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Brew Your Own

SEPTEMBER 2002, VOL.8, NO.5

THE HOW-TO HOMEBREW BEER MAGAZINE

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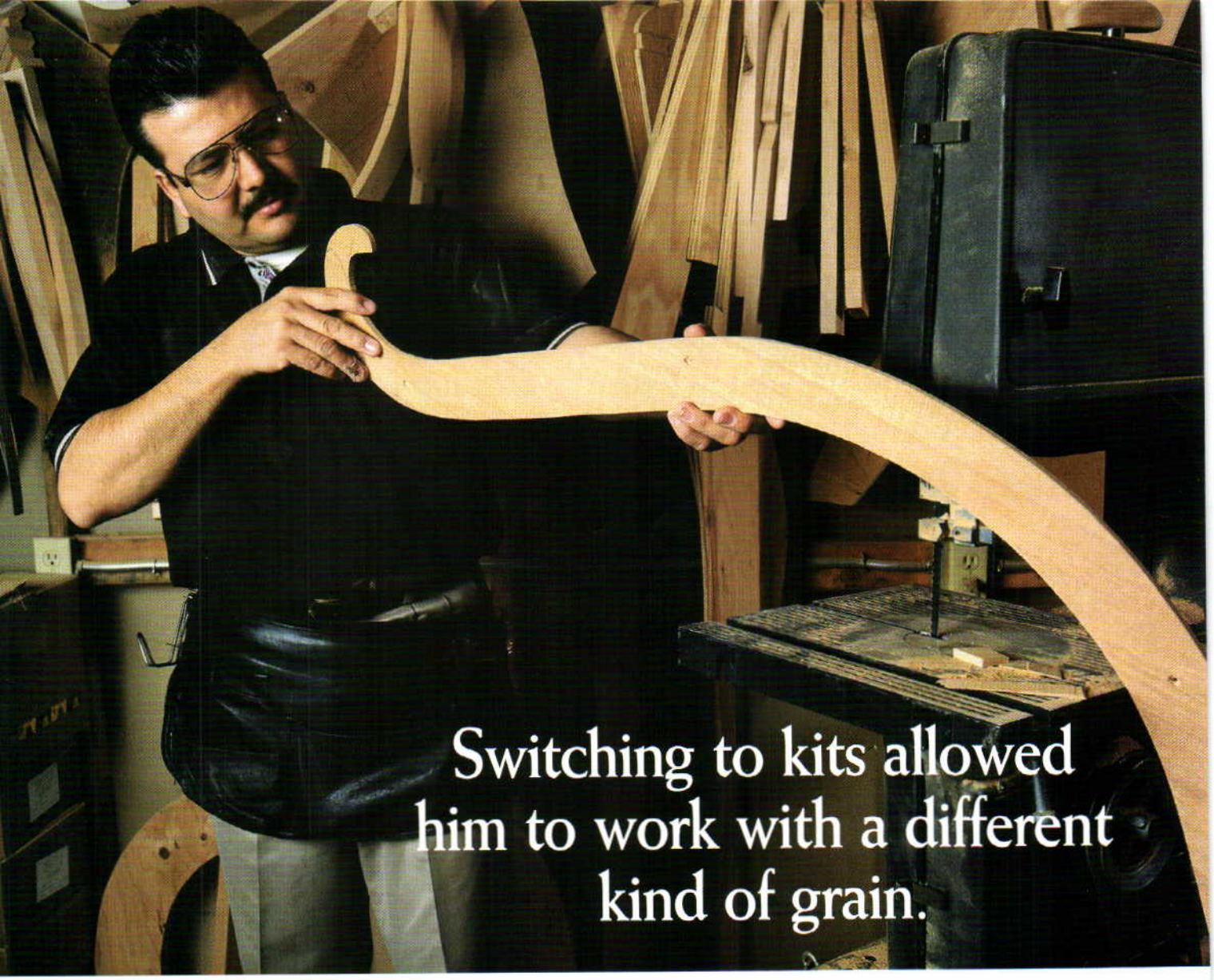

Switching to kits allowed him to work with a different kind of grain.

"I wouldn't have believed that a kit beer could be so good"

Roy Bailey - Beer Corresoondent
CAMRA's 'What's Brewing' magazine (April 2000)

"It tasted just as good - if not better - than many a pint I've drunk in London pubs."

Richard Neill
'Weekend Telegraph' (April 99)

"It resulted in as good a home-made beer as I have ever tasted"

Maximum 5-point rating in kit review
'Bizarre' magazine (September 99)

This man loves beer and brewing. He's also discovered a talent for crafting fine furniture.

Full grain mash brewing was fine but it was taking up too much of his spare time. So he decided to look for an alternative brewing method that would still provide a satisfying hobby and an equally satisfying brew. The answer was waiting at his local brew store - Smugglers Special Premium Ale, Old Conkerwood Black Ale and Midas Touch Golden Ale - the Premium Gold range of brewkits from Muntons.

Because Muntons use only the finest English 2-row barley and water, the kits give the same quality result you get from full grain mashing - except, it comes in a can, is a whole lot more convenient and frees up more time to do other things.

Since switching to kits our man has never looked back. He's still brewing great beer but Premium Gold means he can see the beauty in other grains.

If you're a slave to full grain mashing, don't be! Switch to Muntons today.

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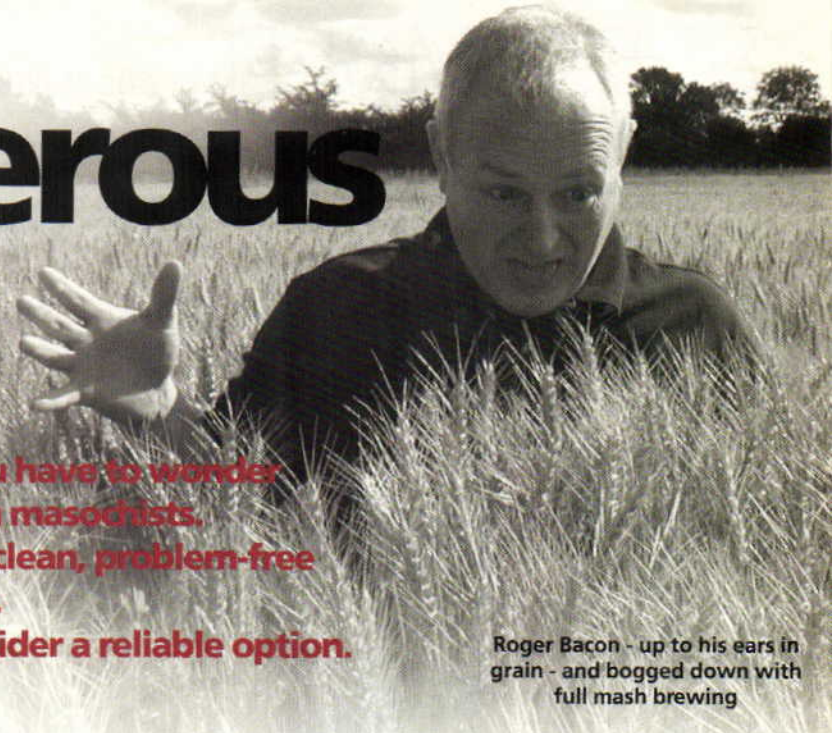
A dangerous game...



With so many things to go wrong, you have to wonder whether grain mash brewers are born masochists. Either that, or they live such squeaky clean, problem-free lives they need a hobby with attitude. Whatever the reason, it's time to consider a reliable option. Roger Bacon explains...

Roger Bacon - up to his ears in grain - and bogged down with full mash brewing

I don't know about you but my life seems to be about problem management. Not that my life is all bad. Most of it in fact is very good. But we all face those trials at home and at work, that put our beliefs and patience to the test.

It's true also that a percentage of my problems revolve around the "art of drinking" (a finely honed skill my wife doesn't yet seem to appreciate). There's the problem of when to start. And when to stop. There's also the major problem of how to breeze through a hangover when, let's face it, none of us are getting any younger.

The answer is to give up.

Cut down.

Or just to drink in moderation.

Cutting down sounds best to me as anything done 'in moderation' brings on more nausea than a three day bender!

The other thing we can do to improve the way we feel the next day is to stick to beer. William Hogarth, the famous English satirist and illustrator had it right when he depicted eighteenth century London in a series of street scenes. *Beer Lane* was a picture of bustling energy and progress, with buildings being constructed by a cheery, zealous workforce. In contrast *Gin Alley* is a desperate and grim depiction of a gin-soaked mother losing her grip on her young child (and ultimately her life).

How right Mr Hogarth was, even today. A hearty consumption of beer with an appropriate cut off point can lead us to bigger and better things - better communication with our fellows, better appreciation of the people and things around us - *the feel good factor* - a faith in all things wholesome.

Problems associated with consuming beer are often as a result of the beer itself. We all know the havoc that a dodgy brew can reap on our system. Just one pint of bad beer can make us rest room bound for days.

And then there's the problem with the brewing process itself. I've written before about the time-sapping nature of full grain mash brewing when compared to kits. There can also be problems with consistency which you don't get with a kit. For instance, why is it that you can go thru exactly the same procedures, using exactly the same ingredients and wind up with two completely different brews? One tastes great and the other will leave you with a puzzled expression and a reflective review of just where things went wrong?!

Grain mash brewing is a long, drawn-out process. Even supposing you've bought the best malt - Muntons for instance - you still have to crush it perfectly. Crush it too fine and you get run off problems and cloudy beer. Too course and your crystal clear beer either tastes as thin as tonic water or you end up with half the beer you expected!

Even if you get your malt crushed to perfection you still have to battle with temperature and time. Any errors here can lead to cloudiness, poor starch conversion, poor sugar balance and ultimately poor beer. With a Muntons kit this process has been done for you. Many brewers struggle with this as they feel they are cheating by using a kit. But ask yourself this. How many bakers mill their own flour? Or grow their own corn? There is still an art in producing good kit beer but by so-doing you minimise the risk of a brew going wrong.

If you're grain mashing you'll need to select and boil in hops. Muntons choose only the finest hops for their beer kits. The right hops can make or break a grain mash brew.

Let's suppose you've produced a perfect wort but it's still hot. With a grain mash you'll need to get that cooled as quickly as possible. The longer it hangs around slowly cooling the more prone it is to bacterial invasion and things going wrong. So what do you do? Invest in tricky equipment to get the temperature down as quickly as possible. Or use a kit and just add cold water up to the directed amount and get fermenting.

From here on grain mash and kit brewing are identical. But to get to this point using the grain mash method you've had to spend more time, use more expensive equipment and run greater risk of the brew going wrong.

Grain mashing can be a problem. And I don't need any more problems. I need solutions - preferably cool and brown in a glass with the perfect balance of hops and malt! And that's precisely what I get with a Muntons kit. There are lots to choose from so I can always brew the kind of beer I want. And they always deliver when it comes to quality, consistency and taste.

Of course, if you're a sucker for punishment you can always stick to mash brewing. Whatever method you choose (and at least *try* kit brewing before you question it) I wish you all happy brewing and good drinking!

Why not ask for a kit at your local brew store and discover what Muntons can do for your brewing?

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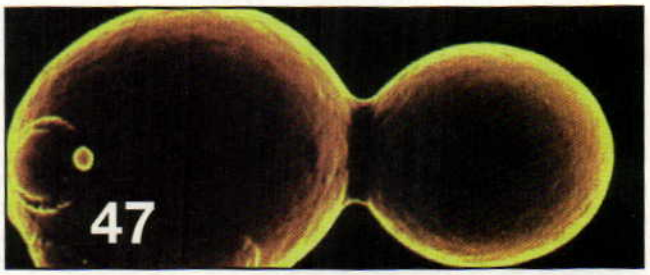

Where to find it

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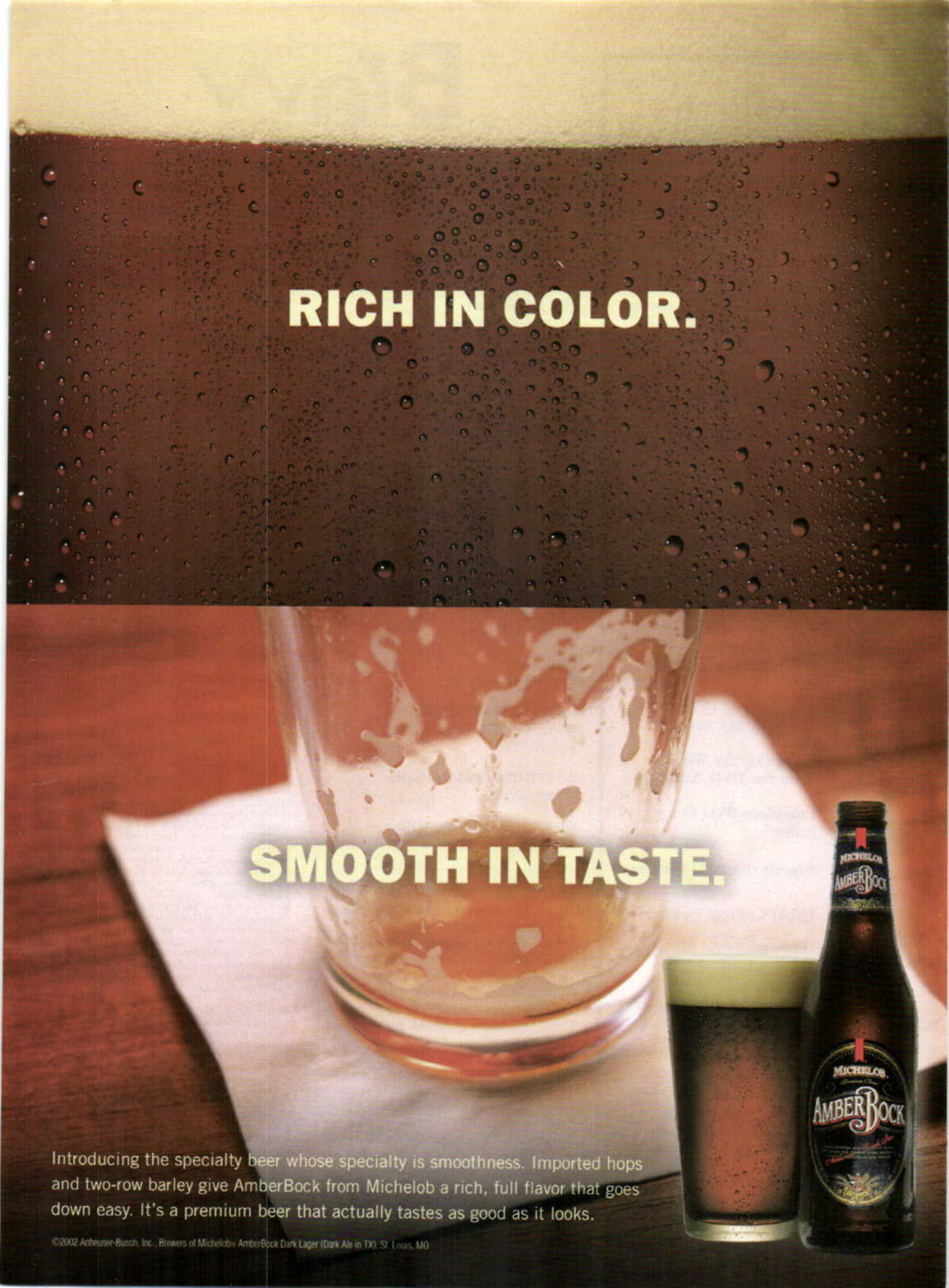

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Mail

A Hoppy Wife

My friend and I are growing hops (Cascade, Tettnang, Fuggles and Mountain Gold). They are doing nicely, but my friend developed a skin rash on his hands and arms immediately after handling them. He thinks he may even have passed it on to his wife. (There was much rejoicing after planting.) Are hops known to cause skin reactions?

Brian W. DelVecchio
Pittsburgh, Pennsylvania

"Although it's rare, hops can cause an itchy skin irritation called 'contact dermatitis,'" says Dr. Bob Schwartz of the Northshire Medical Center in Manchester, Vermont. "It's an allergic reaction, similar to the rashes some people get from Band-Aids or wristwatch straps. It's unlikely, though, that your pal could have passed on the rash to his wife. Maybe the post-harvest lovefest had something to do with it, but let's not go there, OK?"

Was He Making Tequiza?

I am asking this for my brother-in-law who makes his own beer. He has found little worms in his last few batches of beer. Can you explain why?

Name (understandably) withheld
via email

Yuck. Tequila bottles should have a worm at the bottom — but beer bottles definitely should not. What did the worms look like? Were they white? Segmented? Did they form little brownish "cocoons" inside the beer bottles? If so, the most likely candidate here is fruit fly larvae. Fruit flies love beer and beer yeast. Unwashed homebrew bottles, especially those with yeast on the bottom, attract fruit flies. Female fruit flies will lay their eggs in the yeast and the larvae — which look like small, white worms — will eat it.

Worms or insect larvae cannot survive and grow in beer. So the "worms" must have been in the beer bottles before the beer was bottled. Always thoroughly clean and visually inspect beer bottles before use. Also, rinsing homebrew bottles immediately after opening will keep them from attracting fruit flies. And finally, in all seriousness . . . yuck.

Erratic Efficiencies

It seems that every recipe in your magazine has its own assumed grain efficiency. Have you ever thought about putting the recipes' assumed efficiency in the header for each recipe?

Joseph F. Peterson
Marysville, California

Every all-grain brewer, including those that submit recipes to BYO, has a different extract efficiency. We try to check each recipe so that efficiencies are in a reasonable range, but leave the recipe alone to preserve the author's original contribution. We do print the target original gravity so, if you know your own extract efficiency, you can adjust the amount of base malt accordingly.

Clarity from Cow Hooves

Your article on clear beer *("How Clear is Your Beer?" by Colin Kaminski, July-August 2002)* didn't contain one sentence on the proper use of gelatin. How about some info on gelatin?

Paul V. Baker
Chandler, Arizona

Kaminski says: "I prefer to use isinglass to settle yeast, but gelatin can be used as well. Gelatin is about 1/2 to 1/3 as effective as isinglass ("An Analysis of Brewing Techniques," Fix and Fix, 1998), but has the advantages of easier availability and lower cost. I have only used the powdered gelatin sold by brewing suppliers and have not tried the gelatin from the grocery store. For a five-gallon batch, I would recommend using 1 to 1.5 grams (1/3 to 1/2 tsp) of gelatin dissolved in an ounce or two of 150° F water. This is usually added during cold storage and the beer is given a week or so to settle before racking off. If you are not using cold storage, it can also be effective in the secondary. Bottle-conditioned and cask-conditioned ales usually omit fining agents in order to ensure enough yeast remains to carbonate the beer."

RECIPE INDEX

Dutch Lagers

What beer category do beers made in Holland, such as Grolsch, fall into?

Louise Gagnon
Otterburn Park, Quebec

Grolsch is a lager. In the Beer Judge Certification Program (BJCP) Guide to Beer Styles — the style sheet used at most homebrew contests — there is no BJCP category that specifically includes Grolsch or other Dutch lagers. Light lagers are popular worldwide and show quite a bit of variance with respect to their characteristics (most notably in adjunct usage and yeast strains). However, there are only two BJCP categories for light lagers: Category One (American Lagers) and Category Two (European Pale Lagers). Grolsch is a European beer and has the sulfury yeast characteristics shared by beers in Category Two. A similar quandary faces brewers trying to clone Asian lagers such as Tsing-Tao (China) or Singha (Thailand), although Kirin (Japan) is listed as an example of a Category One beer in the BJCP guide.

Skip the Spice Rub

My wife complains about the odor when I homebrew, so I was wondering if it's OK to use the turkey fryer to brew my own beer outside? Should I purchase a different brewpot instead of using the aluminum turkey pot? Would that affect the flavor of the beer?

Andrew Bennet
Mesquite, Texas

Managing editor Chris Colby responds: "Hello, fellow Texan. It's fine to use aluminum stock pots. There was a scare a while back that cooking low-pH foods in aluminum contributed to Alzheimer's, but that idea has since been discredited. (I actually wrote about that controversy in the December 2001 issue of BYO.)

Some brewers claim that using aluminum contributes a metallic taste to their homebrew. I don't believe this. I have an 80-quart (20-gallon) aluminum pot that I bought at an Academy store in Austin. I use it frequently and neither I nor the homebrew judges that have tasted my beer have noticed a metallic flavor.

If you do use the turkey fryer pot, watch for scorching if the bottom is thin. Stir often. If you still get scorching, go to a kitchen gadgets store and get a 'flame tamer,' a round metal plate that you set on top of a stove burner to spread out the heat."

Label Removal

Is there an easy way to get labels off used commercial beer bottles? I have been soaking them in hot water with clorine bleach and it works, but I have to soak them quite a long time.

John Bahlinger
via email

Chlorine bleach and water works, as you mention. You might also want to try ammonia or Five Star's PBW. An overnight soak should do the trick. ■

brewer profile

Burned by Snow • Bob and Millie Taylor • Anchorage, Alaska

PHOTOS COURTESY OF BOB TAYLOR

A lot of steam is produced when you dough in on St. Patrick's day in Alaska.

I live in Anchorage, Alaska and I brew a batch of beer about once a month. Last winter, though, I didn't have the money to do a lot of brewing, so I went from December to February without brewing a drop. When February rolled around, and in anticipation of spring, I decided to brew a batch of Belgian Saison.

I did a lot of research on the subject, went to Arctic Brewing Supply a few times to chew some malt, formulated the recipe for my ultimate Belgian Saison and gave it a name: Cabin Fever Saison (Saison d' Fievre Cabine). Then I set a brew date, March 17 — Saint Patrick's Day — and invited a few friends to help out.

I always make it a point to invite a few guys over to help out on brew day. I brew 10-gallon batches, and lifting a fermenter or brew pot with 10 gallons of wort in it is beyond my physical capacity. So, to brew, I need strong help. No problem: As most of you know, a brewer usually has an abundance of eager friends.

On March 16, I went back to Arctic Brewing Supply to pick up twenty pounds of assorted malt and a fresh yeast culture, then stopped to have my propane tank refilled on the way home. I can remember thinking to myself how the weather always seemed to conspire against me whenever I would brew outdoors, but this time I had the upper hand. I have a balcony now, so I don't actually have to be down and out in the elements should it choose to snow. The weather wouldn't beat me this time!

I should have known better than to brag to myself like that, for that night it began to snow. When you live in Alaska, snow in mid-March is no surprise. Indeed, we had been expecting one last snowfall before breakup (which, because of all the ice melting, is what Alaskans call the beginning of spring). I went to bed excited about being able to brew the next day, and intending to get an "early" start. I told everyone to be at my place at 11 AM for breakfast, and brewing would commence at noon.

When I got up the following morning, the first thing I noticed as I stepped out to pick the newspaper up off of my doorstep was that it was still snowing. The second thing I noticed was that my car was nowhere to be seen. In its place was a large mound of snow. Anchorage received almost three feet (28.6 inches) of snow in that 24-hour period — an astoundingly record-breaking number! (The previous record was 15.5 inches.) Anyone with good sense stayed home for the next few days, and this included my friends.

