



Diacetyl Troubleshooting



Devin Tani

Technical Education Coordinator

Overview of Fermentation

Fermentation Timeline

Early fermentation

- Yeast uses all the dissolved oxygen; there is no detectable uptake of glucose

8-16 hours

- First sign of active fermentation

24 hours

- Budding yeast cells observed
- The temperature, if uncontrolled, rises due to heat generated by the fermentation

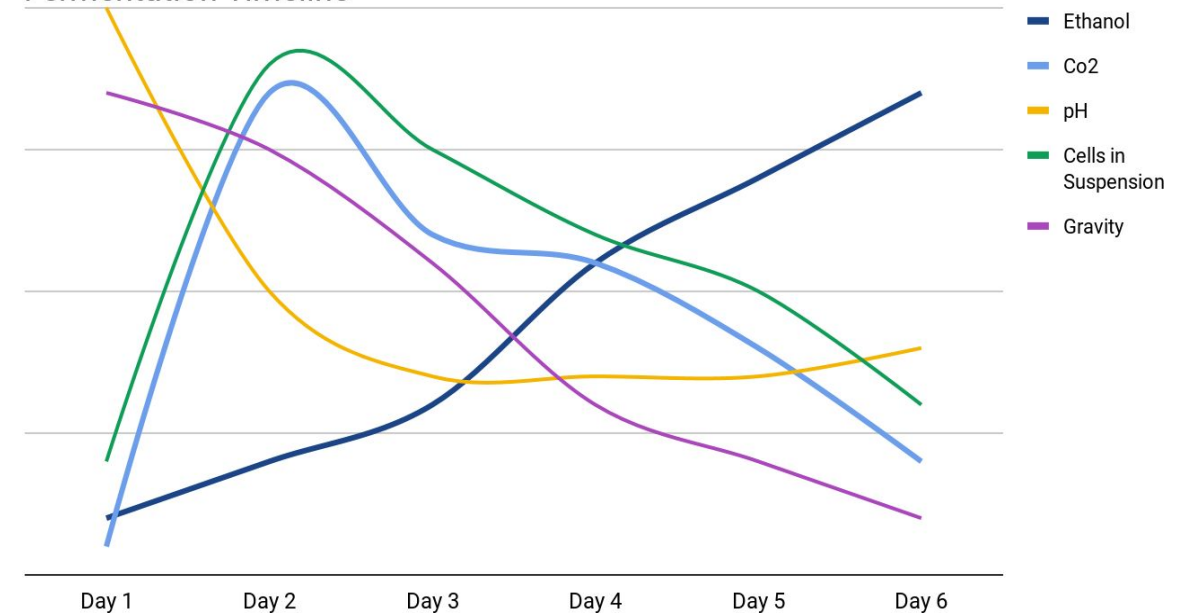
24-48 hours

- The rate of yeast growth and carbohydrate assimilation reaches a maximum

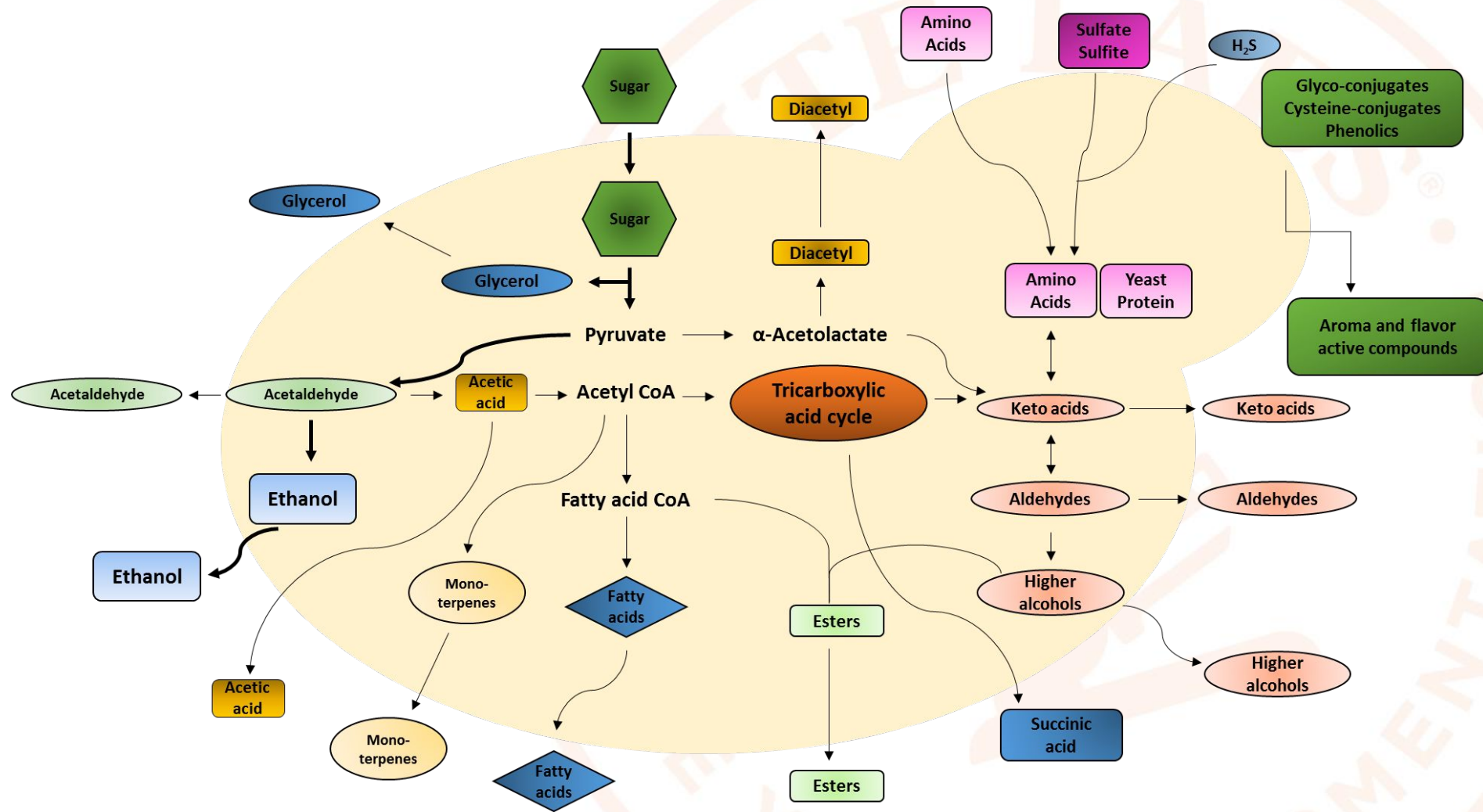
Post 48 hours

- The pH falls to a minimum of 3.8 - 4.4 before rising slightly towards the end of fermentation

