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International Association for Food Protection®

Hygienic Sampling: Practical Considerations for the Food Industry

Sponsored by the IAFP Foundation and Food Safety Microbiology Hygiene

09:00 AM (CENTRAL U.S. TIME) 14:00 PM (LONDON) 15:00 PM (PARIS)

March 24, 2020


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Webinar Housekeeping

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Webinar Housekeeping

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- This webinar is being recorded and will be available for access by IAFP members at www.foodprotection.org within one week.

Learning Objectives

Understand the big picture:

- Sampling education/resource shortcomings
- Learn microbiological sampling risks
- Implications of poor sampling data

Apply to your work:

- Learn how to control contamination across the entire process
- Aseptic & representative considerations

Take away tools to:

- Select locations to sample
- Choose the right sampling tools to avoid sample contamination
- Develop a sampling training program

Webinar Outline

9:00 – 10:15 Central US Time

- **François BOURDICHON**, Principal Consultant, Food Safety Microbiology Hygiene, France
  Introduction and setting the frame, *20 Minutes*
- **Roy BETTS**, Microbiology Ambassador, Campden BRI Group, *United Kingdom*
  Practical Considerations, *20 Minutes*
- Moderation by **François BOURDICHON**
  Questions and Answers. Conclusion. *20 Minutes*

Webinar Abstract Overview

Misunderstandings about sampling:

- Statistical representation: unit vs global
- Proper analytical method
- Validation and verification process
- ISO TC34 / SC9 on microbiology

The sample itself is not questioned

QA/QC operations base crucial decisions from sample data

Where to Start?

No Overarching Sampling Guidelines

The food sample is not a focus per se in the ISO documents.
(The analytical sample is however)

- ISO 707 Milk and milk products — Guidance on sampling
- ISO 6887-3 Microbiology of the food chain — Preparation of test samples
- ISO 13307, Microbiology of food and animal feed — Sampling techniques
- ISO 17468, Microbiology of the food chain
- ISO/TS 17728, Microbiology of the food chain — Sampling techniques for microbiological analysis of food and feed samples

Evolution of the concept of Microbiological Criterion

Report of CCFH 17th Session Appendix II 1981	CAC/GL 21 1997	CAC/GL 21 1997 rev 2013
Border Control (No history of the product)	HACCP Hazard Based FSMS	SPS - ALOP Risk Based FSMS
⬇	⬇	⬇
Acceptance, non acceptance of a food product	Process calibration Validation of control measures	Process control

