

Risk in Fruit & Veg processing

EMP focus

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Agenda

- ▶ **Managing risk in food.**
- ▶ **Risk within fruit & vegetable category.**
- ▶ **What do we need to consider with EMP?**
- ▶ **What is a comprehensive program?**

How do we control microbe risk in food?

▶ Product Management

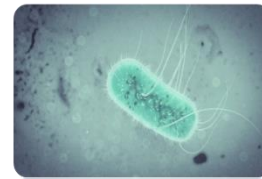
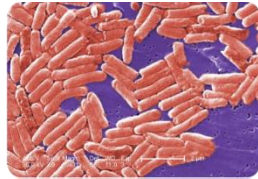
- ▶ GMPs/GAPs/Supplier management
- ▶ HACCP/HARPC
- ▶ Water activity, pH
- ▶ Cooking/Freezing
- ▶ Pasteurization (“kill steps”)

▶ Facility & processing risks

- ▶ Sanitation
- ▶ Equipment design
- ▶ Process design

Common organisms of concern

- ▶ *Salmonella*
- ▶ *E.coli* O157:H7
- ▶ STEC
- ▶ *Listeria*
- ▶ *Cyclospora*
- ▶ Spoilage organisms
- ▶ Hepatitis A & other viruses



Fruit & Veg Risk

Food safety for fruit & vegetables is dynamic

- ▶ Variable supply chains
- ▶ Seasonal quality issues
- ▶ Short-shelf life
- ▶ Adjacent land use changes
- ▶ Animal intrusion
- ▶ Lack of kill-step...

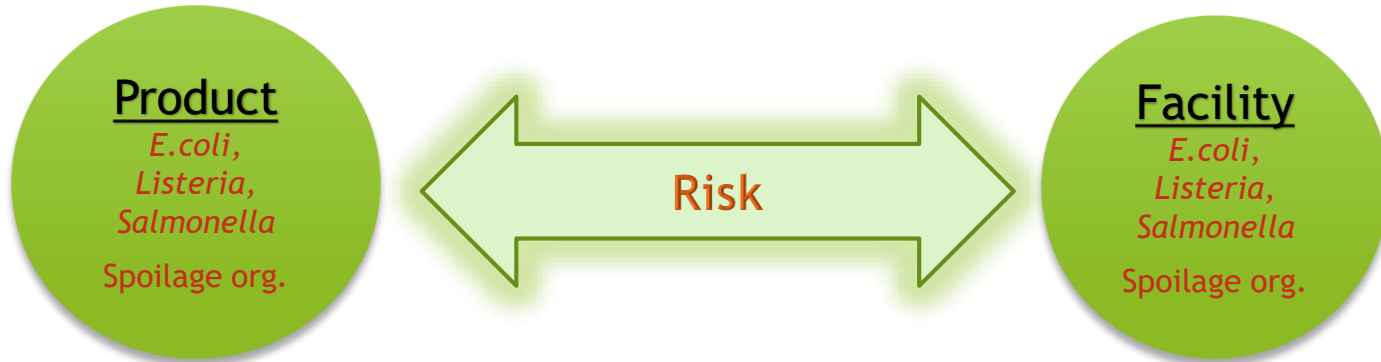


Fruit & Vegetable Risk

Managing a “certain level of risk”

- ▶ Risk from product
- ▶ Risk from process
- ▶ Key is to minimize or keep stable the “normal” risk

Product – Facility Relationship



Product & Facility Risk

- ▶ Agricultural items can be facility risk.
- ▶ Facilities can be a risk to agricultural items

Environmental Monitoring



Environmental Monitoring

- ▶ EMPs are surveillance activities
- ▶ Focus on “finding risk” using tools
- ▶ Identify trends & areas of risk (zones)

A concept of “tools”



- A scale will tell you your weight
- A scale will not make you gain or lose weight
- Some scales are more accurate than other scales
- Weight changes during the day.
When to use the scale?

EMP Testing

- ▶ Testing is a means of verification
- ▶ Testing can identify a risk, but it alone does not change a risk.
- ▶ Your actions following a result ultimately impact a risk.
- ▶ No tool is perfect - the key is to identify the best tool

Where to monitor?

- ▶ Zone 1 - The area in the plant where there are direct product contact surfaces immediately after a microbial reduction step and before packaging
- ▶ Zone 2 - This zone comprises non-product contact areas that are adjacent to product contact surfaces
- ▶ Zone 3 - Non-product contact areas within the processing area that are removed or far away from product contact surfaces but could result in cross-contamination
- ▶ Zone 4 - The farthest from the production area, this zone includes all non-product contact surfaces outside the processing room

What to monitor?

