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HOMEBREWING *with* **ALTITUDE**

Brewing Sour Beers at Home Using Traditional & Alternative Methods

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Sour Beers in Belgium

- Orval
 - Lambic
 - Flanders Red
 - Flemish Brown (Oud Bruin)
 - New World Sour Beers
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The Basic Rules of Brewing Funky Beers

- **Be patient.**
 - **Don't look or taste every day.**
 - A brewer of funky beers has little control over the fermentation, barrel aging, and the final product.
 - Do not add lactic acid to your funky beer, it will lend a harsh and sometimes medicinal character when compared to the natural taste from Lacto & Pedio.
 - **The beer will tell you when it is ready, not the other way around. A beer is ready when it taste ready.**
 - If you are just starting out making funky beers, making a beer that is palatable will be considered a success.
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Armand DeBelder, Drie Fonteinen

“I brew between my pinkies...”

Brettanomyces

- Brett is an oxidative yeast; the production of acids is an oxidative process.
 - There are many strains of Brettanomyces.
 - Common Strains are:
 - B. anomalous
 - B. bruxellensis
 - B. lambicus
 - B. claussenii
 - Brettanomyces can also eat the sugars (cellobiose) from the oak barrel.
 - Brettanomyces can even eat the unfermentable dextrin.
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More on Brettanomyces

- Brett is a surviving yeast.
 - Brett is a super attenuating yeast.
 - Brett will dramatically slow down at 3.4 pH.
 - Brett forms a pellicle- a lumpy white film yeast that coats the top of the beer in fermentation. The yeast cells form chains that can float on the top of beer making use of atmospheric oxygen, thus, Brett is an oxidizing yeast. The pellicle will form in the fermenting vessel (porous or non-porous) and help guard against oxidation during the long aging / fermentation time. The pellicle also guards against acetobacter.
 - Leave the pellicle in tact.
 - A pellicle can form in the bottle as well.
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Lactobacillus

- Lactobacillus plays a major role in Flanders type beers and a minimal role in true Lambic.
 - Lacto can ferment both in the presence or absence of oxygen but prefers reduced levels.
 - Lacto is lighter on the palate and is more tart and tangy than sourness derived from *Pediococcus*.
 - The Lactobacillus commonly used by brewers, *Lactobacillus delbrueckii* produces both lactic acid as well as carbon dioxide as a by product of fermentation.
 - For the most part, Lactobacillus will cease to reproduce at a pH of around 3.8- that is pretty sour though!
 - Like most gram-positive bacteria, the presence of certain hop acids will slow the growth of most Lactobacillus.
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Pediococcus

- Although Lacto plays a role, *Pediococcus* is responsible for the bulk of lactic acid production in Lambic and at Russian River.
 - *Pedio* ferments glucose into lactic acid, but, unlike *Lactobacillus*, produces no carbon dioxide.
 - *Pedio* will produce heavy amounts of diacetyl (yuck).
 - *Pedio* is a somewhat hop resilient gram-positive bacteria, *Pedio* reacts to rising levels of alcohol.
 - *Pedio* ferments poorly in the presence of oxygen.
 - *Pedio* grows slowly.
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Help, my beer is sick?

- *Pediococcus* produces a slimy elastic thread like consistency if the conditions are just right. Belgian brewers call this being “sick”, the technical term is “ropy”.
 - This slimy substance is harmless. It is composed of carbohydrates, acids, and proteins, and plays an important role in Lambic and Russian River funkified beers.
 - A beer will become “well” after 3 or 4 months.
 - A beer that has been “sick” exhibits a deeper acidity and mouthfeel.
 - A Beer can be sick twice.
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Acetobacter

- Acetobacter is responsible for producing vinegar by oxidizing ethanol to acetic acid.
 - Many beer souring microorganisms find oxygen or the production of alcohol during fermentation to be detrimental to their viability. Acetobacter requires oxygen to convert alcohol to a acidic acid.
 - Fruit flies and bees can carry acetobacter.
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More on Acetobacter

- Remember, acetobacter is not added to the beer, it develops through the type of vessel used to ferment and age your beer.
 - The creation of acetobacter is also based on how you take care of your barrels.
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Kloeckera apiculata

- At Russian River we have a strong flora of *Kloeckera apiculata*.
 - Our spontaneous fermented beers have a strong fruiting, floral, & citrus character, a trait exhibited by *Kloeckera apiculata*.
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Making Lambic at Home

VESSEL

- 50 - 60 Gallon Oak Barrel
 - 5 – 8 Gallon Oak Barrel
 - Non-Oak Barrel Vessel
 - Stainless Steel Fermenter or Keg
 - Glass Carboy
 - Plastic Bucket
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Barrels

