# Hygiene in High-Risk Food Production:

## Keep it Clean and Chill

The webinar will begin shortly.
Thank you for your attendance!

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# Hygiene in High-Risk Food Production:

## Keep it Clean and Chill

**Deb Smith - Vikan**
Global Hygiene Specialist

**David Buckley - Diversey**
Director of Technical Consulting

# Webinar Housekeeping

- ❑ The presentation will last about 45 minutes.
- ❑ After the presentation, there will be a 10-15 minute Q&A session. You may send your questions in the chat box provided.
- ❑ This webinar is being recorded and we will send you the recording a few days after the live event.
- ❑ We will reach out after the webinar to answer any questions we do not address during the session.


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# About Vikan and Remco

Vikan®

Leading provider of advanced hygiene and cleaning products and solutions for key sectors, with a global presence in over 90 countries.

Remco
a Vikan company

Supplies color-coded sanitation and material handling tools for the food industry in North America.

Remco is Vikan's dedicated presence in North America (U.S. and Canada).

For more information, visit us at:

- Remcoproducts.com/about
- Vikan.com/int/about-vikan/who-we-are

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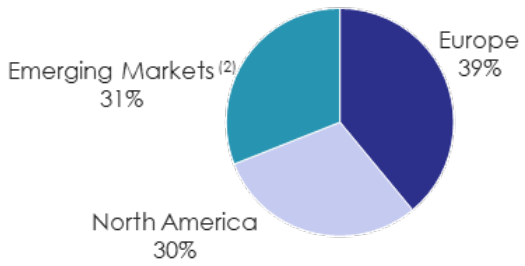
# Diversey Overview

## Diversey At-a-Glance

| | | | |
|---|---|---|---|
| **95+** Years of History | **$2.6Bn** 2020 Revenue | **15%+** 2020 Adj. EBITDA Margin | **~8,500** Employees |
| **~$46Bn** Market Opportunity | **#1 or #2** Market Positions | **80+** Countries Served | **1,400+** Patents |

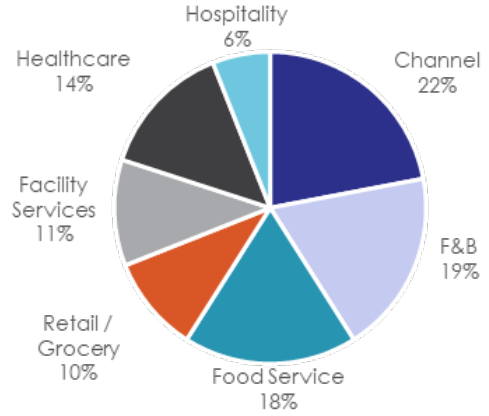
## Global, Diversified, and Balanced Business Model

### 2020 Revenue by Geography

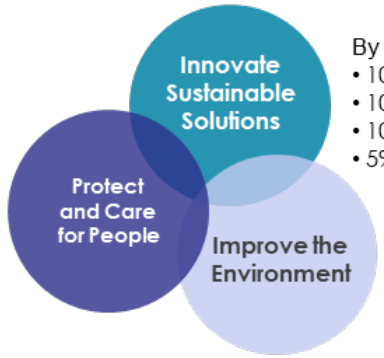



**Market Leading Scale in All Regions**

### 2020 Revenue by End Market




### Diversey's Facilitators for Life goals




By 2025:
- 10% reductions in energy
- 10% greenhouse gas emissions
- 10 % waste reduction
- 5% reduction in water

**Sustainability is at Our Core**

# About our presenters


## Deb Smith

### Global Hygiene Specialist

Deb has over 35 years of food safety and research training and experience. At Vikan, Deb provides food safety and hygiene advice, training, and support to colleagues and customers.


## David Buckley, PhD

### Director of Technical Consulting

David's team is responsible for industry engagement and science-based consulting with customers on a wide range of areas, such as food safety, sanitation, and infection prevention and control programs.

# Hygiene in High-Risk Food Production:

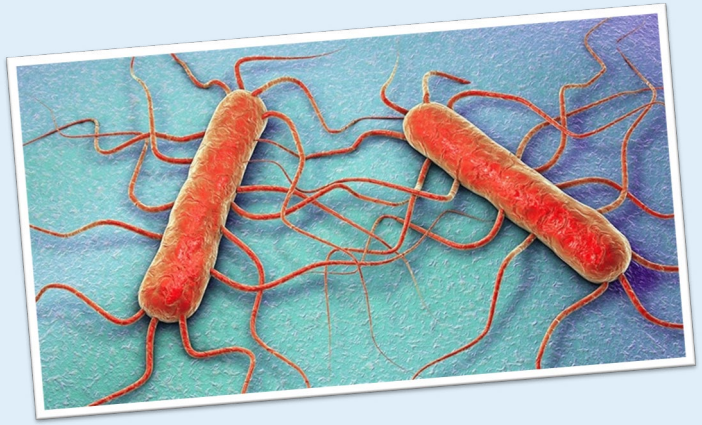
## Keep it Clean and Chill

**Deb Smith - Vikan**
Global Hygiene Specialist

# High-risk foods

# 218

- No. of deaths recorded by September 2018. Outbreak of Listeriosis, South Africa
- French Polony sausage: long shelf-life, chilled, ready-to-eat (RTE) meat product
- Largest ever recorded: 1065 confirmed cases
- Estimated cost: *> 280 million USD
- New SA legislation (Regulation 638: 2018) requiring application of HACCP/FSMS principles and absence of *Listeria monocytogenes*




* https://www.sciencedirect.com/science/article/abs/pii/S0956713519300556?via%3Dihub

# What are High-risk foods?

Classically defined as

- “any ready-to-eat food that will support the **growth** of pathogenic bacteria easily and does not require any further heat treatment or cooking”

Traditionally associated with

- chilled, ready-to-eat foods containing raw materials of animal origin, such as eggs, fish, meat, poultry and dairy

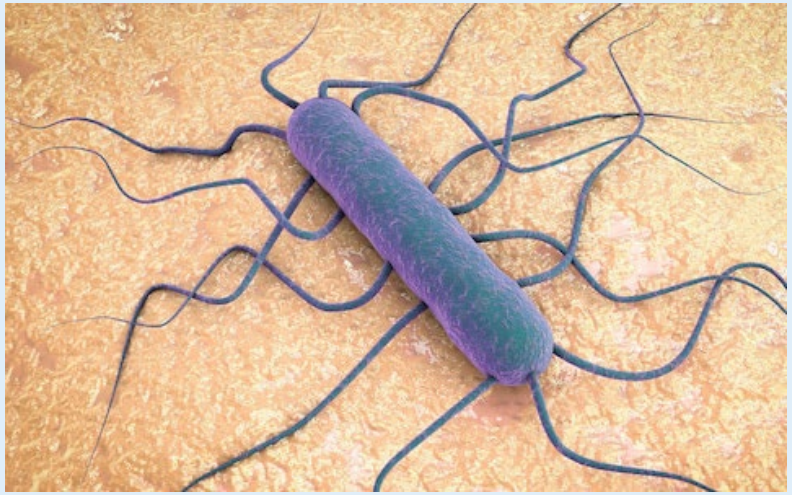
Growing incidence of pathogen **survival** in

- frozen foods like ice cream, frozen fruit and vegetables



# Listeria

- An environmental bacteria – found everywhere
- *Listeria monocytogenes* is pathogenic – causes Listeriosis in humans (pregnant women, children, elderly, immunocompromised, stressed)
- Rare disease - 0.1 to 10 cases/million people/year but high mortality.
  - U.S. CDC (2020) estimated ~1,600 infections/year, ~94% hospitalised, ~260 deaths (>16%).
- Strict controls on the levels of *Listeria monocytogenes* allowed in RTE foods & production environments
  - Commission Regulation (EC) 2073/2005 – Microbiological criteria for food.
  - Regulation (EC) No 852/2004 on the hygiene of foodstuffs.
  - US FDA 21 CFR 117, relevant to Listeria control.
  - US FSIS-USDA 9CFR 430, Listeria rule.



# Listeria in High-risk foods

- Product contamination can occur as a result of, Listeria on raw foods / produce / ingredients.

- Post-process Listeria cross-contamination from,
  - Other foods (raw to cooked)
  - Equipment (food production surfaces, utensils)
  - The environment (air, water droplets)
  - People
  - Packaging
  - Pests

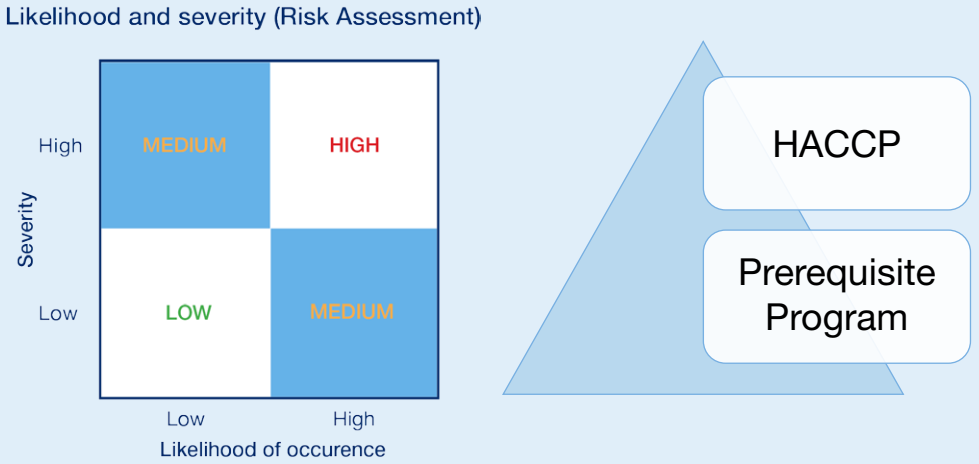
# Contamination control

Use of risk assessment based management systems, e.g.

