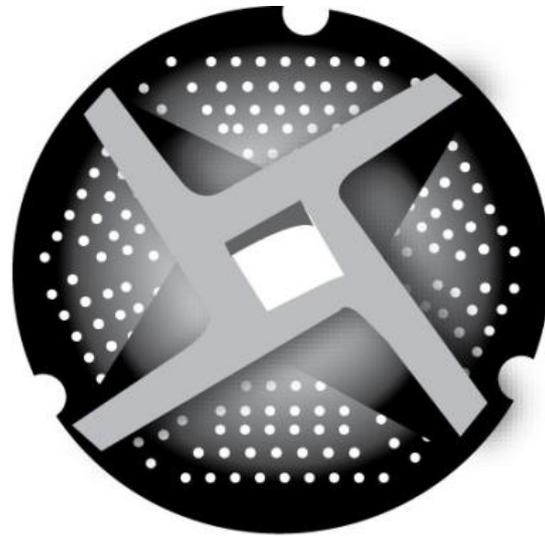


# Microbiology 201 for Small Meat Processors



**NICHE MEAT PROCESSOR**  
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**ASSISTANCE NETWORK**

*August 29, 2012 Webinar*



*[www.nichemeatprocessing.org](http://www.nichemeatprocessing.org)*

# MICROBIOLOGICAL SAMPLING

Penn State Department of Food Science



Penn State **Extension**

# **Microbiological Sampling**

- **Microbiological Sampling Introduction**
- **Environmental Sampling**
- **Product Sampling**
- **Testing Laboratories**

# Goals of Microbiological Sampling

- Determine risk associated with the process
- Establish historical benchmarks
- Help identify trends
- Verify process or procedures
- Identify and correct issues



# Microbiological Sampling

## Remember

- Sampling cannot guarantee product safety if there is no preventive control;
- You cannot rely on government testing alone;
- Because pathogens are often present in low levels, they may not be detected by testing.



# Microbiological Sampling

## **Risks vary by plant.**

- There is no “one plan fits all” approach;
- The mix of plant environments, processes, and ingredients is complex;
- This complexity is different for each plant;
- This complexity affects what type of pathogens are found and where.

# Microbiological Sampling

## General

- Prepare a written plan.
- Consider sample types – environmental, ingredient, in-process, and finished product testing. **You may want to focus on environmental.**
- Develop written procedures for sampling, handling, testing, and verification.
- Document your results.
- Your plan should continually evolve.



# Designing a Sampling Program

- Purpose of sampling – Why?
  - Verification of process, customer requirement, etc.
- What will be sampled
- Frequency of sampling
- Sample size
- Analytical method
- Effectiveness of method



# Designing a Sampling Program

## Aseptic Sampling Technique

- Do not add organisms to sample during collection
- Microorganisms associated with hands, clothing, sample containers may lead to erroneous results



# Microbiological Sampling

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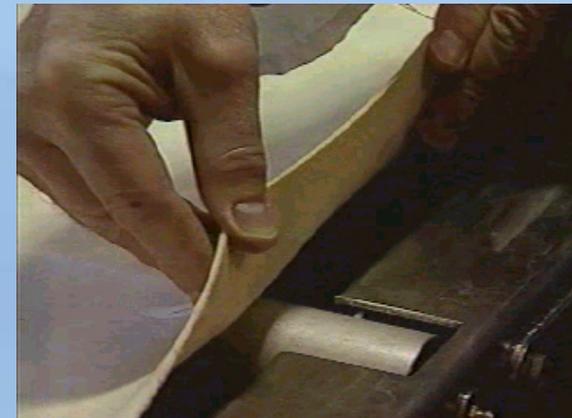
# Environmental Testing

Testing the surrounding environment and those surfaces that come into contact with food

- Not normally statistically designed, but often based on prior experience
- More cost effective than product testing
- Use for trend analysis, verification of sanitation, evaluating the risk of exposure to pathogens
- Helps discover bacteriological niches

# Environmental Testing

- Where
  - Areas that are good indicators of control
  - e.g., exposure to food, cross contact, high traffic
- Frequency
  - 2 to 10 samples weekly?
  - Enough to assess control.
- Composite samples can be done, but individual samples are better to show trends