The weather had won. I didn't brew that day — but damned if I didn't do it the next day! Everything went fine, too. The Saison turned out fantastic. It came out with a light amber-copper color, a wonderful malty aroma and a *huge* head! See the sidebar for my recipe for this beer.

reader recipe

Cabin Fever Saison (10 gallons, all-grain)

OG = 1.055 **FG = ~1.008**
SRM = 6–7 **IBU = 25**

Ingredients

16.0 lbs. Belgian Pils malt
2.0 lbs. Belgian CaraVienne malt
2.0 lbs. CaraPils Dextrine malt
2.0 lbs. flaked oats
8 AAU Czech Saaz hops (plugs)
(60 minutes, first wort)
(2.0 oz. of 4.0% alpha acids)
8 AAU Czech Saaz hops (plugs)
(45 minutes)
(2.0 oz. of 4.0% alpha acids)
1.0 oz. whole coriander
(15 minutes)
1.0 tsp. whole cardamom
(15 minutes)
1.0 tsp. Irish moss (15 minutes)
White Labs WLP565 (Belgian Saison I) yeast (2-liter starter)
13.0 oz. corn sugar (for priming)

Step by step

Make a two-liter yeast starter, with an original gravity of 1.048, a day or two before brewing. Dough-in the mash at 149° F. Rest for 90 minutes. Raise the mash temperature to 168° F and mash-out for 30 minutes. Take the next 45 minutes to sparge with enough 168° F water to collect 12 gallons of wort. Go ahead and be lazy like me and add the first hop addition to the kettle now. Boil for 60 minutes. Add second hop addition 15 minutes into the boil. At 45 minutes into the boil, add Irish moss and spice (coriander and cardamom — tie it in cheesecloth and crush it lightly with a rolling pin). Chill and transfer to your fermenter and pitch the whole yeast starter. Primary fermentation should take about 10–14 days, then rack it to secondary for an additional 7–14 days. Prime with 13 ounces of corn sugar, bottle. Age for 4 weeks before sampling the beer.

homebrew club

This Club Blows . . . Foam, That Is • Indianapolis, Indiana

F.B.I.
Foam Blowers of Indiana
"We tap kegs....not phones"

The Foam Blowers of Indiana (FBI) is a 15-year-old homebrew club comprised of people interested in quality beer and brewing. The FBI has several certified beer judges as members. Club meetings are generally held monthly in or around Indianapolis at either the home of a member, or at one of the fine brewpubs or beer bars in the area. These meetings take several different forms and may include a blind tasting or competition, a group brewing session, an instructional seminar, a picnic, a chili cook-off, a brewery tour or just a simple get-together.

If the meeting is being hosted by a member at his home, he gets to set the theme and agenda for the meeting, which adds variety and makes the meetings even more fun. It has become a tradition for attendees of the meetings to bring a potluck dish, so there's always plenty of tasty food to eat while we sip our latest homebrew.

Some annual tradition meetings include the January barleywine and strong ale competition, where the winner takes home the traveling Heavy Hydrometer Trophy, and the summer picnic, where lots of great beer and food are provided by the club. Although the meetings may take on several forms, the focus is always on homebrewing and enjoying quality beer.

The club has no formal officers or directors, but rather is run by consensus vote. An annual "business meeting" takes place in the fall to set the stage for the upcoming brewing season. Any club member can attend the meeting, and decisions for the next year are made among those present. Meeting themes are determined, meeting hosts are assigned, club events are discussed and club expenditures for the next year are settled.

For more information about the Foam Blowers of Indiana, contact Ron Smith (RonSmith@MarketWiseSolutions.com) or Greg Christmas (FBI@insightbb.com) or visit the club's Website at www.FoamBlowers.com.

— Ron Smith

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homebrew calendar

August 31–September 1

Hopmadness
Salem, Oregon

Bring your portable brew kettles, malt and yeast and plan to brew harvest ales with fresh-picked hops. Other events include hop-picking contests, hop wreath-making and a hop king and queen pageant. The events are at Willamette Mission State Park in Filbert Groves, Oregon (8 miles north of Salem). Starts at 2 PM with harvest tours at 3 PM, 6 PM and midnight. Cost is $3 per car. Call Freshops at (541) 929-2736.

September 13

Friday the Firkenteenth
Philadelphia, Pennsylvania

The Grey Lodge Pub in Philly hosts its Friday the Firkenteenth event every Friday the 13th. September's event will include at least 10 firkins of fresh cask-conditioned ale. For more information, call (215) 624-2969 or check it out on the Web at www.greylodge.com/fri13th.htm.

September 13–15

9th Annual Telluride
Blues and Brews Festival
Telluride, Colorado

The Telluride Blues and Brews Festival features three days of blues music and beer from 50 microbreweries. Tickets for a single day range from $35-45; a three-day pass is $105. For more information, call (866) 515-6166, email info@telluridebLues.com or visit their Website at www.telluridebLues.com.

September 20–21

5th Annual Northern
California Homebrewers' Festival
Napa, California

California homebrewers will meet at Skyline Park in Napa for two days of live music, good food, free tent camping, plenty of homebrew and other activities. On Friday, the festival goes from 2–10 PM; on Saturday, the hours are noon–10 PM. Admission is $30. For information, call Mike Winslow at (650) 225-0656 or email mksgrist@aol.com.

September 28

8th Annual Brewer's Dream
Homebrew Competition
Lincolnshire, Illinois

The competition will be held at Flatlander's Restaurant & Brewery. All 1999 BJCP-recognized beer styles will be accepted, except for categories 20, 21, 22, 25 and 26. Judging begins at 11 AM. The "best of show" winner gets to assist in the brewing of a scaled-up commercial version of the winning recipe. Admission is $6 per entry, $5 per entry with four or more. Contact Greg Love at (847) 249-4486 or email gregory.love@attbi.com.

October 1–19 & 26

2002 Queen of Beer Competition
Shingle Springs, CA

After a several-year hiatus, the nationwide Queen of Beer competition is back — for female brewers only! Entries are accepted October 1–19 and judging is the 26th. The competition is BJCP sanctioned. For info, see www.hazeclub.org or email QOB2002@hotmail.com. ■

Smoke in the Water

Märzens or porters? Smoke 'em if you got 'em!

by Thomas J. Miller

The smokiness in smoked beer comes from smoked barley malt. You can purchase smoked malt or make your own in a smoker or on a backyard grill. Examples of smoked beers incude classic German rauchbiers such as Spezial and Schlenkerla as well as American craft brews such as Rogue Smoke and Alaskan Smoked Porter. Follow this month's tips to make great smoked beers — just like the pros!

Brewer: Alaskan Brewing Company Plant Manager, Dayton Canaday, began his career at Alaskan Brewing Company in Juneau, Alaska in 1986. He is an avid homebrewer who specializes in meads.

Some homebrewers make beer using Weyermann's beechwood-smoked malt. Others enthusiastically smoke their own malt using their barbecue grill or an electric smoker. At Alaskan Brewing Company, our preferred method is to use the commercial smokehouse at Taku Smokeries, a local Juneau smokehouse.

One advantage for homebrewers electing to smoke their own malt is a wider range of possibilities for smoking wood. Brewers can smoke with apple, mesquite, pecan, oak, hickory, sassafras, walnut, alder, cherry, almond, maple or even Cabernet grapevine.

We have found that smoke acts as a preservative in beer. The smoke, combined with the yeast left in the bottle, allows the beer's flavor and aroma to evolve over time.

When smoking, always use chlorine-free water to moisten the grain. Use a cool fire with no glowing coals or flames. Use a fine mesh to protect the malt from ash and tar. Ensure the malt is well-dried for best storage.

You can check the flavor profile of your home-smoked malt by making a "tea" from it. Pour two cups of hot water (140° F) over one cup of smoked malt. Allow this to steep for 10 minutes, then cool the tea to room temperature. Strain the tea and taste it to assess the smoke flavor.

The flavor will be mild in the tea, but more evident in the beer as the aromatics will be enhanced in the finished product due to the carbonation.

Brewer: Lawrence Miller is a former homebrewer and the founder of Otter Creek Brewing, Inc. in Middlebury, Vermont. Lawrence started Otter Creek in 1991. Hickory Switch Smoked Amber Ale is a scaled-up version of one of his homebrew recipes. Otter Creek was recently purchased by Panorama Brewing Company of California, which makes the Wolaver's line of organic beers.

I got intrigued by smoked beer when I got stuck in Bamberg, Germany for a few days. As I drank my first few glasses of rauchbier, I realized there was a terrific connection to the beers of history. Back in the days when all malt was dried in open-fire kilns, the smoke from the local wood would have infused the malt with that element of local flavor.

Choice of wood is the first question you face when formulating a smoked beer. If you want to go for the classic Bamberg flavor, you can purchase Weyermann's smoked malt and use that right up to 100 percent of the grist for a solid beech character.

For me, though, it is the local character that is wonderful. When I lived in Oregon, I used alder for smoking. When I moved to Vermont, I switched to hickory because that is a much more common smoking wood in New England. I have had good success with mesquite as well.

Smoking techniques are varied, but I like to use a fairly cool smoke. I think it is sweeter. Take a portion of your pale malt — I use 15–25 percent of the total grist depending on the intensity desired — and smoke it as best you can. We lay the malt one-half inch deep on screens, then use a spray bottle to moisten the malt slightly. We put the smoke to the chamber for about four hours at 120° F. At the end, the malt should be dried out and have a nice smoke flavor. The malt will have darkened slightly.

The next decision you face in recipe formulation is choosing a base beer. The classic smoked-beer style is built on a Märzen grist bill, but porter has been a very successful base for many brewers. In particular, Greg Noonan's Smoked Porter at the Vermont Pub and Brewery in Burlington and Geoff Larson's Alaskan Smoked Porter are worth a journey.

Hickory Switch is built on a Märzen base, but I have successfully used bock, helles, Vienna lager and other beer styles as a base. The key is to use a recipe that reliably turns out a clean profile. There it is: Have a blast and send me a bottle when you're done! To argue or ask questions, send an email: lmiller@ottercreekbrewing.com.

Brewer: Jeff Williams has been brewing since 1983. He joined Rock Bottom Brewing Company (Irvine, California) in 2001 and is also the owner of the O'Shea Brewing Company, a homebrewing store located in Laguna Niguel, California.

Most people have eaten some type of smoked food, but few have ever tasted a smoked beer. The good thing about smoked beers is that your threshold increases the more you drink it. The first time I drank a glass of Aecht Schlenkerla Rauchbock, I vowed to never drink it again. Years later, I can't get enough of smoked beers. I put three pounds of rauchmalt in my porter and a quarter pound of peat malt in my Scotch ale. A good homebrewing friend of mine makes a smoked rye that is to die for.

You can buy smoked malt or smoke your own on a smoker or barbecue grill. I use orange wood for smoking.

To do this, I soak the wood in a bucket of water and allow it to dry. Put the wood on hot coals on one side of the grill. Put a pound of base malt on a screen on the other side of the grill (you want to cold-smoke it). Mist the malt with purified water. Close the lid and you're smoking.

Normally, I smoke my grains for 20 minutes to an hour, depending on the intensity I want.

Once the grains have been smoked, lay the tray in your oven on the lowest temperature with the door open for a few hours to dry the grains. Once dried, put your grains in a Ziploc bag and store them in the freezer for use at a later time.

Home-smoked grains are more intense than commercially produced smoked malt. If you purchase commercially smoked malt, make sure it is fresh. The older the malt, the less smoke flavor and aroma it will contain.

I prefer to mill the pale ale malt prior to smoking. This aids the absorption of the smoke and prevents a messy grain mill. Home-smoked malt is normally high in moisture content. If this smoked grain is milled, the high moisture content will most likely gum up your grain mill.

As for hopping rates in smoked beers, I like to balance out the maltiness and add just a hint more hop bitterness. I believe that bitterness accentuates the smokiness of the beer, so I add a little more hops for flavor and to add depth to the beer. ■

Hose Longevity

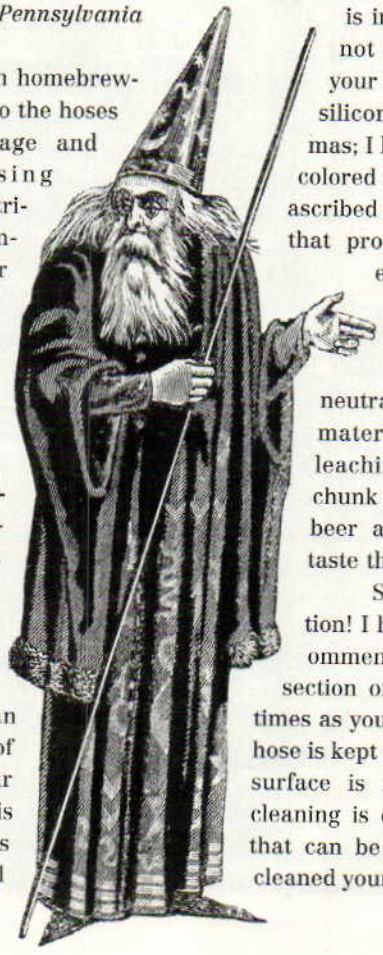
Plus: Hydrometers, carbonation and low gravity

"Help Me, Mr. Wizard"

When Do I Heave Hose?

How many times can you reasonably use flexible silicone hose, the kind most homebrewers use for siphoning? I tend to start with a new hose, use it to rack cooled wort or green beer five to ten times, then convert the hose to fermentation blow-off tubes. After one use as a blow-off tube, the sucker is pretty well stained and I throw it away. Am I overusing my hoses? If not, how can I squeeze more use from them? Would high temperatures (from hot wort) running through the hose impart any off-flavors? Also, what effects does alcohol have on stainless steel? I always wipe down my equipment before and after I brew to ensure sterility. I was wondering if this practice is potentially harmful to my equipment. Thanks for the help.

Brendan Benson
Pittsburgh, Pennsylvania



The hoses used in homebrewing are similar to the hoses used in beverage and food-processing plants, except the industrial-grade hoses are reinforced to increase their pressure rating and usually covered by a durable protective outer covering to increase ruggedness in a plant environment. At first glance, a commercial-quality brewery hose looks like a completely different beast than the typical homebrew hose. But if you strip all the covering off of many commercial hoses, you will find an inside liner that is made of silicone just like your homebrew hose. Silicone is a wide array of polymers based on the structural unit R_2SiO, where R is an organic group, Si is the element silicon and O is oxygen. Silicones are used in adhesives and lubricants as well as homebrew hoses. Silicone is used in all sorts of products because it holds up over a wide temperature range, is resistant to all sorts of nasty chemicals and light and is inert. The addition of different chemical groups to the basic polymeric structure of silicone elastomers can add special functions. As a result, there is a wide array of silicone polymers designed for special, severe-duty use.

The homebrewery is not a severe-duty environment and standard silicone hose more than covers the temperature range used in homebrewing (32–220° F). Silicone hose is resistant to all the standard brewing cleaners (including sodium hydroxide, phosphoric acid and bleach) and is inert (meaning it will not leach flavors into your beer). Some special silicones can have aromas; I know that some red-colored silicones have been ascribed with a fishy aroma that prompted some breweries that had these gaskets to switch to white silicone, which is aroma neutral. One way to test materials for aroma leaching is to soak a chunk of the material in beer and then smell and taste the beer.

So on to the question! I have no trouble recommending that you use a section of hose for as many times as you can, as long as the hose is kept clean and the inside surface is not cracked. Hose cleaning is one of those things that can be overlooked. If you cleaned your blow-off tube after using it with a hot bleach solution, I bet it would look like new! One half cup unscented bleach per gallon of hot tap water is a good cleaning solution.

Hoses should be cleaned by either recirculating cleaning solution through the hose (this requires a pump) or by soaking the hose in a cleaning solution. This is best done soon after the hose is used so that the soil has little time to harden inside of the hose. Many hoses have some type of barbed fitting connected to the end. It is a good idea to routinely remove the fitting and clean the area around the connection or, better yet, cut a small portion off of the hose and reattach the fitting to a smooth hose section. This helps to keep the intersection between the fitting and hose clean and the crevices in this region to a minimum. When I have a long piece of hose and am unsure if it is in good condition, I cut a piece off the hose, split the sample in half and inspect the inside of the hose. If there are small cracks, or if the hose has a build-up of beer stone (calcium oxalate deposits that appear like brown-tinted glass), I will toss it. Otherwise, there is no reason to waste good hose.

One thing to be careful about at home is pressure. Hoses that are not reinforced with braids should not be pressurized, especially with hot liquids. When silicone hose is heated, it gets soft and is easy to rupture if pressurized, for example by a pump. If you pump wort or beer, or move wort or beer using compressed gas, you need to buy braided hose. As long as the braided hose has an interior made of silicone, you can treat it like you do your non-braided hose. I have been using the same sections of commercial-grade hose continuously for the last 4.5 years without any problem.

As far as alcohol — be it ethyl alcohol (drinking alcohol) or isopropyl alcohol (rubbing alcohol) — and stainless steel are concerned, you have

absolutely no problems. Do you remember the last time you were harpooned with a surgical needle? If you do, you probably remember alcohol swabs and so forth in the physician's room. Alcohol has no deleterious effect on stainless steel regardless of contact time. The one commonly used household chemical that can really damage stainless steel is bleach. Bleach (sodium hypochlorite) is corrosive to stainless steel when the pH is less than about 12 and causes the steel surface to develop small pits. Eventually, the pits can turn into holes, transforming a pot into a strainer. Pits are also hard to clean and can be a place for bacterial contaminants to hide.

Specious Specific Gravity

What's the best way to take an accurate original specific gravity reading? I use a sampling thief to collect a wort sample from my carboy before pitching. The readings are different depending on how long the wort settles before measuring and how deep into the carboy I dip to collect the sample. Is this caused by picking up different amounts of sediment in the samples? Should the sample come from wort that is relatively free of sediment? Should specific gravity be measured before pitching?

Jack Van Overloop
Grand Rapids, Michigan

This question brings up some issues that I have experienced over the years and I have been somewhat surprised by my observations. I usually collect a wort sample from a sample valve placed in-line between the wort cooler and the fermenter. I do this because I want to know my wort density prior to pitching, since liquid yeast will lower the wort gravity slightly by diluting the wort sugars with the liquid in the starter. With that said, your method of sampling from the fermenter should work fine, as long as you take your sample before fermentation begins. Just keep in mind that the wort gravity is a bit higher before adding the yeast. This is only of importance if you are strictly tracking your brewhouse efficiency. Otherwise, the difference in gravity is trivial.

There are some oddities about gravity checks that I want to point out. But before I drift too far off, I want to point out one key piece of information for extract brewers — be diligent about mixing your wort and any topping-up water prior to checking your specific gravity. If the wort is not thoroughly mixed, the likelihood of having stratification in the wort gravity is very high. In fact, it's almost a guarantee!

Let's assume, however — for the sake of argument — you are an all-grain brewer and that the wort is thoroughly mixed. The puzzling part about this scenario is that the wort gravity changes depending on the depth of the sample. If you had pitched, I'd suspect that your yeast starter not being completely mixed in the wort was the cul-

prit, especially if you used a large-volume starter. Liquids of varying density are more difficult to thoroughly mix than one would guess. The only other thing that could cause this difference is temperature variation, as temperature affects liquid density and the hydrometer reading. Temperature stratification in liquids is very common. If you are not measuring the temperature of your sample along with the specific gravity, you should.

I usually add some water after wort boiling to adjust gravity and want to know the wort gravity after the water addition to confirm that my calculations and water addition were done correctly. I collect multiple samples during the course of wort cooling and the samples do vary slightly from beginning to end. The variation is typically between 0.1–0.2° Plato or about 0.0004–0.0008 specific gravity units. The only conclusion that makes any sense to me is that the top-up water is not evenly distributed in the wort, even after pumping it to a whirlpool and allowing it to rest before cooling to allow the trub to settle.

Personally, I feel the best place to sample wort is from the kettle, immediately after boiling. At this stage, the wort is well mixed and nothing has been added, such as water for top-up or yeast. The wort gravity combined with wort volume is used to calculate brewhouse efficiency and this is the place to collect the data. Although suspended solids, such as trub and hop particles, should not affect the hydrometer reading — since hydrometers measure dissolved solids — I collect a sample and first allow the solids to settle, then transfer clear wort to my hydrometer test container.

This brings up the wonderful and exciting topic of hydrometers. For starters, don't ever assume any measuring instrument is properly calibrated. A hydrometer should indicate that distilled water has a specific gravity of 1.000 (a Plato hydrometer should read 0.00°) at the temperature for which the hydrometer is calibrated. Most laboratory-type hydrometers read true at 68° F (20° C) and many homebrew hydrometers read true at 60° F. In most cases, the sample is at some other temperature and the hydrometer reading must be adjusted up if the sample is warmer than the hydrometer temperature calibration or adjusted down if the sample is cooler than this temperature.

This trivial issue gets nasty when you step back and carefully look at the problem. For example, I have a sample of wort and plunk a hydrometer in it and the reading is 12.5° Plato. Having a good idea the sample is warmer than room temperature (68° F in my chilly, imaginary room) I grab a floating thermometer from the bench and plunk it into my wort sample and determine that the wort temperature is 78° F. I can go to a table and determine that I need to add about 0.5° Plato to my reading. No problem, right? Wrong. When I put the thermometer in the wort I changed the wort temperature,

since the large floating thermometer was cooler than the wort sample.

One way to get around this problem is to measure the gravity and the temperature at the same time. You can do this with a separate hydrometer and thermometer or you can buy a hydrometer with a built-in thermometer. These little guys are nice and range in price from about $15 up to $160. I like accuracy and have some of the expensive models. These are really cool because they are big and you need two. They also set you back $320 if you want to measure both wort and beer. The low end measures 0–14° Plato and the upper end measures 12–26° Plato.

Last year, the lower-end hydrometer was broken (not by me!). I ordered a replacement. It came in a few days and we were back in business "spindling" beer samples — so we thought.

A few months later, it was obvious that something was amiss and our beers were not fermenting as dry as they once did. After wasting a lot of time investigating everything but the bloody hydrometer, I decided to check it and discovered that it was not reading true. I couldn't believe that this expensive, impressive-looking instrument was not properly calibrated.

I called the supplier and was assured that this had never before happened and was sent another instrument. To my amazement, this one was worse than the first. I called back again and was told that this just couldn't be true. After all, these expensive items are purchased by the world's largest brewery and they had never had any problem. I politely suggested that if they didn't fix their quality problems, the company I work for would not be buying these units in the future. Finally, I was sent a third. This particular unit was far worse than the first two. In the end, I resolved the problem by simply subtracting the error since hydrometers have a linear scale.

The moral of the story is that instruments cannot be trusted for accuracy, no matter their price. The corollary is that most things assumed to be homogenous are not and multiple samples are usually required to get a reliable estimate of the average.

