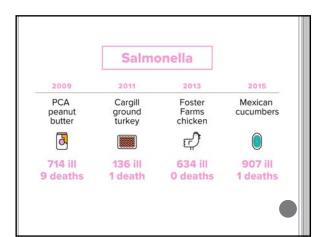


SALMONELLA



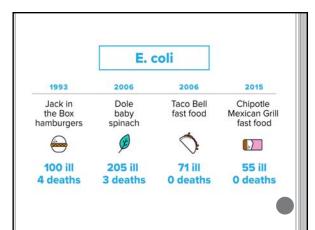
- · Gram negative rod, motile
- Can survive well in both food and on environmental surfaces.
- Survives in dry environments and under refrigeration.
- The heat resistance can go up in a dry environment
- Source: intestinal tract, fecal material
- Hillfarm Dairy, Con Agra peanut butter, Wright Egg



E. COLI



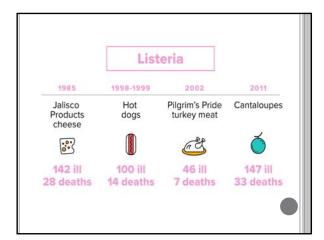
- Both an indicator organism and a potential pathogen, although many do not cause illness.
- Part of the normal flora of the intestinal tract of humans and animals.
- Five main types of E. coli, the most infamous of which is Enterohemorrhagic E. coli (EHEC) – of which 0157:H7 is a member.
- This was what caused the Jack in the Box outbreak in 1993 which resulted in several deaths.



LISTERIA



- Gram positive, motile
- Listeria monocytogenes is the Listeria organism of concern and is the one that can cause disease in humans. Listeria ivanovii can cause disease in animals.
- Although other Listeria species do not cause illness they are still of extreme concern. If one exists in a niche then so can L. monocytogenes and they can exist side by side.



WHY SUCH A FOCUS ON LISTERIA

- In the U.S., the estimated total annual cost of listeriosis including medical cost is \$2.6 billion. Making it the second most costly foodborne illness with one of the highest mortality rates.
- We become infected with Listeria monocytogenes by eating contaminated food!
- And it is our jobs to make sure we have a safe product for the consumer to eat!!



Brief History of L. monocytogenes

- Isolated in 1911 and 1926 in livers of sick rabbits under different names
- $\bullet\,$ Officially named Listeria monocytogenes in 1940.
- 1929 first confirmed cases of listeriosis in people.
- Since 1980 there have been numerous severe large
- The largest ever detected Listeria outbreak just occurred in South Africa – 1,060 lab confirmed cases and 216 deaths.

Listeriosis in Humans

- Human listeriosis occurs in two forms
 - · Self-limiting gastrointestinal illness
 - · Invasive listeriosis which is life threatening
- Invasive listeriosis occurs most in pregnant women, newborns, the elderly and people with weakened immune systems.
 - Pregnant women are 18 times more likely to get listeriosis than healthy adults

Contamination Sources

- Widespread in environment
 - · Soil, water, sewage, decaying vegetation
- · Isolated from various sources
 - Humans
 - · Domestic animals
 - · Raw agricultural commodities
 - Food processing environment (cool, damp)
- Can multiply slowly at refrigerated temperatures challenging refrigeration as a defense against foodborne pathogens

Foods that can be contaminated

- Raw meat
- Ready-to-eat processed meats
- Raw and bagged vegetables and salads
- Ready-to-eat smoked and raw seafood
- Prepared salads and fruit salad
- Melons
- Soft cheeses, shredded bagged cheeses
- Unpasteurized milk and milk products



Why is Listeria difficult to control

- Widespread in the environment, especially soil and water
- Survive and grow at refrigeration temperatures
- Tolerates both acidic and salty conditions
- Survives frozen storage
- Relatively resistant to nitrite
- Readily adheres to surfaces creating biofilms

Controlling Listeria

- Application of good manufacturing practices
 - Controls on ingredients
 - Listericidal and listeristatic processes
 - Segregation of cooked and uncooked foods
 - Sanitation
- Sanitation controls include effective environmental monitoring programs
 - Identify and eliminate $L.\ monocytogenes$ in and on surfaces and areas in the plant

Potential Sources

- · Raw products and ingredients
- · Solutions to chill foods (ex: brine solutions)
- Loose product
- Rework
- $\bullet \ \ Returned \ product$

Potential Sources

Contact surfaces for RF-RTE foods

- Fibrous and porous conveyor belts
- Filling and packaging equipment
- Belts, peelers, and collators
- · Containers, bins, tubs, and baskets
- · Slicers, dicers, shredders, and blenders
- Utensils
- Gloves



Potential Sources

Surfaces that do not contact foods

- · In-floor washing equipment
- Cracked hoses
- · Hollow rollers for conveyors
- Wet, rusting, or hollow framework
- · Open bearings within equipment
- Poorly maintained compressed air filters
- Condensate drip pans
- Motor housings



