Sometimes, Luck is with you….

Sometimes, It’s Not!!!!

Our Theme Today

- Poor decisions and inattention usually result in bad things happening. In between all of the good information, I will provide you with numerous examples.
- More often than not, you make your own luck.
- In order:
  - Study Overview
  - Methods
  - Study Participants (9 plants)
  - Superlatives focused on specific issues

- So, fasten your sealtbelts, it’s going to be a bumpy ride!!!!!

- Case in Point!!!!!!!!!!!!

McCue’s Maniacally Massive and Monumental Move

Enabling the implementation of effective environmental monitoring programs to control *Listeria* in small to medium sized dairy processing plants across New York State

For the first time in 108 years, Blue Bell announces a product recall.

One of our machines produced a limited amount of frozen snacks with a potential listeria problem.

When this was detected all products produced by this machine were withdrawn. Our Blue Bell team members recovered all involved products in stores and storage.

This withdrawal in no way includes our half gallons, quarts, pints, cups, three gallon ice cream or the majority of take-home frozen snack novelties.

For more information call 979-836-7977, Monday – Friday 8 a.m. – 5 p.m. CST or click here.

Problem: *Listeria monocytogenes* persistence in food processing environments

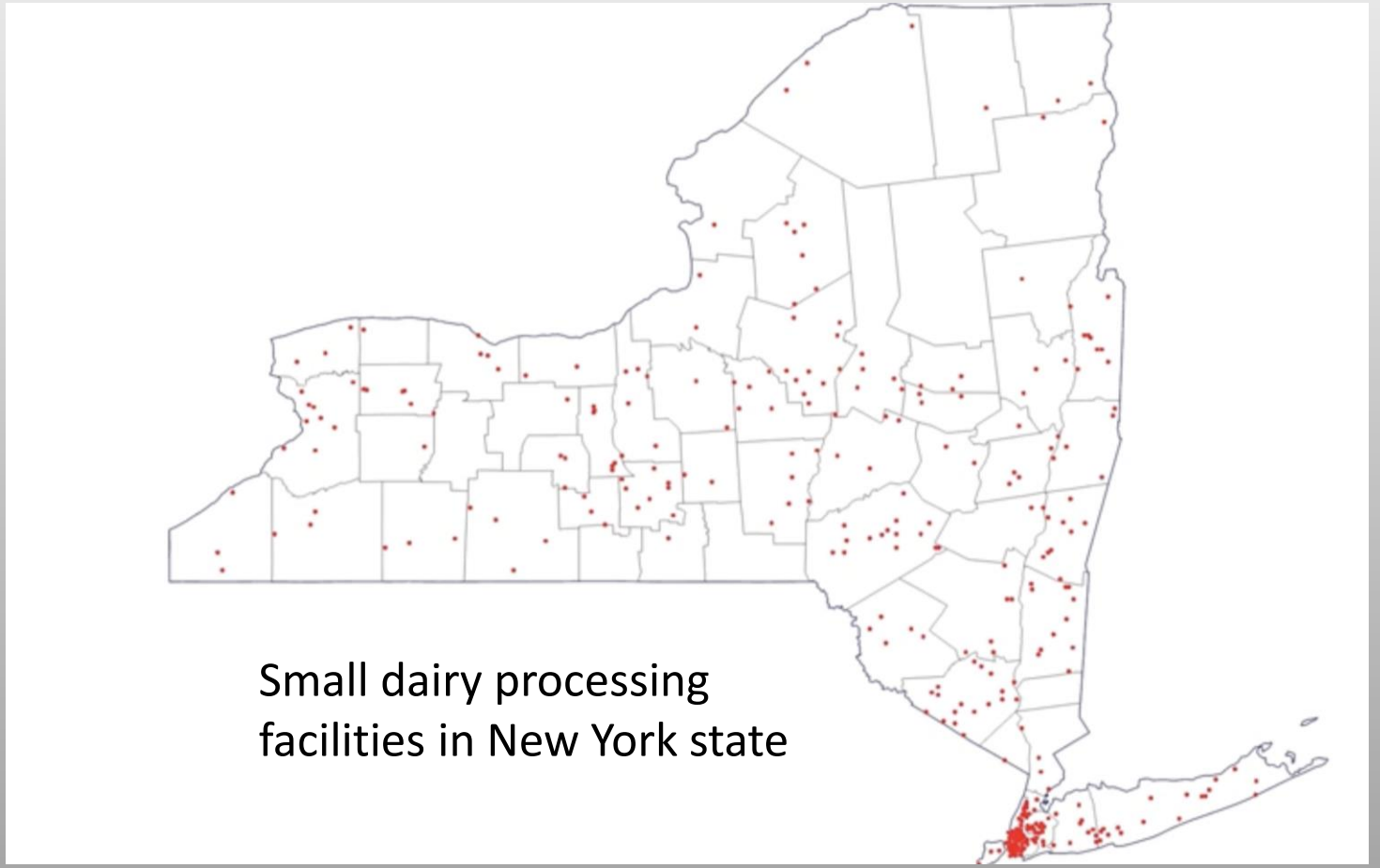
- *L. monocytogenes* present in the food processing environment can increase the risk of foodborne illness outbreaks associated with *L. monocytogenes*

https://www.chron.com/news/houston-texas/houston/article/Blue-Bell-had-condensation-problems-six-years-ago-6278480.php#photo-3125666

Challenges small dairy facilities face when controlling *Listeria* in the processing environment

- Fewer resources (e.g., time, money, personnel, etc.) to dedicate to "seeking" and "destroying" *Listeria*

- Less expertise regarding food safety procedures
  - Lack of knowledge regarding cleaning and sanitation procedures
  - Lack of understanding about the importance of certain food safety procedures



Small dairy processing facilities in New York state

What can happen when a facility fails to control *Listeria* in their processing environment: *L. monocytogenes* outbreak example (Big Olaf creamery, 2022)

Year	Food Product	Illnesses	Hospitalizations	Deaths
2021-2022	Ice cream	28	27	1

- Notable outbreak facts:
  - Seven illnesses were among pregnant people or newborns
    - One illness resulted in a pregnancy loss
  - Traceback sampling identified samples from both the processing environment (10) and finished ice cream products (20) that were positive for *L. monocytogenes*
    - At least one sample collected for 16 out of 17 ice cream flavors came back as positive for *L. monocytogenes* contamination

Vulto Creamery Listeria Outbreak "over" at 8 with 2 dead

By Denis Stearns on May 3, 2017

POSTED IN FOODBORNE ILLNESS OUTBREAKS

Case Count: Connecticut (1), Florida (1), New York (5) and Vermont (1)

CDC collaborated with public health and regulatory officials in several states and the U.S. Food and Drug Administration (FDA) to investigate a multistate outbreak of *Listeria monocytogenes* infections

FDA OBSERVATION 2

Failure to perform microbial testing where necessary to identify sanitation failures and possible food contamination.

Specifically, a review of your environmental sampling test records noted the following:

- You have conducted environmental sampling during 20 months from 7/28/2014 through 2/19/2017 . **Your records show** 54 out of 198 results positive for *Listeria* spp. taken from various locations throughout your manufacturing facility, which include, but are not limited to: floor drains in the manufacturing room, wash room and cheese aging room; outside of brine tanks in the walk-in cooler ; door handles to the cheese aging room, walk-in cooler and entry door; various areas of the floor in the cheese aging room; bottom of a squeegee in the cheese aging room; employee aprons; and wooden cheese rack dollies in the cheese aging room. The most recent positive finding being a swab taken from the floor in the manufacturing room on 2/19/2017 . You have not conducted an investigation to provide identification of the *Listeria* spp. to Genus and species and you have also failed to identify its source or point of entry/harborage in your facility.

FDA OBSERVATION 2 (cont.)

Failure to perform microbial testing where necessary to identify sanitation failures and possible food contamination.

- A total of 10 of the 54 positive results were found on food contact surfaces between 10/30/2014 and 4/28/2015. You did not conduct microbial testing of finished products to confirm that your finished products were not contaminated with the organism found by your environmental testing program . According to your sample records, the **food contact surface locations** were as follows :

o Wooden cheese aging board in cheese aging room; positive result from 10/30/2014.

o The cheese brush used to brush Ouleout and Miran da soft cheeses and two wooden cheese aging boards in cheese aging room; positive results from 12/3/2014 .

o The cheese brush used to brush Ouleout and Miran da soft cheeses and two wooden cheese aging boards in cheese aging room; positive results from 11/6/2015.

o Two cheese brushes used to brush the Andes and the Walton Umber hard cheeses; positive results from 2/3/2015.

o Two cheese brushes used to brush the Andes and the Walton Umber hard cheeses; positive results from 3/22/2015.

o A cheese brush (not specified to product); positive result from 4/28/2015.

- You did not continue sampling food contact surfaces after 4/28/2015 to determine if *Listeria* spp. was still present on these surfaces representing a continued contamination risk to your cheese products.

FDA Observation 3

- The procedure used for cleaning and sanitizing of equipment and utensils has not been shown to provide adequate cleaning and sanitizing treatment.
- Specifically, review of your environmental sampling results across 20 months from 7/28/2014 through 2/19/2017 showed positive results for *Listeria* species on several food contact and non-food contact surfaces in your facility. **Per your documented corrective actions, upon getting a positive result you re-cleaned and re-sanitized the affected areas using your routine cleaning and sanitizing operations.**
- **However**, when you re-sampled these locations a month or more later and tests showed repeated positive results, **you did not investigate the use of a more effective method of cleaning and sanitizing.**

Thompson’s Terrifying Trials and Tribulations Tempting Trouble at the Track

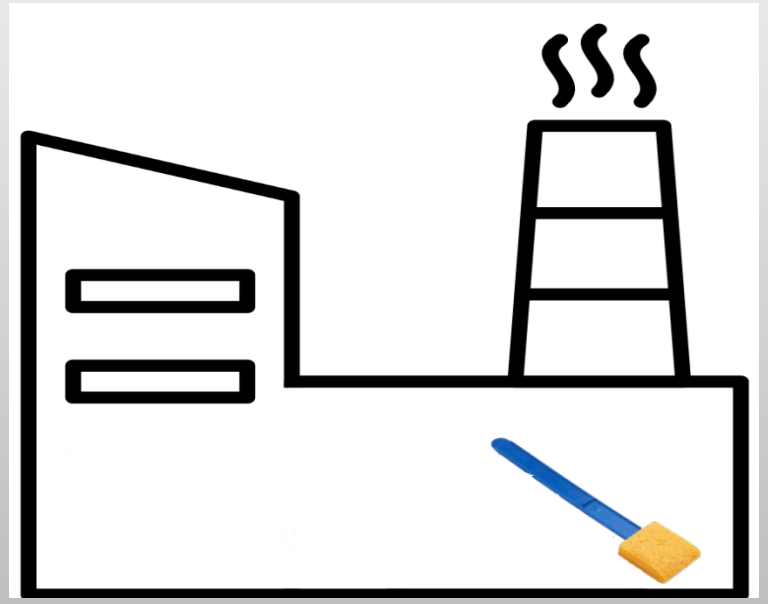
Objective: Implement and evaluate environmental monitoring programs in 9 small to medium sized dairy processing plants across New York State (3 fluid milk, 3 ice cream, 3 cheese)

Main information we wanted to gather from this study:

With the right tools (EMP SOP developed by Cornell) and support (Cornell Dairy Extension consulting) throughout the year:

1. Will *Listeria* prevalence decrease?
2. Even if *Listeria* prevalence doesn't decrease in the 1-year period of the study, are these plants in a position in which they can implement an effective EMP in the future after the study is over?

