Effective Food Plant Sanitation

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Presentation Objectives

- Why we Clean: Our motivation
- Food Manufacturing Hazards
- Sanitation Challenges
- Sanitary Design
- Sanitation Best Practices
- Maintaining Sanitary Conditions

Why We Clean the Manufacturing Asset

Protect Consumers

- Prevent illness or injury to consumers
- Prevent losses by our customers

Protect Company

- Prevent harm to company, brand names
- Assure continuity for stakeholders

Regulatory

- Conform to regulatory requirements
- Prevent regulatory action, scrutiny

Food Safety Hazards - Microbiological

Organism	Example	Severity
Bacteria	***Listeria monocytogenes***	High for immunocompromised, elderly, youth and pregnant women
	Salmonella	High rate of hospitalization and death
	E. Coli O157:H7	High rate of hospitalization, HUS
	Staphylococcus aureus	Nausea, vomiting, diarrhea; treatable
	Clostridium perfringens	Gastrointestinal distress; treatable
	Campylobacter spp.	High rate of hospitalization, can be deadly
Viruses	Hepatitis	Can have long term affect on health
	Norovirus	High rate of hospitalization, can be deadly
Parasites	*Toxoplasma gondi*	High rate of hospitalization
	Trichinella spiralis	Has been greatly reduced due to practices
	Cryptosporidium parvum	Vomiting, diarrhea, dehydration

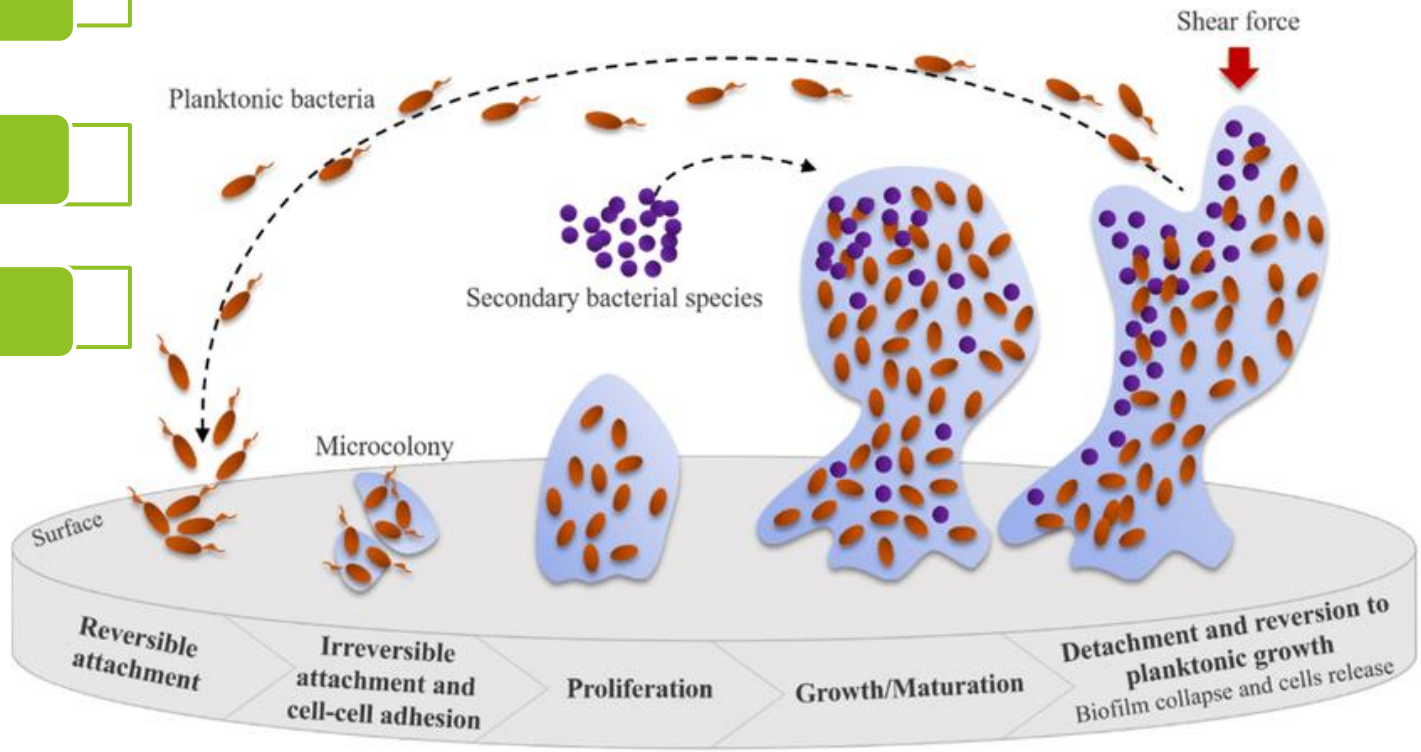
Sources can be animals, produce, personnel, pests and equipment

