



# History of Norwegian Kveik Cultures and Novel Uses in Modern Brewing

Lance Shaner, owner



**OMEGA YEAST**

# Educational and Professional Background

- B.S. in Microbiology from U. of Ill. at Urbana-Champaign ('01)
- Ph.D. in Microbiology & Molecular Genetics from UT-Houston Graduate School of Biomedical Sciences ('06)
- J.D. from University of Houston School of Law ('09)
- Patent Attorney at Marshall Gerstein & Borun LLC ('09-'13)
- Co-founder of Omega Yeast Labs LLC ('13-present)

# What does Omega Yeast do?

- Propagate and ship brewing yeast and bacterial cultures for microbreweries and home brewers all over the US (and some international).
- Create and develop new brewing strains
- Basic differential plating-based contamination testing of beer samples.
- Advice on strain selection and fermentation parameters.
- Proprietary strain banking and propagation.



# What is Kveik?

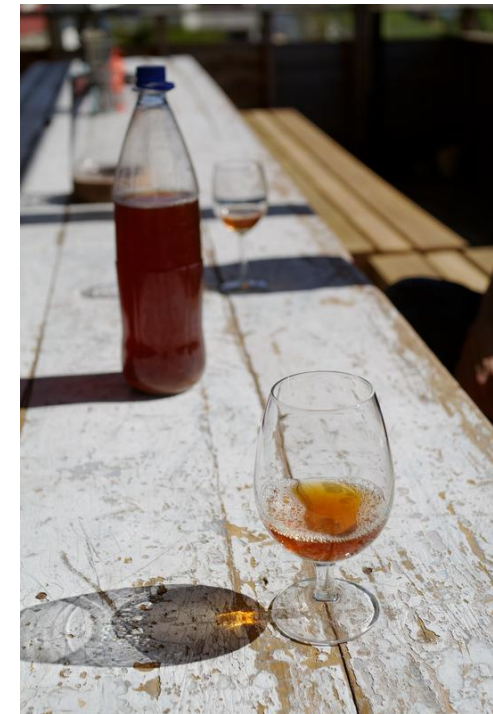
---

- Norwegian dialect word for “yeast”, not a style of beer
- Traditional Norwegian farmhouse cultures passed on for generations
- Brought to the attention of the brewing world by blogger Lars Marius Garshol (Larsblog)
- Generally speaking, the cultures are high temp tolerant, flocculent, non-phenolic (POF-) and high alcohol tolerant.
- Norwegian brewers regularly push temps to 100F!