Project Timeline



Initial swabbing

- We selected 18-66 sites (Zones 2, 3, and 4) **in each plant** and swabbed them for *Listeria* to obtain a baseline prevalence in the facility at the start of the project

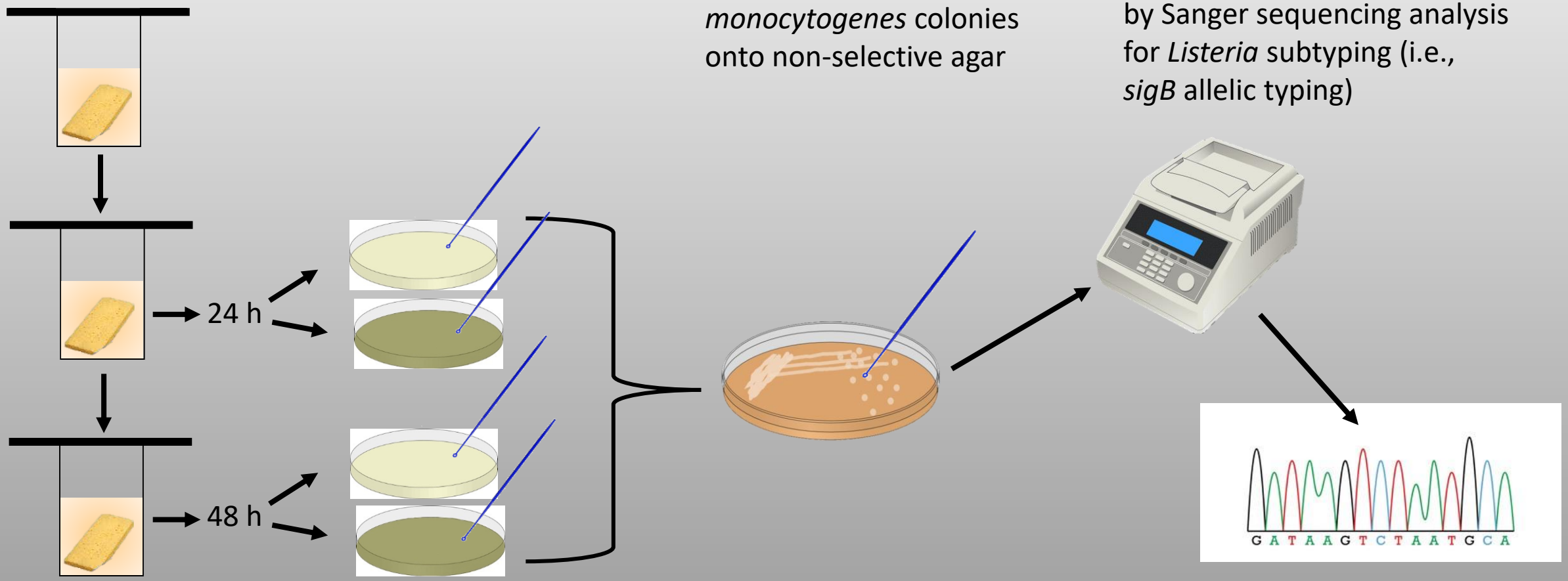
Detection of *Listeria* from environmental sponge samples

1. Enrich sponge

2. Streak enrichments onto *Listeria* selective agar

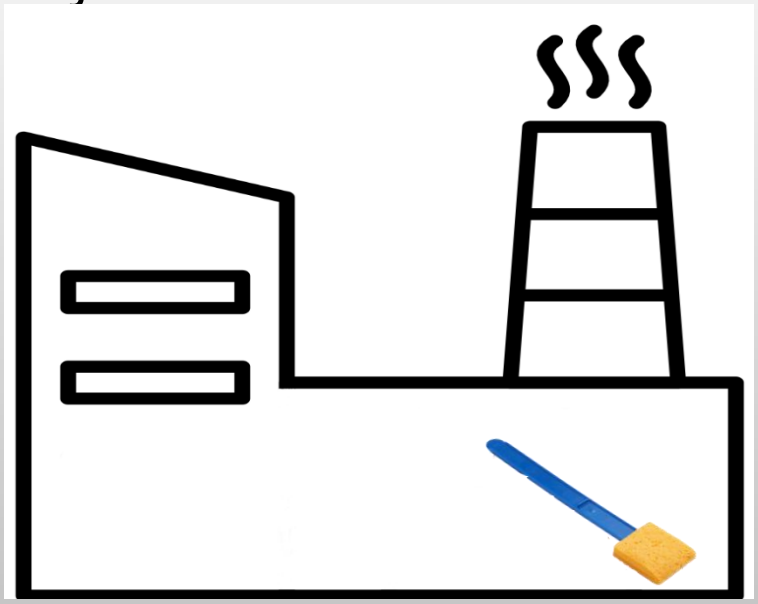
3. Sub-streak presumptive *Listeria* species and *L. monocytogenes* colonies onto non-selective agar

4. Performed PCR amplification of s*igB,* followed by Sanger sequencing analysis for *Listeria* subtyping (i.e., *sigB* allelic typing)



FDA. 2022. Bacteriological Analytical Manual (BAM) Chapter 10: Detection of *Listeria monocytogenes* in Foods and Environmental Samples.

Project Timeline



Initial swabbing

Follow each plant for ~1 year and support them as they implement their EMP

- Provided each plant with an EMP SOP to implement throughout the year
- Documented when they did environmental sampling events and what they swabbed
- Provided consulting services to aid in root cause identification of *Listeria* contamination and provided suggestions for appropriate corrective actions to implement

Each plant performed their own routine swabbing for *Listeria* throughout the year

- Each plant was tasked with conducting environmental sampling of a sub-set of sites on their site list (**recommended: monthly, 5-10 swabs per sampling**) to help monitor their environment for *Listeria*
  - Swabs were sent to an external testing lab for detection of *Listeria* using certified methods
- **When a site tested positive for *Listeria*, the testing lab was instructed to send the enrichment from the positive swab to Cornell**
  - We isolated colonies from these enrichments and performed *sigB* allelic typing for these isolates
- **We used subtyping data from *Listeria* isolates detected in the plant throughout the year to identify potential persistence in each plant**, and provided guidance for what they should do (i.e., corrective actions) to eliminate this potential persistence

Example:

Site ID	Site description	2/21/2021 (Initial sampling performed by Cornell)	6/22/2021 (routine sampling performed by plant CO)	10/29/21 (routine sampling performed by plant CO)
CO1	Cooler ramp seam	S5005	3, 71	72
CO2	Cooler drain	S5005	3, S5005	S5005
CO3	Crack in floor transition area	Negative	Not sampled	Not sampled
CO4	Truck bay floor drain	S5005	S5005	69

- Here we identified that the *sigB* allelic type S5005 was potentially persisting in plant CO, particularly in drains

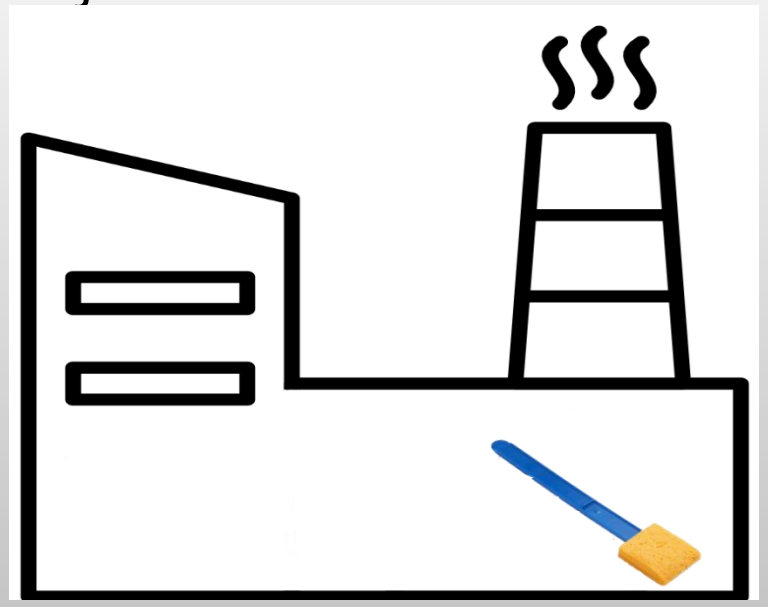
Example:

Site ID	Site description	2/21/2021 (Initial sampling performed by Cornell)	6/22/2021 (routine sampling performed by plant CO)	10/29/21 (routine sampling performed by plant CO)
CO1	Cooler ramp seam	S5005	3, 71	72
CO2	Cooler drain	S5005	3, S5005	S5005
CO3	Crack in floor transition area	Negative	Not sampled	Not sampled
CO4	Truck bay floor drain	S5005	S5005	69

- Here we identified that the *sigB* allelic type S5005 was potentially persisting in plant CO, particularly in drains
- We consulted with plant CO about implementing a corrective action of performing a bi-weekly deep cleaning and sanitation of their drain system using a Quat-based sanitizer
- **We'll revisit this later.**

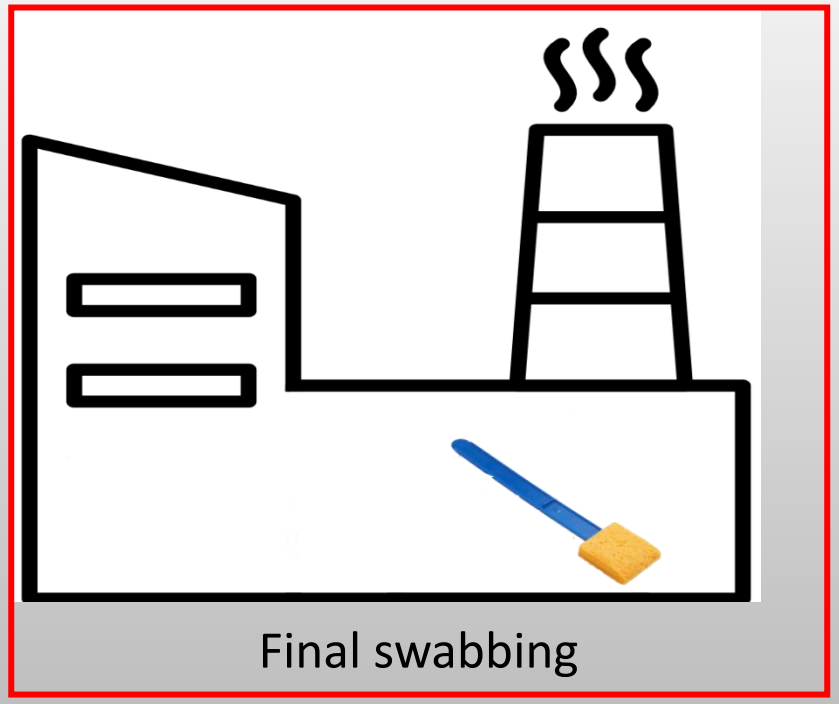
Intervention 1: Drain cleaning and sanitation: Implement protocol for cleaning and sanitizing the trench drain that extends from truck bay area to cooler area
Frequency of activity: This activity should be performed ideally on a bi-weekly basis (if possible). It should be performed before cleaning and sanitation of the equipment to avoid cross-contamination of the equipment from the floor.

Project Timeline



Initial swabbing

Follow each plant for ~1 year and support them as they implement their EMP



Final swabbing

- We swabbed the same (or similar) sites that were swabbed in the initial sampling in each plant to gauge how *Listeria* prevalence changed after 1 year

Questionnaire we used to evaluate each plant's food safety attitude and dedication to carrying out their EMP

- Questionnaire was answered by the 5 members of the *Listeria* Dairy project team after the study period was over (Sam, Tim, Rob, Anika, Al)
- Nine questions; Each question was scored on a scale of 1-5 (5=strongly agree, 1=strongly disagree)
- Scores were added up and each plant received a score out of 225 (the higher the score the better)

#	Question
1	Facility X was proactive in the implementation of their environmental monitoring program for Listeria control.
2	Facility X reached out independently for guidance or help with their environmental monitoring program.
3	Facility X selected sites to swab with the intention of seeking out locations that could harbor Listeria.
4	The attitude of management and employees at facility X had a positive impact on the employees' ability to implement a strong environmental monitoring program.
5	Facility X showed commitment to following up on positives and took action to identify root causes of positives detected in their facility.
6	Facility X carried out corrective actions that were well thought out and were effective at controlling Listeria detected in their facility.
7	Facility X has demonstrated that their environmental monitoring program is robust and capable of seeking out and destroying persistent Listeria in their facility.
8	Facility X is in a position where they can have a sustainable environmental monitoring program in the future.
9	Facility X has a strong food safety attitude.

Big Olaf had poor food safety attitude

- Prior to Florida Dept. of Agriculture and Consumer Services (FDACS) formal environmental assessment of Big Olaf's creamery (July 5th 2022) they expressed that they felt unjustifiably targeted on social media
- Food safety attitude: doing the right thing even when no one is watching
  - "We passed all the previous inspections though"
- A Regulatory Inspection is only enforcing the regulation (the bare minimum). If you're relying on that to be your food safety program, you are making your own 'luck'.

Big Olaf Company
July 3, 2022 at 3:55 PM ·

Regarding the investigation for possible listeria contamination:

For now it is only speculation as it is an ongoing investigation, our brand has not been confirmed to be linked to these cases, I am not sure why only Big Olaf is being mentioned and targeted. The original report we got from the Florida Department of Health on Friday July 1st, was that there are 23 cases reported, the first one reported was January 2021. 6 out of the 23 patients mentioned having consumed Big Olaf ice cream, but nothing has been proven. We have been cooperating with the Florida Department of Health, FDACS and the FDA as soon as we were informed about the situation. We have been transparent and have answered all their questions and provided them with all the information requested from us, as the health and well being of the public is our first priority.

- Big Olaf Creamery

Big Olaf Creamery - St Armands Circle
July 5, 2022 ·

Update: the Florida Department of Health contacted the media about 3 days before they even reached out to us on Friday. We don't understand why they waited until Friday afternoon to contact us, this being such serious and time sensitive matter. The misinformation by the media has caused the production and most of their customers to get harassed and threatened, It is very sad and unfair. We have passed almost every inspection with 100% and nothing has even been proven so we do feel targeted for sure, and we still haven't heard about what the other 17 patients had to say or what they consumed that may have caused them to get sick, they aren't even mentioning those. We are also very confused because the the Florida department of health has still not even come out to investigate, we still have not heard from them, we have been waiting all weekend.

