



WHEAT YEAST

THE STOP OF BELL'S AND

ATTACK

Craft Brewers (*SACCHAROMYCES CEREVISIAE* VAR. *DIASTATICUS*)

April 12, 2017

Bell's Brewery


Lauren Torres

Disclaimer

This is a story of our journey in discovering a problem and the measures we took to improve it.

We do not know the whole story, but look forward to continuing to shine a light on this problem for the betterment of our industry.





**Winter
2013**

Winter 2013



- Conducting routine 1 month carb check on a batch of Winter White Ale (WW)
- Out of spec high



Winter 2013



- Instrument working correctly
- Data mining
 - Carbonation and ABV values at time of package
- Inventory



What now?

- Plated samples
 - UBA, SDA, HLP, NBB, LCSM, WLN
- Sent samples out for sequencing analysis
- Tested more samples and ABV



Kevin Verstrepen's Lab

Map Satellite

United States

North Atlantic Ocean

Germany

KATHOLIEKE UNIVERSITEIT LEUVEN

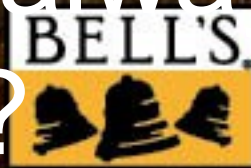
Home Research Consultancy Publications

The Verstrepen Lab
VIB Laboratory for Systems Biology
& Laboratory for Genetics and Genomics
Centre for Microbial and Plant Genetics
KU Leuven

Anecdotes come out



Has this always been a
problem?



THE RESULTS ARE IN!

Saccharomyces cerevisiae var. *diastaticus*



Saccharomyces cerevisiae **var.** *diastaticus*

- Contains genes for glucoamylase production
- Can break down starches and dextrans into fermentable sugars
- Can cause phenolic off flavors
- Can increase CO₂ and ABV
- Can over-pressurize containers
- Can grow on LCSM, LWYM, and dextrin media
- Can be detected by PCR
- Looks like our house yeast



Lin's Cupric Sulfate Media (LCSM)

- Had stopped using LCSM for WW Belgian yeast due to high level of growth on plates
- We plated this on LCSM and did see growth this





We set to work!

- Looked into several batches of WW that had gone to bottle
 - Cold- and warm-stored
- 7/12 batches showed increases in ABV and CO₂
- Thus, problem was not

Where did it come from?

- Could not conclusively say where the infection came from
- At the time, we did not have great tools for detecting *diastaticus*
- This sent us into a panic and we proposed to hire a trained microbiologist



THE MAN, THE LEGEND, THE

MI
T: V

IS
W



A satellite image of the Arctic region, showing a large, swirling ice vortex in the central part of the image. The vortex is a complex, multi-lobed structure of white and light blue ice, surrounded by darker, more uniform ice fields. The overall scene is a high-contrast, monochromatic view of the polar region.

