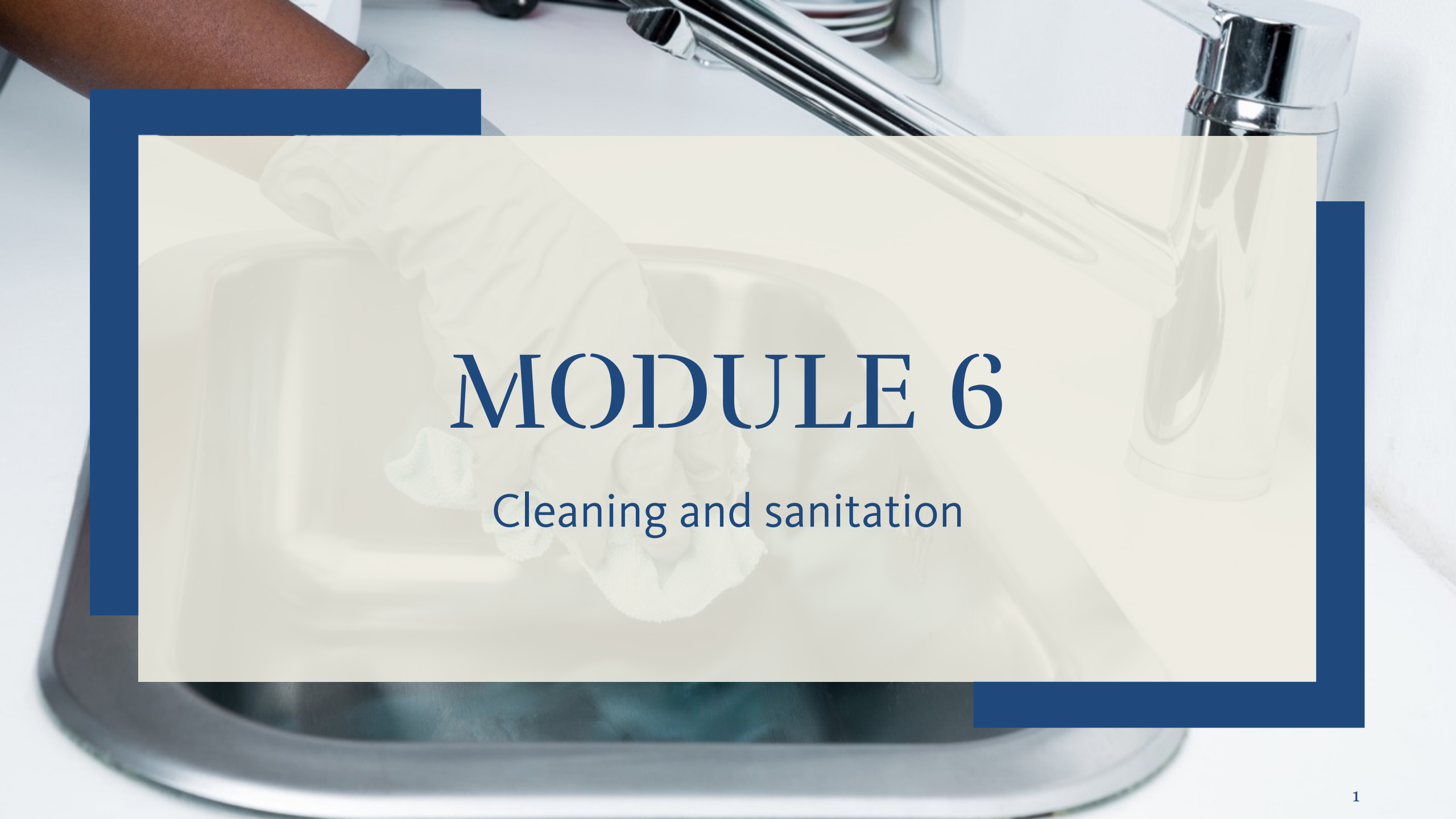


MODULE 6

Cleaning and sanitation

Learning objectives

- Definitions important to sanitizers
- Major food safety hazards controlled by sanitation practices
- That sanitation preventive controls are identified through hazard analysis
- Sanitation preventive controls management components required in a Food Safety Plan
  - Monitoring
  - Corrections
  - Verification
- Different sanitizer chemical classes and uses

Sanitation is the Beginning of Food Safety, Not the End.

