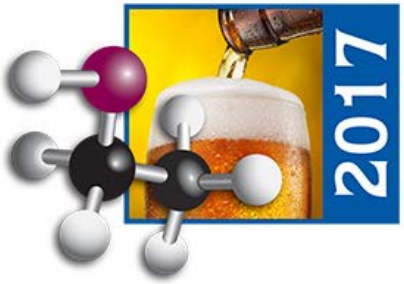

ASBC Annual Meeting

June 4–7 ■ Fort Myers, Florida

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Getting Ahead of Beer Spoilers:

A brewery's case study of aerobic plating to prevent beer spoilers

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Abstract

- Most of our microbiology programs focus on chasing beer spoilers, including tailoring the media we use to isolate spoilers only.
  - Unfortunately, these programs are inherently reactive and take several days to give a result, potentially allowing an infection to spread and do more damage.
  - We have found that the best way to combat spoilage is to zoom out from our focus on beer spoilers and to look instead at the aerobic environments they live in.
  - I will present some background information and a case study from Ballast Point to prove why looking ‘beyond beer spoilers’ is essential for managing proper hygiene in the brewery.

Common *Beer spoilers*

ASBC METHODS OF ANALYSIS 2008

Common Brewery-Related Microorganisms

WITH CONTRIBUTIONS BY

Anheuser-Busch, Inc.

MillerCoors

Candida intermedia ..... Plate 1
Hanseniaspora uvarum ..... Plate 1
Klebsiella terrigena ..... Plate 2
Kluyveromyces marxianus ..... Plate 2
Lactobacillus acidophilus ..... Plate 3
Lactobacillus brevis ..... Plates 4, 5, 6
Lactobacillus buchneri ..... Plate 7
Lactobacillus curvatus subsp..... Plate 8
Lactobacillus delbrueckii ..... Plate 9
Lactobacillus paracasei subsp. *paracasei* ..... Plate 10
Lactobacillus plantarum ..... Plate 11
Pectinatus cerevisiiphilus ..... Plate 12
Pediococcus damnosus ..... Plate 13
Pediococcus parvulus ..... Plate 14
Pediococcus pentosaceus ..... Plate 15
Pichia membranaefaciens ..... Plate 12
Rhodotorula glutinis ..... Plate 16
Saccharomyces diasticus ..... Plate 16
Schizosaccharomyces pombe ..... Plate 17
Torulaspora delbrueckii ..... Plate 17
Zygosaccharomyces bailii ..... Plate 18
Zygosaccharomyces rouxii ..... Plate 18
Zymomonas mobilis ..... Plate 19