**Winte
r 2014
#polar
vortex**

THE PCR! Polymerase Chain Reaction

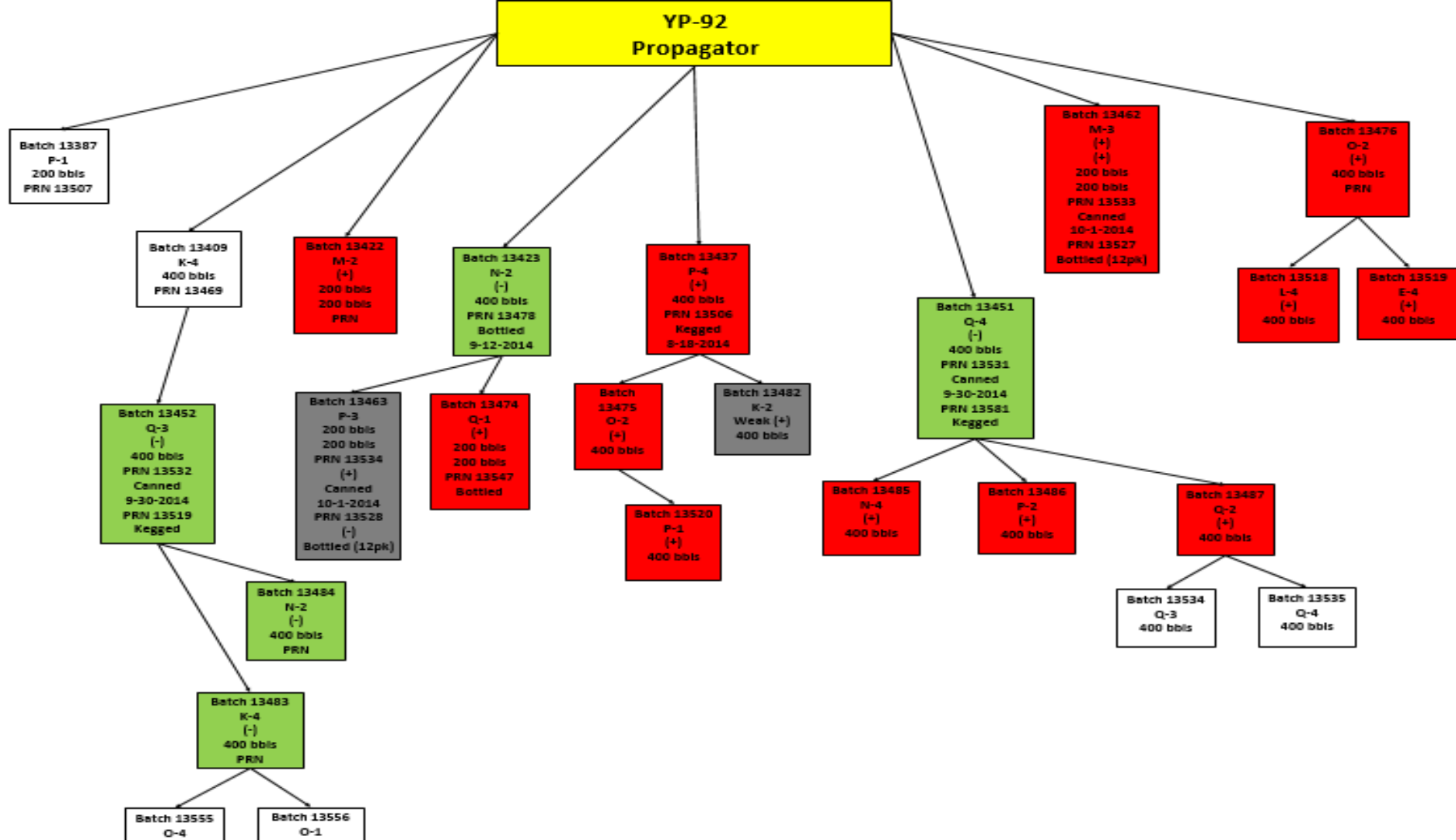


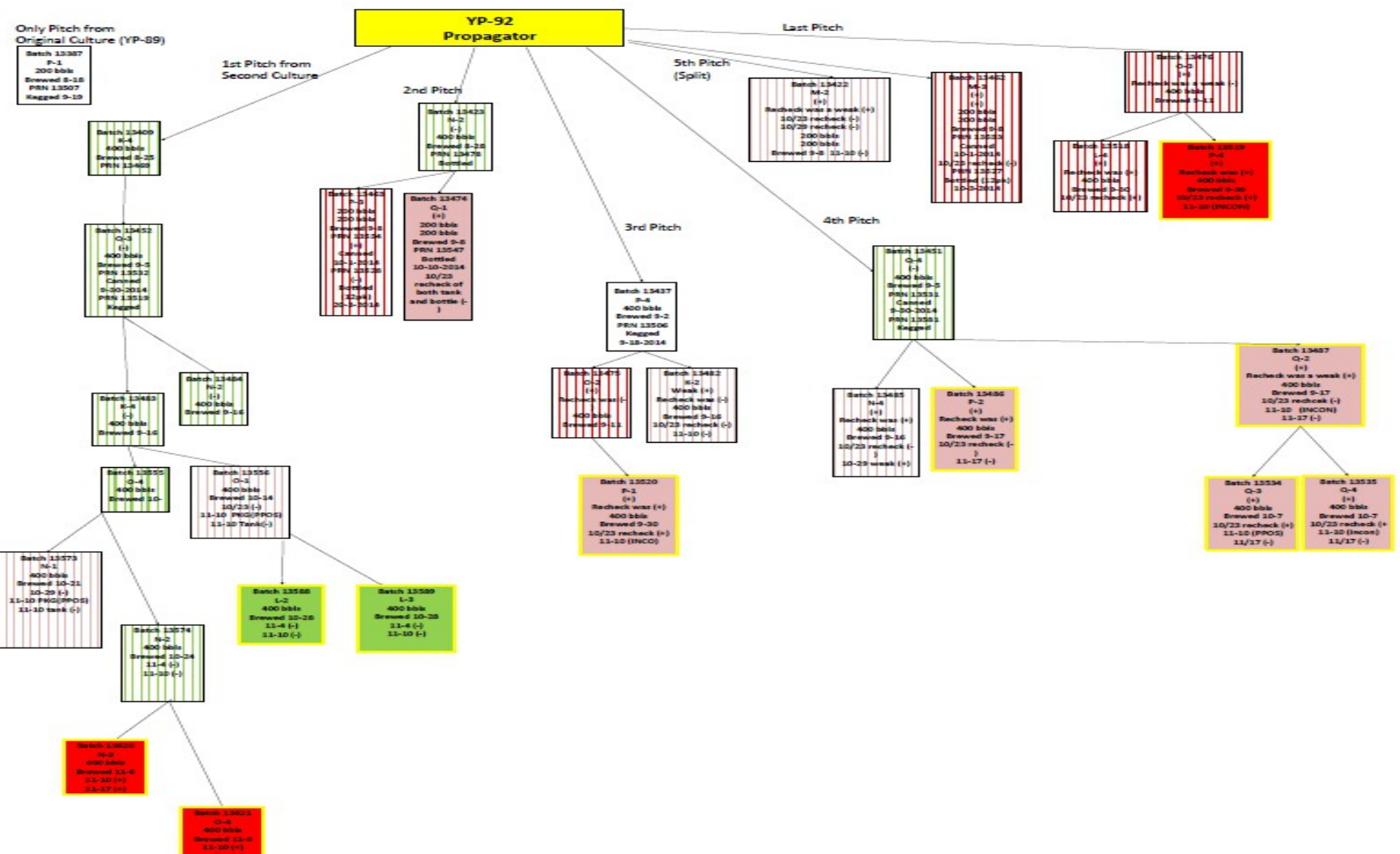
The Details

- Had the PCR, now we needed to find a way to detect *Diastaticus*
- Had to find a kit, incubation media, incubation time, and