- GMPs/ HACCP Pre-requisite programme (PRPs)
- HACCP
- TACCP (Threats)
- VACCP (Vulnerabilities)

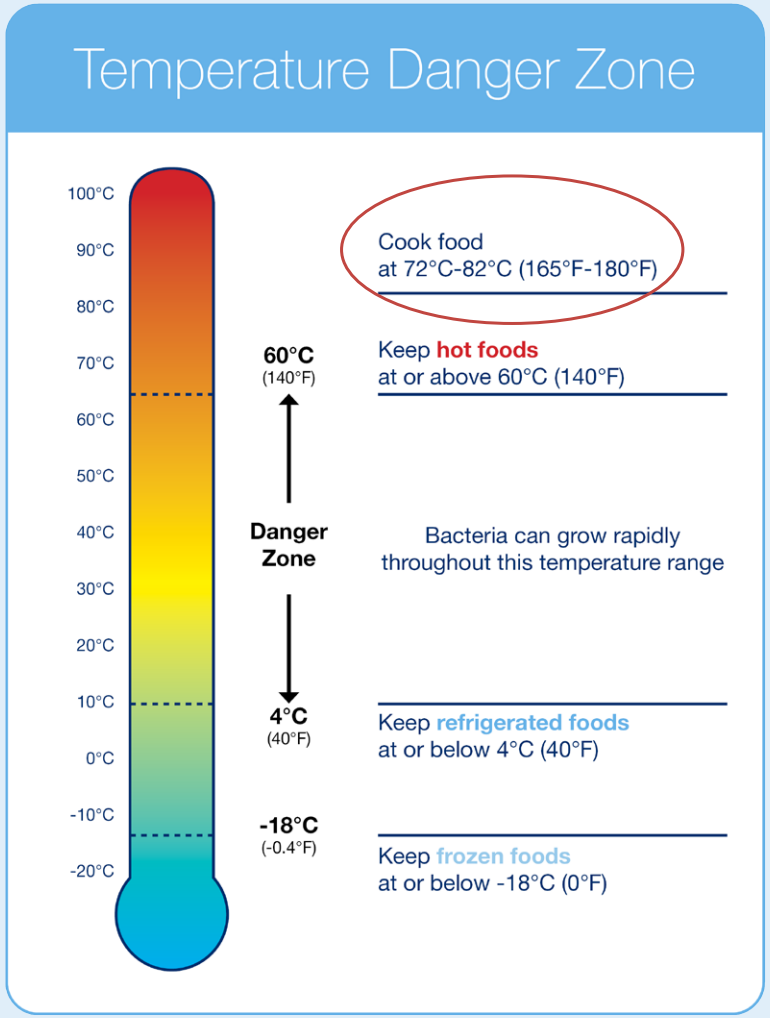
The 4C's

- Cook (or any process that lowers the level of contamination to an acceptable level, e.g. wash, irradiate)
- Chill
- Clean
- Cross-contamination control



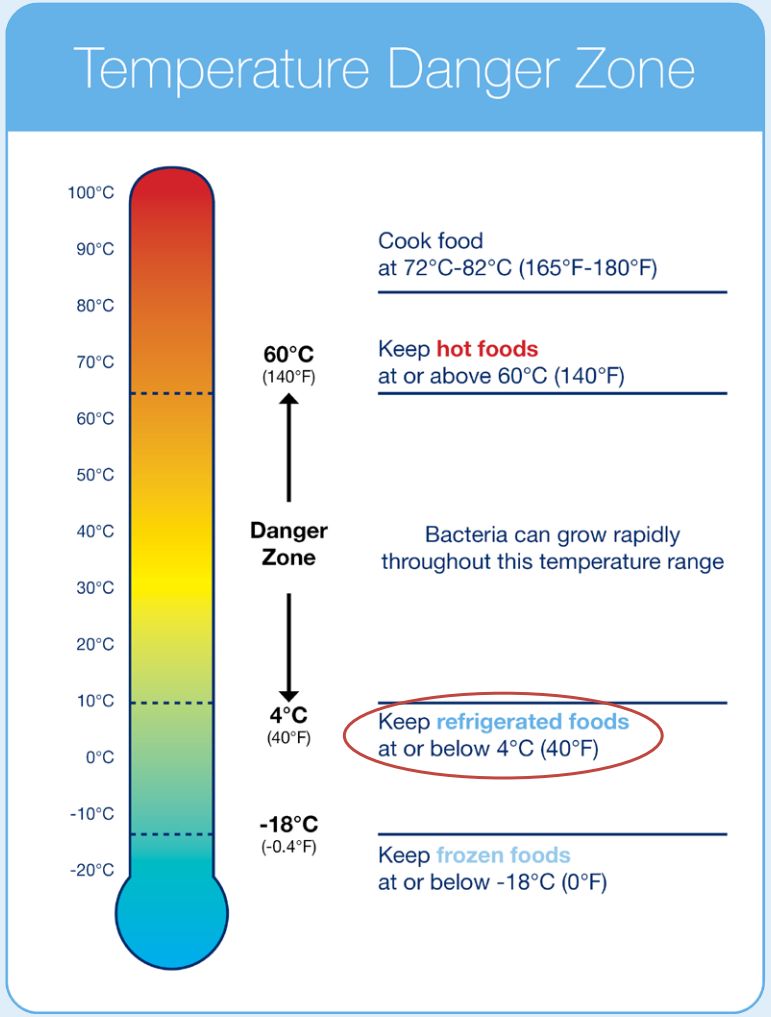

# Contamination control: Cook

- *Cooking food at the right temperature and for the correct length of time will ensure that most bacteria are killed.
- Advice in Europe is to cook food until food has reached a minimum core temperature of 70 (158oF) for 2 minutes. Other time and temperature combinations can be used.
- *Can be any process that lowers the level of contamination to an acceptable level, e.g., wash, irradiate, etc.
- The cook time and temperature (or other decontamination parameters) must be
  - validated (to make sure that the chosen parameters achieve the desired level of microbial kill/removal) and
  - monitored (to check that the defined parameters are consistently achieved).



# Contamination control: Chill

- Chilling food helps prevent the growth of any remaining bacteria
- Guidance on chilling of food is to cool it as soon as possible after cooking and then place in cold storage
- Cold storage should be at 8°C (46°F) or below
- The chill time and temperature must be validated (to make sure that the chosen time and temperature achieves the desired cooling and reduction in microbial growth)
- The chill temperature must monitored (to check that the defined temperature is consistently achieved)
- The chill storage time and temperature should be indicated on the product label



# Contamination control: Clean

- Cleaning (sanitation) is a critical step in the maintenance of food safety and quality, especially for high-risk foods.
- Cleaning minimises the risk of cross-contamination and pest infestation
- Most common cause of inspection non-compliance

Top 10 Major SQF Non-Conformances

| # | ELEMENT for SQF Food Safety Code for Food Manufacturing | Edition 9 |
|---|---|---|
| I | Cleaning and Sanitation | 11.2.5.1 |
| II | Identified Pest Activity Risk | 11.2.4.3 |
| III | Internal Audits and Inspections | 2.5.4.1 |
| IV | Pest Prevention Program | 11.2.4.1 |
| V | Senior Management Commitment | 2.1.1.2 |
| VI | Product Trace | 2.6.2.1 |
| VII | Food Safety Plan Development | 2.4.3.1 |
| VIII | Food Safety Plan CCP Monitoring | 2.4.3.12 |
| IX | Management Review | 2.1.2.1 |
| X | Corrective & Preventative Actions | 2.5.3.1 |

**Source:** SQFI Compliance

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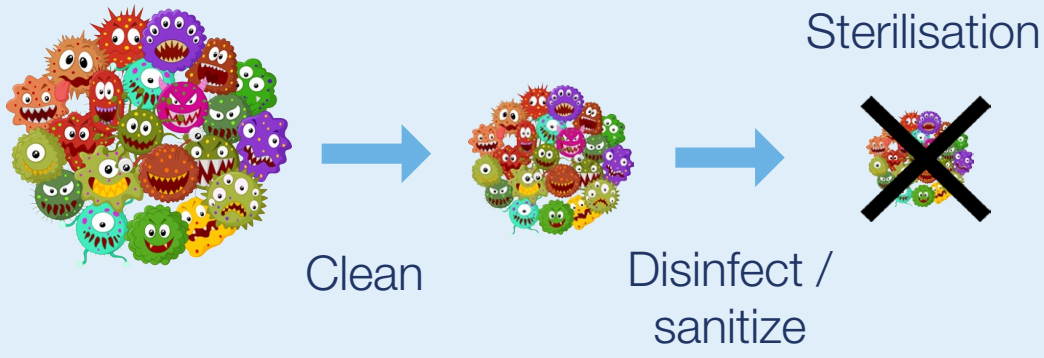
# Clean: A multi-task force approach

