

#### THE EVOLUTION OF PREMIUM DRY YEAST



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#### **CULTURE COLLECTION**

Close to 4,000 yeast strains in collection About 400 strains in production

Storage

Liquid nitrogen -171 °C Freezer -80 °C (Microbank)

The integrity and characteristics of the yeast remain intact

General strain characterization (Genetic profile, sugar spectrum, Killer, POF,...)

Screening for specific applications







#### **FLOW CHART - YEAST PROPAGATION**



## **Crabtree Effect**



↑ Sugar => ↑FDP & Pyruvate

- Activation of fermentation enzymes
- Inhibition of Pyruvatedehydrogenase

cells switch to fermentation



### **BATCH VS. FED-BATCH PROPAGATION**



- Batch propagation
  - All nutrients are in fermenter
  - Alcohol and little yeast is produced
- Fed Batch
  - Carbohydrates and nitrogen are added at a certain flow rate
  - Aerobic fermentation => Alcohol decreases, yeast production



## **MAIN GOALS OF PROPAGATION**

#### Biomass Production

Aerobic growth

feeding & aeration

#### Yeast conditioning for drying

- Protein content
- Matured cells
- Trehalose enrichment
- Unsaturated fatty acids
- Sterols (Ergosterol)

feeding rate feeding rate stress aeration

aeration



#### Flow Chart -Downstream





#### Quality Control on bulk and packaged yeast (24 Tests, 2 weeks)

- Viability (YPD, Cellometer)
- Vitality (Clinitest, Ankom)
- Wild Yeast (Lysine, LWYM, LCSM)
- Bacteria (PCA, UBA, LMDA)
- Beer fermentation
- DNA fingerprinting
- STA (qPCR after enrichment)



### **WORT AERATION**





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Dry Lager Yeast Fermented at 14 °C with and without aeration





#### REHYDRATION VS. DIRECT PITCH Grape Must VS. Beer Wort

	Grape must	Beer wort
Starting pH	3.0 - 4.0	5.4 - 5.6
Organic Acids	TA: 5-10 (tartaric acid)	low
FAN or YAN	30 - 450 mg/L	180 – 220 mg/L
Starting Gravity	Sugar concentration (200-280g/l)	10-18 °Plato
Sugar	Glu, Fru, Suc (DP1 & DP2)	Glu, Mal, DP3, DP4+





### **REHYDRATION VS. DIRECT PITCH**





#### **REHYDRATION VS. DIRECT PITCH**

SRM = Standard Rehydration Method DP = Dry Pitch











## **SERIAL REPITCHING**

#### LALBREW DIAMOND LAGER™







**G4** 



## **SERIAL REPITCHING - PERFORMANCE**

Generation	Viability	Alcohol	Final Gravity (°Plato)
G0 Dry	63.7%	5.44%	2.4°Plato
G0 Wet	98%	5.54%	2.2°Plato
G1 Dry	97%	5.73%	2.7°Plato
G1 Wet	96%	5.66%	3.1°Plato
G2 Dry	93%	5.07%	3.8°Plato
G2 Wet	92%	5.16%	3.7°Plato
G3 Dry	91.3%	5.71%	3.4°Plato
G3 Wet	91.2%	5,74%	2.7°Plato
G4 Dry	95%	5.87%	2.5°Plato
G4 Wet	98%	5.63%	2.9°Plato

Powell et al., J. Am. Soc. Brew. Chem. 68(1):48-56, 2010



## **SERIAL REPITCHING - PERFORMANCE**

	Flavor Threshold	Wet G0	Dry G0	Wet G4	Dry G4
Iso-amyl alcohol		66.4	66.2	54.1	40.2
Iso-butanol	100 ppm	23.1	27.8	10.7	9
Iso-propanol		<1	<1	<1	<1
Ethyl acetate	30 ppm	38.9	20.1	30.8	26.7
Iso-amyl acetate	1.4 ppm	3.3	1.6	2.6	2.5
Ethyl hexanoate	0.2 ppm	<1	<1	<1	<1
DMS	30 ppb	116	100	130	166

