

101: Introduction to Sour Beer Brewing

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Presentation Overview

Important MicroOrganisms

- Brettanomyces
- Lactobacillus
- Pediococcus
- Acetobacter

BJCP Category 17

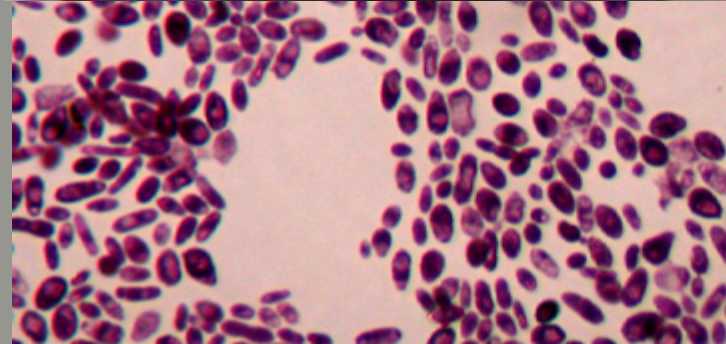
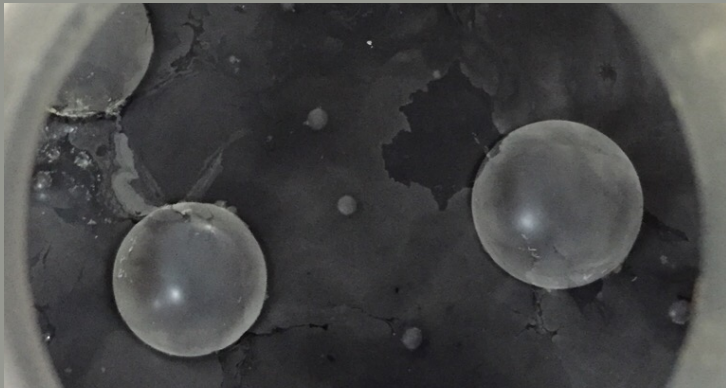
- 17A: Berliner Weisse
- 17B: Flanders Red Ale
- 17C: Flanders Brown Ale / Oud Bruin
- 17D: Straight (Unblended) Lambic
- 17E: Gueuze
- 17F: Fruit Lambic

General Sour Brewing Tips

Question & Answer



Brettanomyces



Yeast (not a bacteria)

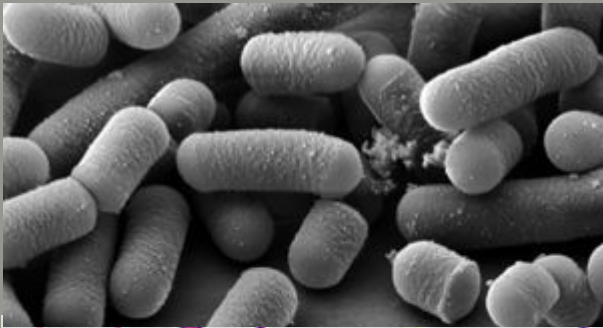
More complex than Sacchromyces – has multiple metabolic pathways that lead to flavor development

- If oxygen is present (aerobic), will produce small amounts of acid (mostly acetic, some citric), but not on the scale as bacteria
- If oxygen is not present (anaerobic), can still metabolize sugars (complexity varies by strain) to produce ethanol, CO₂ and flavors
- Does not need to metabolize sugars/carbohydrates to produce new flavors. Metabolizes acids, esters and phenols (i.e. 4 vinylphenol (plastic) – 4 ethyl phenol (barnyard); acetic acid (vinegar) to ethyl acetate (fruity, solventy))
- Contain different enzymes that can breakdown complex carbohydrates (dextrins, cellobiose) that can result in high attenuation (strain dependent)

There are many strains of Brettanomyces (likely more than Sacchromyces, but still being discovered)

Forms a pellicle (lumpy white film on top surface). It is a reaction due to the presence of O₂ and has nothing to do with flavor development. Acts as a weak barrier to oxygen.

