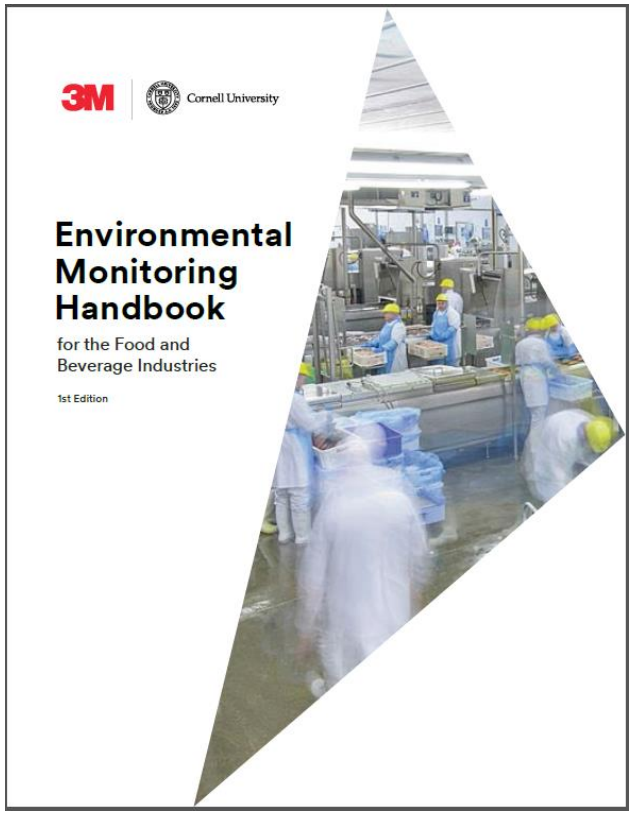

3M Food Safety

# Testing Supply Technologies for Environmental Monitoring

# Integrated environmental monitoring

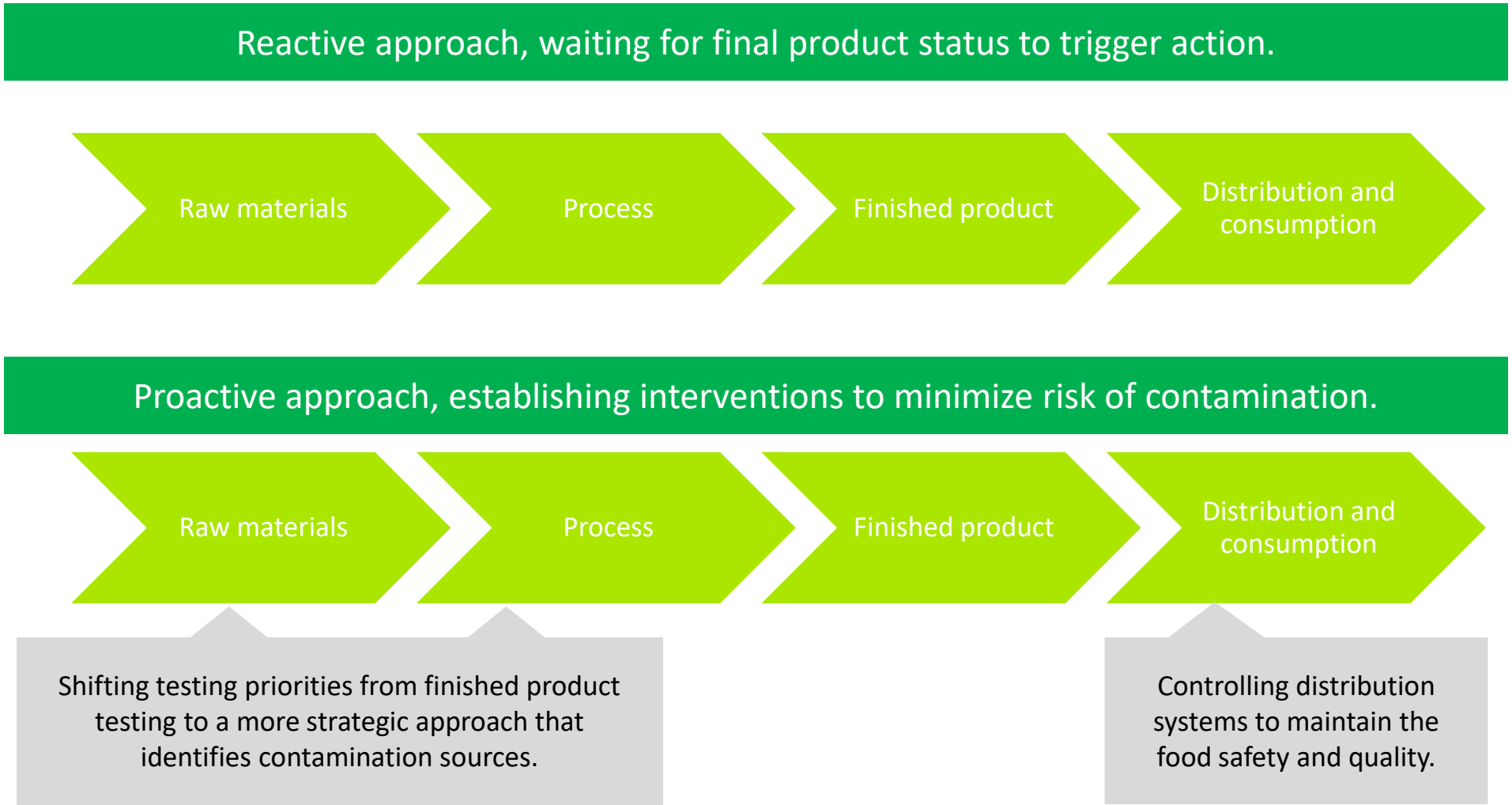
Today you'll learn about:

- Importance of environmental monitoring
- Objectives of environmental sample collection and a risk-based approach to site selection
- Guidance for building components of a holistic program, including testing for ATP, indicator and spoilage organisms, pathogens, and allergens
- Best practices for data trending




3M.com/Environmental Monitoring

# How to focus on preventing food safety issues



# What is environmental monitoring?

Sampling and testing the environment and equipment within a food manufacturing facility to prevent cross contamination of the finished product from the environment.

Environmental monitoring should be approached holistically, encompassing a range of tests to ensure both food safety and quality.

ATP Monitoring

Indicator Organisms

Pathogens

Spoilage Organisms

Allergens

# Why focus on environmental monitoring?

## Food safety events

Food safety events are often attributed to failures of Prerequisite Programs (PRPs) and not Critical Control Points (CCPs).

- Sanitation
- Sanitary design
- Personnel Hygiene
- Raw material storage

## Regulations and standards

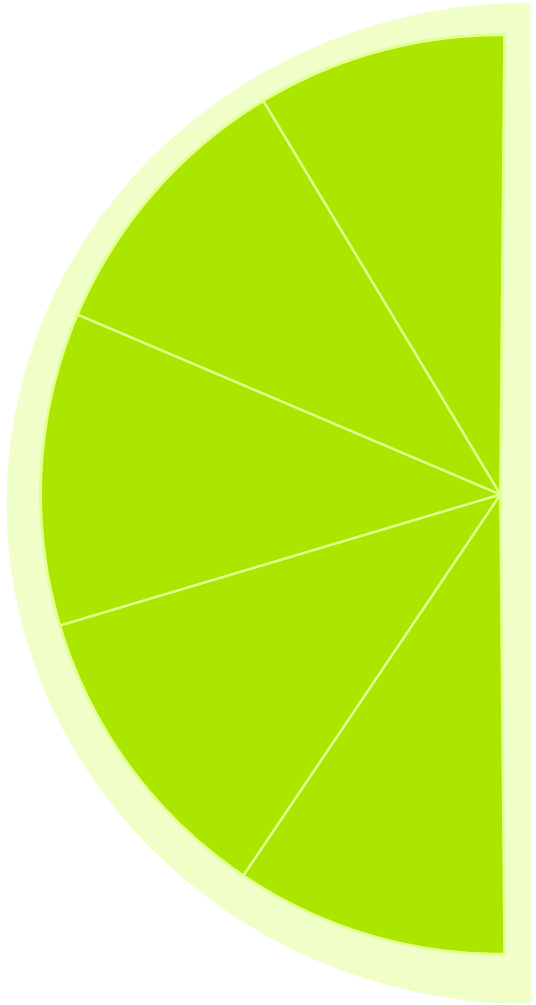
Regulations and standards are including validation and verification of activities previously considered Prerequisite Programs.

- FDA FSMA requires environmental monitoring as a sanitation verification activity, if post-lethality contamination is a risk

## Financial return on investment

- Reduce risk of product recalls
- Limit the size and scope of recalls
- Mitigate brand damage
- Possibly validate extended production run times
- Increase overall productivity in the plant

# Guidance on building an environmental monitoring program



Identify sampling sites

Determine sampling frequency

Analyze the data

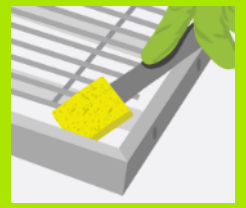
Perform root cause analysis

Implement Corrective Actions

# Selecting sampling sites using zones

## Zone 1

Food Contact Surfaces
Slicers, peelers, fillers, hoppers, screens, conveyor belts, air blowers, employee hands, knives, racks, work tables

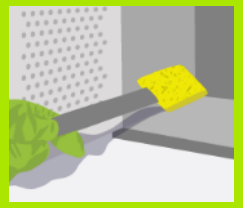


## Zone 2

Non-Food Contact Surfaces in Close Proximity to Food and Food Contact Surfaces
Processing equipment exterior and framework, refrigeration units, equipment control panels, switches

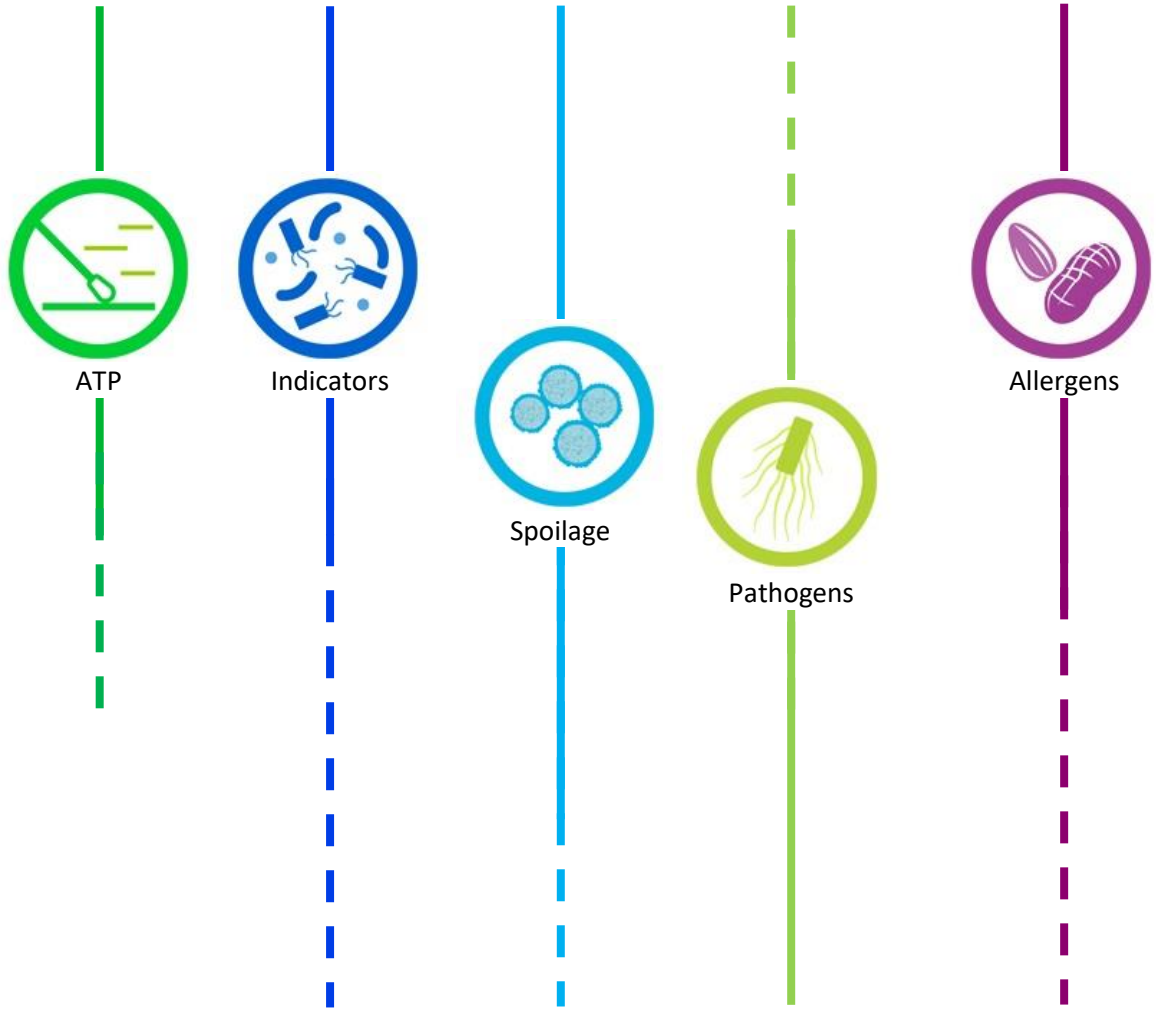
## Zone 3

More Remote Non-Food Contact Surfaces Located In or Near the Processing Areas
Forklifts, hand trucks, carts, wheels, air return covers, hoses, walls, floors, drains



## Zone 4

Non-Food Contact Surfaces Outside of the Processing Areas
Locker rooms, cafeterias, entry/access ways, loading bays, finished product storage areas, maintenance areas



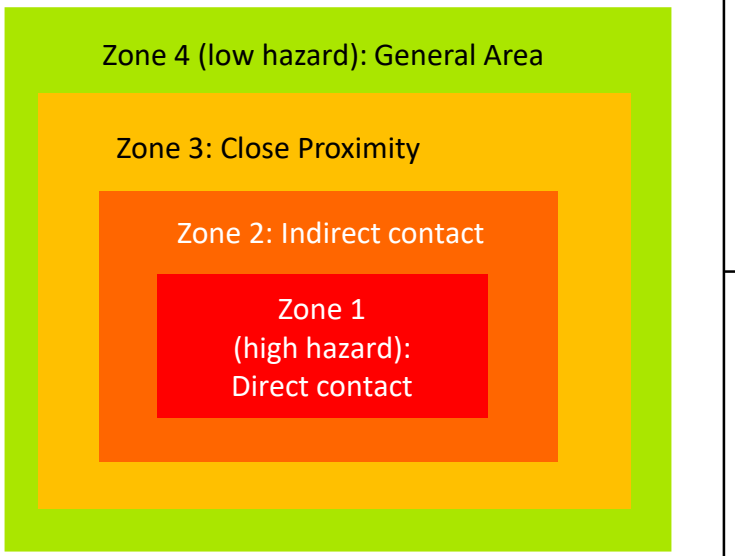

Higher focus/frequency

Lower focus/frequency

# Test point selection process:
# How do you determine which sites to swab?

## Risk-Based Approach

### How close to the food?




### How hard is it to clean?

| Hazard | Probability: Low | Probability: Medium | Probability: High |
|---|---|---|---|
| High | Once per week/month | High frequency testing | High frequency testing |
| Medium | Low frequency testing | Once per week/month | High frequency testing |
| Low | Low frequency testing | Low frequency testing | Once per week/month |