Food Safety Hazards - Allergens

Allergen (Common Name)	Also Identified As
Wheat	Triticale, durum, semolina
Milk	Cheese, butter, casein, cream
Soy	Edamame, tofu
Egg	Meringue, albumen
Peanuts	Goobers, ground nuts
Tree Nuts	Cashews, almonds, pecans, Brazils, Hazelnuts/filberts, coconut, walnuts, pine nuts, macadamia, pistachio
Fish	Tuna (ahi, poke), mahi mahi, salmon
Shellfish, mollusks, crustacea	Shrimp, crab, lobster, oysters, clams
Sesame (as of 2023 in US)	Seed, Oil
Mustard (in Canada)	
Sulphites in Canada; sensitizing ingredient in the US (>10 ppm)	
Gluten, lactose linked to food intolerance (inability to digest a food)	

Challenges with Sanitation - Biofilms

- Can contain multiple bacterial varieties
- Periodic shedding of bacteria
- Prevention>Detection



Organisms may be pathogenic or spoilage
Shedding can result in adulteration or reduced shelf life
Prevention involves mechanical action when cleaning

Sanitary Design – Equipment

10 Principles of Sanitary Design (NAMI)

1. Cleanable to a Microbiological Level
2. Made of Compatible Materials
3. Accessible for Inspection, Maintenance, Cleaning and Sanitation
4. Self-draining, No Product of Liquid Collection
5. Hollow Areas are Hermetically Sealed
6. No Niches
7. Sanitary Operational Performance
8. Hygienic Design of Maintenance Enclosures
9. Hygienic Compatibility with Other Plant Systems
10. Validate Cleaning and Sanitary Protocols

Implementation helps make cleaning and sanitizing more effective and efficient!

From This

To This

Sanitary Design – Facility

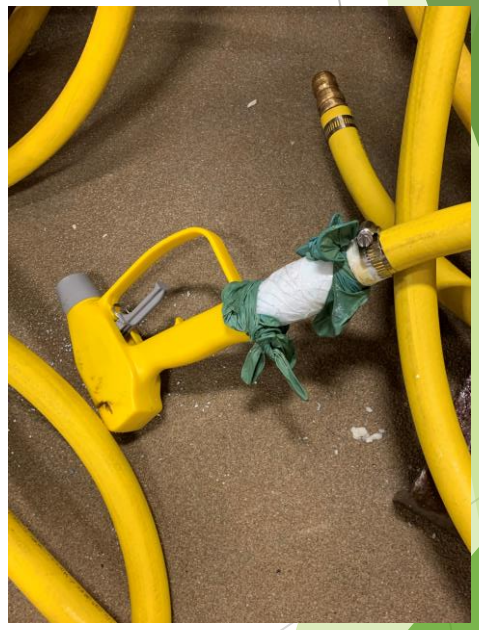
11 Principles of Facility Sanitary Design (NAMI)

1. Distinct Hygienic Zones Established in the Facility
2. Personnel and Material Flows Controlled to Reduce Hazards
3. Water Accumulation Controlled in the Facility
4. Room Temperature and Humidity Controlled
5. Room Airflow and Room Air Quality Controlled
6. Site Elements Facilitate Sanitary Conditions
7. Building Envelope Facilitates Sanitary Conditions
8. Interior Spatial Design Promotes Sanitation
9. Building Components and Construction Facilitate Sanitary Conditions
10. Utility Systems Designed to Prevent Contamination
11. Sanitation Integrated into Facility Design

Implementation helps eliminate sources of harborage and translocation

Sanitation Best Practices

- Pre-requisites Include:
  - Commitment from Company/Facility Management
  - **Safety training for all sanitation personnel (LOTO, chemical handling)**
  - Adequate staffing: management, supervision sanitors
  - Good supply of PPE, cleaning and sanitizing tools, good condition
  - Sanitary design of the manufacturing asset
  - Well written general sanitation procedures (include pictures)
  - Adequate supply of water (potable, temperature, pressure)
  - Correct cleaning chemicals for soils to be cleaned
  - Validation of sanitation efficacy, ongoing verification of process
  - Effective communication between Ops, FSQA, Maintenance and Sanitation
  - Reassessment of cleaning and sanitizing protocols to address changes



