want enough heat to get the wood to smoke and gently dry the grain. Too much heat will scorch the grain.

Drain the water from the wood and place it in your wood holder. Place the holder in the grill and wait for it to start

smoking. After it has smoked for a few minutes, put the grain on the grill and loosely cover it.

Smoke the grain

You don't need to do much while smoking the grain. Raking the grains a few times helps them dry more evenly. And opening or closing the lid of the grill to keep the grains from getting too hot helps to keep them from scorching. Once the malt looks dry, start pulling a couple grains off every few minutes and chewing them. This will help you to tell if the grains are dry. Failure to dry the malt completely can lead to stale (or perhaps even moldy) malt. If you want to be absolutely sure you've dried the malt, you can always weigh the grains before and after wetting, then once more after smoking. If the grains are dry, they should have dropped back to their initial weight.

The amount of time it takes to dry the malt depends on how much water you added and how much heat the grains were exposed to. For lightly wetted malt, exposed to heat around 200 °F (93 °C), the grains may dry in about 30 minutes.

Using smoked malt

Once your malt has been smoked, just use it as you would any other grain. Smoked crystal malt (or other specialty malts) can be cracked and steeped by extract brewers. All-grain brewers can just crush and put their smoked malts in the mash. The $64,000 question is, of course, how much do you use?

Gauging how much home-smoked malt to use can be tricky. You can grind a handful of your malt and steep or mash it in a pint glass, then siphon off the grain tea or wort. Taste the smoky liquid, and perhaps dilute it with beer, to get a rough idea of how smoky it is. In most peated malt recipes, only 2–3 oz. (56–85 g) are added per 5-gallon (19-L) batch. Rauchmalz, a much more lightly smoked malt, is used from 0.5 lb. (0.22 kg) for a faint smokiness to 100% of the grain bill for a strong, Schlenkerla-like level of smokiness. Realistically, you will just need to dive in and brew your beer to really find out exactly how smoky your malt is.

As with any ingredient that's effect is hard to gauge, blending the beer made from it is always an option. If you've recently brewed a style of beer that would taste good smoked, brew it again with some home-smoked malt. If you overshoot the level of smoke you're looking for, you can use the previous, unsmoked beer to blend down the flavor, assuming you keg your beer.

So now that summer's here, keep your grill fired up — and be sure to reserve some room on the grill for smoking malt. That way you can brew a nice, smoky beer to go with your barbecued masterpieces. ■

Chris Colby spends as much of his summer grillin' and chillin' as possible.

Lager Climate Control

A consistent temperature is critical to lagering

story and photos by Thom Cannell

Say good-bye to frozen kegs left in the garage next winter. Be sure to keep your homebrew flowing with this project.

It's winter in Michigan and the temperature is a brisk 10 °F (-12 °C). In my garage there are three corny kegs inside a refrigerator. That refrigerator has been converted to a lagering chest. Inside the insulated compartment the temperature is 47 °F (7 °C) the perfect serving temperature of most beers. The reason why my beer has not frozen — which has been known to happen in colder climates — is the inspiration for our project.

Four years ago, in November of 2000, we built a lagering chest that utilized a Ranco ETC electronic controller. It's sold by many local home brew shops. At the time I thought the world was complete. Then came winter. Cold, cold winter. Two kegs of beer in the lagering chest froze solid when the temperature dipped to below 0 °F. I tried dangling a light inside, and, with a 60-watt bulb, my beer stayed above freezing. Sometimes way above freezing when outside temperatures rose.

This year I vowed to have better, more consistent beer storage. My first thought was a heat source that would be more sophisticated and accurate than a light bulb. There are many useful and safe heat sources. Some homebrew shops sell specially made "heating pads" designed for wrapping around fermenters or sticking to the walls inside refrigerators. Other creative souls report using ceramic reptile cage heaters, aquarium heaters, heated dog dishes, even cattle trough heaters. I had a different solution.

Like many children of the '70s, I have a waterbed. Over the years, as various heaters and temperature controllers failed, I kept the left over parts. Friends who have moved on to air beds, foam beds, even conventional coil spring mattresses have made gifts of heaters and controllers, so I had a source of heat — lots of heat! Waterbed heaters are usually 1,500 Watts. If you choose this option, start shopping thrift stores and garage sales.

As fall approached I separated a used waterbed heater from its controller. I planned to connect the heater to the Ranco ETC controller that governs the lagering fridge. Then I thought, "what range of temperatures does the original waterbed controller cover?" The dial said a high of over 90 °F (32 °C) and a low of 50 °F (10 °C)? That would be perfect for beer. So I reconnected the heater to the original waterbed controller and installed it into the fridge. It worked alright, but it could use improvements.