Lactobacillus



Bacteria (gram positive)

Producer of Lactic Acid (yogurt type sourness)

Lacto can ferment both in the presence or absence of oxygen but prefers reduced levels and is strain dependent.

Like most gram-positive bacteria, the presence of certain hop acids will slow the growth of most Lactobacillus.

Lactobacillus tends to cease to reproduce at a pH of around 3.8 and viability is short term – brew often

Several Strains commercially available

Homofermentative – produces only lactic acid

- Acidiophilus (99F), Delbrueckii (100F)

Heterofermentative - produces both lactic acid and ethanol

- Brevis (75), Plantarum (59F)

Pediococcus



Bacteria (gram positive)

Produces Lactic Acid and diacetyl (artificial butter)

Prefers reduced levels of oxygen

Responsible for the bulk of lactic acid production in long aged styles (Flanders Red, Oud Bruin, Lambic)

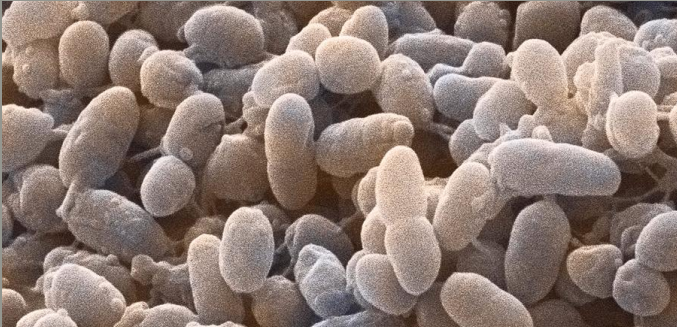
Ferments glucose into lactic acid, but does not produce carbon dioxide.

Grows slowly, usually most active in 9 – 12 month time range

Has symbiotic relationship with Brett

- Brett has enzymes to break down complex carbohydrates that Pedio can metabolize into lactic acid
- Brett can metabolize the diacetyl that is produced by pedio
- Pedio can also produce a “ropy” or “slimy” carbohydrate chain that Brett can metabolize with time. Usually a sign that pedio is most active or in response to oxygen.