# Integrated environmental monitoring.

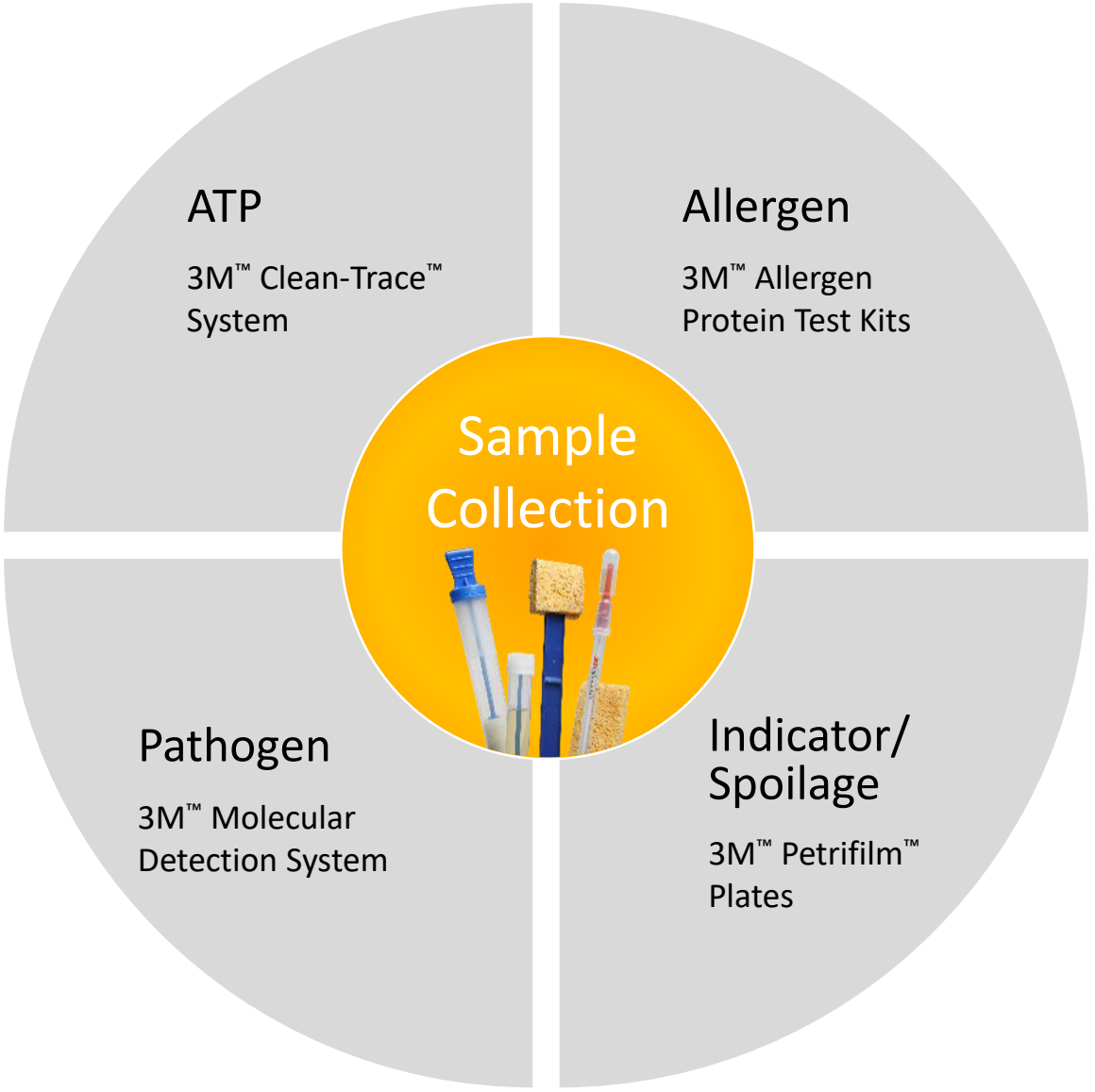
Not just ATP…

Not just Pathogens…

Not just Allergens…

Not just Indicator Organisms…

A holistic EMP should address relevant hazards in a plant!



# Sample to find

## Growth Niches

- Location that supports microbiological growth and is protected from the sanitation process
- Characterized by high microbial counts after cleaning and sanitation
- May trap nutrients or water which can promote the growth of bacteria
- Can be a potential place for the formation of biofilms

# Selection of the sample collection device

Select a sample collection device that:

- Reaches the sample target area
- Aseptically collects the sample
- Dislodges microorganisms from the surface
- Neutralizes residual sanitizer

# Selection of the sample collection device

## Sponges

Larger sampling devices and are available in a variety of formats.

Preferred choice when the area being sampled is large and readily accessible (greater than 100 $cm^2$).

Preferred if qualitative pathogen testing is to be conducted.

## Swabs

Smaller sampling devices consisting of a tip or bud for collecting the sample attached to a long flexible stem.

Due to their smaller size and ease-of-use for sampling a defined area, they are preferred for small crevices and penetrations (areas of 100 $cm^2$ or less).

Can be particularly useful for quantitative environmental testing (e.g. for indicator organisms).

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ATP

3M™ Clean-Trace™ System

Allergen

3M™ Allergen Protein Test Kits

Sample Collection

Pathogen

3M™ Molecular Detection System

Indicator/ Spoilage

3M™ Petrifilm™ Plates

# The importance of hygiene monitoring

Cleaning and sanitation to remove or prevent pathogens, spoilage microorganisms and allergens.

Hygiene monitoring to assess the effectiveness of your cleaning and sanitation programs.

Just because it looks clean, doesn't mean it is clean

- Microbiological testing (swab & plate)
- Visual Inspection
- ATP bioluminesence

All have their place in a robust hygiene monitoring program

Hygiene monitoring generates data to determine if a surface has been cleaned sufficiently and enables the high-risk decision to start food production

# ATP as a tool for hygiene monitoring

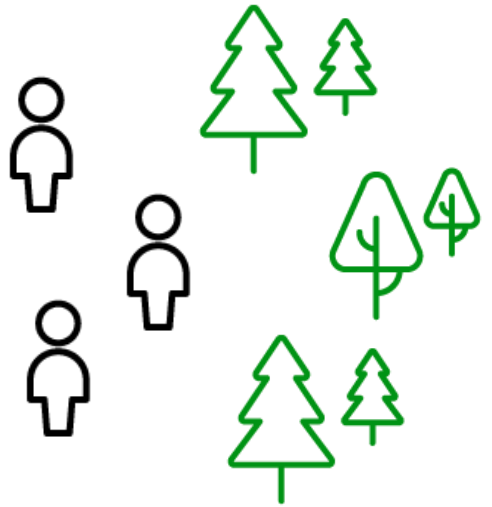
## Principle behind ATP bioluminescence

ATP = Adenosine Triphosphate
The “energy currency” molecule
of all living organisms

+

Luciferin/luciferase

Increase
In organisms or
organic residues



Increase
In ATP levels

Increase
In light (RLU)

# Sample site selection example: meat slicer

| Guard | Low | Medium | High |
|---|---|---|---|
| High | ★ | | |
| Medium | | | |
| Low | | | |

| Blade | Low | Medium | High |
|---|---|---|---|
| High | | | ★ |
| Medium | | | |
| Low | | | |

| Back Plate | Low | Medium | High |
|---|---|---|---|
| High | | ★ | |
| Medium | | | |
| Low | | | |

| Slicer Handle | Low | Medium | High |
|---|---|---|---|
| High | | | |
| Medium | ★ | | |
| Low | | | |

| Collection Area | Low | Medium | High |
|---|---|---|---|
| High | ★ | | |
| Medium | | | |
| Low | | | |

| Slice Thickness Knob | Low | Medium | High |
|---|---|---|---|
| High | | | |
| Medium | | ★ | |
| Low | | | |

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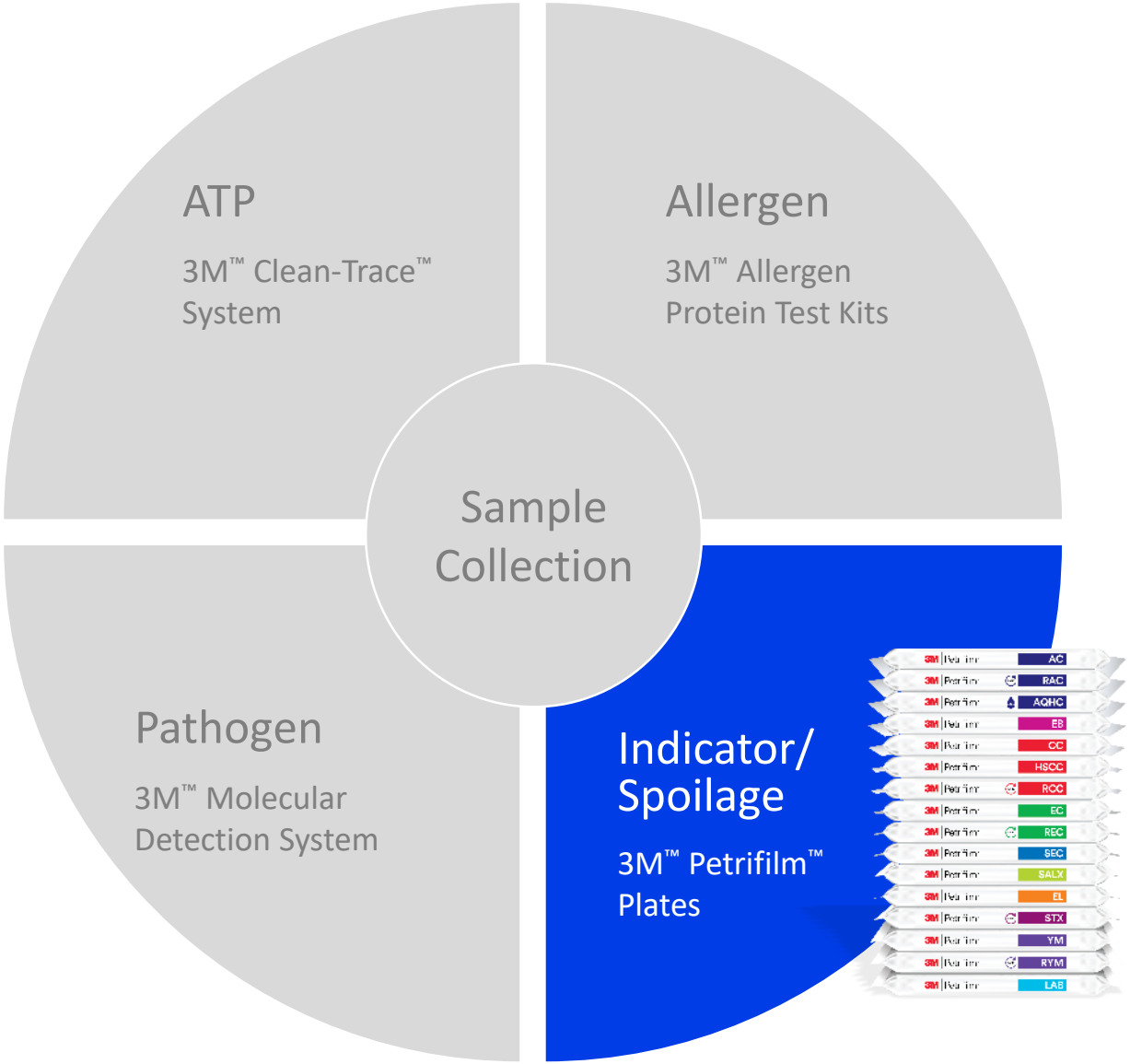

# “I use ATP, why would I need to do indicator testing?”

ATP verifies

Cleaning

Indicators validate and verify

Sanitization

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Organisms can exist in sites where sanitizer is not able to reach.

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If the processing environment is under control, indicator organisms will be under control.

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# Spoilage and indicator organisms

## Indicators

Help us to determine hygienic status of the processing equipment and environment.

Validate and verify sanitation and process control steps.

- Total Plate Count
- Coliforms
- *Enterobacteriaceae*

## Spoilage

EMP allow companies to take a proactive approach to microbial spoilage, rather than retrospectively addressing failures as they arise.

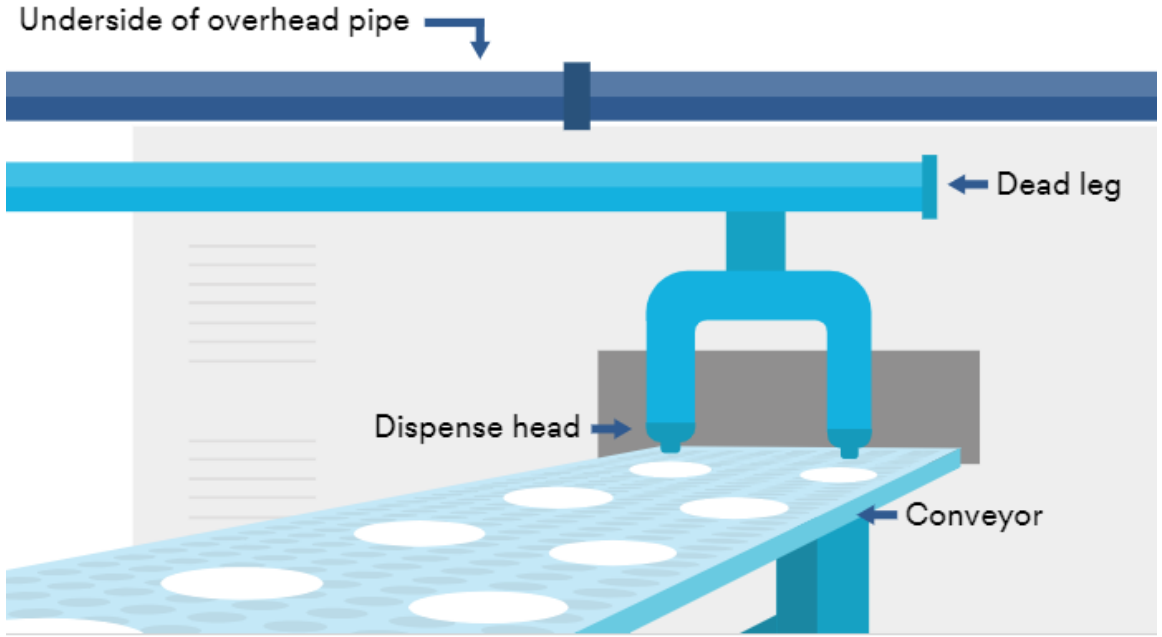
- Total Plate Count
- Yeast and Molds
- Lactic Acid Bacteria

Environmental Monitoring Handbook for the Food and Beverage Industries. 1st. Ed. 3M and Cornell University. 2019.