Beam’s Baffling and Bombastic Bid to Become a Beautiful Bird

Results

Key Trends

Plant code	*Listeria* prevalence		# of routine samplings carried out by plant during study period	Dedication to EMP questionnaire total
	Initial sampling event	Final sampling event		
N	1/116 (0.9%)	8/129 (6%)	50	222/225
CM	2/73 (3%)	2/74 (3%)	4	198/225
BY	9/18 (50%)	3/37 (8%)	8	190/225
CQ	4/53 (8%)	8/54 (15%)	9	166/225
W	25/81 (31%)	18/81 (22%)	22	129/225
CO	4/42 (10%)	9/44 (20%)	2	122/225
CN	33/52 (63%)	8/54 (15%)	2	100/225
CL	14/50 (28%)	13/50 (26%)	2	79/225
CP	2/94 (2%)	25/70 (36%)	0	56/225

BEGGED to be in the study!!!!!

- Not showing dedication to carrying out an effective EMP (low questionnaire scores) are trended with either maintaining or developing high *Listeria* prevalence (e.g., plants CL and CP)

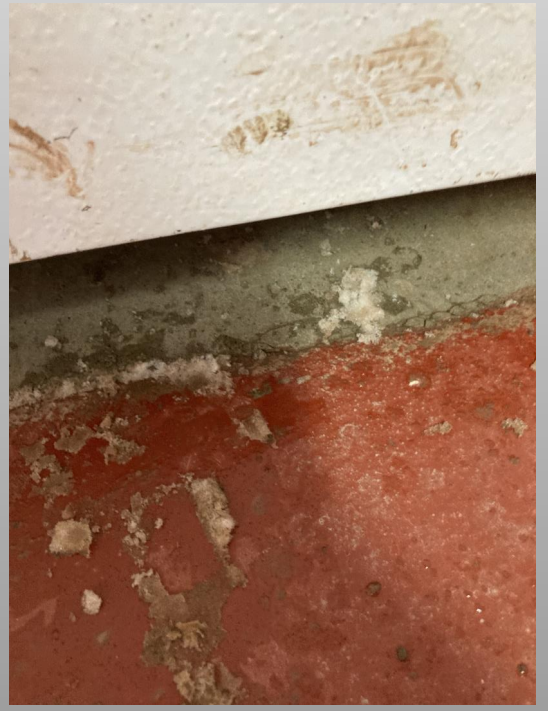
Plant CL was not dedicated to implementing their corrective actions

Highlighted corrective action:

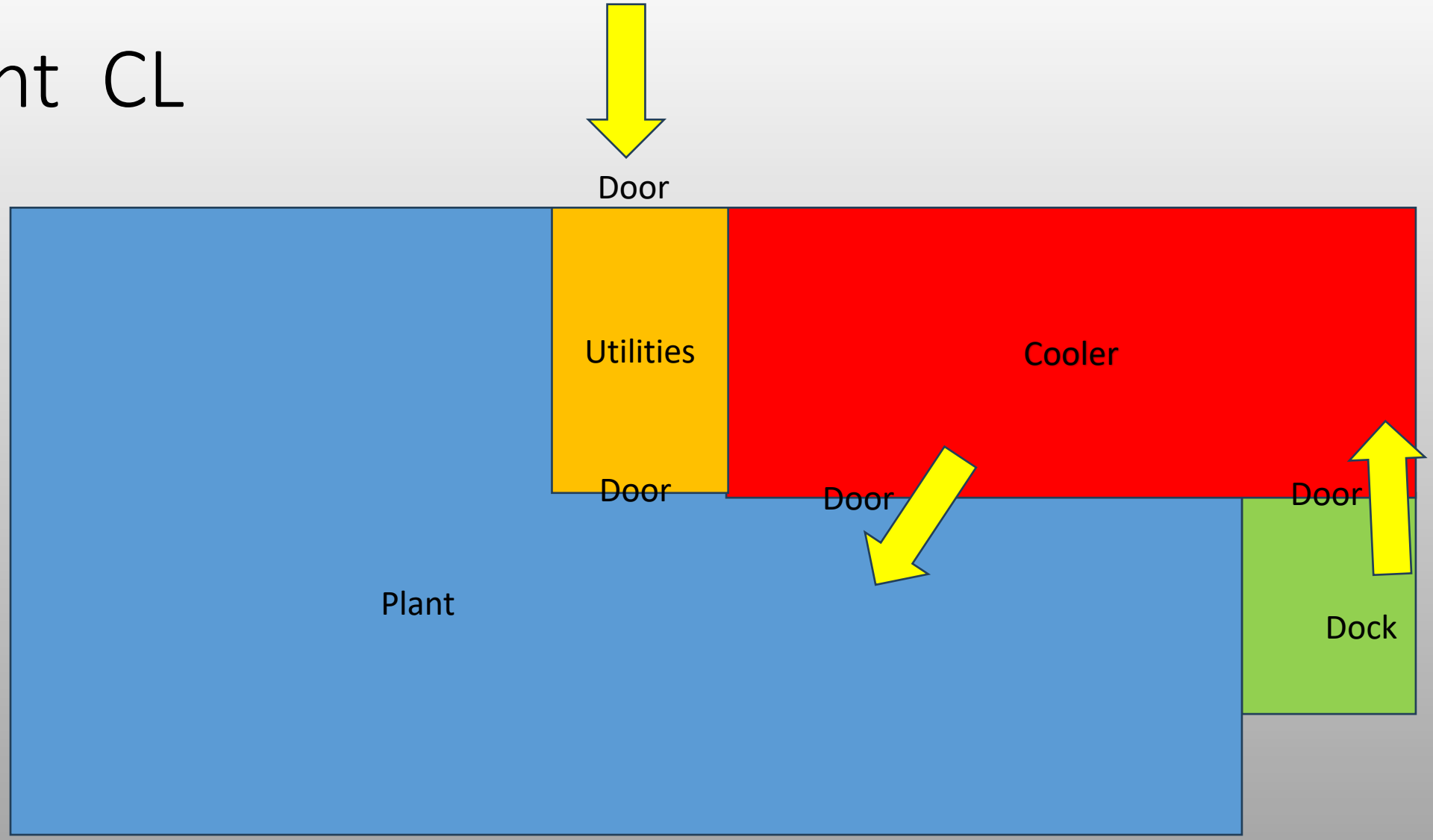
1. **Several sites in the cooler were positive for *Listeria* in Cornell's initial sampling (2/14/21)**
   - **<u>Potential root cause identified</u>: Non-plant employees (e.g., delivery couriers, customers) were able to access the cooler via an external door**
   - **<u>Corrective action</u>: Restrict customer access to cooler, provide protective footwear (booties) for visitors**
   - **<u>Outcome</u>: Corrective action was not effective. Sites in the cooler remained positive for *Listeria* in multiple sampling events throughout the year**

<u>Evidence to suggest plant CL was not dedicated to implementing this corrective action:</u>

- The delivery courier was still allowed to enter the cooler from the outside without wearing booties
  - We observed that the delivery courier tracked in snow and dirt into the cooler during our final sampling event
- Booties were not even present when Cornell visited plant CL for their final sampling event



Plant CL



Plant CP had no dedication to even carrying out an EMP

- No EMP in place (they performed no routine samplings on their own) when we last saw them in March 2022 for our final sampling event
- We saw >30% prevalence of *Listeria* in their plant in our final sampling event (compared to initial swabbing where they had 2% prevalence)
    - Suggests that they developed a *Listeria* problem over the course of the year

- They **begged to be in the study**, yet did nothing throughout the year and it was even difficult getting them to respond or react.

Key Trends

Plant code	*Listeria* prevalence		# of routine samplings carried out by plant during study period	Dedication to EMP questionnaire total
	Initial sampling event	Final sampling event		
N	1/116 (0.9%)	8/129 (6%)	50	222/225
CM	2/73 (3%)	2/74 (3%)	4	198/225
BY	9/18 (50%)	3/37 (8%)	8	190/225
CQ	4/53 (8%)	8/54 (15%)	9	166/225
W	25/81 (31%)	18/81 (22%)	22	129/225
CO	4/42 (10%)	9/44 (20%)	2	122/225
CN	33/52 (63%)	8/54 (15%)	2	100/225
CL	14/50 (28%)	13/50 (26%)	2	79/225
CP	2/94 (2%)	25/70 (36%)	0	56/225

- Showing strong dedication to carrying out an effective EMP (high questionnaire scores) are trended with developing or maintaining low *Listeria* prevalence (e.g., plants BY, CM and N)

Plant BY and Plant CM demonstrated the ability to ”close-out” corrective actions

- ”Close-out” means that in three subsequent swabbing events the site(s) identified as positive were negative for *Listeria*

Plant BY highlighted corrective action:

1. Chemicals being used to clean and sanitize the processing plant environment were intended to wash and sanitize farm milking systems
    - Potential root cause identified: The chemicals used by plant BY could not effectively clean and sanitizing a food processing environment
    - Corrective action: Started using cleaning and sanitation chemicals intended for use in food production environments (using Hydrite as their chemical supplier) in March 2021
    - Close-out: **Yes**, most sites throughout the plant (with two site exceptions) that were positive in initial Cornell sampling were negative in at least three follow-up swabbing events. In addition the hydrite chemicals were present in their plant in all visits by Cornell personnel following the implementation of this corrective action

Plant CM highlighted corrective action:

1. Two sites in or near their cooler were positive for *Listeria* in initial sampling (2/15/21)
    - Potential root cause identified: carrying milk totes into cooler introduced contamination
    - Corrective action: Implemented a deep cleaning and sanitation of milk totes after each use
    - Close out: **Yes**, the positive sites in the cooler area were negative in 3 additional sampling events (5/3/21, 6/7/21, 8/10/21)

And Plant N did frequent sampling for *Listeria* (50 routine sampling events) and took well thought out steps to address corrective actions

Plant N highlighted corrective action:

1. The ½ gallon filler drain was positive for *Listeria* in eight routine sampling events (starting 12/9/21 – 2/9/22)
   - Potential root cause identified: Compromised floor/pillar juncture was identified close to the drain that was likely harboring *Listeria*
   - Corrective action: The damaged concrete was removed from the floor/pillar juncture to make the area more cleanable on 2/1/22
   - Close out: **Technically yes**, the site was negative in 3 additional sampling events (2/17/22, 2/23/22, 3/2/22)

Before corrective action

After corrective action (2/1/22)