Cleaning Considerations

Water Quality		
Potable (water report)	Hardness	0 – 3.5 grains per gallon = Soft 3.5 – 7.0 grains per gallon = Moderate 7.0 – 10.5 grains per gallon = Hard >10.5 grains per gallon = Very Hard
Soils to be Cleaned	Fats/Lipids	Insoluble in water – use alkali
	Proteins	Insoluble in water – use alkali, acid
	Carbohydrates	Soluble in water or alkali
	Minerals	Insoluble in water and alkali, use acid
Other considerations:	Soap contact time = 10 – 15 minutes MAX	
Surface to be cleaned: stainless steel, aluminum, UHMW, galvanized		
Water temperature for rinsing: 49^0 C (120^0 F) - 60^0 C (140^0 F)		
Water pressure: max 200 psi to prevent creation of aerosols		
7 steps for wet cleaning		4 – 5 steps for dry cleaning
Verification of cleaner or sanitizer concentration for efficacy		

Sanitizing Considerations

- Conduct pre-op inspection after cleaning but *before* applying sanitizer

Sanitizer	Organism Controlled	Residual	Corrosiveness	Stability
Chlorine	Gram -, spores	None	Soft metals	Unstable
Quat	Gram +, mold	Slight	Minimal	Stable
Iodophores	Gram + and -	Slight	Minimal, but stains	Stable <49⁰ C (120⁰ F)
Ozone	Gram + and -	None	Mild	Unstable
PAA	Wide spectrum	None	Soft metals	Stable
Chlorine Dioxide	Wide spectrum, biofilms	None, quick kill	Minimal	Breaks down to H2O, NaCl
Silver Dihydrogen Citrate	Bacteria, virus and fungi	Quick kill	Minimal	Stable, no rinse required, citrus odor

Consider: concentration, rotation of sanitizers, fogging (misting)

Sanitation Validation vs. Verification

Validation

- Scientific documentation that a process will prevent or significantly reduce a food safety hazard.
- Examples:
  - Collecting swabs from equipment and environment for Listeria species analysis
  - ELISA testing of equipment and utensils for specific allergen proteins
- Conducted on consecutive days for sufficient data
- Once process is validated, proceed to routine verification

Verification

- Verification is routine (i.e., daily pre-op) and is used to demonstrate that the *validated* process is being followed effectively
- Examples:
  - Organoleptic inspection (visual, smell, touch);
  - ATP to detect presence of organic material (i.e., bacteria, food residue)
  - Generic micro monitoring (i.e., APC, Coliform, enterobacteria
  - Protein indicator swabs for allergens

Maintaining Sanitary Conditions

- The motto of food manufacturing is “Clean to run”!
- Once the plant is clean, then it’s necessary to maintain sanitary conditions operationally
- Keep the facility clean and in good repair
- Do not allow the process to contribute to microbiological translocation or the facility to provide microbiological harborage
- Determine if there is a need for periodic operational cleaning, sanitizing
- Prevent harborage, attraction or entry of pests to the plant
  - Limit lighting that is directly on the outside walls of the building
  - Eliminate or control materials to prevent pest harborage
  - Maintain door controls to prevent access to the plant
  - Clean up spills to prevent attraction
  - Conduct regular inspection, particularly in stored ingredient areas
  - Utilize a qualified, licensed PCO to create an effective control plan

Good Manufacturing Practices

- In the US, the Food Safety Modernization Act provides general guidelines for GMP's (21 CFR 117)
- Typical GMP's include, but are not limited to, the following:

GMP	Description
Cleanliness	Coming to work clean, wearing clean clothing
Handwashing	How to wash, frequency of washing hands
Hairnets	How to wear, where they are required, color coding (?)
Smocks	Where they are required, frequency of changing
Separation	Raw and RTE area controls
Jewelry	Limitations of rings, piercing, bracelets or watches

- It's important to have
  - Documented GMP training/education for all employees
  - Monitoring for conformance to GMP requirements
  - Remediation for GMP non-conformance

Thank you for your time and participation.

Let's take time for some questions!