# Hallmarks of Norwegian Farmhouse Brewing

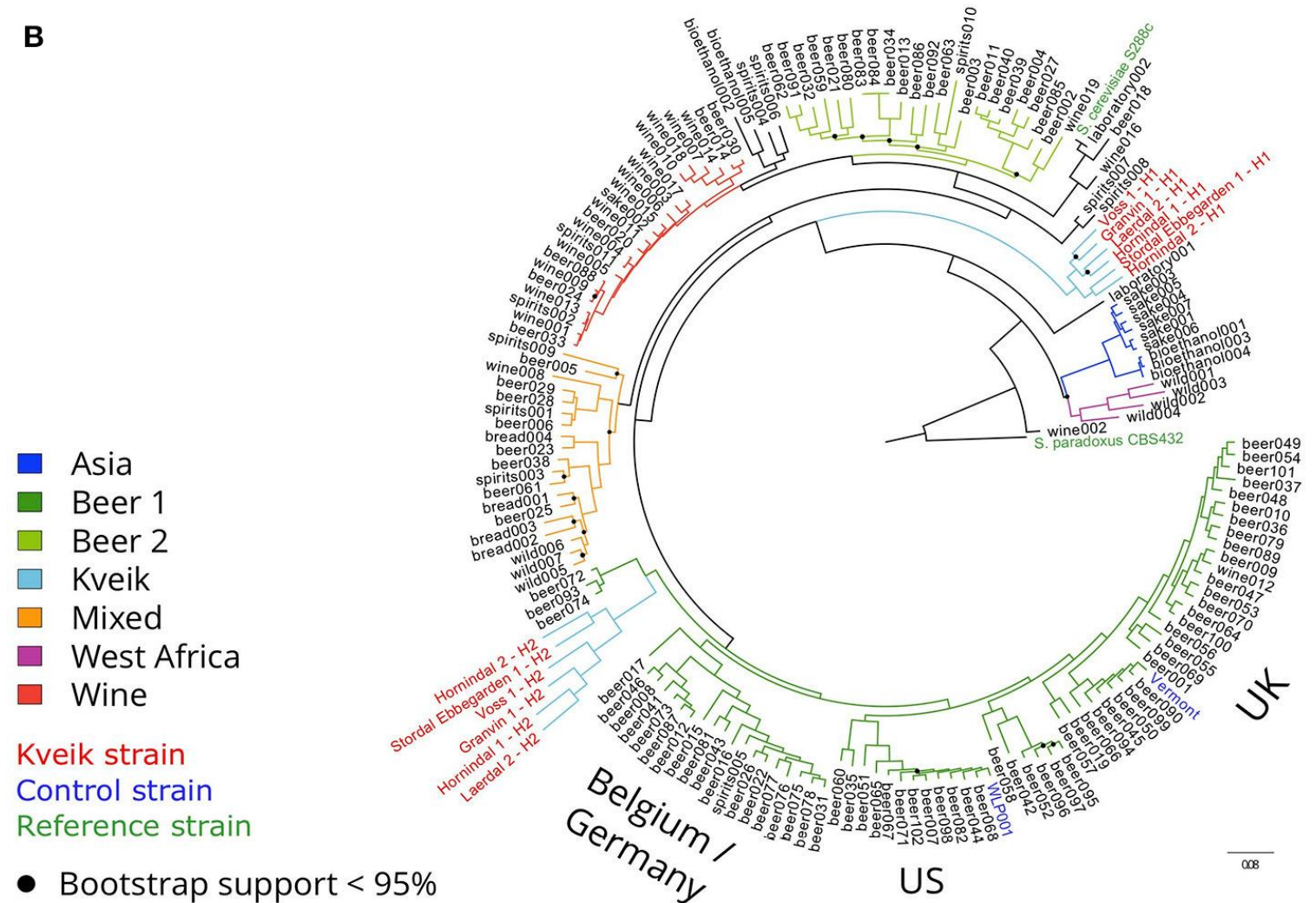
- Juniper-infused mash water, long boils, little hop character
- Rapid fermentation (1-2 days) of high gravity (~19P) wort
- Yeast stored dry on kveikstokker (yeast logs)
- Kveikstokker used to inoculate next batch by dipping in 86-104F (30-40C) wort(!)
- In one region of Norway, they scream into the fermenter as yeast is being pitched



# Hallmarks of Kveik Cultures

Distantly related to other domesticated brewing yeast  
Data from Preiss *et al.*, 2018

