



WORLD BREWING CONGRESS

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#ElevateBeer



Microbiological assessment of compressed gases, ambient air, and surfaces in the brewery

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Two Parts

Part 1:
**Microbiological
contamination in
the brewery – an
overview**

Part 2:
**Microbiological
sampling
techniques**



Agenda and Scope

- Overview of microbiological contaminants in the brewery environment
 - Compressed gasses
 - Solid surfaces
 - Ambient air
- Microbiological sampling techniques
 - Compressed gas sampling
 - Ambient air settling plates



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- **Biological constituents**
 - Yeast, bacteria, spores, pollen
 - **Non-biological constituents**
 - Dust, minerals, manufacturing debris



Microbiological Contaminants

- Predominantly yeast and bacteria
 - i.e. *Brettanomyces* and *Lactobacillus*
- Contamination vectors include:
 - Improperly cleaned and sanitized equipment (hoses, pumps, tanks)
 - Compressed air contamination
 - Ambient air contamination





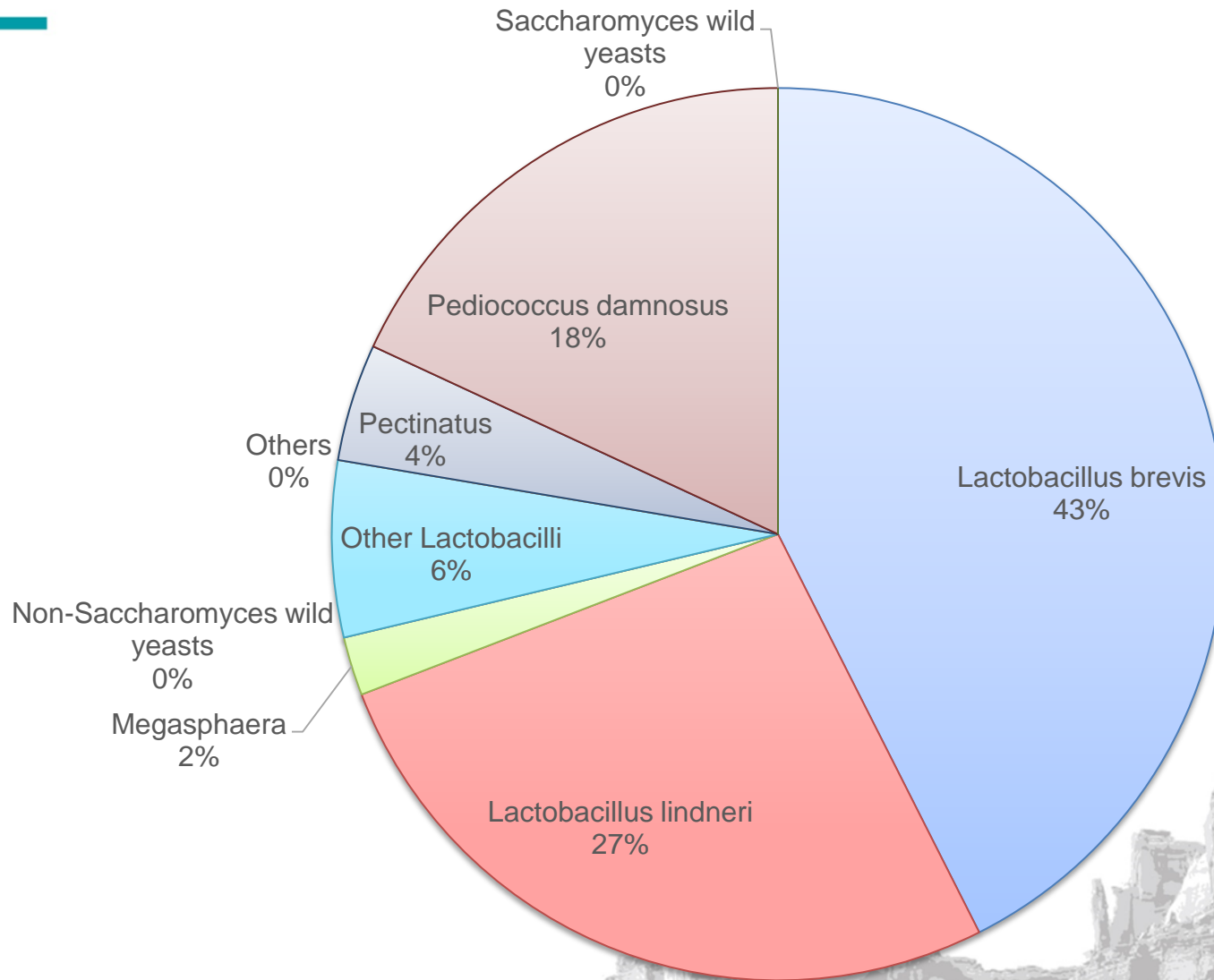
“Know your enemy”

