



STONE<sup>®</sup>  
BREWING CO.

# **Intro to Professional Brewing Quality Assurance**

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# What is Quality?

- Quality
  - the degree of excellence of something
- Keeping our beer consistently awesome



# Quality Control

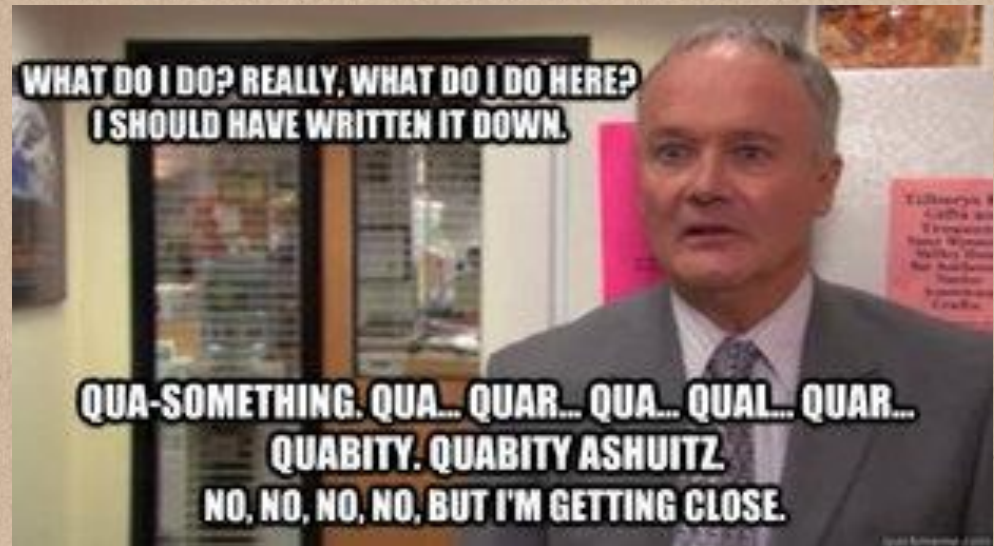
- Quality Control
  - Reactive
  - Needs specifications
  - Allow or deny product release





# Quality Assurance

- Quality Assurance
  - Proactive
  - “Right the first time”
  - Ultimate goal is to reduce the number of defects
  - You can only fix what you can measure



# Quality Management

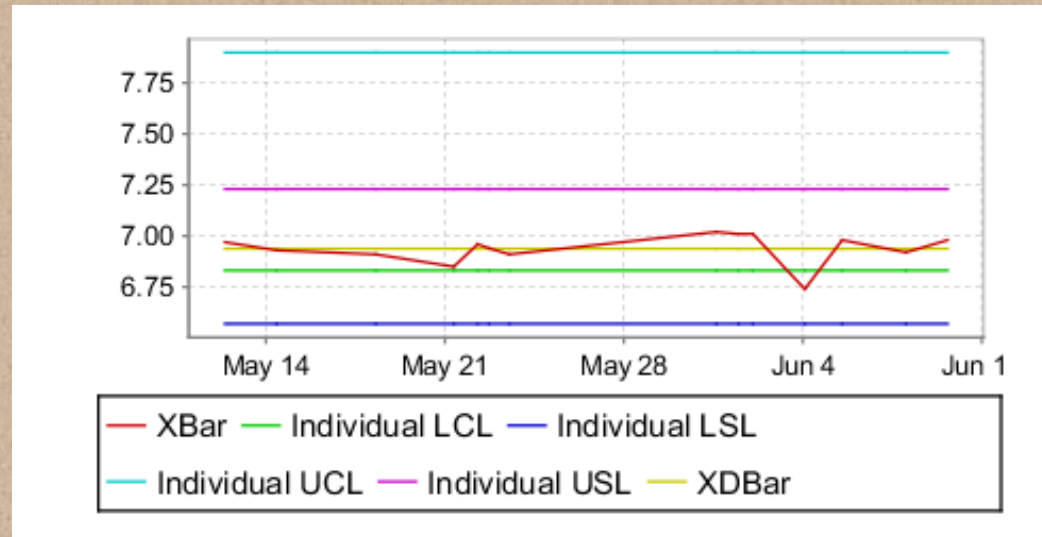
- Quality Management
  - Incorporates both QC and QA into a robust quality program
  - Quality program in place to direct testing
  - Stone's 3-pronged approach:
    - Analytics
    - Microbiology
    - Sensory