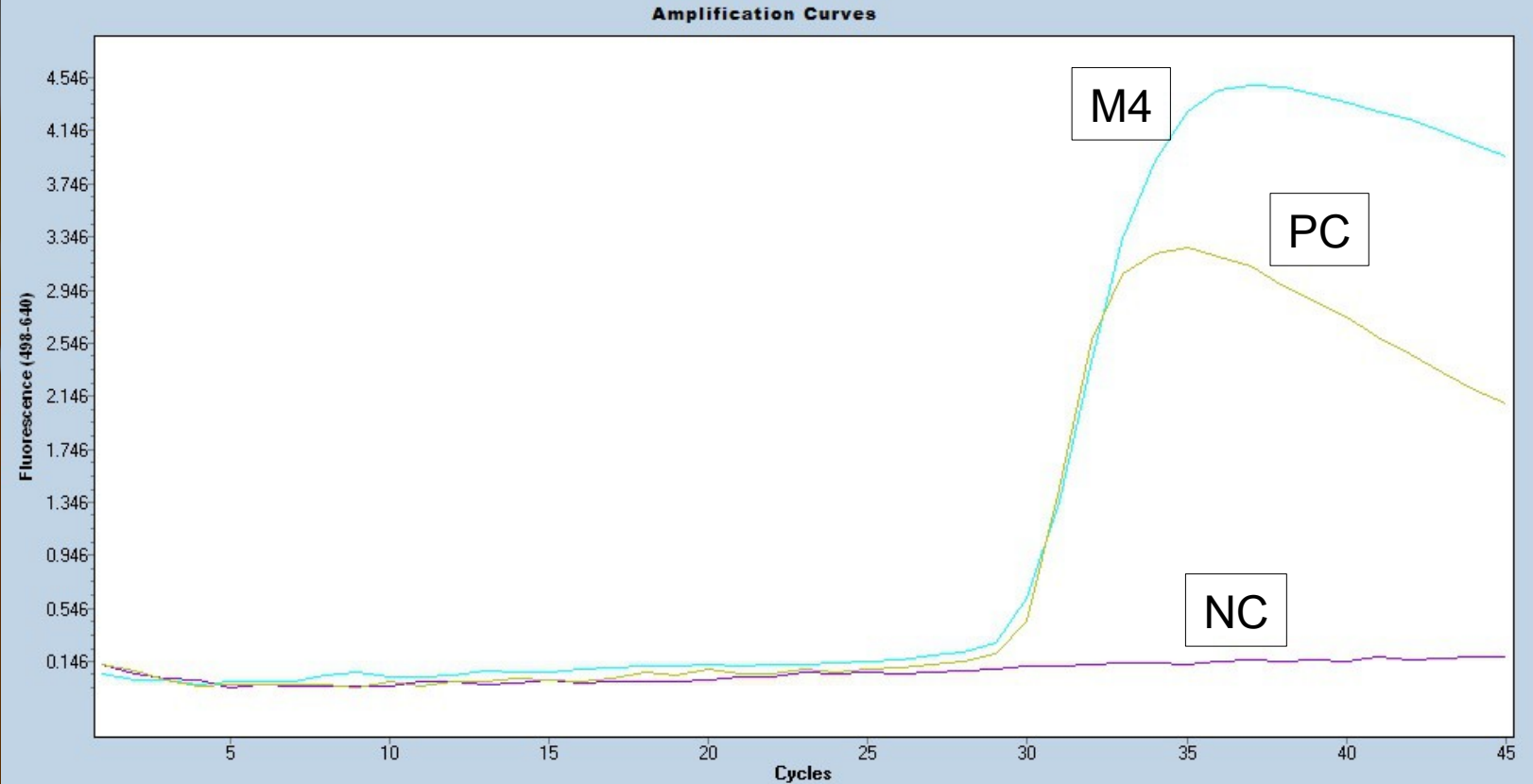


Winter White Ale
Winter
2014





PCR DATA



LIFE LESSONS

- Some tanks are infected and others are not
- We obtained *diastaticus* positive and negative results from the same tank
 - My theory: very low concentration and flocculation
- We test ABV a lot in tank and saw no change
- We don't know where the infection



REACTION PLAN

- We care about our Bee Lover's experiences
- Release plan
 - What, where, when?
- Huge increase in lab inventory samples for