# Identify **sources of contamination and sampling sites**

## Sources

- Cross-contamination of sources outside the production area or in process (water)
- Ingredients and raw materials
- Atypical activities (change in cleaning chemicals, new personnel)
- Equipment design/repairs
- Part wear




## Frequency and application

- After each sanitization cycle and before starting production (useful strategy to perform data trending)
- Pre-production: run the equipment (conveyor belts) before sampling to have a better chance of collecting residual microorganisms that remained after the sanitization process
- During production: ideally 3-4 hours into run or at multiple time points
- After non-routine activities such as construction or maintenance

Environmental Monitoring Handbook for the Food and Beverage Industries. 1st. Ed. 3M and Cornell University. 2019.

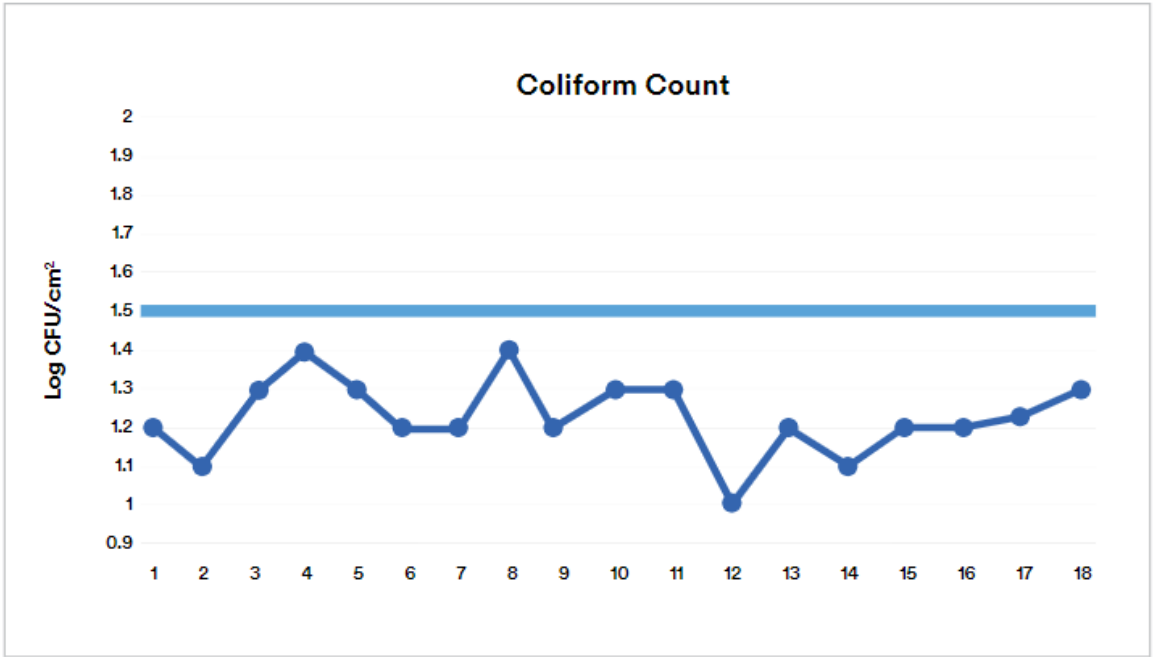
# Continuous improvement

Monitoring for indicator and spoilage organisms is beneficial in that the quantitative results allow for baseline determination which defines the acceptable limits and analysis of trends.

This allows for:

- Identification of a failure point that triggers an investigation and a root cause analysis
- Action before a failure point is reached
- Understanding of seasonality effects
- Identify opportunities for operational and product improvements

**Figure 2.** Example of coliform counts and baseline-level post-sanitation




Take the time to analyze results in order to gain the full benefit of implementing environmental monitoring for indicator and spoilage organisms.

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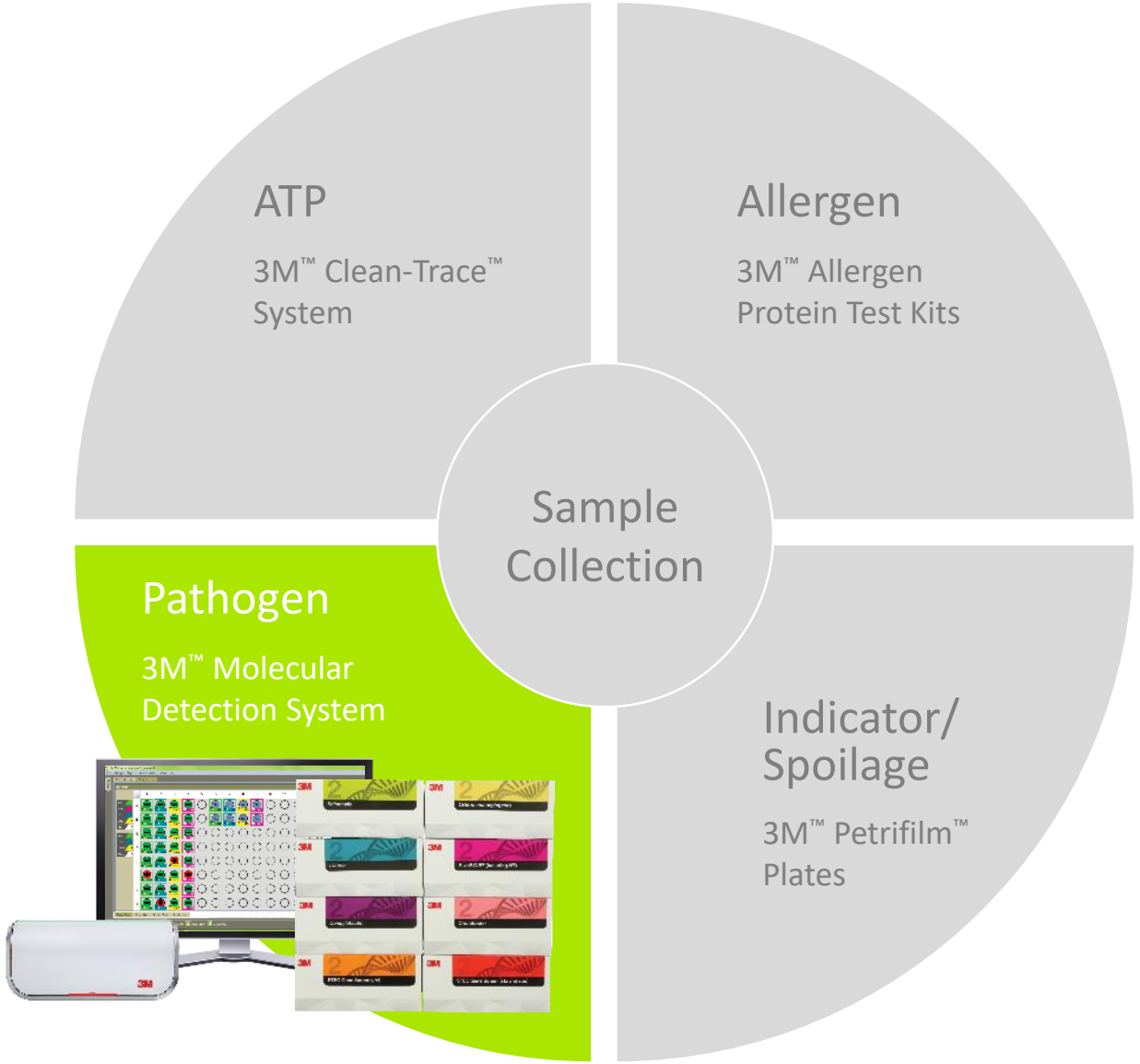
A holistic EMP addresses relevant hazards in a plant!



# Key parameters of pathogen environmental monitoring

Risk-Based Approach

| | |
|---|---|
| What to Test For | What microorganism?<br>What makes sense based on product/process?<br>Consider regulatory and customer requirements. |
| What to Test | Swabs, sponges, dust, air, scrapping material, product residue etc.<br>Remember sample collection/sample maintenance. |
| Site Selection | Explore and mapping the entire plant, identify posible sampling sites, potential niches, sites of accumulation, sites with high traffic etc. |
| Site List | Representation of all possible sampling sites.<br>It does not imply all have to be sampled every time. |

# Sample to find

# Be aware of the square inch or $cm^2$ mentality.

Many training materials and even government guidance documents specify a certain area that should be sampled (typically 12 × 12 in or 30 × 30 cm).

Remember that these are guidelines, as virtually all potential niches that should be sampled as part of an environmental monitoring program are not square or even flat areas.

If sampling sites are not easily accessible, a swab may be more suitable.

# If a positive is found

Before start testing for pathogens, you need to get ready for a positive.

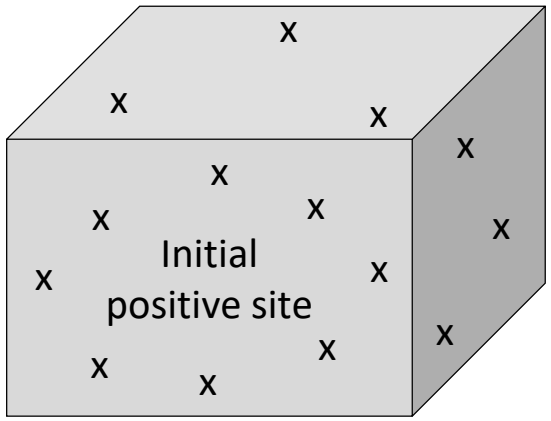
Documented

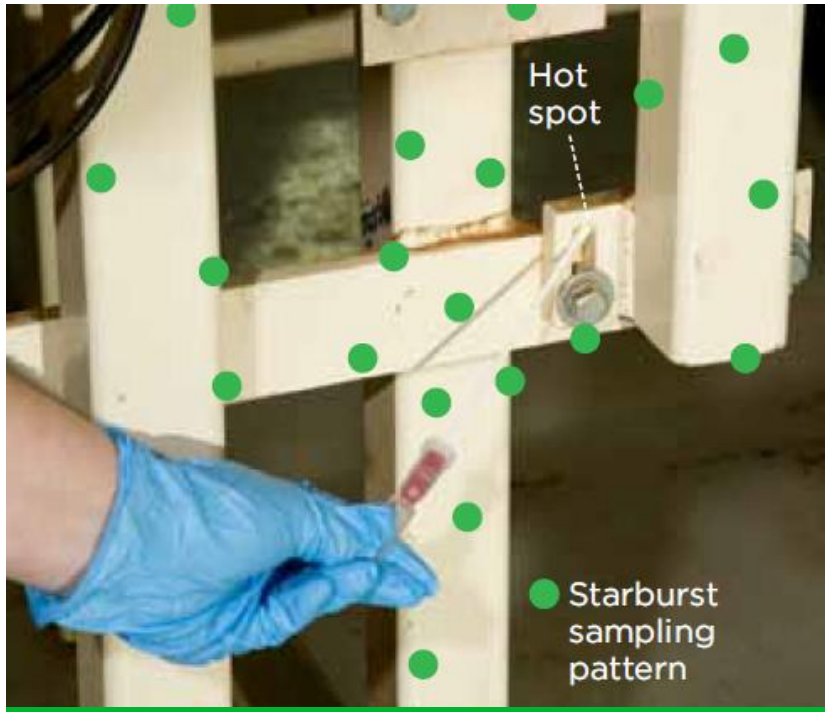
- Action plan ready for immediate corrective actions by zone.
- Action plan to verify the absence of a pathogen from an area after a positive finding.
- Action plan to execute root cause analysis and establish preventive actions.

Recommended to execute with a presumptive result (e.g., DNA-based test)

# If a positive is found

- Thorough examination of the area
- Visual examination
- Vector swabbing




Vector sponge/swab sampling starburst pattern around the initial *Salmonella* presumptive positive site

Use a starburst pattern
Radiate from initial positive site in all directions (3D).

Collect additional 10–15 samples.

Analyze separately.

Do not composite or pool the samples.