# Environmental Testing for Listeria



# Environmental Testing for Listeria

## Food Contact Surfaces – Zone 1

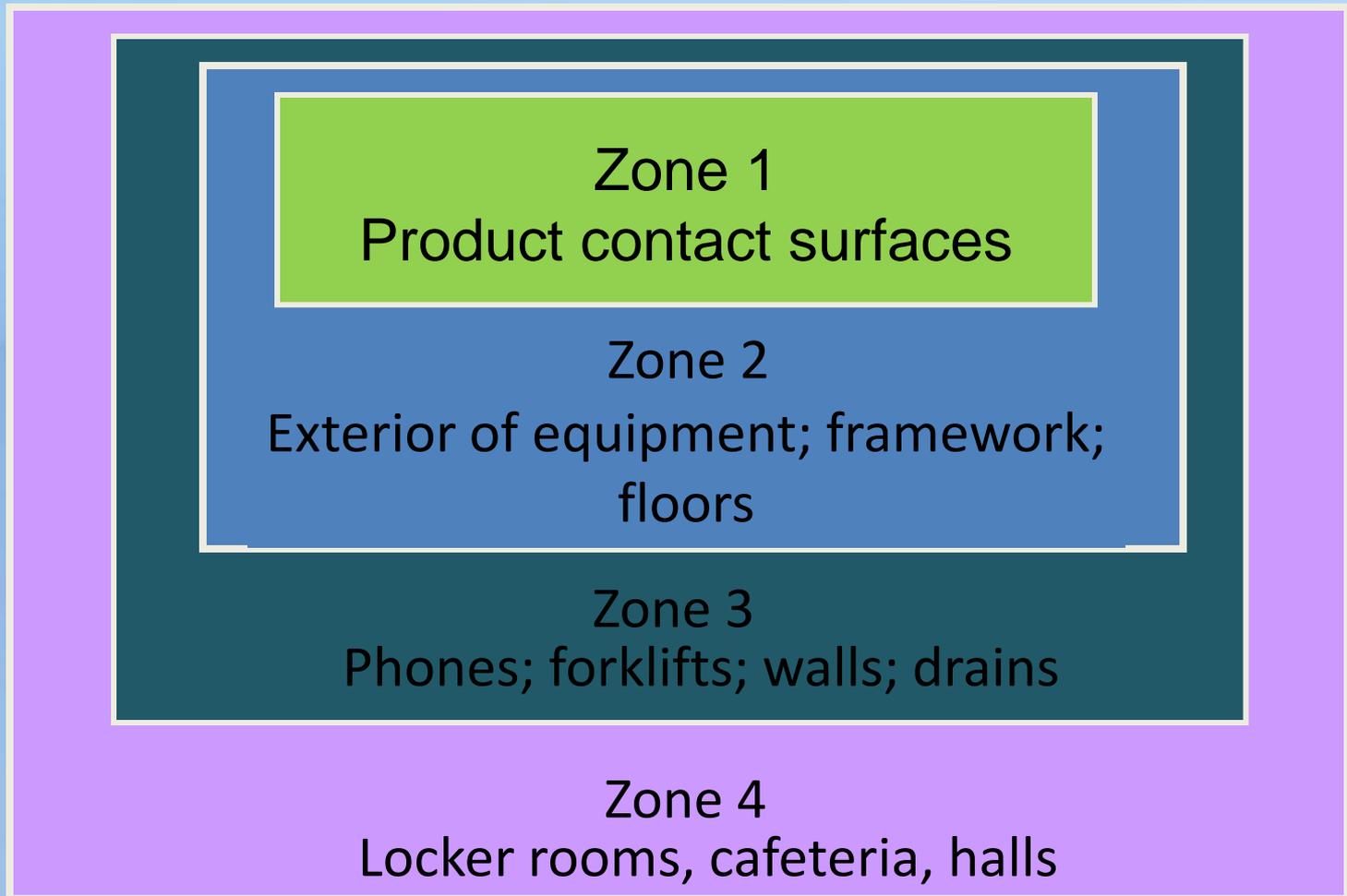
- 25% or less of your samples
- Best to get pre-operational and operational (mid-shift samples)
- Alternate sampling sites each week (to get an entire set within 1 to 3 months).