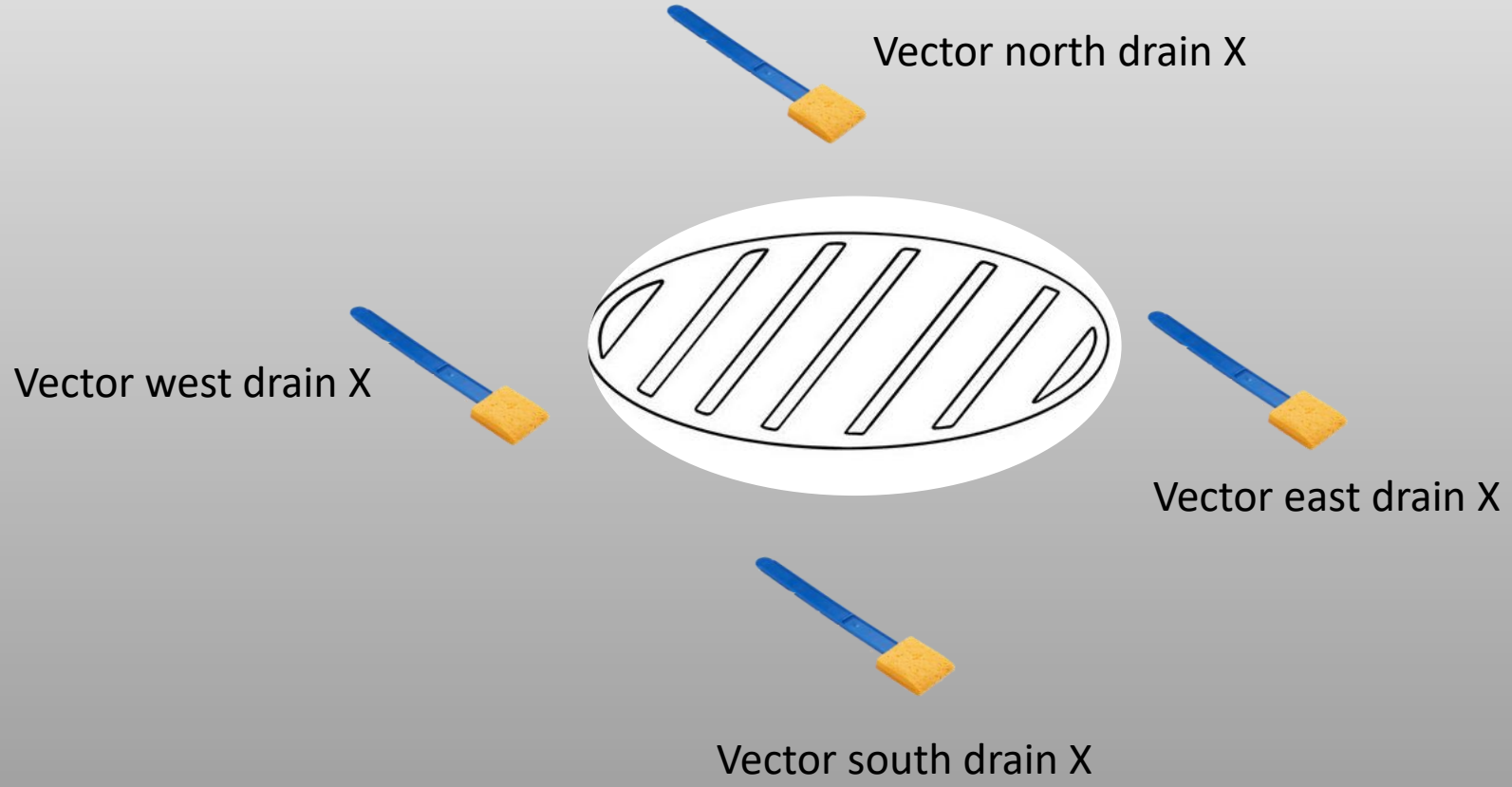
Key Trends

Plant code	*Listeria* prevalence		# of routine samplings carried out by plant during study period	Dedication to EMP questionnaire total
	Initial sampling event	Final sampling event		
N	1/116 (0.9%)	8/129 (6%)	50	222/225
CM	2/73 (3%)	2/74 (3%)	4	198/225
BY	9/18 (50%)	3/37 (8%)	8	190/225
CQ	4/53 (8%)	8/54 (15%)	9	166/225
W	25/81 (31%)	18/81 (22%)	22	129/225
CO	4/42 (10%)	9/44 (20%)	2	122/225
CN	33/52 (63%)	8/54 (15%)	2	100/225
CL	14/50 (28%)	13/50 (26%)	2	79/225
CP	2/94 (2%)	25/70 (36%)	0	56/225

Overall key takeaway: Showing strong dedication to carrying out an EMP is an important for it to be effective

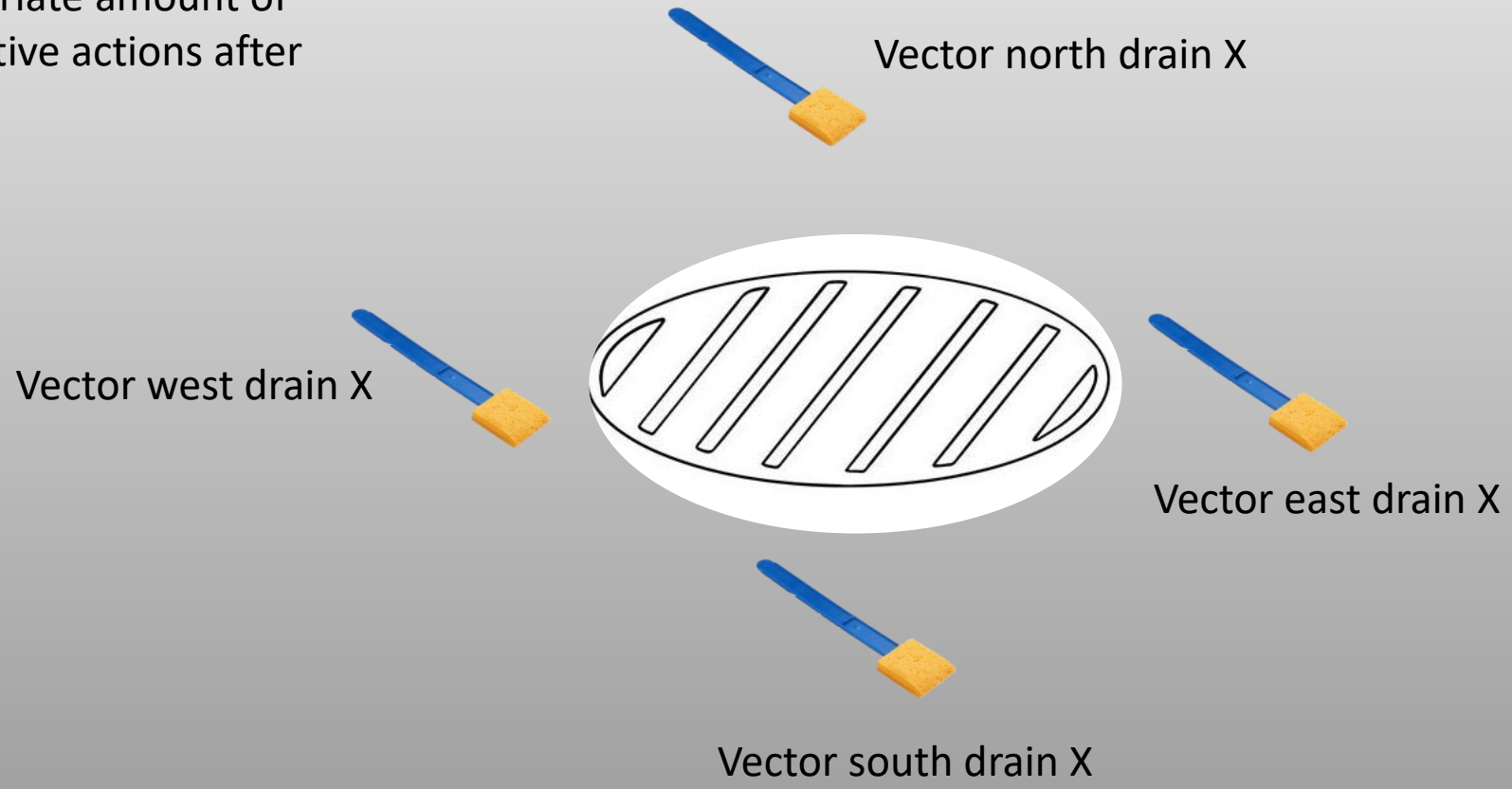
Flory’s Fascinating Finesse and Fabulous Feats

Plant W did lots of monitoring for *Listeria,* but couldn't follow through with that same rigor with their corrective actions



Plant W did lots of monitoring for *Listeria,* but couldn't follow through with that same rigor with their corrective actions

- Plant W made the critical mistake of not providing employee personnel with the appropriate amount of time to commit to performing corrective actions after finding all this *Listeria*

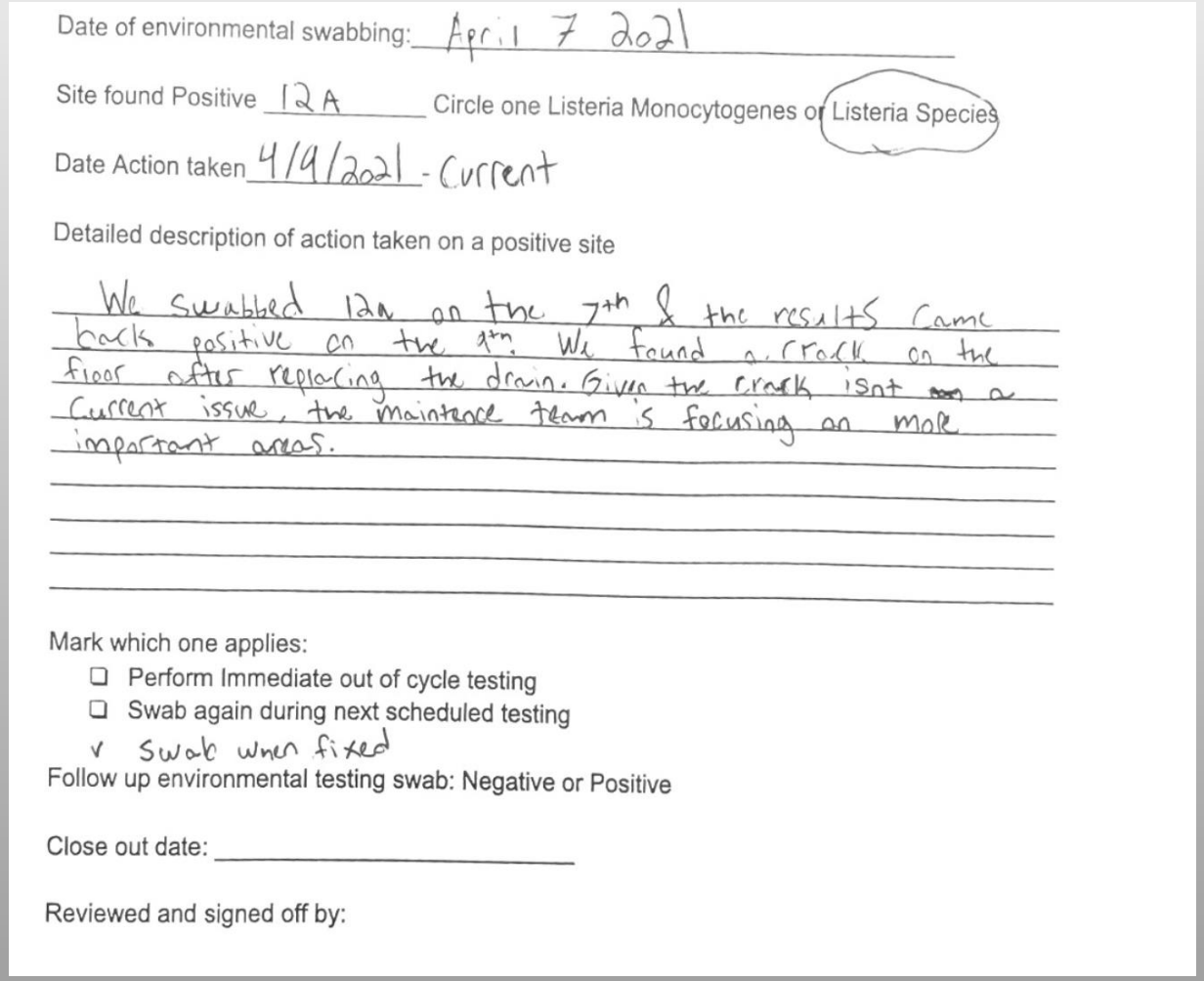


Plant W did lots of monitoring for *Listeria,* but couldn't follow through with that same rigor with their corrective actions

- And so things like this happened:
  - Wrote that the crack in the floor near positive drain "isn't a current issue", so "maintenance team is focusing on more important areas"

- Potential independent party interpretation: "The drain consistently coming back positive for *Listeria* is not an issue we are prioritizing"

- Not good. Could have been read by an inspector/auditor that they were not prioritizing food safety, and thus had poor food safety attitude/culture



Date of environmental swabbing: April 7 2021

Site found Positive 12A Circle one Listeria Monocytogenes or Listeria Species

Date Action taken 4/9/2021 - Current

Detailed description of action taken on a positive site

We swabbed 12a on the 7th & the results came back positive on the 9th. We found a crack on the floor after replacing the drain. Given the crack isnt a current issue, the maintence team is focusing on more important areas.