- The majority of significant beer spoilers prefer anaerobic conditions
 - High risk areas include:
 - Fermenters, pumps, barrels, CO2 tanks, packaging lines
 - Exceptions: Acetic acid bacteria (AAB), *Obesumbacterium* spp.
- Brewery microflora is not static.



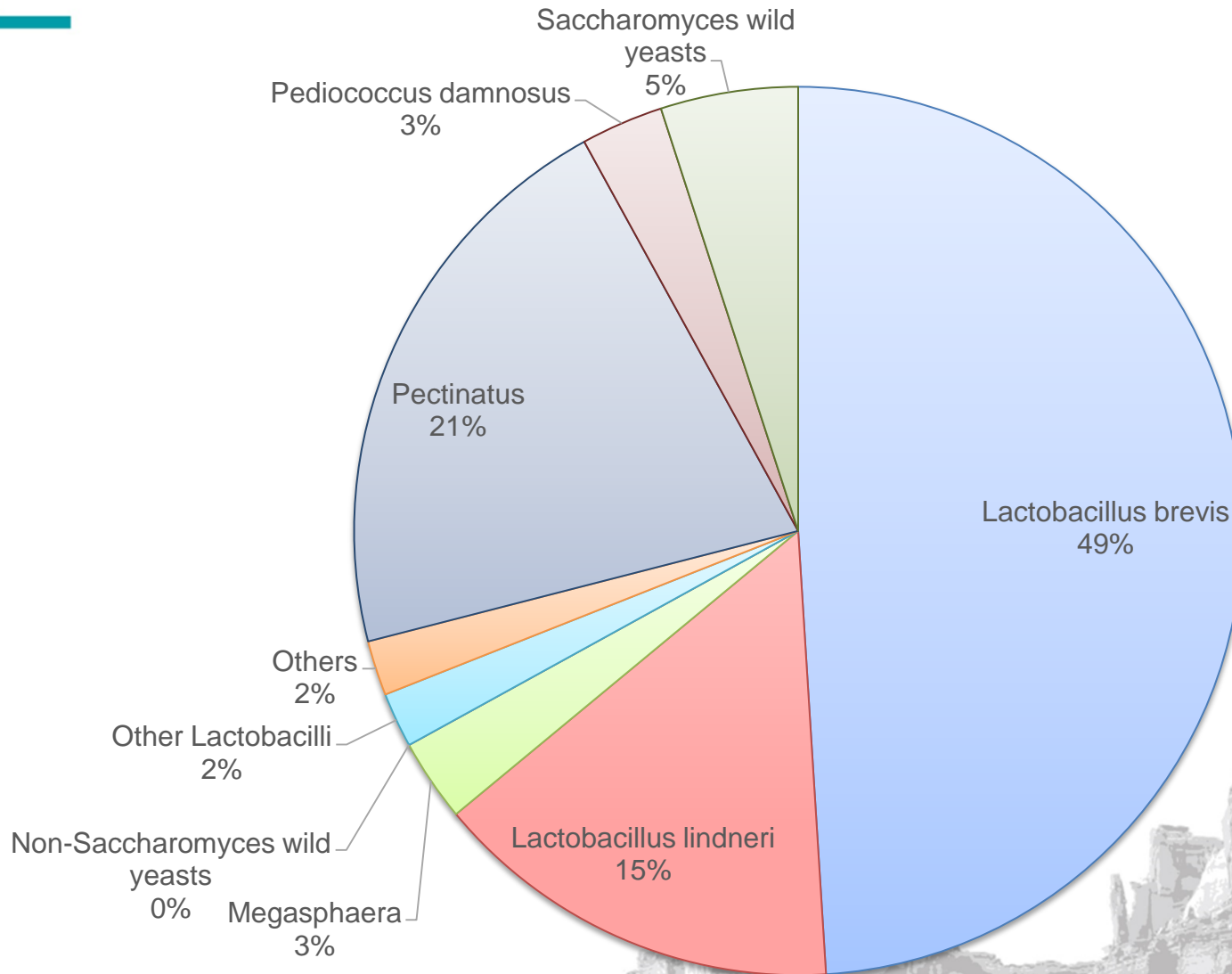