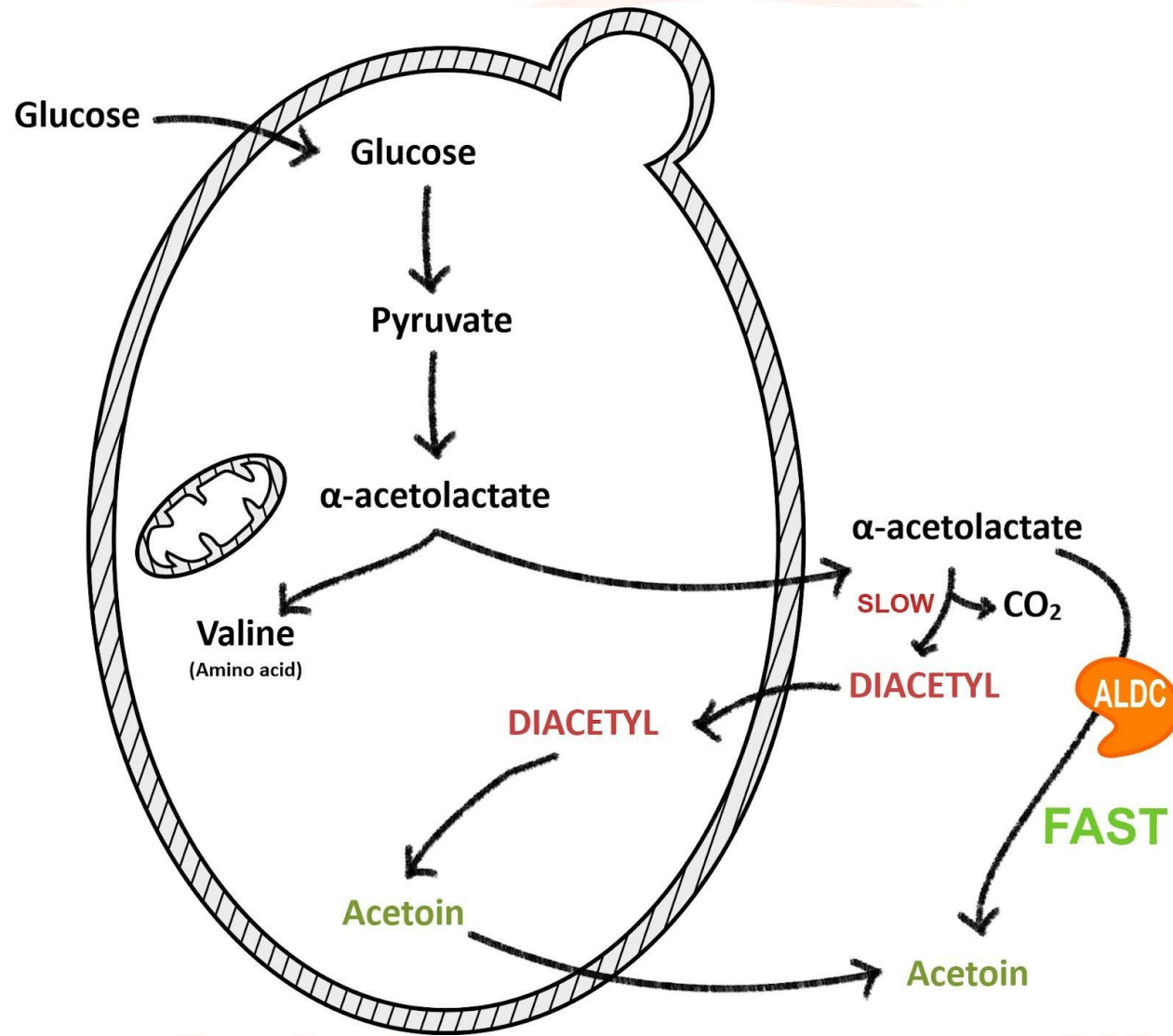
Fermentation Timeline



Yeast Flavor Development



Diacetyl

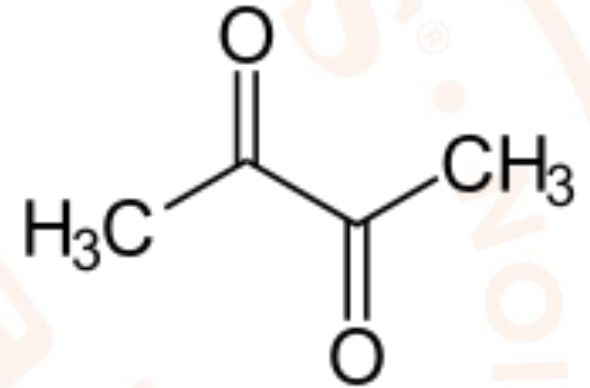


Diacetyl

Flavor – Buttered popcorn, butterscotch, yogurt, slick mouthfeel

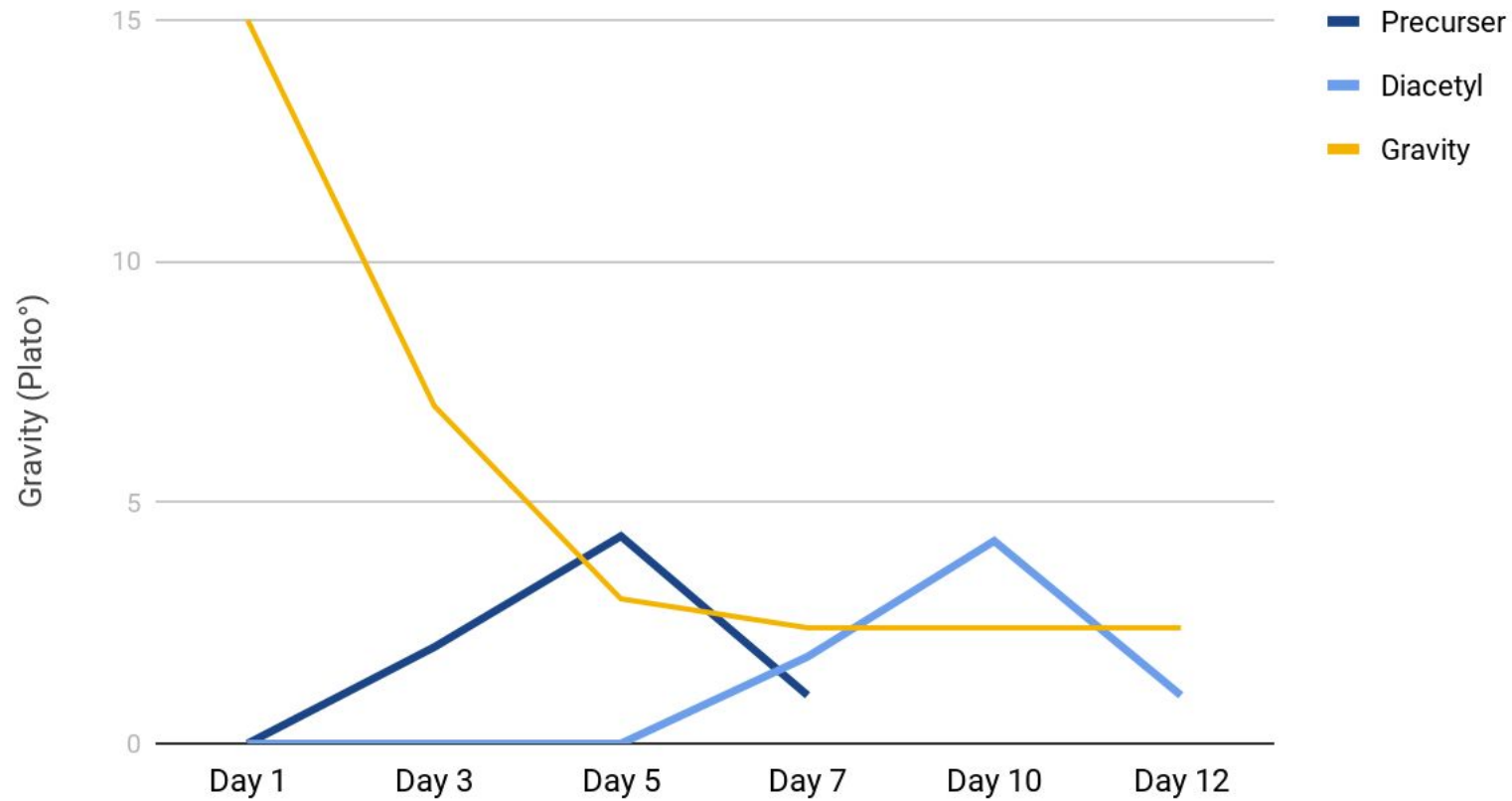
Formation:

- Precursor (α -AL) produced during primary fermentation
- α -AL is converted to diacetyl outside cell
- Diacetyl is again taken up and metabolized by yeast during maturation
- Reaction related to amino acid synthesis
- pH and temperature dependent



Diacetyl

Diacetyl Production



Forced Diacetyl Testing

Purpose

- A Quick & Easy Sensory Test
- Heating Beer before cold crashing to convert α -AL to Diacetyl
- Prevents Diacetyl Bombs from happening post fermentation

Required Materials

• Sterile
• Brewery
Sample



• Water
Bath



• 50 mL
• Conical
Tubes



• Centrifuge



• Thermometer



• Timer



Forced Diacetyl Testing

Method



01 Heat the water bath to 140-160°F (60-71°C).

02 Aseptically collect beer into two 50mL conical tubes and centrifuge.



2A. Move beer off sediment into a clean new 50mL conical tube.



Note: If a centrifuge is not available, cold crash beer sample to get yeast out of solution.

Method



03 Place one 50mL tube in the water bath at 140-160°F (60-71°C), while keeping the other at room temperature.

04 After 10-30 minutes, remove the sample from the hot bath and cool to the same temperature as the other sample. An ice water bath or cold box is effective for cooling.



