

Verifying your sanitation program – environmental monitoring

Linda J. Harris, Ph.D.
Specialist in Cooperative Extension
Food Science and Technology
University of CA, Davis
ljharris@ucdavis.edu

Visalia, CA January 27, 2015

2014 Nut Butter Outbreak - Identification in Reverse

- Routine inspection of facility
 - January
 - Isolates *Salmonella* Braenderup
 - PFGE fingerprinting
 - Whole genome sequencing
- Search PulseNet for cases
 - January (2), February, March, April, May
- Epidemiology
- Re-inspection, re-isolation
 - Salmonella* Braenderup
 - 6 months product recall**

<http://www.cdc.gov/salmonella/braenderup-08-14/>

Published 2000

PUBLICATION 8015

Guidelines for Controlling *Listeria monocytogenes* in Small- to Medium-Scale Packing and Fresh-Cut Operations

TREVOR SUSLOW, Extension Specialist, University of California, Davis; and LINDA HARRIS, Extension Specialist UC Davis. The assistance of Shantana George is gratefully acknowledged.

Recent outbreaks of the bacterial pathogen *Listeria monocytogenes* have drawn attention to the severity of listeriosis in humans, and to the risk of *L. monocytogenes* contamination in all foods. The risk is highest in refrigerated and ready-to-eat

<http://anrcatalog.ucdavis.edu/pdf/8015.pdf>

Guidance Resources: RAC's, Fresh-cut, Dry Facilities

Guidance on Environmental Monitoring and Control of *Listeria* for the Fresh Produce Industry

pathogen environmental monitoring program (PEM)

Developed by the United Fresh Food Safety & Technology Council
2013

<http://www2.unitedfresh.org/forms/store/ProductFormPublic/>

<http://www.almonds.com/processors/processing-safe-product#pem>

Environmental monitoring Builds on Existing GMP and Sanitation Programs

Zoning Controls

Preventive Maintenance

GMPs

Sanitation Control(s)

Employee Hygiene Training

Environmental Monitoring

- A verification step**
 - Verify** that you are following the procedures you developed ('**compliance**')
 - Verify** that the plan is working in practice.

Verification activities include

- **Review** of
 - written policies and procedures
 - quality systems audits, GMP self-audits, etc.
 - records that support the GMP programs
 - E.g., sanitation and training records
- **Observation** of
 - cleaning and sanitation, sanitary conditions,
 - GMP compliance, etc.

2-15 7

Zone Concept for Setting Master Schedule Cleaning and Sanitation & Environmental Monitoring Programs

Zone 1
Product Contact Surfaces
(Slicers, peelers, fillers, hoppers, screens, conveyor belts, air blowers, employee hands, knives, racks, work tables)

Zone 2
Non-Product (Near) Contact Surfaces
(Exterior, under, & framework of equipment; refrigeration units, equipment housing; switches)

Zone 3
Other Areas within Finished Product (RTE) Room
(Air return covers, phones; hand trucks, forklifts, drains, wheels)

Zone 4
Area Outside of RTE Room
(Locker rooms, cafeteria, hallways, loading dock, maintenance areas)

2-15 8

Zone 1

- *Direct or indirect* product contact surfaces
- **Direct**
 - surfaces exposed to product during equipment operation
 - conveyor belts, brushes, rollers
 - ladders, hoses, tools, etc. used by workers who also handle product or touch product contact surfaces

2-15 9

Zone 1

- **Indirect**
 - surfaces from which liquids or dust or other material may drain, drop, diffuse, or be drawn into the product or into the container, and surfaces that touch product contact surfaces or the product container (ABC PEM manual)
 - Not universal agreement on which surfaces classify as indirect
 - A sanitation survey can be used to identify and reduce the number of indirect contact points in a facility

2-15 10

Zone 1

- **Routine Tests**
 - Visual Inspection – is it clean?
 - Adenosine triphosphate (ATP) testing
 - Indicator organisms
 - aerobic plate count, coliform count

2-15 11

Environmental Testing

- How often is it recommended to swab food contact surfaces for APC...once week...once a month, etc.?

Develop a Master Swab Plan

Frequency of testing: Routine sampling may be performed weekly, monthly or quarterly depending on the amount of product produced, risk and facility history. There is no "right" answer as to frequency and number of swabs.

2-15 12

Zone 1

- **Special circumstances only**
 - Environmental Pathogens
 - *Listeria spp.*, *Listeria monocytogenes*, *Salmonella*

2-15 13

Environmental pathogen

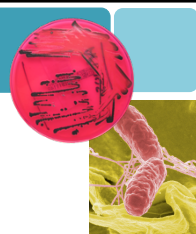
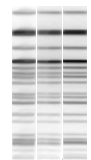
- means a pathogen capable of surviving and persisting within the manufacturing, processing, packing, or holding environment such that food may be contaminated and may result in foodborne illness if that food is consumed without treatment to significantly minimize the environmental pathogen.