Waterbed heaters provide warmth when the temperature falls and turn off when the temperature rises. Lagering chests call for cold when temperatures rise, the opposite action. Now, when the temperature inside the lagering chest fell to less than 50 °F (10 °C), the waterbed heater would turn on, and my beer would not freeze. Unfortunately the waterbed controller is a bit erratic and temperatures were

PARTS LIST

Romex connector(s)	$1.19
Romex right angle flex connector	$0.69
1/2" close nipple	$0.59
A/C Cord	$4.97
Lamp Kit (double covered outlet)	$8.98
Ranco Controller $60 (approximate)	
15 Amp Ground Fault Circuit Interrupter Duplex Receptacle)	$14.00

TOOL LIST:

Screwdriver
Pliers
Hacksaw or Dremel rotary cutter
Wire stripper, wire cutter
Soldering iron and solder (optional)
Electrical tape and (optional) heat-shrink tubing

From back to front: the Ranco controller (left), the duplex box (right), the power cord and the appropriate conduit pieces.

With the duplex box disassembled, screw in the close nipple and open the controller.

With ordinary shears or aviation snips, cut a plastic or non-metallic material for a spacer.

far from stable. Sometimes the temperature of my beer is 43 °F (6 °C); other times it's 51 °F (11 °C). Temperature changes are not good for beer, so I decided a better controller was needed.

I went back to my original idea of using the Ranco ETC controller to govern the heating source. Ranco ETC controllers use a remote sensor (thermocouple) to measure temperature. The controller reads the temperature and follows programmed instructions. You can program it to send power to a device when the temperature rises or falls. To control a heating or cooling device, you pick a temperature "set point" as well as a temperature "span" or "control zone."

To avoid the controlled device switching on and off frequently, you tell the controller if the temperature is within the control zone, no action is needed. For instance, if you want your beer at a serving temperature of 45 °F (7 °C) you would program the set point for 45 °F (7 °C) and the control zone 6 °F (~3 °C). The controller will then turn the heater on when the sensor reads a temperature of 42 °F (18 °C) and turn off when it reaches 48 °F (9 °C). If you desire cooling, the set point would remain the same and the on/off temperatures would be opposite. (*Note: most controllers, the ETC included, operate in Fahrenheit or Celsius and 240-volt models are also available.*)

For our project we'll assume that you will drill a hole into your lagering chest to admit the temperature sensor and that the sensor will be mounted (duct tape rules!) on the back wall. When drilling, be sure to avoid the cooling coils! That should be simple as the coils are easy to see and every refrigerator I've ever seen has one or more entry ports for electrical wires. Most also have injection ports where thermal insulation was introduced.

So, the parts that you will need are few: the controller, a power cord and a

power receptacle. We've built for maximum safety and connected an outdoor rated duplex receptacle directly to the controller. Replacing the regular duplex outlet with a GFCI (ground-fault circuit interrupter) as we did prevents dangerous shocks and makes the project more safe.

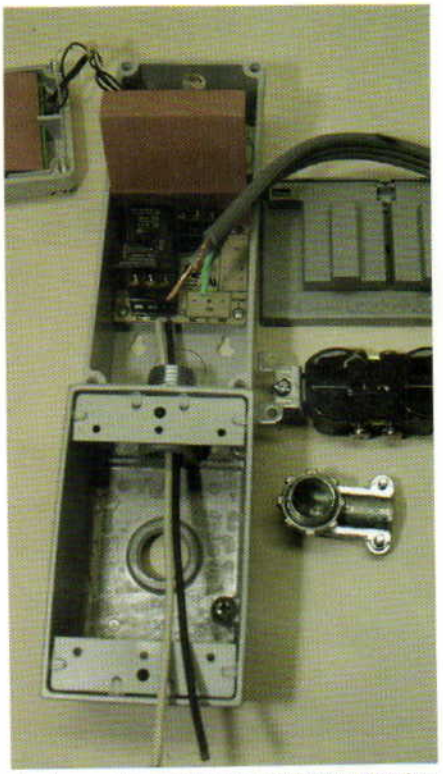
Before you decide whether to use a duplex outlet or GFCI, you need some additional information. If you will use the device to convert a refrigerator into a lagering chest — the Ranco ETC will provide the correct control for heating or cooling — you might not want a GFCI. The reason being that the current draw of a cooling compressor might fool the GFCI into turning off. Also, a current surge could cause the GFCI to do the same thing. Normal grounding should provide sufficient protection.

Electricity is potentially dangerous! If you are unsure of your talents, work with a pal who is sure of his . . . or have a licensed electrician advise you. You may also purchase similar devices already wired at most homebrew shops.