Hop Hop Fizz Fizz

Every time I dry-hop a batch in the secondary, I get a super-carbonated beer. I have seen this using pellets and whole leaf hops. After five to seven days of dry-hopping, I bottle using the standard 3/4 cups of sugar to prime. After a week in the bottle, I open one and bam — superfoam. I only see the superfoam when we dry-hop. I am super-anal about cleaning bottles, so I know it's not a dirty bottle or bad batch. My friends in my clubs have seen the same thing. I have a friend in my club that is an Assistant Brewmaster for Anheuser-Busch. He thinks it might be CO_2 sticking to the particles from the hops.

Brian Rousseau
Hopkinton, New Hampshire

I agree with your club member from Anheuser-Busch about the cause of this problem. When hops are used for dry-hopping, small particles — for example the lupulin glands that contain the bittering compounds and oils — may remain in the beer and find their way into the bottle. I don't believe your beers are any more carbonated when you dry-hop. I think what is happening is that the particulates carried into the bottle act as nucleation sites for gas break-out when the bottle cap is removed. This is similar to the foaming that occurs when salt is sprinkled into a glass of beer.

There are a couple of things you could do to solve this problem. The easiest thing to try is to rack the beer out of the secondary after your week of dry-hopping and allow the beer to settle a few days, preferably at cooler temperatures, prior to bottling. This may help to settle the suspect particles.

You could add another step to your brewing and filter the beer prior to packaging. If small particles are the source of the problem, filtration will probably solve it. There are some cases where very small particles can cause excessive, uncontrollable foaming, known as gushing, even after filtration. The best-known examples of gushing are from using malt made from barley contaminated with *Fusarium* mold. This mold secretes a protein infamous for its ability to cause beer to gush. I have never heard or read of any cases of gushing related to hops and I am willing to bet that filtration would certainly cure this problem.

If you don't want to filter, and the second racking does not help, you still have a few options. The first is to reduce your carbonation level. The amount of sugar you are using is enough for a fully carbonated beer. Most traditional dry-hopped beer styles (such as English ales) are cask conditioned, carbonated to a much lower level than bottled beers and served using a beer engine. If dry-hopping does cause a greater release of carbon dioxide, lowering the carbonation level will certainly help. Another idea is to not dry-hop! Some brewers add hop oils for aroma and you can make a beer with that fresh hop character without using the dry-hop method. By the way, I think I know your friend at Anheuser-Busch. If his initials are M.S., he can probably set you up with some hop oil samples.

Going For Gargantuan Gravities

I've been homebrewing since 1972. I have a three-tier, gravity-fed system that works well with gravities up to 1.095. Extract efficiency is 77 to 82%. I'll use about 16 pounds of grain for a five-gallon batch of Scotch ale and hit 1.090-plus on the hydrometer, but when I try to make a 1.120 barleywine and add an extra six or seven pounds of grain, I'm short. I'll get into the 1.090s and that's it. The totals of both starting gravities are what I figured for a five-gallon barleywine. In other words, I can't get all the extract into

one boiler. I suppose if I sparged half a day and boiled half a day that I might be able to get the extract into one pot. But a normal brew day is long enough, with mashing for 1-1/2 hours, sparging 1-1/2 hours, boiling 1-1/2 to 2 hours, cooling 1/2 hour and so on. Any ideas? Please don't say to add dry malt extract to supplement the shortage.

Dave Hartwig
Kingsville, Missouri

The easiest thing to do is to dump a bunch of sugar into the wort to beef up your gravity. After all, you said not to suggest DME! Just kidding.

I ran into the same problem a few weeks ago with a barleywine. The key to obtaining a very high-gravity wort after boiling is to begin with a high-gravity wort running from the mash. This means that the mash has to be on the thick side. A thinner mash has more water per pound of grain and the first-wort gravity will decrease as mash thickness decreases.

You will have to determine your mash thickness empirically, since the malt you are using and the size of the grist after milling will have an impact on the gravity of the first wort. But a good starting point for a high-gravity wort is to use 74 fluid ounces (4.6 pints) of mash water per pound of malt. (For you metric brewers, this translates to 2.2 liters water per kilogram of malt.)

Another key pointer to brewing high-gravity beers is to sacrifice your efficiency. You can do this by either not sparging at all or by sparging very little. You can sparge and get good extract efficiency but you have to use a much longer boil to evaporate the sparge water needed to improve your efficiency. Most commercial brewers take a compromise approach. They sparge a little bit to improve their efficiency over not sparging at all, then use a longer boil — up to three hours — to hit their target gravity.

When using very long boils, you still want to add the hops at about the same times you do for a normal-length boil. For example, boil your bittering hops for 60–90 minutes, your middle addition for 30–40 minutes and your aroma addition for 0–10 minutes. Boiling hops for extremely long times can lead to unpleasant bitter flavors caused by the thermal decomposition of isomerized alpha acids. ■

Do you have a question for Mister Wizard? Write to him c/o Brew Your Own, 5053 Main Street, Suite A, Manchester Center, VT 05255 or send your e-mail to wiz@byo.com. If you submit your question by e-mail, please include your full name and hometown. In every issue, the Wizard will select a few questions for publication. Unfortunately, he can't respond to questions personally. Sorry!

Beers Cloned

Creemore Lager and Bell's Best Brown Ale

by Steve Bader

Dear Replicator,

I was in Toronto, Canada last Christmas, visiting some friends, and I was introduced to a premium lager called Creemore Springs. It was a great beer! I have searched high and low for something similar in the United States, but nothing comes close. Please help, because I would love to make this beer and share this nectar of the gods with my friends. They're going to love it!

Paul Gora
McAllen, Texas

Creemore Springs is a European-style full-bodied lager, and that is somewhat unusual in North America, where lagers are often drier and less full-bodied. That full-bodied flavor explains your difficulty in finding an acceptable beer in Texas. (These beers are out there, but you have to look harder than for most other beer styles.) Most North American lagers are normally Budweiser clones that rely on a high percentage of adjuncts to lend the "light" color, body and flavor that is common in this style of beer. You'll just have to resort to making your own full-bodied lager to satisfy your thirst!

I spoke to Gord Fuller, head brewer at Creemore Springs in Toronto, about making this beer at home. As a "premium lager," Creemore Springs uses 100% malted barley to make this beer. This full-on maltiness is what makes the beer premium. Gord says they use about 10% crystal malt (40° L) in the malt bill to give this beer a little color, and some additional maltiness comes from the non-fermentability of the crystal malt. Creemore Springs uses Czech Saaz hops, at an IBU level of about 25, to achieve a nice balance between the malt and hop bitterness.

The yeast that Creemore Springs uses is a private strain, one that was actually an old Stroh's yeast. This yeast produces a slight estery (fruity) flavor that is somewhat unusual for lager yeasts. None of the lager yeasts from Wyeast and White Labs offer quite the right combination, so here I would suggest that you use one of the lager yeasts listed below, but ferment at about 58 to 60° F to add a bit of fruitness that lager strains produce at higher temperatures. Then, after the yeast has finished fermenting, drop the temperature of the beer to about 35–40° F for a minimum of 2 weeks to lager the beer and give it a chance to mellow out in the colder lagering temperatures.

You can get more information about Creemore Springs Brewery at http://www.creemoresprings.com/ on the Web, or by calling the brewery at (705) 466-2240.

Creemore Springs Premium Lager

(5 gallons, extract with grains)

OG = 1.048 FG = 1.014 IBUs = 2.5 ABV = 4.5%

Ingredients

6.6 lbs. Coopers light malt extract syrup
1 lb. crystal malt (40° L)
6.1 AAU Czech Saaz hops (bittering hop)
(1.75 oz. of 3.5% alpha acid)
3.5 AAU Czech Saaz hops (aroma hop)
(1 oz. of 3.5% alpha acid)
1 tsp. Irish moss for 45 min.
White Labs WLP810 (San Francisco Lager) or Wyeast 2112 (California Lager) yeast
0.75 cup of corn sugar for priming

Step by step

Steep the crushed crystal malt in 3 gallons of water at 150° F for 30 minutes. Remove crushed grains from wort, add malt extract syrup and bring to a boil. Add Saaz (bittering) hops, Irish moss and boil for 60 minutes. Add Saaz (aroma hops) hops for last 5 minutes of the boil.

When done boiling, strain out the hops, add wort to 2 gallons cool water in a sanitary fermenter, and top off with cool water to 5.5 gallons. Cool the wort to 80° F, aerate the beer and pitch your yeast. We recommend making a yeast starter. Allow the beer to cool over the next few hours to 58°–60° F, and hold at these cooler temperatures until the yeast has fermented completely. Then drop the temperature of the beer to 35 to 40° F and lager for a minimum of 2 weeks. Bottle your beer, age for 2-3 weeks and enjoy!

All-grain option:

Replace the light syrup with 8.25 lbs. two-row pale malt. Mash all your grains at 155° F for 60 min. Collect enough wort to boil for 90 min. and have a 5.5-gallon yield. Lower the amount of the Saaz boiling hops to 1.5 oz. to account for higher extraction ratio of a full boil. The remainder of the recipe is the same as the extract.

Dear Replicator,

Help! I have not had any luck finding my favorite brown ale of all time for about two years now. This is a seasonal beer made by the Kalamazoo Brewing Company in Kalamazoo, Michigan. Our local specialty liquor stores have not been able to order this particular beer, but carry other styles by this brewery. I have even gone so far as asking friends that travel to be on the lookout. I am desperate, so can you please provide a clone? My beer-loving friends and I would be grateful.

Ed Vandegrift
Lee's Summit, Missouri

Your desperation for this beer is inspiring, so I called Kalamazoo Brewing to find out more. I talked to head brewer Alec Mull, who has brewed at Kalamazoo for three years. Alec said that Bell's Best Brown Ale, named after brewery owner Larry Bell, is one of the company's most popular beers.

Alec said Best Brown is made from September to March, and — as a winter seasonal — they give it a bit more maltiness and alcohol warmth than their regular beers. Alec also said that brewing this beer was an evolutionary process, and that they have changed the recipe a number of times in years past. Recently, though, Alec and his assistants have settled on a consistent recipe and have loved the results.

This beer is slightly sweeter than normal brown ale, with a bit of a caramel flavor from the crystal malt. It also gets some nutty flavors from the combination of Briess Victory and Special Roast malt. The small amount of chocolate malt is added mostly to get the rich color that Alec wants in this stellar seasonal brew.

Hop flavor for the Best Brown Ale is achieved by using Nugget and Cascade for the bittering hops and Fuggle for the aroma and flavor hops. Hop bitterness is at 30 IBUs, which is in the proper range for the British brown ale style. American brown ales are normally in the 40-50 IBU range.

You can get more information about the Kalamazoo Brewing Company at http://www.bellsbeer.com/ or by calling (616) 382-2338. ■

Want your favorite commerical beer cloned?

Email your request to:
edit@byo.com
or mail to:
Brew Your Own
5053 Main Street, Suite A
Manchester Center, VT 05255

Bell's Best Brown Ale

(5 gallons, extract with grains)

OG = 1.058 FG = 1.013 IBUs = 30 ABV = 5.9%

Ingredients

6.6 lbs. Briess light malt extract syrup
14 oz. Briess Victory malt
14 oz. Briess Special Roast malt
14 oz. Briess crystal malt (60° L)
2 oz. Briess chocolate malt
6.2 AAU Cascade hops (bittering hop) (0.75 oz. of 8.3% alpha acid)
3.25 AAU Nugget hops (bittering hop) (0.25 oz. of 13% alpha acid)
1.2 AAU Fuggle hops (flavor hop) (0.25 oz. of 4.7% alpha acid)
2.4 AAU Fuggle hops (aroma hop) (0.5 oz. of 4.7% alpha acid)
1 tsp. Irish moss for 45 min.
White Labs WLP001 (California Ale) or Wyeast 1056 (American Ale) yeast
0.75 cup of corn sugar for priming

Step by step

Steep crushed malts in three gallons of water at 150° F for 30 min. Remove grains from wort, add malt syrup and powder and bring to a boil. Add Cascade and Nugget (bittering) hops, Irish moss and boil for 45 min. Add 0.25 ounce of Fuggle hops (flavor hops) for last 15 min. of the boil. Add 0.5 ounce of Fuggle (aroma) hops for the last two minutes of the boil.

When done boiling, strain out hops, add wort to two gallons cool water in a sanitary fermenter, and top off with cool water to 5.5 gallons. Cool the wort to 80° F, aerate the beer and pitch your yeast. Allow the beer to cool over the next few hours to 68-70° F, and ferment for 10-14 days. Bottle your beer, age for two to three weeks and enjoy!

All-grain option:

Replace the light syrup with 8.25 lbs. 2-row pale malt. Mash all your grains at 155° F for 45 minutes. Collect enough wort to boil for 75 min. and have a 5.5-gallon yield. Lower the amount of the Cascade boiling hops to 0.5 of an ounce to account for higher extraction ratio of a full boil. The remainder of the recipe is the same as the extract.

Rauchbier

An ancient beer style that's still smokin'

by Horst D. Dornbusch

RAUCHBIER by the numbers

OG	1.048–1.070 (12–17.5 °P)
FG	1.013–1.016 (3.25–4 °P)
SRM	22–30
IBU	29–32
ABV	4.8–5.5%

PHOTO COURTESY OF JOHN COHEN

Rauchbier is associated with Bamberg, Germany, where patrons at the Greifenklau biergarten enjoy the unique flavor of this smooth, smoky style.

The term "rauchbier" means smoked beer in German. Once upon a time, all beers were smoked beers. With the ancient kilning methods of drying green brewer's malt over open fires, all grains picked up smoke flavors and passed them on to the beers that were made from them. Today, however, with "clean" malt being the dominant brewing grist, old-style smoked beers have set themselves apart as an atavistic rarity, a throwback to a time gone by.

Style Parameters

Today, rauchbier is its own beer style, but not all modern smoked beers are rauchbiers. Smoked ales, for instance, are not. Modern rauchbier is understood to mean primarily a barley-based, opaque smoked lager that is brewed and aged in a manner similar to a Märzen-Oktoberfest beer.

Some rauchbiers are like smoked featherweights, with an original gravity (OG) of around 1.048. Other rauchbiers are real bock-type heavyweights, with an OG in the 1.070s. However, most rauchbiers fall within the middleweight category, with an OG of around 1.054. In all cases, there is usually a bit more hops in the brew to counterbalance the otherwise too-assertive smoked flavor and aromas.

In addition, rauchbier is also identified with its place of origin. Just as the altbier style has been defined by the brewers of Düsseldorf and the Kölsch style by the brewers of Cologne, the modern rauchbier style is primarily the creation of brewers in and around the Franconian city of Bamberg in northern Bavaria. *(For more on beers from this region, see "The Beers of Franconia" by Matt Cole on page 40.)*

The most prominent commercial rauchbier brand — the one that is considered the rauchbier archetype — is Aecht Schlenkerla Rauchbier, brewed by the Hellerbräu of Bamberg. The word "aecht" is a Franconian mangling of the High German "echt," which means "true" or "original."

Schlenkerla also appears to be the most readily available rauchbier brand in most parts of North America. Two other brands that can occasionally be found in the New World are Kaiserdom Rauchbier and Rauchenfelser Steinbrau (a smoked stone beer).

Beer Color

Most rauchbiers are amber like a Märzen, yet some are almost black, like a Schwarzbier. Still others are almost blond, like a Helles.

Most rauchbiers are made from a foundation grist of pale Pils malt (<2° L) mixed with a significant but widely varying portion of malt that is kilned the old way, over an open fire

Bamberg Rauchbier (5 gallons, all grain)

OG = 1.054
FG = 1.013
SRM = 28
IBU = 30
ABV = approx. 5.3%

Ingredients

4.0 lbs. Pils malt (<2° L)
2.0 lbs. Munich malt (10° L)
2.0 lbs. Weyermann smoked malt (2–3.5° L)
0.5 lb. dextrin malt (Briess CaraPils, 1.5° L)
0.5 lb. Vienna malt (2–3.5° L)
1.0 lb. caramel malt (20° L, such as Briess) or Weyermann Cara Munich II (~45° L)
3 oz. Weyermann dehusked Carafa III (450–488° L)
6.7 AAU German noble hops, such as Hallertauer or Tettnanger (bittering) (1.5 oz. of 4.5% alpha acid)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (flavor)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (aroma)
2 packages of Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager)
1 cup DME or corn sugar (for bottling)

Easy Rauchbier (5 gallons, all grain)

OG = 1.054
FG = 1.013
SRM = 28
IBU = 30
ABV = approx. 5.3%

Ingredients

4.0 lbs. Pils malt (<2° L)
4.0 lbs. Weyermann smoked malt (2–3.5° L)
4 oz. Weyermann dehusked Carafa III (450–488° L)
6.7 AAU German noble hops, such as Hallertauer or Tettnanger (bittering) (1.5 oz. of 4.5% alpha acid)

0.75 oz. German noble hops, such as Hallertauer or Tettnanger (flavor)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (aroma)
2 packages of Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager)
1 cup DME or corn sugar (for bottling)

Step by Step

Rauchbier-mashing involves several rests. To imitate the original Bamberg method, dough in at a cool 113 °F (45 °C) and keep the temperature at that level for about 30 minutes. Next, infuse the mash slowly with very hot water, while stirring gently, to raise the temperature by about 2° F per minute to 149° F for another 30-minute rest. At 149° F, beta amylase enzymes are at their peak performance, while alpha amylase have become active as well (they start at 140° F). The optimum target pH value for a rauchbier mash is around 5.0. Infuse the mash again with hot water to reach 162° F for yet another 30-minute rest. At this temperature, alpha amylase reach their peak performance. Finally infuse the mash to reach 170° F. This is the temperature you should maintain for the duration of a 90-minute sparge.

Boil time for the wort is at least 90 minutes, but two hours is better, because a longer boil promotes wort browning from melanoidins. Add the bittering hops about 15 minutes into the boil, the flavor hops about 30 minutes before shut-down, and the aroma hops about 15 minutes before shut-down. Check the gravity at the end of the boil and compensate for evaporation losses by adding cold water to the fermenter.

Heat-exchange the wort to roughly 55° F and aerate. Primary fermentation lasts about seven days, at which point there should be a gravity drop of about 90% of the difference between OG and FG. Rack the brew, and start reducing the brew's temperature by about 2° F per day to as close to 28° F as your equipment allows. Lager the brew at this temperature undisturbed for six to eight weeks. Then rack, prime and bottle. The rauchbier is ready for drinking after about another week. Serve the beer at around 45° F.

Bamberg Rauchbier (5 gallons, partial mash)

OG = 1.054
FG = 1.013
SRM = 28
IBU = 30
ABV = approx. 5.3%

Ingredients

3.0 lbs. Bierkeller plain light or Weyermann Bavarian Pilsner malt extract
1.5 lbs. Bierkeller or Weyermann amber extract
2.0 lbs. Weyermann smoked malt (2–3.5° L)
0.5 lb. dextrin malt (Briess CaraPils, 1.5° L)
0.5 lb. Vienna malt (2–3.5° L)
1.0 lb. caramel (20° L, such as Briess) or Weyermann Cara Munich II (42–49° L)
3 oz. Weyermann dehusked Carafa III (450–488° L)
6.7 AAU German noble hops, such as Hallertauer or Tettnanger (bittering) (1.5 oz. of 4.5% alpha acid)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (flavor)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (aroma)
2 packages of Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager)
1 cup DME or corn sugar (for bottling)

Step by Step

Mill the Weyermann smoked malt and the Weyermann dehusked Carafa III separately from the remaining specialty malts. Place the Weyermann specialty malts into one muslin bag, and the other specialty malts into another muslin bag. For higher extraction values during steeping, it is best not to stuff too much milled grain into one bag. Immerse both bags in about 3 gallons of cold water. Heat slowly to about 170-190° F. This should take about half an hour. Turn off heat. Lift bags, rinse with 4-5 cups of cold water, and discard.

Add the malt extract and stir. Bring to a boil. Boil the wort according to the instructions in the all-grain recipe. Cool the wort, siphon to your fermenter and aerate. From this point, follow the directions in the all-grain recipe.

Mostly-Extract Rauchbier (5 gallons)

OG = 1.054
FG = 1.013
SRM = 28
IBU = 30
ABV = approx. 5.3%

Ingredients

6.0 lbs. Bierkeller or Weyermann amber extract
1.0 lbs. Coopers, John Bull or Alexander's stout extract
3.0 lbs. Weyermann smoked malt (2–3.5° L)
6.7 AAU German noble hops, such as Hallertauer or Tettnanger (bittering) (1.5 oz. of 4.5% alpha acid)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (flavor)
0.75 oz. German noble hops, such as Hallertauer or Tettnanger (aroma)
2 packages of Wyeast 2206 (Bavarian Lager) or White Labs WLP830 (German Lager)
1 cup DME or corn sugar (for bottling)

Step by Step

Divide the three pounds of unmilled, whole-kernel, Weyermann smoked malt roughly into two portions and place each into a muslin bag. Immerse both bags in about three gallons of cold water. If you do not have muslin bags, you can also just pour the whole kernels of smoked malt into the water.

In either case, heat the water slowly, to about 170–190° F. Turn off the heat and let the grain steep for about half an hour. If you used bags, lift them and rinse them with four to five cups of cold water. If you steeped the grain loosely in the water, pour the grain broth through a fine sieve or strainer to separate the liquor from the debris.

Add the extract, stir, and bring the three gallons of water a boil. Boil the wort for 60 minutes. Add the bittering hops at the beginning of the boil, the flavor hops about 30 minutes before shut-down, and the aroma hops about 15 minutes before shut-down.

Cool the wort, siphon to your fermenter and aerate. From this point, follow the fermentation, lagering and packaging directions as outlined in the all-grain recipes.

fueled by local beechwood. Schlenkerla makes its rauchbier without any "clean" malt at all, just 100% smoked malt. They are the only brewery to do so. The Bamberg style of drying brewer's grist is similar to the kilning of malt over peat moss for Scotch whisky. The smokiness from the beechwood imparts a bit of a bacony flavor to the beer. Schlenkerla, by the way, is also one of the last breweries in Germany that still malts its own grain.

The Schlenkerla brewery owns a beer hall at Dominikanerstrasse 6, in the old town of Bamberg. This venerable drinking establishment used to be a medieval brewpub known as Zum Blauen Löwen (At The Blue Lion), which is first mentioned in a document dating from 1405. It is not certain when the current version of the rauchbier emerged around Bamberg. However, because of the malting methods employed by the Schlenkerla brewery even today, we can reasonably assume that some form of smoked beer has been brewed by this enterprise for at least five centuries.

Schlenkerla makes several types of rauchbier. The standard is the Aecht Schlenkerla Rauchbier-Märzen, which weighs in at an OG of 1.054. The brew finishes at about FG 1.014 for an ABV of about 5.1%. On the lighter side, there is the helles rauchbier (around an OG of 1.048). On the heavier side, there is Aecht Schlenkerla Rauchbier-Urbock, which is available only between October and December. It comes in at a gravity of OG 1.070. The Schlenkerla brewery also makes a smoked wheat beer, the Aecht Schlenkerla Rauchbier-Weizen, which is brewed with top-fermenting yeast and has a starting original gravity near 1.053.