Potential Sources

Surfaces that do not contact RF-RTE foods

- Maintenance tools (wrenches, screwdrivers)
- Forklifts, hand trucks, trolleys, and racks
- $\bullet \quad \text{On/off switches, J-Box, Control Panels} \\$
- Vacuum cleaners and floor scrubbers
- Trash cans and other ancillary items
- Cleaning tools (brushes, scouring pads)
- Spiral freezers/blast freezers
- · Compressed air
- Ice makers
- Aprons



Potential Sources



Plant Environment

- Floors, walls, and drains
- · Ceilings, overhead structures, and catwalks
- Wash areas (sinks), condensate, standing water
- Wet insulation in walls or around pipes and cooling units
- · Rubber seals around doors, especially in coolers
- · Contents of vacuum systems

LOCATION OF LISTERIA IN DAIRY PROCESSING PLANTS FROM USDA STUDY

Area/location	%
Drains	38
Conveyors	36
Floors, pooled liquid	18
Packaging equipment	5

Contamination Scenarios

- Increased production causes a wet cleaning of lines in the same room where production lines are still running.
- Equipment parts, tubs, screens, etc are cleaned on the floor.
- Waste bins are not properly maintained or cleaned.
- Personnel contaminate foods or food contact surfaces.
- Re-circulating pumps and lines are not cleaned.

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Contamination Scenarios

- Indiscriminate use of high-pressure hoses in cleaning.
- · A drain backs up.
- An equipment breakdown occurs.
- Inappropriate use of footbaths in dry processing areas
- Water is sprayed on wheels on transport cars when in-process product is stored near the wheels.

Contamination Scenarios

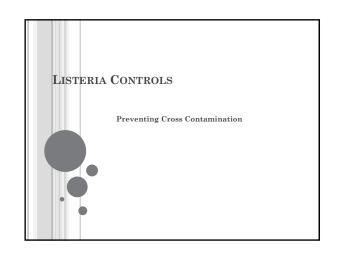
- A packaging line is moved or modified significantly.
- Used equipment is brought from storage or another plant and installed into the process flow.
- Construction or major modifications are made to an area where RTE foods are processed or exposed.
- A new employee has been hired to work in an area where RTE foods are processed.

Contamination Scenarios

- Periods of heavy production make it difficult to clean floors of holding coolers as scheduled.
- Product is caught or hung-on on equipment.
- Raw or under-processed foods are placed in an area designated for cooked foods.
- Frequent product changes on a packaging line.
- Personnel are used interchangeably for processing and non-processing areas
- Heat exchangers have become compromised.

Contamination Threats TRASH CANS & INEDIBLE CONTAINERS How many times a day do they travel between trash docks and production areas? How and how often are they cleaned?





Contamination Threats

What is Cross Contamination?

- Cross contamination occurs when bacteria, like Listeria are moved from one object or place to another.
- It is your job to prevent cross contamination if you work in areas where "ready-to-eat" finished products are handled!



HOW IS LISTERIA TRANSFERRED IN THE PLANT?

- · By people with dirty hands, clothing etc.
- · By dirty utensils such as scrapers
- · By dirty totes or other containers
- By dirty processing equipment
- By dirty carts or racks used to move products around the plant
- · By splashing or dripping water
- Any surface that hasn't just been cleaned and sanitized should be considered "dirty"

PREVENTING CROSS CONTAMINATION

- Making sure all equipment is clean before you use it
- Keeping your work area clean
- Not bringing personal items into work area
- Never putting finished product back onto a packing line if it dropped onto the floor or touched something dirty



PREVENTING CROSS CONTAMINATION



- People can carry Listeria on their hands, gloves, aprons, clothing, and shoes.
- Listeria can get onto equipment, containers, and racks or carts and their wheels.





PREVENTING CROSS CONTAMINATION

- Cleaning & sanitizing equipment, carts, or containers before you move them from one area to another.
- Cleaning up puddles & standing water that could splash onto equipment.





Preventing Cross Contamination

CLEANING AND SANITIZING

- Proper cleaning and sanitizing is necessary to kill harmful bacteria that could contaminate your company's products.
- All food packaging and products must be removed, before cleaning starts.





Preventing Cross Contamination

YOU PREVENT CROSS CONTAMINATION BY FOLLOWING PROCEDURES FOR:

- · Routine cleaning of your work area during the day.
- Final cleanup of your work area at the end of the shift.