Mark which one applies:

- ☐ Perform Immediate out of cycle testing
- ☐ Swab again during next scheduled testing
- ✓ Swab when fixed

Follow up environmental testing swab: Negative or Positive

Close out date: _____

Reviewed and signed off by:

Key Trends

Plant code	*Listeria* prevalence		# of routine samplings carried out by plant during study period	Dedication to EMP questionnaire total
	Initial sampling event	Final sampling event		
N	1/116 (0.9%)	8/129 (6%)	50	222/225
CM	2/73 (3%)	2/74 (3%)	4	198/225
BY	9/18 (50%)	3/37 (8%)	8	190/225
CQ	4/53 (8%)	8/54 (15%)	9	166/225
W	25/81 (31%)	18/81 (22%)	22	129/225
CO	4/42 (10%)	9/44 (20%)	2	122/225
CN	33/52 (63%)	8/54 (15%)	2	100/225
CL	14/50 (28%)	13/50 (26%)	2	79/225
CP	2/94 (2%)	25/70 (36%)	0	56/225

Overall key takeaway: Commitment to monitoring for *Listeria* alone is not enough for an EMP to be effective at controlling *Listeria*. Doing corrective actions that actually work are necessary for an EMP to ultimately be effective

Future directions

Plant code	*Listeria* prevalence	
	Initial sampling event	Final sampling event
N	**0.9%**	**6%**
CM	**3%**	**3%**
BY	**50%**	**8%**
CQ	**8%**	**15%**
W	**31%**	**22%**
CO	**10%**	**20%**
CN	**63%**	**15%**
CL	**28%**	**26%**
CP	**2%**	**36%**

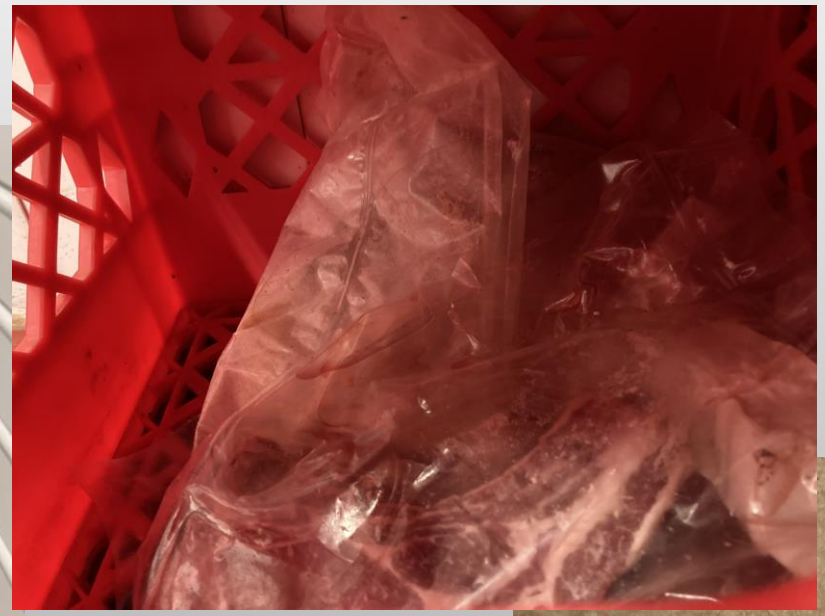
Target *Listeria* prevalence level in the processing environment: <10%

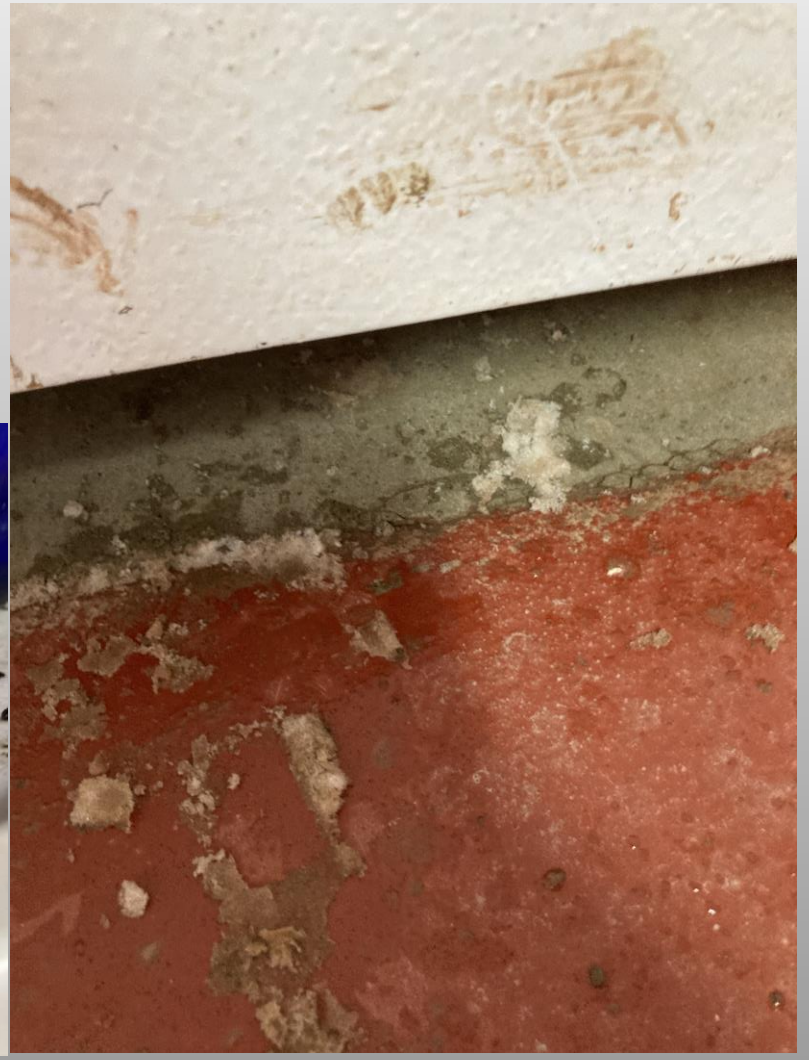
- Small dairy facilities have fewer resources (e.g., time, money, personnel, etc.) to dedicate to "seeking" and "destroying" *Listeria* (the traditional EMP framework)

- **Thus, the development of additional strategies outside of the traditional EMP framework may be needed to improve the ability of small dairy facilities to control *Listeria* in their processing environments**

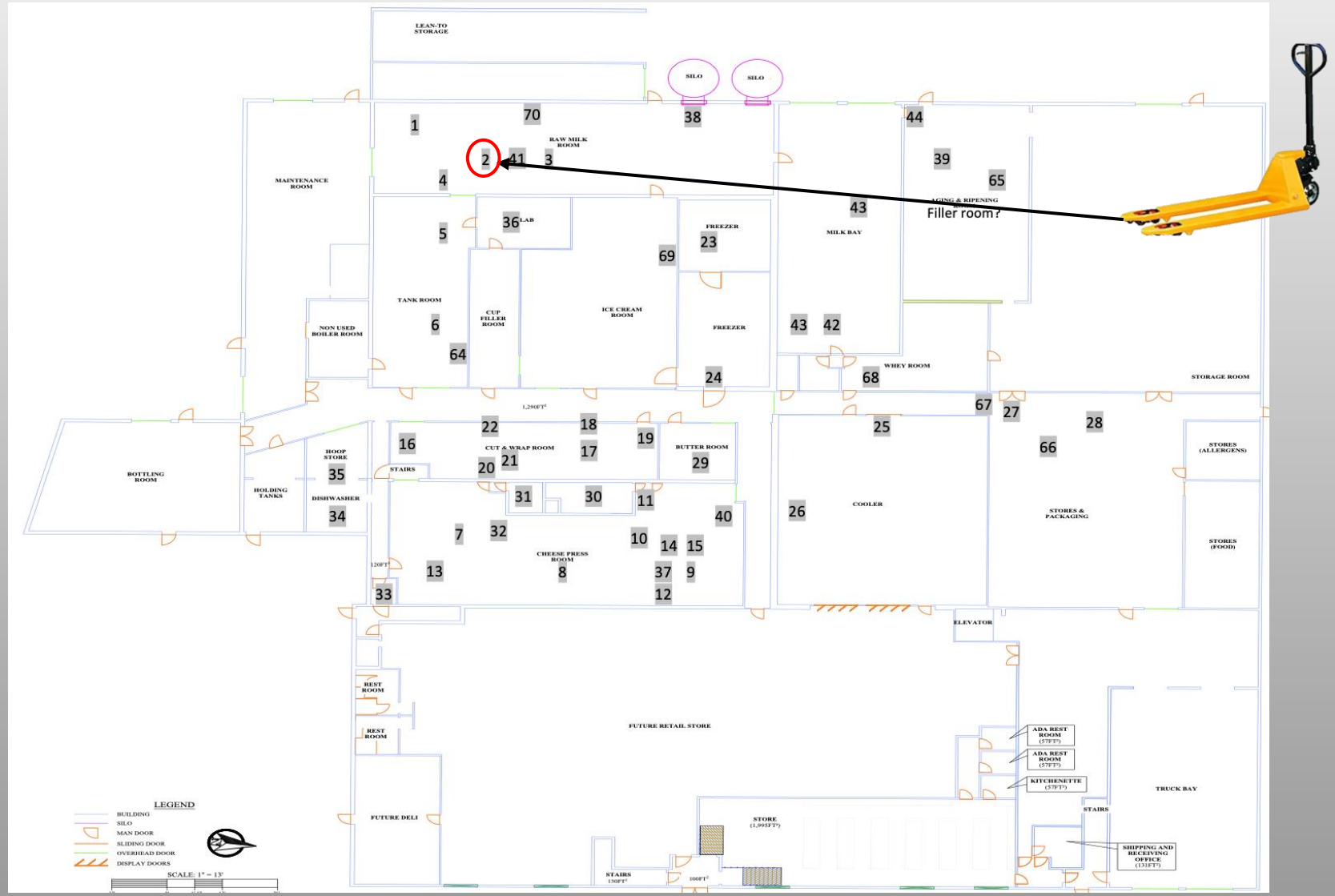
Plant Superlatives

Plant CL superlative: most unsanitary processing environment



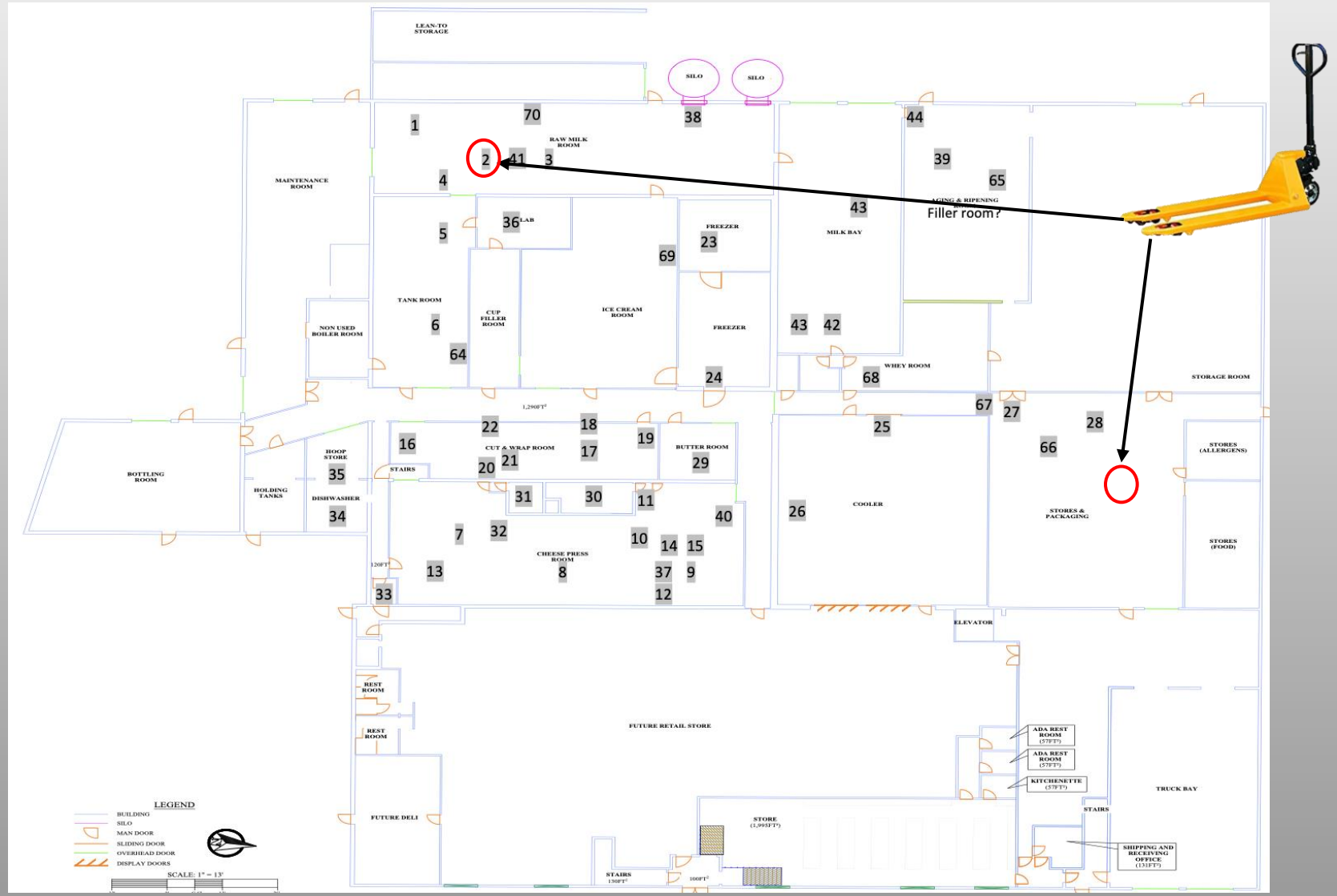


Plant CM superlative: most likely to not be able to find their moveable equipment



- In their final sampling event (2/15/22) we spent ~20 minutes trying to locate this yellow pallet jack which is supposed to remain on the raw side (either in the truck bay area or the raw milk holding tanks area)

Plant CM superlative: most likely to not be able to find their moveable equipment



- In their final sampling event (2/15/22) we spent ~20 minutes trying to locate this yellow pallet jack which is supposed to remain on the raw side (either in the truck bay area or the raw milk holding tanks area)

- We ultimately found it in their packaging warehouse
  - This yellow pallet jack, and the only other pallet jack on our site list (orange pallet jack, site 28) were the only two sites positive for *Listeria* in this final sampling event

Plant CN superlative: most concerning plant infrastructure

Example: corrective actions that don't actually correct the problem

Problem: Facility CN was seeing repeat positives in February 2021 and May 2021 samplings at a doorway threshold with pitted concrete

Corrective action: Doorway threshold pitting was re-finished with concrete in July 2021 for a low cost to make the surface more cleanable

Outcome: The re-finished concrete was not cured properly. This caused the concrete to remain non-cleanable, and the site continued to see repeat positives

Site Desc.	Feb 2021	May 2021	Aug 2021	Oct 2021
Doorway threshold	Pos	Pos	Pos	Pos

Hopefully this corrective action is more effective (corrective action performed right before Cornell final sampling)

Before corrective action

After corrective action (negative for *Listeria*!)

