

ASBC Annual Meeting

June 4-7 ■ Fort Myers, Florida

See what SCIENCE can brew for you

**WORSE THAN WE
THOUGHT:
A MEGASPHAERA
CEREVISIAE ISOLATE IS
ABLE TO SPOIL FULL
STRENGTH BEER**

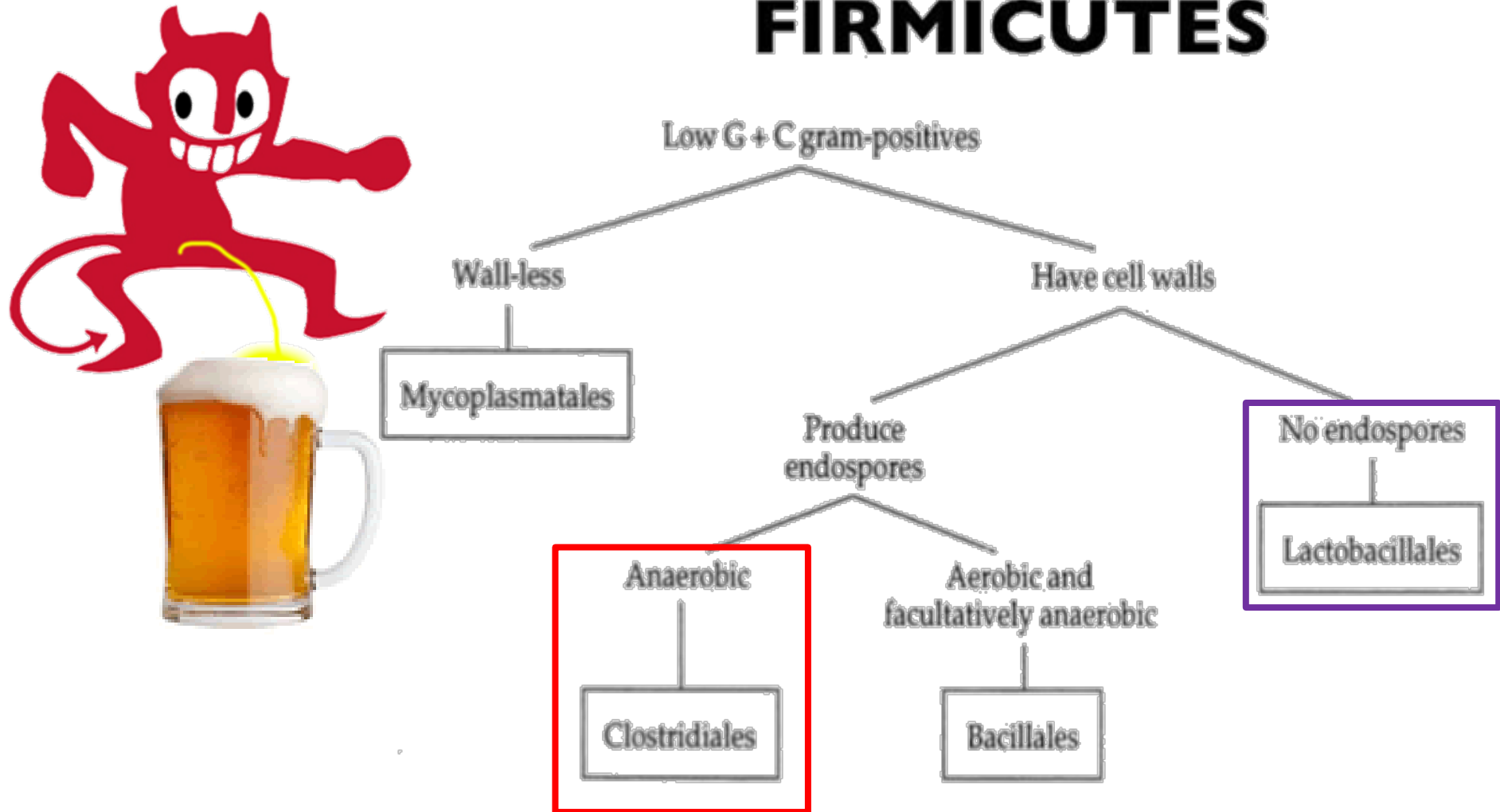


Euan Thomson

Bacterial beer spoilage

2

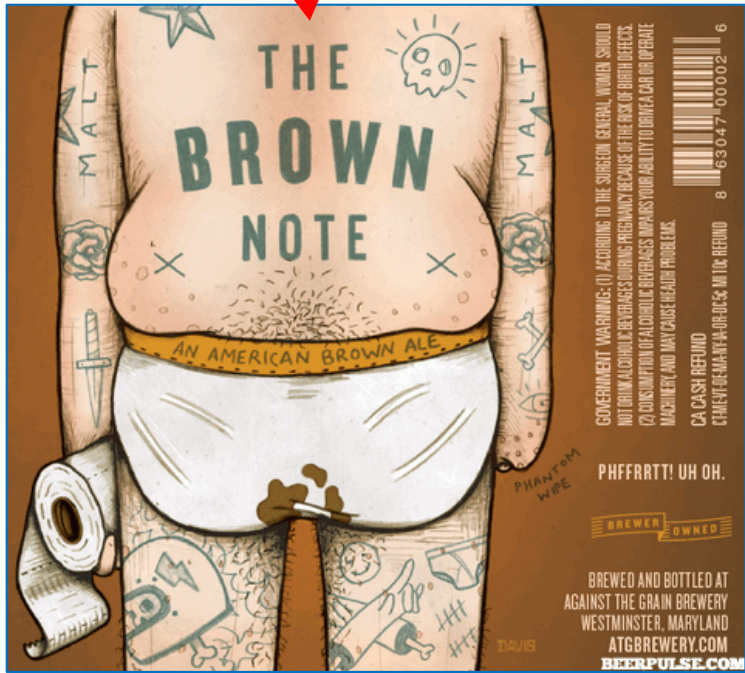
FIRMICUTES



Megasphaera cerevisiae

3

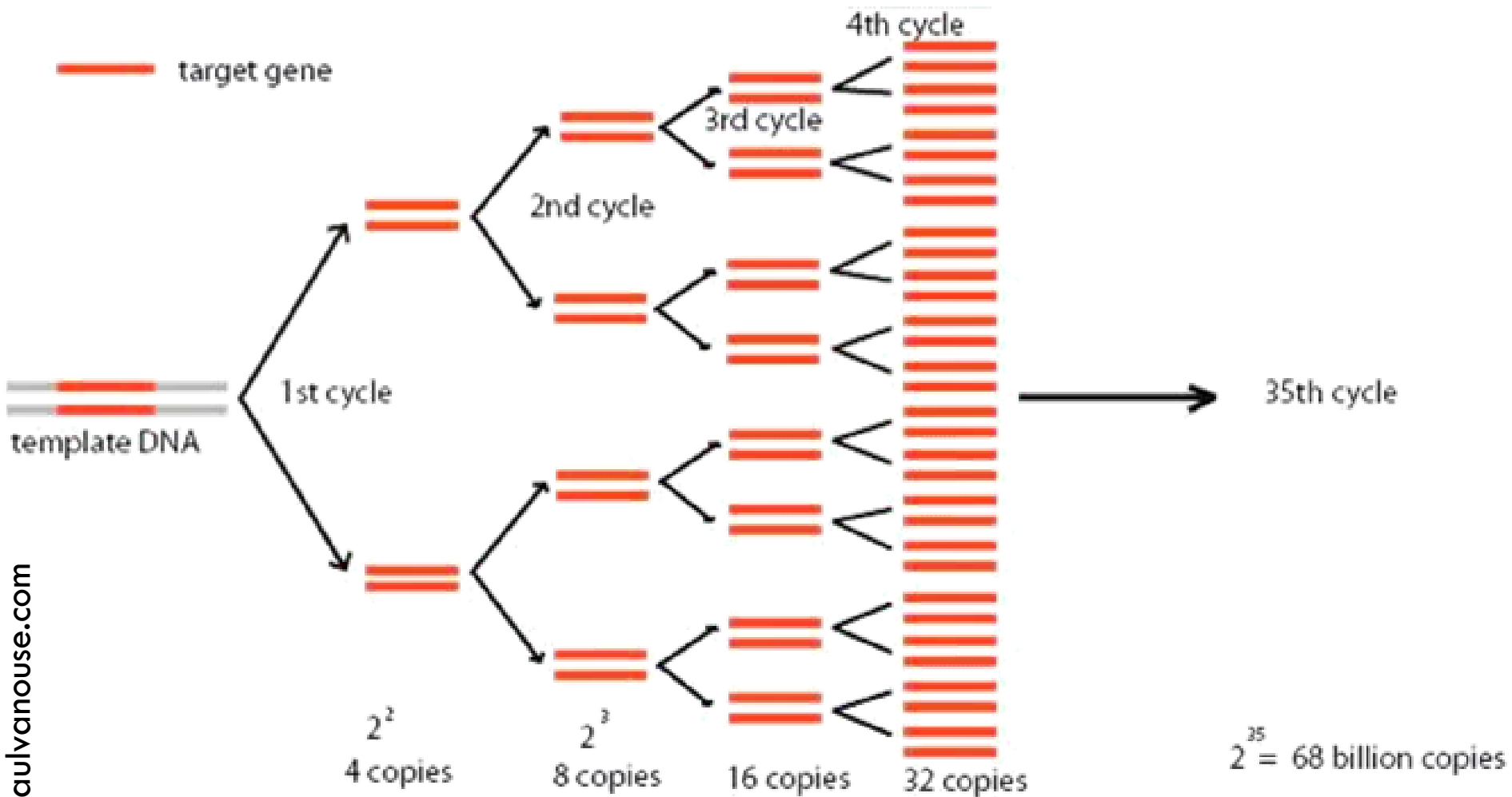