Beer spoilage from 1980-1990



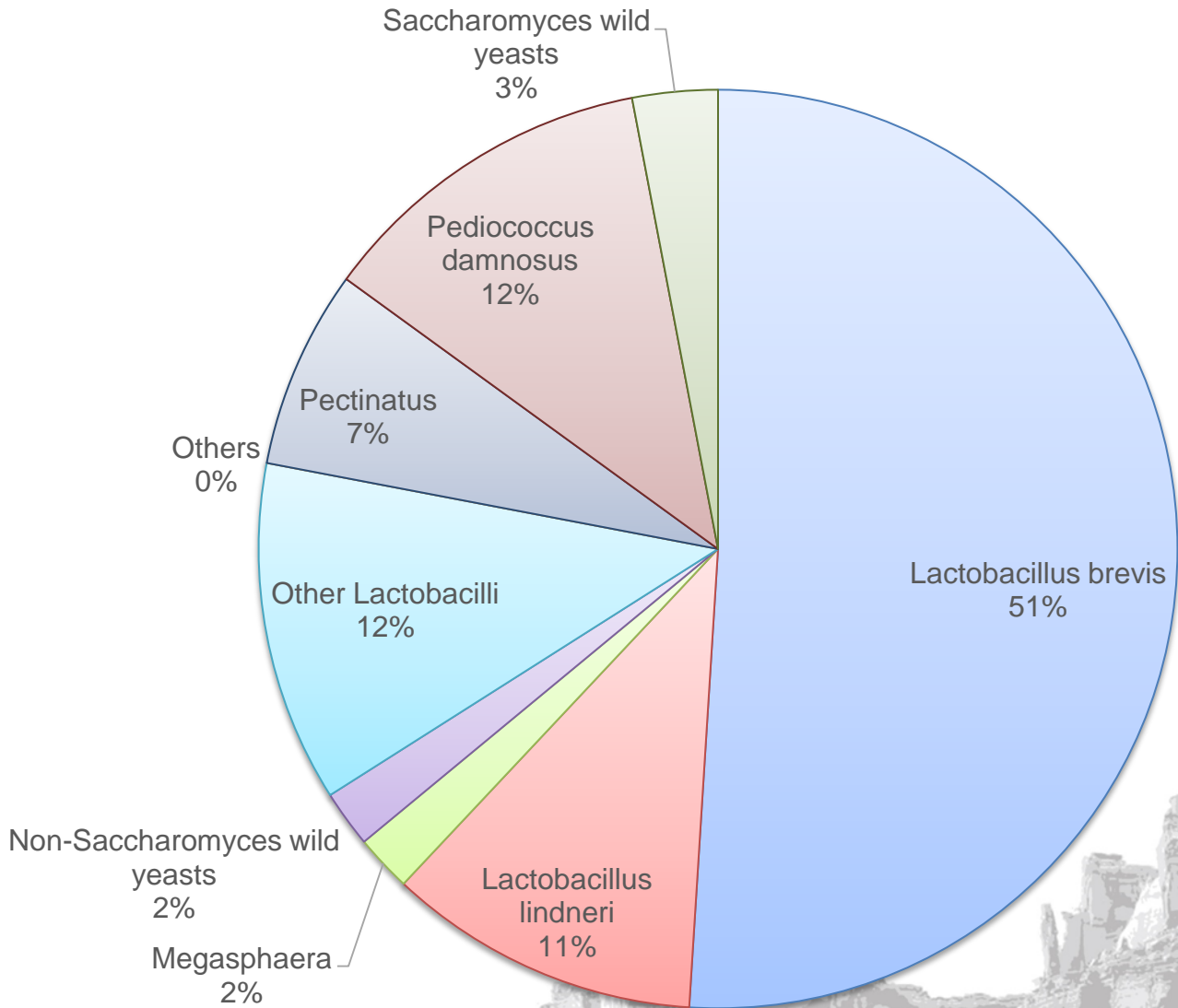


Beer spoilage in 1993





Beer spoilage in 2002





Cleaning vs. Sanitation

Cleaning

- Physical removal of debris and soil from equipment
- Usually involves heat and/or a surfactant
- Does not necessarily reduce or eliminate biological activity