Definitions

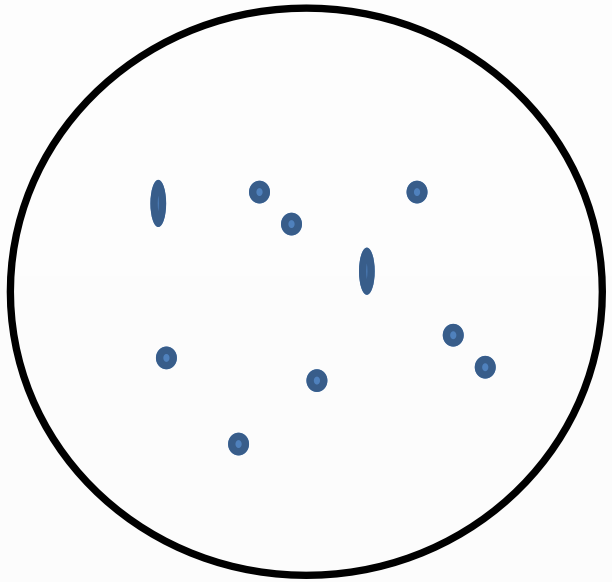
How a product is classified is VERY important to understand. It is essential when determining WHEN, HOW, and WHERE to use a product.

Sanitizers: reduce bacteria to levels considered safe by many public health agencies. Commonly used in food processing environments.

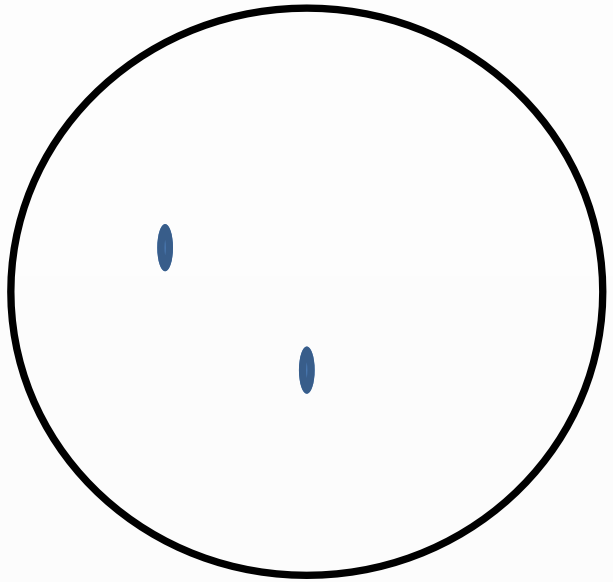
Disinfectants: these products kill all bacteria/molds/most viruses. However, they do not kill bacterial endospores. They are often used in hospitals.

Sterilants: these products kill all microorganisms, including endospores. They would be used in aseptic processing and sterilizing surgical devices.