Aerobic bacteria are dangerous

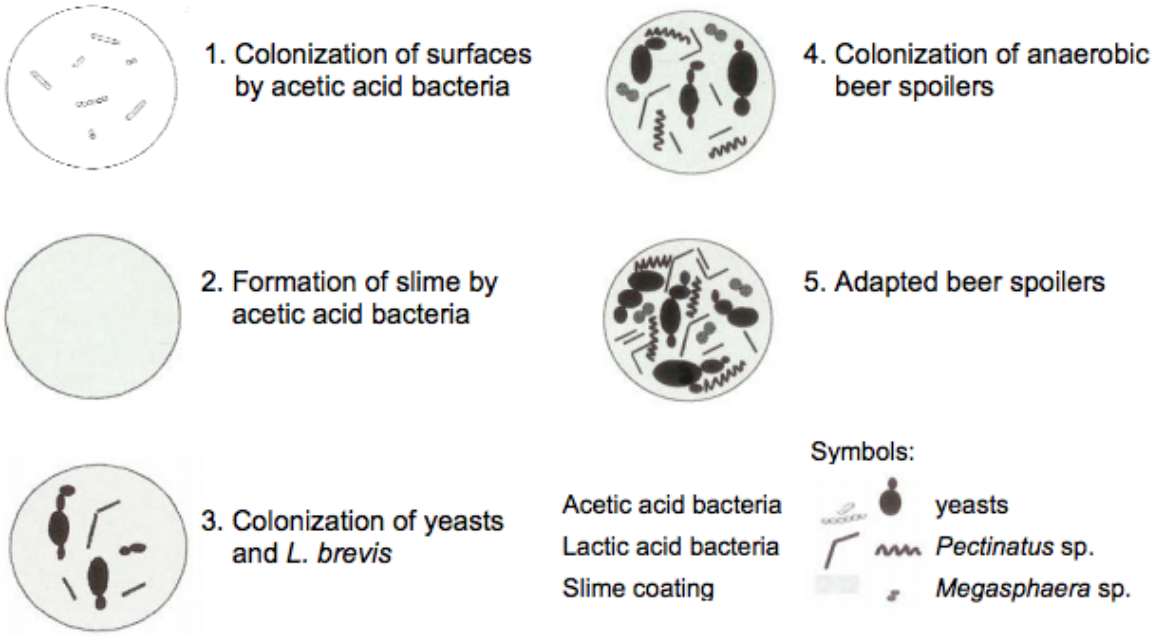
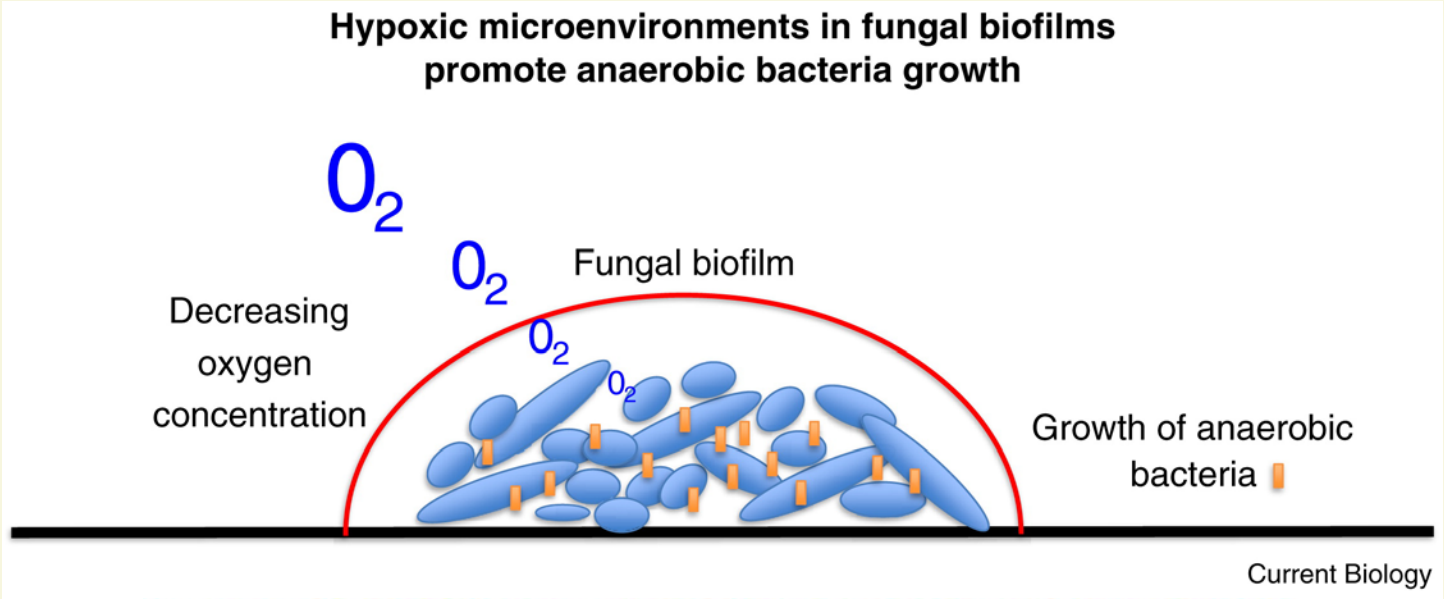
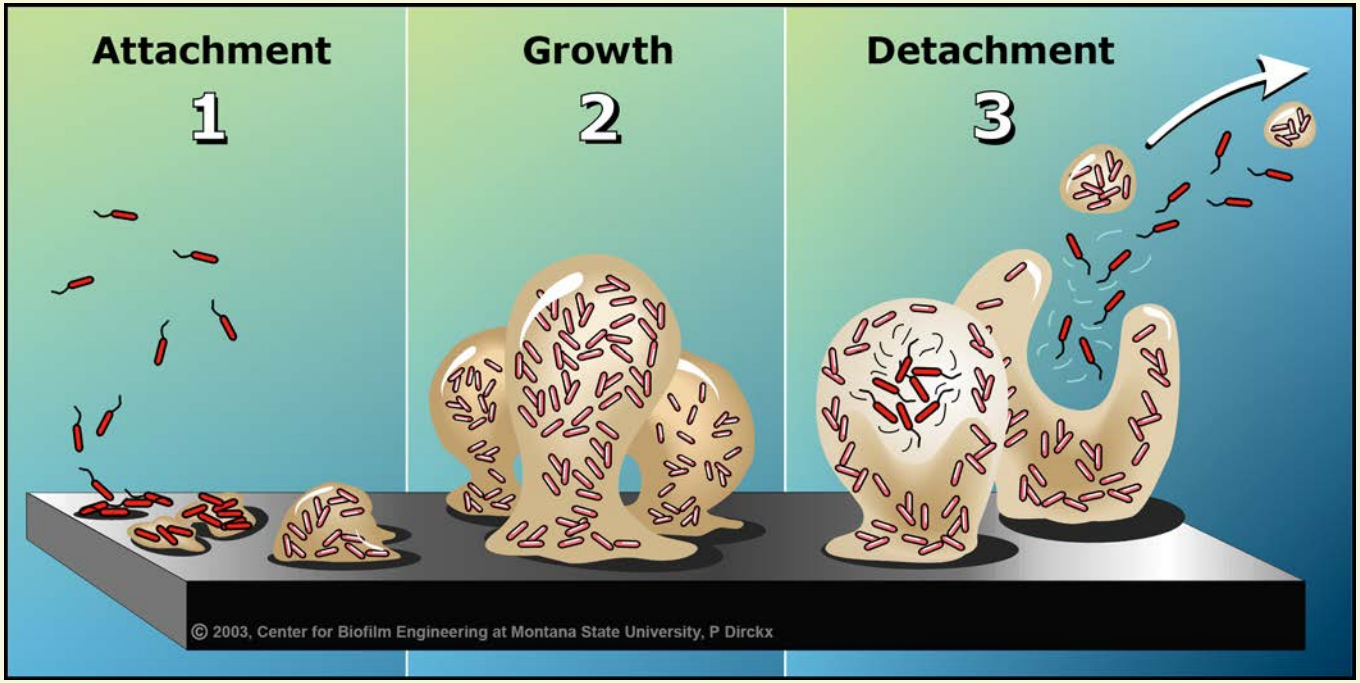