2-15 14

Proposed preventive controls rule, 2014

Dry processes

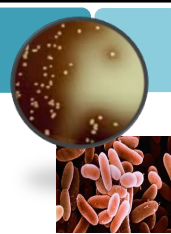
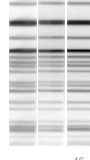
- Pathogen:
 - *Salmonella*
- Example indicator organism
 - *Enterobacteriaceae*
- Infant formula
 - Pathogen: *Cronobacter sakazakii* (formerly *Enterobacter sakazakii*)

2-15 15

Wet processes

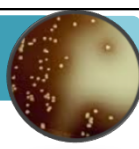
- Pathogen
 - *Listeria monocytogenes*
- Example indicator organism
 - *Listeria spp.*
- NOTE: Positive for *Listeria spp.* on food contact surface may be considered equivalent to finding *L. monocytogenes*

2-15 16

Testing for *Listeria spp.*

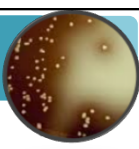
- Zone 4
 - Removed from processing
 - Warehouses, bathrooms, maintenance areas, loading docks, offices, entrance
- Why?
 - Confirmation that tests for *Listeria spp.* are working
 - May reveal ingress points



2-15 17

Testing for *Listeria spp.*



- Zone 3
 - Surfaces further removed from product contact
 - Walls, walkways, phones, carts, air handling units, drains
- Why?
 - These areas provide niches and harborages
 - Can accumulate moisture and nutrients
- Zone 3 contamination can move to Zones 2 and 1
 - Workers, air, water (often during cleaning)



2-15 18

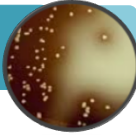
Testing for *Listeria* spp.

- What is the recommended frequency for swabbing drains for *Listeria* spp. in a fruit packing house?

2-15 19
See United Fresh guidance document for discussion

Testing for *Listeria* spp.



- Zone 2
 - Immediately next to food contact surfaces
 - Outside and under food contact surfaces
 - Exterior, under, & framework of equipment; refrigeration units, equipment housing; switches
- Why?
 - More likely than Zone 3 to collect moisture and nutrients, shorter distance to transfer bacteria to food contact surfaces.

2-15 20

Testing for *Listeria* spp.



- Zone 1
 - Food contact surfaces
 - Hoppers, conveyor belts, brushes, employee hands, racks, work tables
- *Listeria* spp. testing NOT USUALLY DONE
 - A positive on this surface may be considered **indicative of product contamination**
- If/When?
 - Between production lots, **when affected product can be held** until results are know.
 - During in depth investigations

2-15 21

Where to look? “Be the *Listeria*”









2-15 22

Pathogen Accumulation

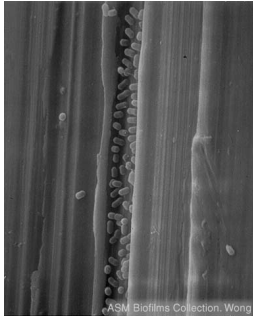
- Microbes may survive, especially on surfaces that remain wet (brush/sponge rolls; floors)
- Contact of plant material with surfaces:
 - waxes and plant sap accumulate
- Partially decayed plant material:
 - sticks to surfaces
 - is loaded with microbes
- Use of dump tanks
 - Pathogens can accumulate during packing



2-15 23

Bacteria Can Hide

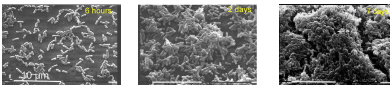
- Even though a surface may appear smooth, there are many places for bacteria to hide!
- This is polished stainless steel.



2-15 24
<http://www.asmsa.org/edusr/biofilms/hires/044h.jpg>

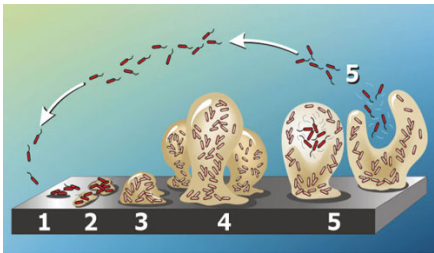
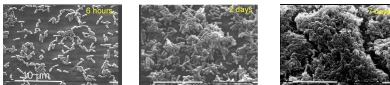
Listeria form biofilms

- Biofilms can be found everywhere
- Collections of microscopic organisms which have attached themselves to a surface (and each other) in the interests of survival.
- Characterized by a sticky adhesive substance.
 - Provides protection
 - Serves as attractant



2-15 25

The Making of A Biofilm

2-15 26

What about a positive finding?

- You **MUST** have a written corrective action.
- Transient
 - Not found in repeated testing
- Resident
 - Repeatedly found
- Examine the site, implement appropriate cleaning/sanitation
 - Retest the site and surrounding area
 - Increase routine testing in and around area until several negative results
- If resident *Listeria* spp. is suspected
 - Form a team
 - Investigate potential cause, implement corrective action, retest
- Document all activities

2-15 27

Special Events

- Enhanced environmental monitoring should be considered when:
 - Construction
 - New equipment installation
 - Major repairs
 - Breaks in operation

2-15 28

Indicator and Pathogen Testing

- Results
 - Understand the limitations.
 - Define Critical Limits **in Writing**
 - What is unacceptable?
 - Define Corrective Action **in Writing**
 - Action for unacceptable result?
 - Written** data disposition **policy**.

2-15 29

Indicator and Pathogen Testing

- Data processing
 - Keep good records
 - Evaluation of trends
 - Recognizing site-specific deviations
 - Recognizing equipment or practice-specific risks
- Further characterization of isolates
 - Listeria* spp. to *L. monocytogenes* to fingerprints

2-15 30

Summary

- **Environmental monitoring**
 - Is a verification activity that can be used to assess the efficacy of GMPs and a sanitation program
 - For zone 1 surfaces assessing for indicators of reduced organic or microbial load (e.g., ATP, APC) is common
 - For zone 2 to 4 surfaces assessing for a pathogen or pathogen indicator (e.g., *Listeria* spp.) may be appropriate
- **Written**
 - Environmental monitoring plan and corrective actions
 - Documentation is critical

2-15

31