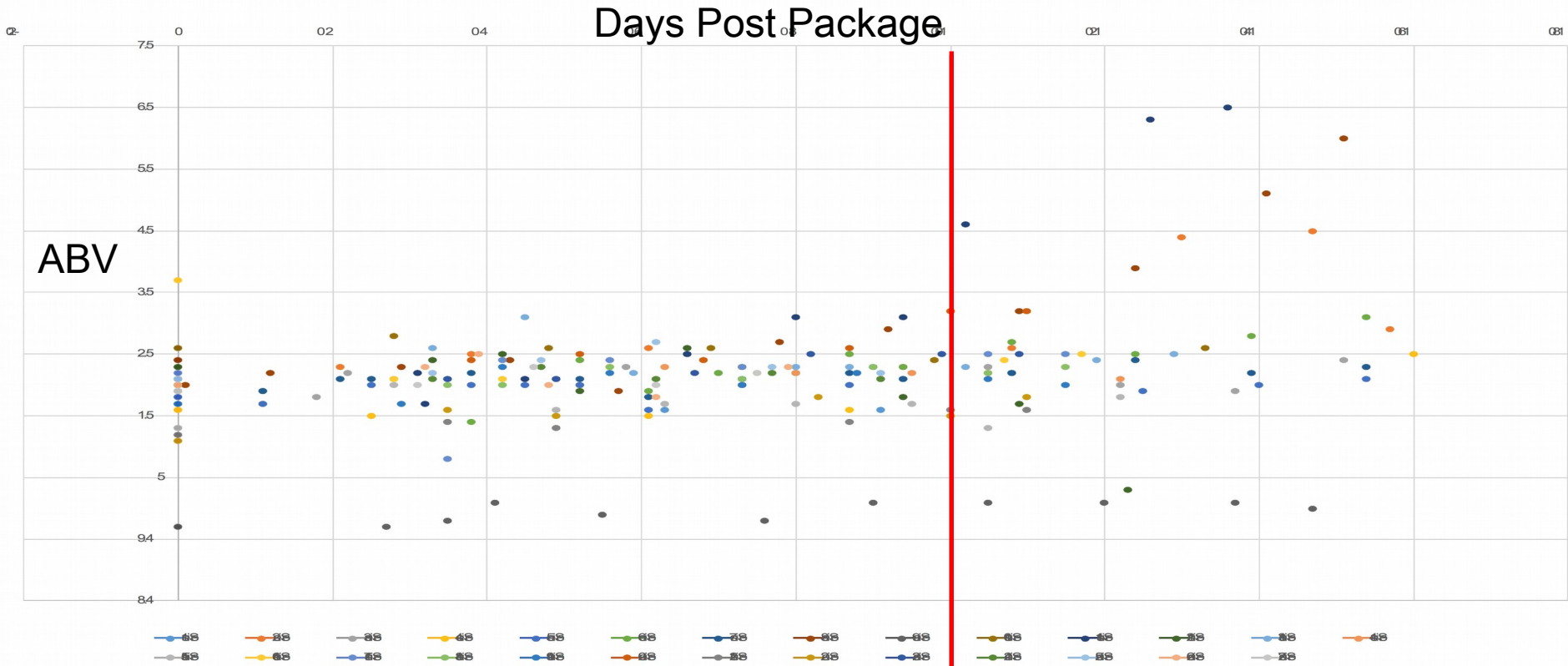


Long Term Analysis Plan

- Gather a lot of samples (4 cases/run)
- 2 cases kept cold, 2 cases kept warm
- Test a bottle for CO₂ a every two weeks from



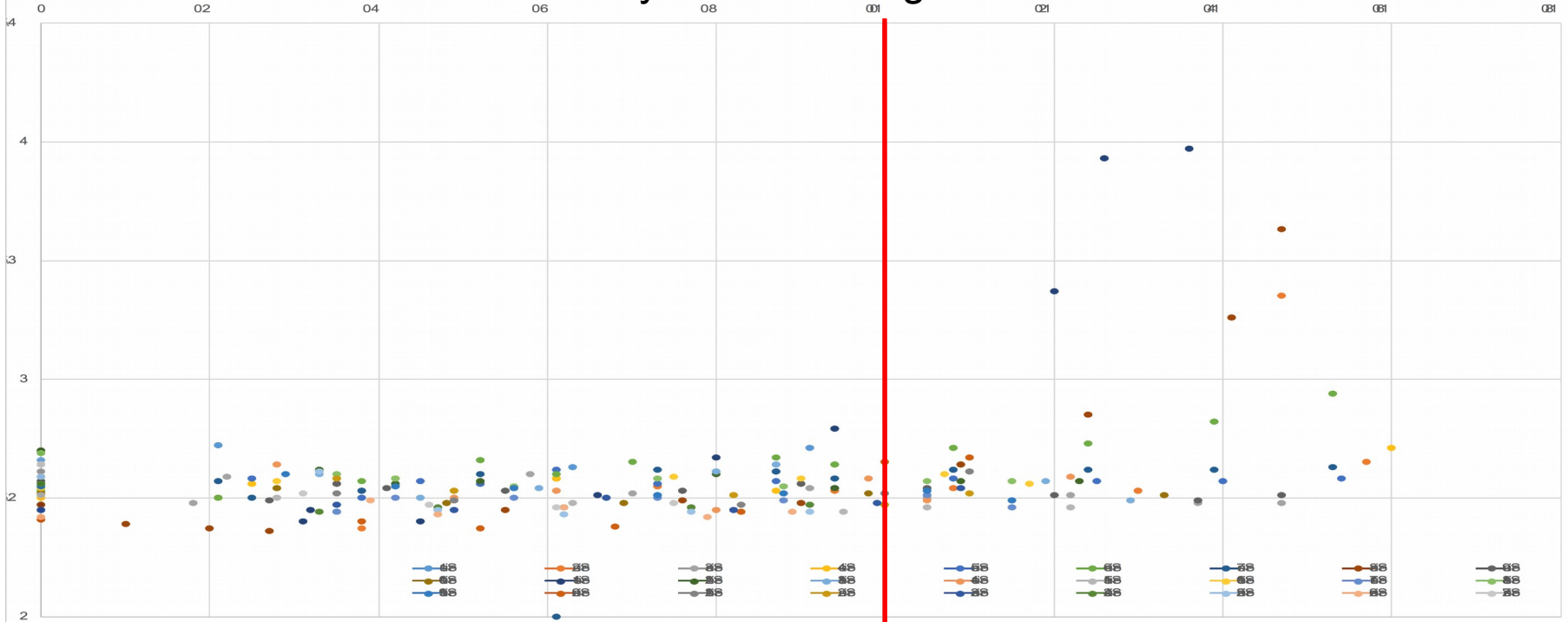
Results



Results

Volumes of CO₂ in Package

Days Post Package





Results

- Warm stored batches with zero positive PCR hits did not change
- Warm stored batches with vacillating PCR hits did change
 - Some batches went outside of government compliance for ABV
 - Some even increased CO2 beyond glass manufacturer's spec for pressure
- Cold-store packages were stable, regardless of PCR





Recovery

- We issued a recovery for beer that had not been sold at the end of the season, this was expensive
- Its always cheaper to fix or stop the problem in house
 - Dr. Luke: A pint of prevention is worth a barrel of cure
- We vowed this would not be a problem in 2015
- What would a recovery or recall do to your



BEER.
HERE!