05 Remove cap, smell and taste each sample.

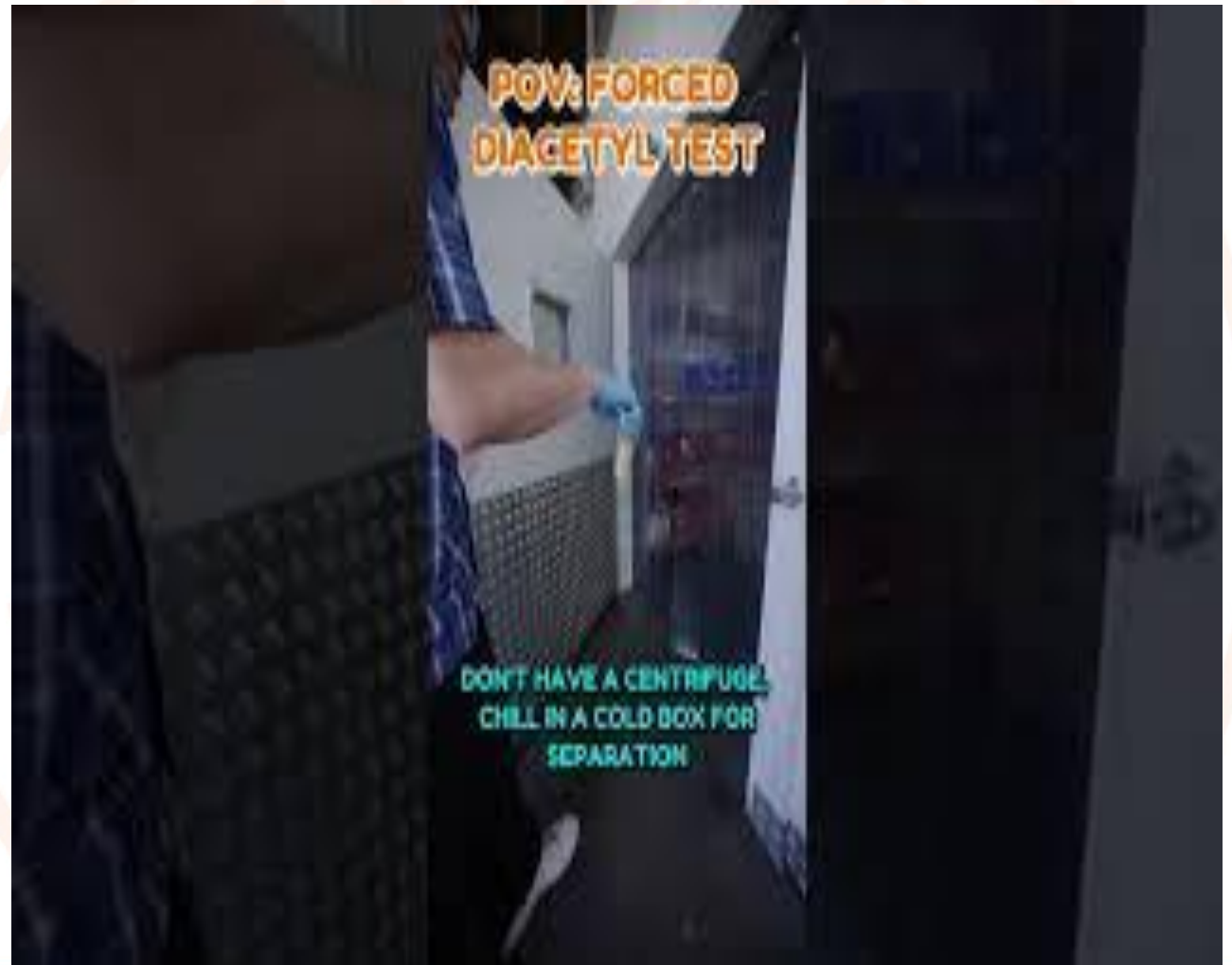
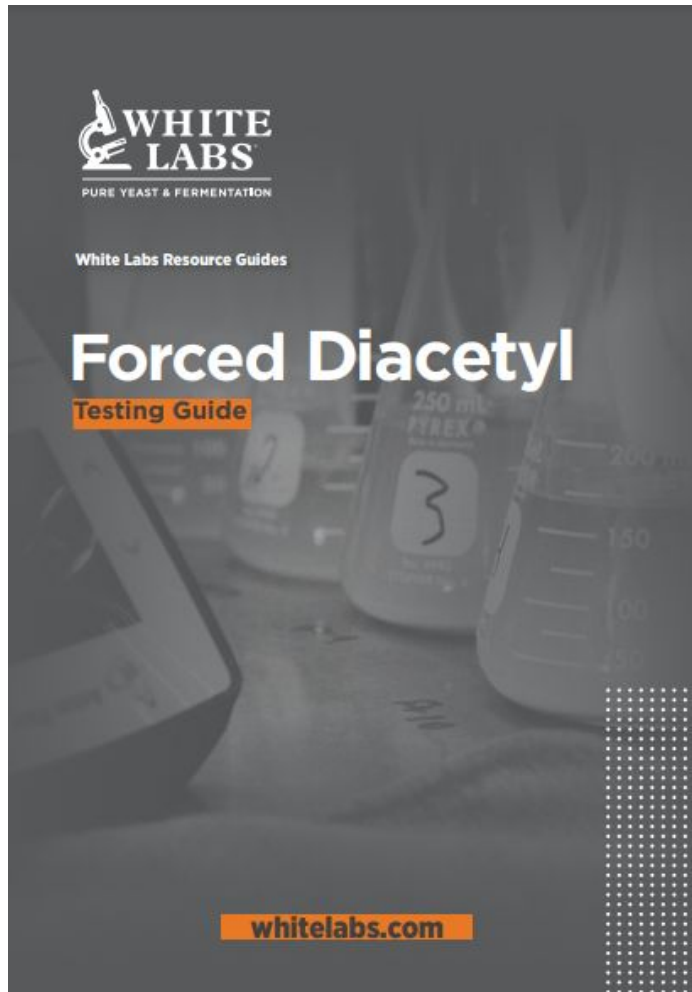
5A. If you smell the buttery character of diacetyl in either or both samples, let the beer condition longer.