Figure 1. Development of contaminations in breweries according to Back (1994).

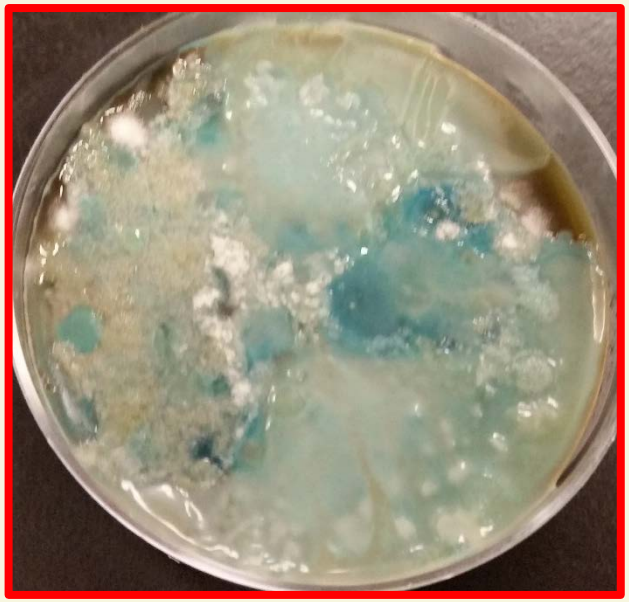
Biofilms allow anaerobic growth



Biofilms allow exponential growth



Aerobic swabs are enlightening!