Hopefully this corrective action does is more effective (corrective action performed right before Cornell final sampling)

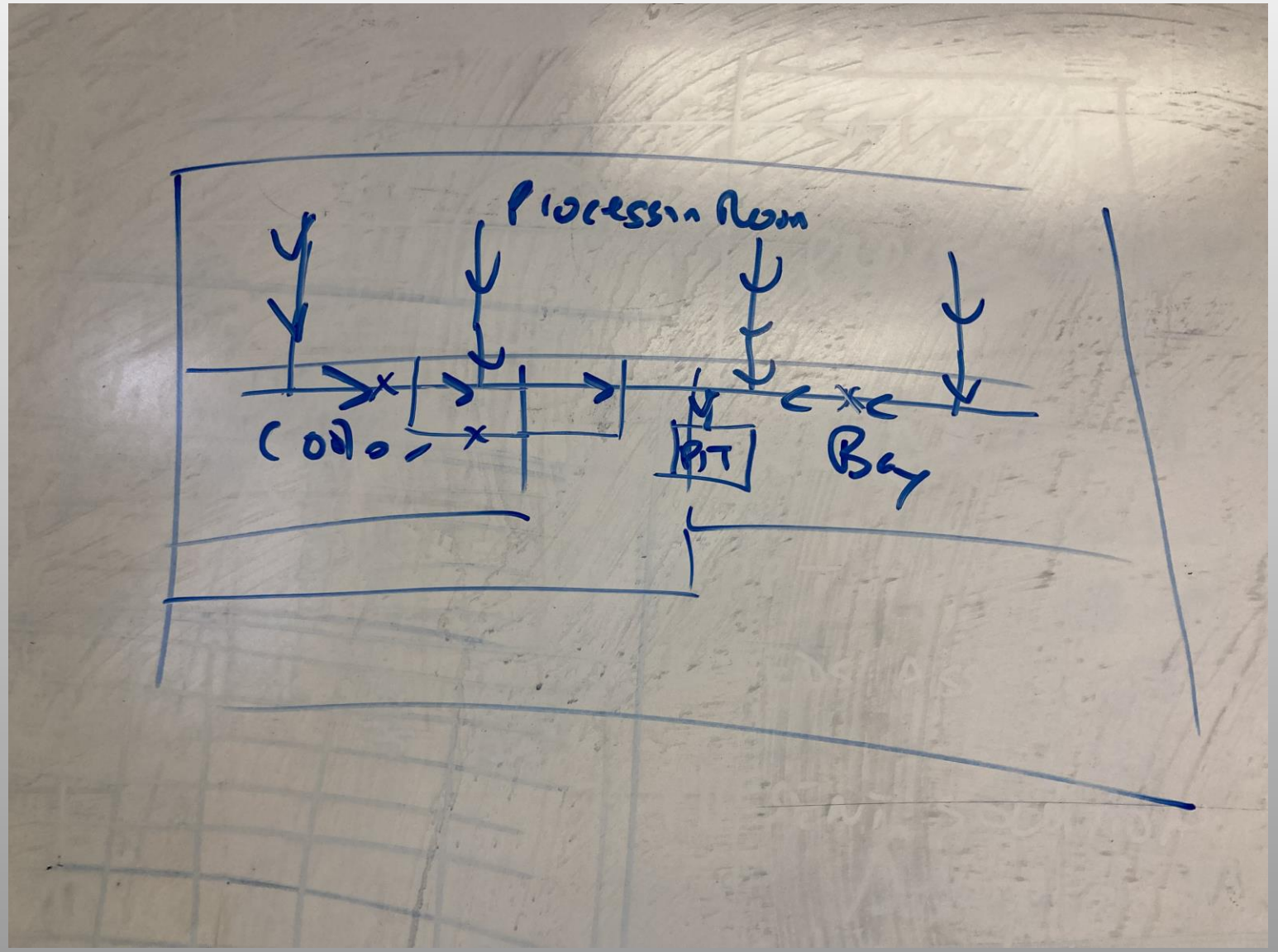
Before corrective action

After corrective action (negative for *Listeria*!)

Schlappi’s Slippery Slide and Squeeze from her Suzuki

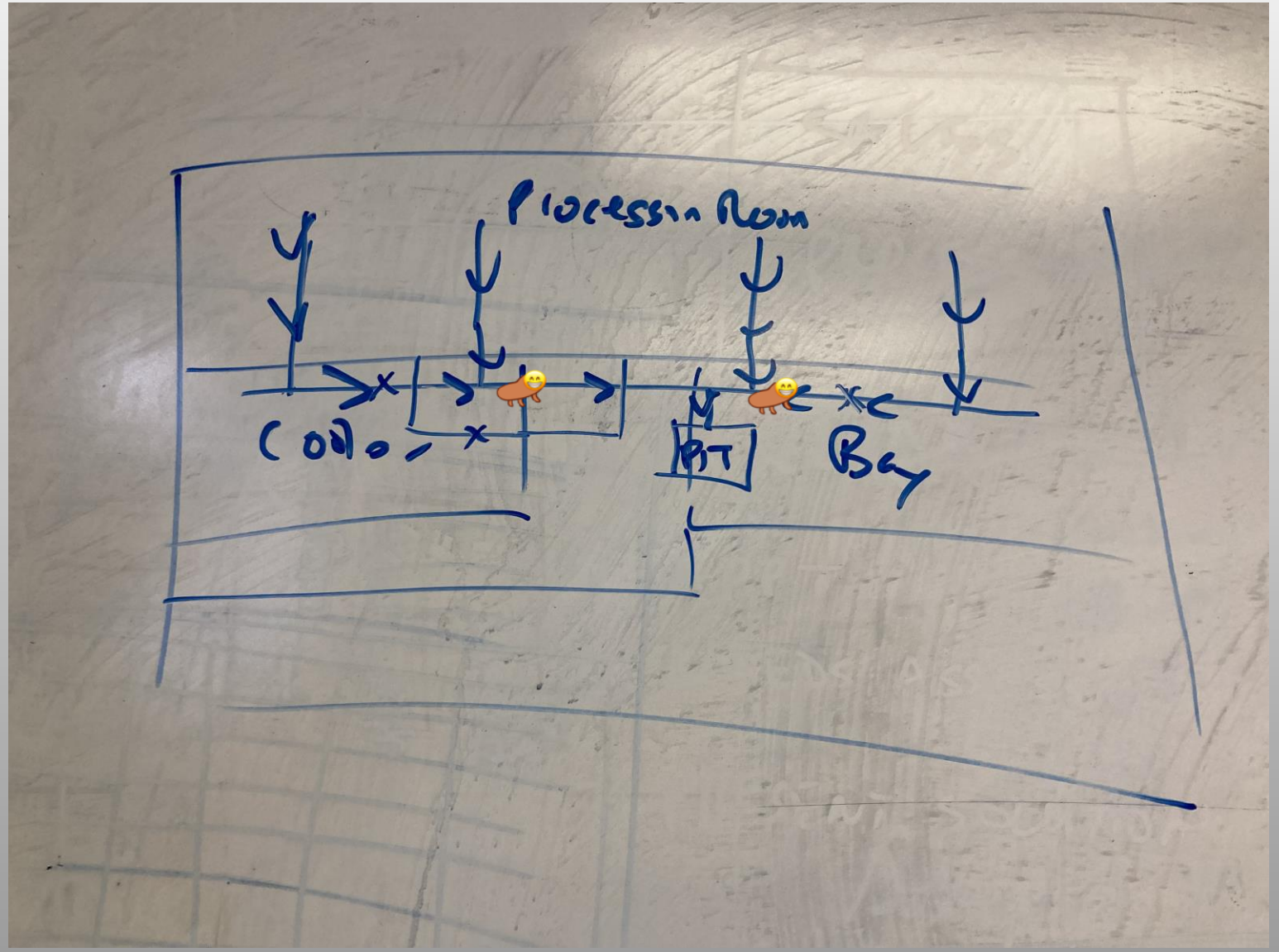
Plant CO superlative: most New York Pride

- They had a true New York native (*Listeria newyorkensis*) persisting in all parts of their drain system



Plant CO superlative: most New York Pride

- They had a true New York native (*Listeria newyorkensis*) persisting in all parts of their drain system



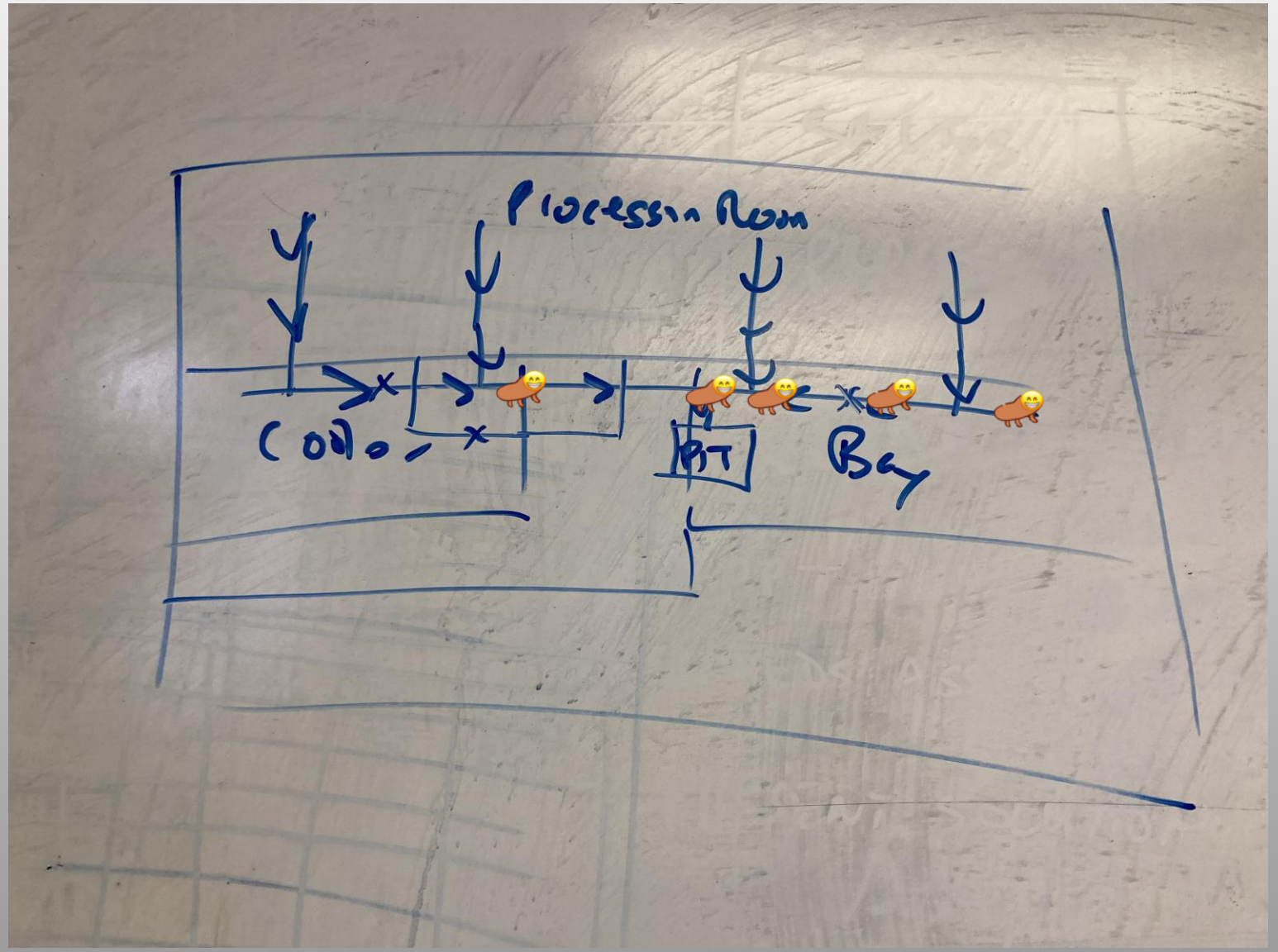
Plant CO superlative: most New York Pride

Cooler drain (CO2)

Truck bay drain (CO4)