Results

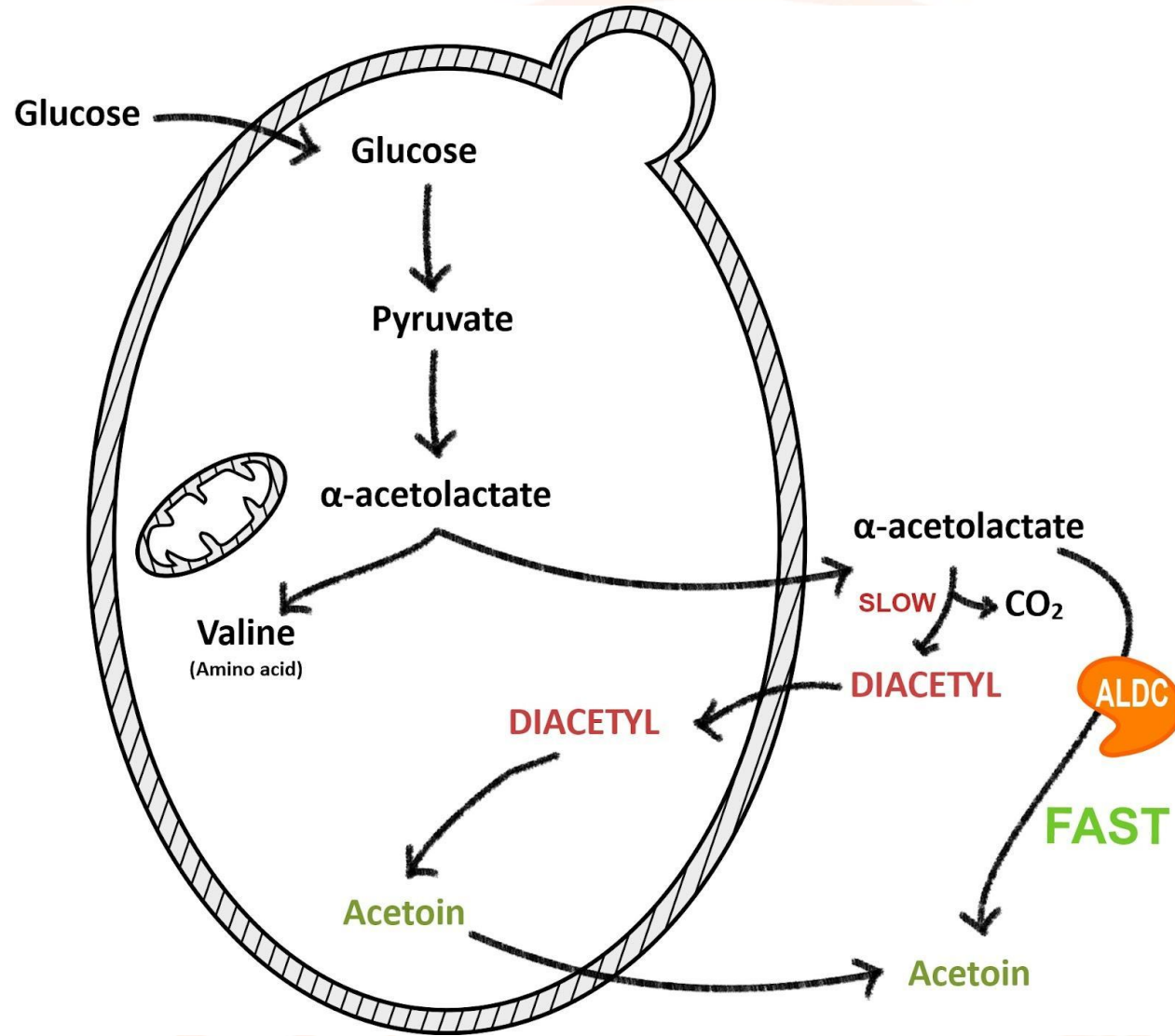
Room Temp Beer	Heated Beer	Conclusion
Negative	Negative	No precursor present, beer is ready to go
Negative	Positive	Precursor present, beer needs more time on yeast and increase temperature
Positive	Positive	Beer is loaded with diacetyl or possibly contaminated. Beer needs more time on yeast