Acetobacter



Bacteria

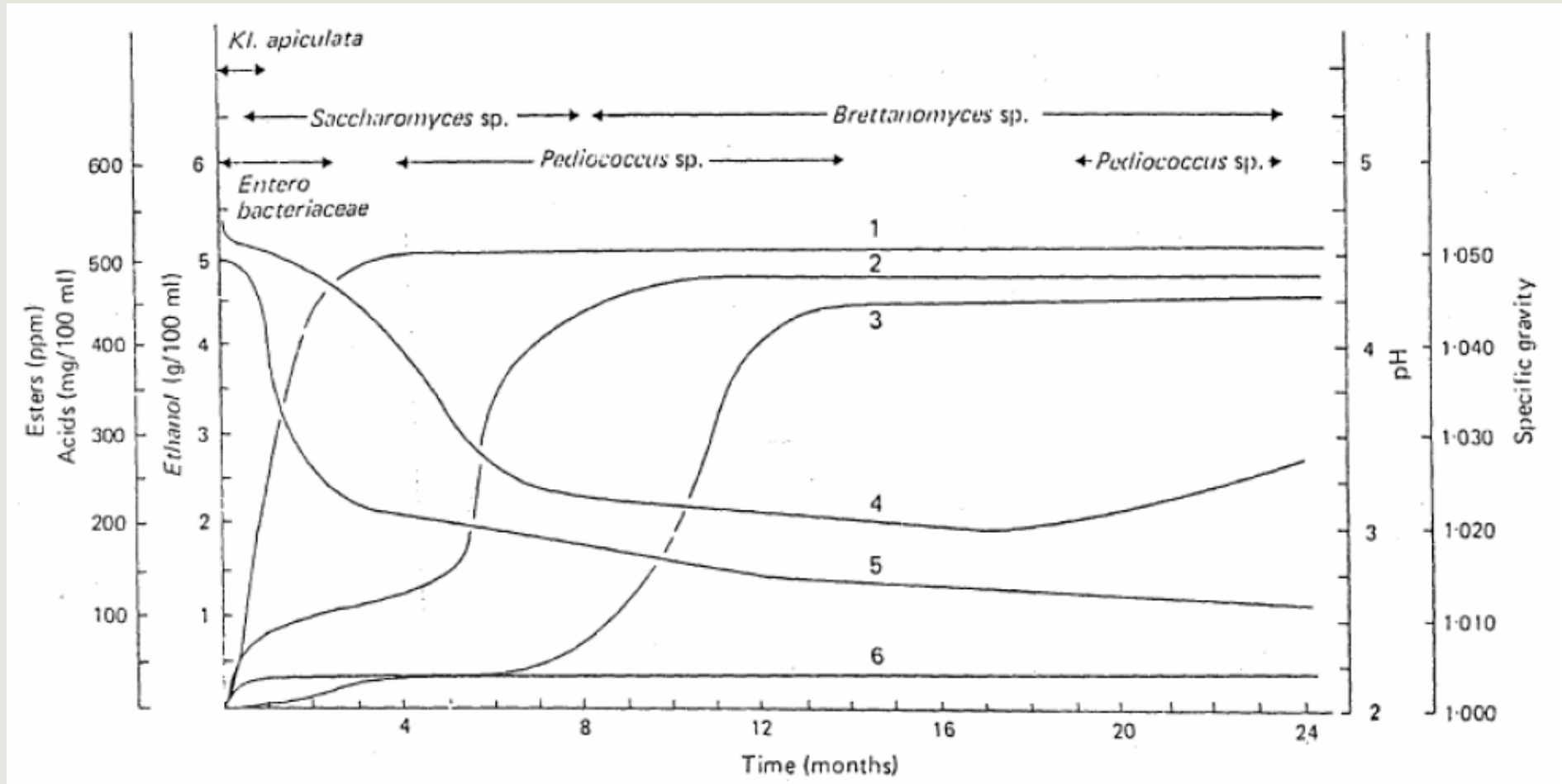
Produces Acetic Acid (vinegar)

Acetic acid is produced by oxidizing ethanol

Avoiding oxygen pick-up while aging and packaging is very important

Early signs may taste/smell like ethyl acetate (nail polish)

Fruit flies can carry acetobacter.



Mixed Fermentation Timeline

Notice the dominant microorganisms at each stage. By knowing what is dominant you can feed that bacteria directly

17A Berliner Weisse

OG: 1.028 – 1.032

FG: 1.003 – 1.006

IBU: 3-8

SRM: 2-3

ABV: 2.8-3.8%

Aroma: Sharp Lactic Acid, moderately fruity, mild Brett

Appearance: Very Pale, low head retention

Flavor: Lactic Acid, bready and grainy malt character, mild Brett

Mouthfeel: Light body, dry, high carbonation

Malt: 50% Wheat, 50% Pilsner (Add 5%-10% Melanoidin if no decoction)

Mash: Low, Single Decoction is Traditional

Hops: 0 IBUS, Not needed

Yeast/Bacteria: See below for bacteria; Yeast – Neutral – minimal esters

Multiple Souring Techniques:

Sour Mash:

Pro: Good Complexity, No extra ingredients, Fast Souring, Bacteria only in Mash Tun

Con: Little control, Horrible smell, Inconsistent results, Extended or 2 part brew session

Sour Wort:

Pro: Same as Sour Mash with a bit more "control" with CO2 blanket and smell better contained

Con: Same as Sour Mash, but more equipment touches bacteria

Commercial Lacto:

Pro: More consistent results, mild complexity

Con: Extra cost for lacto, souring takes longer, must build starter, bacteria in fermenter

Adding Acid:

Pro: Fast, No bacteria in brew system, easy to control acid level

Con: Low complexity and very clean (could be a pro depending on taste)

Preferred: Ferment in Corny keg (flushed with CO²) with heating blanket.