- **Cleaning**
  - physical removal of contamination (food debris, allergens, microbes, foreign bodies)
- **Disinfection** (sanitization)
  - use of heat, radiation or chemicals to reduce microbial load to an acceptable level




Cleaning removes most of the contamination and makes disinfection more effective

Factory trial data – Courtesy of Campden BRI

| Before cleaning | After cleaning | After cleaning and disinfection |
|---|---|---|
| 1,320,000 microbes | 86,700 microbes | 2,500 microbes |
| Microbial reduction | 1,233,300 microbes 93.4% | 84,200 microbes 6.4% (99.8%) |

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# Clean: Biofilms

Water 98-99%

+

Microbes 1-2%

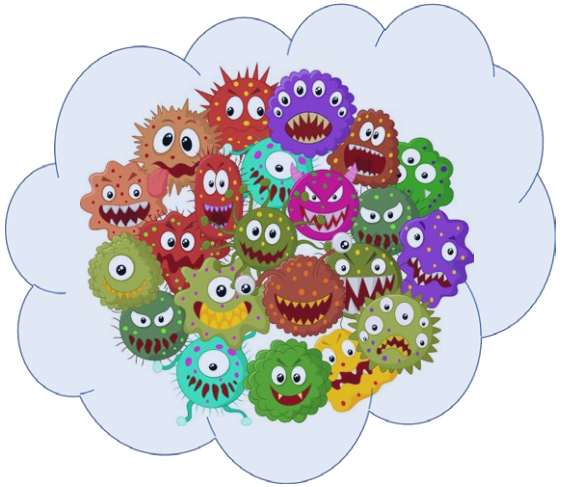
Complex mixture microbes working together to survive and spread

+

SLIME

Polysaccharides + nucleic acids + glycoproteins = *Extracellular* or *Exopolymer* matrix

= Biofilm



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# Clean: Why?

## Biofilms aid microbial *survival, growth and transfer

Transferred from:

- the environment to food contact surfaces
- food contact surfaces to the food product

Transferred by:

- people, air, moisture, equipment, pests

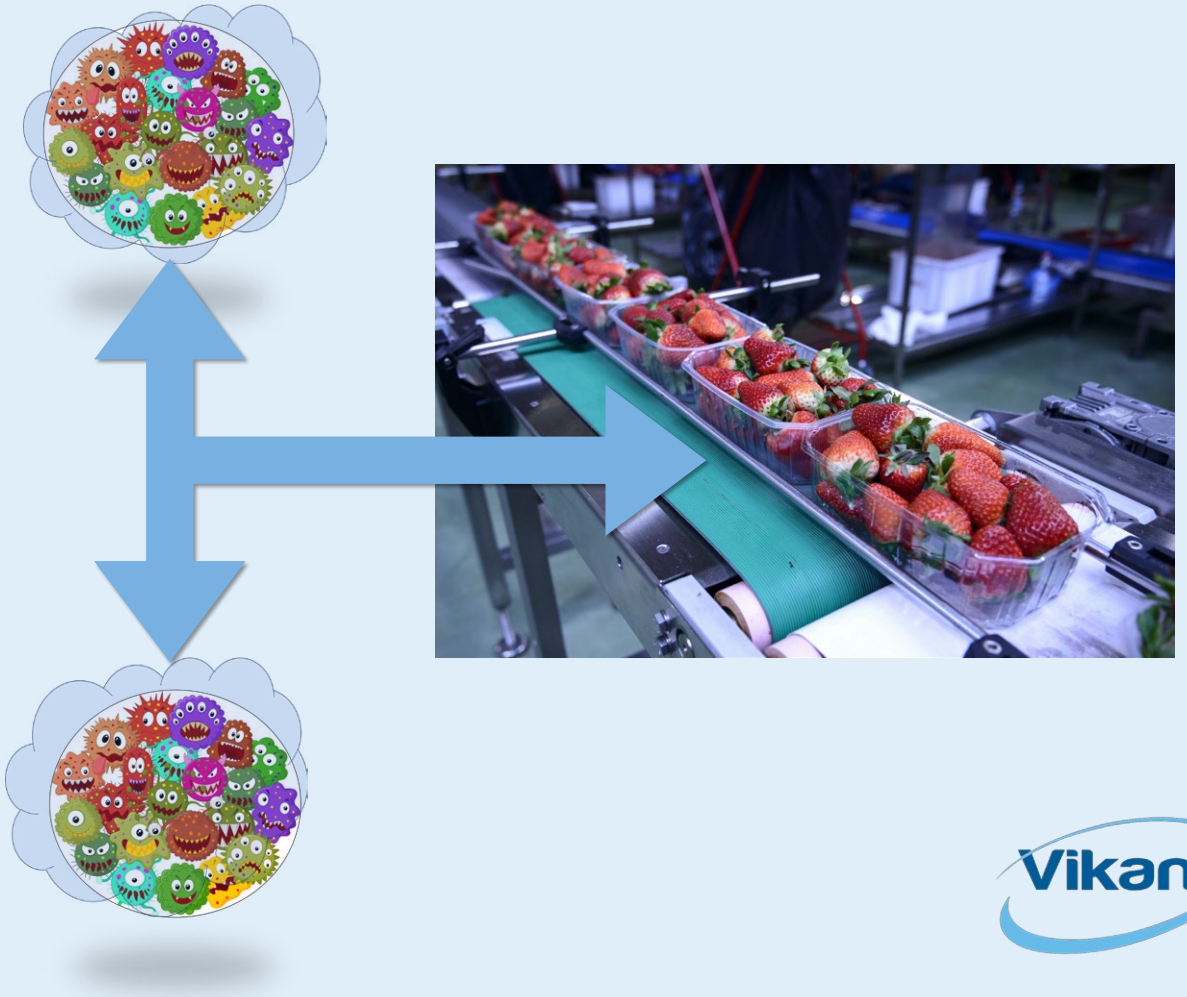
Resistant to:

- detergents
- disinfectants
- preservatives
- antimicrobials
- biocides
- heat
- radiation (UV)

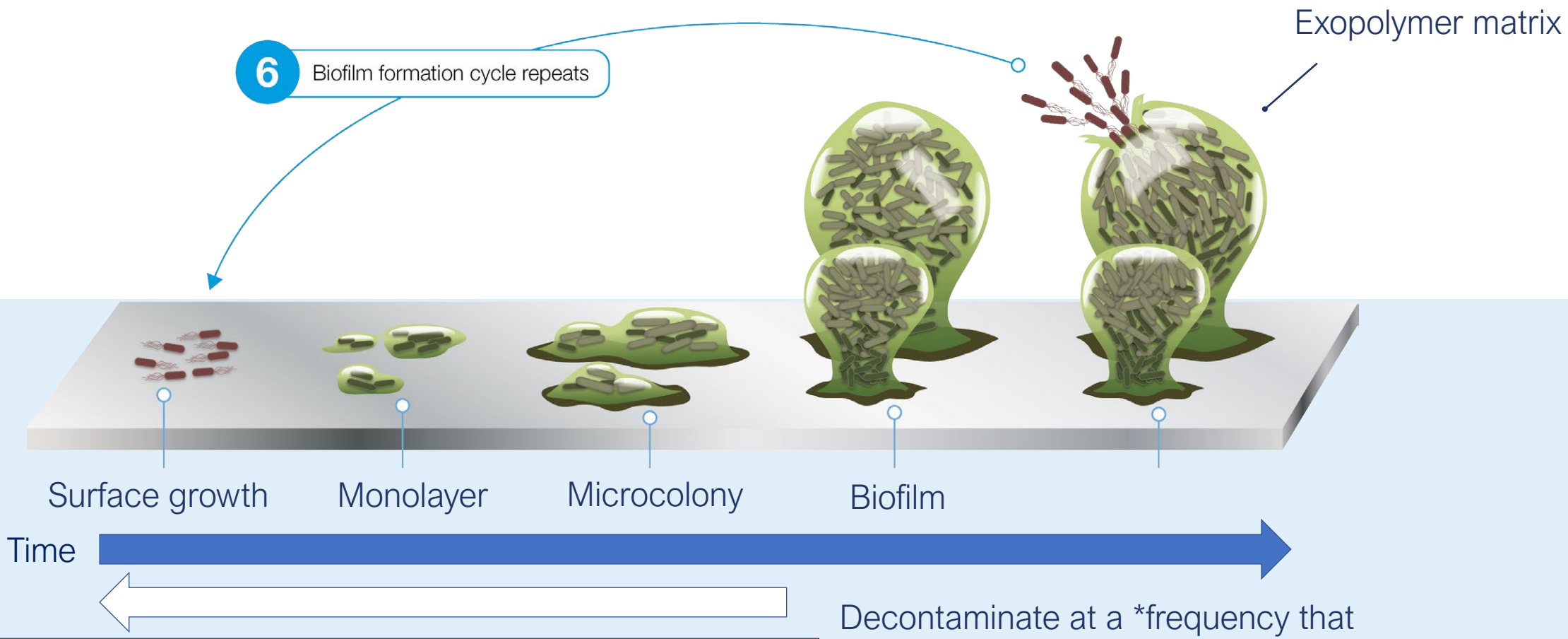
*Microbes in biofilms may be up to

3,000

times more resistant to hypochlorous acid than free cells (Le Chevalier *et al*, 1988)