Plant CO superlative: most New York Pride

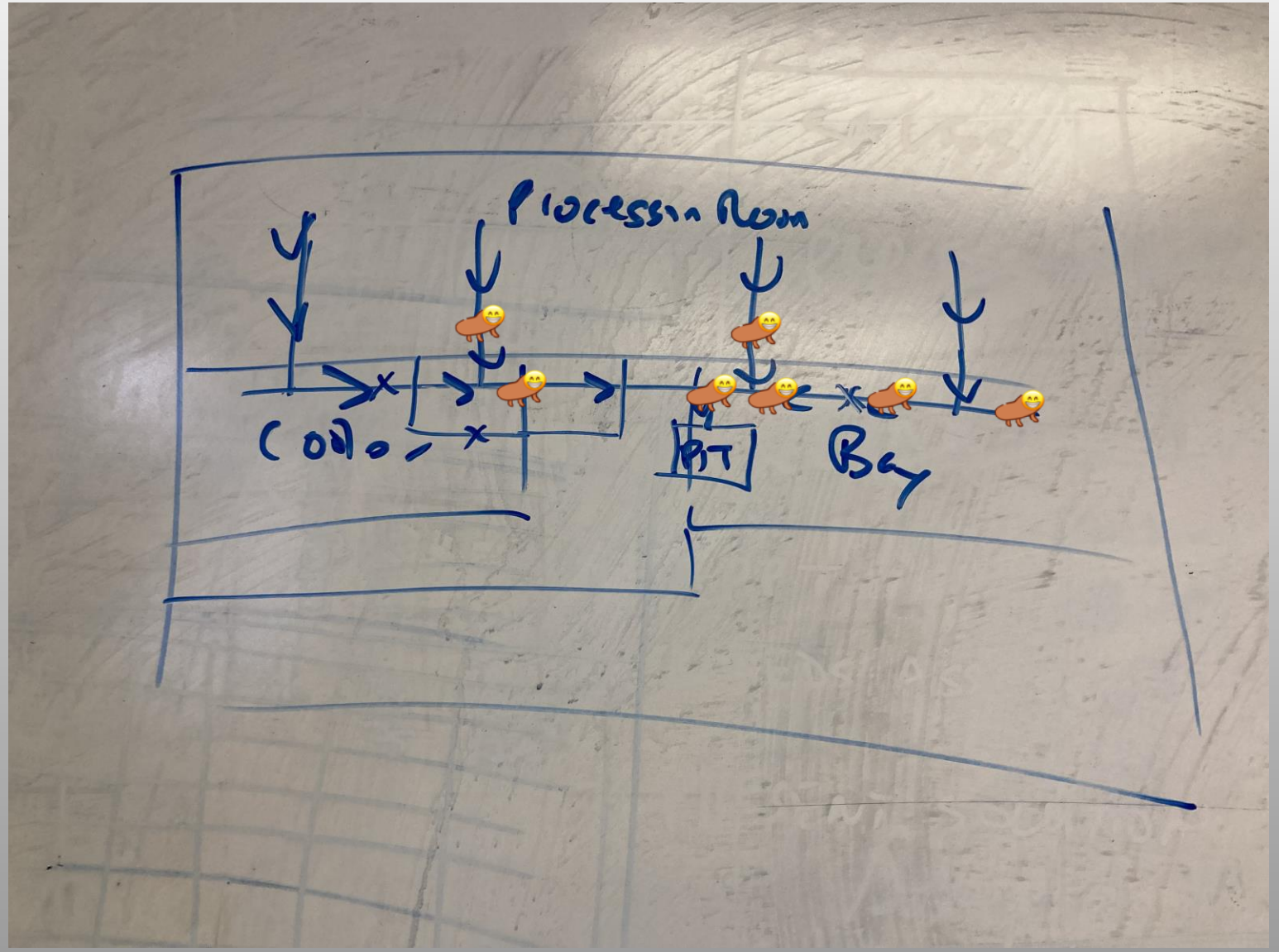
- They had a true New York native (*Listeria newyorkensis*) persisting in all parts of their drain system



Plant CO superlative: most New York Pride

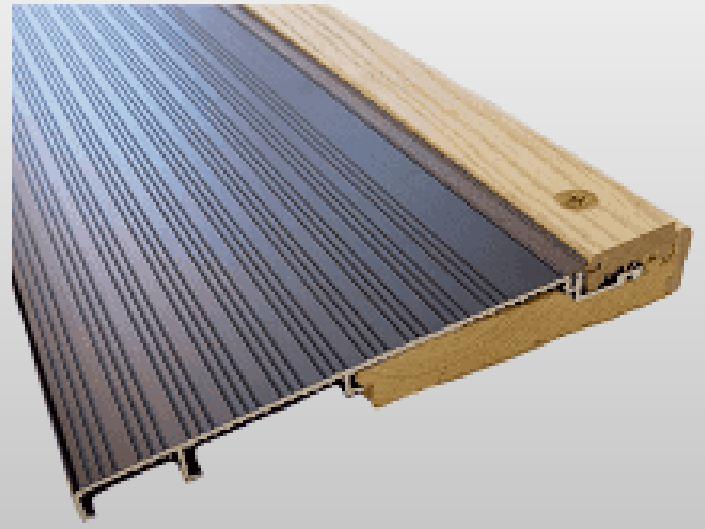
Plant CO superlative: most New York Pride

- They had a true New York native (*Listeria newyorkensis*) persisting in all parts of their drain system



Plant CO superlative: most New York Pride

Plant CQ superlative: most improved food safety attitude (post-project)

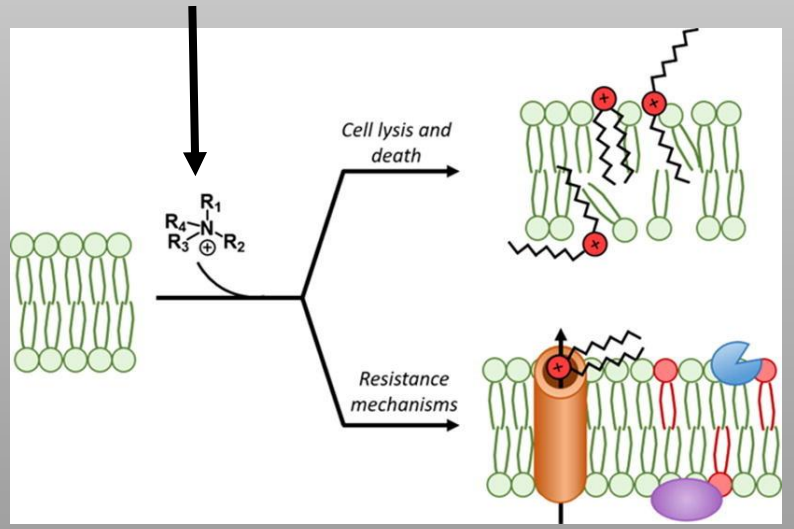


Plant N superlative: most sanitizer tolerance genes

- A total of 23 isolates were sequenced from plant N for persistence analysis
  - We identified that 22 of these isolates contained a gene cassette (*bcrABC*) that is associated with conferred tolerance of *Listeria* to quaternary ammonium compound-based sanitizers

bcrABC encodes an efflux pump that can pump quats out of bacterial cells

Quaternary ammonium compound



Morrison et al., 2019. *Tetrahedron Letters.*

Plant N superlative: most sanitizer tolerance genes

- A total of 23 isolates were sequenced from plant N for persistence analysis
  - We identified that 22 of these isolates contained a gene cassette (*bcrABC*) that is associated with conferred tolerance of *Listeria* to quaternary ammonium compound-based sanitizers

- We did a previous study that showed that *bcrABC* really only confers phenotypic tolerance of *Listeria* to low levels (e.g., <20 mg/L) of one particular quat (benzalkonium chloride), not high levels (>200 mg/L most def) like you would expect to see here in this picture

Hello quat overload

However if this quat is diluted…potentially the isolates with *bcrABC* could be selected for?

Detlefsen’s Duck, Dive, Dart, Divert and Dodge Disaster

Plant BY superlative: best storyline

AT58

New York State Department of Agriculture and Markets Commissioner Richard A. Ball today warned consumers not to consume [redacted] raw milk cheese made by [redacted] located at [redacted] NY [redacted] due to possible Listeria monocytogenes contamination. To date, no illnesses have been reported to the Department associated with this product.

A routine sample of the cheese, taken by an inspector from the Division of Milk Control and Dairy Services on January [redacted], was subsequently tested by the New York State Food Laboratory and discovered to be contaminated with Listeria monocytogenes. On January [redacted] the manufacturer was notified of a preliminary positive test result. Test results were confirmed as positive for Listeria monocytogenes on January [redacted]. The cheese will be destroyed by the manufacturer.

Site ID	Initial swabbing results (01/29/2021)	Final swabbing results (02/02/2022)
BY1	Negative	Positive for L. mono (AT61)
BY2	Pos. for L. mono and L. spp (AT61 and AT31)	Negative
BY3	Pos. for L. spp (AT53)	No longer exists
BY4	Pos. for L. mono (AT67 and AT61)	Negative
BY5	Pos. for L. mono (AT61 and AT57)	Negative
BY6	Negative	Negative
BY7	Negative	No longer exists
BY8	Pos. for L. mono (AT57)	No longer exists
BY9	Negative	No longer exists
BY10	Negative	No longer exists
BY11	Negative	No longer exists
BY12	Pos. for L. spp. (AT47 and AT37)	No longer exists
BY13	Negative	Pos. for L. mono (AT61)
BY14	Negative	Negative
BY15	Pos. for L. mono (AT61)	No longer exists
BY16	Pos. for L. spp. (AT37)	No longer exists
BY17	Pos. for L. mono (AT61)	Negative
BY18	Negative	Negative
BY19	Not sampled	Negative
BY20	Not sampled	Negative
BY21	Not sampled	Negative
BY22	Not sampled	Negative
BY23	Not sampled	Negative
BY24	Not sampled	No longer exists
BY25	Not sampled	Negative
BY26	Not sampled	Negative
BY27	Not sampled	Negative
BY28	Not sampled	Negative
BY29	Not sampled	Negative

- BY's prevalence of *Listeria* dropped from 50% in initial sampling to <10% in final sampling

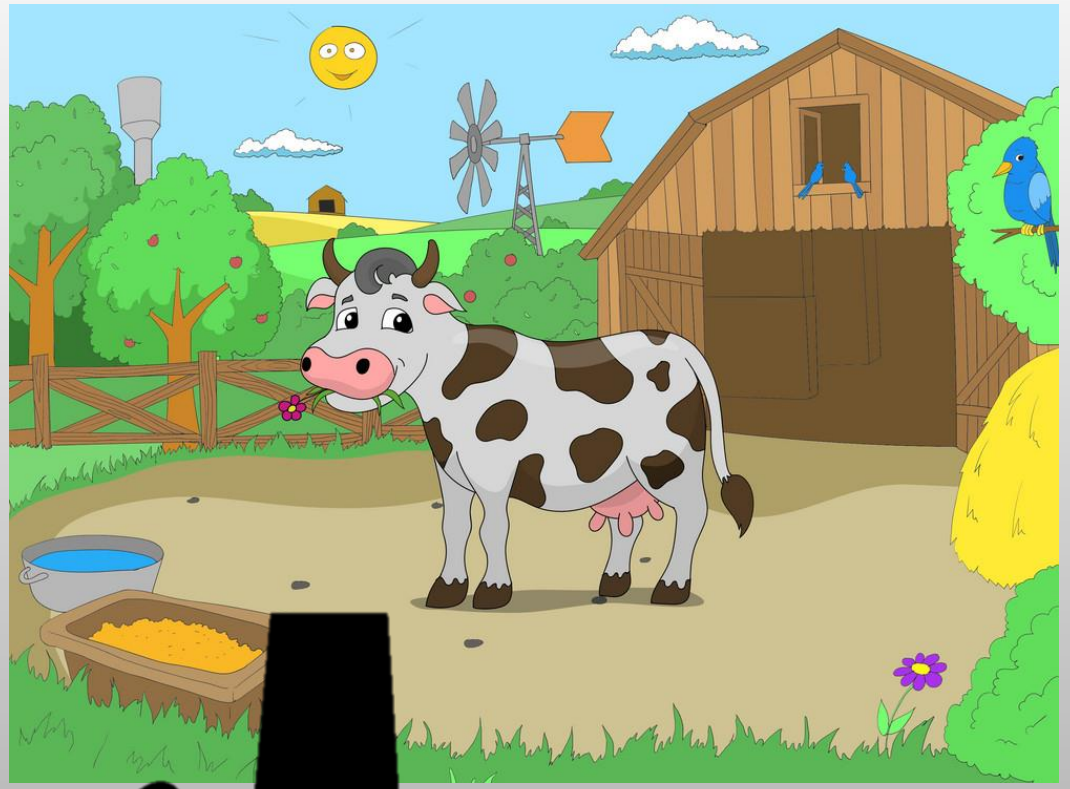
- We also decided to take a raw milk sample from plant BY's bulk tank during the final swabbing event on 2/2/2022

Site ID	Initial swabbing results (01/29/2021)	Final swabbing results (02/02/2022)
BY1	Negative	Positive for L. mono (AT61)
BY2	Pos. for L. mono and L. spp (AT61 and AT31)	Negative
BY3	Pos. for L. spp (AT53)	No longer exists
BY4	Pos. for L. mono (AT67 and AT61)	Negative
BY5	Pos. for L. mono (AT61 and AT57)	Negative
BY6	Negative	Negative
BY7	Negative	No longer exists
BY8	Pos. for L. mono (AT57)	No longer exists
BY9	Negative	No longer exists
BY10	Negative	No longer exists
BY11	Negative	No longer exists
BY12	Pos. for L. spp. (AT47 and AT37)	No longer exists
BY13	Negative	Pos. for L. mono (AT61)
BY14	Negative	Negative
BY15	Pos. for L. mono (AT61)	No longer exists
BY16	Pos. for L. spp. (AT37)	No longer exists
BY17	Pos. for L. mono (AT61)	Negative
BY18	Negative	Negative
BY19	Not sampled	Negative
BY20	Not sampled	Negative
BY21	Not sampled	Negative
BY22	Not sampled	Negative
BY23	Not sampled	Negative
BY24	Not sampled	No longer exists
BY25	Not sampled	Negative
BY26	Not sampled	Negative
BY27	Not sampled	Negative
BY28	Not sampled	Negative
BY29	Not sampled	Negative

- BY's prevalence of *Listeria* dropped from 50% in initial sampling to <10% in final sampling

- We also decided to take a raw milk sample from plant BY's bulk tank during the final swabbing event on 2/2/2022
  - It was positive for L. mono AT58.