Source: *Almond board of California. Pathogen Environmental Monitoring.*

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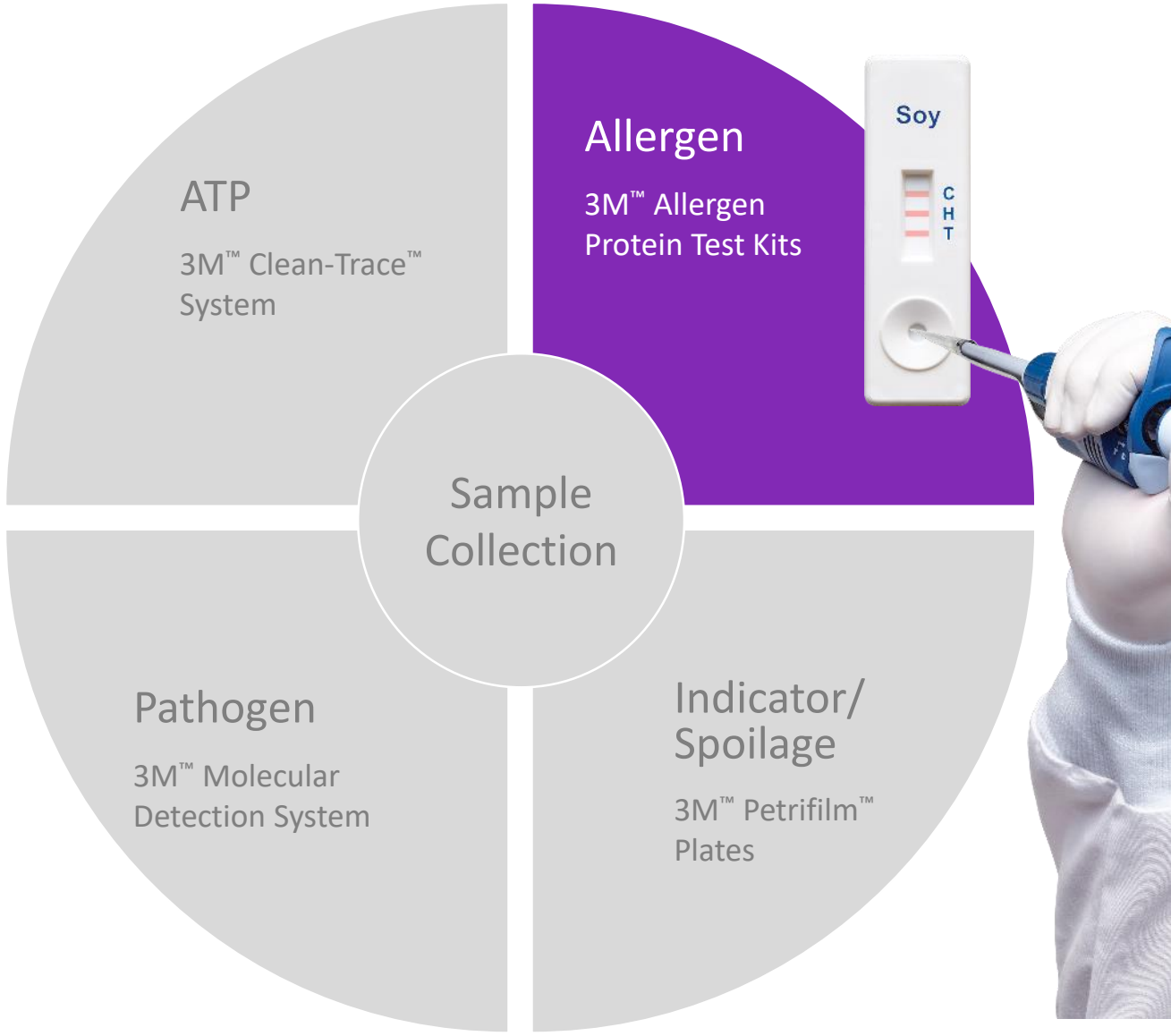
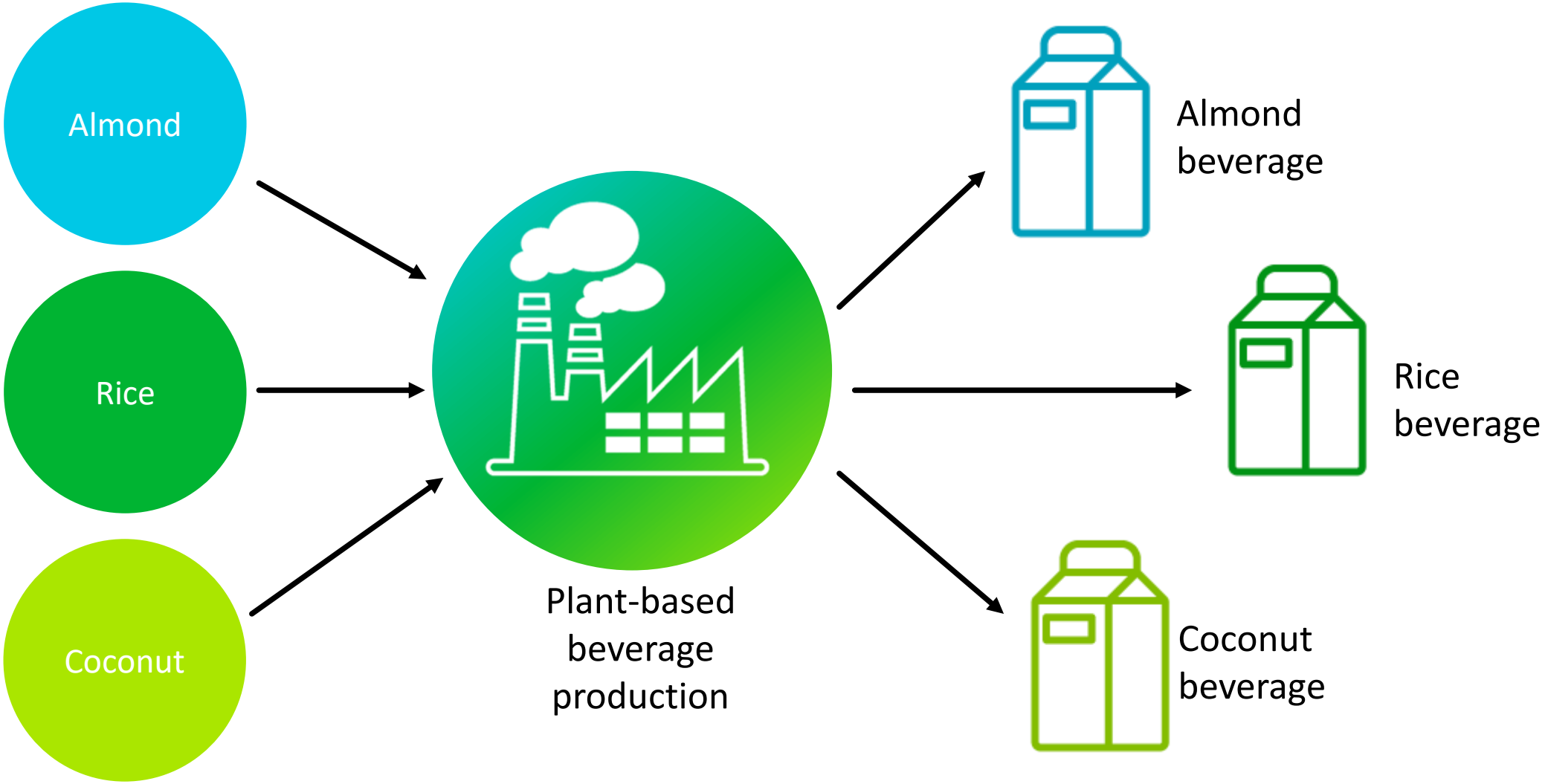


# Cross-contact contamination with allergens



# Root cause analysis/investigation testing

## Zones 1 and 2

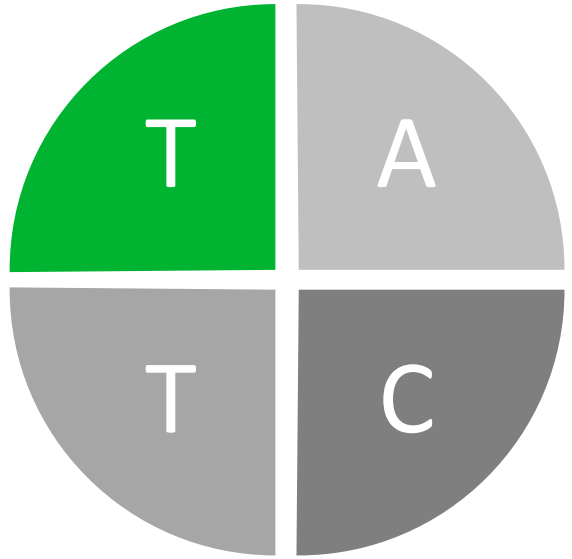
How has the cleaning failed?

What needs to be changed to prevent failure again?

## Zones 3 and 4

How did the product get there?

People, traffic, construction, spatter, drift, fans, HVAC?




## TACT Every day, every time

Time enough time for effective cleaning

Action sufficient mechanical action supplied

Chemical type/concentration

Temperature too hot/too cold

# Allergen detection methods

## Non-specific test

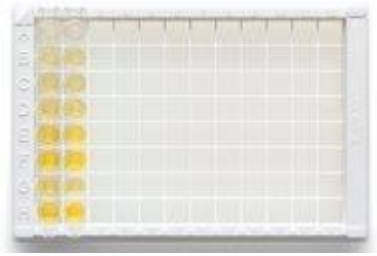
### ATP test swabs


### Non-specific protein swabs

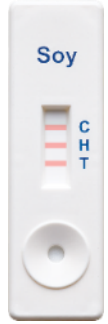

- Non-specific
- Indirect measurement
- Application: Cleaning procedure verification of complex (ingredient) production lines

## Specific protein test

### Quantification and detection of specific protein



### Qualitative detection of specific protein




- Highly specific and selective
- Direct measurement of specific proteins
- Application: Validation and verification of cleaning procedures

# Integrated environmental monitoring generating knowledge to act

An Environmental Monitoring Program results in an abundant source of data.
What do we do about it?

**Data**
Facts and figures which rely on something specific, but which are not organized in any way

| | | | |
|---|---|---|---|
| 120RLU | 945RLU | 119RLU | 120RLU |
| 110RLU | 132RLU | 987RLU | 110RLU |
| 107RLU | 156RLU | 771RLU | 107RLU |
| 605RLU | 123RLU | 98RLU | 605RLU |

*Yordem, B (2018) Using Hygiene Monitoring Data to Meet Regulation and Optimize Processes and Resources. 3M Food Safety.*

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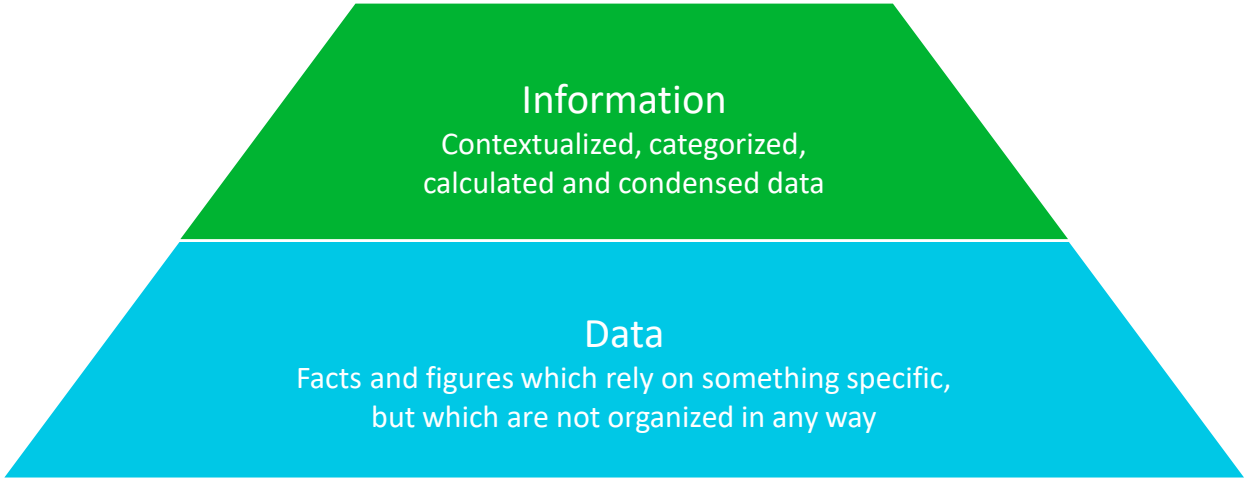


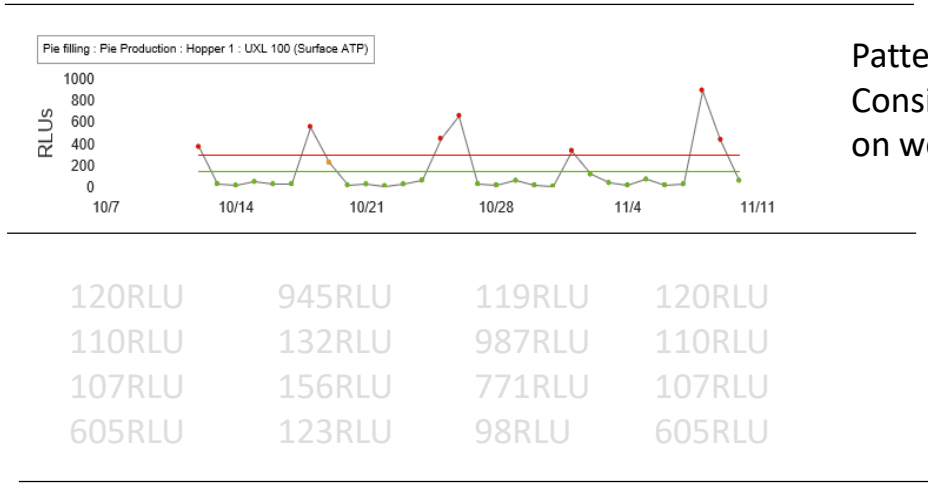


Pattern:
Consistent fails on weekends

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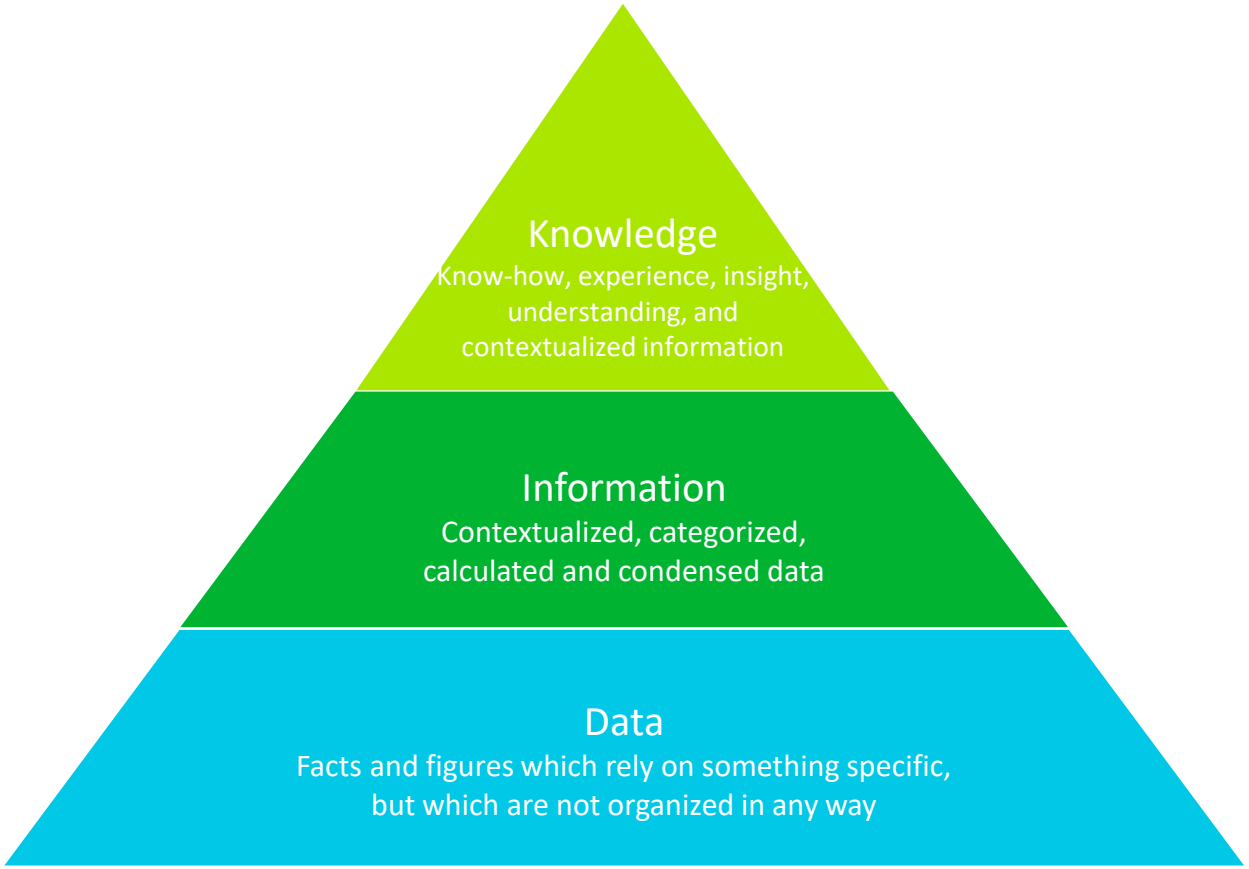
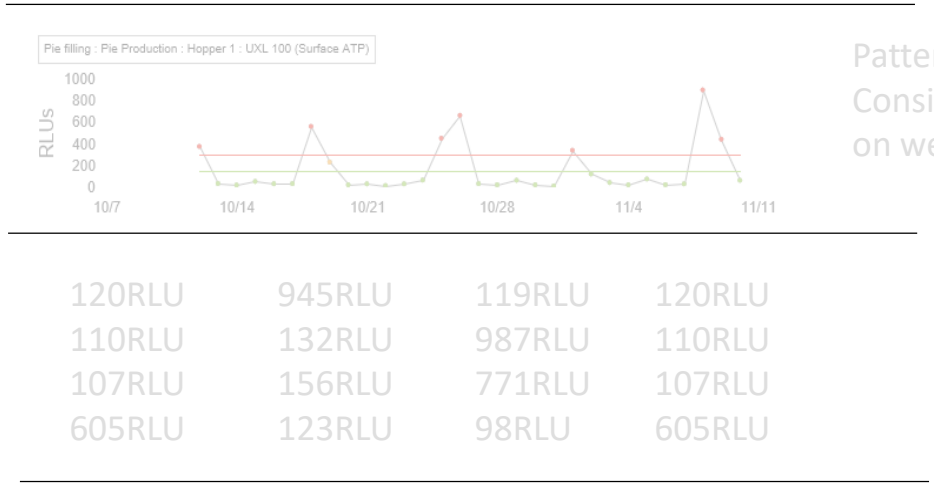