# Analytics

- Analytics
  - Utilizes instrumentation
  - Acquire Data from Process
  - Trends data
  - Control limits
  - Statistical Process Control (SPC)



# Microbiology

- Microbiology
  - How clean is the process?
  - Samples samples samples
  - Yeast wrangling

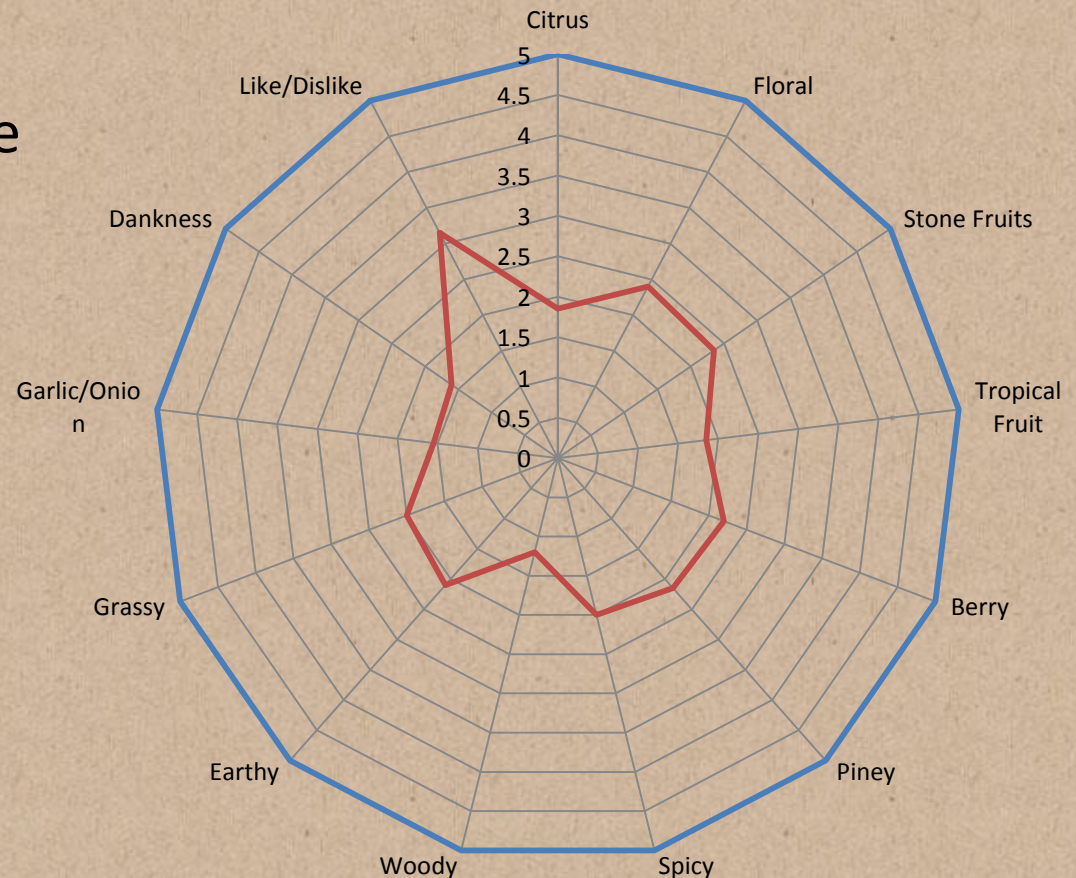




# Sensory

- Sensory
  - Utilizes the human palate to determine quality of product
  - “Quantifying the subjective”

