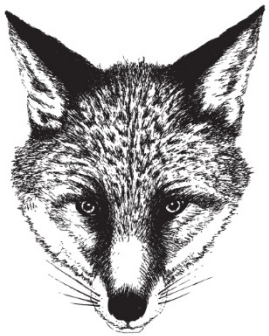
Multiple Personalities of Brett



JESSUP FARM
BARREL HOUSE

Our Mutual Friend
Brewing Company

INLAND ISLAND
YEAST LABORATORIES
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Good Bugs Philosophy

- **Microbes play a vital role in not only the fermentation of both beer and food, but bring dynamic flavor expressions to everything they touch.**
- **Good Bugs intends to spark a dialogue about yeast and bacteria as culinary ingredients.**
- **Explore the vast microverse of spontaneous and mix-culture fermentation.**
- **Experiment with blended yeast cultures to coax out flavors yet to be discovered.**

GOOD BUGS
FERMENTATION SERIES BY BREWED FOOD

Re-Imagine an Approach to Brewing

Traditional Approach to Building a Recipe and Brewing:

Brewer chooses a style of beer they want to brew. They then pick grains, hops, and adjuncts defined by the style. Finally, a yeast strain is selected based on style guidelines, attenuation and generally accepted brewing practices.

Our Approach to Building a Recipe and Brewing:

Brewer imagines a flavor profile they would like to create. It could come from nature or the culinary world. They then select yeast and bacteria that are capable of producing flavor compounds similar to the flavor profile they are looking to create. Grains and hops are then selected that will help to amplify the flavors produced during fermentation.

GOOD BUGS
FERMENTATION SERIES BY BREWED FOOD

Get to Know Brett

Brettanomyces (*Greek for British Fungus*)

'Wild Yeast' as opposed to domesticated Brewer's yeast (Saccharomyces cerevisiae)

Originally isolated in 1903 by Hjelte Clausen at Carlsberg Research Laboratory

Commonly found on the skins of fruit, olives and the wood of barrels.

More genetic diversity than Saccharomyces cerevisiae

Most Brettanomyces strains have the capacity to metabolize a wide range of sugars, mono-saccarides, di-saccarides, trisaccharides and dextrins.

(Very Attenuative)

The 1%

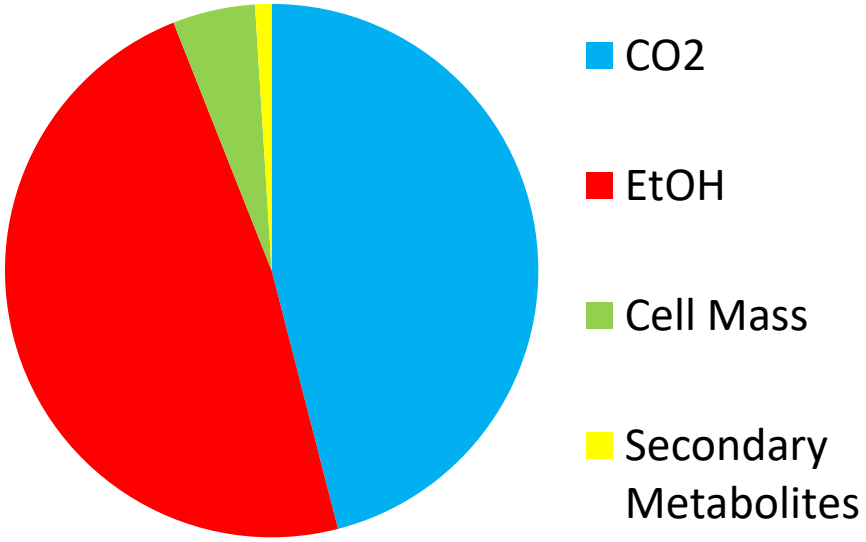
During fermentation, yeast consume sugars and primarily produce Ethanol, CO_2 and Cell Mass.

46.3% CO_2, 48.4% EtOH, 5.3% Cell Mass

<1% esters, phenols, aldehydes, ketones, acids, etc.

An **Ester** is a volatile compound formed from an organic acid and an alcohol which is responsible for the fruity aromas and flavors in beer.