Sampling ?
It's either math or methods

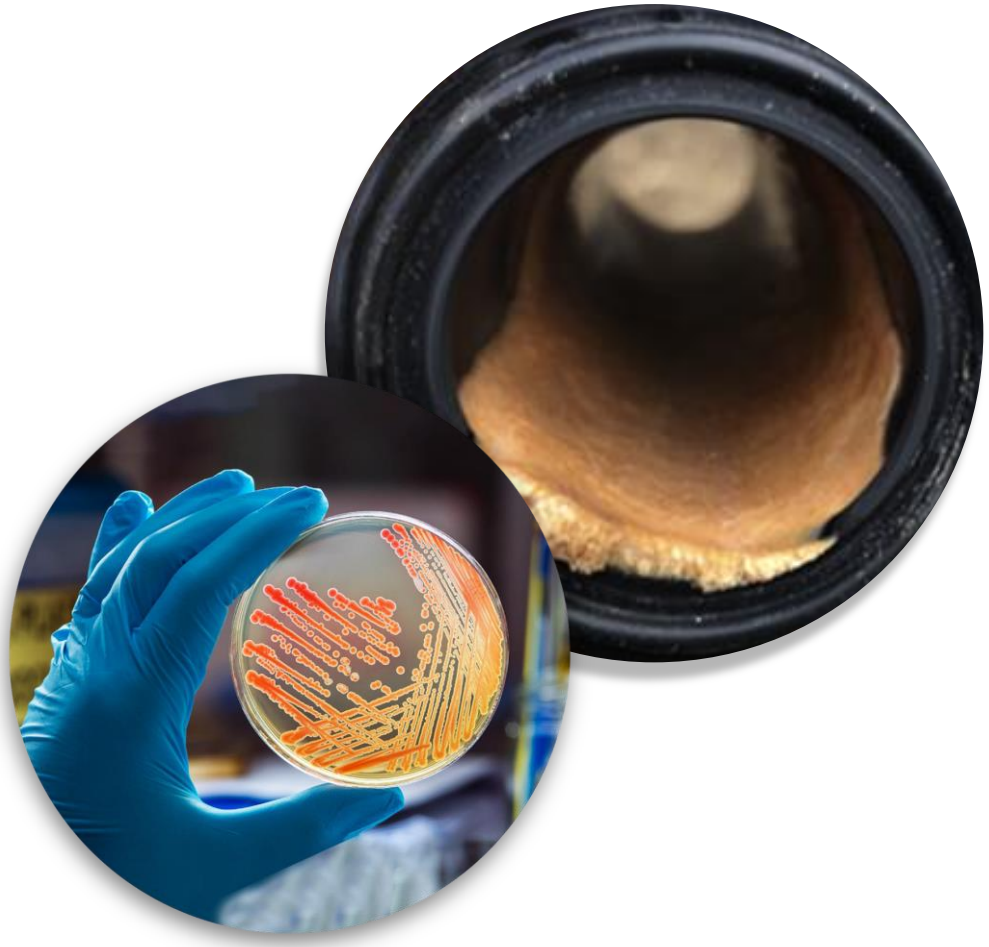
In food microbiology, sampling approach is referred to:

- Statistical representation
- Analytical method

But, how many people really care about the sample itself?

- **Who** took the sample?
- **Where** and **When** was it taken?
- **How** was it taken?
- **What** training did she/he receive?

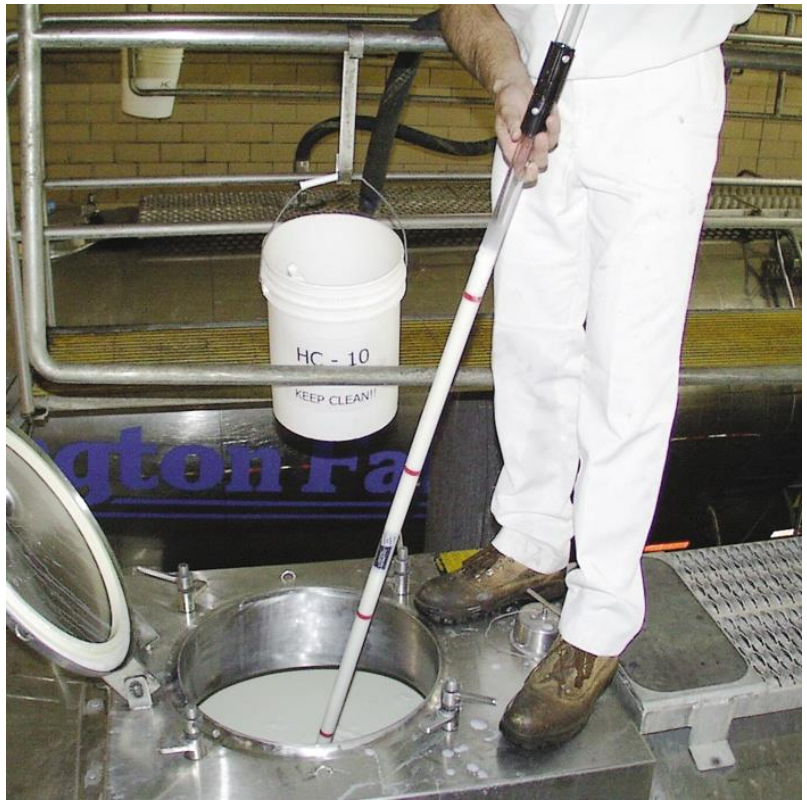
What are we Sampling for ? Microbiological Risks



- Biofilm
- Harbourage sites
- Microorganisms of concerns
- Microbiological Risk Assessment
- Hazard identification