Plant BY layout



So we call up Plant BY's owner and break the news

- In February 2022 we followed up with plant BY about their EMP results as well as the *L. monocytogenes* that was detected in their bulk tank milk
- During this talk BY's owner was surprised to hear about the raw milk positive. But he also had a revelation where he informed me that **"back in Spring of 2020 one of my cow's looked like she had circling disease (which can be caused by encephalic listeriosis)"**
  - **She recovered on her own, stopped showing symptoms of circling disease, and he kept on milking her, everything was fine**

- So we did some more testing to of plant BY's raw milk to see if that one bulk tank milk positive we saw was a fluke
  - Raw milk ~5-10% *Listeria* prevalence, at least in New York State

Results from testing plant BY's raw milk for four consecutive days

Sample Description	3/28/22	3/29/22	3/30/22	3/31/22
Raw milk taken from bulk tank	Pos, AT58, AT257, AT37 (Lm and Lspp)	Pos, AT58 (Lm)	Pos, AT58 (Lm)	Negative
Milk sock from farm	Pos, AT58, AT61, AT37 (Lm and Lspp)	Pos, AT58, AT61, AT53 (Lm and Lspp)	Pos, AT58, AT61, AT37, AT116 (Lm and Lspp)	Pos, AT58, AT37 (Lm and Lspp)
Raw milk from cow that showed symptoms of listeriosis in Spring 2020	Not sampled	Not sampled	Not sampled	Pos, AT58 (Lm)

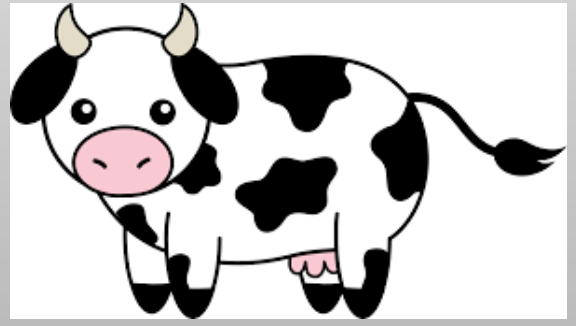
- So we identified that this L. mono positive in BY's raw milk was, in fact, not a fluke
- **We also identified that this one cow (Annabelle) was still likely carrying subclinical levels of *L. monocytogenes* in her raw milk**
- The owner of plant and farm BY ended up culling this cow a couple days later (RIP Annabelle ☹)

Did Annabelle cause the raw milk cheese recall back in January 2021?

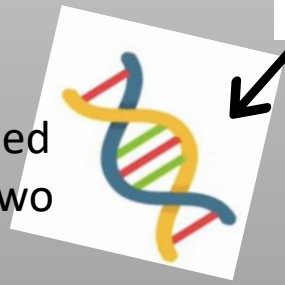
Some preliminary results:

- We have whole genome sequencing data on a raw milk isolate from Annabelle and compared its sequence to the raw milk cheese isolate from the January 5th, 2021 sampling that resulted in a recall of plant BY's raw milk cheese (whose sequence is deposited on NCBI pathogen detection tracker)

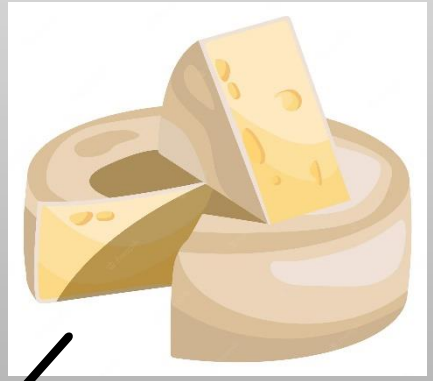
Annabelle's milk, tested on March 31, 2022

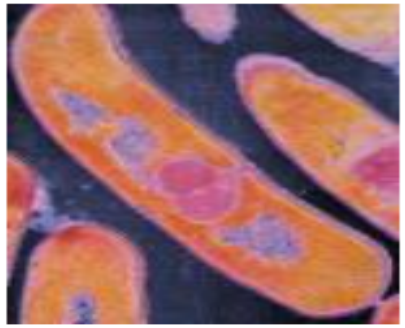


9 SNPs identified between the two isolates



Raw milk cheese tested on January 5, 2021





Listeriosis in Ruminants and Human Risk

Listeriosis, also called Circling Disease or Silage Sickness, is a disease of worldwide occurrence that can affect all ruminants as well as other animal species and humans. It is, therefore, of zoonotic importance. The causative agent is usually *Listeria monocytogenes*; however ruminants, mainly sheep, also get listeriosis from *Listeria ivanovii* infection.

L. monocytogenes is a ubiquitous, facultative pathogen that is a small, gram-positive, non spore-forming, catalase-positive, facultative anaerobic, motile rod sometimes arranged in short chains. Flagella are produced at room temperatures, but not at 37ºC. It can grow in refrigeration temperatures (4ºC - also known as cold enrichment) which is why this bacterium can cause severe food-borne infections. Sources of *L.* monocytogenes include soil, mammalian gastrointestinal tract, vegetation and silage.

Listeriosis affects all ages and sexes, but animals less than three years of age are more commonly prone to clinical disease than older animals. The bacterial disease is seen clinically in animals as one of four forms and is more common during the winter or spring months. Adult animals usually get the encephalitis form, while neonates often get the septicemic or visceral form of the disease. Cattle and sheep can also get the abortion form of the disease if there is an intra-uterine infection of the fetus. The fourth form of the disease is ophthalmitis associated with bacterial contamination of the cornea from the feed source. Some lactating ruminants may also have clinical mastitis associated with listeriosis.

The septicemic/visceral form in young animals is due to ingestion of the bacterium and primarily affects the gastrointestinal tract. Bacteria are usually found in the intestinal epithelial cells and specialized epithelial cells covering the Peyer's patches. Infection may be inapparent or may progress to bacteremia resulting in fatal septicemia.

Abortion is caused by placentitis resulting in fetal death and abortion. Some infections by *Listeria sp.* may result in fetal infection leading to stillbirths, neonatal death, or possible viable carriers of the bacteria. Listerial abortion rarely occurs with the encephalitis form of the disease.

The ophthalmic form is often associated with silage feeding and corneal contamination by the bacterium while eating. Ocular involvement may also consist of exposure keratitis if the animal has the encephalitis form with CN VII dysfunction resulting in inability of the animal to blink properly.

Mastitis caused by *L. monocytogenes* is rare but may occur. *L. monocytogenes* does not readily invade the udder. If mastitis occurs, the animal may have prolonged shedding of the bacteria in the milk.

Adult ruminants may also have the visceral form of the infection, but not have clinical disease. The bacterium is generally in the distal intestinal tract and most cases are too mild to be recognized clinically. Animals may commonly be asymptomatic intestinal carriers and shed the organism in significant numbers.

Infection by *L. monocytogenes* has been reported to be increasing in incidence and may be as high as 52% in farm animals, but overt clinical disease is considered to be rare. The disease is diagnosed clinically by the history and presenting signs with a failure of response to thiamine therapy. The most common treatment is oxytetracycline or penicillin G. Therapy works best in animals treated early in the disease process. Sheep and goats usually have an acute form of listeriosis and death occurs in 4-48 hours. Recovery is rare. Cattle, on the contrary, have a more chronic disease with survival for 4-14 days and potential spontaneous recovery with lasting brain damage.

A definitive diagnosis can only be made postmortem by histopathology of the pontomedullary region of the brainstem and by bacterial culture. Usually there are no gross lesions seen in the brain at necropsy. The characteristic microscopic lesions include multifocal asymmetrical microabscesses and mononuclear cell meningoencephalitis (thus, the name *L. monocytogenes*) in the brainstem, anterior spinal cord and, occasionally, cerebellum. Peroxidase-antiperoxidase test, a more accurate diagnostic tool than histopathology, is used to detect degraded bacterial proteins as well as intact bacteria in formalin-fixed tissue.

L. monocytogenes is transmitted from animal to animal through fecal oral routes, usually via manure contamination of the pasture or silage with the microorganism. Animal to human transmission is either directly through contact with infected animals or indirectly via milk, cheese, meat, eggs, or vegetables. The bacterium is inactivated with pasteurization; however, contamination of the pasteurized product with raw product has been reported as a source of infection.

- • Observation: **The three plants that scored highest in the questionnaire evaluating their dedication to carrying out their EMP (plants BY, CM, and N) were also the three plants in which we observed the lowest prevalence (all <10%) of Listeria in our final sampling event.**
- o Trend: showing strong dedication to carrying out an effective EMP is trended with either maintaining low Listeria prevalence (e.g., plants CM and N) or reducing Listeria prevalence (e.g., plant BY).

- • Observation: **The plants that carried out the most routine sampling for Listeria throughout the 11-13 month study period were not necessarily the plants that showed lowest prevalence of Listeria in final sampling event** (e.g., plant W and plant CQ carried out the 2nd and 3rd most routine samplings throughout the year, but still had >10% Listeria prevalence in final sampling event).
- o Trend: **Commitment to monitoring for Listeria alone is not enough for an EMP to be effective at controlling Listeria. Doing the right follow-up actions (e.g., corrections and corrective actions that actually work) are necessary for an effective EMP.**

Pearce’s ‘Paul Bunyan’ Pennsylvania Pine Processing Project

Dairy Foods Extension

Providing cutting-edge research and support to New York state's dairy industry.

https://cals.cornell.edu/dairy-extension/course-calendar

Course Name	Delivery	Course Dates	Registration Link
Introduction to Food Safety Principles in **Spanish** and **English**	Subscription model, self-paced training	Rolling Admission	Contact Louise Felker
Artisan Dairy Food Safety Plan Coaching	Self-paced online course with Virtual Office Hours	Rolling Admission	Register
Dairy Science and Sanitation in **Spanish** and **English**	Self-paced online course	Rolling admission	Register
Hazard Analysis Critical Control Points (HACCP) in **Spanish** and **English**	Self-paced online course	Rolling admission	Register
Vat Pasteurization	Self-paced online course	Rolling admission	Register
Dairy Lab Analyst Training	In-person, Ithaca Cornell campus	January 10-12, 2023	
Fluid Milk Processing for	Hybrid: Self-paced online session	Online open 01/02/23	Register

And Last but not Least:

Lester’s Lazy Life Loving Leisure at a Lakeland Lakehouse

Meanwhile to the North, Torino is plotting her retirement strategy….


WOLLERSHEIM
WINERY & DISTILLERY
Welcomes
NADRC
WOLLERSHEIM
WINERY
Ruby
Nouveau
Lake Wisconsin
Viticultural Area
Dry Red Wine
2022

Euler's Identity

$$e^{i\pi} + 1 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\int_a^b f(x)\,dx$$

$$X_k = \frac{1}{N} \sum_{n=0}^{N-1} x_n e^{i 2\pi k \frac{n}{N}}$$

$$\frac{\sqrt[n]{PA^2 + (CI \times N_c)^{\Delta}}}{\delta_{ij}}$$

$$P(H_h|E_e) = \frac{P(E_e|H_h)\,P(H_h)}{P(E_e)}$$

$$y = \sum_{i=0}^{10} x_i$$