A **Phenol** or Phenolic Compound is a hydroxylated aromatic carbon ring responsible for smoky and spicy flavors in beer.



Secondary Metabolites in Beer

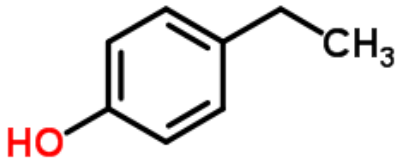
Compound	Concentration in Beer (detected) mg/L	Aroma Threshold mg/L	Aroma descriptor
Ethyl acetate	22.5-63.5	7.5	Nail polish, fruity
Isoamyl acetate	0.1-3.4	0.03	Banana, pear
2-phenylethyl acetate	0-18.5	0.25	Flowery, rose, fruity
Isobutyl acetate	0.01-1.6	1.6	Banana, fruity
Hexyl acetate	0-4.8	0.7	Sweet, perfume
Ethyl butanoate	0.01-1.8	0.02	Floral, fruity
Ethyl hexanoate	0.03-3.4	0.05	Green apple
Ethyl octanoate	0.05-3.8	0.02	Sweet soap
Ethyl decanoate	0-2.1	0.2	Floral, soap
Propanol	9-68	500	Pungent, hard
Butanol	0.5-8.5	150	Fusel, spirituous
Isobutanol	9-174	40	Fusel, spirituous
Isoamyl alcohol	6-490	30	Harsh, nail polish
Hexanol	0.3-12	4	Green grass
2-phenylethyl alcohol	4-197	10	Floral, rose
Acetic acid	100-1150	280	Vinegar
Acetaldehyde	10-75	100	Sherry, nutty, bruised apple
Diacetyl	5-40	2.8	Buttery
Glycerol	5-14 g/L	5 g/L	Odorless, slightly sweet
Linalool	0.0017-0.010	0.025	Rose
Geraniol	0.001-0.044	30	Rose-like, flower
Citronellol	0.015-0.042	100	Citronella
2-acetyl-1-pyrroline (ACPY)	Trace	0.0001	Mousy
2-acetyltetrahydropyridine	0.0048-0.1	0.0016	Mousy
4-ethylphenol	0.012-6.5	0.14	Medicinal, barnyard
4-ethyl guaiacol	0.001-0.44	0.11	Phenolic, sweet
4-vinyl phenol	0.04-0.45	0.02	Medicinal
4-vinyl guaiacol	0.0014-0.71	10	Clove-like, phenolic

Brett Is A Complicated Fella

Phenols Most Commonly Associated with Brett

4-ethylguaiacol — often characterized as smoky or spicy

4-ethylphenol — described as a sweaty horse blanket, barnyard, or Band-Aid

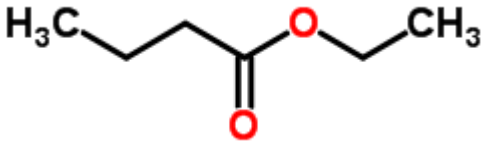


Esters Most Commonly Associated with Brett

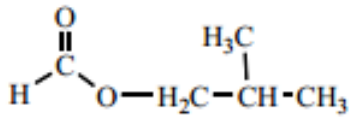
Ethyl acetate — fruity, pineapple, pear

Ethyl caprylate — sweet, waxy, fruity and pineapple

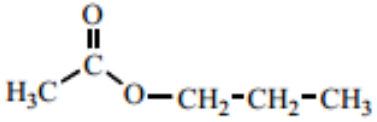
Ethyl butyrate — pineapple, mango, tropical fruit