Microbiological Contamination during sampling:

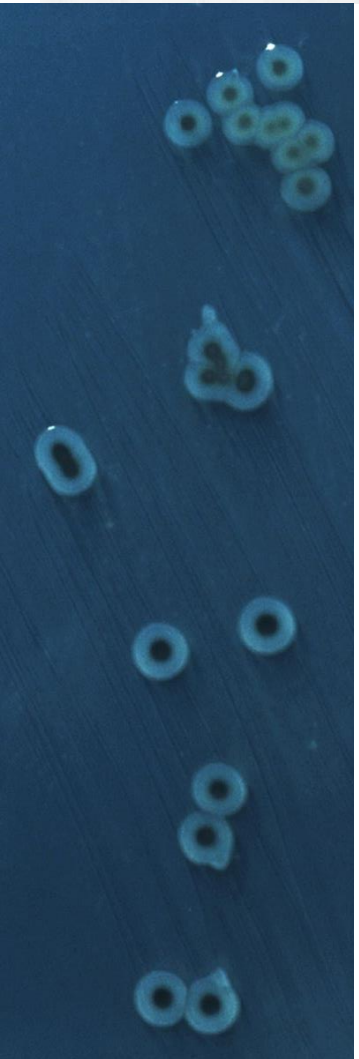
both sample AND container get contaminated



- Real life example: Contamination by coliforms of milk cisterns sent from France to Spain *(Names of company not given for confidentiality reason)*
- Milk analyzed in France – Coliforms not detected
- Milk analyzed in Spain – Coliforms detected
- Litigation for weeks between the two companies
- Audit of sampling practices concluded to contamination during food sample preparation

Is the sample representative?

How to detect low levels in the supply chain before final product



Two Consecutive Large Outbreaks of *Salmonella enterica* Serotype Agona Infections in Infants Linked to the Consumption of Powdered Infant Formula

Cécile Brouard, MPH,† Emmanuelle Espié, DVM, MPH,* Francois-Xavier Weill, MD,‡ Annaëlle Kérouanton, PhD,§ Anne Brisabois, PhD,§ Anna-Maria Forgue, RN,‖ Véronique Vaillant, MD, MPH,* and Henriette de Valk, MD, MPH**

(*Pediatr Infect Dis J* 2007;26: 148–152)

Conclusions: Powdered infant formulas are not sterile products and may contain low levels of *Salmonella*. Routine microbiologic controls are insufficient to detect a low-grade contamination, which may cause serious illness and outbreaks among infants.

Always start with the WHY

- Process monitoring
- Unreliable data
- Customer requires data trail
- Unable to identify or track process hygiene
- Unpreparedness for audits

Bring it to Your Work,
What are the Sampling Considerations?

Always ask yourself (and formalize it):

- What am I looking for in my **process?**
- What do I need to know about my **product?**
- What level of **accuracy** do I need from my sample?
- Does it need to be **representative?**

What is Aseptic & Representative?