- Change in staff over the weekend is not following protocol properly
- Additional training or oversight is required

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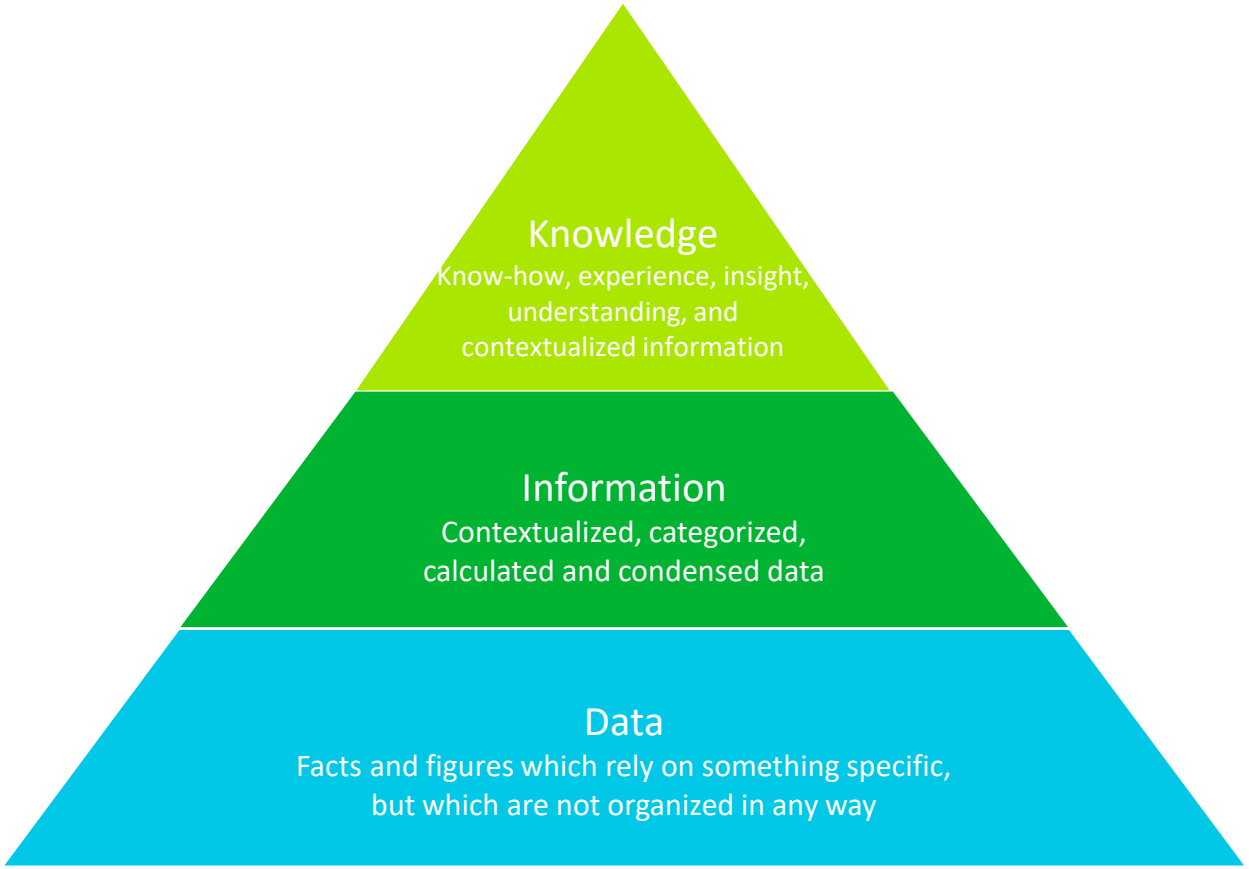


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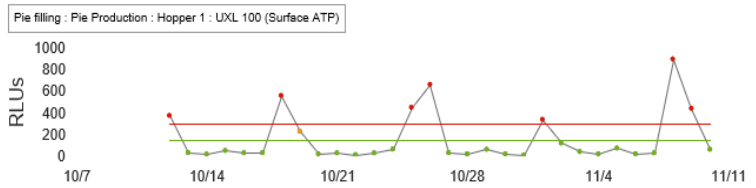


Pattern:
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| | | |
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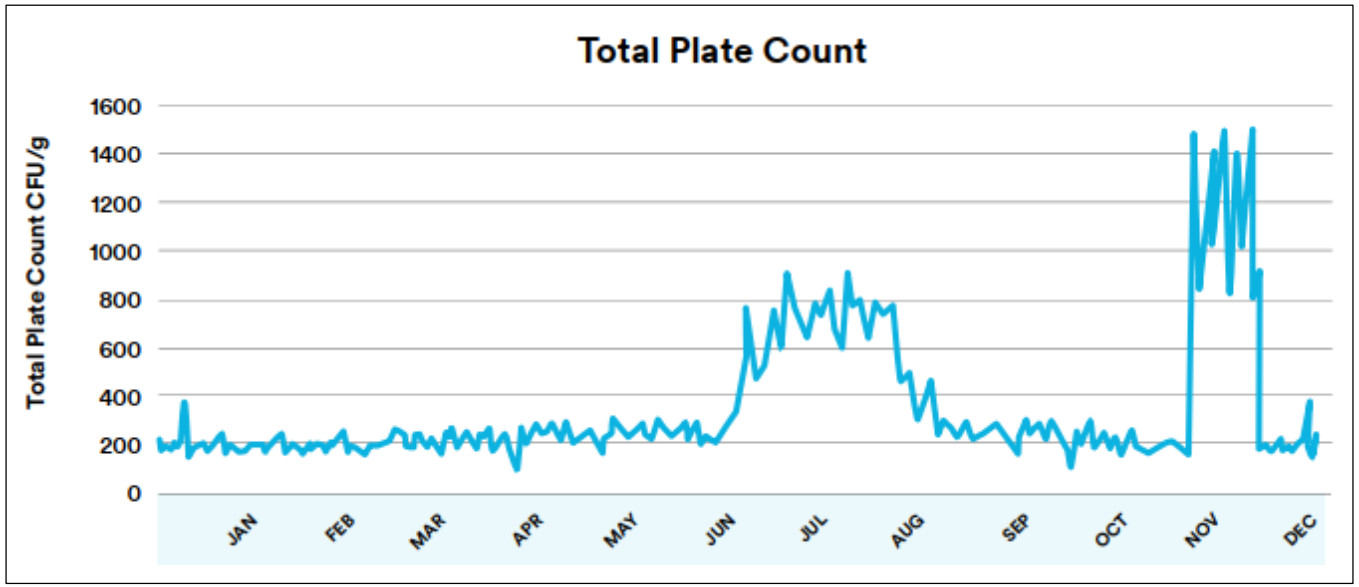
# Trending

| Define these to improve clarity. |
| --- |
| Who will track and analyze the data? |
| Who will review the data, and when? |
| Will upper management support corrective actions? |
| How will the findings be shared within the company? |
| Who is accountable, who is a stakeholder? |

| Consider the big picture of the plant when analyzing data. |
| --- |
| Temporary construction project |
| Changes to activities/sanitation processes/raw material |
| New equipment/personnel |
| New QA staff still learning how to sample |
| Seasonal variation |



# Supporting a food safety culture

Sharing information enables:

- Staff to see their positive impacts on performance and that goals are being met
- Management to recognize and reward staff
- Management to communicate opportunities for improvement

Supports employee involvement and communication.

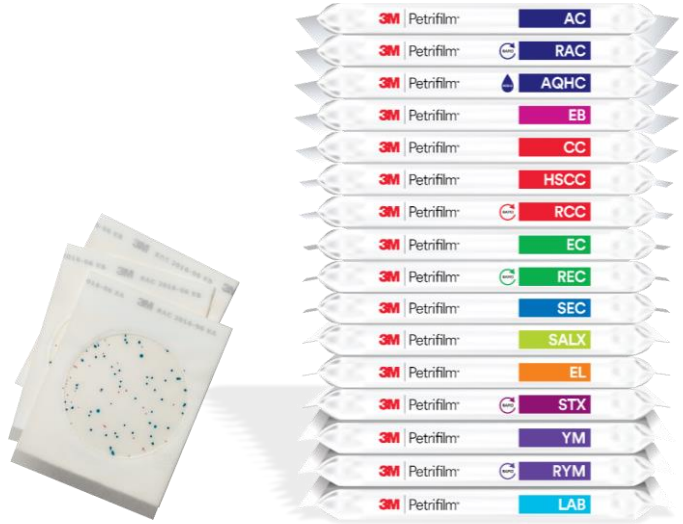

3M Food Safety

# Microbiological Solutions and Technology

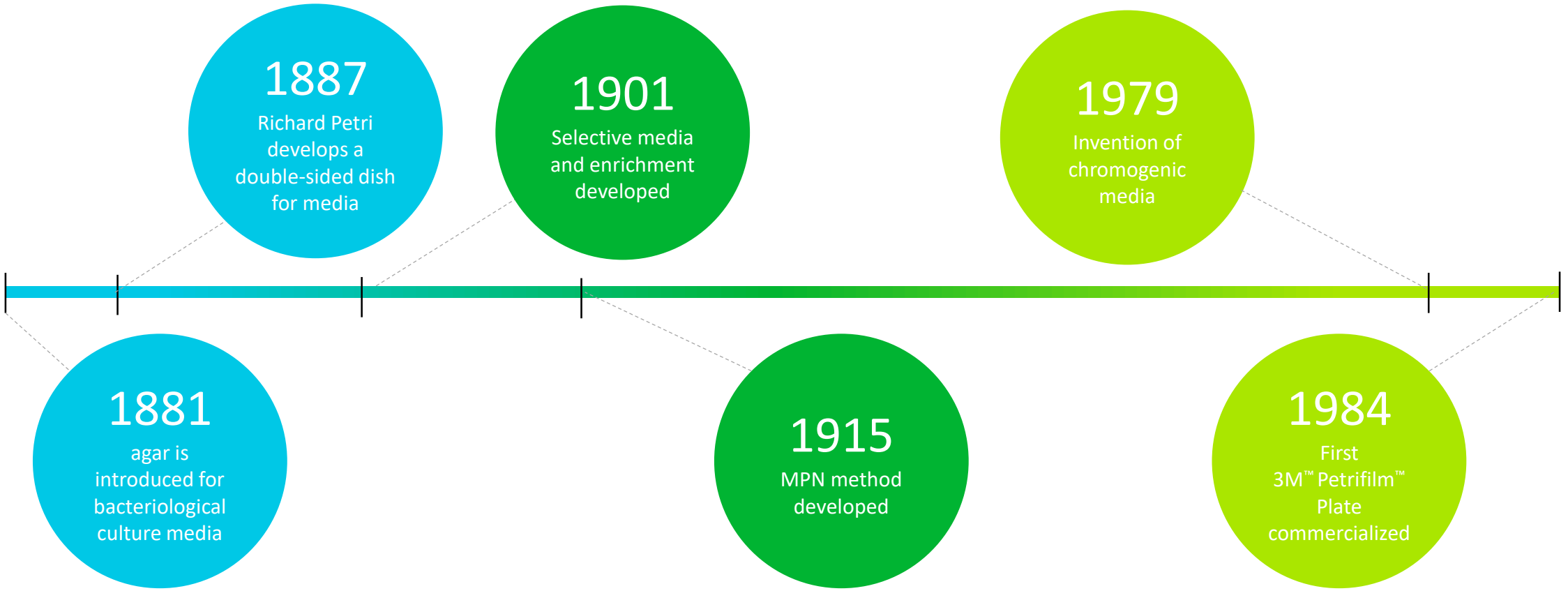
# Agenda

I. Evolution of Quantitative Microbial Methods

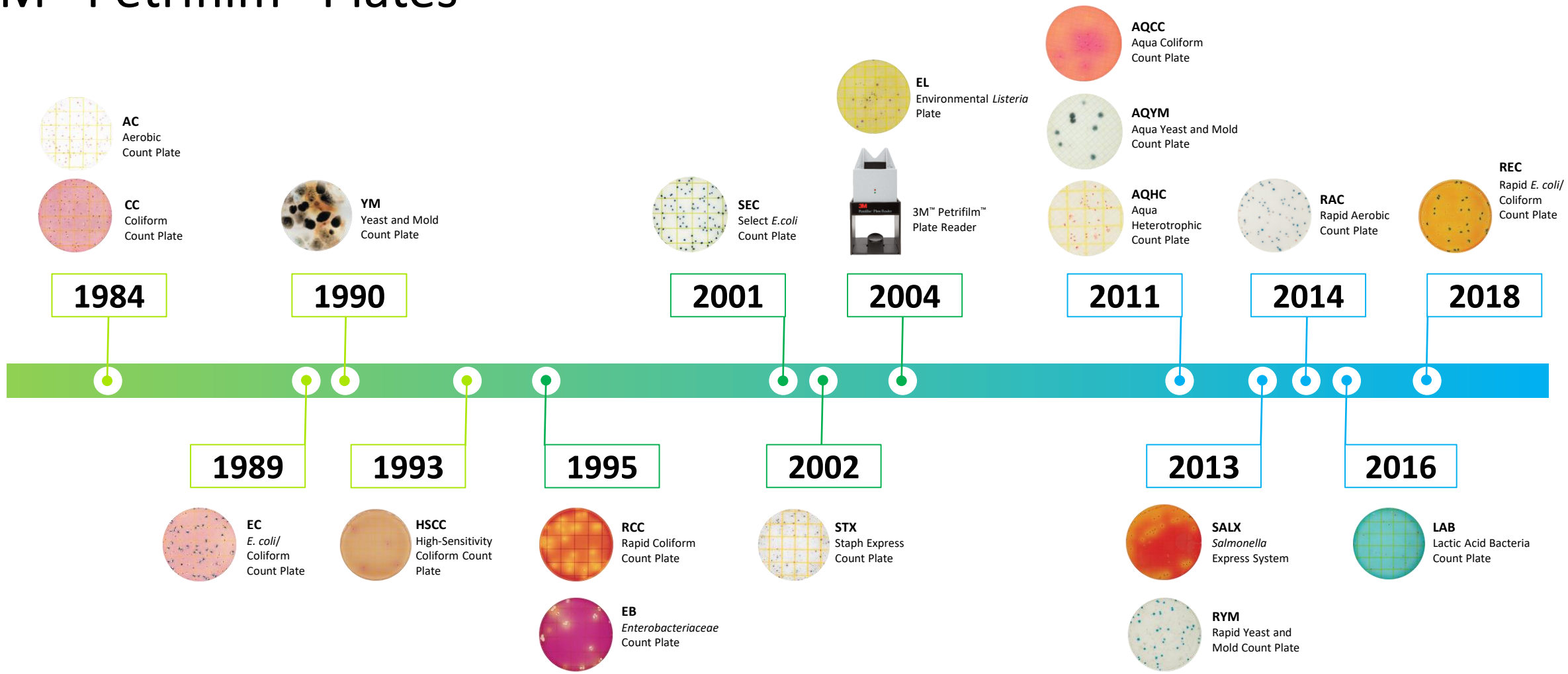
II. Evolution of Pathogen Detection Technologies