BELL'S[®]



Winter White Ale
2014

FALL 2015

BRACE YOURSELVES

WHITE

WINTER IS COMING



Preparation for next WW season

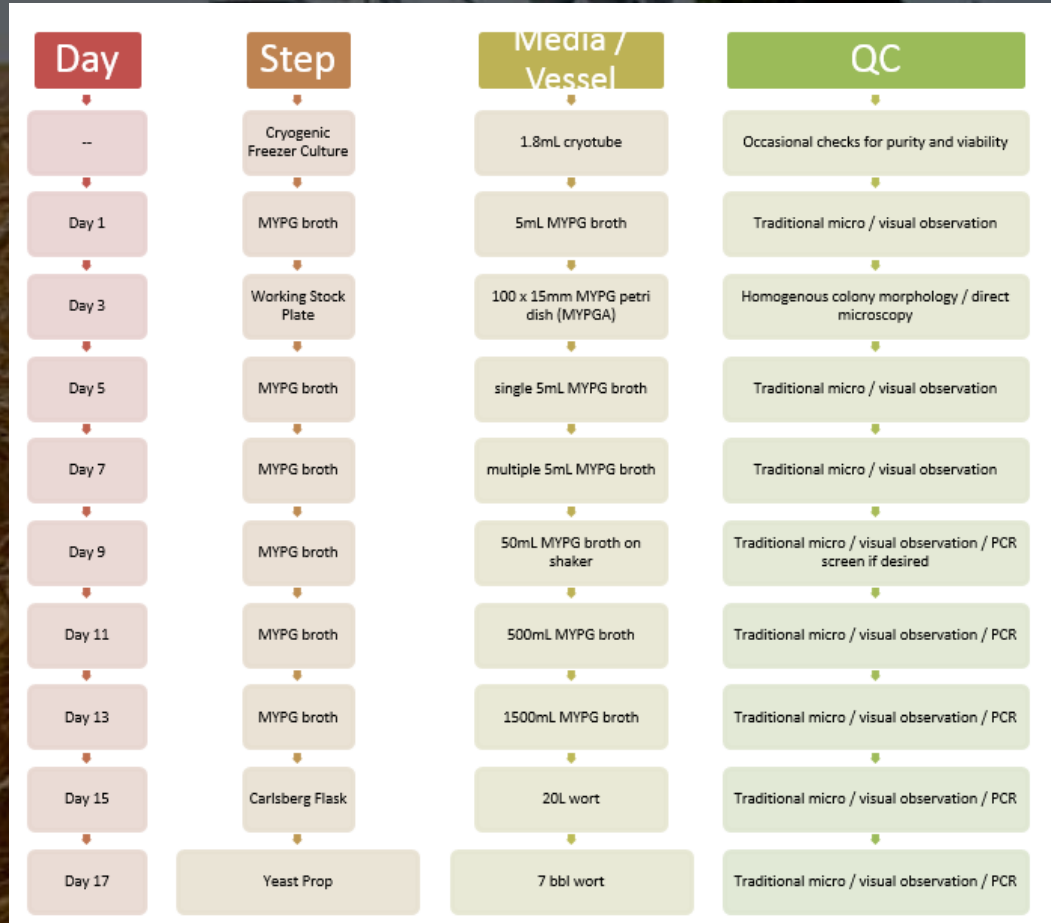
- **Goal: have WW be *diastaticus* free**
- Ordered a *diastaticus* type strain
- Started with a new streaked