# Clean: When?



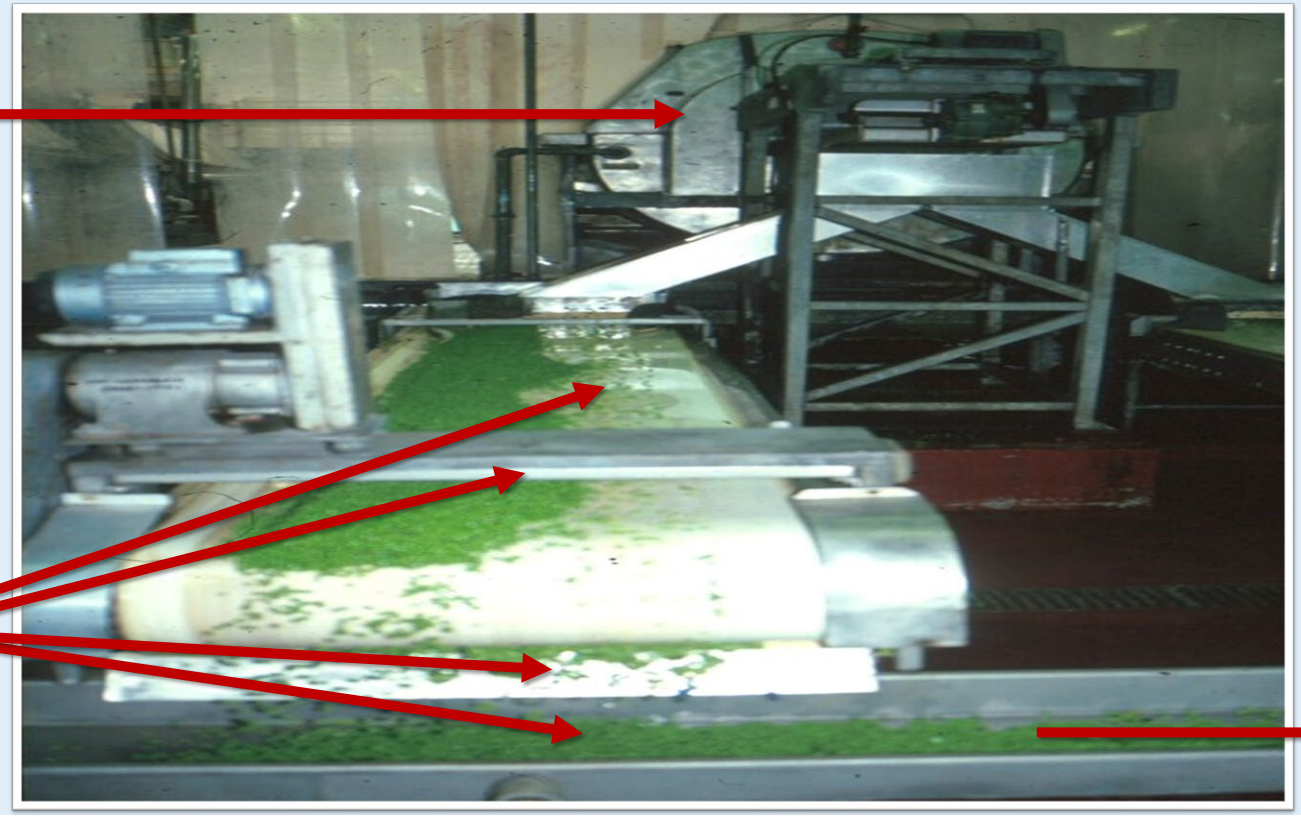

*Many things affect the speed at which a biofilm develops, including the environmental temperature, the availability of water and nutrients, & the microbial composition of the biofilm.

Decontaminate at a *frequency that prevents them reaching their mature phase. Frequency determined through monitoring biofilm formation and risk assessment

# Clean: Biofilms in the food industry

## Biofilm formation in frozen pea processing

Hot water blancher = 'clean' peas



Biofilm

Conveyor transport to freezer = 'dirty' peas

Courtesy of Campden BRI

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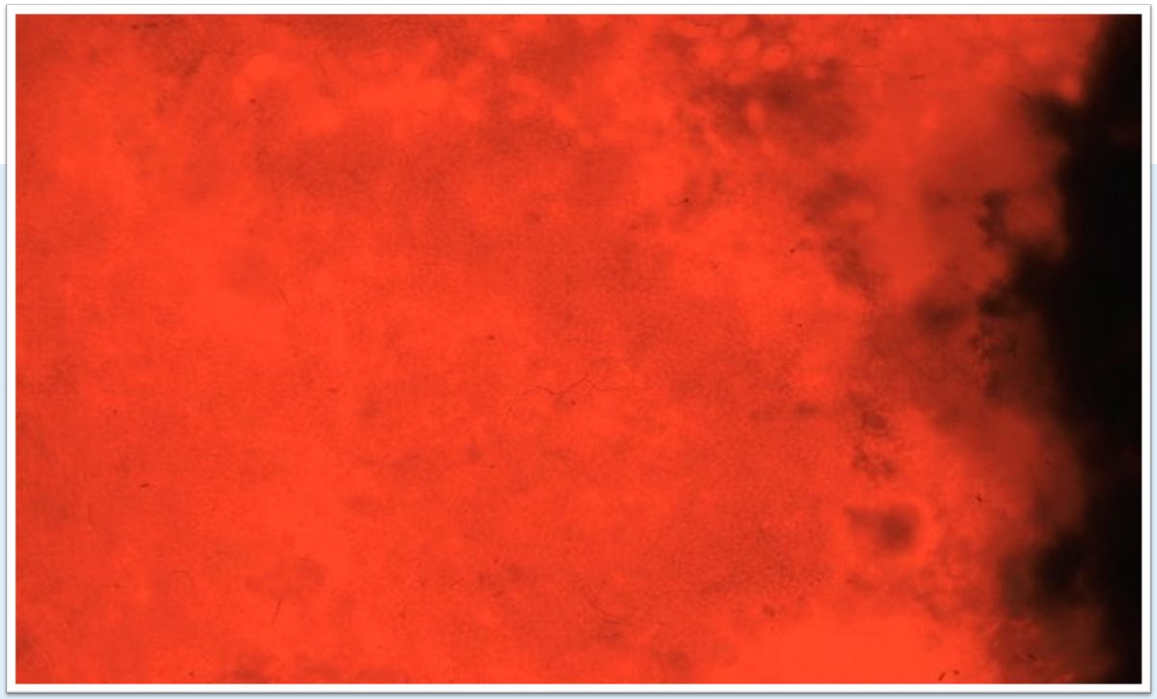
# Clean: Biofilms in the food industry

## Biofilm formation in frozen pea processing

Stainless steel plates on side of conveyor

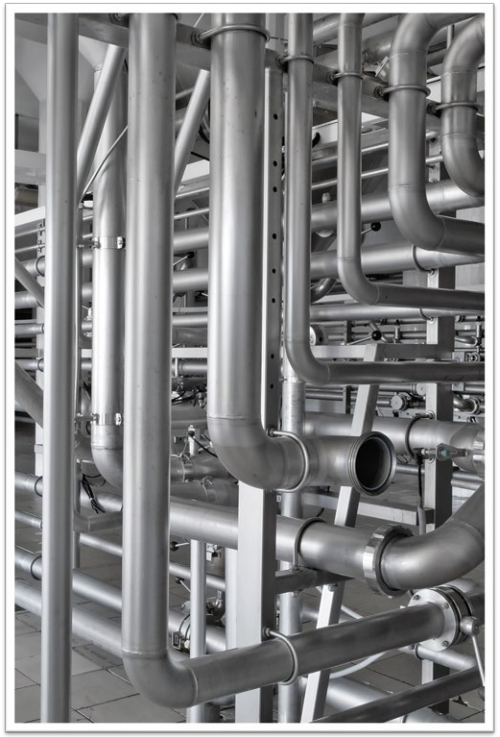
Biofilm >16 hours



Courtesy of Campden BRI

# Clean: How?

**Foaming**
Good for decontaminating large areas such as walls & large production equipment



**CIP**
Commonly used to clean pipework used for liquid/semi-solid foods

**Manual cleaning**
Good for:

- decontaminating small to medium sized production areas/equipment;
- deep cleaning
- detail cleaning; and
- cleaning of complex equipment