# Microbial enumeration and biochemical differentiation: A very brief timeline.



# History of Innovation
# 3M™ Petrifilm™ Plates



# Identify a need: What problem can we solve?

75% less greenhouse gas emissions

75% less energy use

66% less waste

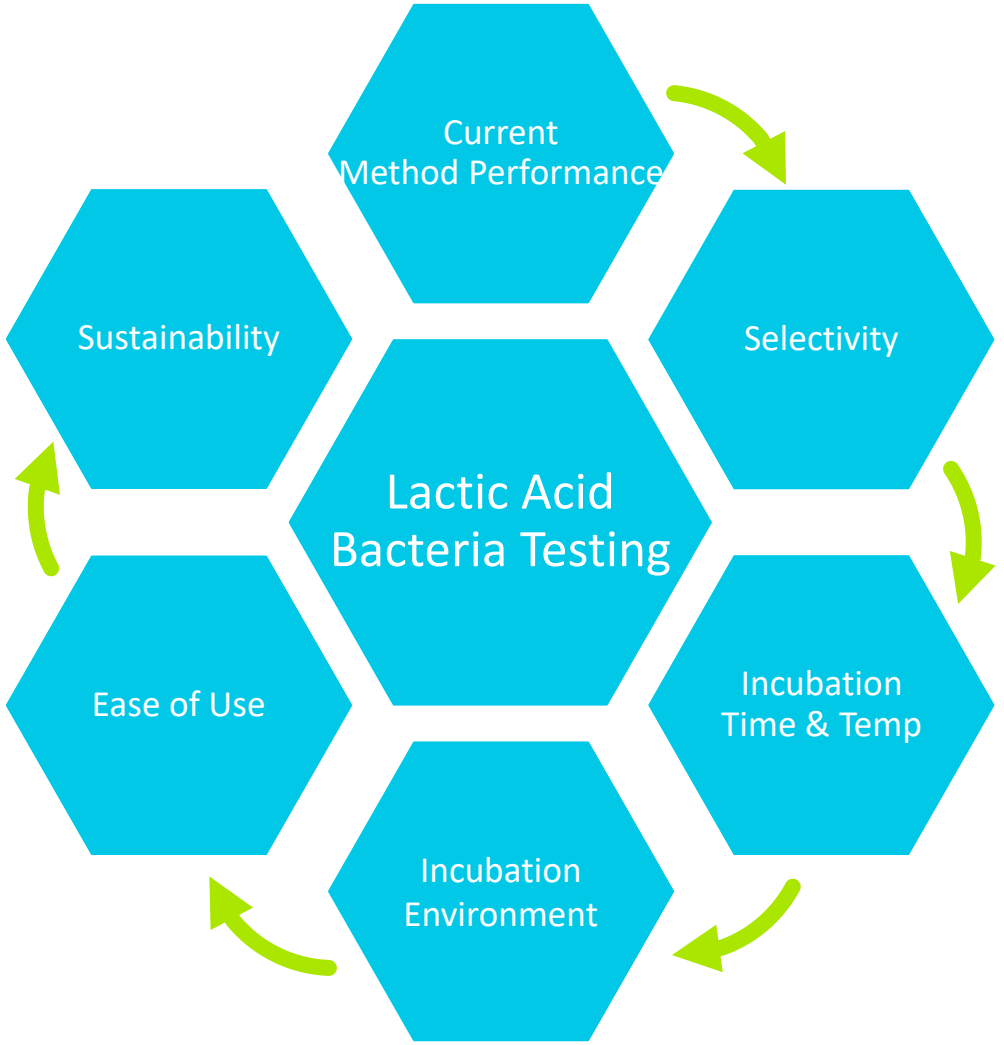
80% less water

Gas ID without Durham tubes

No pH adjustment

No special diluents

No agar preparation




ISO 15214

"Bacteria which form colonies at 30C in a solid selective media (MRS at pH 5,7) under the test conditions specified in [ISO 15214] international standard." (1998)

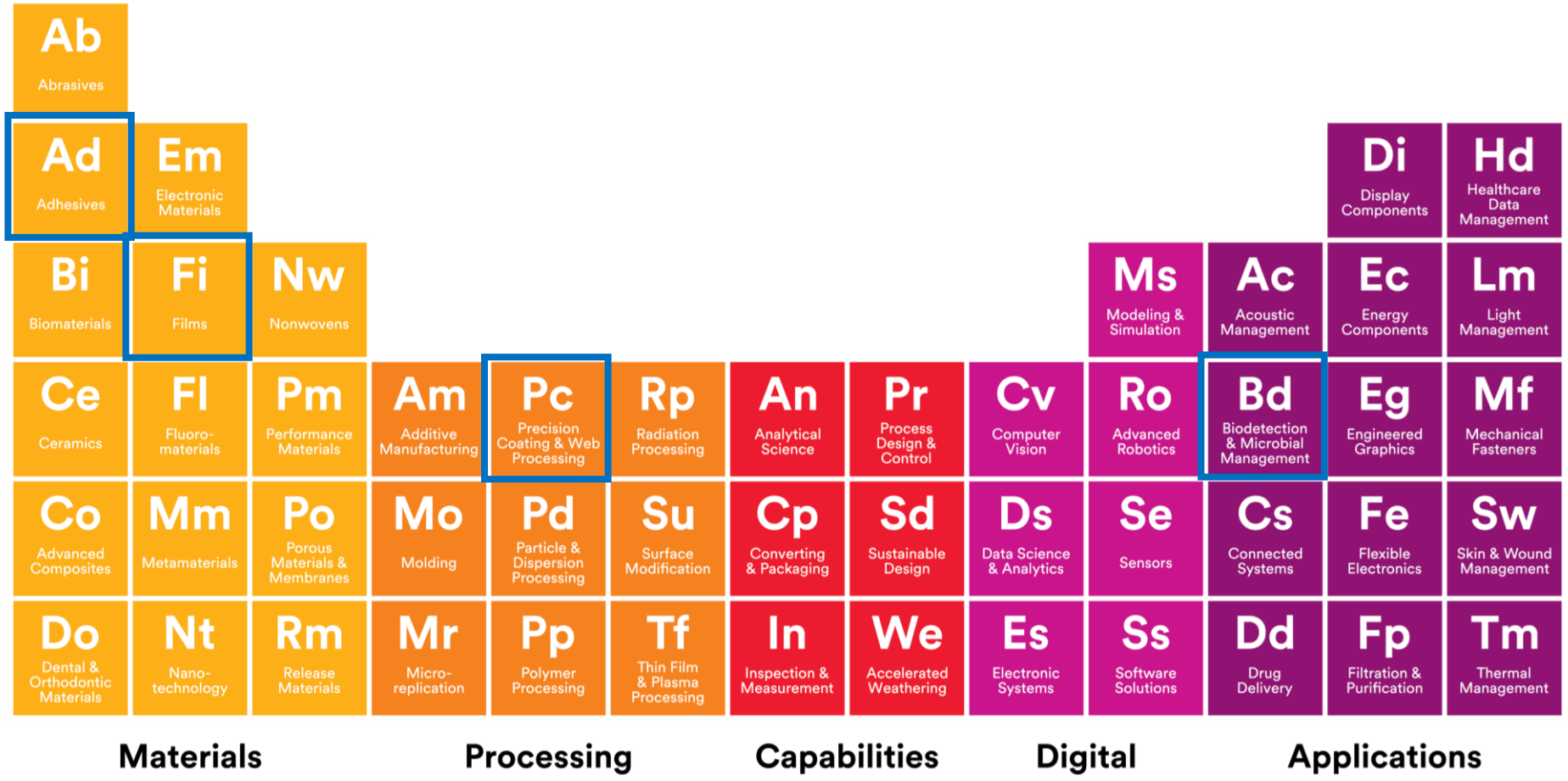
Compendium of Methods for the Microbiological Examination of Foods, 4th edition

"non-spore forming, non-respiring cocci or rods, which produce lactic acid as the major end-product during fermentation of carbohydrates. Historically this group has included the genera *Lactobacillus, Leuconostoc, Pediococcus* and *Streptococcus*."

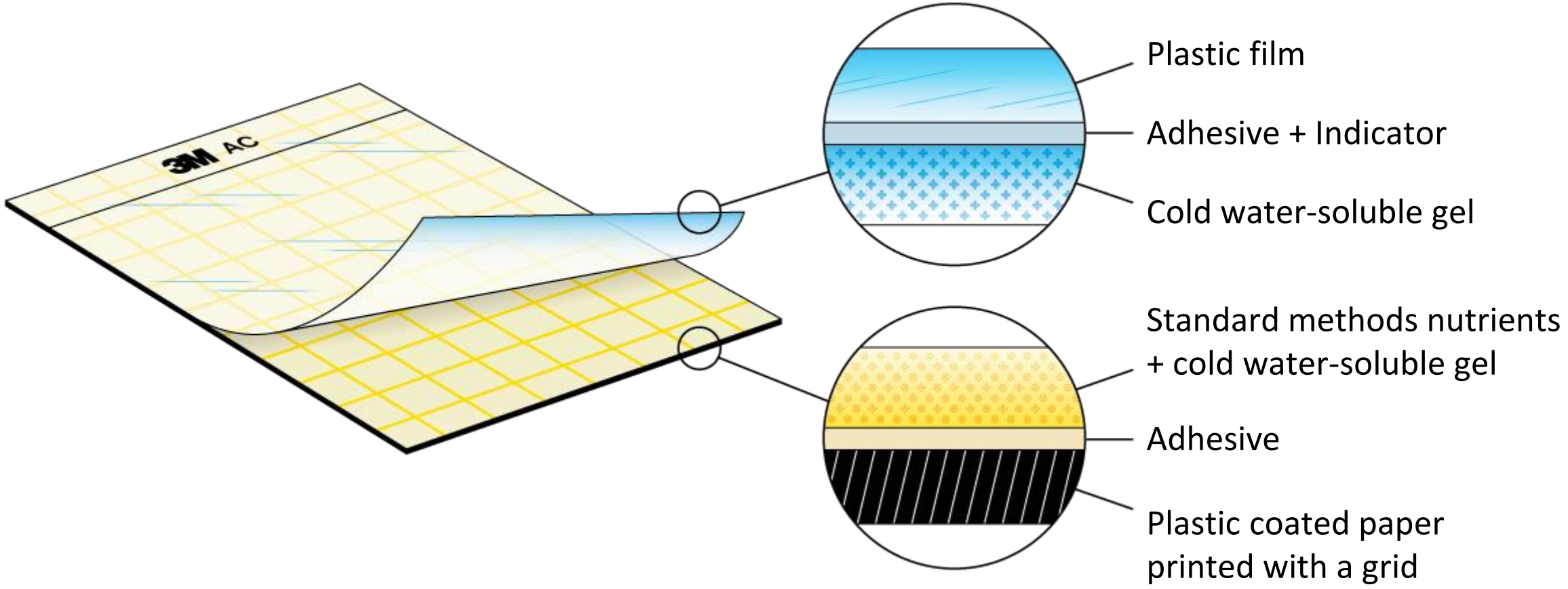
Standard Methods for the Examination of Dairy Products, 17th edition

"Lactic acid bacteria found in dairy products are a diverse group consisting of primarily of *Streptococcus*, *Lactococcus*, *Leuconostoc*, and homofermentative and heterofermentative *Lactobacillus* species."

# 3M Technology Platforms

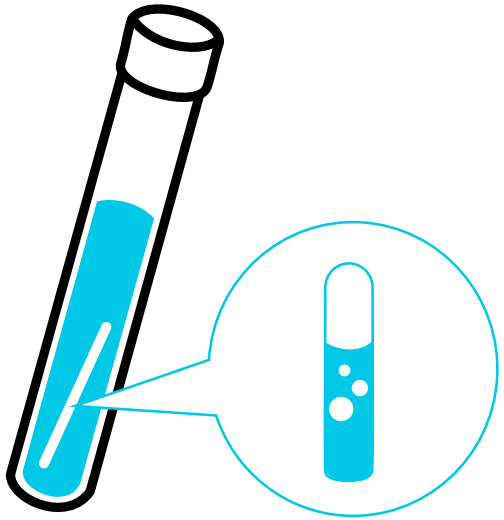


# 3M™ Petrifilm™ Aerobic Count Plate construction

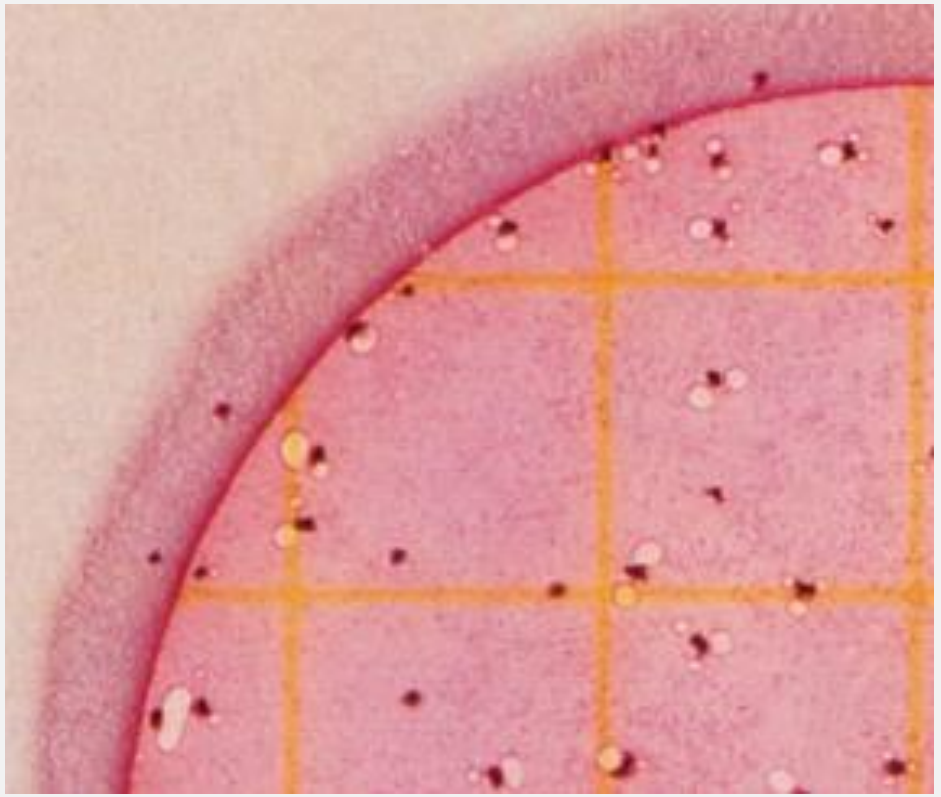



Product illustration is for demonstration purposes only.

# A new way to detect gas and confirm results



Coliform is not a taxonomic classification but rather a work definition used to describe a group of Gram-negative, facultative anaerobic rod-shaped bacteria that ferment lactose to produce acid and gas within 48 h at 35°C.



