On-the-job Training: Lessons from my first year as a brewing microbiologist

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Overview

- **Not** Brewing Microbiology 101
- Offering a glimpse inside our brewery (MillerCoors, Milwaukee)
  - Set-up
  - Our main responsibilities
  - Our objectives
- The pros and cons of our large, old brewery from a microbiology perspective
- What can smaller or more resource-restricted breweries capitalize on?

Set-up of our brewery

- Milwaukee Brewery
  - 4 full-time microbiologists
  - 2-4 temporary contract technicians
  - Shift rotation/24-hour coverage
- Corporate Microbiology
  - 2 corporate microbiologists in Milwaukee
  - More in Golden, CO

Our responsibilities
Sampling and plating

- **Everywhere** throughout the brewery—favorite part of my job!
- Includes water and diluent systems, air, and packaging line surfaces
- Exact locations, sample volumes, and frequencies determined by corporate
- Transfer samples onto growth media (“plating”) inside laminar flow hood

Our responsibilities

Data analysis

- Data storage and analysis system
  - Worth investing in!
  - If sample data goes unused, resources are wasted (time, supplies, beer)
- Knowing our brewery's baseline normal/"native flora"
- Correlating micro data with process and sensory data
- Recognizing shifting or abnormal patterns

Our responsibilities
Yeast

- Yeast propagation
  - Lots of time, energy, and sampling dedicated to this
  - High risk area
- General yeast management
  - Area of opportunity for us and many breweries
  - Cell count/viability relatively easy to incorporate
  - Need to be able to confidently determine **every time** whether your yeast will give the expected outcome, how it's affected by process variables

Benefits of our brewery

- Resources
  - Money
    - Dedicated lab space
    - Equipment, instruments, supplies
    - Computing power, databases, tech support
    - Staff
  - Expertise/knowledge pool

Challenges of our brewery

Old age and large size

- Physical structure, layout
  - Numerous separate buildings with many stories, doors, and windows
  - Long lengths of piping, buffer tanks
- Materials, e.g. steel tanks with liners
- Employee engagement, e.g. ownership of sanitation
- Communication across shifts and functions

Substitutions/work-arounds for smaller breweries

- Be creative!
- Equipment
  - Home pressure cooker vs. autoclave
  - “Old-fashioned” microbe ID methods and correlations with process and sensory data vs. PCR
  - Partnerships
    - Other breweries
    - Academic institutions’ labs
  - Third-party testing?
- People/knowledge
  - MBAA, professional organizations
  - Suppliers
  - Academic institutions’ personnel and libraries

Summary of key first-year brewing microbiology learnings

- Invest time and thought in design of sampling plan and record-keeping/data analysis systems.
- Get to know your brewery's baseline; look for patterns and how they correlate with sensory.
- Visual inspections/observations outside of plates can be powerful.
- Quality belongs to everyone; communication is key.