Powell et al., J. Am. Soc. Brew. Chem. 68(1):48-56, 2010



## Why Dry?

- Brewers are asking for the convenience of it more and more as quality has improved
- We originally thought, we can't do it if we can't make it perform and taste exactly like liquid
- We realized that if we can provide the best dry brewers yeast possible in our strains, we can give brewers the choice of what format they want and elaborate on the differences
- By combining our companies expertise, we can provide the highest quality QC and most repitches possible







## QA Sheet Example



WLP001 is famous for its clean flavors and hardy fermentations and is known for its use in hoppy beers. It accentuates hop flavors and aromas and attenuates well, even for high gravity beers. A higher than average attenuation leads to drier beers as well as medium flocculation to leave a clean and crisp beer. With a healthy pitch of yeast, WLP001 is also quick at reabsorbing diacetyl.

This strain has the ability to be used in almost any style of ale ranging from IPA to porter and even kölsch, which makes it a great all-around house strain. Now in liquid and dry format.

Visit whitelabs.com for more information

#### Flocculation: Medium

#### Ferm Temp:

68°- 73°F (20°- 23°C)

#### Attenuation:

75-85%

#### Alc Tol: High (10-15%)

STA1: Negative

#### Scan QR for:



CERTIFICATE OF ANALYSI
DRY BREWER'S YEAST



TEST	RESULT	SENSITIVITY
WILD YEAST DETECTION	Pass	<1 CFU PER 40 MILLION CELLS
AEROBIC BACTERIA DETECTION	Pass	<1 CFU PER 1 MILLION CELLS
ANAEROBIC BACTERIA DETECTION	Pass	<1 CFU PER 1 MILLION CELLS
PARAMETER	PRODUCI	SPECIFICATIONS
VIABILITY	>5 X10'9 CFU PER GRAM OF DRY YEAST	
PERCENT SOLIDS	93-95%	
PHENOLIC OFF FLAVOR (POF)	NEGATIVE	
STAI GENE PRESENT IN STRAIN	NEGATIVE	

#### Manufacturing Location: Product of Austria

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**URE YEAST & FER** 

Finished product is released to the market using ASBC and EBC methods. Each lot is individually tested for each parameter.

These results are true and accurate at the time of QC release. Microbial test results are actual results obtained from quality control testing on each individual lot. Parameters are based on verifiable product specifications during manufacturing. It is the responsibility of the purchaser, formulator or those performing further manufacturing to determine suitability based upon the intended use of the end product.



## **Re-pitching**

- Collect yeast within 24 hours of terminal gravity
- . Store at 4°C for less than 14 days
- Yeast Health Optimization
  - Zinc • 0.5ppm in wort
  - Dissolved oxygen?
    We believe it is still best to achieve 1ppm per Plato in wort



#### WHITE LABS BREWING CO.

#### **Tabberer IPA®**

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	<b>YEAST:</b> WLP001 California Ale Yeast® Dry Yeast or WLP001 California Ale Yeast® Liquid Yeast		MALT: Pale Malt ( Golden Oa Carapils (6	(81.6%) hts (12.2%) 5.2%)
A	HOPS:			
	BOIL	WHIRLPOOL	DRY HOP	Ultraferm
	Warrior (30 min)	Simcoe	Simcoe	Servomyces
		Amarillo	Amarillo	Clarity Ferm

Citra

#### Gravity (Plato)

• WLP001 Calfornia Ale Yeast (Dry) • WLP001 Calfornia Ale Yeast (Liquid)

Citra



	DRY	LIQUID
App. Attenuation (%):	85.6	85.3
Starting pH:	5.2	5.2
Final pH:	4.8	4.7
Ferm Temp (°C)	18	18
Ferm Temp (°F)	64	64

	DRY	LIQUID
Diacetyl As-is (ppb):	82.1	31.7
Diacetyl Total (ppb):	128.7	54.4
cetaldehyde (ppm):	5.2	6.0
thyl Acetate (ppm):	33.5	34.6
amyl Acetate (ppm):	1.2	1.2

### **Flavor Impact**



### CONCLUSION

- Dried brewing yeast has come a long way.
- From baking yeast in early beer kits to high quality brewing yeast for specific applications.
- But we are not done. This is a continuous learning process and constant improvement of our products.
- The partnership with White Labs allows us to revisit and improve even more.



# THANKS