Confirmed Result

# Creating the optimal environment

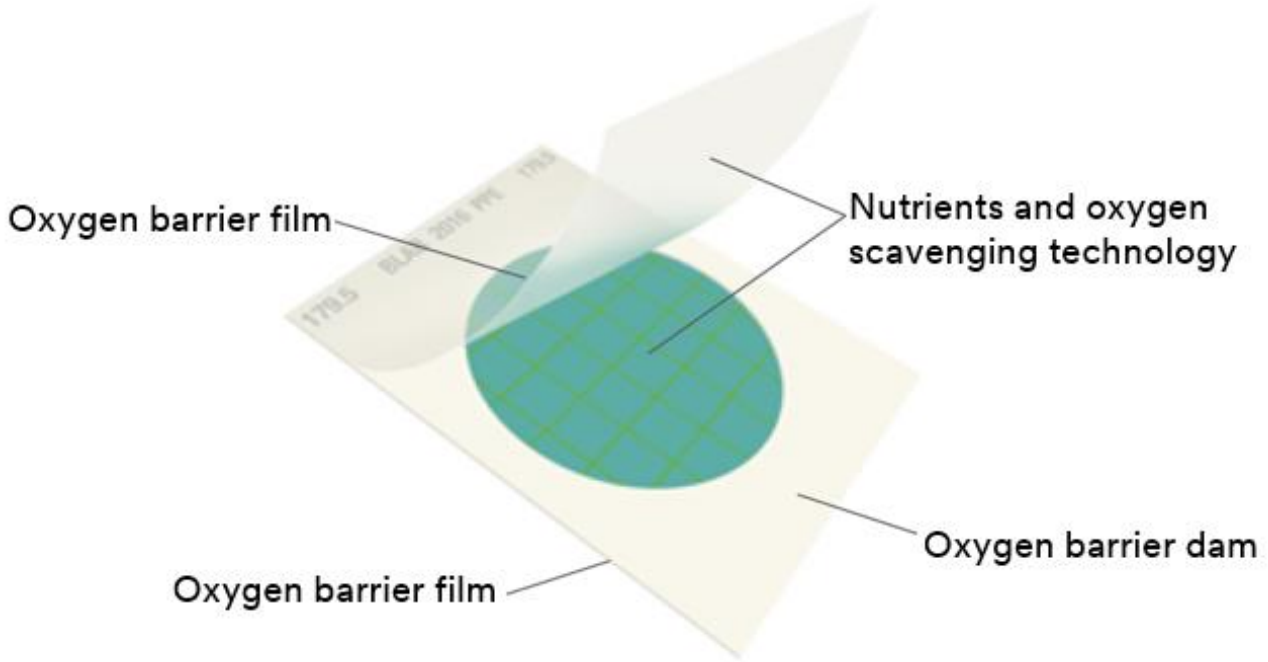
## Aerobic

- Products developed for organisms that grow in environments containing oxygen contain films that are gas permeable.

## Anaerobic

- Organisms such as lactic acid bacteria grow in the presence of oxygen but thrive in the absence.
- When developing the 3M™ Petrifilm™ Lactic Acid Bacteria Count Plate the inventors sought after new technology to contain a self-contained anaerobic environment.

Anaerobic made easy.
The first self-contained anaerobic plate for lactic acid bacteria testing.



# Validations for 3M™ Petrifilm™ Plate Methods

More than **105** global validations

## International Recognition

### AOAC® Performance Tested Method℠

Environmental *Listeria Plates*
*Certificate #030601*

Aqua Coliform Count Plates
*Certificate #091101*

*Salmonella* Express System
*Certificate #061301*

Rapid Yeast and Mold Count Plates
*Certificate #121301*

Rapid Aerobic Count Plates
*Certificate #121403*

Lactic Acid Bacteria Count Plates
*Certificate #041701*

*Rapid E.coli*/Coliform Count Plates
*Certificate #051801*

### AOAC® *Official Method of Analysis℠*

Aerobic Count, Coliform Count Plates
*AOAC 986.33, AOAC 989.10*

High-Sensitivity Coliform Count Plates
*AOAC 996.02*

Aerobic Count Plates
*AOAC 990.12*

Coliform Count, *E.coli*/Coliform Count Plates
AOAC 991.14

Yeast and Mold Count Plates
*AOAC 997.02*

Rapid Coliform Count Plates
*AOAC 2000.15*

*E.coli*/Coliform Count Plates
*AOAC 998.08*

*Enterobacteriaceae* Count Plates
*AOAC 2003.01*

*Salmonella* Express System
*AOAC 2014.01*

Staph Express System
*AOAC 2003.07, AOAC 2003.08, AOAC 2003.11*

Rapid Yeast and Mold Count Plates
*AOAC 2014.05*

Rapid Aerobic Count Plates
*AOAC 2015.13*

### AFNOR or MicroVal Certification (following ISO 16140-2)

Aerobic Count Plates
*3M 01/01-09/89*[2]

Rapid Aerobic Count Plates
*3M 01/17-11/16*[2]

Coliform Count Plates
*01/02-09/89 A*[2], *3M 01/02-09/89 B*[2], *3M 01/02-09/89 C*[2]

Select *E.coli* Count Plates
*3M 01/08-06/01*[2]

Rapid Coliform Count Plats (14 hour result)
*3M 01/05-03/97 A*[2]

Rapid Coliform Count Plates (24 hour result)
*3M 01/05-03/97 B*[2]

*Enterobacteriaceae* Count Plates
*3M 01/06-09/97*[2]

High-Sensitivity Coliform Count Plates
*3M 01/07-03/99*[2]

Staph Express System
*3M 01/09-04/03 A*[2], *3M 01/09-04/03 B*[2]

Rapid Yeast and Mold Count Plates
*3M 01/13-07/14*[2]

Lactic Acid Bacteria Count Plates
*3M 01/19-11/17*[2]

Rapid E. coli/Coliform Count Plates
*2017LR76*

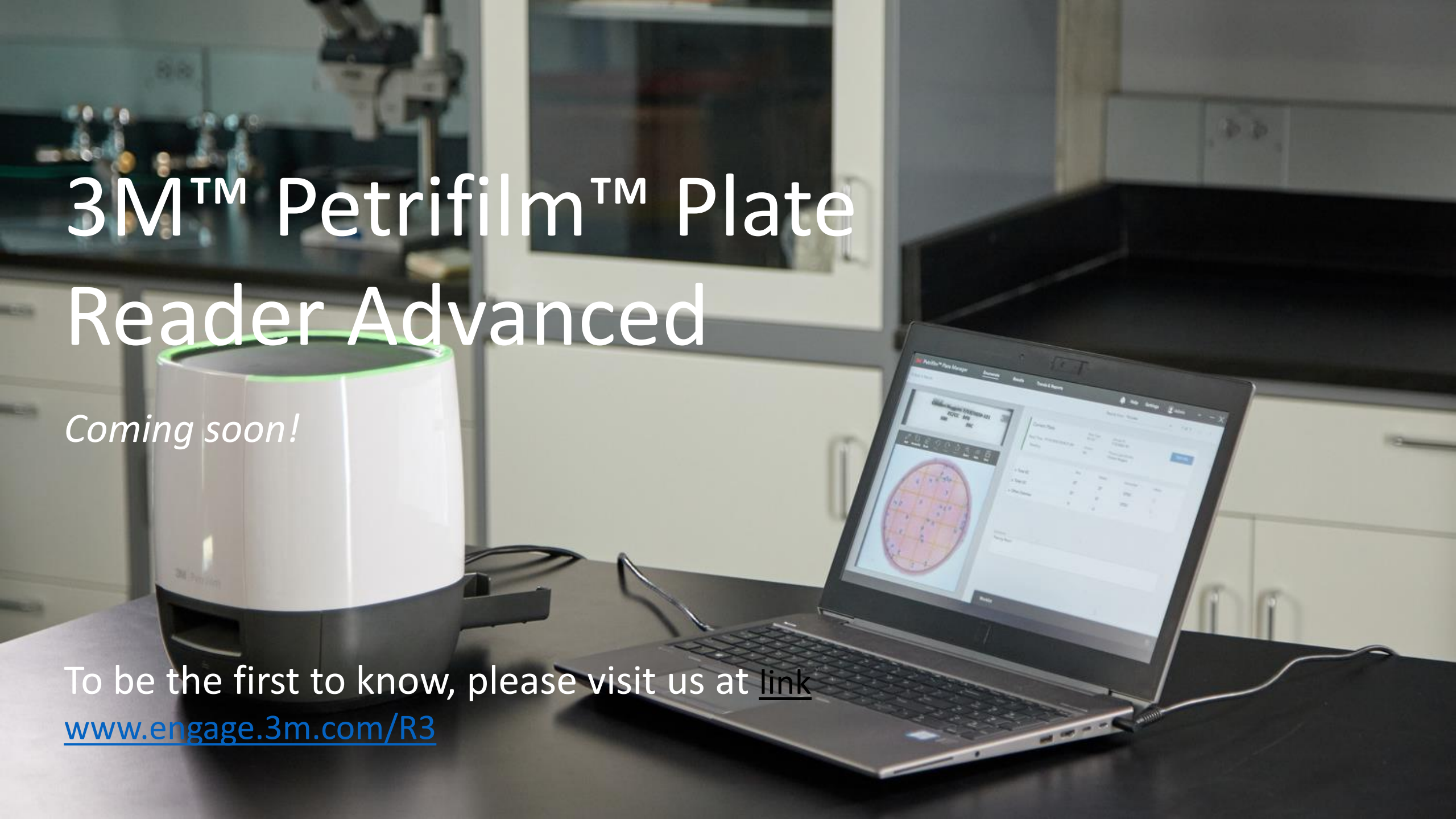
### United States Industry Recognition

US FDA (United States Food and Drug Administration) Agricultural Marketing Service

| | | |
|---|---|---|
| Milk | Aerobic Count Plates<br>Coliform Count Plates<br>High-Sensitivity Coliform Count Plates<br>Rapid Aerobic Count Plates<br>3M™ Petrifilm™ Plate Reader | *FDA Evaluation of Milk Laboratories,* 2017 Revision: https://www.fda.gov/media/115265/download |

USDA FSIS (Food Safety and Inspection Service)

| | | |
|---|---|---|
| Examination of fresh, refrigerated and frozen prepared meat, poultry and pasteurized egg products | Aerobic Count Plates<br>*E.coli*/Coliform Count Plates<br>Enterobacteriaceae Count Plates | *Microbiology Laboratory Guidebook,* Chapter 3.01, Quantitative Analysis of Bacteria in Foods as Sanitary Indicators. January 20, 2011 |



# 3M™ Petrifilm™ Plate Reader Advanced

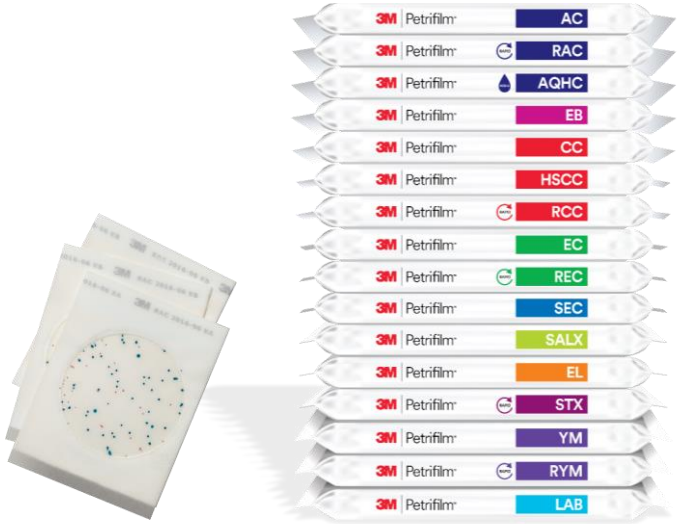
*Coming soon!*

To be the first to know, please visit us at link
www.engage.3m.com/R3

# Agenda

I. Evolution of Quantitative Microbial Methods

II. Evolution of Pathogen Detection Technologies




# Foodborne pathogens

Pathogen: A bacterium, virus, or other microorganism that can cause disease.

- In most cases these microorganisms should be absent in a food or water sample
- Typically used as a qualitative assessment (presence/absence) to determine the microbiological safety
- For certain foodborne pathogens and particular food segments, a quantitative assessment may be necessary (Example: *Staphylococcus aureus, Bacillus cereus* and *Campylobacter)*

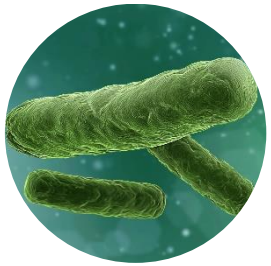
## Common foodborne pathogens

*Salmonella*

*Listeria monocytogenes*

*Campylobacter spp.*

*E. coli*

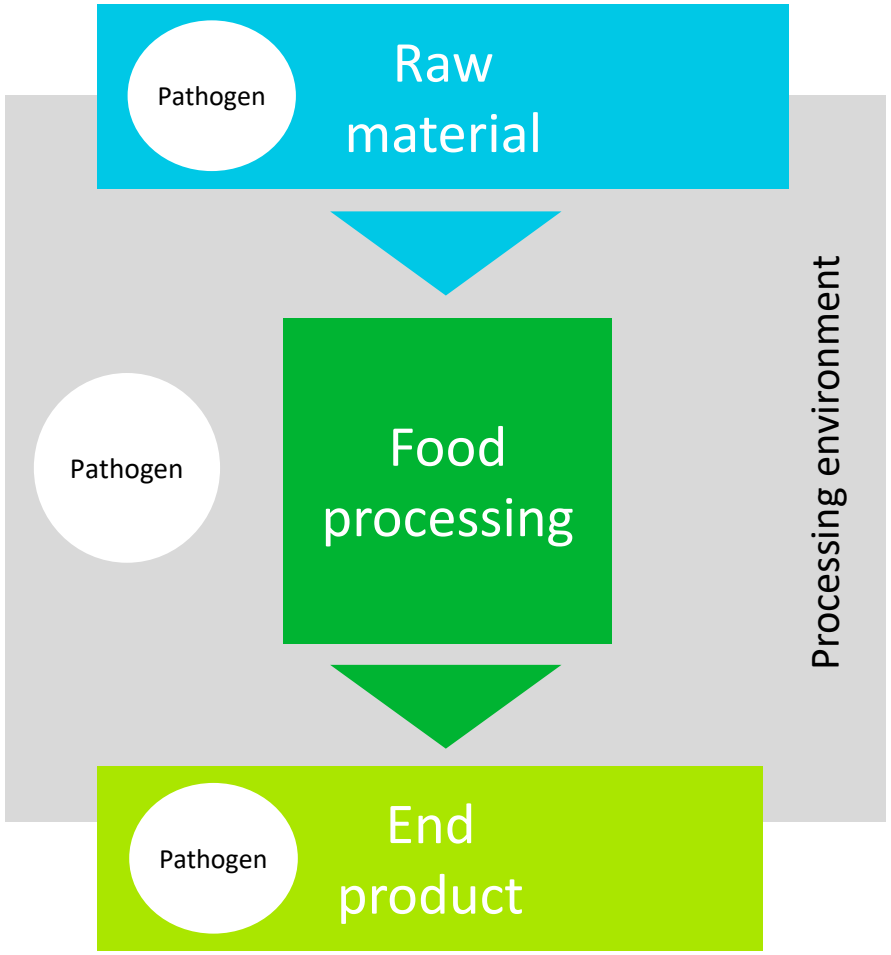


*Cronobacter*

## Other foodborne pathogens

- *Vibrio spp.*
- *Shigella*
- *Bacillus cereus*
- *Clostridium botulinum*
- Norovirus