Actual beer label





Polymerase chain reaction

5



PCR on a budget

6

\$2,000



\$500



\$100



\$50



\$5,500

\$50



\$500



\$100



\$2,000



Initial

7

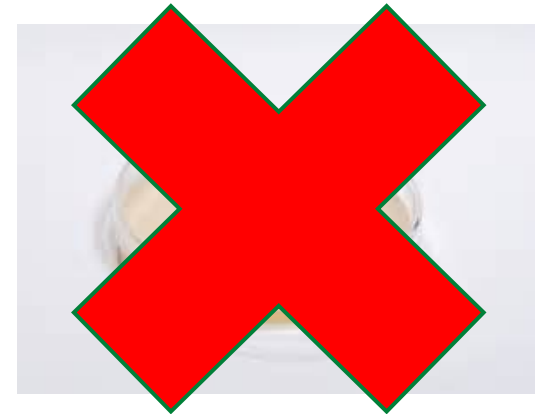
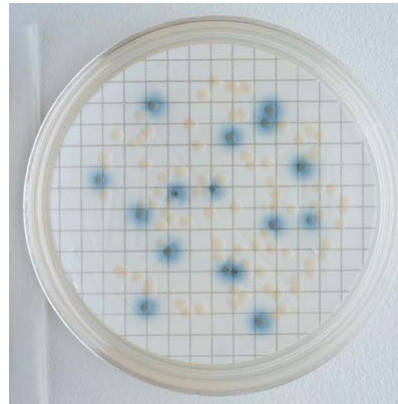
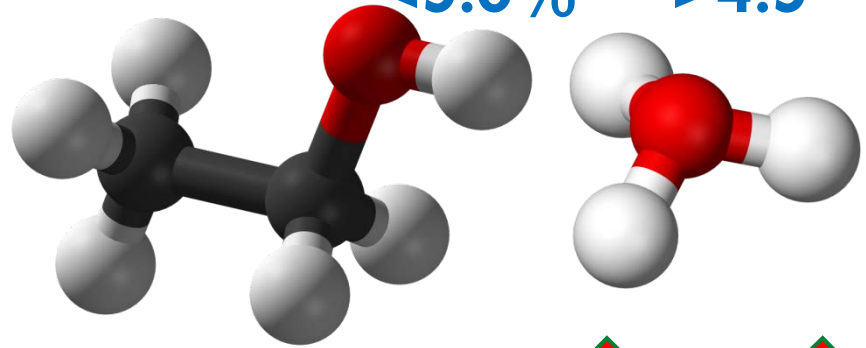


Incubation and spoilage

8



ABV vs pH
<5.0% >4.5



Growth in MRS broth

9



Genome sequencing