**EKG Redsell #7165**



# Essential Equipment

- Starter QC Equipment
  - Microscope (need 40x)
    - Hemacytometer
    - Methylene/Trypan Blue
  - pH Meter
  - Stir Plate/Shaker Plate
  - Hydrometers
  - Thermometers
  - Dissolved Oxygen Meter
    - Hach Orbisphere 3100
    - Hamilton Beverly
    - Hach/Mettler High Range
- Other Recommended Equipment
  - Grist Sieve and Shaker
  - ATP Luminometer
    - Charm
    - Hygenia
  - Autoclave/Pressure Cooker
  - Centrifuge
  - UV-Vis Spectrophotometer



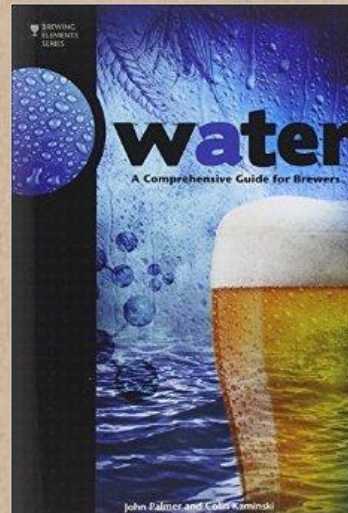
# Simple Tests

- Forced Fermentations
  - Helps determine the end gravity of fermenting beers within 24 hours
  - Accelerated Tank Force (XTF)
    - Added yeast cake
  - Tank Force (TF)
    - No added yeast, pulled directly off of the fermenter after 2-3 days of primary



# Simple Tests

- Brewing and Process Water Testing
  - Using Titration
    - Hardness
    - Alkalinity
    - Chlorine
    - pH
  - Resource: *Water* by John Palmer and Colin Kaminski





# Instrumentation

- UV-Vis Spec
  - Spectrophotometer
    - Measures absorbency of light through a substance at discrete wavelengths
    - Basically it finds how much “stuff” is in a medium like beer or wort
  - Applications
    - Bitterness
    - Color
    - Free Amino Nitrogen (FAN)



# Instrumentation

- Special Instruments
  - Anton Paar Alcolyzer
    - What does it measure?
      - ABV
      - Gravity
      - Density





# Special Instruments

- Gas Chromatograph (GC)
  - Gas is the mobile phase
  - Detects volatile compounds
  - Applications
    - Off-Flavor Detection and quantification
    - VDK (Diacetyl)
    - Acetaldehyde
    - Sulfur Compounds



# Microbes in Beer

- Some microbes that can live in beer can affect flavor or clarity. These are called beer spoilers.
  - Lactobacillus
  - Pediococcus
  - Pectinatus
  - Megasphaera
  - Acetobacter
  - Brettanomyces
  - Glucanobacter
  - Oenococcus
  - Zymomonas
  - Enterobacter
  - Lactococcus