Beer spoilers are *always* available

Bokulich *et al.* eLife 2015;4:e04634. DOI: 10.7554/eLife.04634

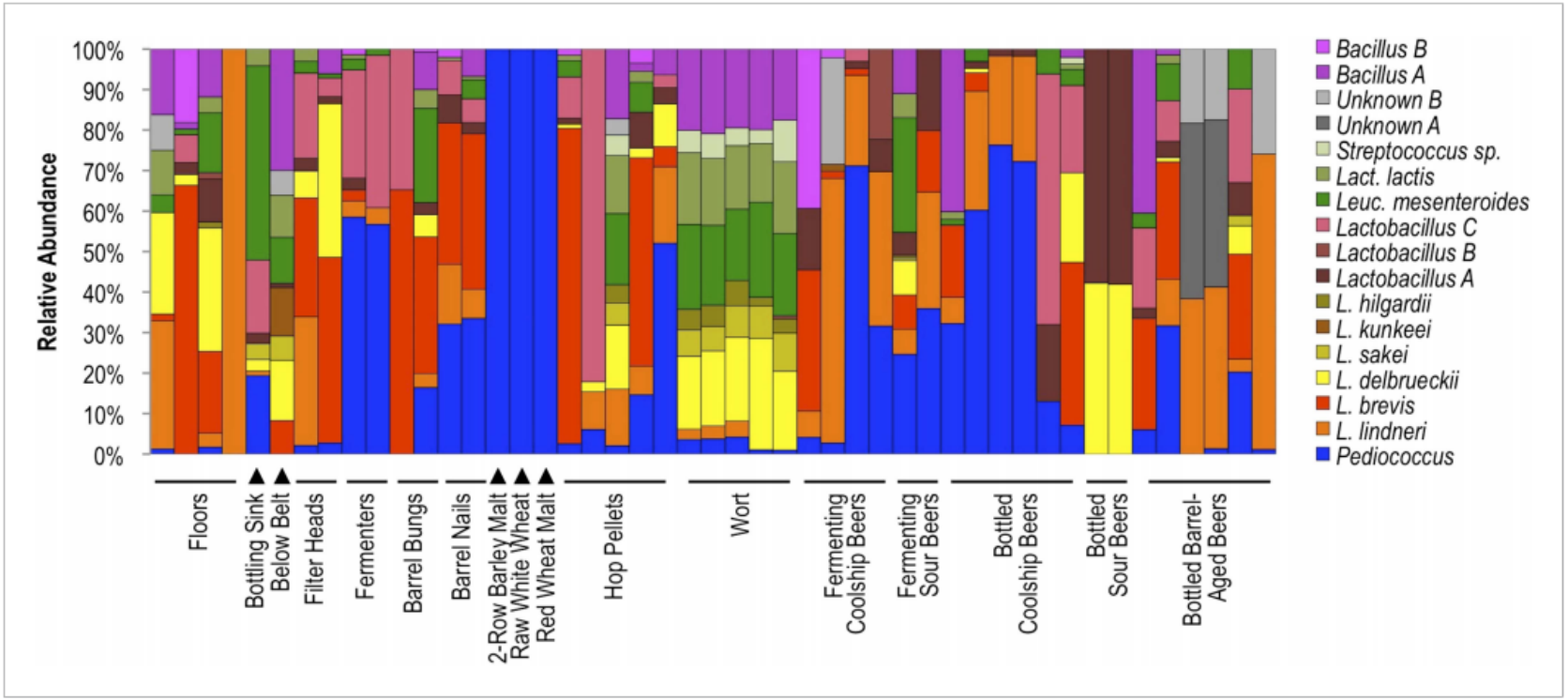
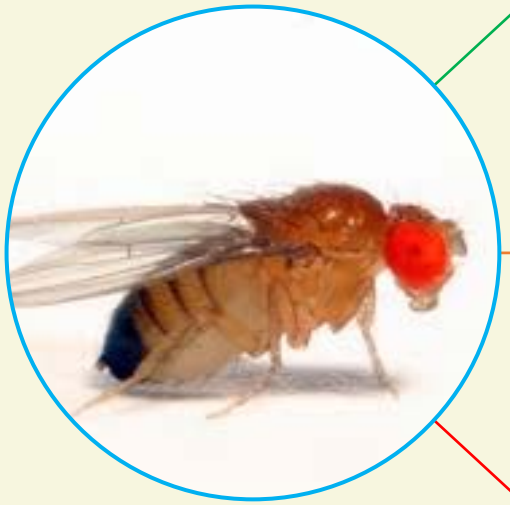