# Environmental Testing for Listeria

## Non-Contact Surfaces

- Split between Zone 2 and Zone 3 with a few from Zone 4
- Best to get pre-operational and operational (mid-shift samples)
- Areas of focus: high traffic, high moisture, product build-up

# Environmental Testing for Listeria



# Corrective Action for Listeria

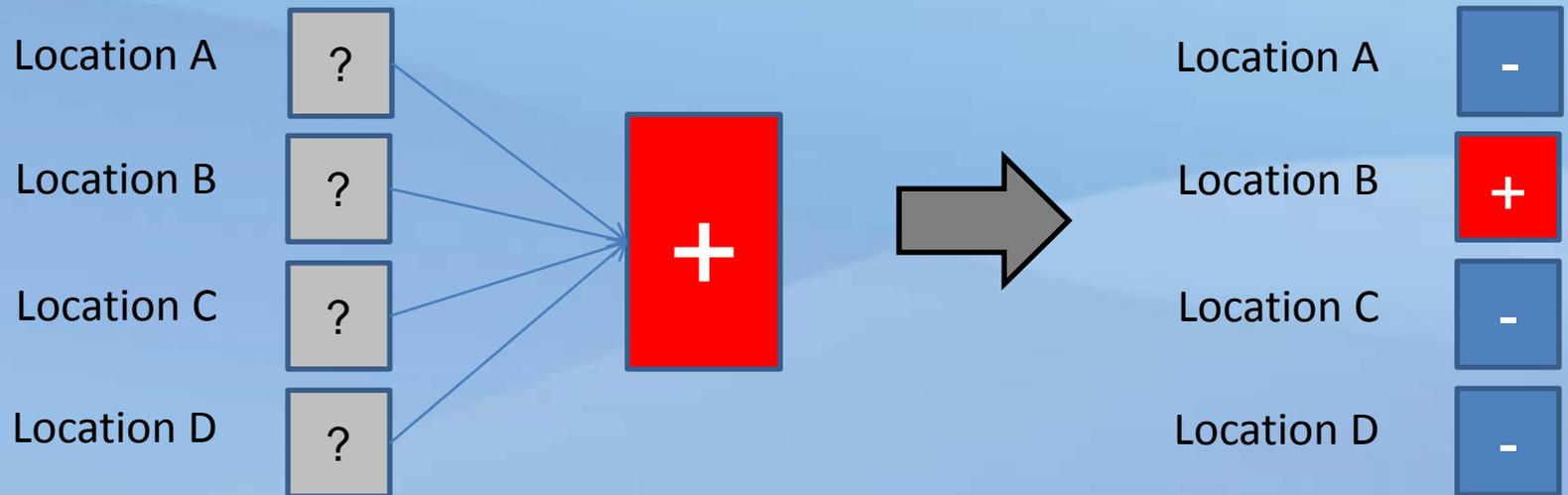
You must:

- Take corrective action, whether you test for *Listeria* spp. or *L. monocytogenes*
- Have a written protocol for non-contact and product contact surfaces
- Keep records of corrective actions taken



# Additional Considerations

If you take composite samples, conduct additional sampling and testing to determine the specific surface or area that is contaminated.



# Additional Considerations

- Test waste product from the bottom of conveyors, etc.
- After taking sponge samples on pre-operational product contact surfaces, sanitize entire area
- Consider collecting operational samples in addition to pre-operational samples



# Verification of Sanitation

## Why:

- Best way to verify effectiveness of cleaning and sanitizing
- Establishes a record for review
- May help identify trends and thus prevent potential issues