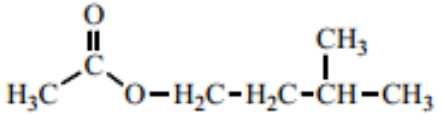
Familiar Esters



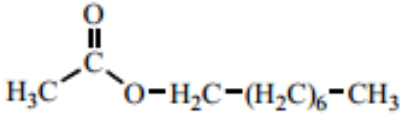
Raspberry



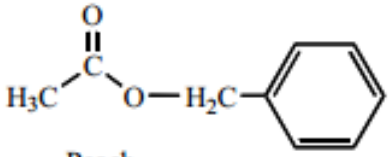
Pear



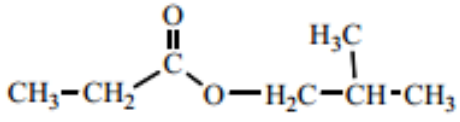
Banana



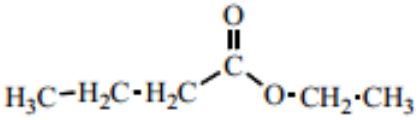
Orange



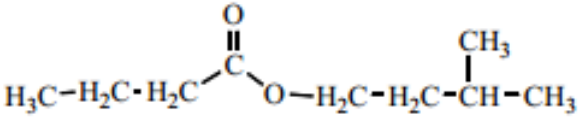
Peach



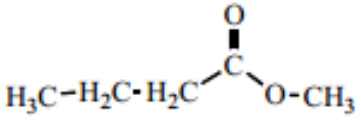
Rum



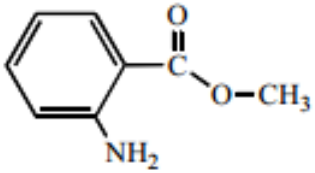
Pineapple



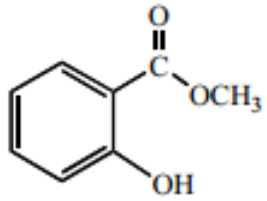
Apricot



Apple



Grape



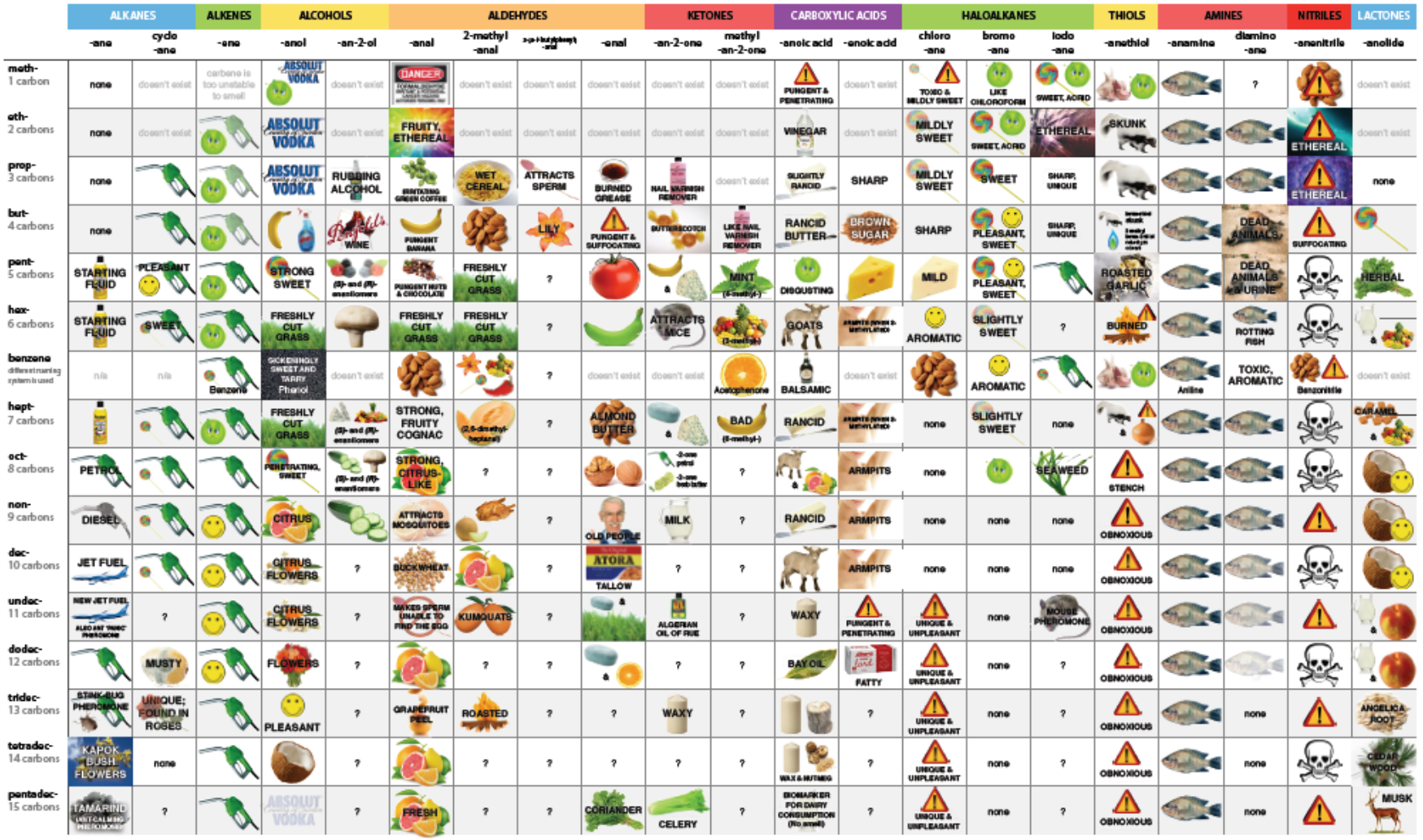
Oil of Wintergreen

Figure 10.1. Structures of some familiar esters

Organic Compounds and Their Aromas

Organic Chemistry

Table of organic compounds and their smells



GOOD BUGS FERMENTATION SERIES

Beer Name – Kōbo Kai

Style – Mixed culture blended sour inspired by saké

ABV – 6.0% **IBU** – 10 **SRM** – 5

Grain Bill – Two row malted barley, cooked white rice, unmalted wheat, malted wheat, malted rye & honey malt.

Hops – Aged hops, German Northern Brewer and Willamette

Yeast Profile – blend of Saké #9 yeast, Brett Morpheus and wild & native yeast

Fermentation Specs – fermented at ambient temp, aged in oak for an average of 14 months.

Beer Description – Kōbo Kai is a saké inspired mixed culture brett beer. The central component to this blend is a golden sour aged in neutral oak barrels, with nearly 20% of the grist bill being comprised of rice and fermented with a blend of sake yeast and acid producing brettanomyces. A wild capture fermented saison and a wild captured fermented table beer were blended alongside, contributing elements of hay, jasmine and subtle barnyard funk. The three components of this beer come together producing stone fruit and citrus aromatics that meld with notes of peach, dried mango, straw, and jasmine. Kōbo Kai roughly translates to “yeast party”, which is exactly what you’ll find with this beer.