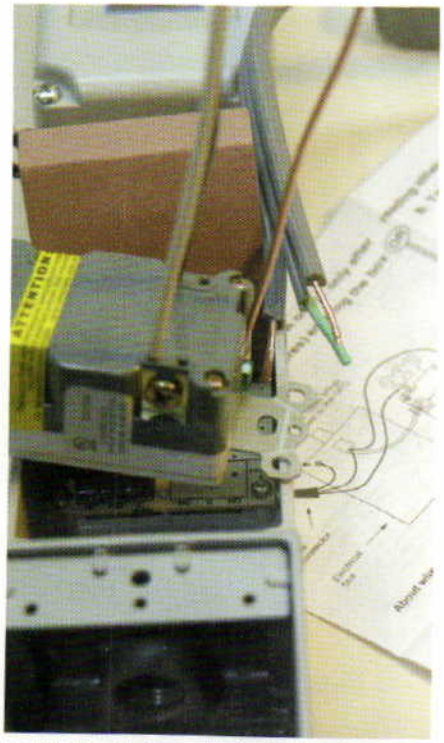
Step By Step

One: Unpack the outdoor duplex box and ETC controller. Using a ½-inch close nipple, join the metallic box to the controller. This is quite straight forward, but requires two additions. First, the controller has no threads, so use a nut from an inexpensive strain relief as the securing nut.

The two boxes might not clamp tightly to each other; the close nipple I purchased had tapered threads. Try to find a conduit close nipple; they have straight threads. Add spacers between the two boxes, like a thick layer of RTV silicone, bits of rubber canning jar seal, thin plastic, or stick-on rubber feet. Anything that is non-metallic. I cut up a plastic food container and used four layers (other options could be ¼-inch plywood or an old inner tube).



As shown, be sure the box is tightly joined to the controller body before proceeding.



Here's the duplex outlet wired and the yet-to-be-tinned power cable. Notice the one green wire and the two colored gray.

Two: Once the boxes are mechanically joined, cut 4 inches (200 mm) of electrical cable and strip the outer insulation away, leaving just the black and white wires (we'll join the green ground in a moment.) Wire the GFCI or regular duplex outlet as shown; white wire to the silver screw and black to the bronze. Make a loop and attach the bare copper wire to the green ground terminal.

Three: If you elect to use a GFCI, you must modify the top panel of the outdoor box. Using a hacksaw or a Dremel tool, cut away the extra metal. Judicious use of a file will make the surfaces clean and neat. You'll have to drill two mounting holes into the top plate because the outdoor box uses a center-mounted screw, like most duplex outlets.

Four: Wire in the power cable. We purchased a high quality 12-gauge extension cable and cut the receptacle end off about 12 inches (30 cm) from the end. That left five feet of power cable ready to be wired.

I stripped the three wires that comprise the power cable and tinned the ends. Tinning consists of coating the ends with solder, which solidifies the wire strands. I expected the power cord to follow the normal color code: white, black and green. White is neutral wire, green is the ground wire and black is hot or the common wire. This cable had a green wire — ground — the other two were gray. What to do? There's another convention. A ribbed wire is the common or (hot) power carrying wire. I wrapped the end of this wire with black electrical tape, also a convention, to signal that it is "hot." The other gray wire becomes the white, or neutral, wire.

The next step was to choose which of the duplex box openings to use: back or bottom. I chose the bottom. To protect the cable entry, a strain relief is used. I chose to use an angled relief

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Thread the cable through the box and into the controller. A bottom connection was preferable for my brewhouse.

Note that the green and bare copper grounds have been joined and partly covered with heat-shrink tubing.

that points the cord to the side. This task requires disassembling the angled strain relief — not a big chore. Thread the cable through the strain relief, into the box and into the controller. The duplex box we purchased includes several threaded inserts to close the remaining openings.

Five: It's not difficult to push the solid wires into the controller from the duplex box — brute force works well. The more difficult part is deciphering the wiring schematic. If you're not electrically literate try writing the color code on the supplied diagrams (or get help!).

Six: The ribbed wire with black tape from the power cord is joined to the black wire from the duplex outlet and inserted into the Common (COM) wiring block (on the upper right side). Insert the gray neutral wire (the wire that should be white) into the "120V" slot located beside it. A jumper then goes from the "120 V" slot to the "C" terminal on the other junction block, the one on the lower left side.

The wiring block on the lower left is the one that switches power to your chosen device, be it our heater, or a cooler. To change between heating and cooling (the power turns on when temperatures fall or rise) is a push-button function of the ETC — all wiring remains the same.