# Verification of Sanitation

## Types of analysis

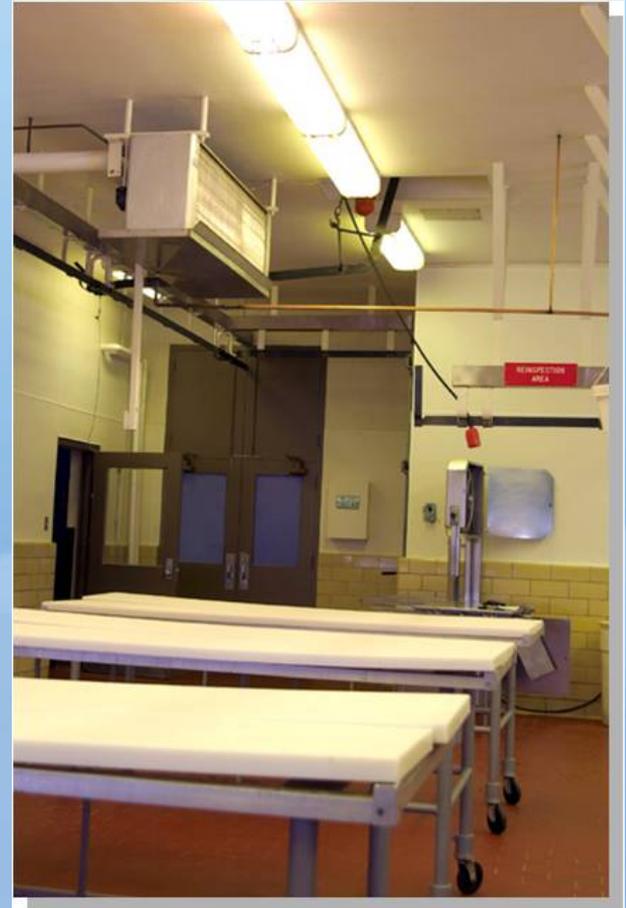
- Microbiological testing
  - APC
  - Coliforms
  - Yeast and Mold
  - Listeria?
- ATP testing
- Food residuals



# Verification of Sanitation

## Types of Surfaces

- Food contact
- Non-contact
- Personnel
- Air sampling



# Verification of Sanitation

## Establish a program

- Standardize your methodology
- Establish frequency
- Identify areas for sampling
- Randomly sample areas, but resample trouble areas, areas not appearing clean



Go off the program occasionally to test new items (maintenance tools, etc.)

# Verification of Sanitation

## Program

- Analyze data for trends
- Ensure follow-up on high count areas, including resampling
- Standards for APC
  - <100 cfu /50 sq cm (<100 cfu /~8 sq in) USPHS\*
  - <5 cfu / sq cm (USDA 1994)
  - <1.3 log cfu / sq cm (<20 cfu / sq cm)
  - <100 cfu / 4 sq in

\*Compendium of Methods for the Microbiological Examination of Foods 2001

# Verification of Sanitation

## Program

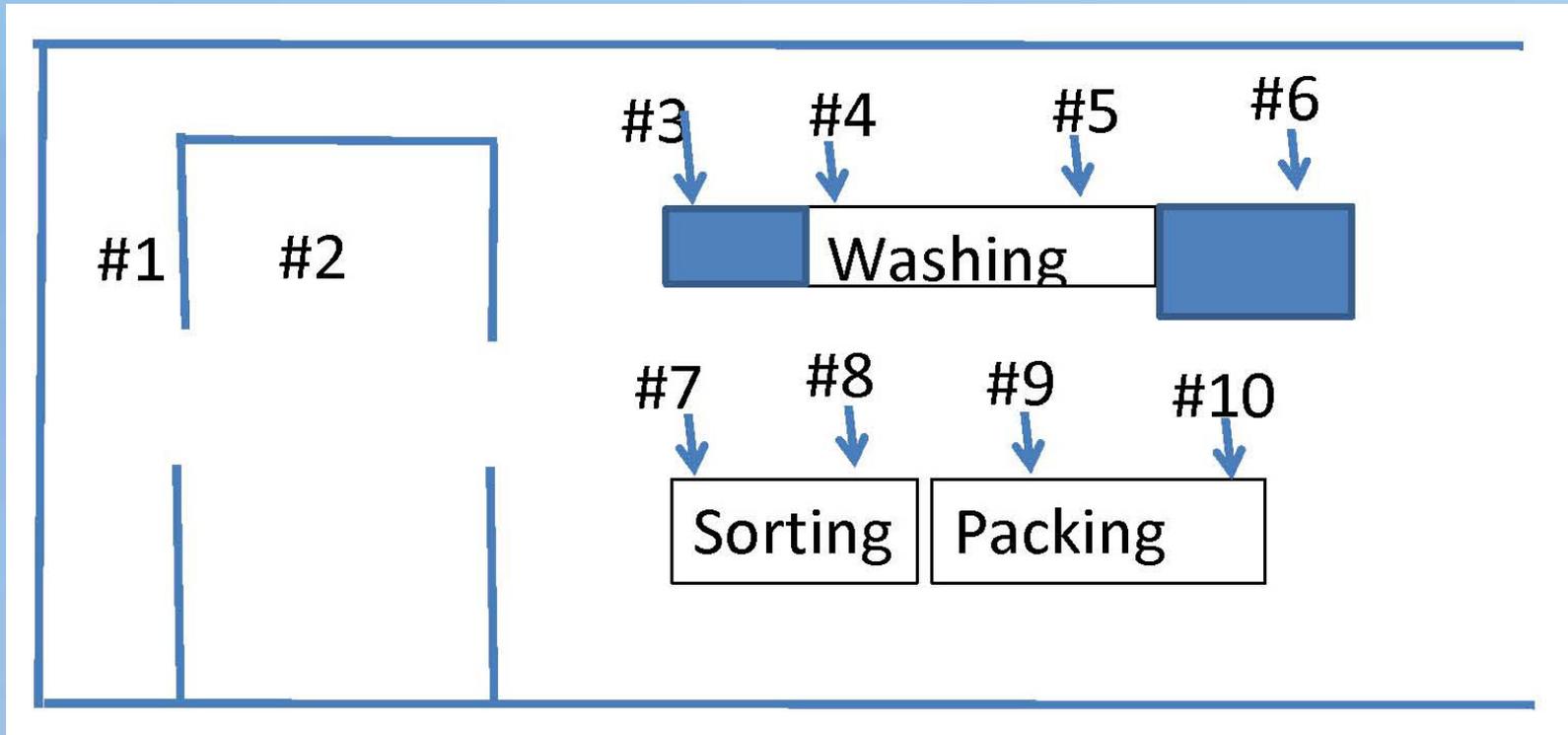
- Coliforms
  - Generally looking for negative results (<10 cfu/area) in pre-operational checks, especially in post-process areas
- Pathogen testing
  - Normally conduct absence/presence testing using sponges for sampling
  - Looking for negative/area sponged