	B424.01 / FV01	WLP001 - California Ale Yeast						B424.02 / FV02	WLP008 - East Coast Ale Yeast				
Date	Day	Gravity	pH	Temperature	Processes	Total VDK (ppb)		Day	Gravity	pH	Temperature	Processes	Total VDK (ppb)
Date	Day	WLP001 - California Ale Yeast	WLP001 - California Ale Yeast	Actual / Setpoint	Cellarwork/ FD&VDK			WLP008 - East Coast Ale Yeast	WLP008 - East Coast Ale Yeast	Actual / Setpoint	Cellarwork/ FD&VDK		
8/20/2024	0	16.9	4.85	16.2/21	Initial KO	Tank RLU:		0	16.9	4.85	21.3/21	Initial KO	Tank RLU:
8/21/2024	1	15.9	4.71	18.8/21				1	15.6	4.68	21.1/21		
8/22/2024	2	8.8	4.3	21.3/21				2	8.1	4.11	20.9/21		
8/23/2024	3	5.3	4.34	20.9/21	temp rise (23°C)			3	6.3	4.11	21.1/21	temp rise (23°C)	
8/26/2024	6	4.7	4.41	21.7/23				6	5.4	4.19	21.8/23		
8/27/2024	7	4.6	4.37	22.4/23		29.07		7	5.2	4.15	22.4/23		41.25
8/28/2024	8	4.7	4.4	22.8/23				8	5.2	4.15	22.7/23		
8/29/2024	9	4.5	4.5	22.9/23	VDK sample taken	34.47		9	5	4.21	22.7/23	VDK sample taken	31.42
8/30/2024	10	4.4	4.44	22.8/23				10	5	4.2	22.6/23		
9/3/2024	14	4.2	4.54	22.9/23	Dry Hop #1			14	5	4.31	22.8/23	Dry Hop #1	
9/4/2024	15	4.4	4.62	22.7/23	DH #2			15	5	4.42	22.6/23	DH #2	
9/5/2024	16	4.5	4.82	22.8/23		190.84		16	5.2	4.66	22.9/23		65.79
9/6/2024	17	3.9	4.84	22.8/23	Trub dump			17	4.8	4.7	22.6/23	Trub Dump	
9/9/2024	20	3	4.82	22.8/23				20	3.7	4.63	23.1/23		
9/10/2024	21	2.8	4.88	22.8/23		Total 102.78		21	3.5	4.63	23/23		Total 59.0
9/11/2024	22	2.7	4.89	22.7/23				22	3.3	4.65	22.8/23		
9/12/2024	23	2.6	4.88	22.8/23	VDK Sample taken	Total 87.9		23	3.1	4.6	22.6/23	VDK sample taken/ capped/crashed	Total 45.9
9/13/2024	24	2.6	4.89	22.5/23	Crop Hops			24				Crop Hops	
9/16/2024	27	2.5	4.87	22.3/23				27					
9/17/2024	28	2.5	4.86	21.9/23	VDK sample taken	As-is = 26.49 Total = 75.73		28					
9/18/2024	29	2.6	4.81	21.9/23	capped/crashed			29					
	30							30					

Forced Diacetyl Testing



Diacetyl



Brewzyme-D

Prevent the Formation of Diacetyl during Fermentation.