Rauchbier Brewing Ingredients and Processes

The smoke and the color of most rauchbiers come entirely from specialty grains. These may include Weyermann rauchmalz (smoked malt, 2–3.5° L) for the signature flavor; Munich malt (6–20° L) for depth, body, nuttiness and color; Cara-Pils (1.5° L) or Vienna malt (5–8° L) for extra body from unfermentable sugars; caramel or

crystal malts (20–40° L) for richness; and Weyermann Carafa or black patent malts (300–500° L) for darkness.

The grain bill for a rauchbier can vary greatly without distracting from the authenticity of the brew. This is good news because you can create your own grain bill depending on the availability of raw materials in your local store. You are on safe ground as long as you furnish the brew with the required color (22-30° L) and with smoke. Next, you must turn your wort into a lager with the body and strength of a Märzen or Oktoberfest.

The Key Ingredient

The only ingredient in the rauchbier grain bill for which there really is no substitute is Weyermann Rauchmalz (smoked malt). This malt is made by the Weyermann Specialty Malting Company of — where else? — Bamberg, just a brisk walk across the River Regnitz from the Schlenkerla beer hall.

This malt is made from two-row German barley that is smoke-kilned over traditional beechwood logs that have been aged and seasoned for at least 18 months. In spite of its open-fire treatment, this grain leaves the malting house with a surprisingly pale color rating of only 2–3.5° L. Weyermann smoked malt goes into virtually every commercial rauchbier made in Germany, and probably the world. Most homebrew shops carry it. If not, you can find it easily on the Internet.

You can also smoke your own malt, but the use of other woods for smoking will not lend an authentic rauchbier flavor. See "Tips from the Pros" on page 11 or "Smoked Beers" by Ray Daniels and Geoffrey Larson (Brewers Publications) for more information.

Specialty Malts

The best choice of grain for the color in rauchbier is another product from Bamberg, Weyermann Carafa III (450–488 °L). Make sure you get the dehusked version, because only without the husks will you get the dark color without the phenolic, acrid, burnt flavors of normal black patent malt. Burnt-husk flavors tend to compete

unfavorably with the dominant bacony beechwood smoke flavor in the beer.

If you cannot find this specialty grain, of course, any brand of black patent malt will do. However, the resulting brew will have less of the original Bamberg taste.

Calculating Color

Because you have such great freedom in blending your own rauchbier grist, consider the grain bills listed in the recipe section as examples only. Use them unchanged, if you can find all the components. But if you can't, don't be vexed! If you want to (or have to) experiment, and if you don't mind a little math, here is a simple formula for calculating the aggregate color of your rauchbier grain bed (a target of around 28 °L is nice), provided you know the Lovibond ratings and quantities of each of the component grains:

$$[{}^{\circ}L_1 \times lb_1 + {}^{\circ}L_2 \times lb_2 + {}^{\circ}L_n \times lb_n]/V$$

In this formula, 1, 2 . . . n are the different grains; $^{\circ}L_1$, $^{\circ}L_2$ . . . $^{\circ}L_n$ are the Lovibond ratings of these grains; lb_1, lb_2 . . . lbn are the amounts (in pounds) of each grain; and V is the volume of wort (in gallons) you expect to send to the fermenter (that is, your net kettle volume). Simply multiply the color rating in degrees Lovibond for each grain by its weight in pounds and add up these products. Then divide this sum by the final volume of wort (including adjustments for evaporation from the boil). Incidentally, if your grain's color rating is given in European Brewery Convention units (EBC), a very rough, but practical, conversion factor is 1 EBC ≈ 0.375 °L. This factor is only approximate, but it becomes more accurate as the Lovibond values increase, which is where it counts for rauchbiers.

Partial Mashing

Partial mashers can substitute the Pils malt or the Munich malt with Bierkeller plain light or Weyermann Bavarian Pilsner as well as Bierkeller Munich amber or Weyermann Bavarian amber, respectively. Steep all the other specialty grains.

Extract with Grains

As far as we know, there is no rauchbier malt extract on the market. Rauchbiers can be made with a partial mash or, at a minimum, from an extract-and-grain recipe. See the "mostly-extract" recipe for an extract-and-grains rauchbier recipe.

Because most extract brewers probably do not own a malt mill, I have adjusted the quantity so that you can steep whole kernels, either in two muslin bags or directly in the brewing liquor, and still get that characteristic Bamberg smoke flavor in your beer.

Smoke Extract

Interestingly, there are recipes in the homebrew literature that recommend the use of so-called liquid smoke

instead of smoked grain. This liquid looks like vanilla extract and is somehow made from smoke residues. I have made two batches of extract-only rauchbier with such liquid smoke, and both brews turned out undrinkable. Given the tricky process involved in making smoked grain, I am convinced that there is no way anyone can make a clean-tasting, appetizing, and authentic extract-only rauchbier by the liquid-smoke method. For this reason, I can't recommend using it.

For hops and yeast, stick with the standards: Any German- or American-grown noble hops, as well as a solid German-style lager yeast, such as Wyeast 2206 or White Labs WLP830.

Rauchbier and Food: A Perfect Match

Because rauchbier is not a delicate brew, it goes extremely well with bold, full-flavored foods, such as smoked ham, smoked pork, smoked salmon, smoked sausages or smoked cheeses (smoked provolone or smoked gouda are great!). The smoky flavors in the beer and food complement each other. Rauchbier also tastes great with some unsmoked foods, such as lamb chops.

There are those beer drinkers who consider rauchbier strictly an acquired taste. They will have none of it, because they find its smokiness a bit too robust, assertive or even overpowering on their palate. If you wish to serve your rauchbier to such rauchbier-haters, you simply have to do so in your cooking. Everybody will love what rauchbier can do to pork ribs, a pork roast or a suckling pig on a spit.

Grilling with Rauchbier

Here is a recipe for using your rauchbier as a marinade and a BBQ basting liquid at your next outdoor (or indoor) party. Quantities are based on two pounds of pork roast or pork ribs, whichever you prefer. Adjust quantities if you are cooking more or less meat for the party.

Dice two onions into about a pint of rauchbier seasoned with a teaspoon each of ground pepper, ground caraway and salt. Marinate the meat in the seasoned rauchbier for 24 to 32 hours in the refrigerator.

After marinating, place the meat in a BBQ (or in your oven) and grill at 450° F until done (about two hours). Baste the meat liberally, at least once every half hour, with the marinade. About ten minutes before the meat is done, cut carrots into strips (julienne-style) and boil them in rauchbier until al dente.

Serve the meat and vegetables with a hearty potato salad and garnish the plate with a sprig of fresh parsley. Wash the meal down, naturally, with flutes of rich, creamy rauchbier. Instead of pork, you can also cook a leg or rack of lamb, using the same cooking technique. ■

Horst Dornbusch is the author of "Prost! The Story of German Beers" (1997, Brewers Publications).

making GREAT WINE from kits

Everyone knows that good grapes make world-class wine. But in recent years, the quality of kit wines has improved enough to impress even the most dedicated fresh-fruit purist. As a homebrewer, you can also try your hand at wine-making with the new generation of kits that are available. You already have most of the equipment, such as fermenting buckets and carboys. Plus, you have a solid grasp on the basic skills needed for wine kits, such as sanitation, racking and siphoning, and using a hydrometer. Making wine from kits as a homebrewer is easy and you'll be impressed with the final quality of your first batches.

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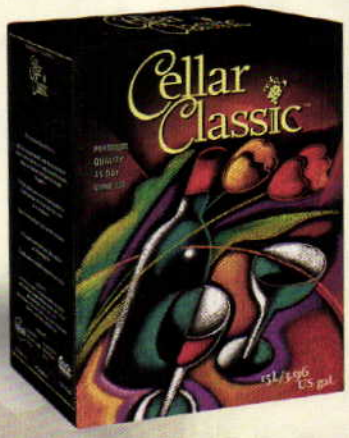

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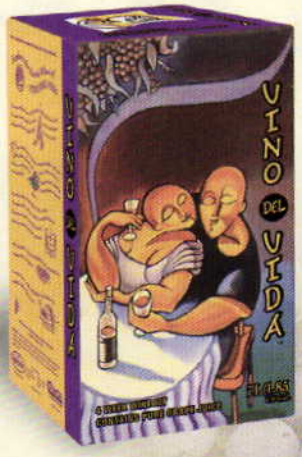

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Another bonus: Many kits are all-inclusive. They contain all the additives you'll need, pre-measured. The recipes are easy to follow and the results are fairly predictable.

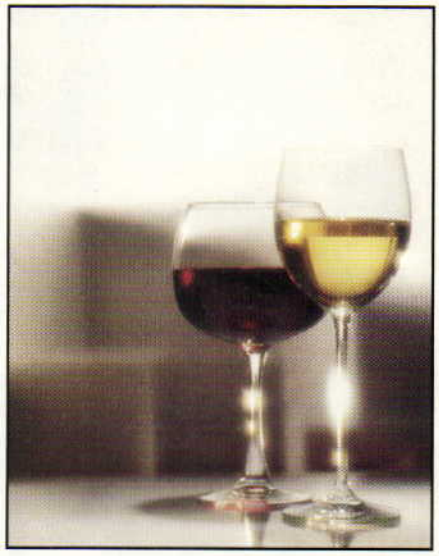
There are four main types of wine kits: sterile juice; fully concentrated grape juice; partially concentrated grape juice; and kits that combine juice and concentrate. Many wine kits will also give you a clear idea of the length of time required before the kits will be ready to bottle, such as four-week or six-week kits.

The approach to making wine from these kits is similar. The only difference is that the all-juice kits require no additional water. These kits tend to be the most expensive due to juice's comparative purity and costly transport (it weighs more than concentrate). Grape concentrates are simply grape juices that have had their water removed through a high-tech process. Some kits are fully concentrated; you have to add water, and sometimes sugar, before making the wine. Juice-concentrate kits require less water added back.

Kit prices should directly correlate to the purity of the product. Higher-percentage juice kits and those with a higher percentage of a specific wine grape will tend to be more expensive.

As mentioned earlier, as a homebrewer you already have most of the equipment you'll need to make wine. You'll use a primary fermenter, a long-handled stainless-steel or food-grade plastic spoon, a glass carboy with airlock, siphon tubing, and a hydrometer.

A typical wine kit recipe will contain one bladder pack of juice and/or concentrate, a yeast packet and several numbered, pre-measured and pre-mixed additive packets. To get started, open the can, pail or bladder pack in your kit. Taste the contents — they should be clean, sweet and fruity. Then pour the contents into a sanitized primary fermenter and add the first group of ingredients called for in the recipe (water, any wine acids, grape tannins and nutrients, and sometimes oak chips, depending on the wine style). The recipe will be very specific and is meant to be followed.



As a homebrewer, you have the necessary skills and the equipment. Now all you need to do is try out a wine kit for yourself!

BY JOE AND DENNIS FISHER

Brewing with HONEY

HONEY IS A VERSATILE, HIGHLY FERMENTABLE INGREDIENT THAT CAN ADD A BIT OF BUZZ TO ALMOST ANY BEER STYLE. SO PUT SOME BEE IN YOUR NEXT BATCH OF HOMEBREW!

When people think about honey brewing, one word comes to mind: mead. The classic honey wine, drink of the druids and Vikings, mead is the heavy hitter of honey drinks. Along with variants like pyment (grape mead), cyser (apple mead) and metheglin (spiced mead), mead seems to corner the market on honey fermentation. But what else can you do with honey?

The answer is: plenty. Honey is a versatile, highly-fermentable substance that's great in specialty and holiday beers, nut brown or pumpkin ales, and especially strong beers that you intend to age for a while. But just about any style can benefit from honey. Cream stouts, porters, light lagers, pale ales and witbiers, not to mention Belgian ales, are just a few of the possibilities.

Honey's Contributions to Beer

Why add honey to beer? For the most part, the brewer adds honey for the same reasons that you would add any sugar: to raise the alcoholic content of beer while lightening the body. The goal may also be to add some sweetness. But honey ferments out so completely (95% of the carbohydrates) that very little honey character will be left in the beer — unless you take special precautions.

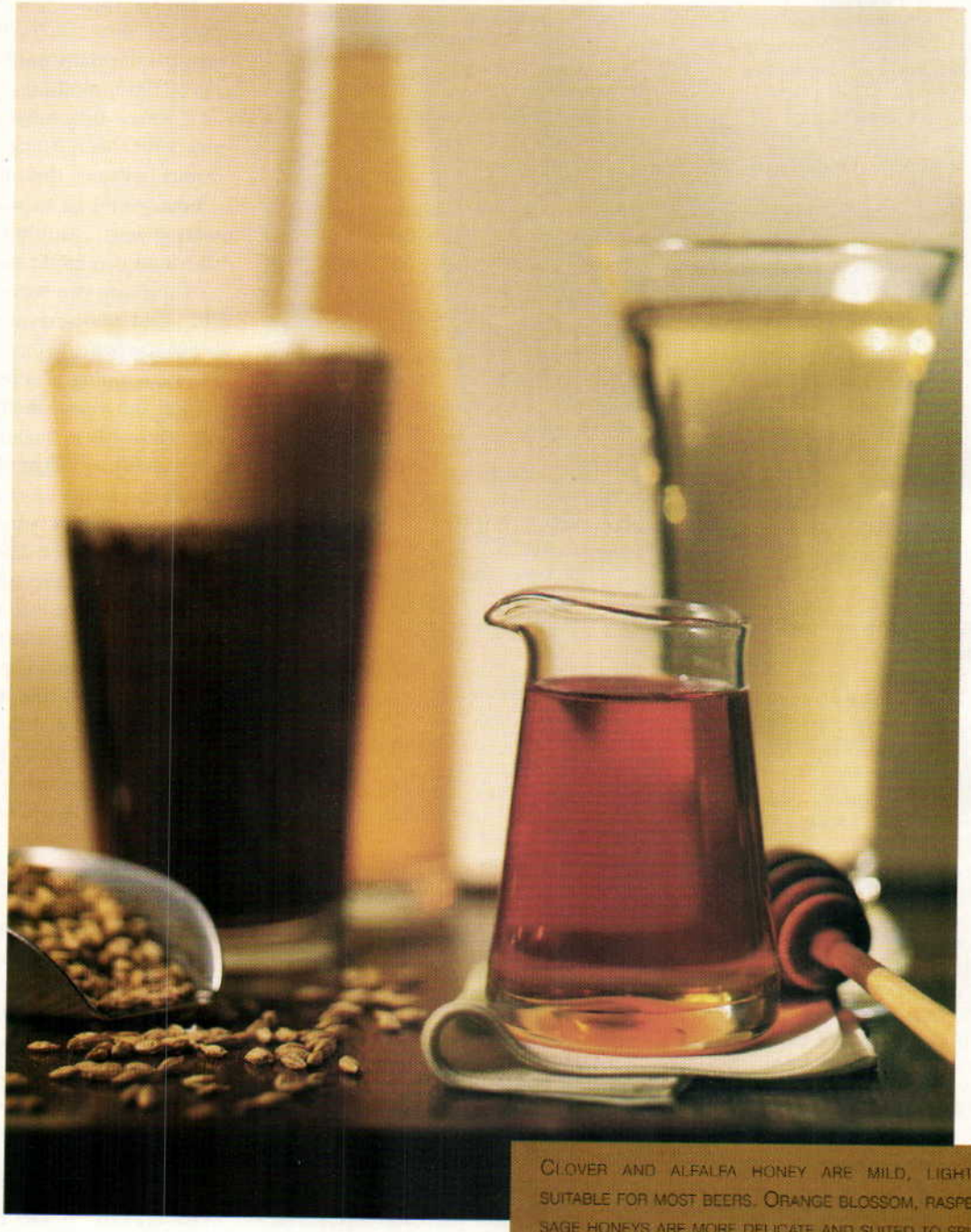
In fact, many honey beers have no residual sweetness. So the essential rule is, if you want a lot of honey character, add diluted, heat-treated honey to the primary fermenter (more on how to heat honey later). And if you want more alcohol, add honey to the boil.

The real strength of honey is that it adds potency and lightness to beer, as other sugars do, yet smoothes out the roughness that inevitably comes from adding sugar. We've found that honey also seems to knock the bitter edge off the hops while allowing some of the more subtle hop character to come through. Of course, if you want a strongly hoppy honey beer, you can always add more high-alpha-acid hops to the kettle. Honey also adds subtle floral notes and aroma to beer, thanks to the various pollens and nectars used by bees in its production.

Honey is an all-natural substance, and is best for brewing in its raw, unheated and unprocessed state. At this point all of its vitamins, antiseptic qualities and nutrients are intact. The crystal-clear honey you see in the supermarket has been heat-treated and filtered to stay that way. Not that your basic commercial honey won't make good beer. If that's what you can get, that's what you should use. Another point in favor of honey beers is that they don't take as long as most meads. We like mead and make it once in a while (we're drinking a nice strawberry mead right now), but it's hard to wait for the yeast to digest all of that fructose. Meads can take months to ferment out completely, and should be aged at least a year. Honey beers, on the other hand, take only a few weeks to ferment and age to perfection in a month or so.

Brewing with Honey

Honey is flower nectar that is gathered, condensed and stored by bees. It contains roughly 80 percent sugars, mostly glucose and fructose (with some other sugars and complex



photos courtesy of National Honey Board

CLOVER AND ALFALFA HONEY ARE MILD, LIGHT HONEYS SUITABLE FOR MOST BEERS. ORANGE BLOSSOM, RASPBERRY AND SAGE HONEYS ARE MORE DELICATE AND SUITED TO SPICED ALES, HOLIDAY BEERS AND LIGHT LAGERS. WILDFLOWER HONEYS ARE DARKER, ROBUST AND FRUITY, MATCHING WELL WITH PALE ALES, FRUIT BEERS, SPICED BEERS AND STOUTS. BUCKWHEAT HONEY IS THE DARKEST AND STRONGEST OF ALL, AND SHOULD BE RESERVED FOR STOUTS AND PORTERS.

RECIPES

Passagassawakeag Porter (5 gallons, extract with grains)

OG: 1.085 FG: 1.020
SRM: 25 IBU: 25–30

Mighty malty with a nice hop nose, slight bitterness and a strong alcohol bite, this is a powerful sipping beer.

Ingredients

0.25 lb. roasted malt
1 lb. British crystal malt (80° L)
2 lbs. Munich malt
3 lbs. dark crystal dry malt extract
4 lbs. Edme IPA kit
1 qt. wildflower honey
6 AAU UK Progress hops
(1 oz. of 6% alpha acid)(60 min.)
2.5 AAU East Kent Goldings hops
(0.5 oz. of 5% alpha acid) (60 min.)
0.5 oz. East Kent Goldings hops
(15 min.)
0.5 oz. UK WGV hops (15 min.)
(Whitbread Goldings Variety)
0.5 oz. UK WGV hops (2 min. steep)
True Brew Thames Valley II ale yeast
or Wyeast 1968 (Special London)
0.6 cup corn sugar for bottling

Step by Step

Heat 3 gallons cold water to 155° F. Mash-in grains and hold at 150° F for 1 hour. Sparge with 3 gallons of 170° F water and collect 5.5 gallons runoff. Add extracts and honey and stir to dissolve. Bring to a boil and follow hop schedule above. Cool wort to 75° F and rack to a carboy. Top up to 5 gallons (if necessary) and add yeast. Ferment at 65° F for 3 to 4 weeks. Bottle or keg when fermentation is complete. Age beer 6 weeks before tasting.

All-grain option: Replace the dark crystal malt extract and Edme ale kit with 1 more lb. of British crystal malt (60° L) and 9 lbs. English mild ale malt. Add another 0.5 oz. Progress bittering hops to replace hop extract in the kit.

Beer Cabinet Bee Brew (5 gallons, extract with grains)

OG: 1.070 FG: 1.015
SRM: 2 IBU: 32

A good clean pilsner we brewed last winter from leftover ingredients.

Ingredients

0.25 lb. Vienna malt
0.5 lb. pale malt
2 oz. toasted malt
3.3 lbs. Muntons hopped light extract
2 lbs. hopped extra-light dry extract
1.25 lbs. light dry extract
2 lbs. clover honey
5.5 AAU Chinook hops
(0.5 oz. of 11% alpha acid) (30 min.)
1.5 oz. Willamette hops (15 min.)
0.5 oz. Saaz hops (3 min. steep)
Wyeast 2007 (Pilsen Lager) yeast or
White Labs WLP800 (Pilsen Lager)

Step by step

Mash-in grains with 2.5 gallons of 160° F water. Hold at 160° F for 30 minutes, strain and sparge with 0.5 gallon boiling water. Add extracts and honey, bring to boil. Boil 10 minutes before adding hops. Boil, following hop schedule above. Cool wort to 75° F with a wort chiller. Strain into a carboy with 1.5 gallons chilled water. Top up to 5 gallons and add yeast. Ferment at 40 to 45° F for 1 to 2 weeks. Rack off to a secondary and lager for 6 weeks. Bottle or keg when lagering is complete. Age 6 weeks before tasting.

Honey Basil Ale (5 gallons, all grain)

OG: 1.062 FG: 1.012
SRM: 10 IBU: 25

This beer uses the pasteurization method of adding honey, as well as fresh basil leaves for extra bitterness.

Ingredients

0.25 lb. toasted malt
0.3 lb. wheat malt
6.5 lbs. English mild ale malt
0.5 lb. unpasteurized raw honey
5.5 AAU Willamette hops
(1 oz. of 5.5% alpha acid) (60 min.)
0.5 oz. fresh basil leaves
0.5 oz. Willamette hops
Wyeast 1052 (American Ale) yeast
3 lbs. pasteurized alfalfa honey
0.6 cup priming sugar

Step by step

Raise 3 gallons water to 160° F. Add 0.5 lb. unpasteurized raw honey, stir to dissolve, mash in grains and hold for 45 minutes. Sparge with 3 gallons 170° F water and collect 3.5 gallons runoff. Boil 20 minutes. Add hops according to schedule above. Turn off heat, add aroma hops and basil and steep 15 minutes. Chill to 75° F and rack to carboy. Take hydrometer reading of wort. Do not top up. Add yeast. Make honey solution with 2 gallons water and 3 lbs. pasteurized alfalfa honey, to match wort gravity as detailed in article. Put honey solution in a sanitized, sealed glass container. When yeast is at its most active (8-12 hours after pitch), add solution. Ferment at ale temperature 3-4 weeks. Bottle or keg when complete.

carbohydrates thrown in), 17.5 percent water, proteins and amino acids, trace amounts of vitamins and minerals, anti-oxidants and enzymes. Wild yeast may also be present.

Owing to its low water content, honey is very stable. Its microorganisms are dormant until they access an appropriate medium, such as your wort, where they have the potential to spoil your beer. Honey also contains various enyzmes that, if not denatured by heat, could go to work in your fermenting wort, resulting in a beer that's drier than you might have intended.