# Procedures and Methods

## Environmental Testing Program

- 1) Establish procedures, including a sampling map of the process



# Procedures and Methods

## Environmental Testing Program

2) Record site numbers into spread sheet along with locations and zone determination

| Area       | Number | Location              | Zone |
|------------|--------|-----------------------|------|
| Fresh      | 1      | Drain in Receiving    | 3    |
| Processing | 2      | Floor in Cold Storage | 3    |
|            | 3      | Unloading table       | 1    |
|            | 4      | Conveyor Switch       | 2    |
|            | 5      | Drain in Processing   | 3    |

# Procedures and Methods

## Environmental Testing Program

### 3) Determine sampling regimens

| Area       | Number | Location              | Zone |   |
|------------|--------|-----------------------|------|---|
| Fresh      | 1      | Drain in Receiving    | 3    |   |
| Processing | 2      | Floor in Cold Storage | 3    | X |
|            | 3      | Unloading table       | 1    |   |
|            | 4      | Conveyor Switch       | 2    | X |
|            | 5      | Drain in Processing   | 3    | X |

# Procedures and Methods

## Environmental Testing Program

### 4) Conduct Sampling

Pathogens – moistened sponge



# Procedures and Methods

## Environmental Testing Program

### 4) Conduct Sampling

APC – Moistened swab and a template



# Procedures and Methods

## Environmental Testing Program

- 5) **Test Samples – send to outside lab or test in-house** (in-house not recommended for pathogens unless strict controls are established).

### Pathogens

- Enrichment – looking for positive or negative result
- Rapid versus cultural procedures

### APC or Coliforms

- Direct plating – looking for a number

# Procedures and Methods

## Environmental Testing Program

### 5) Test Samples

- Consider testing for *Listeria species* on non-contact surfaces and for *Listeria monocytogenes* on contact and product samples
- Consider using rapid methodology with a high degree of specification

# Procedures and Methods

## Environmental Testing Program

### 6) Record Results

| Area       | Number | Location              | Zone | 3/1/2011 | 3/8/2011 |
|------------|--------|-----------------------|------|----------|----------|
| Fresh      | 1      | Drain in Receiving    | 3    | Negative | NS       |
| Processing | 2      | Floor in Cold Storage | 3    | NS       | Negative |
|            | 3      | Unloading table       | 1    | Negative | NS       |
|            | 4      | Conveyor Switch       | 2    | NS       | Negative |
|            | 5      | Drain in Processing   | 3    | Negative | Negative |