10



Glycerol degradation
Drug efflux
Alcohol dehydrogenase
Iron + sulfite homeostasis
~~Arginine breakdown~~

Glycerol growth experiment

11

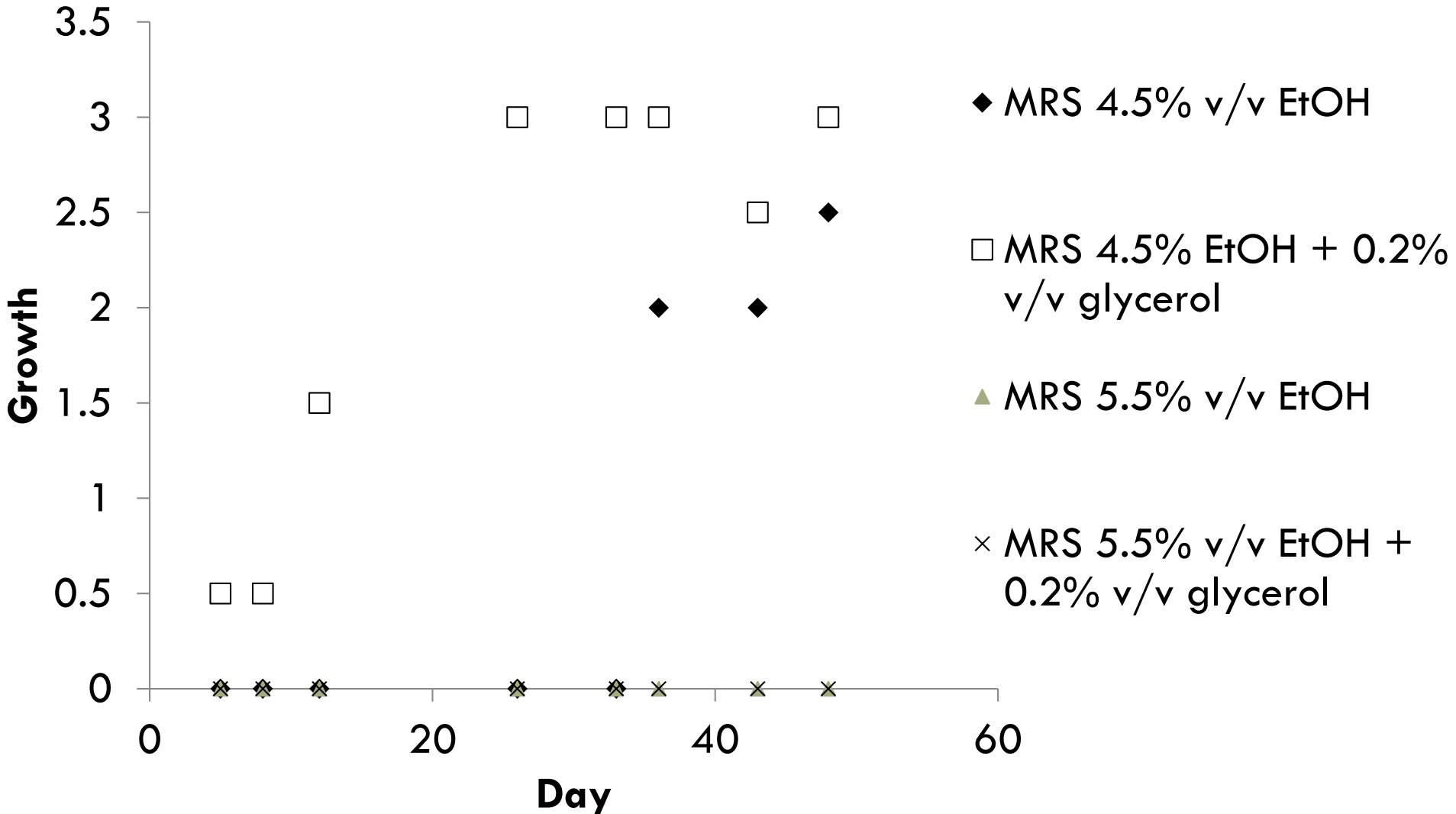
- Grow strains in MRS
 - Inoculate into MRS + ethanol +/- glycerol
 - Observe growth by:
 - Turbidity
 - Odor development
- 0 = no growth
1 = faint visible growth
2 = growth + odor
3 = strong growth + strong odor