Sanitation

- Destroys or inactivates microorganisms on a cleaned surface
 - For beer production: eliminates bacterial and fungal beer spoilers



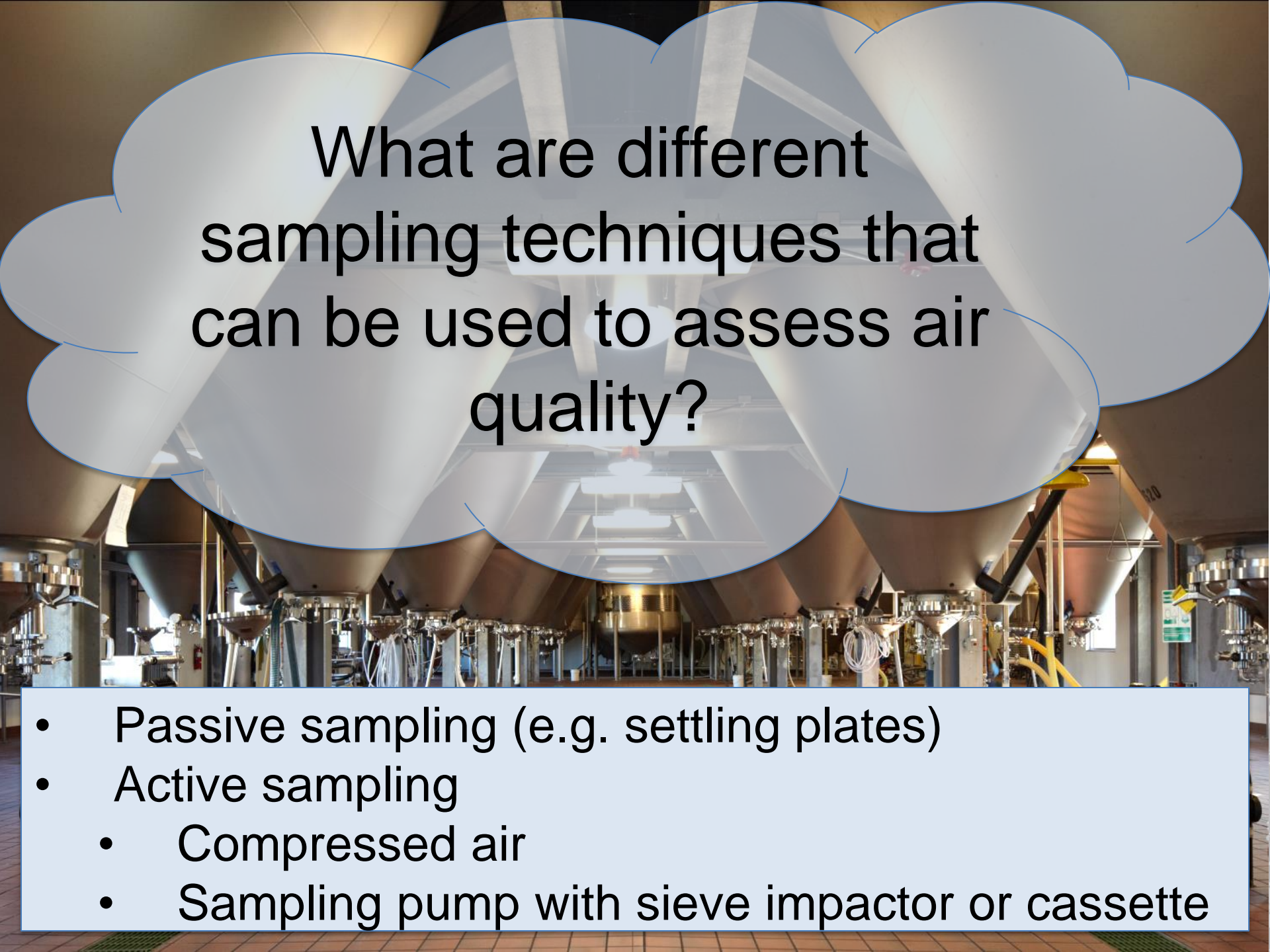
Vectors of Contamination

Physical Contact

- Direct surface to surface inoculation
 - i.e. contaminated pumps, gaskets, tanks, etc.

Inoculation from fluids

- Liquid (i.e. drips, overspray, etc.)
- Gas (i.e. dirty lines, contamination from ambient air, CO₂ bottle rinse)



What are different sampling techniques that can be used to assess air quality?