# Procedures and Methods

## Environmental Testing Program

### 7) Follow-up

- Complete corrective action each time there are unacceptable results
- Record corrective action
- Sample more frequently in problematic areas

# Microbiological Sampling

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- **Product Sampling**
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# Product Sampling

Reasons for product sampling

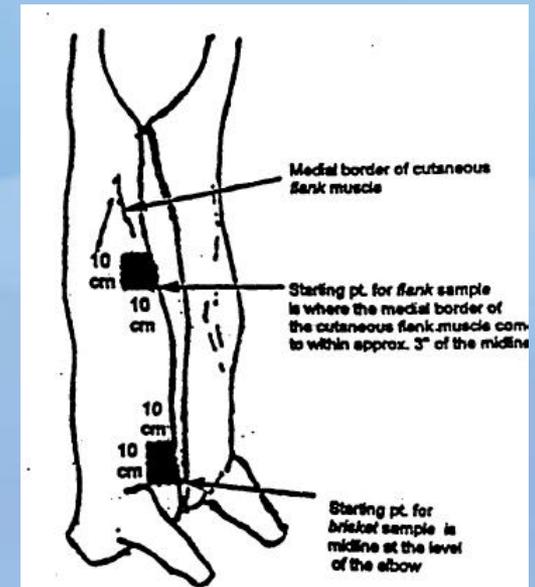
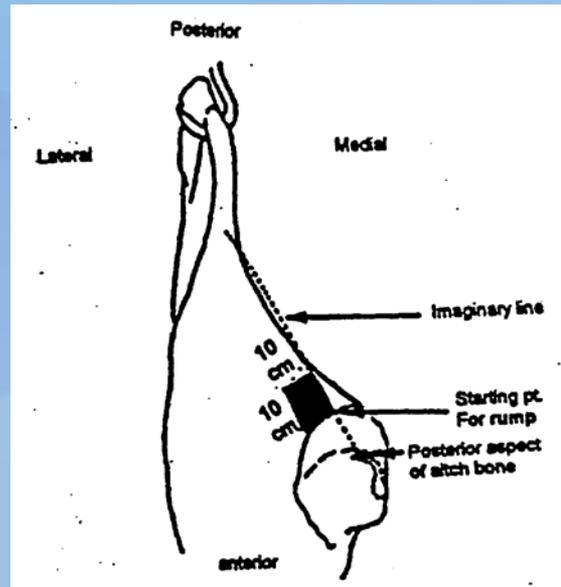
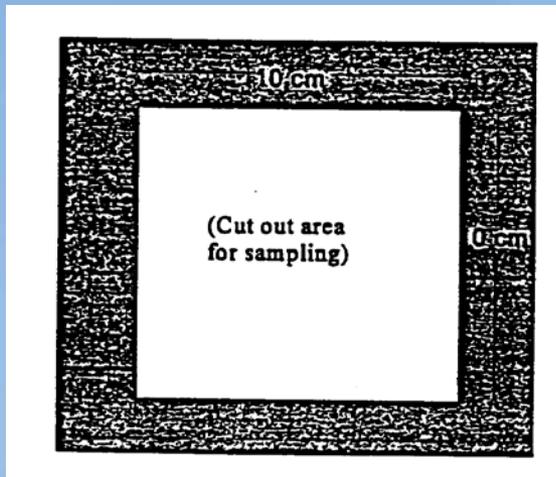
- Comply with government regulations
- Verification testing
- Incoming ingredient testing
- Problem solving



# Product Sampling

Carcass Sampling – Sponge technique for generic *E. coli*

[http://www.fsis.usda.gov/PDF/Guideline\\_for\\_Ecoli\\_Testing\\_Cattle\\_Swine\\_Establishment.pdf](http://www.fsis.usda.gov/PDF/Guideline_for_Ecoli_Testing_Cattle_Swine_Establishment.pdf)



# Product Sampling

Trim samples for *E. coli* O157:H7 (or STEC).

- Define product lot before beginning
- Each supplier tested separately
- Excise 60 'thin' slices from exterior surface of product (12 each for 5 combo bins)
- Product is composited to obtain 325 to 375 gram sample (each slice must contribute ~6.25 grams)
- N60 sampling provides 95% confidence of detecting contamination if 5% of slices within the lot were contaminated



# Product Testing for Listeria

## Product Testing for Verification

- Consider testing a limited number each month as verification
- Frequency will depend on processing procedures, amount produced, establishment history, etc.