Three strains:

- Phillips isolate NSB1
- Type strain DSM 20462
- Random strain VTT-E195

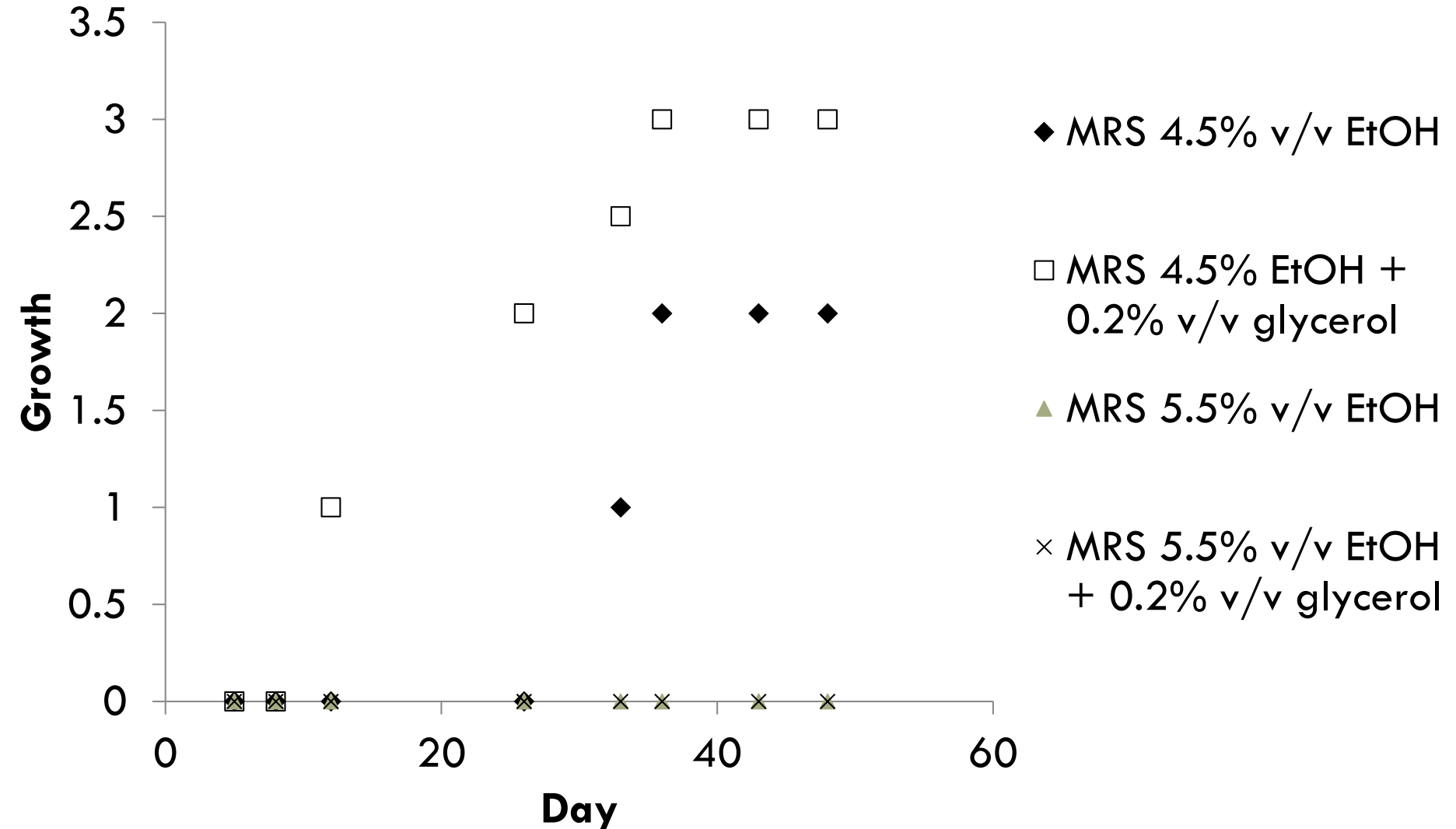