Why Good Bugs? The Good Bugs collaboration was born out of a meeting at last year’s Big Beers festival -- Jensen and I struck up a conversation about the philosophy behind good bugs, and that far too often brewers design a beer concept with the ingredients in mind and driving toward a set of stylistic parameters in order to define “success”. At Wiley Roots, we believe strongly in defining certain attributes that we think would be interesting in the final packaged beer, but we view time and barrel expression as far more important ingredients that we are simply stewards for. The yeast and microorganisms we introduce along with each individualized barrel environment contribute far more to the overall concept and final product than the influence we interweave in the brewhouse. Thus is the inspiration behind Kōbo Kai.

GOOD BUGS FERMENTATION SERIES

Beer Name – Brett Lager Blend

Style – Wild Lager

ABV – 7.2% **IBU** – 15 **SRM** – 3

Grain Bill – 2-Row, Pilsner

Hops – Bravo, Sterling

Yeast Profile – Some typical earthy Brettanomyces notes, but heavier on the citrus and stonefruit aspects of these yeast strains.

Fermentation Specs – Primary fermentation in steel with lager yeast at 48F. Secondary fermentation in three oak barrels, each with a different Brettanomyces strain at 68F.

Beer Description – A blend of three oak barrels of Avery Lager, each with a secondary fermentation in oak with a single Brettanomyces strain. Brux II, Morpheus, and Claussenii team up for a Voltron-esque showcase of three milder “wild” yeast strains

Why Good Bugs? – Because cool shit!