Figure 8. Lactic acid bacterial community composition on brewery surfaces, beers, and ingredients. LAB-TRFLP profiles of samples exhibiting high *Lactobacillales* relative abundance by 16S rRNA gene sequencing.

Beer spoilers are *always* available



Brewery contaminants

- *Enterococcus faecalis*

Wort-spoilage bacteria

(acetic acid)

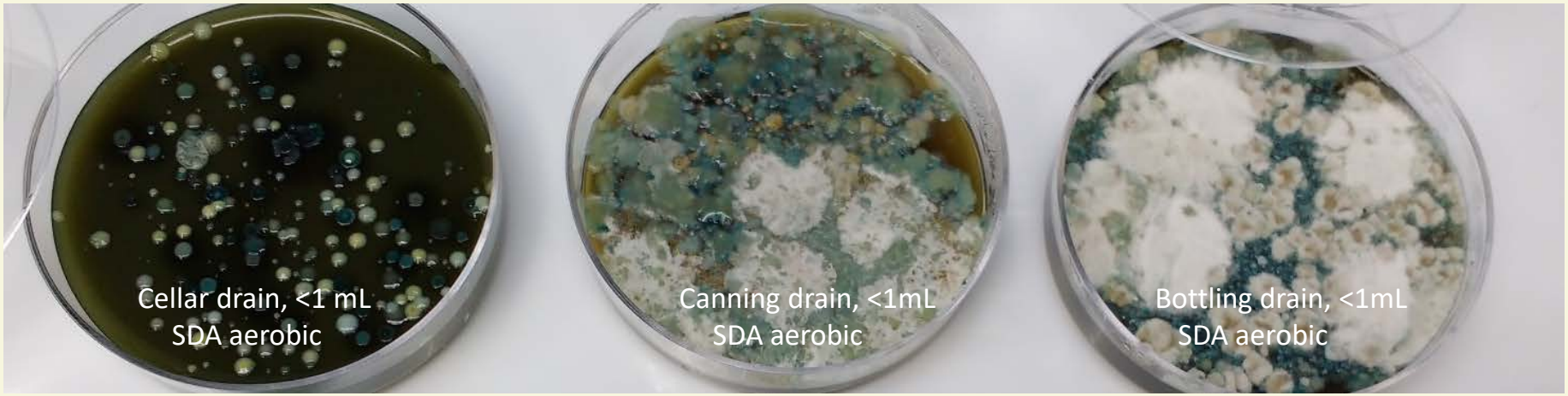
- *Acetobacter aceti*
- *Acetobacter pasteurianus*
- *Gluconobacter species*