- Passive sampling (e.g. settling plates)
- Active sampling
 - Compressed air
 - Sampling pump with sieve impactor or cassette

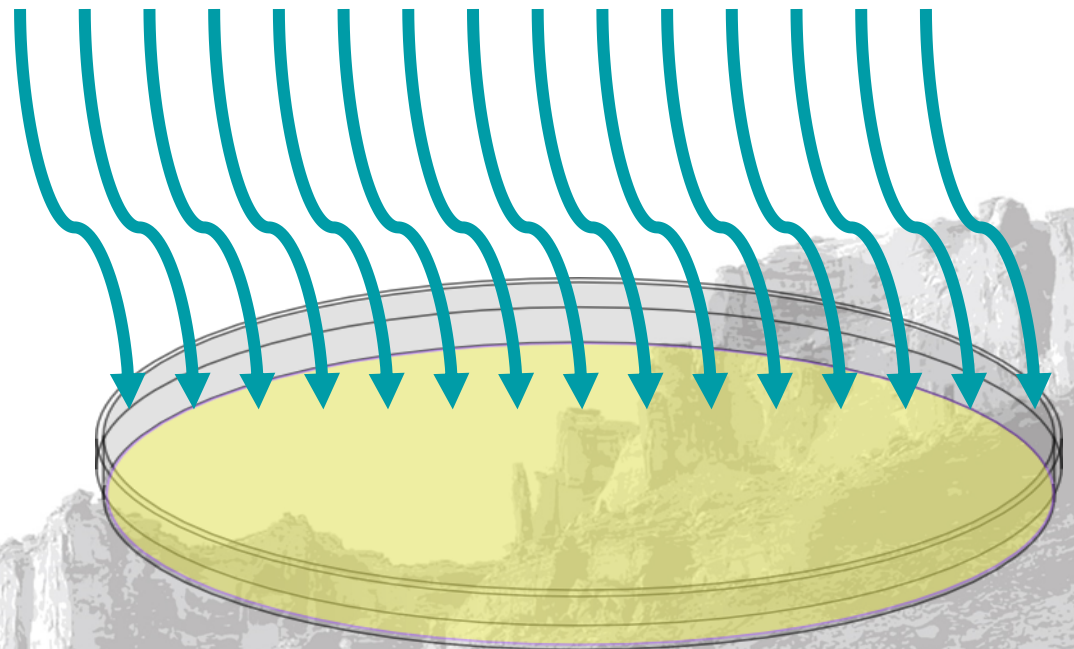


Passive Sampling – Ambient Air





Ambient Air Sampling

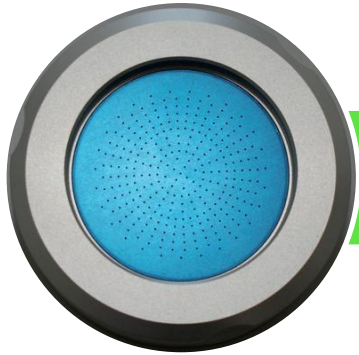




Active Sampling



Compressed gas



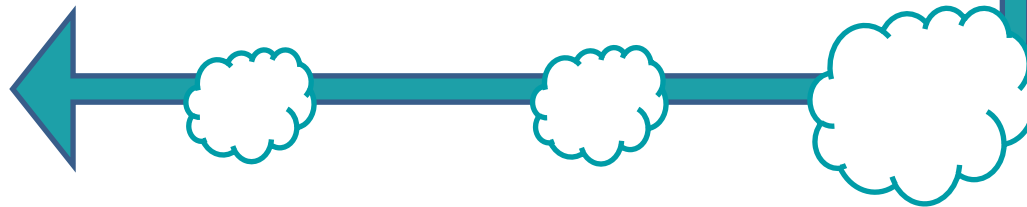
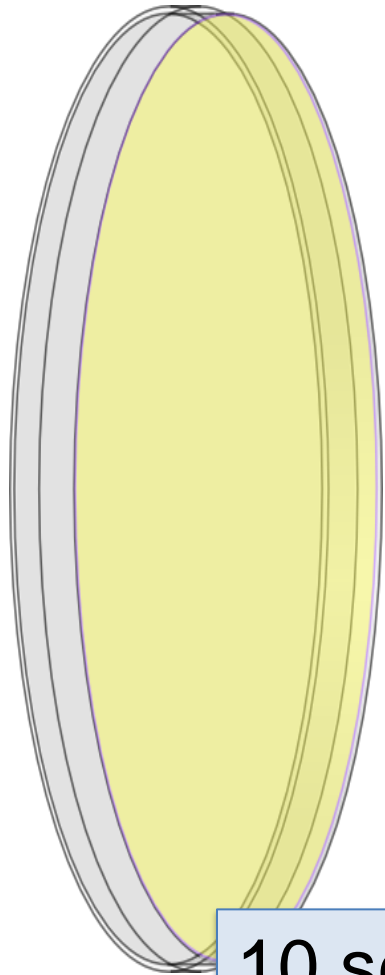
Sieve impaction