B

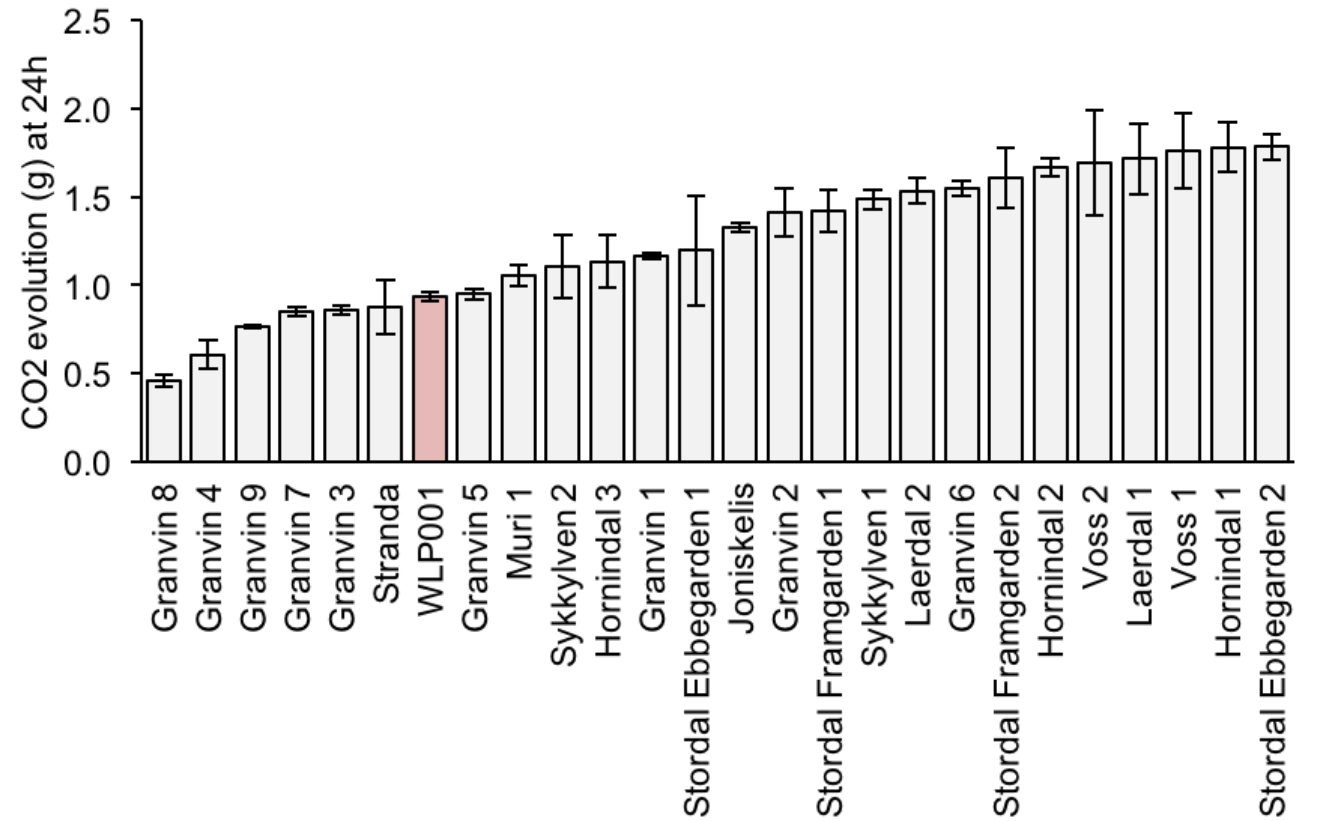


**OMEGA YEAST**

# Hallmarks of Kveik Cultures

Rapidly fermenting

Data from Preiss *et al.*, 2017



**OMEGA YEAST**

# Hallmarks of Kveik Cultures

High temperature and alcohol tolerance

Data from Preiss *et al.*, 2017

Strain	Temperature					Ethanol Tolerance						% Flocculence	+/-		
	15°C	30°C	35°C	40°C	42°C	45°C	9%	11%	12%	13%	14%			15%	16%
WLP570	+	+	+	+	-	-	+	+	+	+	+/-	+/-	-	1.9%	1.0%
WLP001	+	+	+	-	-	-	+	+	+	+	+/-	-	-	45.4%	9.6%
WLP002	+	+	-	-	-	-	+/-	-	-	-	-	-	-	98.3%	0.1%
WLP029	+	+	+	-	-	-	+	+/-	-	-	-	-	-	90.7%	9.0%
Granvin 1	+	+	+	+	+	-	+	+	+	+	-	-	-	76.3%	4.7%
Granvin 2	+	+	+	+	+/-	-	+	+	+	+	+/-	-	-	70.3%	7.9%
Granvin 3	+	+	+	+	+/-	-	+	+/-	+/-	+/-	-	-	-	16.9%	2.3%
Granvin 4	+	+	+	+	+/-	-	+	+/-	+/-	+/-	-	-	-	78.4%	1.2%
Granvin 5	+	+	+	+	-	-	+	+/-	-	-	-	-	-	20.2%	6.4%
Granvin 6	+	+	+	+	+	-	+	+	+	+	+	+/-	+/-	88.4%	1.0%
Granvin 7	+	+	+	+	-	-	+	-	-	-	-	-	-	51.1%	9.3%