Preventing Cross Contamination Gloves

- Employees wash hands before putting on gloves
- Multi-use gloves be washed and sanitized before use and after the employee touches any non-food-contact
- · Single use gloves be discarded and replaced after the employee touches any non-food-contact surface – especially floors or drains
- · Gloves worn outside of RF-RTE areas be discarded before returning

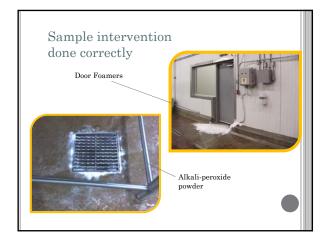


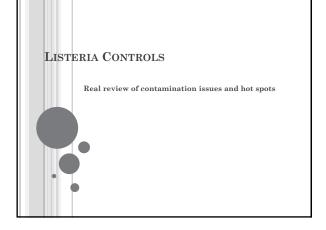


Preventing Cross Contamination Footbaths

- · Footbath is a low flat container or watertight recess in the floor filled with sanitizer
- · Ensure employees can not avoid the footbath
- Check regularly to ensure properly diluted
- · Recommend using dry product in dry processing environments
 - · Absence of water prevents growth
 - · Use dry powdered sanitizer on floors







RECAP PRIMARY SOURCES FOR CONTAMINATION

- Facility
- Processing Equipment
- · Raw ingredients
- People
- ${\ }^{{\ }}$ Things that come in and out of processing areas

RECAP

POTENTIAL SOURCES FOR CONTAMINATION

- Floors & Walls
 - Cracks
 - · Standing water/milk
- · Air flow systems
- \cdot Cooler
- · Conveyor systems
- · Case handling equipment
- · Soiled solutions used to chill food
- · Common areas



CASE STUDY Positive Listeria tests on High Speed Slicer

- High speed slicer in large deli operation tested positive for Listeria.
- · Slicer was taken off the floor and thoroughly cleaned. Tested negative and returned to service.
- · Machine again tested positive. Removed from floor and disassembled. Listeria found in oil reservoir.
- · Machine was cleaned and "cooked" in oven over weekend to kill Listeria. Returned to service and tested positive again in a couple of weeks.



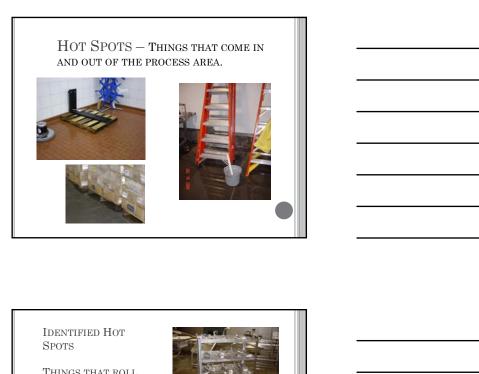
CASE STUDY POSITIVE LISTERIA TESTS ON HIGH SPEED SLICER

- · Slicer again removed from production for cleaning and "cooking".
- This time Listeria is discovered in a refrigeration unit directly above the slicers' normal location on the floor.
- All the refrigeration units were cleaned on the production
- A Master Sanitation Schedule was established with a biocide used in the catch pans.
- This deli operation and the slicer has stayed negative for Listeria



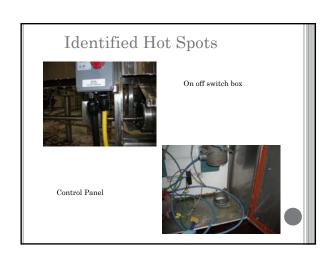


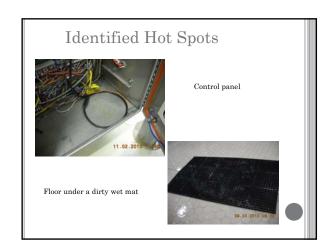
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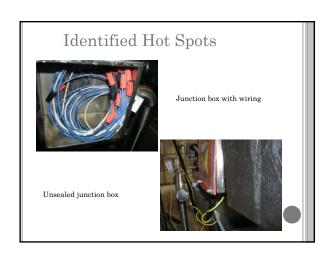






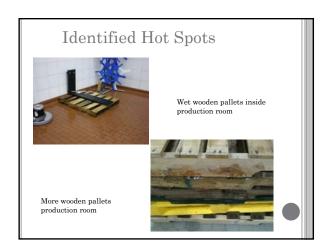














LISTERIA CONTROLS Hotspot Remediation and Follow Up Immediate Action, Ongoing Follow Up, and Long term handling Form a Zero tolerance team program

ZERO TOLERANCE

- Knowing the location of potential sources of contamination is very important to producing a safe product.
- Virtually all outbreaks and product recalls are due to post-processing (pasteurization, heat treatment) contamination.
- After heat treatment manufacturing a safe product depends on proper sanitation and limited handling as well as elimination of crosscontamination in the processing areas.

Zero Tolerance Team Program

- The environmental sampling program is critical to preventing and controlling Listeria.
- The goal of the program is to find the microorganism if it is in your plant.
- However ongoing monitoring is useless unless you fix the problem once identified.
- Your environmental control program must include corrective actions.
- Corrective actions must identify and control the source of the contamination and prevent future contamination.

Zero Tolerance Team Program

Suggest at a minimum members from QC, Sanitation, Production and Maintenance

- Conduct weekly environmental meeting
- Develop remediation program to ensure hot spots are cleaned, sanitized, and retested until cleared.
- $\boldsymbol{\cdot}$ Include hot spots in all SSOPs and training.
- Explore engineering solutions to hot spots to provide more "permanent" elimination of harborages.
- Explore possible sanitation program changes that would support Zero Tolerance

Thank you!

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