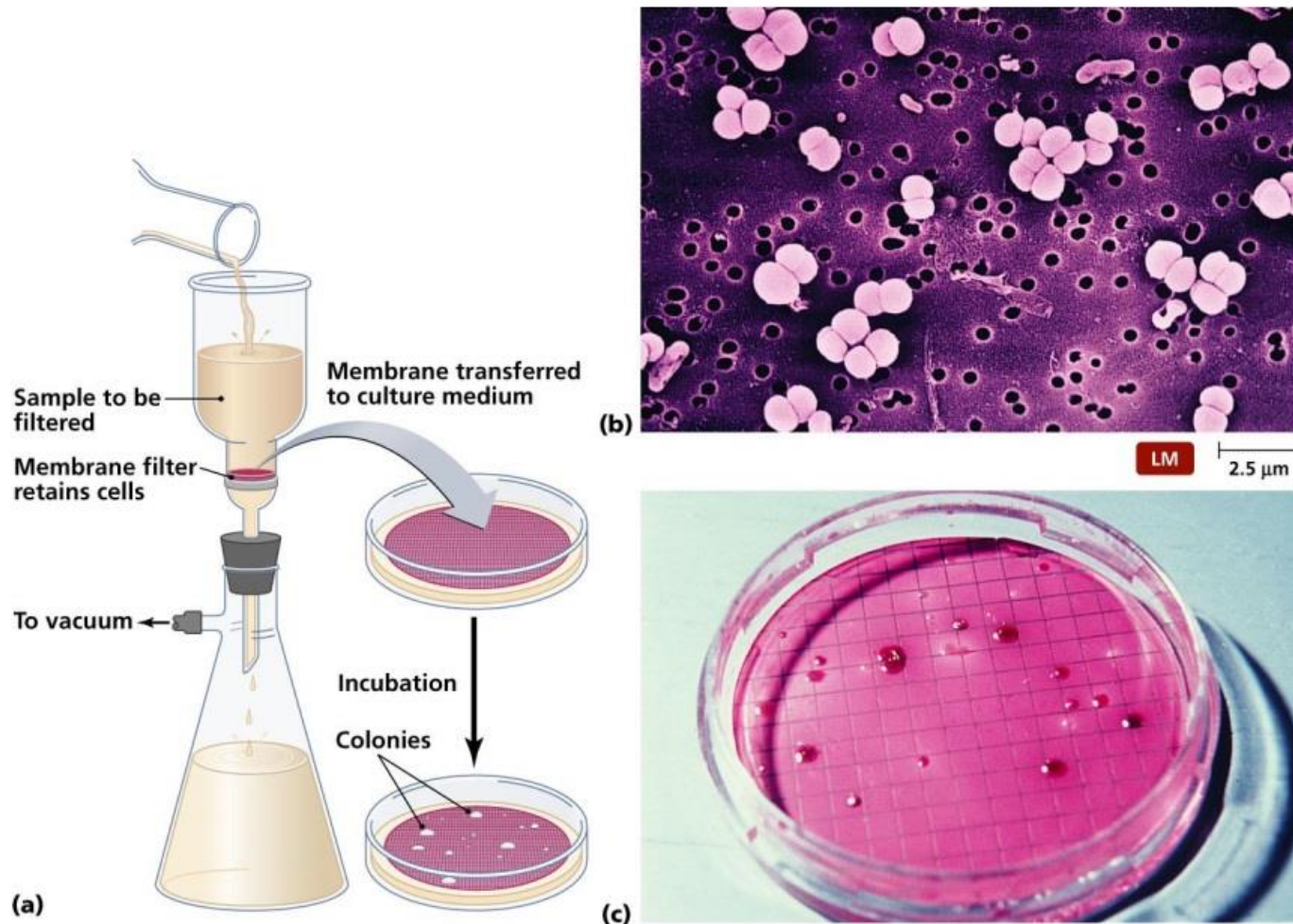


# Detecting beer spoilers: Robust sample collection

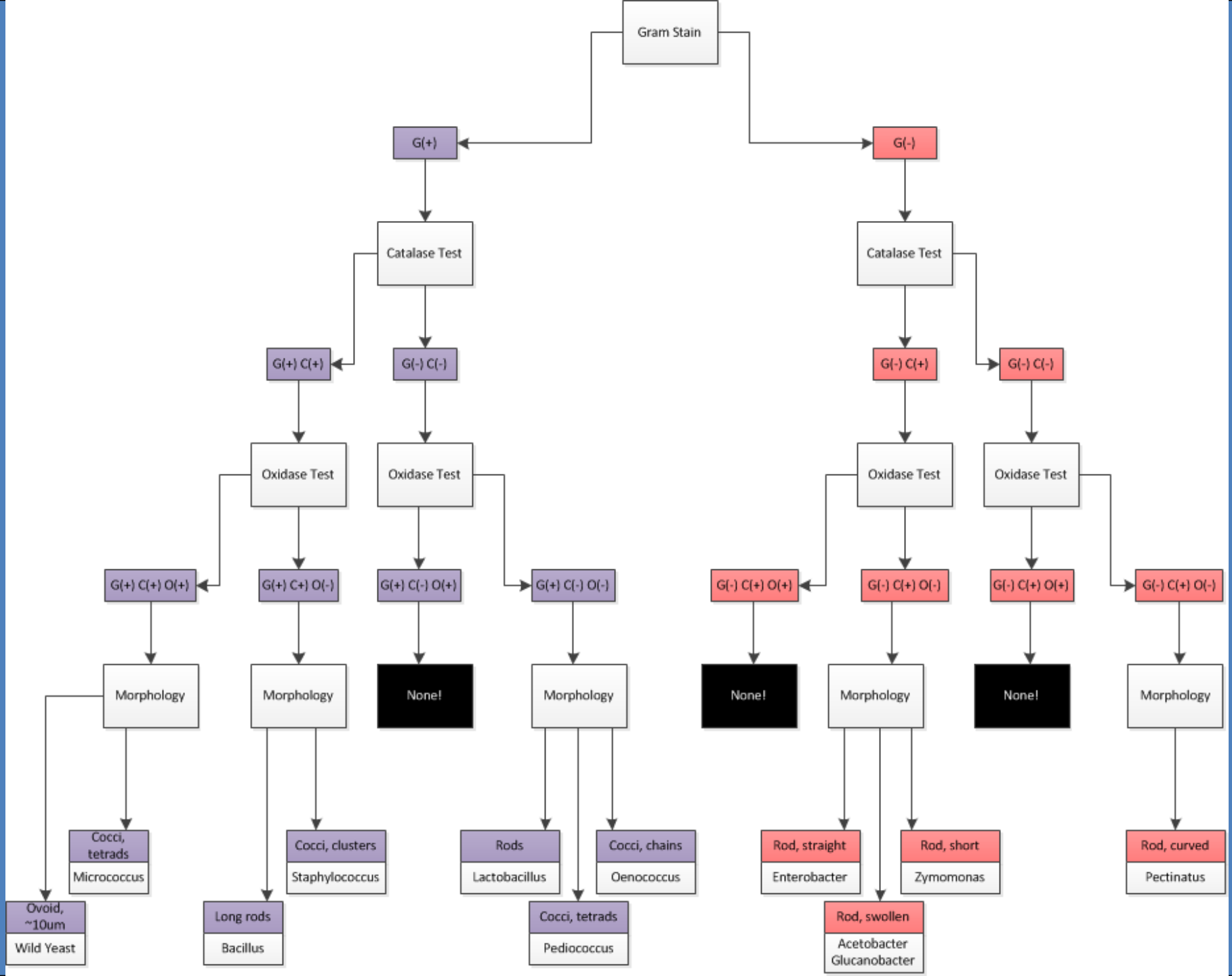
- How do we know whether or not our beer is infected with spoiling microbes?
  - We collect samples from all sorts of different processes to paint a thorough picture of the microbiological stability of the brewery. Our robust micro schedule includes the following samples:



# Detecting beer spoilers: Membrane filtration

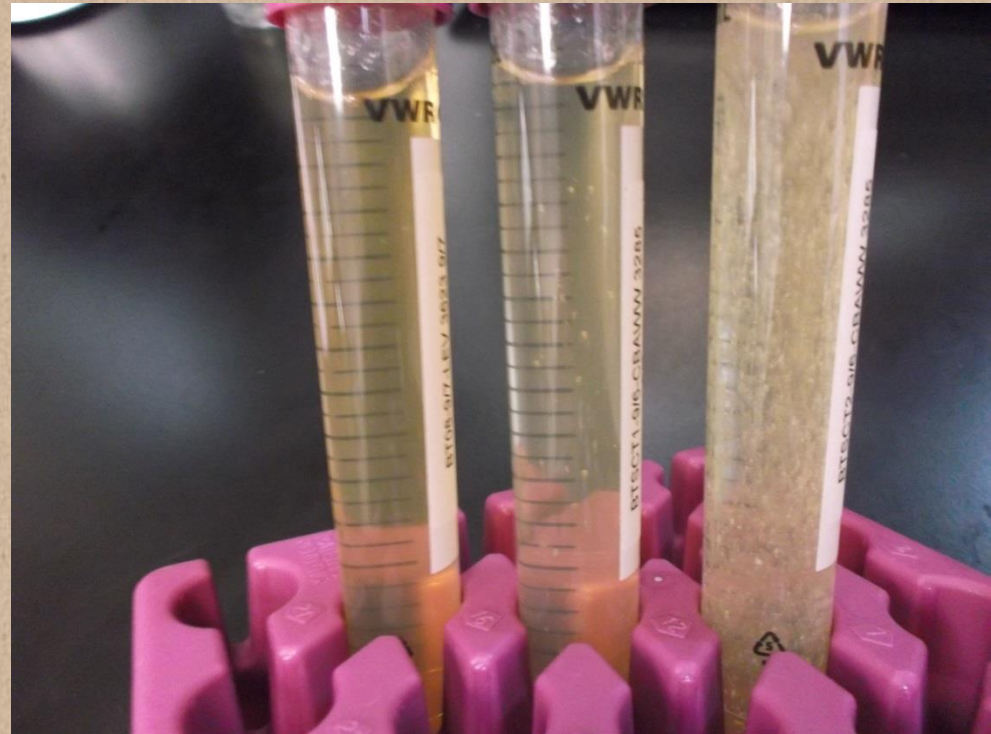






# Detecting beer spoilers: Selective Media

- Some beer spoilers are difficult to grow, or can be indistinguishable from benign microbes using the above methods. Selective media can be utilized to weed out the “background” microbes.
  - SDA - general
  - UBA – made with beer
  - WLN – yeast strains
  - LWYM – wild sacch.
  - Cupric Sulfate – wild non-sacch
  - MRS – acid producing bacteria
  - HLP – lacto & pedio
  - Bromocresol green
  - Cyclohexamide





# Sensory Overview

- Why?
  - We make a product (beer) that is supposed to be tasted by humans
  - The human palate is more sensitive than any piece of fancy analytical equipment we can buy
  - Beer flavor consistency
  - Detect process changes



# Sensory Overview

- Biggest Problem – Human Bias
  - Sensory is a battle against human psychology
  - Humans aren't robots (yet)
  - Numbers
  - Other humans
  - Ego
  - Prior Knowledge
  - Mood
  - Fatigue





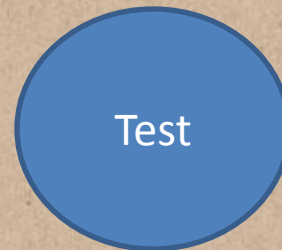
# Sensory Overview

- Primary Sensory Goal
  - To turn panelists into beer tasting cyborgs
- Easy right?
  - Training first → we'll talk about that later



# Sensory Overview

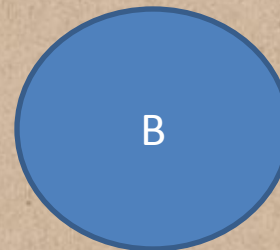
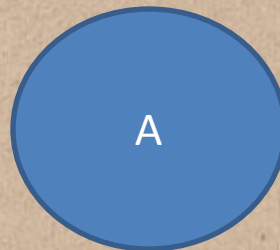
- Types of Sensory Testing
  - Triangle Testing
    - Helps with process change validation or off-flavor threshold testing
    - Two control samples and one test sample
    - Goal is to pick the different sample
    - All samples are unknown to panelists





# Sensory Overview

- Types of Sensory Testing
  - Duo-Trio Test
    - Helps with process change validation
    - Less intimidating than triangle testing, but less statistically relevant
    - One known control sample and unknowns A and B – one of which is the control sample. Pick the test



# Who is the Real QC Judge?

- Consumers!
  - Final QC inspector
    - Package defect
    - Flavor defect
    - Storage defect
  - Feedback
    - Positive
    - Negative





# Additional Resources

- Professional Organizations
  - American Society of Brewing Chemists (ASBC)
- Brewers Association
  - Quality Sub-committee



- Master Brewers Association of the Americas (MBAA)



# Questions ?