▶ Pathogen

- ▶ *Listeria monocytogenes*
- ▶ *Salmonella*
- ▶ Pathogenic *E.coli*

▶ Indicators

- ▶ *Listeria species*
- ▶ Generic *E.coli*
- ▶ Coliform
- ▶ *Enterobacteriaceae*

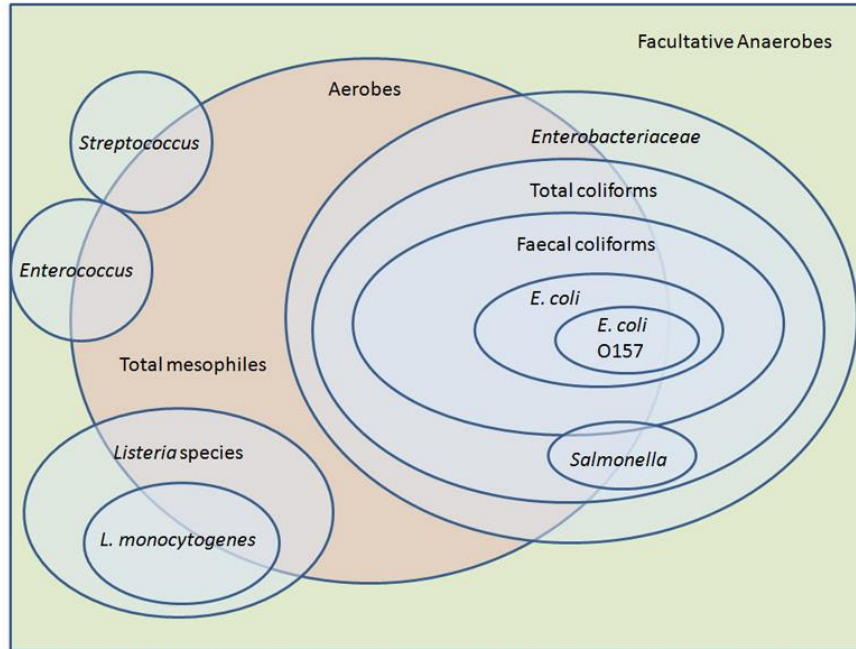


Figure 1 The relationships between commonly-encountered bacterial indicators and selected human pathogens

How to monitor?

- ▶ Common types of “tools”
 - ▶ PCR based tests
 - ▶ Immunoassays
 - ▶ rRNA based methods
 - ▶ ATP based assays
 - ▶ Petri dish/Petrifilm

Fit for Purpose

Time

Sensitivity (false negative)

Specificity (false positive)

Cost

Info Needs

Facility Risk Management

What does manage your risk?

- ▶ Sanitation programs
- ▶ GMPs
- ▶ Movement control
- ▶ Supplier management
- ▶ GAPs, etc.



Testing SHOWs risk but doesn't manage it.

Packing shed EMP example

Citrus Pack Sheds (10 facilities swabbed during 2016-2018)

- ▶ Zones 2,3 - 1,475 swabs
- ▶ 31% PCR positive for Listeria
- ▶ 30 % culture positives
- ▶ Seasonal influence
- ▶ Cleaning & sanitation programs, in general, were found inadequate

Principal Investigator
Trevor Suslow
University of California, Davis

https://www.centerforproducesafety.org/amass/documents/researchproject/408/CPS%20Final%20Report%20-%20Suslow%20%28Zone%201%29_January%202019.pdf

Risk in Fruit & Veg Facility

- ▶ Drains, wash flumes, belts, peelers/grinders
- ▶ Hygienic zones/design
 - ▶ Product storage, staging & traffic patterns
 - ▶ Minimize hollow equipment - design to minimize water collection
- ▶ Cooling & condensation tunnels, forced air, ice machines, blanchers



Facility Risk – Processing areas

- ▶ Air flow & heat/cold air units
 - ▶ Contaminated air units
 - ▶ Fans

- ▶ Temperature/Condensation zones
 - ▶ Seasonal changes/risks
 - ▶ Moisture
 - ▶ Drip pans/ice buildup

Data Trending & Reporting

- Identify trends (e.g. sanitation cycle, weather)
- Visual aids using floorplans/heat maps

Time Period

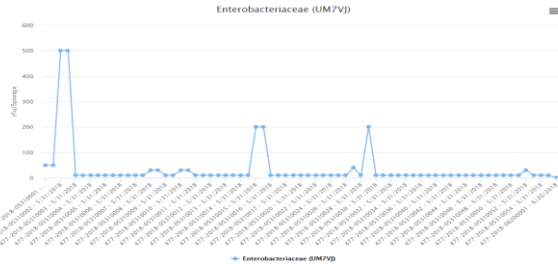
Current Year

- 1 Door Handle
- 2 Drain
- 3 Front of Eyewash
- 4 Front of Tank
- 5 Pressure Tank
- 6 Underneath Tank
- 7 Pressure Tank Opening
- 8 Holding Rail
- 9 Railing Handle
- 10 Inside Dust Collector
- 11 On/Off Buttons
- 12 Scale Surface
- 13 Shelving
- 14 Staircase
- 15 Top of Black Handle
- 16 Inside Part Washing Tub
- 17 Table Surface
- 18 Toolboard
- 19 Tank Opening