Seven: Close the box, put the duplex box cover on and screw everything down tightly. Select a location for the controller that's safe. Push the temperature sensor into the refrigerator as mentioned previously and tape it in position. If you're using a heater, I'd suggest mounting the sensor high, as heat rise, and at a mid-point if cooling. Be sure there is airflow around the sensor.

Eight: Connect the heater. If you use a waterbed heater as I did, you'll have to disconnect it from the original controller, push the cord through the refrigerator wall and attach a power plug.

Nine: Program the Ranco controller, the instructions are simple. Connect your device and give it a test run. Then enjoy the benefits of precise temperature control, come winter's chill or summer's heat. ■

When not pursuing his other career writing about cars, Thom Cannell writes "Projects" in every issue of Brew Your Own magazine.

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Homebrew Heaven

A retirement community for the brewer

by Nick Riehle

PHOTOS COURTESY OF NICK RIEHLE

In 1980 my wife, knowing I was bored with my job, gave me a book on home winemaking. In the back was a short section on brewing extract beers. I made a couple batches of wine first, but once I tried making beer I was hooked. Of course I obtained more books and all-grain mashing became my standard practice. As batch followed batch, it became clear to me that brewing is an art as well as a science — as little or as much as I brewed, I would never begin to exhaust all there is to learn.

Alas, my work situation changed soon after I began brewing and my spare time was suddenly at a premium. My passion for brewing all-grain beers at times became incompatible with the challenges of career and family. As top-quality beers brewed close to home became more available, the need to brew in order to obtain good, fresh beer became less compelling. For these 20-some years I have continued to brew as the ebb and flow of my career has allowed — but never at the level I would like.

For some time I have considered how I will pursue my brewing hobby once I finally have more time. This fantasy evolved into the idea that, once the kids move on and I retire, my wife and I would buy a smaller house with a large basement and the best brewing equipment available. Then I would be able to develop my skill and experience as a brewer in a more dedicated way. Somewhere along the line I also developed an irrational fascination with water mills. Thus my fantasy brewery shifted to a small building with a water wheel, though I won't suggest that this ever seemed the least bit practical.

This summer, on a walk with my wife, my fantasy of a brewery, a water mill and walking trails converged in what we decided to call Barley Mill Commons. As we see it, the Commons will resemble a golfing community. But instead of homes built around a golf course, our community will be situated in a wooded area interlaced with walking trails. In the middle of the community will sit a millpond and a building we call "The Barley Mill Inn."

Barley Mill Commons is a place people live as they would anywhere else — but with more emphasis on beer!

The inn will mark the center of Barley Mill Commons. It will have a working water wheel that will drive a grain mill and probably an auxiliary electrical generator. The lower floor of the building will house two cement and tile rooms, each equipped with state-of-the-art homebrewing systems. The building will also feature a pub with a large-screen TV, a pool table and extra tables and chairs. The upper floor of the Barley Mill Inn will contain two rooms with in-suite bathrooms for guests who come from out of town to visit community residents.

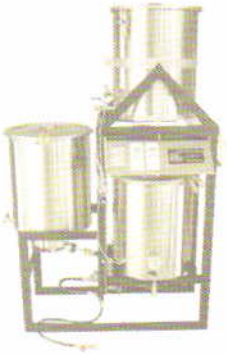
As for the brewery, one room will have a 15-gallon (57-liter), state-of-the-art system suitable for a professional pilot brewery, while the other room will contain similar equipment with a smaller capacity. There will also be a chamber between the brewing rooms and the pub, maintained at 67 °F (19 °C), where five to 15-gallon conical fermenters can rest. Some of these will be in coolers to keep them at lagering temperatures while others will contain ale, fermenting at the reduced "room" temperature. This is also where we will keep kegs that feed the draft taps behind the pub's bar.

We see Barley Mill Commons as a place where people can live their lives as they would anywhere else, but with more emphasis on beer! We want it to be a place where important — and not-so-important — sporting events draw residents to the pub and where every game is accompanied by reasonable quantities of really great homebrew. We hope residents will regularly organize potluck dinners, which will likely be hosted by a proud brewer who will surely want to establish the evening's theme around his or her latest batch.

Oktoberfest must be one of our key holidays. We plan to invite outsiders to help us celebrate it in the picnic area outside the inn, with proceeds going to charity. The residents' brew club, calling themselves "The Uncommon Brewers of Barley Mill Commons," or something equally profound, will strive to be competitive at homebrewing competitions on a national level.

Yes, our beer fantasies have run wild here — and we are looking for equally obsessed brewers to join us. If you are interested, email nick@barleymill.org or see www.barleymill.org. ■





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