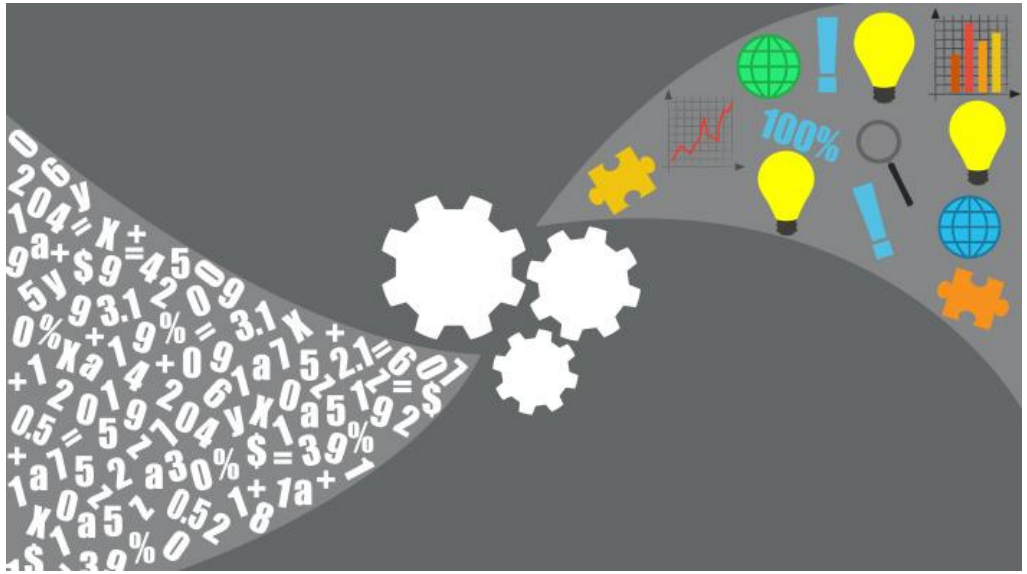
Aseptic

- **Manage risk of contamination**
  - Sample itself
  - Process and/or container
- **Always follow aseptic technique**
- **Use sterile equipment whenever possible**

Representative

- **Food product composition**
- **Nutrient composition: representative of total food product**
- **Microbial contamination: representative of total microbial distribution**
  - Probabilistic laws do apply

Which decisions are made with the sampling data?



- Raw Material acceptance for use in the process
- Finished product delivery to customer
- Control measures validation study
- Processing Environment Monitoring
- Food Safety Management System (FSM) certification
- …

Take home lesson #1: WHERE

- Preventative Control/ Critical Control Points
- Evaluate the entire process
- What equipment requires extra attention?
- Where does your product require extra attention?

Take home lesson #2: WHEN

- Perform a risk assessment along the food chain
- Define inline sampling & silo needs
- Frequency
- Seasonal impacts

Take home lessons #3: HOW

- Key to avoiding contamination
- AVOID dead legs
- Sample hygienically, using Aseptic Techniques
- Question is the sample:
  - Aseptic?
  - Representative?

Examples of Microbiological Risks

Additional Sampling Microbiological Risks

Is the Sample Representative or Aseptic?

Take home lesson #4: Who?

- Who is approved to collect the sample?
- If none, time to train the appropriate person(s)
  - Hygienic Sampling, using Aseptic Technique
  - Microbiological culture
- Are they following Aseptic Technique?

Did we Meet our Objectives?

1. Understand big picture:

- Sampling education/resource shortcomings
- Learn microbiological sampling risks
- Implications of poor sampling data

2. Apply to your work:

- Learn how control contamination across process
- Aseptic & representative considerations

3. Take away tools to:

- Select where to sample
- Choose the right sampling tools to avoid sample contamination
- Develop a sampling training program

Want more?

Email me for a pdf on
Sampling Best Practices

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Codex Committee on Food Hygiene

General Guidelines on Sampling

General Guidelines on Sampling, CAC GL 50 – 2004

2.3 SAMPLING PROCEDURES

2.3.1 General

Sampling procedures should be performed in accordance with appropriate ISO Standards related to the commodity of concern (for example ISO 707 for sampling of milk and milk products).

2.3.2 Employment of Sampling Officers

Sampling should be performed by persons trained in the techniques of sample collection by the importing country.

2.3.3 Material to be Sampled

Each lot that is to be examined must be clearly defined. The appropriate Codex Commodity Committee should stipulate how a consignment should be handled in instances where no lot designation exists.

Codex Committee on Food Hygiene

General Guidelines on Sampling

Codex Guidelines GL 21 1997 Modified 2013:

4. 4 COMPONENTS AND OTHER CONSIDERATIONS

19. A microbiological criterion consists of the following components:

- The purpose of the microbiological criterion;
- The food, process or food safety control system to which the microbiological criterion applies;
- The specified point in the food chain where the microbiological criterion applies;
- The microorganism(s) and the reason for its selection;
- The microbiological limits (*m*, *M*; see Section 4.6) or other limits (e.g. a level of risk);
- A sampling plan defining the number of sample units to be taken (*n*), the size of the analytical unit and where appropriate, the acceptance number (*c*);
- Depending on its purpose, an indication of the statistical performance of the sampling plan; and
- Analytical methods and their performance parameters.