Granvin 8	+	+	+	+	+/-	-	+	+/-	+/-	+/-	-	-	-	22.3%	8.9%
Granvin 9	+	+	+	+	-	-	+	-	-	-	-	-	-	12.9%	6.1%
Hornidal 1	+	+	+	+	+/-	-	+	+	+	+	+	+/-	+/-	97.5%	0.3%
Hornidal 2	+	+	+	+	-	-	+	+	+	+	+	+	+/-	12.3%	7.7%
Hornidal 3	+	+	+	+	+/-	-	+	+	+	+	+	+/-	+/-	97.8%	0.4%
Joniskelis	+	+	+	+	+/-	-	+	+	+	+	+	+/-	-	2.1%	3.0%
Laerdal 1	+	+	+	+	+/-	-	+	+	+	+	+	-	-	83.4%	10.3%
Laerdal 2	+	+	+	+	+/-	-	+	+	+	+	+	-	-	97.6%	0.4%
Muri 1	+	+	+	+/-	-	-	+	+	+	+	+/-	+/-	-	58.9%	9.9%
Stordal Ebbegarden 1	+	+	+	+	+/-	-	+	+	+	+	+	+	+/-	99.3%	0.1%
Stordal Ebbegarden 2	+	+	+	+/-	+/-	-	+	+	+	+	+/-	-	-	22.0%	5.7%
Stordal Framgarden 1	+	+	+	+	+/-	-	+	+	+	+	+	+	+/-	99.2%	0.7%
Stordal Framgarden 2	+	+	+	+	-	-	+	+	+	+	+	+	+/-	89.7%	13.1%
Stranda 1	+	+	+	+	-	-	+	+	+	+	+	+	+/-	99.3%	0.1%
Sykkylven 1	+	+	+	+	+/-	-	+	+	+	+	-	-	-	97.7%	1.3%
Sykkylven 2	+	+	+	+	+/-	-	+	+	+	+	+/-	+/-	-	87.7%	7.7%
Voss 1	+	+	+	+	+	-	+	+	+	+	-	-	-	75.8%	5.3%
Voss 2	+	+	+	+	+	-	+	+	+	+	-	-	-	91.7%	2.1%