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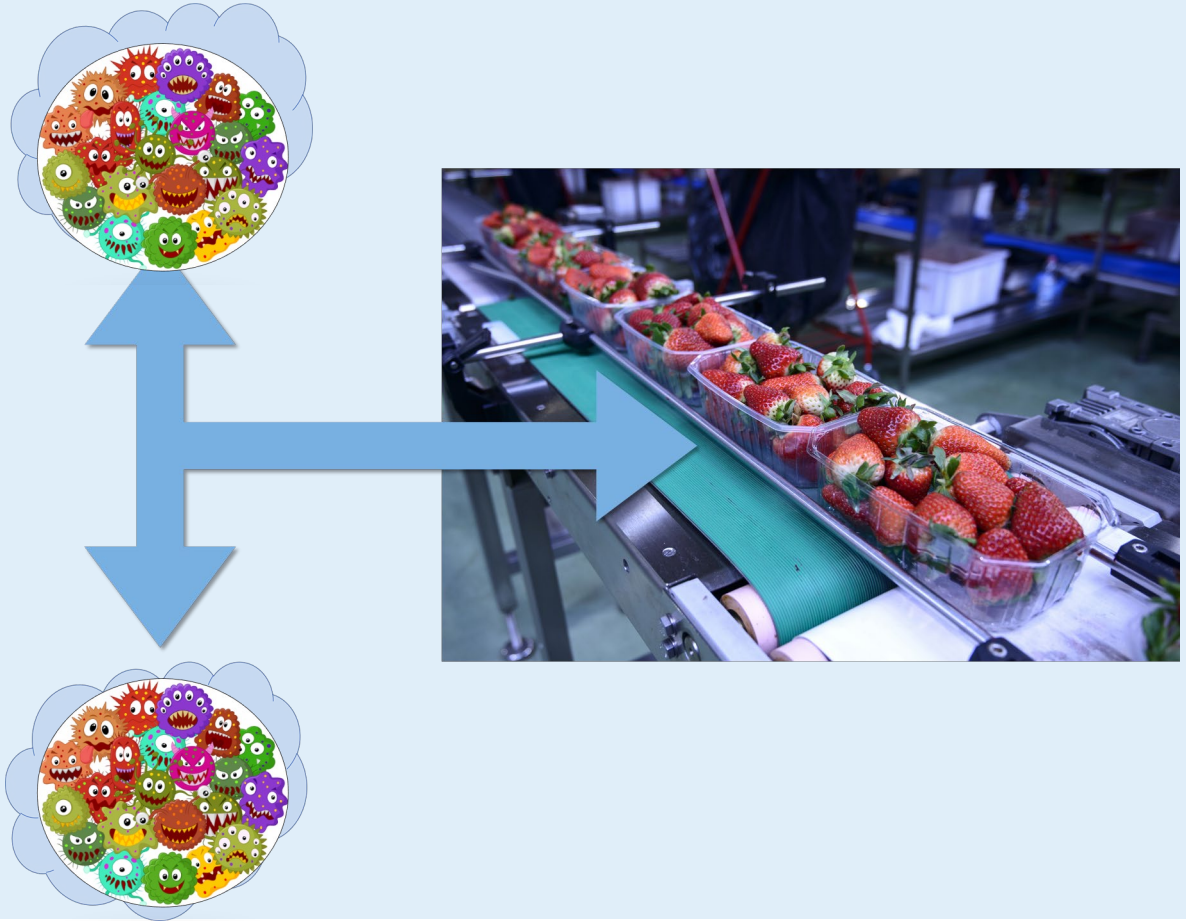
# Cross-contamination

- When bacteria (and other contamination) is spread between food, surfaces or equipment.
- One of the most common events leading to food poisoning.
- Three key controls
  - Hygienic design
  - Segregation
  - Sanitation
- Use a cleaning schedule to ensure that surfaces and equipment are cleaned when they need to be.



# Cross-contamination: Hygienic design

## The ability to clean something easily

### Good hygienic design principles*

- No sharp internal angles
- All areas accessible for easy cleaning and disinfection (sanitizing) – avoid deep recesses, nooks, and crannies
- Of one-piece construction, or quickly and easily dismantled / re-assembled
- Smooth surface finish
- Made of appropriate materials
    - Non-absorbent; Food contact compliant

*EHEDG Guideline 8
"Hygienic Equipment Design Criteria"
https://www.ehedg.org/guidelines-working-groups/guidelines/guidelines

https://www.youtube.com/watch?v=_8ThxynV8mQ

# Cross-contamination: Hygienic design

## Global food safety standard requirements

- New GFSI Benchmarking requirements on Hygienic Design
- https://www.ehedg.org/ehedg/new-gfsi-hygienic-design-benchmarking-requirements/

- BRCv9 Global Standard for Food Safety
  - *4.6. Equipment (4.6.1 – 4.6.7)*
  - *4.11.6. 'cleaning equipment should be hygienically designed'*
  - *8.5.3. 'equipment used for cleaning in high-care/risk areas shall be hygienically designed'*

- FSSC 22000: ISO/TS 22002-1:2009 (2013) Prerequisite programmes on food safety Part 1: Food manufacturing
  - *11.2 Cleaning and sanitising agents and tools:*
    - *'Tools and equipment shall be of hygienic design…'*

# Cross-contamination: Bad hygienic design

- Schäfer[1]
  - 67% of poultry plant equipment and utensils positive for *L. mono,* even after cleaning
- Campden BRI[2]
  - 47% of cleaning equipment positive for *L. mono*

Bad hygienic design


1. Schäfer, D., Steffens, J., Barbosa, J., Jamile Z., Rogério L. C. (2017). Monitoring of contamination sources of Listeria monocytogenes in a poultry slaughterhouse. LWT – Food Science & Technology. Dec 2017, Vol. 86, p. 393-398.
2. Holah, J.T. (1998). Effective microbiological sampling of food processing areas. Guideline No. 20, CCFRA.

# Cross-contamination: Good hygienic design


Courtesy of Buhler



Courtesy of ACO

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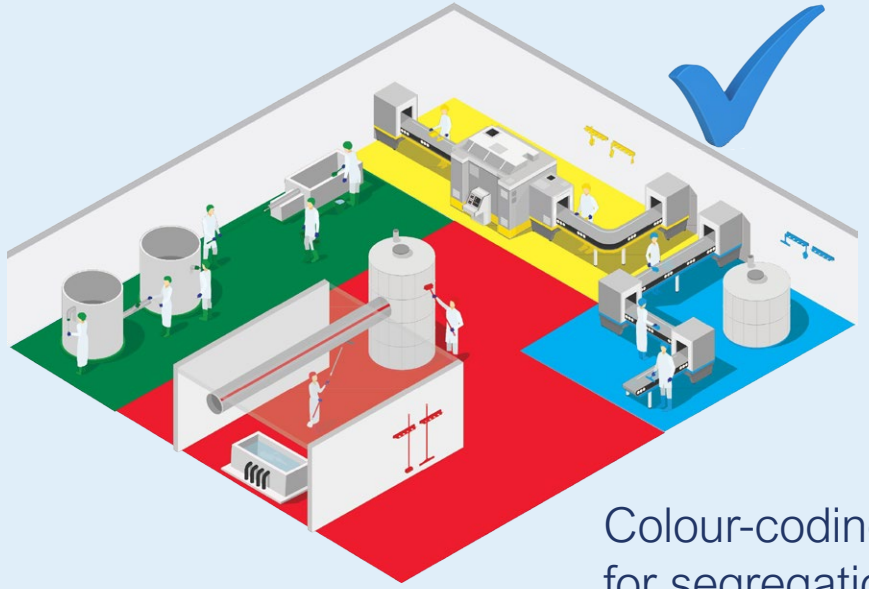
# Cross-contamination: Segregation

- Separate equipment and utensils for contaminated and de-contaminated foods (e.g., raw vs cooked, unwashed vs washed)
- Physical or spacial segregation of production, and food and packaging storage areas.
- Time segregation of production of different foods, cleaning and production activities.