There are two ways of dealing with wild yeast and enzymes. The method we use use is brute force. Adding honey to the beginning of a long, furious boil will kill the yeast, deactivate enzymes and remove any beeswax. The downside is that the delicate flavors and aromas of the honey may be lost, and no residual honey sweetness will remain in the finished beer. The other alternative involves "home pasteurizing" the honey and adding it to the fermenter.

If you are motivated to try the pasteurization method, here it is. Note that a beer produced this way will have to be mashed at a slightly higher temperature (155-162° F) to produce enough dextrins to compensate for adding the diluted honey. It will also be useful to brew a smaller batch to allow carboy space for the honey water. To prevent alcohol levels from becoming too high, start with low- to medium-gravity beers when using this method.

Preheat the oven to 176° F. Place the honey in a sanitized, oven-proof saucepan. Heat the honey on the stovetop to 176° F. The honey should be stirred occasionally to avoid burning it. When the honey reaches 176° F, cover the pan and place it in the oven. Use a thermometer, and hold the honey in the oven at 176° F for 2.5 hours. Then bring the honey to room temperature by placing it in an ice bath. (If you can't hold the honey mixture at precisely 176° F, any temperature from 176–185° F will be fine.)

Now add the honey to sufficient boiled water to match the starting specific gravity of your beer. Honey varies tremendously in most of its character-

istics, including specific gravity. As a rough guide, 1 pound of honey dissolved in 1 gallon of water should yield an SG of about 1.032 to 1.038.

Start by taking a gravity reading of your beer wort. Say you're brewing a nut brown honey ale with a gravity of 1.040. You've brewed a three-gallon batch at high mashing temperatures, and you'd like to add some clover honey. Bring two gallons of water to a boil. Take a gravity reading of the water (it should be 1.000 at 70° F). Dissolve one pound of honey in the water and take another reading (it should be 1.017 to 1.019). Use this figure and some simple math to estimate the amount of honey needed. Continue adding honey and taking readings until a reading of 1.040 is reached. Depending on the gravity of the honey, it could take from 1.10 to 1.36 more pounds of honey to reach target gravity. When the wort is at high krausen (when the yeast activity is at its peak), add the honey.

The National Honey Board in Longmont, Colorado has done research into the effects of honey on beer. Their recommendations for amounts of honey added to a batch of beer (as a percent of total fermentables) are: 3 to 10 percent honey produces a subtle, floral flavor and delicate aroma; 11 to 30 percent produces a robust honey flavor that should be balanced by strong hop flavors, spices, or darker specialty malts; above 30 percent produces beer dominated by honey flavor, which verges on being what medieval brewers called "braggot."

The sources of nectar used by bees influence both the color and flavor of honey. Matching types of honey to beer styles is an inexact science, but in general the stronger and darker the honey, the stronger and darker the beer. Clover and alfalfa honey are mild-flavored, light honeys suitable for most beers. Orange blossom, raspberry and sage honeys are paler and more delicate, suited to spiced ales, holiday beers and light lagers. Blueberry and wildflower honeys are darker, robust and fruity, matching well with pale ales, fruit beers, spiced beers and stouts. Buckwheat honey is the darkest and strongest of all, and should be reserved for stouts and porters. You might also try honey from the tupelo tree, which is highly prized and has a distinctive flavor.

Getting your hands on some honey

Our honey bill for brewing is close to twenty pounds annually. Buying that much at retail prices can get expensive. One path to good, cheap honey is the beekeepers at your farmers' market. They are usually happy to strike a deal for bulk honey, and often have buckets that have slightly crystallized but which are fine for brewing. You can also check www.honeylocator.com. This National Honey Board site helps you find honey suppliers all across the country, and you can search by honey variety and location. ■

Rx FOR BREWING PROBLEMS

by **MARTY NACHEL**

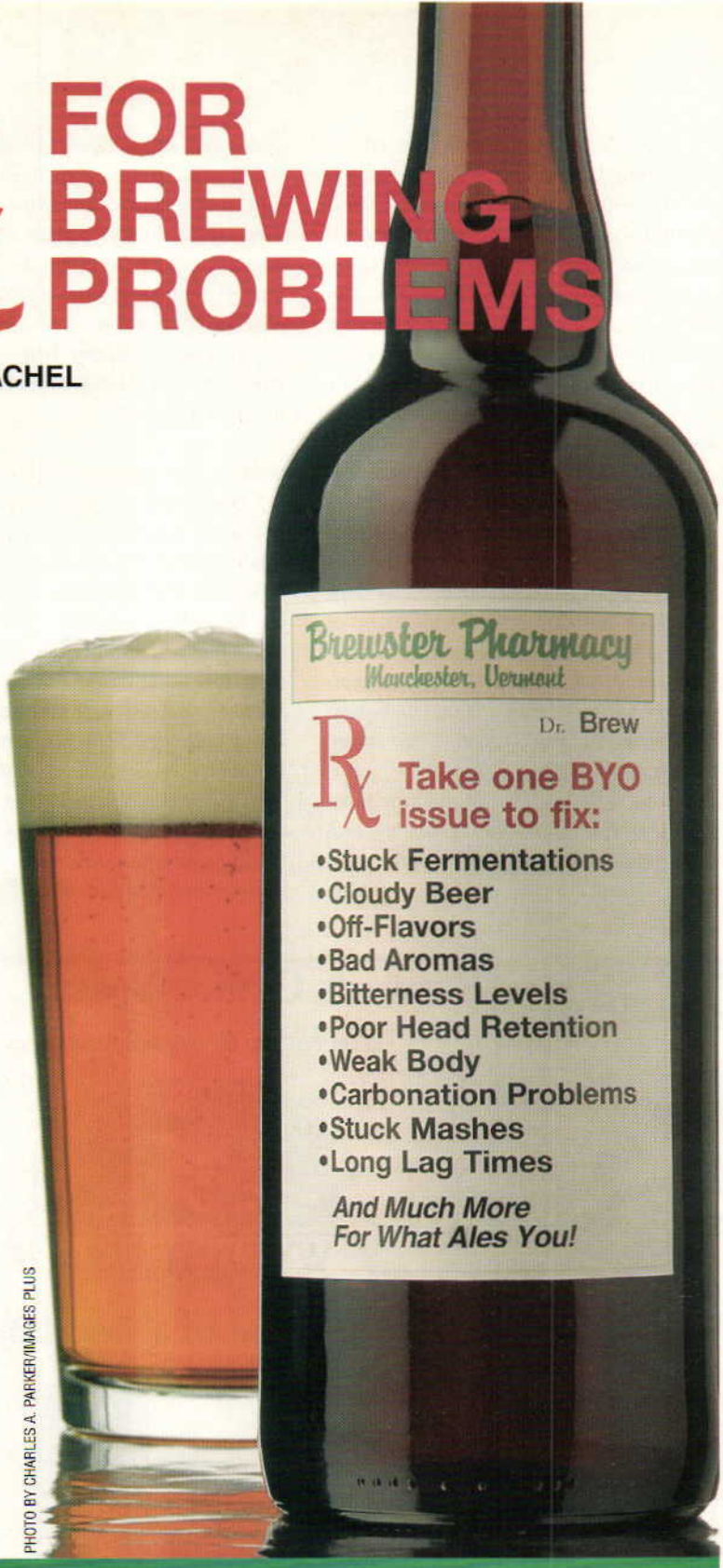


PHOTO BY CHARLES A. PARKER/IMAGES PLUS

Making beer at home is simple. But making good beer on a consistent basis is a bit more tricky. Here's how to prevent common problems, avoid mistakes and fix a batch gone bad.

In a classic scene from a "Three Stooges" episode, Larry, Moe and Curly discover what has caused their freshly brewed beer to wildly churn and froth. As the amateur brewmasters were distracted by phone calls and other diversions, they each, in turn, added more yeast to the brew. These tripled efforts eventually caused their 185 bottles of Panther Pilsner to erupt with volcanic fury, dousing them with bazooka blasts of beer and foam. Woob! Woob! Woob! Woob!

Since these hijinks were simply for our viewing pleasure, we can forgive the madcap trio their lack of technical accuracy when it comes to making beer (since when do you brew, ferment and bottle all in the same day?). After all, their blunders are meant to be entertaining. But it's not so amusing when these blunders happen to you.

Making beer at home is fairly simple; making good beer on a consistent basis is a bit more difficult. The process is fraught with potential problems all the way from brewing to bottling. In this article we will identify the most common mistakes made during the brewing process, along with straightforward corrections and suggestions on avoiding these mistakes in the future.

Recipe For Disaster?

A handful of problems in brewing begins with the recipe, with weights and measures being among the most prevalent. It's not just a matter of the "correct" ingredients, but **using the proper quantities of ingredients.** Novice brewers sometimes fail to note the relationship between the amount of malt extract (or base grain) and the resulting specific gravity. Also important is the relationship between the amount of malt extract and the quantity of hops required to properly balance the flavor of the beer. Specialty grains can easily be misused, with the "if a little is good, a lot is better" mindset. Judicious use of specialty grains — especially dark roasted grains — is important. Additives are often used with little knowledge of their effect on the beer. And adjunct sugar content

should be kept to a minimum (the effects of these sugars on the taste of your beer will be covered later).

Time and temperature are also important measurements to consider. Specialty grains should be steeped — note that this is done at sub-boiling temperatures of 170° F or so — for about 20 to 30 minutes in order to maximize the yield of their color, flavor and scant sugars. For most brews, a good 60-minute rolling boil is considered standard practice. This time is sufficient to create "hot break" (precipitated proteins that separate from the rest of the wort) as well as complete isomerization (dissolving) of hop alpha acids which imbue the beer with bitterness. DMS (dimethyl sulfide) removal is another important feature of the boiling phase.

Time and temperature also represent two of the three most important variables in mashing (pH level is the third). On the opposite end of the thermometer are the cool temperatures required to properly ferment and age lagers — not to mention the doubled length of time required for the traditional lagering process.

There are plenty of good resources for beer recipes out there, in print and online; use them to your brewing advantage. **Always remember to pay attention to weights and measures, times and temps.**

Mashing and Sparging Problems

Mashing and sparging procedures often cause all-grain brewers — even experienced ones — to suffer conniptions. This is due to the number of procedures required to brew beer from grain, multiplied by the number of variables involved.

The ultimate goal of most grain brewers is to achieve high efficiency levels, that is, to derive the greatest possible amount of soluble sugars from their grain. When minimum efficiency levels are not reached, the resulting beer will either be thin and lifeless or the wort may have to be condensed into a smaller volume.

Here are some ways to improve your mash efficiency. Start by using more highly modified malt, which offers a greater quantity of fermentable sugars right from the start. British malts are typically more highly modified. **Correct milling** of grain is also important; proper milling requires that the husk be cracked open to expose the starchy interior without reducing the grain to dust that will later cause sparging problems. Make sure you have the **correct mash consistency**, i.e. water-to-grain ratio. A good ratio is one and one-third quarts of water per pound of grain in your recipe (9 lbs. grain = 12 quarts water).

Now pay close attention to the three important mash variables of **time, temperature and pH level of your mash water**. Once the grain and water are mixed in your mash tun, you need to set the proper pH; measuring can be done with pH test papers or an electronic pH meter. A pH reading of 5.0 to 5.5 (slightly acidic) is considered optimum for most beer styles. You can adjust the pH of your mash by adding a tablespoon of gypsum to lower the pH (or acidify the mash) or by adding calcium carbonate or sodium bicarbonate to raise pH (or make the mash less acidic). Precise mash temperature is important because key enzymes, which are needed to make the grain's endosperm (where the maltose sugars are stored) soluble, perform differently at various temperatures. Proper temperature and timing is needed to break down and extract the maltose sugars during mashing procedures.

When bottles explode on "The Three Stooges," it's hilarious. When it happens to you, it's not.

After mashing has been completed, you need to drain the syrupy wort away from the grain bed. In doing so, you want to leave behind as much of the particulate matter as possible and you want to recover as much of the sugary liquid from the grain bed as possible. The grain bed itself is a practical filter, so re-circulating the wort back through the grain bed will allow you to clear the wort of a lot of particulate matter. In order to do this efficiently you have to **keep the sparge water and the grain bed at the proper temperature** to allow the thick wort to flow better. Remember to maintain proper pH levels in the sparge water, and not to over-circulate the wort. Otherwise you risk extracting harsh tannins from the grain.

Most all-grain brewers would agree that there's no frustration in brewing worse than a stuck sparge. This means the grain bed becomes compacted and will not allow the sparge water to pass through it. This problem can be avoided or minimized by employing a couple simple methods. First, **always sparge at a steady rate**; add fresh sparge water at the same rate that the wort is being drained. Never let the water "channel" down through the grain. Always keep a shallow pool of sparge water at the top of the grain bed as well as an "underlet" or pool of water below or at the bottom of the grain bed. Finally, when brewing any beer style whose recipe calls for a large quantity of huskless grains, such as wheat or rye, consider adding yeast hulls to the grist. These flavorless hulls work to keep the grain bed porous.

Taking another tack, you might want to **give "no-sparge" mashing a try** and simply drain off the "first runnings" of the mash. Should you choose this method to brew a full-volume beer, you'll want to modify your recipe: Because you are not sparging the grain bed, you won't be achieving the full potential of your mash and, therefore, you won't reach the target gravity. Increase the base grain by a couple of pounds per 5-gallon batch. Whether you sparge or not, re-circulating your wort to clarify it is still a good idea. *(For more on this technique, see "Skip the Sparge" in the May-June BYO.)*

Lag Time

As most of us know, yeast quality and quantity is of great importance, the lack of which can lead to some

Over-carbonation can be caused by poor sanitation, residual sugar or too much priming sugar.

What's that funky taste and smell? Learn to evaluate and identify off-flavors and aromas in your beer.

Stuck fermentation? Rouse the yeast, move it to a warmer spot, or add more yeast and nutrients.

common problems. First up is a problem referred to as **long lag time**. This is the amount of time elapsed between pitching the yeast and visible signs of active fermentation. The golden rule is simple: the shorter, the better. In other words, the sooner the yeast kicks in and begins fermentation, the healthier and better-tasting your beer is likely to be. A lag time of 12 hours or less would be considered good; a lag time of 24 hours or more may be inviting a host of problems. It's during lag time that any bacteria present in your wort or on your brewing equipment is likely to begin contaminating your beer.

So, how can a brewer reduce lag time? There are a number of ways. First, make sure the wort is properly prepared for fermentation. This means **chilling the wort down to room temperature** (typically between 65–75° F). Chilling hot wort can be done with cold sink baths (placing the brewpot in a sink filled with cold water), by using a wort chiller (either the simple immersion type or the more effective counterflow type) or by adding cold top-up water in the fermenter. If you really want to chill your wort quickly, you can do all three.

Also **be sure your wort is aerated — after it has been chilled**. Yeast requires oxygen for reproduction, which is an important opening phase of fermentation. You can aerate wort by vigorously pouring the cooled wort into the fermenter (the least efficient method), by adding aerated top-up water or by using a sanitized "beer stone" which, when hooked up to a canister of oxygen or to an air pump, diffuses air bubbles into the wort.

Now **make sure you have the proper quantity of yeast** on hand for pitching. When using sachets of dried yeast, always opt for larger sizes or double up on packets, and always "proof" or re-hydrate the dried yeast in water before pitching. When using liquid yeast strains, consider making what is commonly called a "yeast starter." This is highly advisable at all times, especially when the yeast is old or the beer has a gravity of 1.060 or higher. Making yeast starters for lager beers is standard practice; doubling the typical amount of bottom-fermenting yeast is considered crucial to making good lager beer. When it comes to yeast, more is generally better.

Before pitching the yeast into the wort, it's a good practice to make sure both are at a similar temperature.

Over- and Under-Attenuation

Along with fermentation, brewers are sure to acquaint themselves with the concept of attenuation. Attenuation refers to the yeast's consumption of fermentable sugars in the wort and their transformation into carbon dioxide and alcohol. The attenuation process essentially thins out the beer. Beer can be rendered both under-attenuated (thick and sweet) or over-attenuated (thin and dry), depending on a number of factors.

Under-attenuation occurs when fermentation is not completed; this may be a yeast problem or it may be a brewer problem. Yeast that fails to complete fermentation may have been affected by residual sanitizer still in solution due to poor rinsing, by lack of dissolved oxygen in the wort, by cold temperatures, by extremely high or low pH levels in the wort, or the yeast itself may have been old and fatigued and incapable of multiplying in numbers great enough to complete fermentation. Also, certain liquid yeast strains are known to have low attenuation rates and may have to be roused during the fermentation cycle — consult the manufacturer's data regarding yeast attenuation. Sometimes, for many of the same reasons mentioned above, fermentation may become "stuck" and the process slows way down or stops. Should this happen, the brewer should take immediate action. Typical remedies include agitating the yeast by shaking or stirring the wort (making sure that anything that comes in contact with the wort has been sanitized), moving the fermentation vessel to a warmer location, or adding more yeast or yeast nutrients to the wort.

The brewer may also be at fault for interrupting fermentation before it is complete. The results can be disastrous, from sweet, cloying beer to exploding bottles. This often happens

when a brewer relies on "airlock watching" or "bubble counting." Although vigorous fermentation may subside within a few days of pitching the yeast, an average-gravity brew should still be given a minimum 5- to 7-day primary fermentation, followed by an extended secondary fermentation in a separate vessel before bottling. **Complete fermentation should always be verified with a hydrometer.** (If the specific gravity reading remains constant for three days, you're probably safe.) Malt sugars are approximately 70–80 percent fermentable by beer yeast, so by rule of thumb your beer's final gravity reading should be about 20–30 percent or less of the original gravity reading.

Over-attenuation is a problem of a different sort. **When over-attenuation occurs, your wort is left with very little residual sugar** and the resulting beer is dry, tart and noticeably alcoholic. The causes of over-attenuation are many, from long, warm fermentations to alien bacterias. Over-attenuation can also be due to wild yeast, the so-called "super attenuators."

If over-attenuation is a recurring problem in your beer, **start with impeccable sanitation**. If any uninvited bacteria are allowed to breed in your wort, they may consume a lot of the sugars not normally fermented by beer yeast. This will leave your beer considerably drier and "throat-warming" due to elevated alcohol levels. **Make sure the temperature of the fermentation does not exceed 70° F** (remember that fermentation itself is capable of raising wort temperature).

For most ales of average gravity, three weeks' combined fermentation (primary and secondary) is sufficient time for the yeast to do its job. Allowing your beer to ferment and age beyond this length of time has diminishing effects on your beer (lagers not included). Unless your brew is a barleywine or similar high-gravity style, the longer it sits, the more likely it is to suffer even slight over-attenuation.

Yeast autolysis is a fermentation problem that goes beyond over-attenuation. It refers to the self-digestion of yeast cells by their own enzymes. This slow disintegration and breakdown of the cell membrane releases nitrogen into the wort. The effect of autolysis manifests itself in the aroma and flavor of the beer. At low levels it gives beer a "yeasty" smell and taste; at high levels it is experienced as a rubbery stench.

Since autolysis occurs when fermented beer is left sitting on a sedimented yeast bed for long periods of time, this problem can be avoided by **bottling a beer at the appropriate time, or by racking the beer** over to another vessel when bottling procedures must be delayed. Racking should be considered a short-term avoidance of the problem and not first-choice fix.

Judgment Day

So your beer has been in the bottle for two weeks and you're dying to taste it. You chill a bottle, crack it open, pour it in your favorite beer glass and ... hmmm, not quite you expected. What's that funky smell? What's that taste? Where's the carbonation? This beer was supposed to be amber! What the $#@!! happened!?

Relax, you're not the first homebrewer to blow a batch. But now is the time for reflective evaluation. Before corrections can be made, the problem needs to be properly identified. This calls for sharp senses (sight, smell, taste) and, where necessary, an appropriate vernacular to describe what you see, smell and taste. Fortunately for us brewers, one exists. For a quick guide, see the sidebar on page 39.

Over- or Under-Carbonated Beer and Poor Head Retention

Your beer is as flat as central Illinois or it gushes with the ferocity of a Yellowstone geyser. Carbonation, or the lack thereof, is clearly the problem.

Over-Carbonation. If you failed to properly sanitize your bottles, resident bacteria may have continued to gobble up the sugars that the beer yeast left behind, thus giving your beer an extra-heavy dose of fizz. If your beer was not fully fermented (see under-attenuation, above), most likely residual sugar was left in the brew. By adding priming sugar prior to bottling, you unwittingly

Astringent beer can be caused by over-milling the grain, high steeping or sparging temperatures, or high pH levels in mash and sparge water.

Long lag time? Chill and aerate your wort and pitch enough yeast.

Avoid haze by producing clear wort or by adding a clarifying agent to the carboy.

created a small carbon-dioxide bomb. Even if your beer was fully fermented, adding too much priming sugar can create the same problem; make sure you use the appropriate amount of priming sugar for the volume of beer you are bottling.

Under-Carbonation. If you allowed your beer to ferment for an extended period of time, the vast majority of available sugars were likely consumed (see over-attenuation). Accordingly, the yeast in the beer dropped out of solution, sedimented, and fell back into a dormant state. If too few of these dozing yeast cells are still in your beer when you bottle it, it may take extra time for what little yeast remains to provide the requisite amount of carbon dioxide. Before blaming the yeast, however, **double-check to make sure you used enough priming sugar.** Furthermore, if you failed to properly rinse your bottles, residue from the sanitizer may have killed off the yeast, or at least kept them from doing their job. Temperature is also a consideration — allow your freshly bottled beer to condition at room temp for a week or two before refrigerating it.

Poor Head Retention. With regards to head retention in your beer, the problem may start with lack of carbonation. Without the minimum amount of CO_2 in your beer, your beer may have difficulty mustering a frothy head. But even with plenty of carbonation, your beer may not sport a good rocky cap for long. This problem can be twofold: Either **your beer is lacking in proteins** that hold the head together and create the "Belgian lace" on the sides of your beer glass, or a contaminant is prematurely breaking down the head. Adding more proteins to your beer is a simple fix; head-building proteins come from grain, and wheat malt is an excellent source. Simply steep 1/2 pound of wheat malt in water and add it to your wort. **Head-destroying contaminants may be in your beer** or in your beer glass. Review cleaning and sanitizing techniques or inspect your glassware before using. Dust, lint, cleanser residue, body oils and lip balms may stunt an otherwise normal head. Autolyzed yeast is also a very potent foam killer.

Over- or Under-Bittered Beer

In all my years of evaluating beer, I recall very few instances when I noted too much malt content in a beer. More often than not, when a beer's flavor leaned heavily in favor of the malt, it had more to do with the lack of hop balance than anything.

Hop bittering varies a great deal across the spectrum of beer styles and often requires a bit of finesse (good information also helps). Remember that bitterness from hops can be regulated in at least three different ways.

Hop variety. Each type comes with its own alpha acid (bittering) content, so choose wisely.

Hop quantity. Using more hops usually means getting more bitterness, depending on...