Cassette sampling



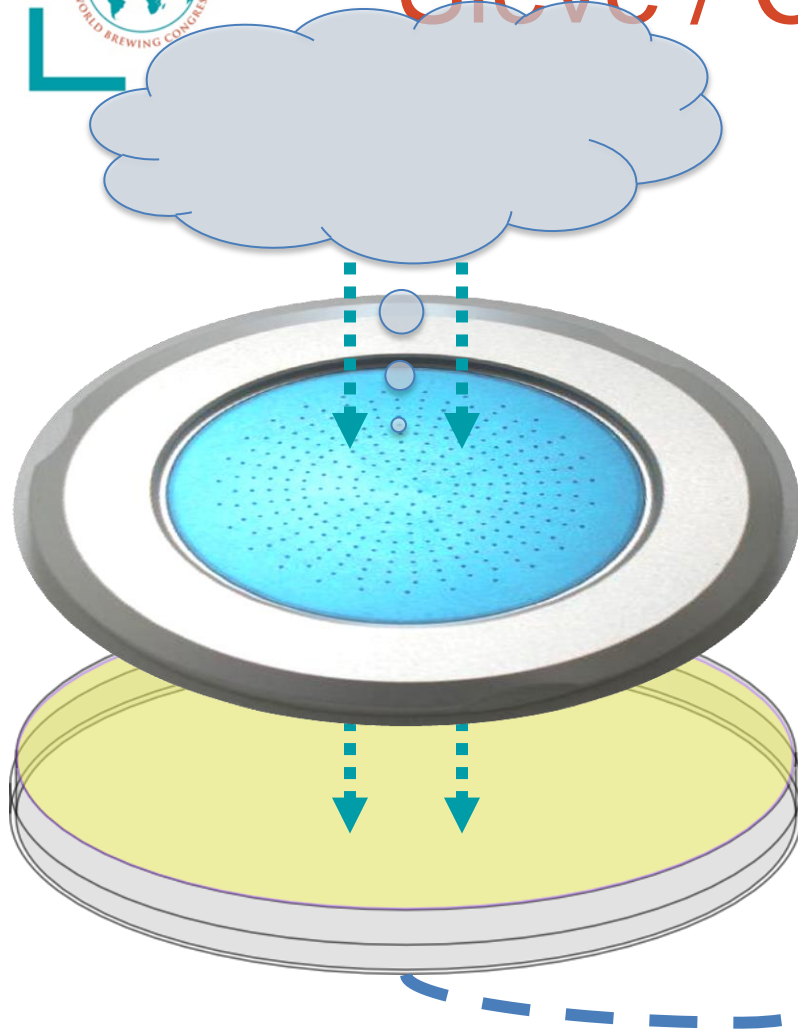
Compressed Air Sampling



10 second bursts (to suit – be consistent)



Sieve / Cassette Impaction



10 minutes @ 100 liters per minute = 1 m³

Sieve / Cassette Examples





Why Monitor?

- Prevent contamination
- Learn about resident airborne and compressed air microflora
- Compressed air may be an ingredient in your product and should be free of contaminants.
 - Safe Quality Foods Institute's SQF code is one of the most popular food safety schemes in the US, and the newest edition
 - Package rinse with CO₂, force carbonation



Safe Quality Foods Institute's SQF Code

- One of the most popular food safety schemes in the US, and the newest edition makes compressed air monitoring mandatory if it is an ingredient.
- SQF Code 7.1 Section 9.5.7.1-2
“Compressed air used in the production process shall be clean and present no risk to food safety; Compressed air used in the production process shall be regularly monitored for purity.”



Concluding Remarks

- Overview of dynamic microbiological contaminants in the brewery environment
 - Compressed gasses
 - Ambient air
- Microbiological sampling techniques
 - Passive sampling (e.g. settling plate)
 - Active sampling (e.g. compressed air / sieve impact sampling)



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Thank you!