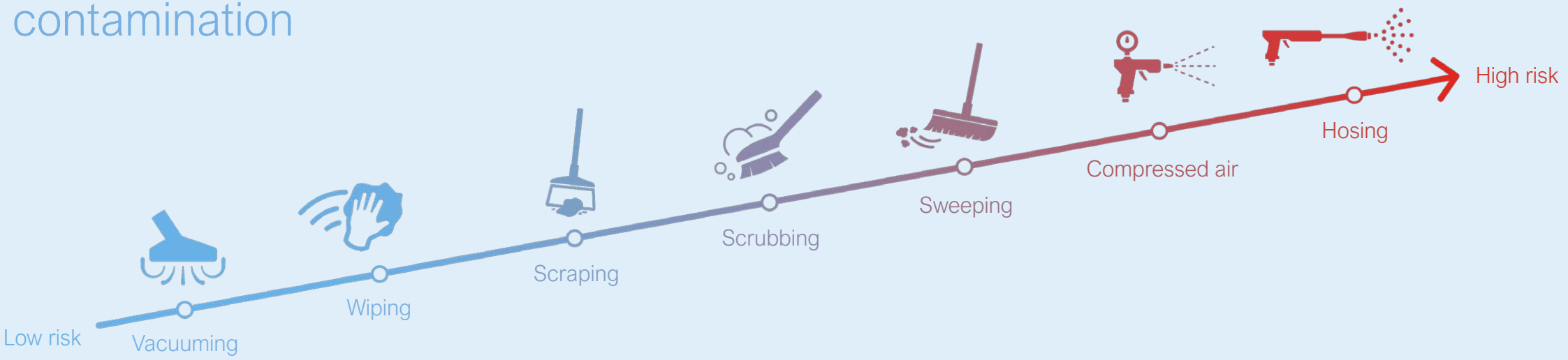
- https://www.vikan.com/uk/services/site-survey



Colour-coding for segregation

# Cross-contamination: Sanitation

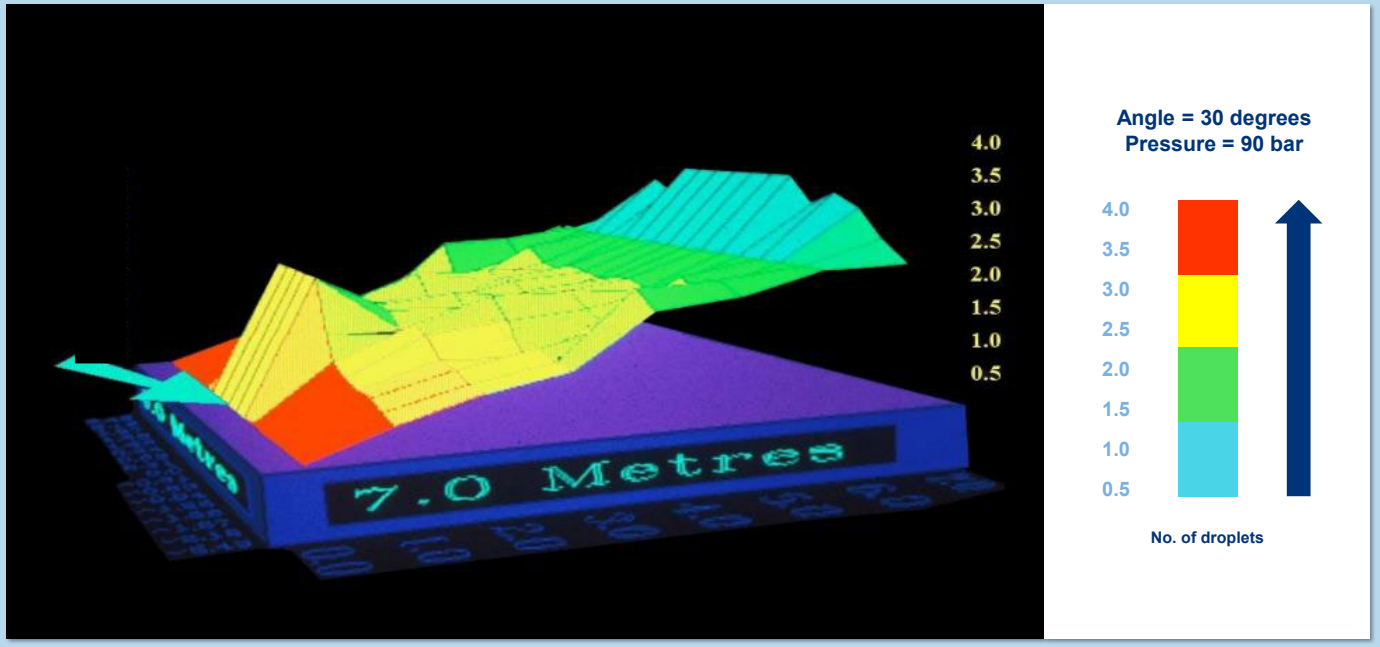
## Nearly all cleaning activities can spread contamination



# Cross-contamination: Sanitation

## Spread of contamination: High pressure hosing

Courtesy of Campden BRI




23 Feet by 11.5 feet

# Cross-contamination: Sanitation

- Choose cleaning equipment and methods that maximise biofilm removal and minimise its spread
- Don't clean / minimise cleaning during production
- Clean things as far away as possible from open product (spacial segregation)
- Clean in physically segregated areas to protect product from splashes etc. (separate cleaning rooms / screens)

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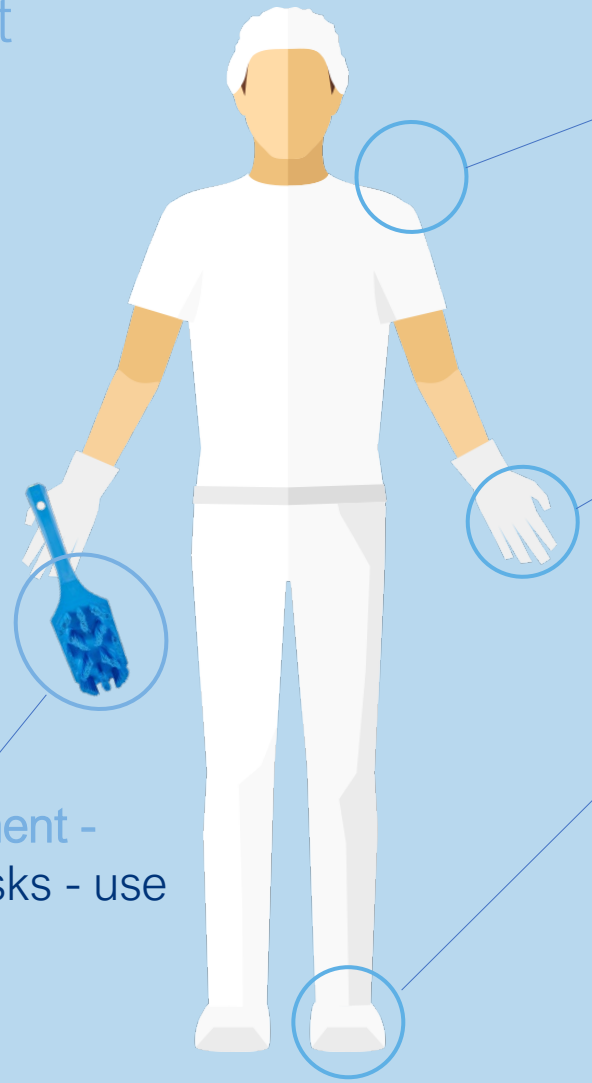
# Cross-contamination: Sanitation

## People – an essential asset in contamination control

Use trained, competent, conscious people. Tell them,

- why it's important
- how to select, use and maintain cleaning equipment effectively
- how to minimise the spread of contamination by themselves, their cleaning actions, and the cleaning equipment



Contamination transfer by **clothing**
Use separate colour-coded clothing, disposable aprons, change between tasks

Contamination transfer by **hands**
Wash & dry hands/change gloves between tasks

Contamination transfer by **footwear**
Keep captive to different areas, clean and disinfect/sanitise based on risk assessment

Use different people for different areas – high/low risk

Contamination transfer by **equipment** -
Keep captive to different areas/tasks - use color-coding

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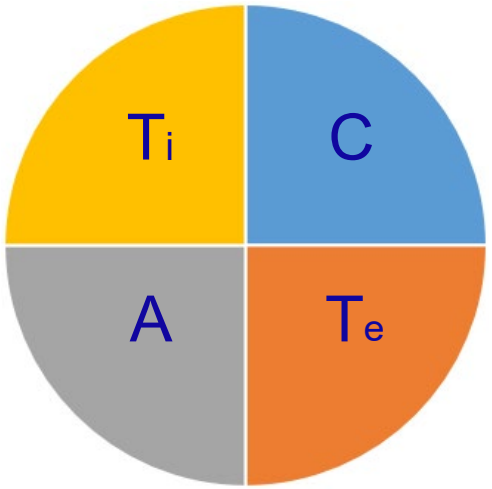
# Clean

Effective sanitation is a multi-task force approach

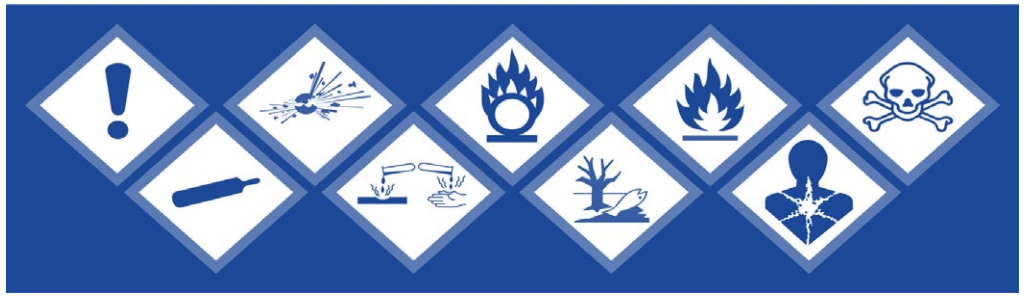
Cleaning performance = $T_i$ * A * C * $T_e$




Where

$T_i$ = Time
A = Action
C = Chemical
$T_e$ = Temperature

Selection of sanitation chemicals



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# Cleaning and Antimicrobial Chemistry

David Buckley, Ph.D.