We Bought

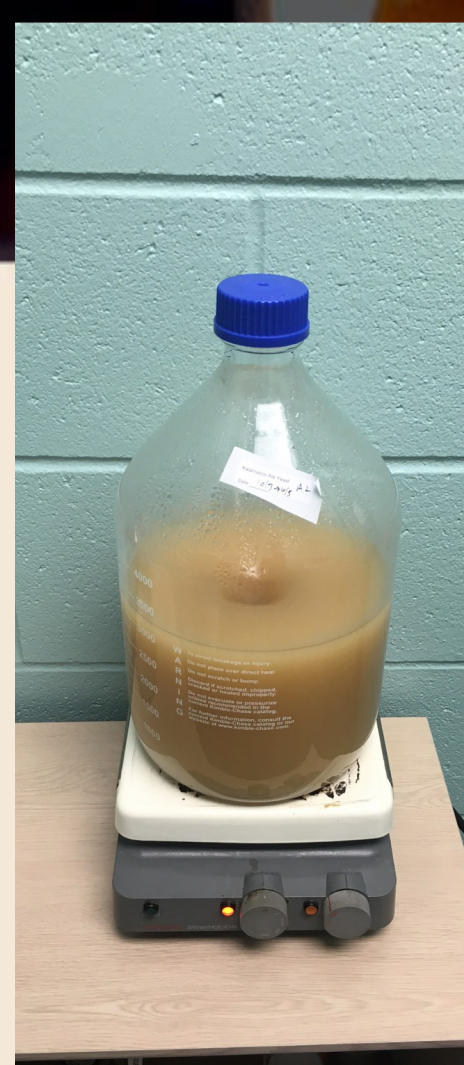
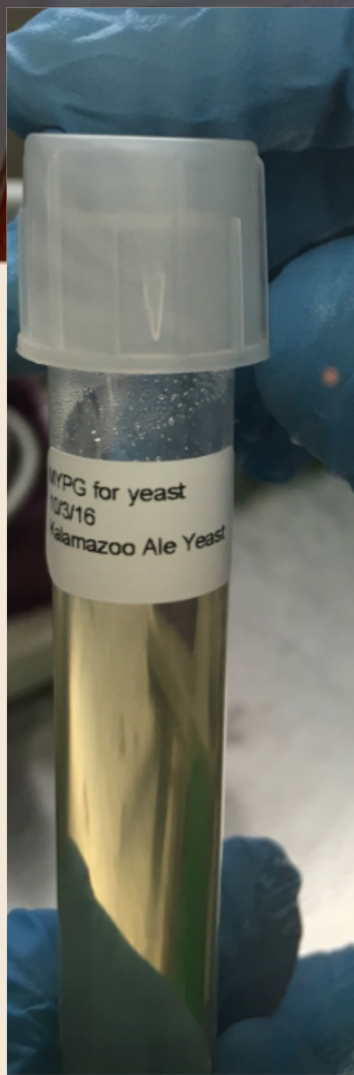
- -80°C freezer
- Lots of flasks
- More stir plates
- More stir bars
- Accessories for the Carlsberg flask

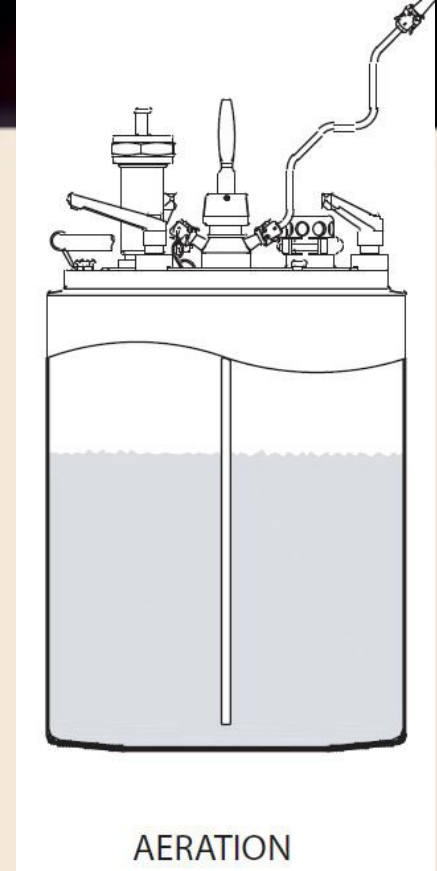
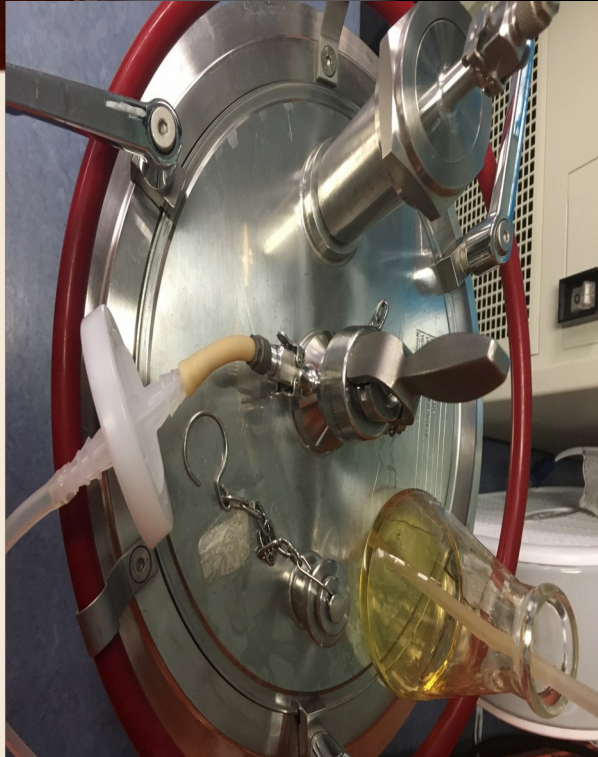
Protocol Development