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Thank You!
QUESTIONS
?

Sampling for Microbiological testing

Roy Betts, Microbiology Ambassador
Campden BRI

Objectives of this talk

- Why sampling is important
  - Sampling shortcomings
  - Take away practical tools
  - Where to sample
  - How to sample
  - Training

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Why test?

- Need an understanding of why a test is being done.
  - Testing never assures safety
    - Unless you test everything
  - Verifies HACCP
  - Verifies cleaning procedures
  - Used correctly monitors performance over time - trends

What you need before starting

- A criterion
- What do you want to know and why do you want to know it?
- Will the test result tell you what you want to know?
- Test type/volume/mass/location/sample numbers per unit time
- Test method- valid/fit for purpose
- Test limits- target/out of specification
- Action to take if target breached

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Sampling

- Things to consider
  - Where to take the sample
  - What to sample
  - How to sample
    - Methods, tools, containers, sampling staff
  - Sample storage & transport
  - Time to laboratory
  - Storage in laboratory
  - Test Method

Issues with sampling incorrectly

- Brilliant lab
- Highly trained lab staff
- Fantastic fully validated method
- Huge LIMS holding/analysing results

But:

- Wrong sample/ or sampling method
- Wrong result
- Incorrect action taken

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Any help from standards?

- ISO 4833-1 APC at 30C
  - 7. Sampling
  - Sampling is not part of the method specified in this part of ISO 4833. See the specific International Standard dealing with the product concerned. If there is no specific International Standard, it is recommended that the parties concerned come to an agreement on this subject. It is important the laboratory receive a truly representative sample which has not been damaged or changed during transport or storage.
- ISO 7218- General Requirements for Microbiological examination
  - “Although extremely important for the interpretation of the results, sampling and sampling plans are not a part of this International Standard. It is important that the laboratory receive a sample which is representative of the batch of product and has not been damaged or changed during transport and storage”.
- Some help from:
  - PD CEN ISO/TS 17728:2015: Microbiology of the food chain: Sampling techniques for microbiological analysis of food and feed samples.
    - Equipment and the implements used to take the samples shall be clean, as a minimum and sterile where required, depending on the aim of testing. For example, if testing is to check the intrinsic microbial flora of the product, then the equipment shall be sterile.
  - --- milk and dairy products (ISO 707);
  - — surface sampling of carcasses (ISO 17604);
  - — samples from environmental surfaces (ISO 18593);
  - — samples from the primary production stage (ISO 13307).

Where to take the sample

- What is the reason for sampling?
- What do you want to know?
  - This has to drive the decision on sampling location
    - Environmental swab
    - Ingredient
    - Process intermediate
    - WIP sample
    - Finished product

The sampling dilemma 1

- How to take the sample
  - In-pack finished product
    - Direct to lab
  - Environmental sample
    - Swab/sponge—depending on area
      - Sterile/in container and designed for microbiological sampling
      - Quenching agent?
      - Location- what do you want to know?
  - Ingredient/process intermediate/WIP
    - Sterile sampler, grab sample, sterile container
    - Trained staff, risk assess for safety of personnel & product