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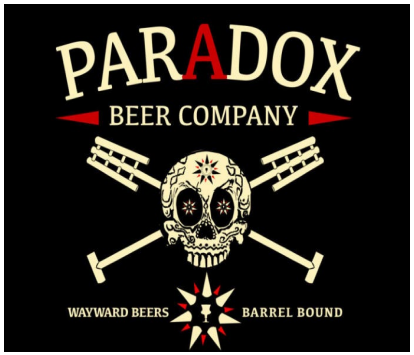
GOOD BUGS
FERMENTATION SERIES BY BREWED FOOD



GOOD BUGS FERMENTATION SERIES

Beer Name – Fermée Boucle (Closed Loop)

Style – Multi-Vintage Blended Wild/Sour Golden

ABV – 7.9% (blended) **IBU** – 7 **SRM** – 4

Grain Bill – German Pilsner Malt, American Flaked Oats

Hops – American Low Alpha

Yeast Profile – (30+ Microbe) House Brett, Sacc, and Lacto/Pedio Collection blended with spontaneously inoculated beer from our Coolship.

Fermentation Specs – Free-rise oak foeder fermentation, blend of three different ages including barrel-fermented spontaneous beer.

Beer Description – Working to balance all the aspects of a blend is like twisting the knobs of an equalizer. The complication is that each flavor knob you twist causes all the other to move up or down slightly. At Paradox one of our favorite levels to play with is salty minerality. By accentuating mineral complexity in our blends we find that both fruity esters are elevated and sharp acids perception is reduced. This beer, intentionally served still, is an example of multi-vintage blending to bring mineral character to the forefront.

Why Good Bugs? Jensen Cummings's culinary exploration from a brewing perspective is the perfect "yin" to our brewing exploration from a culinary perspective "yang."

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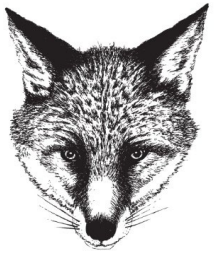

JESSUP FARM
BARREL HOUSE

GOOD BUGS FERMENTATION SERIES

Beer Name – Happy Creatures Brett IPA

Style – Brett IPA

ABV – 7.0% **IBU** – 50 **SRM** – 6

Grain Bill – 40% Troubadour Serenade (Pale), 30% Pilsner, 20% Troubadour Ballad (Munich), 10% Flaked oats

Hops – Azacca, Amarillo, Citra, Nugget, Vic Secret in the boil; dry-hopped with Amarillo, Citra, Vic Secret

Yeast Profile – Primary: Fruit Sacch (wild Saccharomyces) + Brettanomyces Morpheus
– Secondary: Brettanomyces Bruxellensis II + Brettanomyces Clausenii

Fermentation Specs – Primary: 68F with free rise
– Secondary: 3.5 months in neutral oak barrels at 68-70F

Beer Description – A No-coast IPA - inspired by elements of both NE and West coast style IPA - utilizing fermentation by a blend wild yeasts targeting a stone & tropical fruit flavor profile with a layer of funk, which is supported by healthy dose of Amarillo, Citra, and Vic Secret hops both at the end of the boil and in dry-hopping.

Why Good Bugs? It's all about the (wild) fermentation!

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GOOD BUGS
FERMENTATION SERIES BY BREWED FOOD

Our Mutual Friend
Brewing Company

GOOD BUGS FERMENTATION SERIES

Beer Name – Future Imperfect

Style – Mix Culture Blended Golden Sour

ABV – 6.6%

Grain Bill – Super Secret

Hops – Super Secret

Yeast Profile – Over 20 unique cultures + spontaneously fermented microbe capture

Fermentation Specs – Super Secret

Beer Description – A Collaboration Blend between OMF, Good Bugs & Inland Island Yeast Labs. This beer was hand blended from Foeders, wine casks and stainless steel and represents a combination of selected yeast and bacteria and wild capture yeasts and bacteria. It starts off with citrusy aroma that is rounded out with a slight phenolic character from the portion of spontaneous beer added. Flavor is balanced and showcases oak and vanilla from the various cooperage chosen.

Why Good Bugs? Good Bugs and Our Mutual Friend share a like-minded approach to the use of wild yeasts and bacteria. In both our businesses these are organisms we nurture and rely on to make our products flavorful and unique.

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