# Chilled RTE Facilities

## Disadvantages to cleaning in Chilled RTE Production

- No lethality step means there is little room error
- Low temperature slows reaction rates and select for a different microbiome
- Mixture of warm and cool air creates condensation drip hazards

≠ Lethality step

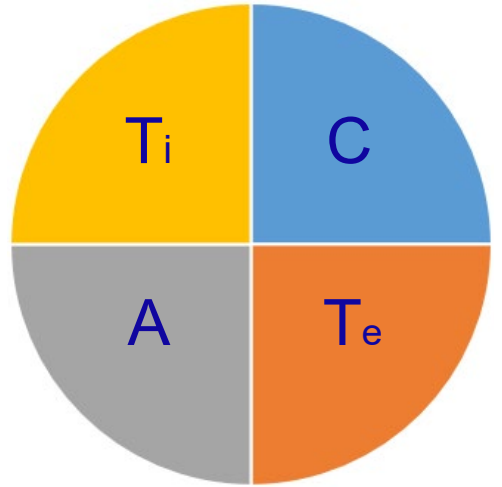
↓ Temperature

↑ Condensation

# Rules to Sanitation

- **Rule 1:** Process beats chemistry EVERY time
- **Rule 2:** Cleaning boils down to 4 factors
- **Rule 3:** There are uncontrollable variables that impact cleaning

Cleaning performance = $T_i$ * A * C * $T_e$



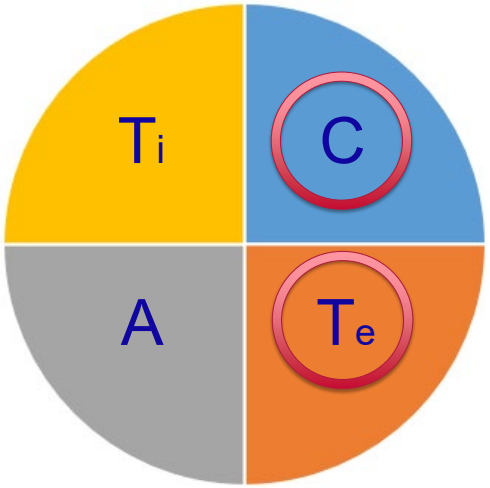

Where

$T_i$ = Time
A = Action
C = Chemical
$T_e$ = Temperature

# So what is the BEST cleaning process formula?

## Cleaning performance = $T_i$ * A * C * $T_e$

- **Correct answer:** it depends!
- Optimizing TACT is about compromise. One TACT approach is likely not the same for another environment.
- That means that there is no BEST TACT equation.
  - It needs to be set empirically
  - It needs to be set for each location
  - It needs to be set for each task



# Which cleaner should you use?

| Type of soil | Example | Optimum cleaner chemistry |
|---|---|---|
| **Organic soils** | | |
| Carbohydrate | Sugar, starch, caramel | Surfactant, alkalinity |
| Protein | Casein | Chlorine, alkalinity, surfactants |
| Fat | Tallow, lard, seed oils, resins | Alkalinity, surfactants |
| Petroleum | Greases, oils, lubricants | Solvent |
| **Inorganic soils** | | |
| Monovalent salts | sodium chloride | Acid or high levels of Chelant |
| Milk stone | Calcium nitrate | Acid or high levels of Chelant |
| Food stone | Beer, milk, and celery stone | Acid or high levels of Chelant |
| Metallic deposits | Rust, aluminum oxide | Acid or high levels of Chelant |

# Some Practical Advice

Meat, poultry, seafood leads to high fat, high protein, and large quantity soil.

Cleaner of choice is usually chlorinated alkali

Dough, batters, pastas usually contain high carbohydrate level and high protein

Chlorinated alkali is a common choice. However, built cleaners with ethoxylated alcohol and acid does well, too

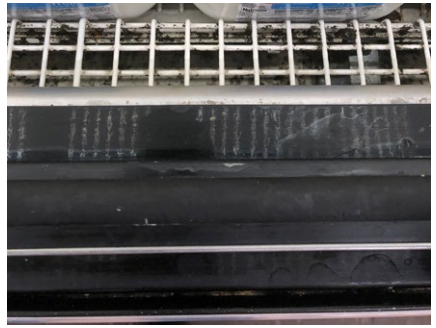
Vegetables have high carbohydrate with some stone issues (e.g. celery and spinach stone).

Any cleaner with surfactant cleaners can work well for these applications, it helps if it is “built”

www.kitchenviva.com/

Carbonized or burnt on soil of any sort is usually cleaned with high caustic levels (1-5%)

Potassium hydroxide



Milk contains Carbohydrate (milk sugar), protein, fats, minerals, and water

Use chlorinated alkali cleaners

# Surface Compatibility

| | |
|---|---|
| ★★★★ | **EXCELLENT** - No effect to integrity of material. |
| ★★★ | **GOOD** - Minor effect, slight discoloration. Damage judged to not affect material performance and not aesthetically objectionable. Periodic rinsing is optional. |
| ★★ | **FAIR** - Moderate effect, not recommended for continuous use. If used, rinsing and drying after each application is recommended. |
| ★ | **SEVERE EFFECT** - Not recommended for use. Severe damage to substrates, discernable corrosion, pitting, or corrosion by product. |

| | Surface/Finish | Example | |
|---|---|---|---|
| GLASS | Etched Glass | Decorative wall panels, bathroom zone | ★★★★ |
| | Fiber Glass | Shower wall, covers | ★★★★ |
| | Glass | Glass walls, X-ray protection, Mirrors, Windows | ★★★★ |
| | Sapphire Glass | Clear protective covers, device screens | ★★★★ |
| POLYMERS | ABS Plastic | Medical devices, keyboards, pumps, isolettes | ★★★★ |
| | Acrylics | Phone displays, incubators, X-ray protection, isolettes | ★★★★ |
| | Copolyester (Tritan™) | Clear hard plastic, bottles, syringes, device, BPA-free | ★★★★ |
| | High-Density Polyethylene (HDPE) | Bottles, toys, containers | ★★★★ |
| | Laminate wall panels | Trespa™, Meteon™, Marlite™ | ★★★★ |
| | Nylon | Pillow covers, laundry bags | ★★★★ |
| | Polycarbonate | Bassinettes, other equipment | ★★★★ |
| | Polypropylene (PP) | Furniture, hard plastic, reusable contaners | ★★★★ |
| | Polyurethane | Tubing, mattress covers, wood furniture finish | ★★★★ |
| | Polyvinyl Chloride or Vinyl (PVC) | Furniture, floors, mattress, tubing | ★★★★ |
| | Rubber | Stethoscopes, bumpers on OR lights, other | ★★★★ |
| | EPDM | Gloves and other | ★★★★ |
| | NeoPrene | Gloves | ★★★ |
| | Nitrile | Gloves | ★★★★ |
| | Silicone Rubber | Bumpers on lights, Stethoscopes, Tubing | ★★★★ |
| | Teflon | Coated metals | ★★★★ |

| | Surface/Finish | Example | |
|---|---|---|---|
| METALS | Aluminum (6061) | Carts, Seating, Isolation Carts | ★★★ |
| | Aluminum Silicate | Instrument trays, walkers, stretchers, crutches | ★★★★ |
| | Anodized Aluminum | Lab instruments | ★★ |
| | Brass | Rails, Decorative, Pipe fittings | ★★ |
| | Bronze | Rails, Decorative | ★★★ |
| | Carbon Steel - Coated | Pipes, ducts, carts | ★★★★ |
| | Cast Iron | Pipes, ducts, carts | ★★ |
| | Copper | Door handles, Infused surfaces | ★ |
| | Galvanized Steel | Pipes, ducts, carts, furniture, equipment | ★★ |
| | Stainless Steel (304, 316) | Bed frames, cabinets, carts, sinks, wheelchairs, wall brackets, fixtures, counters, Mirror frames, sinks | ★★★★ |
| | Titanium | Pipes, ducts, carts, furniture, equipment | ★★★★ |
| Other Hard Surfaces | Corian® | Countertops | ★★★ |
| | EOS® | Overbed tables and counters (copper infused) | ★ |
| | Ceramic | Tiles, sink areas | ★★★★ |
| | Porcelain | Sinks | ★★★★ |
| | Marble | Countertops | ★★★ |
| | Sealed Marble | Countertops, floors | ★★★★ |
| | Sealed Granite | Countertops, floors | ★★★★ |