Hopping schedule. This refers to when the hops are added to the boiling beer. The longer hops are boiled, the more the alpha acids are dissolved (isomerized) in the brew; the less time hops are boiled, the less acid that is dissolved. Conversely, the less time hops are boiled, the less bitterness that is extracted and the more hop flavor and aroma is retained. **The best hopping schedule addresses the bitterness, flavor and aroma of beer.**

Three additional observations on under- and over-hopped beers. First, a beer that tastes over-hopped on the day it's bottled may not seem as aggressive a month down the road. Hop bitterness tends to fade as a beer ages, so if you're patient you may be pleasantly surprised. Secondly, **pay as much attention to alpha-acid content as you do to hop variety when buying ingredients**. Alpha-acid contents are not constant; they often change from one growing season to the next. Finally, untrained palates are quick to detect bitterness in beer, but are rarely able to identify its specific source. Hops are often blamed for bitterness that is actually grain-based astringency. If your low-hopped beer still tastes excessively sharp or bitter, you may want to review your grain bill, mill settings and mashing and sparging technique. Any or all of these variables may contribute a harsh, grainy or tannic bitterness to your beer.

Beer Clarity

To the average beer drinker, beer is supposed to be crystal clear. For the average homebrewer, expectations are different: Homebrew, by its nature, tends to be hazy. This haze is due to particulate matter still in suspension, most often yeast cells that are necessary for bottle conditioning. Even if you are unwilling to spend the time and money on filtering and carbonating equipment and procedures, there's still hope for a clear beer. *(For a complete rundown, see "How Clear is Your Beer" in the July-August issue of BYO.)*

Clear beer starts with clear wort and clarifying the wort can be done in a number of ways. Start by adding an ounce of Irish moss to the brew in the last 15 minutes of the boil. This flaky dried seaweed, once re-hydrated, becomes a coagulant that causes proteins and other organic solids to clump together. These clumps will fall out of suspension with the help of gravity. Using Irish moss is especially effective in conjunction with "whirlpooling." When the boil is done and the wort has been cooled, vigorously stir the wort in a circle. The resulting whirlpool will cause any particulate matter in the brewpot to collect in the relative calm in the center of the pot. By gently siphoning the cooled wort from the brewpot into a fermentation vessel, you can leave most of the hot break (precipitated proteins), grain silt and hop solids behind.

Clarification can also be done during secondary fermentation by **adding a clarifying agent to the carboy**; there are a couple of products available. Isinglass, gelatin, Polyclar and bentonite can all be mixed with water and added directly to the carboy. Simply follow package directions.

Occasionally, following the refrigeration of homebrew, a haze appears where before there was none. This is called "chill haze" and it's caused by a drop in liquid temperature; chill haze usually appears around 36° F and dis-

appears around 64° F. Since this temporary cloudiness is the result of precipitation of protein and tannin molecules during secondary fermentation, protein can be removed with Polyclar and tannin with silica gel.

Body and Mouthfeel

One thing I've found lacking in many homebrews is sufficient body and mouthfeel. Body refers to the thickness or viscosity of the beer and mouthfeel refers to its texture. This problem is especially prevalent in brews made from 100 percent malt extract. The fix is to add a pound of two of specialty grains, especially crystal malts.

Lack of body can be attributed to lack of dextrin, a bodybuilding component derived from grain. If your beers suffer from lack of body, **mash a pound or two of dextrin malt** with your base grain. Extract brewers can steep a pound or two of Carapils malt prior to boiling, or **add a few ounces of maltodextrin powder** to the wort as it boils.

Mouthfeel is the term used to describe the tactile qualities of beer on your palate and in your throat. Texture is the part of this tactile quality (along with viscosity, carbonation, alcohol warmth, etc.) that is often attributed to the malt content, including specialty grains. Oats, flaked barley and roasted grains add a "chewy" quality to beer.

Finally, in the interest of improving your beer's body and mouthfeel, **reduce or remove any simple sugars** that may be included in the recipe. Refined sugars such as dextrose (corn sugar) and sucrose (beet or cane sugar) are about 99 percent fermentable and rob your beer of body while adding little in the way of flavor. Limiting other flavoring sugars such as brown sugar, honey or maple syrup to 20 percent or less of the total amount of fermentable material in your beer is advised. ■

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A MATTER OF TASTE

Here are some terms to aid in beer evaluation techniques.

Acetaldehyde: Acetaldehyde can be identified by the smell or taste of green apples. Often this problem can be attributed to refined sugars, which, when fermented, taste cidery or tart. Disregard extract brewing instructions that call for refined sugar.

Astringency: Astringency is a "huskiness" or dryness from tannin in the grain husk. Tannin may be extracted from the grain in several ways: over-milling, high steeping or sparging temperatures (over 170° F) and high pH levels in mash and sparge water.

Diacetyl: Buttery or butterscotch aromas and flavors indicate diacetyl. Diacetyl occurs naturally during fermentation and it also naturally dissipates in a normal fermentation cycle. Obvious diacetyl character may indicate overly warm fermentation temperatures, unhealthy yeast, underoxygenated wort or contamination. Allow a "diacetyl rest" at the end of primary fermentation. Simply wait 2 to 3 days before racking to secondary, so the yeast can metabolize the diacetyl.

Enteric: An enteric is a bacterial contamination that makes beer smell like a soiled diaper! Sanitize, sanitize.

Fusel alcohol: Occasionally, a beer may have a hot or solventy flavor. This is due to fusel alcohol, which is produced at warm fermentation temperatures (above 75° F). It may smell and taste like paint thinner. Keep your fermentation temperature under 70° F.

Harshness: Some beers have a generic harshness; the sources can be varied. Over-hopping, especially when high-alpha hops are used, can often be the culprit. Beer made with hard (minerally) or chalky water can be blamed for harsh beer; if you can taste minerals in your water, consider buying distilled. Contaminated and over-carbonated beer may taste harsh and prickly. Review your sanitation and priming procedure.

Hydrogen Sulfide: Some sulfury odors emanate from the yeast, while others can be traced to bacteria. These odors can smell like rotten eggs or rubber. Move your beer through each stage of fermentation as is appropriate, and review sanitation procedures.

Oxidized: When wort or beer is exposed to oxygen it becomes oxidized, a condition that leads to premature staling. When mildly oxidized, beer can smell or taste papery; when heavily oxidized, beer can smell or taste like cardboard. Oxidized beer stored long-term takes on a sherry-like character.

Minimize your beer's exposure to oxygen, especially while the wort is still warm. Avoid splashing the wort or beer during racking and consider using oxygen-absorbing caps when bottling.

Phenol: This class of compounds is identified by aromas and flavors that seem medicinal or plastic. Most phenols are produced by wild yeast. Chlorophenol is a byproduct of chlorine, which suggests poor rinsing following bleach-sanitizing.

Sour or Tart: Spoilage bacteria often produce lactic or acetic acids which range from a mild grapefruit-like tartness to the mouthpuckering sourness of lemons or even vinegar. Assuming your beer is not one of the beer styles for which tartness is intentional (gueuze, lambic, Berliner Weiss), chances are it is irreparably damaged.

Vegetal: Vegetal aromas and flavors (cabbage, cauliflower) are the result of bacterial contamination during lag time. Dimethyl sulfide (DMS) is a compound whose aroma and flavor is associated with cooked or creamed corn. DMS originates in malt; when you boil the wort, DMS is created. Typically, DMS is driven out during the boiling process, but the hot wort can continue to create DMS even after the heat is turned off. So cool your wort quickly and minimize lag time. One note: Some DMS is part of the flavor profile of lagers, due to the fact that lager malts produce larger amounts of DMS.

Nyuk, nyuk, nyuk: That's the unmistakable sound of a dimwitted doofus with a propensity for gumming up the works. Don't be a stooge — practice good homebrewing habits!

the beers of FRANCONIA

by MATT COLE

Nestled in northern Bavaria, this region of Germany is home to a startling diversity of beer styles.

Parts of Franconia look as if little has changed since the Baroque period, and many of the beer styles found in modern Franconia echo that long-gone era.

Franconia is a region in Germany, occupying the northern part of Bavaria above the Danube. The cities of Nürnberg, Würzberg, Bayreuth, Bamberg and Kulmbach are located in Franconia. Franconia is not an official state of Germany, but many residents of the region don't consider themselves Bavarian. As such, Franconia has an unofficial flag — a red-and-white shield on a red-and-white background.

Franconia is divided into three political regions: Lower Franconia (Unterfranken), Middle Franconia (Mittelfranken) and Upper Franconia (Oberfranken). However, many residents divide the region into two informal sections — wine Franconia and beer Franconia. The beer section of Franconia, as I found out, produces some of the most interesting beer styles in the world, including the rauchbiers of Bamberg and the high-gravity beers of Kulmbach.

I flew to Franconia last spring on a mission: Seek out the most diverse brewing region in Germany, sample its beers and learn what I could from the local brewers and beer drinkers. Franconia (Franken in German) is littered with old breweries that produce some of the world's classic beer styles.

Franconia is home to about one hundred breweries. Many of these breweries produce beer just for their village or beer garden. In these breweries you will find some of the region's hidden treasures. I remember sampling a roggenweizenbier (rye wheat beer) served straight from a wooden cask at a village brewery. The clay mugs it was served in were used not only to hide the cloudiness of the brew, but to keep it cold as well. Once the beer was consumed, customers laid their empty mugs on their sides to signify they were ready for another beer. Often, the beers from these village breweries do not fall into normal beer-style categories. This particular brew was also known as bauernbier, or farmers' beer, and was produced with a local, organically-grown rye malt.

The arrowhead-shaped region of Franconia is located in Germany's northern Bavaria. It offers the most diverse selection of beers in the country and one of the largest concentrations of breweries in the world.

More than 25% of all the beer produced and consumed in Germany comes from Franconia. And unknown to most beer lovers, Franconia offers the most diverse selection of beers in Germany. Franconians are serious about their beer!

My first stop was to explore some of the breweries in Bamberg. Bamberg dates back to the Holy Roman Empire, and in some ways it's like a town in a fairy tale. Stepping through the streets of Bamberg is like strolling back in time. This historic city of 70,000 people was left untouched by World War II, unlike nearby Nürnberg. Bamberg sits on seven hills and is home to hundreds of medieval buildings, many in the Baroque style. The most famous attraction is the Emperor's Cathedral, which towers over the city. This cathedral was once a guarding castle, securing trade between east and west. The sights of the city amazed me, but I was there for the beer.

My main reason for visiting Bamberg was to seek out the classic breweries of rauchbier, mainly the most famous of Bamberg's beers — Aecht Schlenkerla Rauchbier. Schlenkerla's historic tap is in the heart of the old city. I arrived very early in the morning, around 9 AM. Much to my pleasure, the fortress-like doors were open. The taproom was bustling with patrons enjoying smoked beer and smoked ham, a Bavarian specialty. I ordered a Schlenkerla that was tapped, according to tradition, directly from a gravity-fed oak cask. I remember an intense smokiness at the first sip, finishing through the palate to a clean, long, dry finish. I'll never forget my first taste of Franconian beer. The gentlemen across from me asked me how I liked the rauchbier. I told him it was better than I could have ever imagined. I continued to chat with him about the classic beers of Bamberg. We had a lot in common, but mainly shared an interest in beer. My newfound friend was soon escorting me around to eight other breweries within this majestic city. The people of Franconia loved to see an American brewer get so excited about their beer.

Another brewery that should not be missed is Mahrs-Bräu in the suburb of Wunderberg. This classic Bamberg brewpub is housed in a wonderful building with windowboxes full of geraniums. The brewery is adjacent to the pub and is visible behind glass. As you walk through the front door, you'll notice hundreds of small lockboxes. These lockboxes contain personal ceramic mugs that are carried to a small service window where beer is served directly from wood casks. The beers include ungespundetes lagerbier, known as "U" beer. "U" beer literally means "unbunged," indicating that conditioning was in an open vessel exposed to the atmosphere. These beers are intentionally cloudy, aggressively hopped and served with a low level of carbonation. They are conditioned in oak casks and often stored in caverns to settle naturally. I enjoyed a "U" beer with farmers who produce barley for the Weyermann malting company. This beer pours with a big, creamy head, has a deep golden color, and a fresh hop aroma that is beautifully balanced.

Bigger, stronger, darker, older . . . this describes the brewing town of Kulmbach. Brewing vessels that are more than 2,800 years old have been found around Kulmbach. These are the oldest brewing relics in Germany. The earliest documented records show cloistered monks producing beer in the 1300s. In addition to a long brewing history, Kulmbach produces more beer per person than anywhere else in Germany. With a population of 30,000 people, it produces about 5,300 liters per person. During my two days in Kulmbach, I remember smelling wort in the air nearly every waking moment. Kulmbach is famous for its dark and strong lagers, namely schwarzbier and eisbock. I toured the Reichelbräu and the Mönchshof breweries and was amazed by the quality and volume of the beers produced. At Reichelbräu, I remember tasting Bayerisch G'frorns (literally, Bavarian frozen matter) dating back five years in the tasting room. This beer is frozen for sixteen days, then matured for eight weeks in oak casks. Each year this brew seems to take on more wine or sherry notes. Another famous Kulmbach brewery is the Erste Kulmbacher Union Brauerei (or EKU). EKU 28 has a very distinctive flavor and contains 28% malt extract before fermentation. EKU has a rich, malty flavor and high alcohol levels. The process of elevating the alcohol content by freezing imparts a significant smoothness to the flavor, resulting in a beer with a unique character and style. Now let's discuss what goes into some classic Franconian beers.

Water Treatment

The water around Franconia has a relatively low concentration of carbonate, about 125 to 150 parts per million. The mash pH should be around 5.2 to

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RECIPES

Chocolate Schwarzbier
(5 gallons, all-grain)
OG = 1.056 FG = 1.015
SRM = 38 IBU = 33

Ingredients
7.0 lbs. Pilsner malt
1.0 lb. dark Munich (20° L)
1.0 lb. light Munich (8° L)
0.5 lb. aromatic malt
0.5 lb. Carafa III
5.25 AAU Tettnanger hops (90 minutes) (1.5 oz. of 3.5% alpha acids)
1.4 AAU Tettnanger hops (30 minutes) (0.4 oz. of 3.5% alpha acids)
1 oz. Saaz hops (5 minutes)
Wyeast 2206 (Bavarian Lager) or White Labs WLP820 (Octoberfest/Märzen) yeast (make 2–4 L yeast starter)
3/4 cup corn sugar (for priming)

Step by step
Mash with 3.85 gallons of filtered or boiled water at 122° F for 20 minutes. Ramp to 153° F for 60 minutes (and an iodine test indicates full conversion). Mash-out at 172° F. Bring the wort to a full boil and boil for 90 minutes. Add Tettnanger hops at beginning of boil. Add second charge of Tettnanger hops with 30 minutes left in the boil. Add 1 oz. of Saaz hops for final 5 minutes of the boil. Shut down heat, cool wort as quickly as possible. Pitch yeast starter.

Ferment for nine to ten days at 50° F. Rack to secondary. Condition at 33° F for four to five weeks. Prime with corn sugar and bottle.

Extract with grains option
Replace Pilsner and Munich malts with 7.5 lbs. of malt extract (such as Weyermann or Bierkeller). Steep Carafa III and aromatic malt in 3 gallons of 150° F water for 30 minutes. Bring water to a boil, add malt extract and follow all-grain instructions.

Bamberg Rauchbier
See "Style Profile" on pages 21–26 for recipes and procedures to craft an authentic Bamberg-style rauchbier using all-grain, partial-mash or mostly-extract methods.

Kohl's Kellerbier (unfiltered Pils)
(5 gallons, all-grain)
OG = 1.056 FG = 1.012
SRM = 5 IBU = 40

Ingredients
7.0 lbs. Pilsner malt
1.5 lbs. light Munich (8° L)
0.25 lb. CaraHell malt
0.25 lb. CaraFoam malt
0.25 lb. acid malt
9 AAU Hallertauer hops (90 min.) (2.25 oz. of 4.0% alpha acids)
4 AAU Hallertauer hops (20 min.) (1.0 oz. of 4.0% alpha acids)
1.0 oz. Tettnanger (10 minutes)
0.5 oz. Tettnanger (5 minutes)
1.5 oz. Saaz (dry hop)
Wyeast 2206 (Bavarian Lager) or White Labs WLP820 (Octoberfest/Märzen) yeast (make 2–4 L yeast starter)
3/4 cup corn sugar (for priming)

Step by step
Mash with 3.82 gallons of filtered or boiled water at 122° F for 20 minutes. Raise to 151–153° F for 45 minutes. Raise to 170° F for 10 minutes. Lauter as usual. Bring to a full boil for two hours. Add Hallertauer hops 30 minutes into the boil. Add second charge of Hallertauer with 20 minutes remaining in boil. Add two charges of Tettnanger hops with 10 and five minutes left in boil, respectively. Shut down heat. Cool your wort as quickly as possible. Aerate wort and pitch yeast starter. Ferment at 48° for ten days. Cool, then rack to secondary for five to six weeks at 40° F. Dry hop with 1.5 oz. Saaz hops. Prime with corn sugar and bottle.

Partial mash option
Replace Pilsner malt with 5.75 lbs. of malt extract (such as Weyermann or Bierkeller). Steep light Munich, CaraHell and CaraFoam in three gallons of water at 150° F. Omit acid malt. After 30 minutes, remove grain bag and rinse grains with one quart of 150° F water. Bring steeping water to boil, add malt extract. Shorten the boiling time to 60 minutes. Add 11 AAU of Hallertau hops at the start of the boil instead of 9 AAU of hops for 90 minutes.

5.4 pH. The wort should be below pH 6 before the beginning of the boil. If you must add salts, choose calcium chloride rather than calcium sulfate. This will enhance fullness and maltiness as well as produce a softer and mellower mouthful.

Adding one to two percent acid malt can help reduce the mash pH. Acid malt helps lower the mash pH level of the wort, resulting in intensified fermentation and lightened color. Acid malt also helps improve flavor stability. Acid malt should only be used at one to two percent. Whatever you do to your water, remember to dechlorinate by carbon filtration or boiling your water. As an added bonus for those interested in authenticity, the use of acid malt is Reinheitsgebot-compliant.

Hops
Some of the most highly prized hops in the world are grown in or around Franconia, including Spalt and Hallertauer Hersbrucker. These noble hop varieties have a relatively low cohumulone level and a desired flavor profile. These hops are often described as being very aromatic and spicy. Most of these varieties can be used in recipes for bittering aroma and flavor. The choice hop is Hallertauer, as well as Hallertauer Mittlefrüh and Hallertauer Hersbrucker. Most German hops exhibit a low percentage of cohumulone (a type of alpha acid).

Other suitable hop varieties would include Perle, Spalt and German Tettnanger. If you feel inclined, American varieties work well. I suggest Mount Hood, Ultra, Liberty and Crystal. Most breweries here use three additions in the kettle. Try producing a Kellerbier conditioned on dry hops. Whatever hops you decide to use in your beer, make sure they are fresh and not cheesy or oxidized.

Base Malts
A world-class beer begins with a world-class malt and Germany is full of world-class malting companies, including Weyermann. German Pilsner malt, or Pils malt, is the most common type of base malt. These malts have little color, usually around 1.5–2.1 degrees

Lovibond. Beers made exclusively with this malt tend to have a straw-like color. This malt exhibits a thinner body and a crisper flavor than English pale malt. Pilsner malts tend to be much less modified than pale malt. These malts should undergo a protein rest at around 122° F for 20–30 minutes. Pilsner malts can constitute 60–100 percent of your grain bill, depending on the style you are making. For extract brewers, Pilsner malt extracts are made by Weyermann and Bierkeller.

Munich and Vienna malts can be used as base malts, but are better suited for additions to the base Pilsner. These malts rarely use more than 25–30 percent of the grain bill. Moderately kilned malts lend a toasty, nutty, and sometimes bready mouthful to your German treasure. Vienna and Munich malts contribute the same percentage of fermentables as base malts. Malt extracts containing Vienna and Munich malts are also available.

Specialty Malts

Specialty malts, prized more for their flavor and color contributions than for their enzymatic power, undergo higher temperatures than do base malts. The time, temperature, and length of roasting or stewing determine the malt style that will prevail. When the temperature is raised, the sugars are crystallized, rendering sweetness and body, as well as color.

Bamberg is home to one of the world's oldest malthouses. Weyermann is a protected, historic site. For over 125 years, its malthouse has been one of the world's leading manufacturers of specialty brewing malts. Over one-third of the company's regular rotation consists of specialty malts. Weyermann also produces a wide range of wheat malts subjected to varying degrees of killing and roasting. These malts are intended for top-fermented beers. Another interesting product from this malthouse is the "cara" malts. CaraFoam and CaraHell's main contributions are increased foam retention, increased fullness, and intensified malt aroma in the finished beer.

Yeast

Most German beers are lagers. Lager yeasts work well at lower temperatures. Some have the ability to ferment as low as 42° F. Lager yeasts tend to be less flocculent than most ale yeasts. This increased contact time helps remove compounds, therefore cleaning or refining the beers' flavor. The extended lagering times help clarify the finished beer. Less-flocculent yeasts tend to perform better at lower temperatures. Attention to pitching rates is required to get a satisfactory fermentation. I suggest using Wyeast 2206 (Bavarian Lager), White Labs WLP820 (Octoberfest/Märzen), Wyeast 2124 (Bohemian Lager) or White Labs WLP830 (German Lager) yeast. ■

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Techniques

by Chris Colby

Fruit Beers II

How to make a "berry" good beer

Your beer should taste and smell like fresh-picked fruit. If it looks like this, however, you did something wrong.

Over the years, many beer styles have developed a reputation among homebrewers as being hard to brew. Many homebrewers worry that adding fruit will contaminate their beer with microorganisms from the fruit, leading to off-flavors. This has a basis in fact. Careless use of fruit can contaminate batches. I once made a cherry beer that developed a horrible, tongue-coating, phenolic flavor that was so bad I was afraid to even open the fridge door. However, armed with a little knowledge, you can easily make a fruit beer — full of fruit flavors and aromas — without any worries of contamination. In the last issue of *BYO*, I discussed the flavors in fruits and how they interact with beer flavors. In this article, I'll explain how to go from the idea of a fruit beer in your head to a glass of fruit beer in your hand.

Choosing Fruit

Fruit comes in many forms. Some brewers prefer fresh fruit because none of its taste or aroma have been lost or altered during processing. In addition, many regions have varieties of fruits that are not available in any other form. In general, the best fruit beers are made from fresh fruits. However, there are several disadvantages to using fresh fruit.

Most fruits are seasonal, so the brewer will be limited to making his beer only when the fruit is in season. The brewer may have to do a lot of processing (washing, pitting, etc.) depending on the kind of fresh fruit he chooses. And, of course, all fresh fruit harbors wild yeasts and bacteria. On properly washed fruit, the level of microbes is not high enough to hurt you. However, when submerged in wort, these microorganisms can potentially multiply and add off-tastes and aroma to your beer.