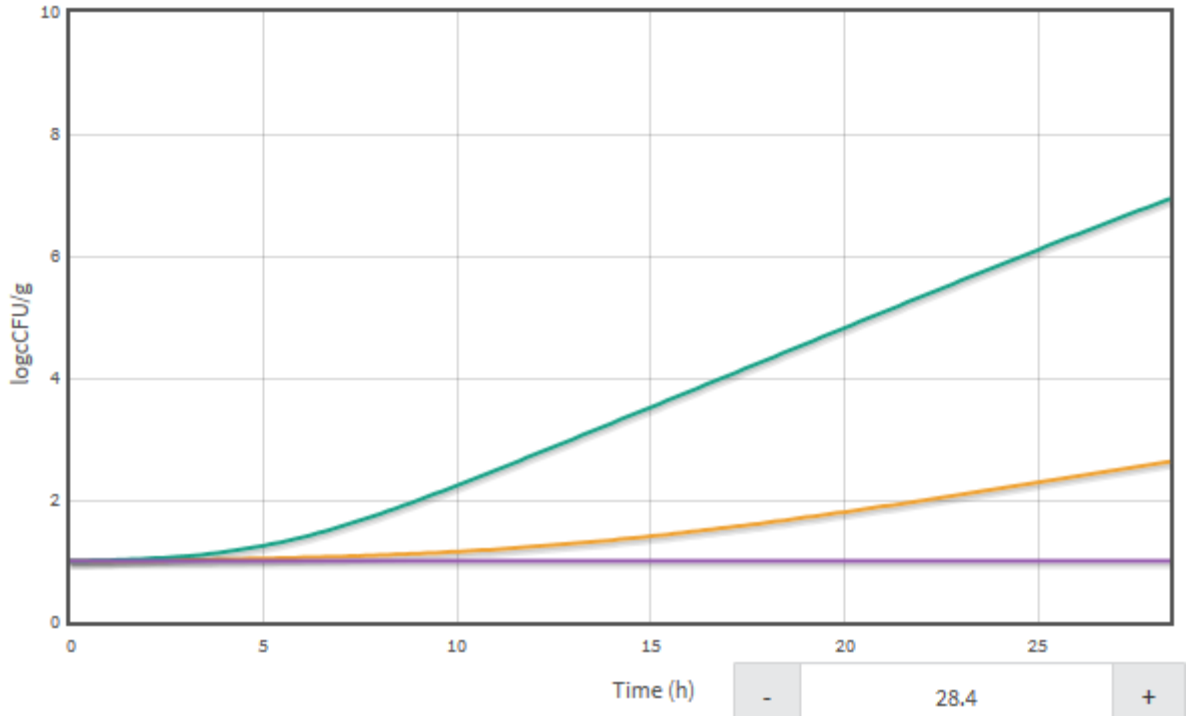
The sampling dilemma 2

- In-Factory sampling
- Check- is what you use production compatible?
  - No glass
  - Detectable equipment
  - Swab diluents food safe or washed off
- Count them in and count them out
- Is sample mass sufficient for all testing

- Sampling cannot compromise food safety
- Labelling- unique, clear, to identify sample, location, sampler, time, date etc.

Sample storage and time

- Preserving the microbiology of the sample
- Sample temperature
- Time to analysis



Combase prediction:
E.coli at 10,15 and 20ºC.
pH7, aW 0.99

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Sample storage and time

- Storage:
  - Ambient stable materials- ambient-cool
  - Chilled materials/swabs- chill (as low as possible without freezing)
    - Coolbox with ice packs- (sample protected), data logger, set temp cut off for lab testing
    - Consider quenching antimicrobials to reduce death
  - Frozen materials- must not be allowed to thaw .
  - Water- fast as possible <24h- die off

- Transport time:
  - Microbiologically stable items (ambient stable/frozen). Non-critical.
  - Microbiologically unstable (chilled). As fast as possible
  - Time also influences when you get the result.

Transport to the laboratory

- Be aware
- Set limits (time and condition of sample)
- Agree with lab
  - If the sample has potentially been compromised-
    - Do not test
    - You will not be able to interpret the results

Sampler Training

- Procedure reproducibility (via SOP)
- Aseptic technique
- Use of tools
- Labelling of samples
- Safe working (via risk assessment)
- Maintaining a safe production area
- Sample storage requirements

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Results

- Action plan on out of specification
  - Define what you will do
- Treatment of other results
  - Trending of data
  - Action levels and actions to take

Final Thoughts

- Success of sampling depends on good reproducible technique
- Understanding of why its being done- what question do you want to answer
- Understanding of what results mean
- Predefined action plans if results are out of specification.
- Training of samplers
- Good techniques for sampling & sample handing before testing- SOP’s in place
- Its all sound simple- get it wrong – big problems

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