Impact of glycerol on growth: NSB1

12



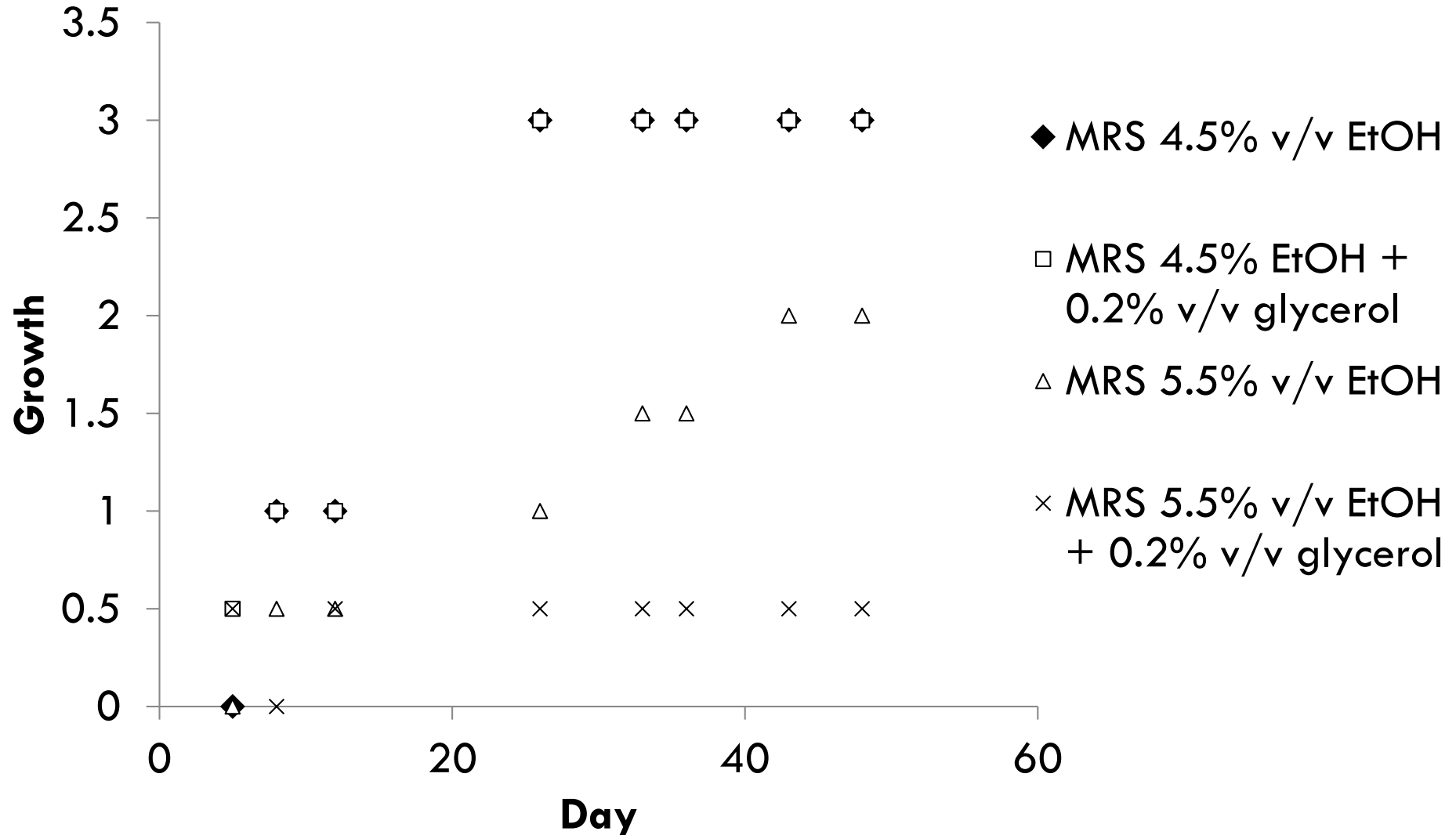
Impact of glycerol on growth: DSM 20462

13