# Pathogen testing



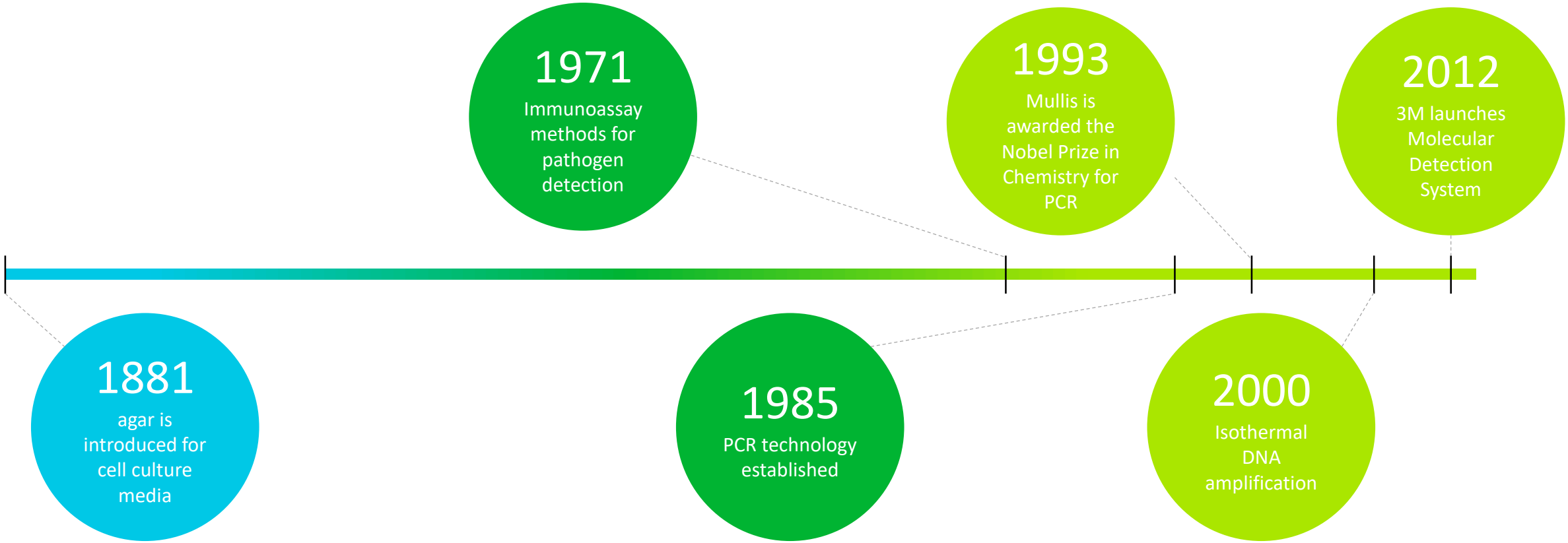

## To prevent foodborne illness

- Pathogen testing is an important element of food safety plans
- Increased trend in pathogen testing for incoming raw materials and food production environment

## Measures to prevent contamination of end product

- Preventing the entrance of contaminated foods
- Monitoring the presence of indicators or pathogenic microorganisms in the food production environment
- Final product testing as part of the release criteria

# Pathogen detection: A very brief timeline



# Pathogen detection overview

1 **Sample Collection**

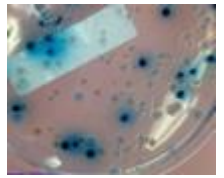
Collect sample and make sure it is maintained intact until analysis

2 **Enrichment**

Allows for recovery and growth of a target organism to facilitate detection

3 **Detection**

Determine through a specific method if target organisms are present



4 **Confirmation**

Confirm the result obtained in the detection step

*Note: Rapid methods (molecular and immunoassay) give presumptive positive results*

# Methods of pathogen detection

## Culture Method

Time consuming

Labor intensive

Look for specific metabolic traits

- Resistant to a particular antibiotic
- Ability to grow in the presence of a particular chemicals (salt, bile etc.)
- Ability to utilize a particular chemical or nutrient

Rely on SELECTIVE media to determine the presence of pathogens

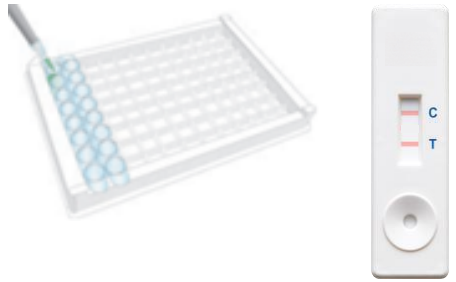
## Rapid

Results in less time

Reduce cost of operation with faster turnaround time

Immuno-based assays

- ELISA
- Immunochromatographic or dipstick assays




DNA-based assays

- PCR
- Isothermal DNA amplification

# The 3M™ Molecular Detection System

# Three main elements of 3M™ Molecular Detection System

The 3M™ Molecular Detection Assays use Loop-Mediated Isothermal Amplification (LAMP) to amplify specific regions of the DNA with high sensitivity and specificity.

1

An optimized enrichment protocol that will allow the growth and recovery of a target pathogen.

2

Specific 3M Molecular Detection Assays which provide all elements for sample preparation and DNA detection.


*Salmonella*
*Listeria monocytogenes*
*Listeria spp.*
*E. coli* O157:H7
*Cronobacter*
*Campylobacter*
STEC (2)

3

The 3M Molecular Detection Instrument for amplifying the DNA and the software to detect DNA amplification.

# Simplified for Productivity

| 3M Method *Salmonella* | **3M Method *E. coli* O157** (including H7) STEC Gene Screen | 3M Method *Listeria* | 3M Method *Listeria monocytogenes* | 3M Method *Cronobacter* | 3M Method *Campylobacter* |
|---|---|---|---|---|---|
| 37°C ±1°C or 41.5°C ±1°C 18-30 h | 41.5°C ±1°C 10-24 h | 37°C ±1°C 24-32 h | 37°C ±1°C 24-32 h* | 37°C ±1°C 18-24 h | 41.5°C ±1°C 22-28 h |
|  |  |  |  *Raw dairy matrices require 40 h |  |  |

One protocol for all pathogen targets

Transfer 20 µL enriched sample to lysis tube.

Heat 15 minutes – 100°C ±1°C.
Cool 5 minutes on block at room temperature.

Transfer 20 µL lysate to reagent tubes containing lyophilized pellet.

Place tubes in instrument.
Start run.
Amplification & detection in 15-75 minutes.
Automated & color-coded real-time results.

*Note: Refer to the assay product instructions for specific protocols*

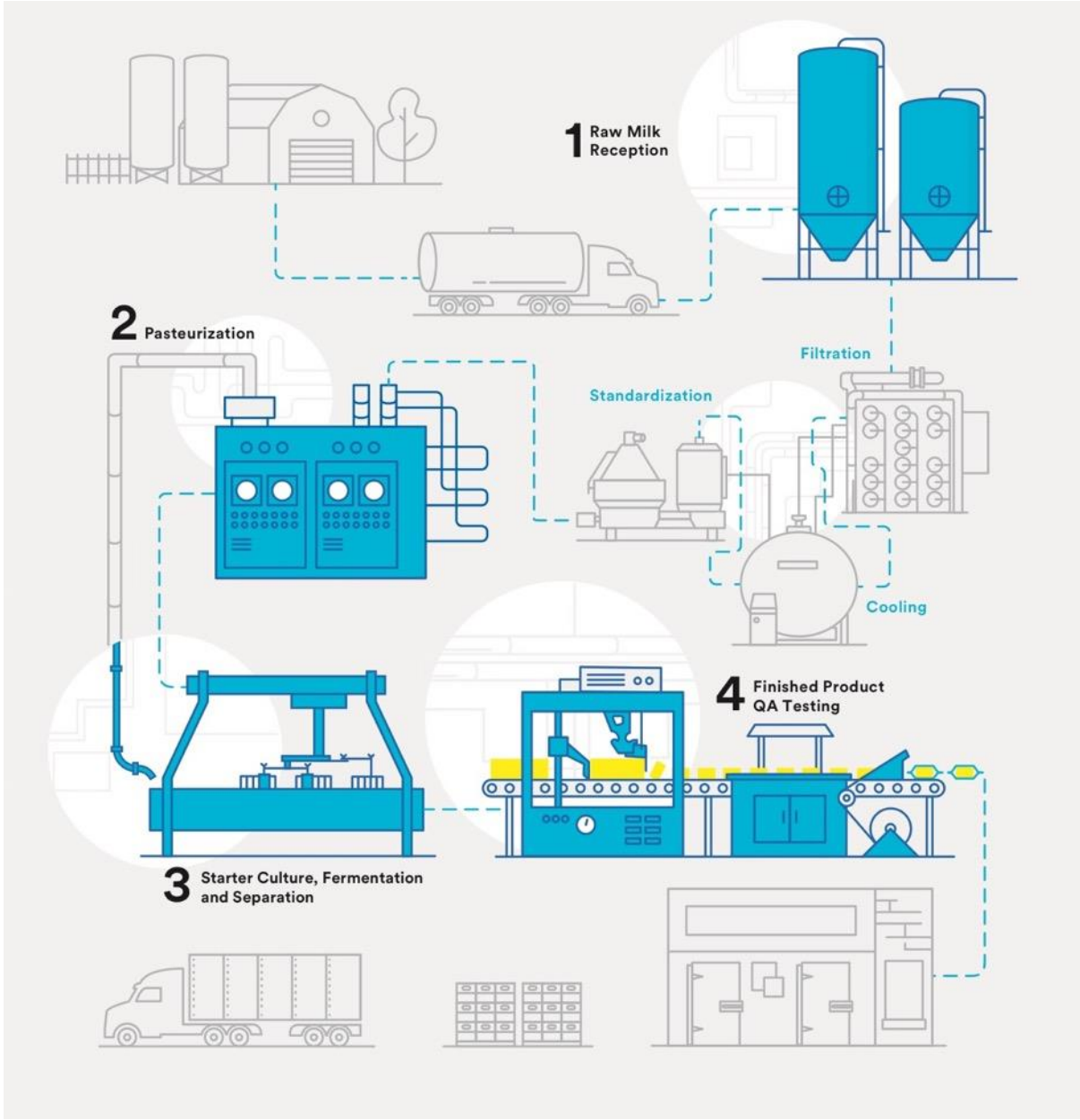
# Dairy Processing


*Listeria*


*L. monocytogenes*


*Salmonella*


*Cronobacter*



# USDA-FSIS MLG and FDA BAM Recognition


**USDA FSIS Chooses 3M**

USDA Food Safety and Inspection Service Chooses 3M for *Salmonella* and *Listeria monocytogenes* Testing.

3M Food Safety is honored to announce that following rigorous performance evaluations against other commercially available rapid methods, the United States Department of Agriculture's Food Safety and Inspection Service (USDA FSIS) has chosen 3M™ Molecular Detection System as the primary method to be used for the detection of *Salmonella and Listeria monocytogenes:* two major pathogenic organisms continually threatening food production and processing.

USDA FSIS MLG method 4.10: *Salmonella*

USDA FSIS MLG Method 8.11: *Listeria monocytogenes*

USDA

FDA U.S. FOOD & DRUG ADMINISTRATION
CENTER FOR FOOD SAFETY & APPLIED NUTRITION

## Equivalent Testing Methodologies for *Listeria* species and *Listeria monocytogenes* in Environmental Samples

FDA has determined that the following methods are "scientifically valid" and "at least equivalent to the method of analysis in § 112.152(a) in accuracy, precision, and sensitivity"[1] in detecting *Listeria* species and *L. monocytogenes*. The method of analysis in § 112.152(a) is "Testing Methodology for *Listeria* species or *L. monocytogenes* in Environmental Samples" (October 2015, Version 1).

1. AOAC Official Method 2013.10. VIDAS® UP *Listeria* (LPT), *Listeria* in select foods and environmental surfaces.
2. AOAC Official Method 2016.07. 3M Molecular Detection Assay (MDA) 2, *Listeria* in select foods and environmental surfaces.
3. AOAC Official Method 996.14. Assurance polyclonal enzyme immunoassay method (EIA), *Listeria* in select foods and environmental surfaces.

3M

# Method Certifications & Validations

*Recognized by organizations and government agencies around the world*

## International Recognition

### AOAC® Performance Tested Method℠

MDA2 – *Salmonella*
••Certificate #091501

MDA2 – *Listeria*
••Certificate #111501

MDA2 – *L. monocytogenes*
••Certificate #081501

MDA2 – *Cronobacter*
••Certificate #101703

MDA2 – *Campylobacter*
••Certificate #111803

MDA2 – STEC Gene Screen
••Certificate #071902 and 071903

### AOAC® Official Method of Analysis℠

MDA2 – *Salmonella*
••AOAC 2016.01

MDA2 – *Listeria*
••AOAC 2016.07

MDA2 – *L. monocytogenes*
••AOAC 2016.08

MDA2 –*E. coli* O157
••AOAC 2017.01

MDA2 – *Cronobacter*
••AOAC 2018.01

*Salmonella*
••AOAC 2013.09

*L. monocytogenes*
••AOAC 2014.07

*Listeria*
••AOAC 2014.06

### NF VALIDATION certificate granted by AFNOR Certification

MDA2 – *Salmonella*
••3M 01/16-11/16

MDA2 – *Listeria*
••3M 01/14-05/16

MDA2 – *L. monocytogenes*
••3M 01/15-09/16

MDA2 – *Cronobacter*
••3M 01/20-03/18

MDA2 – *E. coli* O157
••3M 01/18-05/17

*E. coli* O157
••3M 01/12-03/13

*Salmonella*
••3M 01/11-11/12

### USDA

MDA2 – *Salmonella*
***MLG 4.10*

MDA2 – *L. monocytogenes*
**MLG 8.11

### US FDA (Equivalent technology)

MDA2 – *Salmonella*
••AOAC 2016.01

MDA2 – *Listeria*
••AOAC 2016.07

## Recognition by Country

### Australia

Department of Agriculture/Australian Quarantine and Inspection Service Approved Methods

MDA2 - *Salmonella*
••AOAC 2016.01

MDA2 – *Listeria*
••AOAC 2016.07

MDA2 – *L. monocytogenes*
••AOAC 2016.08

### Brazil

Ministry of Agriculture, Livestock and Supply (MAPA) Official Method

MDA2 – *Salmonella*

MDA2 – *L. monocytogenes*

### Central America

(Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama)

Technical Regulation Annex to Resolution 402-2018

MDA2 – *Salmonella*
••AOAC 2016.01

MDA2 – *L. monocytogenes*
••AOAC 2016.08

MDA2 – *Cronobacter*
••AOAC 2018.01

MDA2 – *E. coli* O157 (including H7)
••AOAC 2017.01

### Canada

Heath Canada Compendium of Analytical Methods

MDA2 – *Salmonella*
••MFLP-100

MDA2 – *Listeria*
••MFLP-101

*Salmonella*
••MFLP-06

*E. coli* O157 (including H7)
••MFLP-73

*Listeria*
••MFLP-05

*L. monocytogenes*
••MFLP-72

# Thank you