Some brewers prefer the convenience of using fruit concentrates, purées or juices. These fruit products are not seasonal and they save you time because you can simply open the can or jar and use the fruit as you would use any liquid sugar source (such as liquid malt extract, honey or molasses). In addition, these products are packaged sterile. If contamination is your biggest concern when considering a fruit beer, using sterile fruit products is an option to consider.

Brewers should avoid fruit products that contain anything other than 100% fruit. Some fruit products contain added sugar. This sugar won't harm your beer — it'll just boost the alcohol content slightly — but you'll need to add more of it to get enough flavor. Some fruit products contain added acids, such as citric acid. In the concentrations they are present at, these probably won't adversely affect your beer, but may add a slight "tang." More problematically, some fruit products contain preservatives, which may interfere with your brewer's yeast. Don't use jams or jellies. These contain pectins (either naturally or added), which can cause haze in your beer.

You can also use frozen fruit in a fruit beer. Buying frozen fruit — or freezing your own fruit when it's at its peak — allows you to brew your fruit beer when the fruit is not in season.

Amount of Fruit

The amount of fruit to add to a beer depends on many variables — the type of fruit, the amount of fruit flavor desired, the beer style and many others — and so there is no simple answer to this question. As a first approximation, add one half of a pound of fruit per gallon of beer for strongly flavored fruits such as raspberries. So, for a five-gallon batch of raspberry wheat, you would add 2.5 pounds of raspberries. For lighter-flavored fruits, such as cherries or peaches, you may need to add up to two pounds of fruit per gallon of beer. Your peach ale would thus need 10 pounds of fruit. Processed fruit is usually more concentrated, so you need to add less of it. Sometimes, the label will give some indication of how concentrated the fruit is. If not, add a small amount of processed fruit to a finished beer and estimate an appropriate rate of addition.

One simple way to get the right balance is to brew a test batch. Once the test batch is ready, taste it and determine if there is too little or too much fruit flavor. Adjust the amount of fruit (and perhaps other ingredients) and brew the beer again. Make note not only of how much fruit you added and the taste of the beer, but also how flavorful the fruit itself was before you added it to your beer.

Another way to get the right balance is to blend your beer. To do this, brew two batches of your base beer and add fruit to one but not to the other. To the "fruity" batch, add about one and a half times the amount of fruit you expect you'll need. Either keg

both beers or bottle a few bottles from each batch and leave the remainder in your secondary fermenter. Blend the two beers in a glass until you find the balance you're looking for in the finished beer, then blend the rest of the beer according to that ratio.

In the Mash

For all-grain brewers, fresh fruits can be added to the mash. To do this, cut the fruit into pieces and stir the fruit into the grains while mashing in. The sugars and fruit flavors will dissolve into the mash and be drained along with the wort. A benefit of adding fresh fruits to the mash is that the wort will subsequently be boiled and any yeasts or bacteria on the fruit will be killed. Simply finish brewing as usual after the mash.

The drawbacks of adding fruits to the mash are that the extracted sugar and flavoring from the fruit will be boiled and then subjected to primary fermentation. Most of the fruit aromas will be lost in the process. In addition, the fruit flavor may seem "cooked" rather than fresh. So, although adding fruit to the mash is safe and convenient, it is not the way to go for most fruit beers.

Pumpkin ales are the only fruit beers typically made by adding this fruit — which is commonly referred to as a vegetable — to the mash. The pumpkin flavor desired in the beer is that of cooked pumpkin, and much of the flavor in a pumpkin ale comes from pumpkin pie spices.

If you are using pasteurized fruit concentrates, purées or juices, these are already sterile so the mash is not the best place to add them.

In Hot Wort

Fruits can be steeped in hot wort before, during or after the boil. For fresh fruit, whole fruit or pieces of fruit are placed in a nylon bag. Submerge the fruit bag in the hot wort and tie the string of the nylon bag to the handle of your kettle. Once you're done steeping the fruit, lift the bag into a sanitized colander and let any wort run into the kettle. The fruit will absorb some wort and lower your volume slightly. To counteract this, you can boil a slightly larger volume of wort or add water to your fermenter to make up the volume. The amount of wort absorbed by the fruit will, of course, depend on how much fruit you steep.

Fruit can also be added directly to the wort and the fruit solids left behind as the wort is siphoned to the fermenter. You may want to use a sanitized kitchen strainer to clear most of the fruit solids from the wort before racking it your fermenter.

The heat from boiling wort will kill any yeasts or bacteria on the fruit. However, pectins in the fruit can be extracted and may cause clouding in the beer if the fruit is placed in boiling wort. To sanitize the fruit, but avoid extracting pectins, you can steep the fruit in hot wort after boiling. At lower temperatures — between 160–170° F — pectins from the fruit will not be extracted but the heat will still kill any microorganisms on the fruit. The fruit itself will cool down the wort, so you may need to heat the wort to keep it above 160° F while you are steeping. For all-grain brewers, a drawback of not immediately cooling the wort is that DMS production continues in hot wort and may lend a cooked corn flavor to the beer. The amount of DMS production will depend on the type of malt you use. Extract brewers do not need to worry about DMS.

When steeping fruit in hot wort, you should allow at least a half-hour to extract as much fruit flavor and sugar as possible. Swirl the fruit bag or stir the wort every five minutes or so to disperse fruit-derived sugars and fruit flavors into the wort. Since steeping involves shorter contact times than other methods of fruit use, you should increase the amount of fruit used by at least 15–20 percent.

For fruit concentrates, purées and juices, simply add the fruit product after the boil but before the wort is cooled below 160° F. Then, finish your brew as you normally would.

Using Fruits in Secondary Fermentation

For most fruits, the best time to add them is in secondary fermentation. When added at this time, the fruits are not subjected to heat, their flavors do not end up tasting cooked and their aromas are not lost. The drawback, of course, is that adding fruits in the secondary fermenter runs the risk of contaminating the beer. However, green beer generally has enough alcohol and a pH low enough to discourage the growth of contaminating organisms.

For fresh fruits, remove the stems, leaves and pits or seeds. Wash the fruit thoroughly. If you want, you can use commercial produce-washing products such as Fit, although this isn't necessary. You should reduce the fruit to small pieces by one of several methods: Mash the fruit with a potato masher, chop it with a food processor or cut it up with a knife. Place the fruit in your secondary fermenter and siphon beer on top of it. It is also important that the fermenter is sealed tightly. If air can get in, microorganisms can grow on the top of the floating fruit. (This is what happened to my ill-fated cherry beer.) It is usually best to use a large bucket — one with some headspace — as a secondary fermenter, as some foaming may occur when the yeast begins working on the fruit sugars.

One way to minimize the risk of contamination from fresh fruits is to take a page from the winemakers' handbook and sterilize the fruit with sulfur dioxide. Winemakers do not sterilize their "wort" by boiling it. They sterilize their "must" by treating it with SO_2 (often in the form of Campden tablets). To sterilize a "mini-must," mush your fruit into a slurry in a sanitized bucket. Add enough water so that it's basically a thick liquid. Add one crushed Campden tablet for every gallon of your "mini-must" and let sit, loosely covered, overnight. During this time the SO_2 will kill any microorganism in the "mini-must," then diffuse away. The SO_2 also acts as an antioxidant, preventing browning of the fruit. The next day, add the now-sanitized "mini-must" to your fermenter.

Adding fruits during secondary fermentation increases the volume of the brew, but some of this volume is lost when beer is racked from the remaining fruit solids. You can plan for this by making less volume of your base beer, but making it somewhat more concentrated. The degree you need to change your base beer depends, of course, on how much fruit you plan to add. (Alternately, you can choose to simply

not worry about it and end up with a couple extra beers in your batch.)

To add concentrates, purées or juices to your secondary fermentation, begin racking the base beer to the secondary fermenter. Slowly pour the fruit into the secondary fermenter as the beer is racked so that the fruit and beer mix well. You may want to stir with a sterilized spoon.

The beer can be left in contact with the fruit for varying amounts of time. One week is long enough to extract most of the fruit flavors, but not prolong the batch interminably. If you want to get the most out of your fruit, let it sit longer. Keep in mind, however, that flavor extraction decreases over time. Letting the fruit sit for two weeks will not give you twice as much fruit flavor as letting it sit for one week.

After secondary fermentation with the fruit, siphon the beer away from the fruit solids into a keg or bottling bucket. You may want to use a sanitized kitchen strainer to remove floating fruit solids before racking. Bottle or keg the beer as you usually do.

Conditioning and Clarifying

Part of the appeal of most fruit beers is their color. In order to best enjoy the color, the beer should be as clear as possible. There are a few ways to achieve this. First and foremost, you should store your fruit beer cold for at least a couple of weeks — but preferably a month or so — after kegging or bottle-conditioning. During this time, much of the yeast and chill haze (if present) will sediment out of the beer. In addition, the fruit flavors will have time to blend more completely with the base beer flavors.

One of the biggest enemies of beer clarity is chill haze, caused by protein/polyphenol (tannin) complexes in the beer. Although aging will help, minimizing chill haze to begin with will speed the development of the beer. Most fruits contribute tannins to a beer. The tannins are mainly confined to the skins of the fruits and these tannins contribute to the flavor of the fruit. Although you can fine for tannins using PVPP (Polyclar AT), this will lessen the fruit color and flavor in your beer. A better method is to minimize the protein level in your base beer.

There are a few easy ways to reduce protein levels in your beers. First of all, use an appropriate amount of Irish moss — between 1.5 and 2 teaspoons of Irish moss per 5 gallons — in the boil. This will reduce protein levels in your beer, but should not affect head retention (which is also related to protein levels). You can also fine with silica gel, which targets proteins of the size that cause chill haze, but not those of the size involved in head retention. I usually rely on the Irish moss and have had good results in my yearly raspberry porter (although the dark malts also help the clarity of this beer). ■

Chris Colby lives and brews in Bastrop, Texas with his wife and nine felines.

Brewer's Yeast

There's a fungus among us . . . and it makes beer

Homebrew Science

by Steve Parkes

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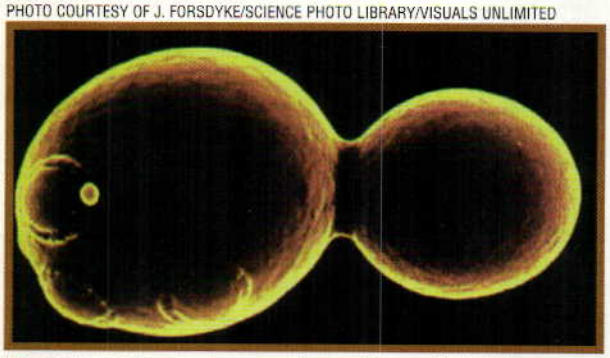


Brewers make wort . . . and yeast turns it into beer. This yeast cell is in the process of budding.

Recently one of the brewers at Sierra Nevada, talking over a couple of beers, proposed that yeast may be the dominant organism on the planet. The basis for his hypothesis was his observation that many of the brightest human beings in the world seem to devote their lives to caring for yeast and making sure they're happy. While the scientist's motives may be ulterior, I think a good argument can be made to support his idea.

Yeast is almost certainly the most important ingredient in beer. Although water, malt and hops are crucial, it is yeast that turns wort into beer. Although the yeast itself is usually not in evidence in finished commercial beers (with some notable exceptions), it is almost always found in homebrewed beers. In addition, the flavors and aromas generated by the yeast are key sensory qualities in beer. Alcohol, higher alcohols, esters, ketones and aldehydes are all products of fermentation. Many brewers go to great expense to accommodate difficult yeast strains to achieve their desired flavor profile, including Anheuser-Busch, with its beechwood aging and specially designed fermenters.

In nature, there are about 350 species of yeasts covering a wide range of functions. Most live on fruits, flowers or other places where simple sugars are found in abundance. Of all the species, there are only a few we are concerned with in brewing.

Brewer's yeast is not found in nature. It is a domesticated microorganism. Unfortunately yeast, like all biological systems, is inherently difficult to control. A five-gallon homebrew fermentation consists of hundreds of billions of living cells carrying out uncountable trillions of biochemical reactions every second, with the outcome of many affecting the outcomes of many others. Commercial brewers, who harvest their yeast and re-use it repeatedly to save money, have the issue of yeast maintenance and care. In contrast, homebrewers have the luxury of purchasing a "ready to use" yeast that can be used once and thrown away. This certainly simplifies life for the homebrewer and allows him to concentrate on producing a wide range of interestingly diverse products.

Yeast Classification

There are three types of cells on earth: eubacteria, archaebacteria and eukaryotes. Eubacteria and archaebacteria — formerly lumped together and called prokaryotes — are smaller than eukaryotes and have fewer internal cellular stuctures. The bacterial species that contaminate beer, including *Pediococcus*, *Lactobaccilus* and *Acetobacter*, are eubacteria. In contrast, all yeasts are eukaryotes.

Eukaryotes include protists, plants, fungi and animals (including humans). The average eukaryotic cell is about 10 times the size of the average bacterial cell and eukaryotic cells have much more interior structure. Most notably, eukaryotic cells have a nucleus while other types of cells do not.

Yeast are fungi, members of the fungal division Ascomycota. There are about 40 genera of yeast and brewer's yeast belongs to the genus called *Saccharomyces*.

Yeast Structure

A mature brewing yeast cell is 8–14 micrometers in diameter, and weighs about 40 pg (40×10^{-12} g). Yeast have a structure that is typical of eukaryotic cells and is thus, in many ways, similar to human cells. Eukaryotic cells have many subunits, called organelles, that help it function.

Cell Wall

The outermost layer of the yeast cell is the cell wall, which gives the cell its shape. The yeast cell wall is composed mainly of beta-glucans (40%) and alpha-mannans (40%), which are carbohydrates. It also contains some proteins (8%), lipids (7%) and mineral constituents (12%). The cell wall makes up about 30% of the total cell mass (dry weight). The outer surface of the cell wall has a high amount of phosphate and carboxyl groupings, giving it an overall negative electrical charge at the pH of beer.

In addition to its contribution to cell shape, the cell wall has several other functions. The cell wall acts as a physical barrier for the yeast cell. It also acts as an osmotic barrier, preventing the cell from drying out or bursting and increasing the cell's tolerance to extreme concentrations of ethanol and sugar. The cell wall also determines the flocculation properties of yeast strains, the degree to which the cells stick together at the end of fermentation. This also determines whether the yeast is top- or bottom-cropping. A yeast's flocculation characteristics are based on the types of protein it has embedded in its cell wall.

The cell wall also surrounds several enzymes that are excreted from the cell. The most important of these is invertase, which can convert sucrose to glucose and fructose for yeast

metabolism. Another enzyme found associated with the cell wall of some yeasts is melibiase, which can degrade the simple sugar melibiose. While not key in beer fermentation, its presence or absence is important in the identification of yeast cells.

Cell Membrane

Inside the cell wall is a secondary protective layer for the cell, called the cell membrane. You can loosely think of the cell membrane as a balloon inflated against a cage made of the cell wall. The cell membrane is a sheet consisting of two layers of phospholipids (relatively large, polar molecules) with proteins floating in it. Many of the cell membrane proteins span the membrane. The two layers of the phospholipid bilayer are arranged so that the outside has an affinity for water and the inside has an aversion to water.

The proteins embedded in the membrane add to the structural integrity of the membrane and many are used for the transport of material across the membrane. Material attaches to the proteins and is carried across the membrane. The cell membrane not only surrounds the cytoplasm inside the cell, but also connects with the other membranous organs inside the cell, such as the Golgi apparatus.

The cell membrane is involved in the uptake of nutrients for the yeast cell, and the proteins in the cell membrane facilitate this transport. The cell membrane must be fluid to allow transport of these nutrients. (In a future article on fermentation biochemistry, I will explain why.) Aeration of the yeast or wort at the beginning of fermentation is key to obtaining membrane fluidity. It enables the growing yeast cell to synthesize necessary molecules, such as unsaturated fatty acids and sterols.

There are three types of transportation that can occur across the cell membrane.

Passive Diffusion: Passive diffusion is the simplest form of transport into the cell and requires no energy from the cell. Molecules simply pass directly through the cell membrane, or through a pore consisting of a protein bridging

the lipid bilayer. The rate of diffusion depends on the charge of the molecule (electrical charge impedes diffusion), its size (smaller molecules diffuse faster than larger ones) and lipid solubility (highly lipid-soluble molecules diffuse faster, since they can penetrate the hydrophobic portion of the lipid bilayer). The net movement is down the concentration gradient for the molecule; in other words, molecules move from regions where they are more concentrated to regions where they are less concentrated. Examples of molecules that can penetrate the cell by passive diffusion are: water, calcium ions (Ca^{2+}), sodium ions (Na^{+}) and potassium ions (K^{+}).

Facilitated Diffusion: Facilitated diffusion is similar to passive diffusion, but requires a permease (carrier protein) to allow diffusion. This allows control of the diffusion, but the diffusion is still down the concentration gradient. In general, facilitated diffusion is faster than simple diffusion, and no energy output by the cell is required. The permeases are specific to the structure of the transported molecules, and they are controlled depending on the needs of the cell. Molecules that enter the cell by facilitated diffusion include: glucose, fructose, maltose, maltotriose, clorine ions (Cl^{-}), and carbonate ions (HCO^{3-}).

Active Transport: Active transport is the only mechanism for moving molecules into the cell against a concentration gradient. It is critical to the health of the yeast cell, since there are many nutrients that must be "hoarded" at a higher concentration than they exist outside the cell. Active transport also uses carrier proteins to transport molecules across the membrane, but they require energy to allow this transport. The transport proteins help move specific molecules, or groups of molecules, across the cell membrane. Molecules that enter the cell by active transport include amino acids (at differing rates) and calcium ions (Ca^{2+}).

Mitochondria

Mitochondria are organelles that are roughly the size of small bacteria. They move around inside the cell and replicate semi-autonomously. They have a small, circular genome (like bacteria) whose DNA sequences are very similar to modern-day purple bacteria. (This, along with much other evidence, has convinced scientists that mitochondria are descended from ancient free-living purple bacteria that came to live inside ancestral eukaryotic cells!)

In most eukaryotic cells, the mitochondria are the site of the electron transport system, a key component of respiration (the aerobic process that releases energy from sugar). For this reason, many biology texts refer to mitochondria as the "powerhouses of the cell." Some homebrew texts refer to the "respiration phase" of fermentation, proposing that early in the fermentation, yeast use oxygen to respire. They quote the Pasteur effect, which states that if oxygen is present, organisms will respire, rather than ferment. However, the Crabtree effect overrides this. The Crabtree effect is the observation that, if the glucose concentration is above 0.4%, yeast will ferment, rather than respire, even if oxygen is available to the cell.

During fermentation, glucose is always present at greater than 0.4%, so brewing yeast are not able to respire. As a consequence, their mitochondria are small and serve little function. If brewing yeast are exposed to oxygen in low glucose conditions, they will overcome the Crabtree effect and their mitochondria will proliferate within six to eight hours. This fact is used to grow yeast rapidly in commercial yeast propogators.

Nucleus

The nucleus is an organelle surrounded by two membranes that resides in roughly the middle of the cell. In a normal yeast cell, the nucleus is approximately 1.5 micrometers in diameter. The nucleus's double membrane is covered in pores, which allow molecules to migrate into and out of the nucleus. The nucleus is the location of the cell's genetic material, deoxyribonucleic acid (DNA). Yeast cells have 16 chromosomes and its genome size is

approximately 1.3 x 10^7 base pairs — in other words, there are about 13,000,000 "letters" in its genetic code. Laboratory species of *Saccharomyces* usually have one copy of each chromosome, except when they undergo sexual reproduction and form a cell with two copies of each chromosome. Brewing strains of *Saccharomyces* carry approximately three copies of each chromosome, but the number for each chromosome varies. Some strains may have more copies of certain chromosomes.

Endoplasmic Reticulum

The Endoplasmic Reticulum (ER) is a membranous structure found throughout the cytoplasm. It is a maze of tubes or sacs that channel materials around the cell. There are two kinds of ER, smooth ER and rough ER. Rough ER is covered with ribosomes, the organelles responsible for the production of proteins. Smooth ER lacks ribosomes. Many metabolic sequences take place in the smooth ER. Smooth ER is also the site of most lipid synthesis, including the synthesis of triglycerides, phospholipids and steroids, all of which are important to cell membrane components. The rough ER makes many proteins, especially glyocoproteins (proteins with carbohydrates attached), for export outside the cell.

Golgi Apparatus

The Golgi apparatus is an organelle that looks like a stack of folded membranes. The Golgi apparatus accepts proteins — including glycoproteins and lipoproteins — made in the ER. They enter one end of the Golgi apparatus, are modified within it, and are excreted on the other end. Excreted molecules are contained in vessicles, "bubbles" of membrane that pinch off the Golgi apparatus. These vessicles bind with the cell membrane and dump their contents outside the cell.

The Vacuole

Brewing yeast typically contain only one vacuole, a storage area for enzymes and nutrients. The vacuole is bounded by a single membrane, and typically contains several dense gran-

ules of phosphate material that will be used during fermentation. The vacuole contains hydrolytic enzymes that are used to recycle large molecules from the cell (RNA and protein for example). If the cell is subjected to conditions that destroy the vacuole (i.e. high temperature or pH), the vacuole will release its contents and the hydrolytic enzymes will destroy the cell (autolysis).

Yeast Life Cycle

Brewer's yeast reproduces by budding, and the budding process leaves behind a bud scar on the mother cell. Once a yeast cell has too many of these scars, it will lose the ability to reproduce (a normal yeast cell can bud up to 50 times). During normal fermentation, the yeast will bud several times, resulting in a three- to five-fold increase in the population, as each daughter cell will bud several times as well.

Yeast Qualities

There are several qualities that brewers look for in their yeast. These include: flavor and aroma qualities, sedimentation and flocculation, attenuation, head size, mutation rate and the consistency of crop.

Flavor and Aroma

Flavor and aroma are often regarded as the most important characteristic of a yeast, as far as the brewer is concerned. In commercial breweries that use only one yeast strain, the flavor and aroma of all of the beers will exhibit the "house character" of that yeast. Many homebrewers will take this approach and develop techniques of reclaiming and re-using their own yeast time and time again. Many commercial brewers also use multiple strains to develop distinct characters in their specialty beers. And as I mentioned earlier, many brewers feel that the flavor and aroma qualities of a particular strain of yeast are so important that they will tailor their process to the idiosyncracies of that particular strain.

Flocculation

Flocculation is the aggregation (grouping) of cells into masses at the end of fermentation. Some yeast flocculate and settle to the top, while others settle to the bottom of the tank. Most modern yeasts can be forced to settle to the bottom of a fermenter, but there are several tenacious top fermenters (such as Bavarian Weiss strains) that can only be harvested from the top of the fermenter. Most of these strains require open fermentations. Flocculation also describes how quickly and densely the yeast tend to drop out of the wort. A yeast that settles too quickly will tend to leave fermentable sugars in the beer, and may also be unable to adequately remove off-flavors during maturation. A poorly flocculating yeast will cause problems in filtering or fining the beer, since it stays in suspension. Flocculation may also affect the flavor characteristics produced by the yeast. The size of the head formed by the yeast while fermenting is important when deciding the size of vessel required for fermentation. Yeast typically produced a head that rises from 15–25% above the level of the wort in the tank, and fermenters should be sized accordingly.