17B Flanders Red

OG: 1.048 – 1.057

FG: 1.002 – 1.012

IBU: 10-25

SRM: 10-16

ABV: 4.6-6.5%

Aroma: Dark Berries and malt, mild sour, mild phenols and esters

Appearance: Burgundy, Avg head retention

Flavor: Complex malt, mild sour, balanced ester/phenol, oak tannins

Mouthfeel: Light body, dry, high carbonation

Malt: 50% Munich, 20% Vienna, 15% Flaked Wheat, 5% Aromatic, CaraMunich, Special B

Mash: High (158 – 160)

Hops: 0-15 IBUS, Only Bittering

Yeast/Bacteria: Preferred: Wyeast Roeselare, Optional: White Labs Sour Mix, East Coast Yeast Bug County

- No starters needed **pitch blend in primary**
- Can pitch dregs for complexity

Additions: 1.5 oz French Med + oak cubes

Blending is critical

- Prefer 5 – 10% malty, rich, fruit (Oatmeal Stout, BDSA, Dubbel)
- Prefer pH in 3.4 – 3.6, but depends on F.G.



17C Flanders Brown / Oud Bruin

OG: 1.040 – 1.074

FG: 1.008 – 1.012

IBU: 20-25

SRM: 15-22

ABV: 4.0-8.0%

Aroma: Complex malt, dark fruits, caramelized sugars, mild sour, mild phenols

Appearance: Burgundy to dark brown, Avg head retention

Flavor: Complex malt, dark fruits, candi sugar, mild sour, mild phenols

Mouthfeel: Light body, dry, high carbonation

Very Similar to Flanders Red – think less sour, more Dubbel/BSDA like

Malt: 70% Munich, 15% Flaked Wheat, 5% Aromatic, Brown Malt, Special B – Use any good Dubbel or BSDA grist

Mash: High (158 – 160)

Hops: 15-25 IBUS, Only Bittering – Some IBUs slow down souring

Yeast/Bacteria: **Preferred: Wyeast Roeselare**, Optional: White Labs Sour Mix, East Coast Yeast Bug County

- Pitch blend in same time as favorite Belgian strain in primary
- Can pitch dregs for complexity

Additions: 1oz French Med + oak cubes

Blending is critical

- Prefer 5 – 10% malty, fruit, phenolic (BSDA, Dubbel)
- Prefer pH in 3.7 – 3.8, but depends on F.G.



17D Straight (Unblended) Lambic

OG: 1.040 – 1.054

FG: 1.001 – 1.010

IBU: N/A

SRM: 3-7

ABV: 5.0-6.5 %

Aroma: Sharp Lactic Acid, moderate Brett notes

Appearance: Very Pale, low head retention

Flavor: Lactic Acid, light bready and grainy malt character, mild Brett notes, light oak tannins

Mouthfeel: Light body, flat

Malt: 67% Pilsner, 33% Wheat

Mash: Turbid Mash is Traditional or Mash Low (150)

Hops: Aged Hops – 3 – 5 oz

Yeast/Bacteria: Traditionally Spontaneous or Wyeast 3278 – Lambic Blend, White Labs 655 Sour Mix

- No starters needed pitch blend in primary
- Can pitch dregs for complexity

Additions: 1 oz French Med + oak cubes

Blending is critical

- Acid beer
- Prefer pH in 3.0 – 3.3, but depends on F.G.