+ = typical growth, +/- = reduced growth, - = no growth

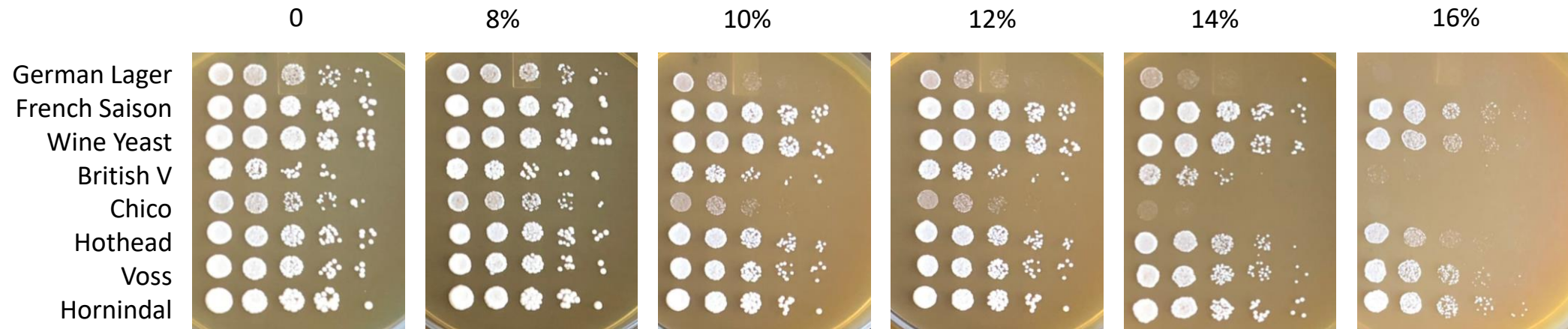


**OMEGA YEAST**

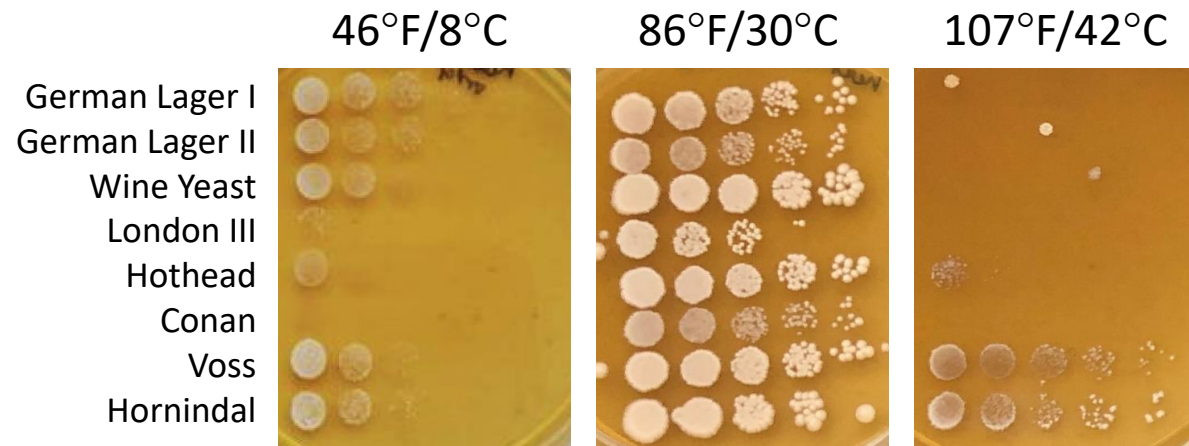


# Kveik Ethanol Tolerance

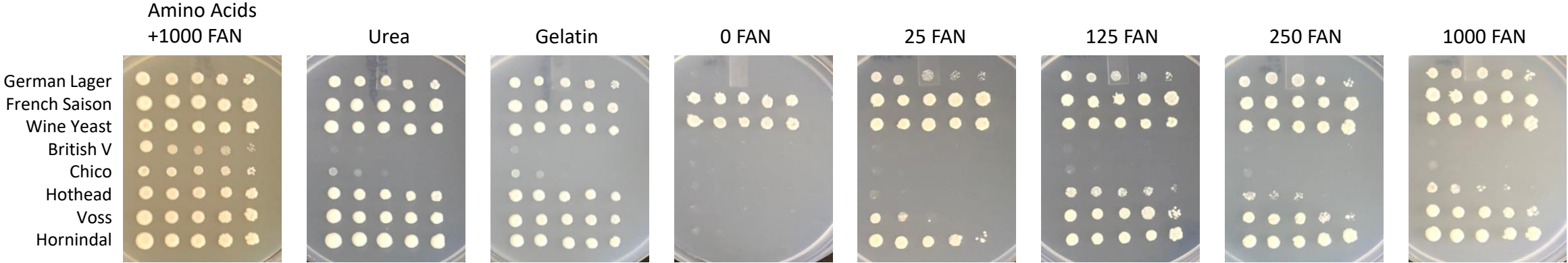
YPD + Ethanol Plates



# Kveik are Heat and Cold Tolerant



# Exploring Kveik Nutrient Requirements



	Ethyl Acetate	Ethyl Caproate	Ethyl Caprylate	Ethyl Decanoate	Ethyl Nonanoate	Hexanoic Acid	Isoamyl Acetate	Isoamyl Alcohol	Isobutanol	Phenethyl Acetate	Phenethyl Alcohol	4-Vinyl Guaiacol
Granvin 1	1.715	0.156	2.512	0.494	0.161	0.023	0.674	6.79	1.324	1.052	19.694	0.058
Granvin 2	3.118	0.366	4.555	0.455	0.197	0.01	0.781	7.879	1.527	1.87	21.603	0.012
Granvin 3	1.492	0.122	1.159	0.013	0.143	0.002	0.744	7.506	2.282	0.36	17.216	0.014
Granvin 4	1.195	0.059	0.232	0.012	0.025	0.004	0.467	4.719	1.126	0.257	15.163	0.043
Granvin 5	2.231	0.116	1.666	0.08	0.149	0.008	0.933	9.432	2.175	0.749	28.262	0.016
Granvin 6	3.2	0.365	5.005	0.88	0.238	0.02	0.905	9.046	1.9	1.36	24.966	0.016
Granvin 7	1.564	0.128	1.712	0.056	0.155	0.001	0.7	7.049	2.022	0.424	20.577	0.012
Granvin 8	1.229	0.056	0.299	0.026	0.028	0.003	0.538	5.423	1.344	0.298	14.628	0.043
Granvin 9	1.537	0.085	1.188	0.076	0.109	0.003	0.467	4.704	1.065	0.474	13.653	0.037
Hornindal 1	3.408	0.193	3.58	1.39	0.164	0.074	0.539	5.436	0.945	2.074	14.128	0.043
Hornindal 2	2.257	0.084	1.271	0.247	0.091	0.002	0.635	6.421	1.184	0.906	15.291	0.043
Hornindal 3	2.505	0.236	4.151	1.412	0.155	0.203*	0.556	5.659	0.838*	1.498	13.504	0.042
Joniskelis	1.495	0.117	2.301	1.277	0.151	0.055	0.589	5.942	1.018	1.568	17.63	0.223
Laerdal 1	1.838	0.315	4.124	0.891	0.204	0.116	0.453	4.689	0.624*	0.687	13.535	0.069
Laerdal 2	1.849	0.102	1.8	0.554	0.159	0.022	0.672	6.927	1.005	1.04	15.838	0.044
Muri	2.713	0.224	2.005	1.078	0.188	0.011	0.53	5.354	0.892	2.276	14.804	0.31