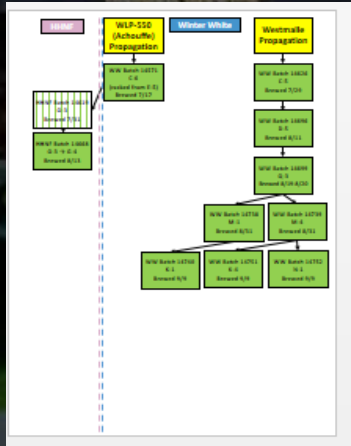
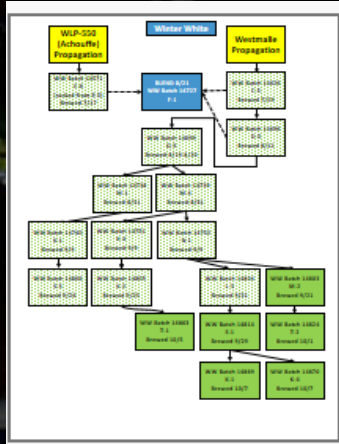
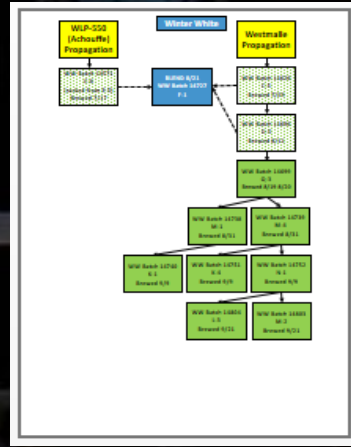
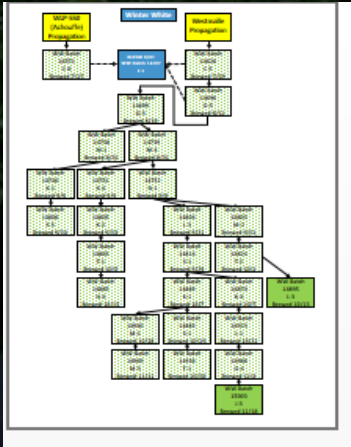
AERATION











**WHAT CAN
YOU DO?**



What can you do?

- Have a warm (~room temp) and cold-stored inventory
- Know your numbers on the day of package
- Know your specifications for CO₂ and ABV in package?
- Decide how often you want to check on your packages
 - 1 month, 3 month, end of shelf life?
- Develop a reaction plan before crisis begins

What can you do?

- Conduct routine maintenance on key instruments
- Establish positive and negative controls and clear-cut reaction plans
 - Keep records, build control charts, and review them
- Operator to operator variation
- Data management
 - Yeast tree data
 - Historical data for trending and further

What can you do?

- Know what tools you have at your disposal
 - Internally
 - Externally: Contract labs, universities
- When in doubt, send it out
- Work with your yeast supplier
 - Check COAs
 - Test your starters

What can you do?

- Take as much control of the process as you can
- Start checking early and frequently
- Do an audit
 - Different yeast strains

If you have found a problem?

- Find a way to verify
- Contain the problem
- Pasteurize
 - Validate pasteurization
- Sterile filter
 - Validate
- Dump ☹️
- Validate your CIPs
 - Plating rinse water
 - ATP

THE LOOK I GIVE



**WHEN I'M COMPLETELY
OVERWHELMED**

**KEEP
SHARING
YOUR
STORIES**





Acknowledgments

- Quality/Lab Team
- Packaging, Beer Production, Logistics Departments

TECHNICAL

QUESTIONS YOU!

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