Beer-spoilage bacteria

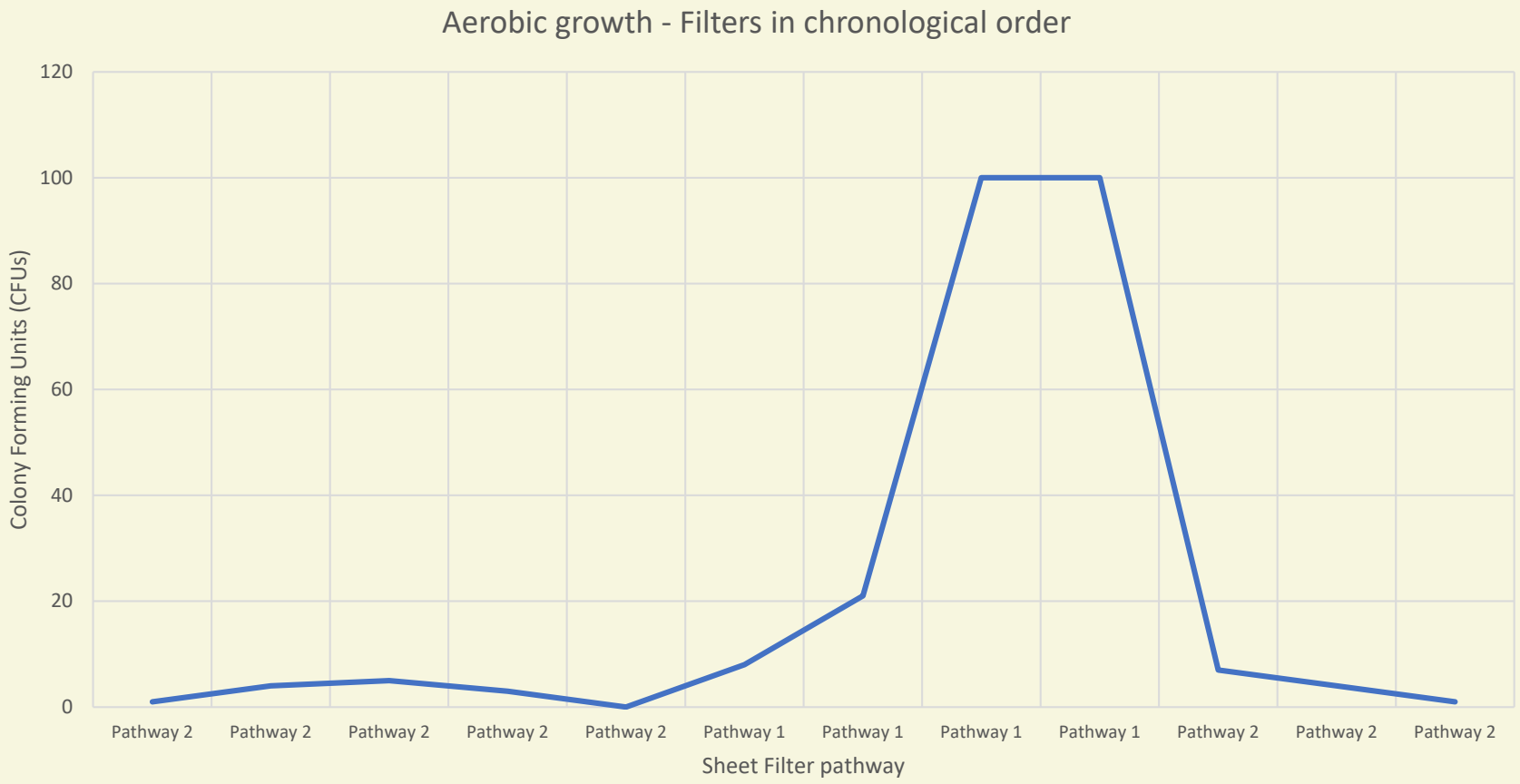
(lactic acid)