- A brewer making funky beers in wood fights to keep bugs and critters at bay, while never actually killing them.
 - Wood will never be totally clean as it is a porous surface.
 - Bugs and critters can penetrate about a $\frac{1}{4}$ inch into the inner surface of the barrel.
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Barrels

- French oak is more porous than American oak.
 - Be sure the barrel is not pitched.
 - TELL YOUR BREWING PARTNER SIZE COUNTS....
 - As the size of the barrel increases, less liquid actually comes in contact with the wood.
 - The smaller the barrel the thinner the barrel stave is, the thinner the stave the more oxygen diffusion you'll have going on in cask.
 - The surface to volume ratio gets smaller as the size of the barrel increases.
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More on Barrels

- Brettanomyces will use oxygen during barrel aging, but, will form a pellicle to protect the beer from too much oxygen.
 - Oxygen promotes the growth of Acetobacter and retards the growth of Pediococcus & Lactobacillus. Higher levels of oxygen will cause acetic acid and ethyl acetate to be produced more quickly than lactic acids.
 - Too much acetic acid and you'll have vinegar.
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Even More on Barrels

- How you clean the barrel will directly influence how the barrel performs in the future.
 - Do not use modern brewing cleaning chemicals on barrels.
 - You want to eliminate the weaker strains while cleaning a barrel and work towards having the stronger flora survive.
 - If you don't have a natural floral, you can put it in yourself.
 - Brettanomyces will find its way into even fresh / new barrels.
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Oxygen Diffusion in Selected Vessels

Type	Volume (Gallons)	O2 / L / Year
Rodenbach Wooden Tun (Large)	5,280	.53
Rodenbach Wooden Tun (small)	3,168	.86
Wine barrel	79.2	8.5
Glass Carboy w/ silicone stopper	5.3	17
Small Homebrewer's Barrel	10.6	23
Homebrew bucket	5.3	220

Thanks to Jeff Sparrow for letting me plagiarize this graph from his book Wild Brews.
If you don't own Wild Brews and you want to brew sour beers, it is the best book to learn from!

■ The 6 “P’s” of Brewing:

- ❑ Prudent beer making
 - ❑ Practices
 - ❑ Prevent
 - ❑ Piss
 - ❑ Poor
 - ❑ Performance
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Oak Chips & Other Home Methods

- Use oak chips to “harbor” your bugs and critters.
 - The oak chips will contribute some oak character and possibly to much if the oak chips are new.
 - Oak chips will add no oxygen diffusion.
 - Consider a mixed use of oak chips, a plastic homebrew bucket, & a carboy or stainless steel vessel.
 - Do not overlook the 10% blending rule.
 - Mixed yeast/bacteria cultures cannot be re-pitched forever.
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Cleaning and Sanitation

- **Have two of everything!**



The Russian River Way

Temptation / Supplication / Compunction

- Each batch of beer is aged in a specific type of wine barrel (Chardonnay, Pinot Noir, Cabernet Sauvignon). The beer will extract wine flavors from the wine that once aged in the barrel, tannins, oak, and any bugs and critters that might be residing in the barrel from past batches of beer. The end beer is a blend of all these elements as well as the aromas and flavor from the beer itself.
 - At some point each barrel will have little to contribute. When this happens at RRBC, the barrels are used to age Beatification a spontaneously fermented beer.
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Brewing 100% Brett Beers

- Increasing the oxygen will increase your cell count but will decrease the overall character of the Brettanomyces.
 - Brettanomyces will behave differently when fully aerated.
 - At RRBC it has been our experience that an all Brett fermentation will have a long lag phase between the heat X and initial fermentation.
 - Rushing the fermentation with aeration, higher cell counts, and temperature will reduce the “funkiness” of a 100% Brett beer.
 - On a 1.060 original gravity wort, once active, a 100% Brett fermentation will ferment to 1.020 in about 10 days. It will take about 8 weeks for the beer to drop to a bottling SG of 1.010.
 - Once bottled, it will take will take 3 to 4 months to become carbonated and clear any “sickness”.
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Blending

- **The beer will tell you when it is ready, not the other way around.**
 - **A blender must envision what the end beer will taste like after blending and after it is carbonated.**
 - Don't blend hoping a character will develop.
 - At RRBC we keep some "Acid Beer" around- this is highly acidic beer that is used for blending to bring up the acidity in a beer.
 - We also keep a more mellow Brett positive around if the beer we are blending is too acidic.
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