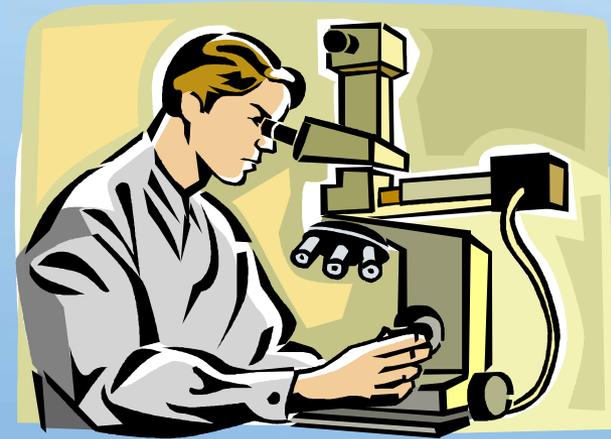
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# Using a Contract Laboratory

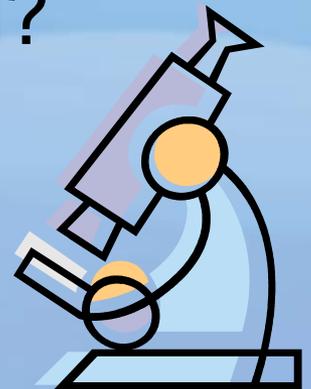
Consider establishing a relationship with a contract laboratory for:

- Pathogen analysis
- Non-routine testing
- Emergency back-up
- Surge
- In-depth analysis, such as identification
- Second opinion
- Independent and “official” tests for COAs, regulatory, customer, etc.



# Using a Contract Laboratory

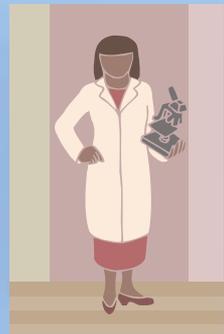
- Do they possess the knowledge and skill?
- Are they certified?
- What is the price?
- What is the turn-around time?
- How will the samples be delivered?



# Using a Contract Laboratory

## Get to know your laboratory service provider

- Do they specialize in food and have they worked on the type of products you want tested?
- What methodologies will they use?
- What are further capabilities (identification, chemical, etc.)?
- Do you expect trending, interpretation, and/or early alert?
- Who will be reporting your results to you? Are they knowledgeable? Will they be responsive?
- Regulatory assistance



# Using a Contract Laboratory

Get to know your laboratory service provider

- Laboratory size and location
- Quality and Certification
  - ISO / IEC 17025: assesses the managerial and technical competence of testing laboratories, and assures the "precision, accuracy and repeatability" of analytical results
  - A2LA or other certification
  - Internal Quality Systems
  - Proficiency or Check Sample Programs



# Using a Contract Laboratory

## Get to know your laboratory service provider

- Discuss methodologies, skills, etc.
- Discuss delivery options
- Negotiate price (total cost)
- Send test samples
- Visit laboratory
- Compare to other contract laboratory service providers
- Review performance



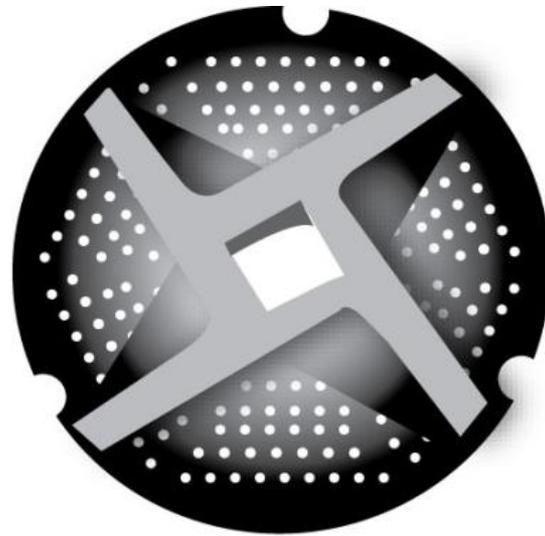
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Thank you!



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