- *Lactobacillus plantarum*
- *Lactobacillus brevis*

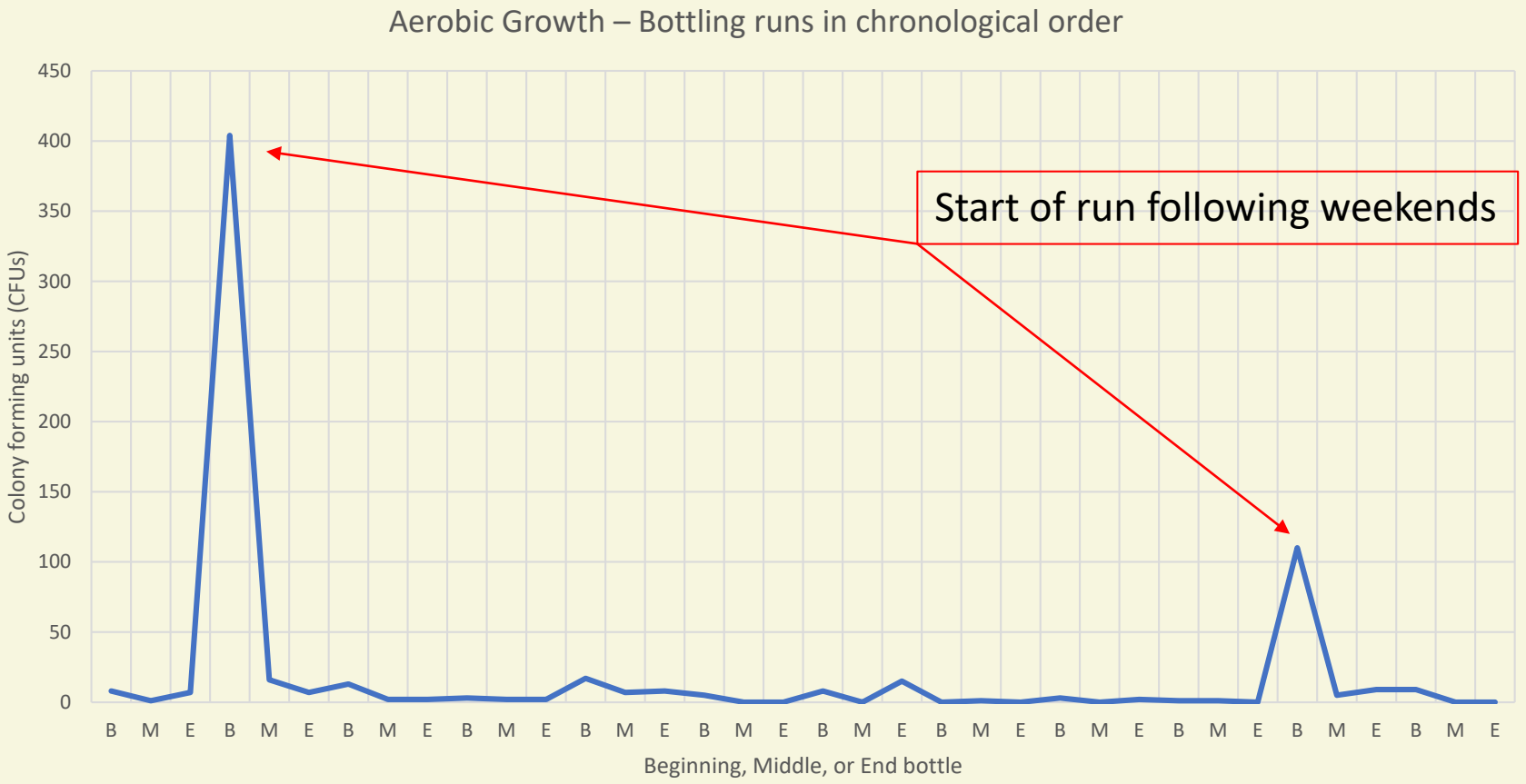
Aerobic plates are enlightening!



Sheet filter pressure problems



Bottling line problems



Conclusions

- Aerobic brewery organisms are easy to detect
- Aerobic brewery organisms are both hygiene indicators and gateway organisms (encourage anaerobic growth)
- Prevention/action at the aerobic stages can help prevent anaerobic growth entirely!

Thank you!

Calm before the Storm, Paul Elder

2017 ASBC Meeting