Stordal Ebbegarden 1	2.103	0.083	0.811	0.272	0.053	0.097	0.475	4.783	0.947	0.794	13.974	0.039
Stordal Ebbegarden 2	2.542	0.089	0.619	0.341	0.041	0.217*	0.677	7.052	1.135	1.074	16.637	0.049
Stordal Framgarden 1	2.395	0.168	2.975	0.772	0.158	0.058	0.55	5.536	0.901	1.635	15.809	0.052
Stordal Framgarden 2	2.654	0.44	4.112	0.753	0.176	0.006	0.593	5.998	0.976	0.864	14.03	0.047
Stranda	2.393	0.168	2.818	1.035	0.157	0.027	0.602	6.086	0.857	1.018	16.056	0.049
Sykkylven 1	2.046	0.101	1.306	0.427	0.08	0.005	0.483	4.883	0.867	0.749	14.28	0.043
Sykkylven 2	1.668	0.102	1.392	0.675	0.079	0.133	0.422	4.257	0.619*	0.622	12.081	0.044
Voss 1	2.156	0.209	3.317	0.618	0.145	0.006	0.463	4.651	0.941	0.825	12.377	0.039
Voss 2	2.364	0.307	3.059	0.347	0.157	0.005	0.519	5.225	1.01	1.148	15.121	0.039
WLP001	2.064	0.192	0.241	0.105	0.196	0.03	0.66	6.654	2.46	1.004	25.918	0.072
WLP002	0.735	0.076	0.537	0.047	0.101	0	0.81	8.168	4.062	0.478	19.481	0.053
WLP029	3.22	0.348	4.142	0.99	0.292	0.002	0.655	6.601	1.962	1.601	21.047	0.013
WLP570	5.734	0.806	8.586	1.583	0.424	0.019	1.395	14.057	2.106	3.529	33.427	0.299
Threshold (ppm)	30	0.21	0.9	0.2	0.85	8	1.2	70	100	3.8	100	0.3

Ethyl caproate = pineapple, tropical

Ethyl caprylate = tropical, apple, cognac

Ethyl deconoate = apple



**OMEGA YEAST**

# Kveik FAQ

- Will kveik infect all of my equipment?
  - No. It's just Sacch yeast. Not diastatic.
- How do I make a kveik beer?
  - There's no such thing. "Kveik" means "yeast". That's like saying "How do I make a yeast beer?"
- What styles can I make using kveik?
  - Anything where you would use an English ale yeast – IPA, NEIPA, APA, porter, stout, barleywine, imperial stout, cream ale, etc.
- How do I pronounce "kveik"?
  - K (combination of w and v) ike
  - Ask a Norwegian.