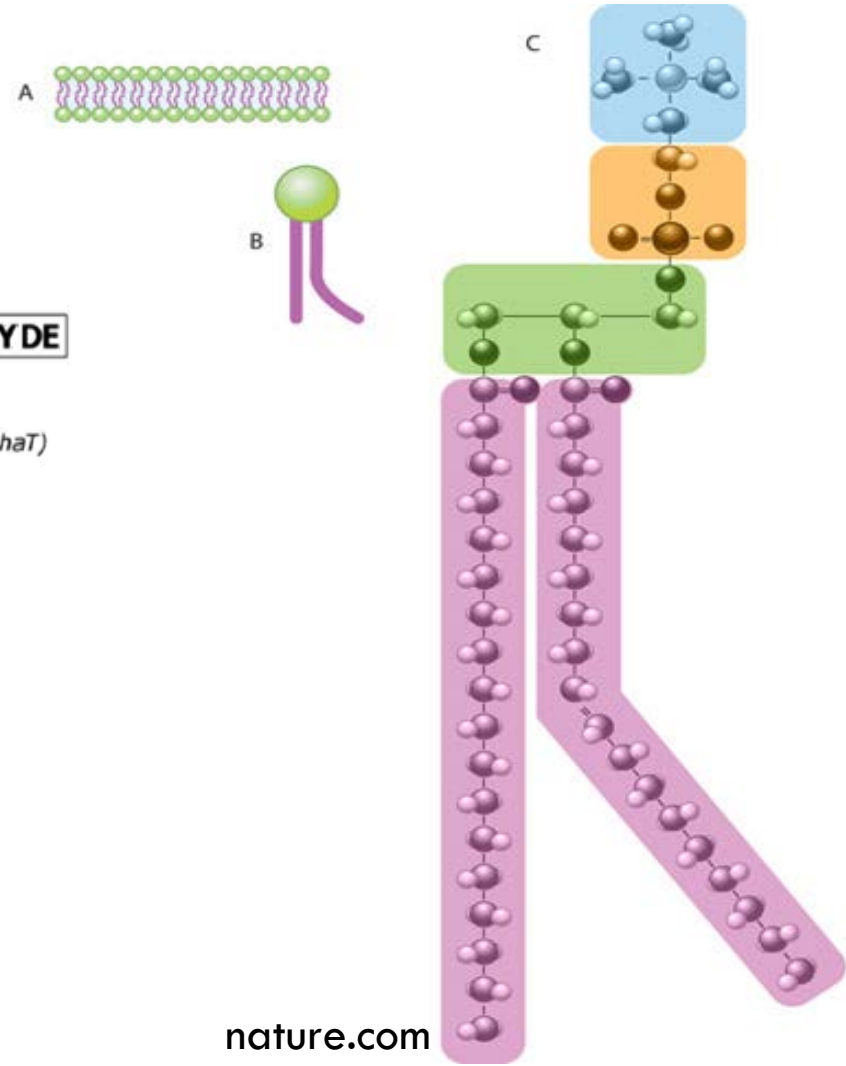
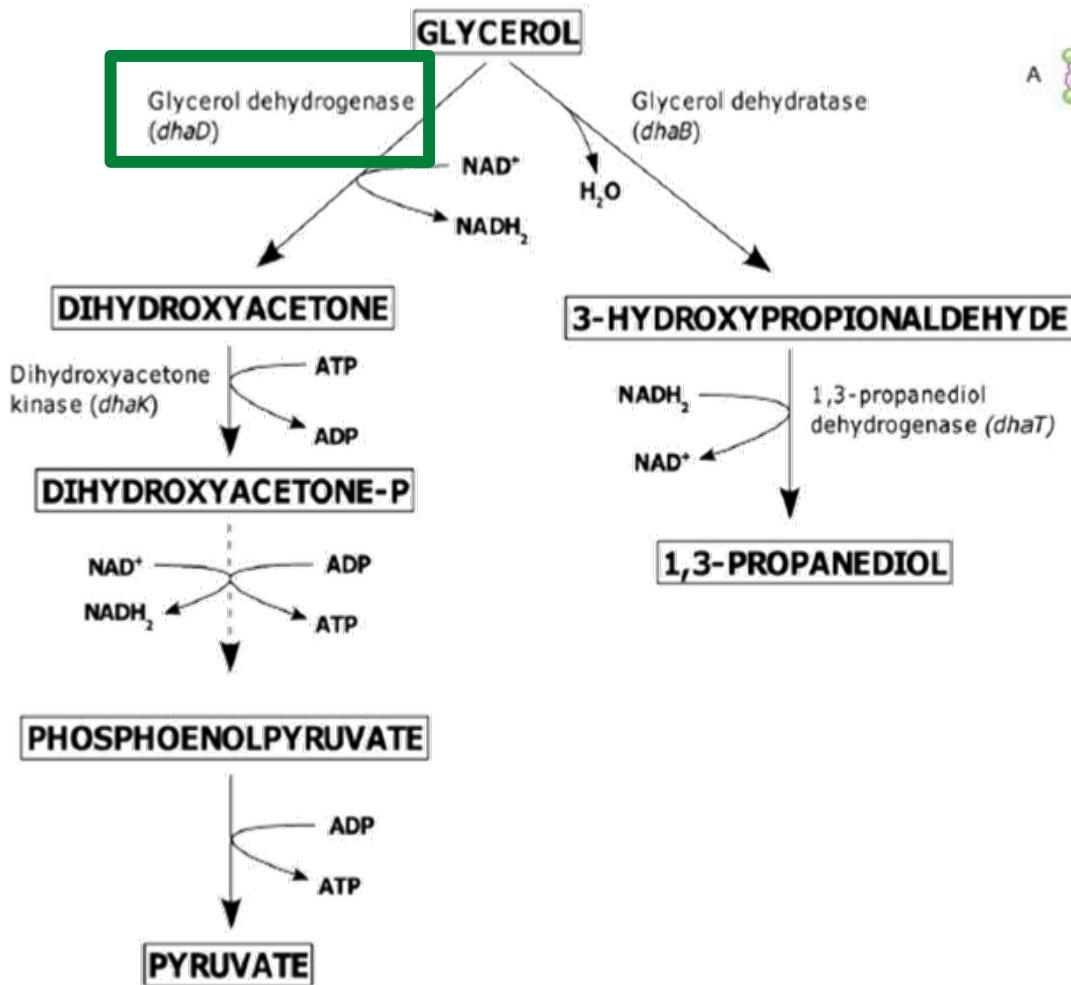
Impact of glycerol on growth: VTT-E195

14





Glycerol: hay or straw?