Mutation Rate

Mutation rate describes the genetic stability of the yeast strain. Mutations such as respiratory deficiency cause problems in flavor and aroma characteristics and in flocculation. So-called "petite" mutants are known for their propensity to leave diacetyl in the finished beer (but are not the first place to look if your beer contains diacetyl). Although mutation rate might seem to be the determining factor in the amount of re-pitchings a yeast strain can withstand over time, the bacterial load is more often the determining factor.

Dried or Liquid Yeast

For the commercial brewer, liquid yeast gives more options, but is typically harder to deal with since it must be grown up from a small sample, or even a slant. The pitching rate is more difficult to determine, and you must brew fairly often to keep the yeast viable in storage between brews, or invest in a yeast propagation system. But for the homebrewer, a wide array of liquid

yeast are available that are simple and convenient to use. They are grown on nutrient-rich media in the presence of oxygen and are incrementally fed low concentrations of glucose.

Dried yeast is easier to use, since all it requires is hydrating and dumping the yeast into the fermenter. Although it is easier to control the pitching quantity (simply the weight of yeast added), there are less choices of variety of dried yeasts.

Lager vs. Ale Yeast

Strictly speaking, yeast that can metabolize melibiose are classified as *Saccharomyces uvarum*, or lager yeast. Brewing yeasts that lack this ability are classified as *Saccharomyces cerevisiae*, or ale yeast. In recent years, it has been found that the distinction between these yeast on a taxonomic level does not correspond well with the actual performance of the yeast in brewery fermentations. A yeast may have an ale yeast taxonomy (it does not metabolize melibiose), but it may perform like a lager yeast in the brewery (it bottom ferments at low temperatures). Some brewers report that their ale strain routinely is more attenuative than their lager strain. Most brewers are under the impression that lager yeast makes drier beers, but this is not always the case.

Top fermenters vs. bottom yeasts can be determined by cell wall composition and can be tested by placing them in a clean test tube with H_2O and shaking. Those that make a "skin" at the top are probably top fermenters. *Saccharomyces cerevisiae* can ferment glucose, sucrose and maltose, *S. uvarum* can ferment all including melibiose, and *S. diastaticus* can ferment all of the primary sugars plus dextrins. The last strain mentioned, *S. diastaticus*, produces considerable quantities of a buttery off-flavor known as diacetyl and is considered a wild yeast. Since it can ferment carbohydrates the others cannot, it is a big risk in bottle-conditioned beers. It can over-attenuate them and cause bottles to explode.

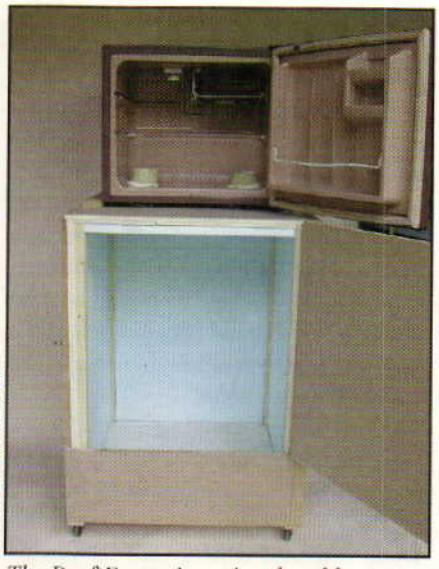
As a living system, yeast metabolism is even more complex than the enzymatic changes in the mash. Do not expect to be able to completely control the activity of the yeast, since we cannot hope to control all the factors and changing one thing generally affects many others. Watch for patterns that develop in yeast performance, and pay attention to the many factors that might affect them. The amount the yeast grows, the time it takes to fully ferment the wort and the size of the head in the fermenter are all clues to yeast performance. Fermentation flavor and aroma are clues that all is going well, so develop your senses. The variables controlling yeast activity and flavor development are innumerable, and the best you can hope to do is shepherd it in the right direction. ■

Steve Parkes is the owner and lead instructor at American Brewer's Guild.

The DraftErator

Keeping it cool with your fridge from school

by Thom Cannell



PHOTOS BY THOM CANNELL

The DraftErator is an insulated box cooled by a dorm fridge. It will keep four Cornelius kegs at serving temperature.

This month's project, which I'm calling the DraftErator, is a refrigerated box just for keeping beer at optimum dispensing temperature. While a refrigerator is designed to have many levels of coldness, and to be opened on a regular basis, our box is designed to hold four undisturbed kegs at about 45° F.

Think of a tiny dorm fridge sitting atop a well-insulated box. Drill out the bottom, force cool air down into the box, add a tap handle or four and you've created our DraftErator.

Step by step

I made my cabinet from 1/2" MDF. It's insulated with 1.5–3" of expanded polystyrene home insulation and sits on casters for easy movement. Atop is a dorm fridge I purchased for $25. Materials run the cost to nearly $120, not including dispensing taps and lines.

If you don't have a power saw, relax. Most home improvement stores will cut your MDF for a couple of bucks. If you go when the employees are bored, not on Saturday afternoon, it might be free. I based the interior volume on 8.5 x 25" Corny kegs and left about 5" of headroom for attachments, hoses and air shafts.

Box

Cut all MDF panels (see dimensions in sidebar) for the sides and back. Screw on 2 x 2" support rails — two for the back, one each for sides. Each support provides something for screws to attach to, because MDF's end grain just isn't sturdy enough. And where we do screw into the MDF end grain, you absolutely must pre-drill. A bit of construction adhesive, carpenter's glue, or silicone seal applied to every joint will provide extra security.

Attach two supports (the frame of the box) to the back panel. Apply one support to each side panel. Attach the side panels to the back with the sides' end flush with the back surface. Pre-drill and screw together. You should now have a three-sided "box."

Set the bottom onto the supports, pre-drill and screw in. Be particularly careful with any end-grain screws. Repeat with the top and you'll have a five-sided box, open in front.

Attach a couple of 1 x 2" boards to the bottom at the outside edges for skids. This gives the sides something to rest on and provides air space underneath. It also serves as support for the casters underneath.

While the box is open, caulk all the seams with silicone or other caulk. Leaks will make the refrigerator compressor work harder.

Attach very short casters: two fixed at rear, two swivel at front. I got four 1-5/8" swivels for $6.50.

Insulation

Once the box is complete, cut three pieces of insulation to the size of between-support dimensions and glue each piece to its interior position. You must use special glue or adhesive meant for this task. Ordinary adhesives contain solvents that melt polystyrene.

Next, cut the floor and top insulation. It will have to be notched to fit around the supports. Cut a floor panel from 1/8–1/4" luan plywood or any other similar sheet stock. The floor panel provides a sturdy base for your Corny kegs; insulation is soft and your kegs would tip if they rested on it.

Door

The door (it should be a single piece; not shown in photo) needs insulation, hinges and a closure hasp with lock. It also needs a gasket to keep it

PARTS LIST WITH SIZES

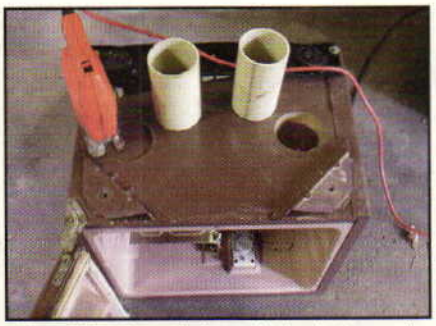
MDF (top and bottom)	24-3/8 x 24"
MDF (front and back)	24 x 33"
MDF (sides)	25 x 33"
pine rails (4)	2 x 2 x 31-1/2"
insulation (back)	20-7/8 x 31-1/2"
insulation (sides)	21 x 31-1/2"

Tools required: Saw, drill and bits, screwdrivers, saber saw with metal-cutting (24-tooth) blade, caulking gun

MDF	$19.00
2 x 2" pine	$4.50
insulation	$13.50
weather strip	$5.00
runners (skids)	scrap
casters	$6.50
axial 4" fan	$25.00
pvc or other pipe (2-6" sections)	$2.00
insulation adhesive	$4.00
1-1/2" galvanized deck screws — 1#	$4.00
1" sheet-rock screws (for casters) 16	$1.00
hinge(s)	$7.00
hasp or latch	$1.50
door handle	$0.98
refrigerator (used)	$25.00

Tap items, available from any homebrew store:

hose 3/16" (per foot)	$0.40
manifold (5 port)	$24.00
shanks (per)	$17.00
faucet (per)	$23.00



Air will be forced through the bottom of the fridge through three-inch pipes.

airtight. I used ordinary soft weather stripping, which fits tightly. Locate your door and add a gasket to all four sides of the box. Add a latch and a handle. Be sure your screws aren't longer than the panel is thick! If so, cut them.

Now would be a good time to paint everything. Or at least paint the top before attaching the refrigerator.

Cooling section

Set your refrigerator atop the box in preparation for permanent attachment, leaving an inch behind for air flow. Cut attachment blocks or angle iron for securing the fridge to the box. Once the fridge is ready to attach, remove it and turn it upside down. Mark and cut holes for 3" pipe. I predrilled with a 1/2" drill and cut the steel bottom, fiberglass insulation, and plastic inner panel with a saber saw.

Don't worry about cutting a coolant line. With ancient designs like this dorm fridge, the coolant entry and exit pipes should be clearly visible. Old refrigerators and tiny ones have only the ice box as a cooling surface.

Once the holes are cut to a nice snug fit, return the refrigerator to its rightful place atop the box and secure it. Set in the pipes and use silicone caulk to secure them. You now have two large air transport holes betwixt refrigerator and box chamber.

Convection will move air, but a fan will do better. I had a nice little pie-plate fan laying around that seemed perfect for this project. Any small fan that can be attached to your ductwork will do. I used long screws to attach the outlet or breezy side of the fan to the inside top of the DraftErator box. This will push air up into the refrigerator chamber and back down into the box.

Wire Fan

I decided to plug the axial fan directly into the main electrical system so it would recirculate air continuously. The alternative was to relocate the refrigerator's temperature probe into the cabinet and wire the fan to the compressor. These fans cost under $30 and are part of almost every commercial electronic device (copiers, vending machines, overhead projectors and the like), so you should be able to salvage one with no problem.

Now all you need to do is add a few taps, as you would to a jockey box or fridge, which is a project of its own. ■

Thom Cannell writes the "Projects" column in every issue of BYO.

Beer Gear Here!

The Fermenator is a stainless conical fermenter with a weld-free interior.

New Stainless Conical

The Fermenator is a new 100% stainless-steel conical fermenter that's now available from many homebrew shops and mail-order outlets. Designed with easy sanitation in mind, the Fermenator has a weld-free interior, so no need to worry about bacteria lurking in the weld cracks. The fittings are removable, so they can be scrubbed, boiled, soaked or autoclaved.

The Fermenator has a racking arm and a bottom dump valve. The rotating racking arm makes it convenient to collect a wort sample or move sediment-free beer to another vessel. The bottom valve comes in handy for dumping trub or harvesting yeast.

The Fermenator comes in three sizes: 7.1 gallons (for 5-gallon batches), 12.2 gallons (for 10-gallon batches) and the whopping 27-gallon model. The compact, low-slung fermenter is designed to fit in a refrigerator. It comes with carry handles, and bolt-on leg extensions are optional. The removable lid can be sealed snug and fitted with an airlock.

The Fermenator is manufactured by Blichmann Engineering. Retail prices vary, so shop around. For information, email john@fermenator.com or check out www.fermenator.com.

Who Needs an Old Fridge?

The Fermenterator — not to be confused with the Fermenator — is a self-contained, temperature-controlled enclosure for glass carboys and plastic fermenting buckets. It can accommodate vessels up to ten-gallon capacity (the main compartment fits fermenters as large as 14-1/4" in diameter and 16" tall). It's a good alternative to buying a spare refrigerator and temperature controller, and it saves $7 to $15 a month in electricity compared to the cost of running a used fridge. Plus, it's smaller and lighter than a banged-up GE. The Fermenterator is cut from a solid block of styrofoam, then coated to make it durable.

The Fermenterator holds your carboys or buckets at a steady temperature.

The Fermenterator allows you to maintain steady fermentation temperatures, which means you can lager or brew in the hottest weather. It's powered by a low-voltage supply and has an easy-to-use dial for setting the proper temperature. You simply place your carboy in the Fermenterator, fill the smaller compartment with frozen water jugs and pop on the lid. You need to replace the ice every one to three days. You can push a probe thermometer through the lid to monitor the temperature inside the chamber.

The Fermenterator costs $149.95 plus UPS shipping. To order, call (800) 632-6637. For information, go to www.homebrewproducts.com or email info@homebrewproducts.com.

The only book you'll ever need to plan an extended pub crawl in Great Britain.

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Beer writer Richard Protz takes readers on a colorful tour of Great Britain by way of its pubs, from 300-year-old English taverns to Victorian saloons. Protz's book includes such fascinating spots as a 900-year-old brewhouse in Nottingham and Davy Byrne's in Dublin, where Leopold Bloom stops for a drink in "Ulysses."

With 60 watercolor illustrations and 10 maps, this guide provides a full description of each pub, plus every practical detail you need to get there and enjoy it: phone number, directions, history, setting and ambience, food and a list of available beers. The book is divided into themed sections, including historic interest, Dickens connections,

acclaimed gardens, genuine Irish pubs and pubs with outstanding food.

The paperback sells for $18.95 and is published by Carlton Books. Call (800) 462-6420 or send an email to lboegehold@att.net. ISBN: 1-84222-564-2. It's available on amazon.com.

Pardon Me, But There's a Bottle Cap on Your Coat

Is your old jean jacket looking a little blah these days? Turn it into wearable art with the Bottle Cap Buddy. This clever little gizmo snaps into a regular crown cap and turns it into a pin, which you can then use to decorate your favorite hat, homebrew T-shirt or necktie. The idea was the brainchild of two Canadian guys who were sitting around one night and admiring the excellent bottle caps on the beers they were drinking. It's a bit of a leap between admiring crown caps and inventing the Bottle Cap Buddy, but they made the jump. And now they're in business.

For more information, check out http://bottlecapbuddy.tripod.com or email to bottlecapbuddy@webhart.net. Wholesale only, so be a good buddy and get your favorite homebrew store to carry them.

Vinoka on Ice

Vinoka recently released a new kit line called Vinoka Ice. The kit makes a refreshing drink that's similar to Smirnoff Ice. Vinoka Ice kits are made with fresh, natural ingredients at the company's plant in Kelowna, British Columbia. The kits come in 23-liter and 46-liter sizes and are available at U-brew and U-vint stores in British Columbia, Ontario and Washington state. The kits are ready in four weeks and the beverage measures 6 percent alcohol by volume. They currently come in two styles: hard lemonade and hard cranberry lemonade.

The Dotti family established Vinoka in 1993, and Helmut Dotti has more than 30 years of experience as a winemaker. Vinoka's first product, an apple cider kit, was an immediate success. Vinoka has since grown to become a leading producer of sparkling cider and wine-cooler kits. Other Vinoka kit lines include Cider Press hard ciders, Lone Cactus wine coolers, Breezes fruit-flavored wines, Calypso wine cocktails and Vinoka white and red table wines. Call Vinoka at (250) 769-6431. ■

With the Bottle Cap Buddy, you, too, could make this fab 20-pound jacket!

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Ode to Pasteur

He didn't like beer, but cheers for Louis

by Matt Cole

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On September 28th, every homebrewer should pause a moment to mourn the death (in 1895) of a Frenchman who didn't like beer. Although his taste in beverages differed from ours, the work of this man — Louis Pasteur — ushered in the modern era of brewing.

In the 1870s, by studying microorganisms and their effect on the fermentation process, microbiologist Louis Pasteur unlocked some of the mysteries of brewing science. Prior to his discoveries, many people knew how beer could be made, but much was still unknown about the science underlying the fermentation process as a whole. The process of fermentation had been used for thousands of years and was thought to be a magical, rather than a biological or even a chemical process. While exploring the microscopic world, Louis Pasteur identified yeast and other microorganisms as the source of fermentation, which proved to be a groundbreaking discovery and consequently resolved the ambiguity of the fermentation process.

Louis Pasteur was born on December 27th, 1822 in Dole, France. As a young man, Louis preferred fishing and painting to academics. His father was a poorly-educated tanner, but Louis was nonetheless exposed to science while young. He quickly became interested and began to explore the fields of chemistry and biology. His interest in science led him to enroll in a local college, where the headmaster recognized his potential and consequently encouraged him to attend the most prestigious university in France— École Normale Supérieure. At this school, he became intrigued by the study of chemical bonds and the geometric structure of chemical compounds that would later be used to identify molecular structures.

His research and academic careers began at the Collège Royale de Bésançon as an assistant professor of chemistry. Eventually, he would teach at a variety of institutions. At the height of his academic life, Pasteur was appointed dean of the school of science at the Université Lisle. While in this prestigious position, a local distiller approached him to determine the problem of lactic-acid production in the alcohol produced in his distillery. The patriotic Pasteur still experienced wounded pride from the embarrassing defeat of France in 1870-1871 by the Prussian army. He believed that if he could apply scientific principles to the production of French beer and improve its quality, it might be possible to drive German beers from the French markets. Up to this point, German beers had proven to be superior in taste and quality and a blow to the advantage of France would be crucial.

Louis continued his studies of the fermentation process in London, where he inspected several breweries, including Whitbread. Several breweries at the time were already using microscopes to examine their yeast, however, Whitbread was not among them. Pasteur examined the yeast strain used to ferment the Whitbread porter and quickly found signs of contamination. Whitbread, as well as many other breweries, had sustained enormous losses from unpredictable changes in their beers, averaging 20 percent of its total production.

Pasteur returned to France and during the next four years continued his research with a team of assistants. It was here, at the École Normale, where he examined various beers at a small pilot brewery that he established. In 1876 Pasteur published his "Études sur la Bière," which translates as "Studies on Beer." Most of the book is devoted to Pasteur's notion that every fermentation, as well as every putrefaction, is brought on by microorganisms. Fermentation is a result of life without air. Pasteur concluded that competition from outside organisms, such as bacteria, make yeast very unstable. Infections from bacteria inhibit yeast growth and give the beer off-flavors. Cleanliness is therefore of paramount importance.

Pasteur didn't like beer very much and took little interest in its flavor and taste. So it's little surprise that his book was more a medical tome than a brewing-science reference guide. What mattered to Louis was that the beer be stable and free from contamination.

Pasteur also developed the process known as pasteurization. This process prevented the spoilage of perishable products — like beer, milk and cheese — by using heat sterilization to destroy harmful microbes. Many breweries today use the process of pasteurization to stabilize their products. This accomplishment landed Pasteur in the National Inventors Hall Of Fame.

One can divide the history of brewing science into two periods: before and after Pasteur. Pasteur solved many of the mysteries of fermentation, and devised some of the most important theoretical concepts and applications of modern brewing science. Pasteur's work in the field of yeast research left a lasting and valuable legacy for all brewers. Louis Pasteur died at the age of 72 on the 28th of September, 1895. If one were to choose the greatest benefactors of brewing science, Louis Pasteur would most certainly rank at the top of the list. ■

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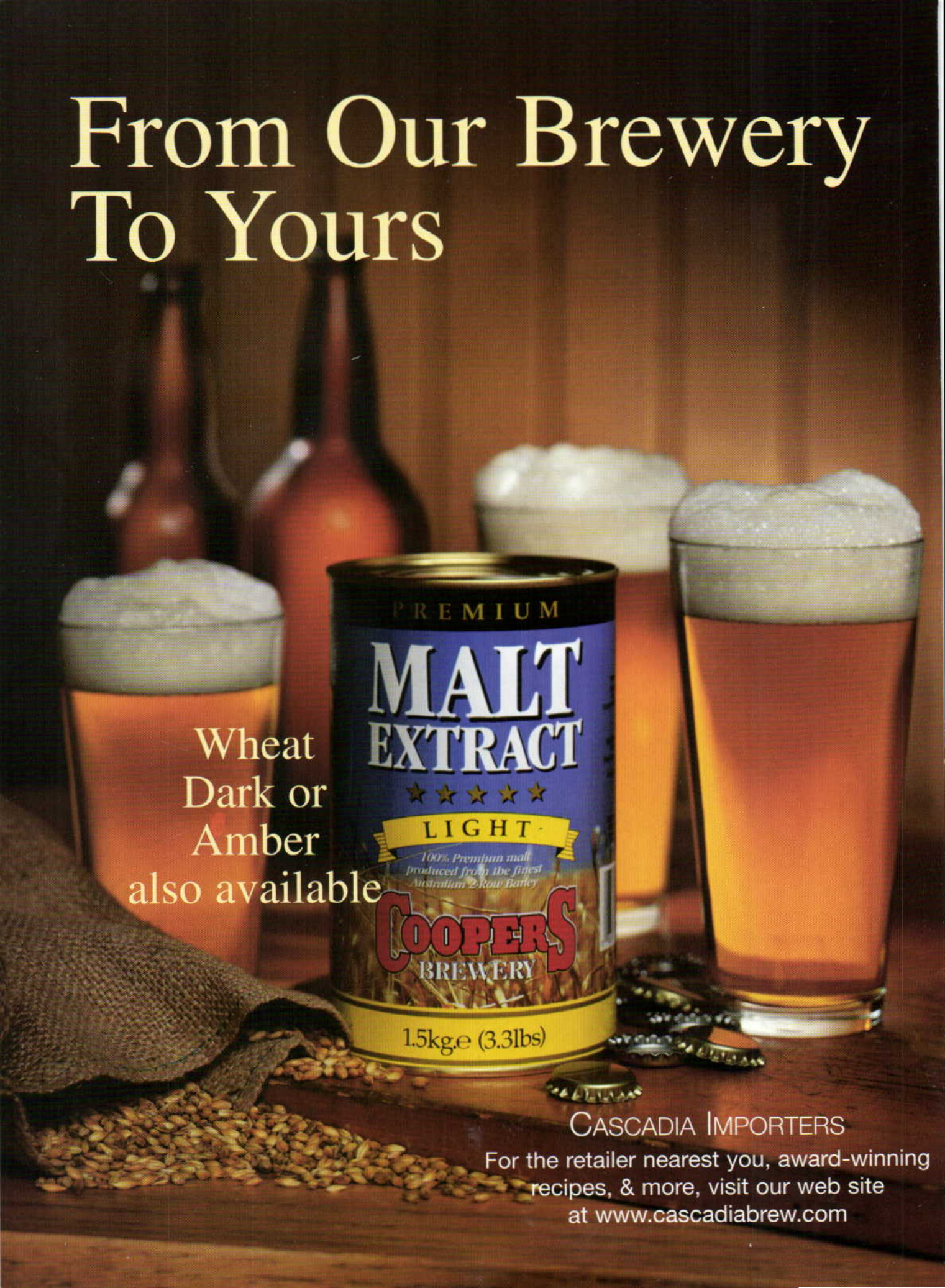

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