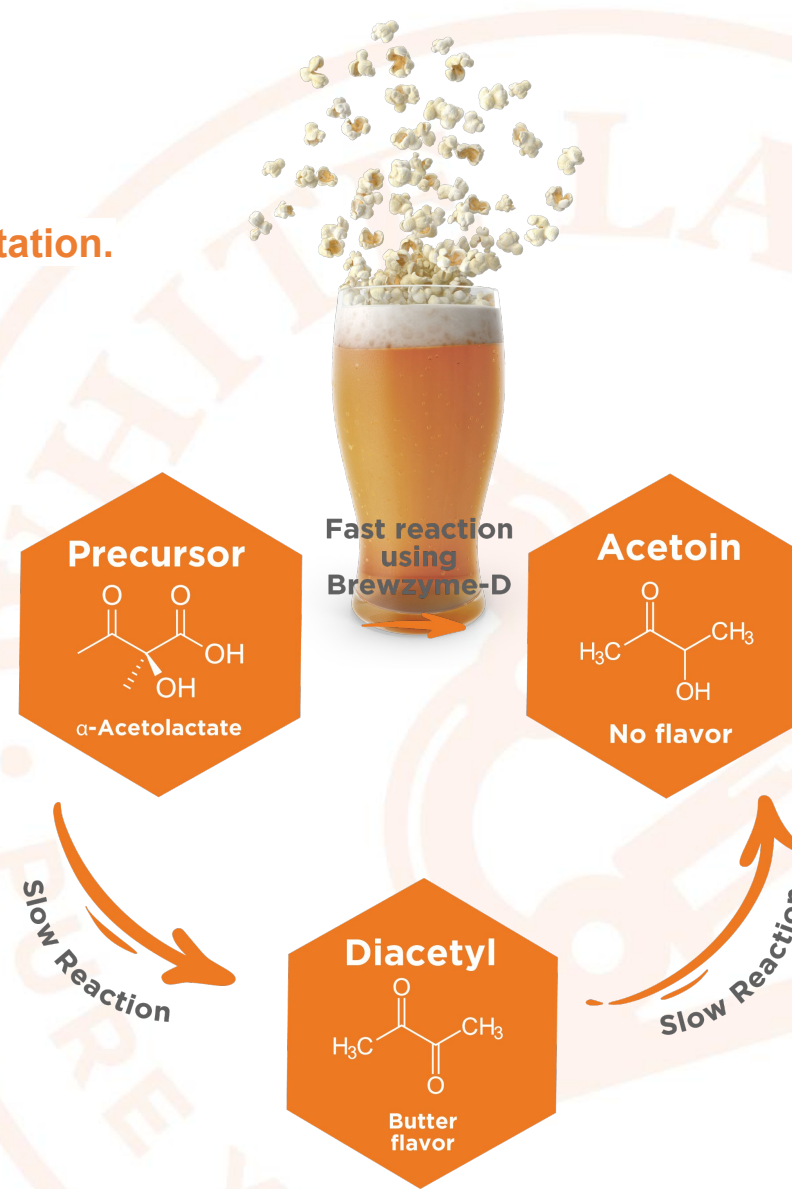
Made with Alpha Acetolactate Decarboxylase (ALDC)

- Eliminates the risk of diacetyl formation in your beer.
- Reduces maturation time = Faster Beer Turnaround Timelines.
- Improves overall beer quality.
- Prevent hop-creep in dry hopped beers

Dosage:

Pro (1L, 10L): 15-20mL/hL(0.84 BBL)

HB (10mL): 10mL/ 20L(5Gal)



Conclusion

- Forced Diacetyl Testing - Easy to implement in brewery SOPS
- Enzymes can help quicken Fermentation Tank Time = \$\$\$
- Better understanding of strains/beer
 - Checking can save a brand



Thank you, from White Labs
-Cheers!



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