Bottled still – so must confirm fermentation is complete



17E Gueuze

OG: 1.040 – 1.060

FG: 1.000 – 1.006

IBU: N/A

SRM: 3-7

ABV: 5.0-8.0%

Aroma: Sharp Lactic Acid, moderate Brett notes (earthy, citrusy)

Appearance: Very Pale, Average to good head retention

Flavor: Lactic Acid, light bready and grainy malt character, mild Brett notes (earthy, citrusy)

Mouthfeel: Light body, high carbonation

Malt: 67% Pilsner, 33% Wheat

Mash: Turbid Mash is Traditional or Mash Low (150)

Hops: Aged Hops – 3 – 5 oz

Yeast/Bacteria: Traditionally Spontaneous or Wyeast 3278 – Lambic Blend, White Labs 655 Sour Mix

- No starters needed pitch blend in primary
- Can pitch dregs for complexity

Additions: 1 oz French Med + oak cubes

Blending is critical

- Traditionally blend of 1,2 and 3 yr old beer
- Acid beer
- Prefer pH in 3.0 – 3.3, but depends on F.G.

Bottle to 3- 4 Volumes – use Champagne or Belgian style bottles



17F Fruit Lambic (Gueuze)

OG: 1.040 – 1.060

FG: 1.000 – 1.010

IBU: N/A

SRM: 3-7

ABV: 5.0-7.0%

Aroma: Sharp Lactic Acid, dominate fruit flavor, moderate Brett notes (earthy, citrusy)

Appearance: Color depends on fruit, Average to good head retention

Flavor: Lactic Acid, dominate fruit flavor, light bready and grainy malt character, mild Brett notes (earthy, citrusy)

Mouthfeel: Light body, high carbonation

Same as 17E

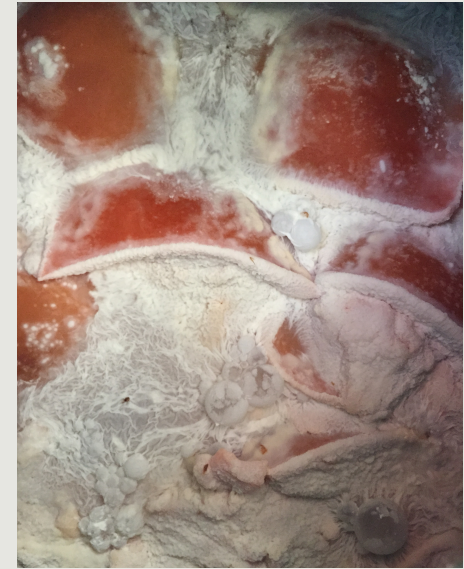
Add fruit to fermenter/keg after base beer is blended and finished

Extraction time is based on fruit type and whole/puree

- Puree – 2-4 wks
- Whole – 2-3 months

Amount varies on how dominant you want flavor and whole/puree

Fruit Type	lbs/ gal
Raspberry/Blackberry	1 - 1.5
Cherry	1.5 - 2
Blueberry/Strawberry	1.5 - 2
Peach/Apricot/Nectarine	1 - 2
Grapes	.5 - 1
Citrus Zest	1 – 2 oz



General Sour Brewing Tips

Separate equipment helps as plastic or complex parts are difficult to fully clean

Use same cleanliness and sanitization methods as “clean” beers

- Difficulty comes from low pH and nutrient tolerance, low cell count-> big flavor

Easy method to get started – 1 gal batches taken from main batch + bottle dregs

Be Patient – Do not taste too often, Beer is done when you like the taste

Tasting adjustments can be made (i.e. maltodextrin at 9 months to feed pedio)

Oxygen is the enemy for long term storage

Blending is mandatory for world class beer

Bottle with wine yeast (.2 gr/gal) and use a priming calculator



201: Brewing American Wild Ales

How to apply the basics of mixed fermentations to new flavor profiles

- Available *Brettanomyces* strains
 - Primary Fermentation flavors and procedures
 - Secondary flavors and procedures

Blending Basics

- Type of beers to have on hand (i.e. Acid beer, Brett beer...)
- Procedures and Calculators

Secondary Flavors

- Oak/Wood Aging
- Fruit/Spice Additions





Question and Answer

Follow-up on the QUAFF Email list or directly by email (Jeff@Councilbrew.com) or Peter