# What Antimicrobial Chemistry Works Best?

| Ingredient | Spectrum of activity | Advantages | Disadvantages |
|---|---|---|---|
| Free available chlorine (chlorine, hypochlorous acid, sodium hypochlorite) | Vegetative bacteria and enveloped and non-enveloped viruses | - Broad spectrum of activity<br>- Good hard water tolerance | - May be incompatible with some soft metals<br>- Rapidly inactivated by soil<br>- Limited shelf life<br>- Can generate chlorine gas if mixed with acid or ammonia<br>- Can be inactivated by organic matter |
| Quaternary ammonium compounds | Vegetative bacteria and enveloped and non-enveloped viruses | - Broad spectrum of activity<br>- Compatible with most surfaces<br>- Very stable with long shelf lives<br>- Less reactive with soil | - Can be inactivated by hard water<br>- Can be inactivated by some surfactants used in cleaners<br>- May bind to cleaning cloths reducing active levels in a solution<br>- Food Code requires use above 24°C (75°F) |
| Peroxides | Vegetative bacteria and enveloped and non-enveloped viruses | - Minimal residue<br>- Formulated for good hard water tolerance | - May require elevated levels to be effective against catalase positive organisms.<br>- High levels of peroxide (>30%) can be significant health and flammability risks.<br>- May be incompatible with some soft metals |

Adapted from Fraser et al. 2021

# What Antimicrobial Chemistry Works Best?

| Ingredient | Spectrum of activity | Advantages | Disadvantages |
|---|---|---|---|
| Peracids | Vegetative bacteria and enveloped and non-enveloped viruses | - Broad spectrum of activity (note that antifungal activity may require a mixture of peracid)<br>- Compatible with most surfaces<br>Minimal residue | - Pungent odor<br>- Limited shelf life<br>- Inactivated by some types of soil<br>- May be incompatible with some metals |
| Acid Anionics | Vegetative bacteria and enveloped and non-enveloped viruses | - Compatible with residual cleaners if rinsing is incomplete<br>- Good cleaning performance<br>- Good material compatibility<br>- Good hard water tolerance | - May be incompatible with some soft metals and some plastic surfaces<br>- Can generate chlorine gas if mixed with chlorine products |
| Alcohol | Vegetative bacteria and enveloped viruses | - Can be used in environments where aqueous sanitizers or disinfectants cannot<br>- No residue<br>- Limited impact of organic matter | - High flammability<br>- Limited material compatibility<br>- RTU format only |

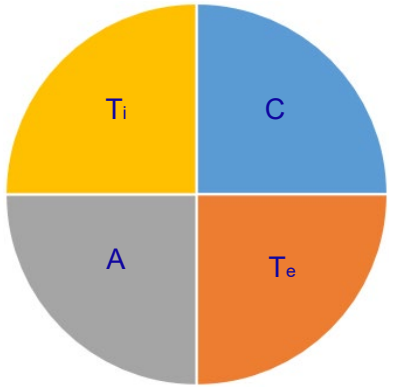
Adapted from Fraser et al. 2021

# What Antimicrobial Chemistry Works Best?

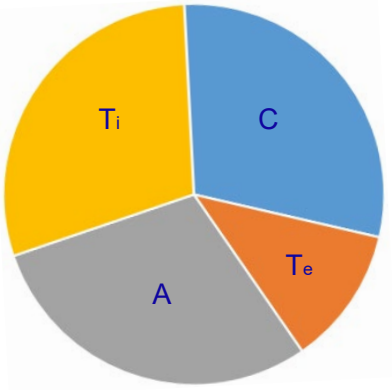
- Do not purchase antimicrobials based on active ingredient alone. Instead look at the product's label claims
- Professionally sold products are often formulated meaning they may include surfactants, solvents, chelants, etc.
- A formulated ethanol based product is going to perform much differently than a solution of 60% ethanol

# Temperature Impacts on Antimicrobials

- Standardized test methods for antimicrobial evaluation are conducted between 20 to 25°C
- A product's efficacy changes when used at low temperatures
- Critical to validate sanitation protocols in RTE facilities




25°C

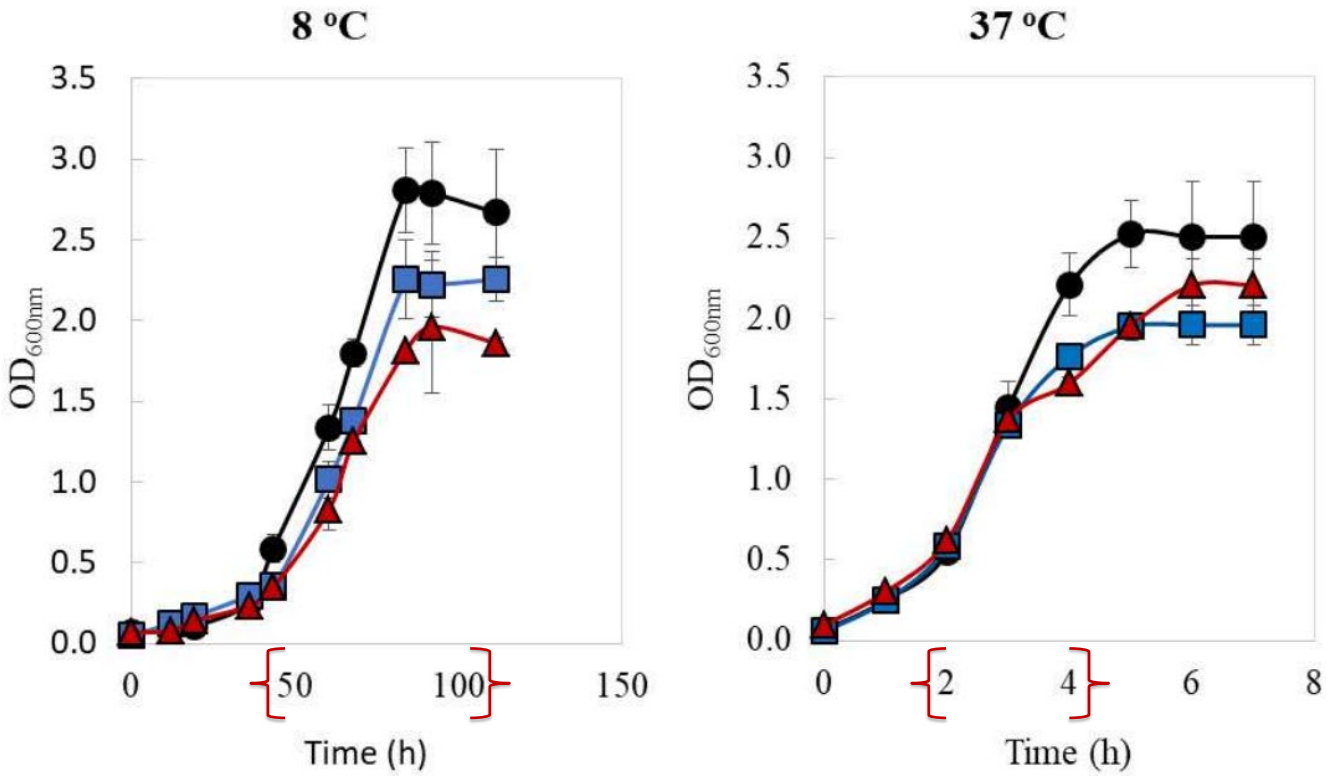



4°C

Quesille-Villalobos et al. 2019

# Low Temperature Impact on Microorganisms

- Low temperature is a great preservation tool and a must in certain RTE manufacturing settings
- Low temperature environments select for cold-tolerant bacteria, such as *Listeria monocytogenes*




Listeria monocytogenes growth curves from Quesille-Villalobos et al. 2019

# Eliminating Biofilms

Exopolysacharide
- Carbohydrates
- Protein
- DNA

Microorganism
- Carbohydrate
- Protein
- Lipid
- Minerals
- Trace compounds

What is soil in a food processor made of?
- Carbohydrates
- Protein
- DNA
- Lipid
- Minerals
- Trace compounds

# Lessons from the Field

**Setting:**
- RTE food manufacturer of >1K meals per day
- Produces primarily salads and sandwiches under chilled conditions

**Issue:**
- Unit has persistent *Listeria monocytogenes* positive samples from EMP on zone 2 and 3 surfaces.
- Problem existed under two different chemical providers

**Resolution:**
- Restorative clean by 3rd party found certain areas inaccessible. Areas cleaned were negative for *L. monocytogenes* and facilities improvements made.
- Another restorative cleaning prior to government inspection led to zero L. monocytogenes positives
- Months later, 3rd party cleaning changed and EMP began to find high positivity of *L. monocytogenes*
- Company built a new facility

**Restorative Clean #1**
- Chlorinated alkaline cleaner
- Quat based disinfectant
- Quat based sanitizer

**Restorative Clean #2**
- Chlorinated alkaline cleaner
- Peroxide/Quat based disinfectant
- Quat based sanitizer

# Key take home messages

- Understand which foods are high-risk and why
- Understand Listeria as a key hazard for high-risk chilled foods
- Understand contamination control
  - Use established risk-based management approaches, e.g., HACCP
  - The 4 C's
    - Cook
    - Chill
    - Clean
      - a multi-task force approach
      - Biofilm formation and control
    - Cross-contamination control
      - Hygienic Design
      - Segregation
      - Sanitation

# Vikan food safety webinar series

## What's next?


**Topic:**

Food Safety in Food Retail

**Date & Time:**

23rd February 2023
3 PM CEST (9 AM EST)

**Presenter:**

Amit M. Kheradia, Remco

# Further information and support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