# How do Kveik Cultures Fit Into Modern Brewing?

- Non-phenolic and fruity = IPAs, pale ales, English ales, stouts, imperial stouts, barleywines, porters, etc.
- High alcohol tolerance = Imperial stouts, barleywines, etc.
- Rapid, high temp fermentations mean lower tank residence time, faster product turnaround
- Rapid, high temp fermentations mean lower energy costs due to less chilling during KO, less glycol demand during fermentation
- Unique ester content can make products stand out while still being recognizable



# Real World Examples

- 5-Day Berliner Weisse
- Imperial Stout (9.7% ABV)
- 10-Day Barleywine (16% ABV)



# Berliner Weisse

## Vitals

**OG:** 1.039

**FG:** 1.010

**ABV:** 3.8%

**IBU:** 0

**pH:** 3.34

## Ingredients

- 40% Pilsner Malt
- 50% White Wheat Malt
- 10% Munich Malt
- No hops!



**OMEGA YEAST**



# Berliner Weisse

## Process

- Mash at 148°F for 60 minutes
- Boil for 30 minutes
- Knock out at 95°F

## Fermentation

- Pitch OYL-605 and apply heat wrap to maintain 90°F
- After 24 hours, pitch OYL-057
- Terminal gravity and pH were reached after 96 hours.



# Imperial Stout

## Vitals

**OG:** 1.114

**FG:** 1.040

**ABV:** 9.7%

**IBU:** 50

## Ingredients

- Light DME - 38.9%
- 2 row - 22.2%
- Munich Malt - 11.1%
- Crystal 60L - 5.6%
- Special B - 5.6%
- Roasted Barley - 5.6%
- Black Malt - 5.6%
- Hopped with Warrior and EKG



**OMEGA YEAST**

# Imperial Stout

## Process

- Mash at 150°F for 60 min
- Boil for 150 min with hop additions at 60, 15, 10 and flameout
- Knockout at 90°F and oxygenate generously

## Fermentation

- Pitch 2x standard pitch rate of OYL-091 (~14 mil cells/mL)
- Ferment at 90°F+
- Reached terminal gravity on Day 4.



# Imperial Stout

- Smooth, rich dark chocolate character.
- Stonefruit esters compliment dark malts.
- No fusels = dangerously drinkable



# Barleywine

## Vitals

**OG:** 1.150

**FG:** 1.030

**ABV:** 16%

**IBU:** 45

## Ingredients

- Dark Munich (30 SRM) -65 %
- Flaked Barley - 32%
- Pale 2-row - 3%
- Hopped with Columbus



**OMEGA YEAST**

# Barleywine

## Process

- Mash at 154°F for 60 min
- Boil for 240 min with hop addition at 60 min
- Knockout at 95°F and oxygenate generously

## Fermentation

- Pitch 2x standard pitch rate of OYL-091 (~14 mil cells/mL)
- Ferment at 90°F+
- Reached terminal gravity in 36 hours.



# Barleywine

- Small amount of acetaldehyde conditioned out at 72 hours.
- Rich maltiness + kveik esters = candied fruit
- Again, no fusels means no boozy burn.



# Acknowledgements

Lars Marius Garshol

Richard Preiss, Escarpment Labs

## Omega Yeast crew

Nate Gibbon, Plant Manager

Laura Burns, Ph.D., R&D Director

Marete Seymour, Intern

Nik Allen, Yeast Propagation Technician

Adi Hastings, Shipping Manager

Matt Glazier, Production Manager



**OMEGA YEAST**



# OMEGA YEAST