Straw Theory vs Hay Theory

16

Straw Theory (shelter)

No spoilage at 30°C vs severe spoilage at room temp

Interplay between pH and ABV

Addition of glycerol promotes growth near ABV limit

Hay Theory (food)

Many glycerol dehydrogenase genes identified in genome sequence

Interplay between pH and ABV

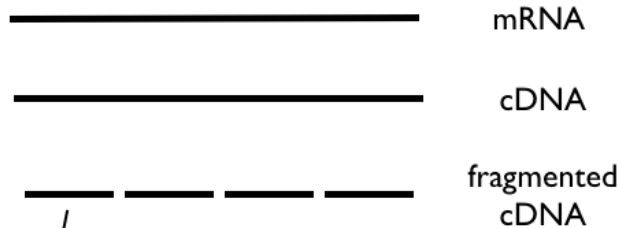
Lactobacillus has been shown to use glycerol as energy source in beer

RNAseq: Gene expression

17

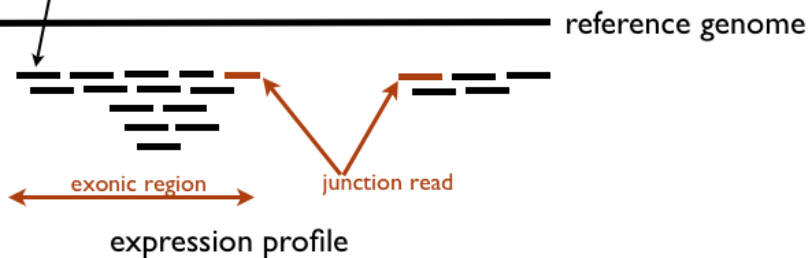


sample preparation



in vitro

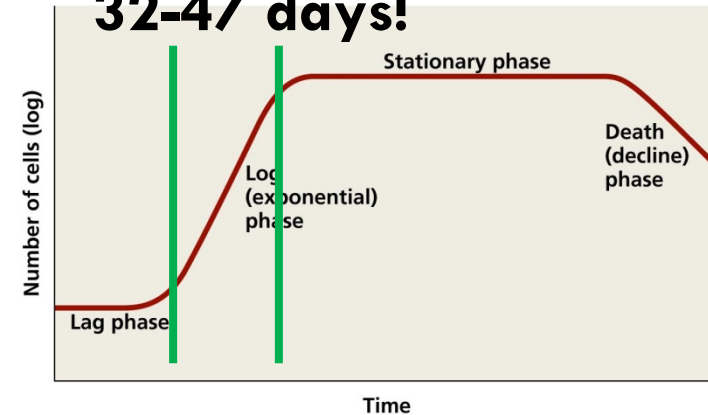
read mapping



readcount

in silico

32-47 days!

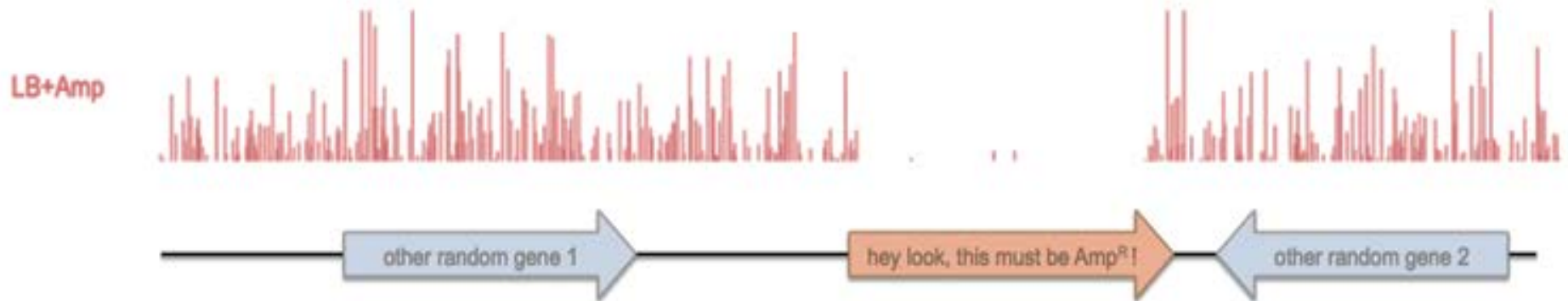
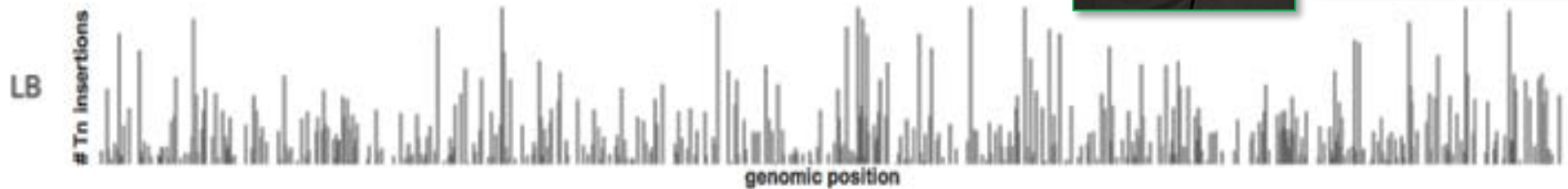


Copyright © 2006 Pearson Education, Inc., publishing as Benjamin Cummings.