Download as PNG

Environmental swabs
Back To Categories
Enterobacteriaceae (UM7V)
Salmonella (UM9IK)
Listeria Species (UM9GT)
Salmonella (UMAZ1)
Salmonella (UMC9H)
Total Aerobic Microbial Count (UM1VZ)
Moulds (UM9CL)
Yeast (UM9GL)
Yeast & Moulds (UM9GL)
Coliforms (UM9BO)



Make your data work for you:

Site #	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Overall + % by Site
1	-	-	-	-	-	-	-	-	-	-	0%
2	-	-	+	-	-	-	-	-	-	-	10%
3	+	+	+	+	+	+	+	+	+	-	90%
4	-	-	-	-	-	-	-	-	-	-	0%
5	-	-	-	-	-	-	-	-	-	-	0%
6	-	+	+	+	-	-	-	-	-	-	30%
7	-	-	-	-	-	-	-	-	-	-	0%
8	-	-	-	-	-	-	-	-	-	-	0%
9	-	-	-	-	-	-	-	-	-	-	0%
10	+	+	+	-	-	-	-	-	-	-	30%
11	-	-	-	-	-	-	-	+	-	-	10%
12	-	+	+	-	-	-	-	-	-	-	20%
13	+	+	+	-	-	-	-	-	-	-	30%
14	-	-	-	-	-	-	-	-	-	-	0%
15	-	-	-	-	-	-	-	-	-	-	0%
Weekly + %	20%	33%	40%	13%	7%	7%	7%	7%	13%	0%	

Look for sites of high risk (% positive)

Look for seasonality of high risk (% positive)

Visitor or resident?

- ▶ **Transient organism**
 - ▶ Occasional finding of different organism
- ▶ **Resident organism**
 - ▶ Repeat findings of same organism
- ▶ **Typing & Whole Genome Sequencing**
 - ▶ 16S, PFGE, NGS
 - ▶ Resolution differences

EMP summary

- ▶ Testing surveils if our mitigations work
- ▶ Activity vs. Value
 - ▶ Taking weekly samples doesn't mean you have a valuable program
 - ▶ Don't be afraid to change plans if “information” is not helpful
- ▶ Identify risks as they come, & prevent resident risks

EMP overview

- ▶ Snapshots in time
 - ▶ One test proves nothing, many tests show patterns
- ▶ Activity vs. Value
 - ▶ Build systems to validate, verify & communicate your programs
 - ▶ Drive effective management decisions based on data, not “feel”

Eurofins Online Results

Quality Results, In Real Time



View and Export

View results and make exports of results into Excel.



See Results in Real Time

Results update per test shortly after result validation.

Results

Views

<input type="checkbox"/>	Eurofins sample code	Client code	Sample description	Your order reference	Your sample code	Reception date
<input type="checkbox"/>	813-2018-10220002	A00298903YRG				10/22/2018
<input type="checkbox"/>	498-2018-11260001	A00298903YRG				11/26/2018
<input type="checkbox"/>	498-2018-10310022	A00298903YRG	test description			10/31/2018
<input type="checkbox"/>	473-2018-11110061	A00298903YRG	Test Sample, not real; Test Sample, not real		Test Sample, not real	11/11/2018
<input type="checkbox"/>	473-2018-11110060	A00298903YRG	Test Sample, not real		Test sample, not real	11/11/2018
<input type="checkbox"/>	473-2018-11060336	A00292663N6F	DO NOT TEST - DEPLOYMENT TEST	DEPLOYMENT PROCESS TEST DO NOT PROCESS IN LAB	DO NOT TEST - DEPLOYMENT TEST	11/6/2018

Sample details

[Return to results](#)

Eurofins sample code: 498-2018-11260001
Reception date: 11/26/2018
AccountSender: A00298903YRG: N.A. FOOD_Internal_EOL Demo Global Corporate
Received In Good Condition: Yes
Sample Is On Hold: Not On Hold
SubSampleCode: Micro
Sample status: Validated

Analytical reports history

Type	Document code or name	Date
Analytical report	AR-18-QP-062921-01	11/26/2018

Test code	Test	Fraction	Parameter	Test status	Value	Unit	Result severity
UMAEK	Salmonella /25 g AOAC 2003.09		Salmonella	Done	Not Detected	per 25 g	○