<http://academic.pgcc.edu/~kroberts/Lecture/Chapter%206/growth.html>

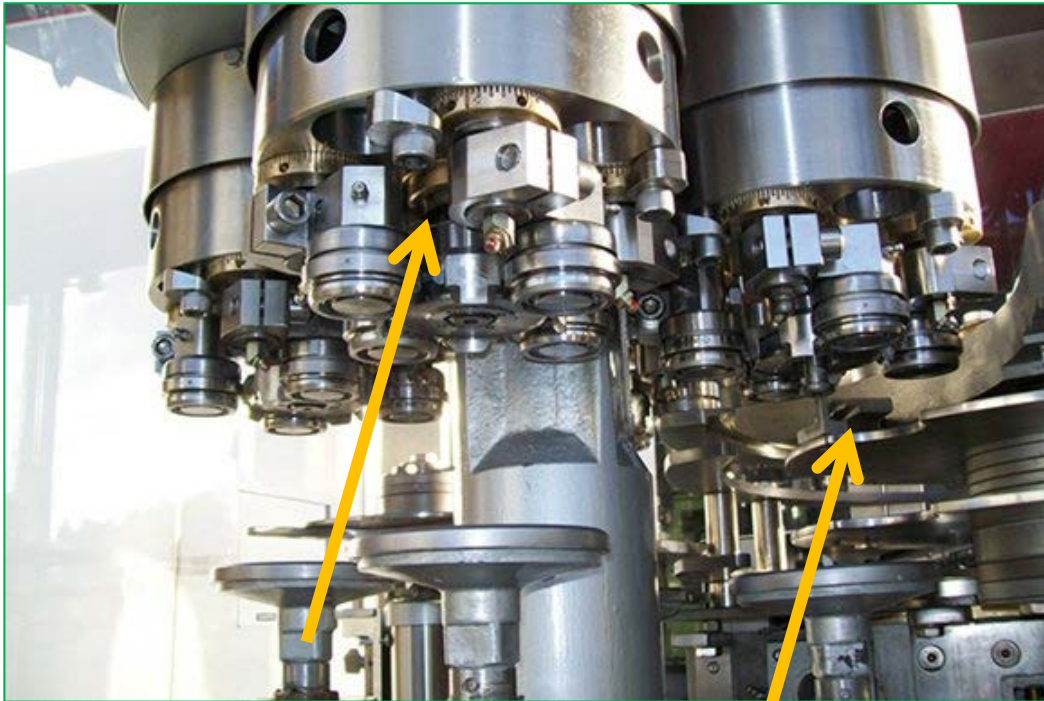
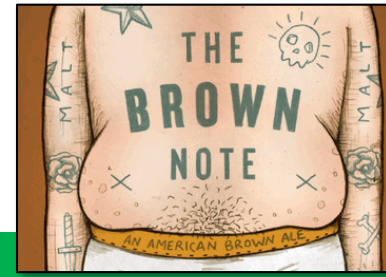
TnSeq: Critical genes

18

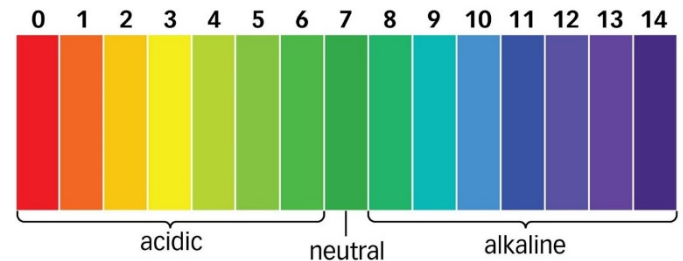


How to avoid hitting

19



somme.com



The lab

20



Projects



**NSERC
CRSNG**



CAMOSUN



**University
of Victoria**



Yeast

- Aging epi-proteomics
- Strain development & physiology

Malting

- Tannin solubilization enzymes: stability & astringency

Hops

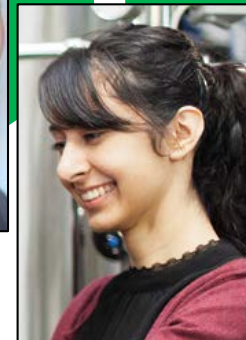
- Extraction improvement
- Volatile oil analysis

Spoilage

- Genome sequencing
- PCR/qPCR detection

Spirits

- Volatile analysis
- Accelerated aging





Sorry.

23

evan.thomson@phillipsbeer.com

Instagram:

[@elsthomson](#)

[@smokeandmirrorscoffee](#)

[@phillipsbeer](#)