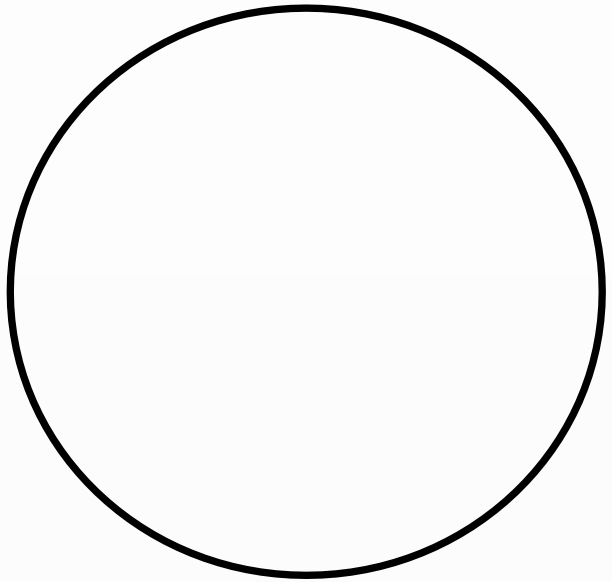
Sanitization



Disinfection



Sterilization



Factors Relevant to Sanitation Preventive Controls

- Environmental pathogens when RTE product is exposed to the environment prior to packaging

  e.g., *Listeria monocytogenes*

- Pathogens transferred through cross-contamination

  e.g., Employees handling raw/processed product and unsanitary objects

- Food allergen cross-contact
  - Unintended soy, milk egg, fish, crustacean shellfish, wheat, peanut or tree nut cross-contact

GMPs That Support Cross-contamination and Cross-contact Prevention

- Employee hygiene practices
- Employee food handling practices
- Plant design and layout
- Packaging material storage and handling
- General cleaning and sanitizing
- Physical separation of:
  - Raw and ready-to-eat products
  - Unique food allergens

Sanitation Preventive Controls*

- Procedures, practices and processes for:
  - Cleanliness of food-contact surfaces
  - Prevention of allergen cross-contact and cross-contamination
    - From insanitary objects and personnel to food, food packaging material, other food contact surfaces
    - From raw product to processed products

* When hazard analysis identifies a hazard requiring a preventive control

Sanitation Considerations for:

- Wet cleaning versus dry cleaning
- Personnel practices
- Hygienic zoning

Hard Surface Sanitizers

Sanitizers approved for use for hard services can be divided into two major categories: food contact sanitizers and non-food contact sanitizers.

- For food contact sanitizers, these products are specifically registered for use on hard surfaces where food products make any type of contact.
- Food contact sanitizers are required to reduce pathogens (*E. coli* and *S. aureus*) by 99.999% (5-log) within 30 seconds.
  - *Note: a potable water rinse is typically not allowed following the application of a sanitizer of a food contact surface.*

Non-food Contact Sanitizers

- These products are used for applications on hard services in which food products have no contact. Sometimes these surfaces are referred to as “environmental surfaces.”
- The minimum requirement for these products is a 3-log reduction (99.9%) of pathogens (*S. aureus, K. pneumonia*) within 5 minutes contact time.
- The main purpose is to prevent cross-contamination of food contact surfaces through the application of sanitizers to non-food contact areas.

The Power of Log Reduction

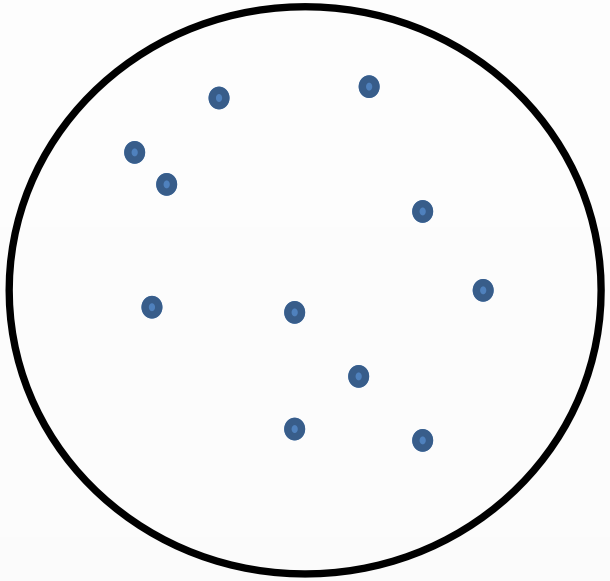
If you begin with 1,000,000 organisms, this the effect of exponential log reduction on bacteria from different sanitizers.

Non-food Contact

1,000 organisms remain

Three log reduction
99.9%

Food Contact



10 organisms remain

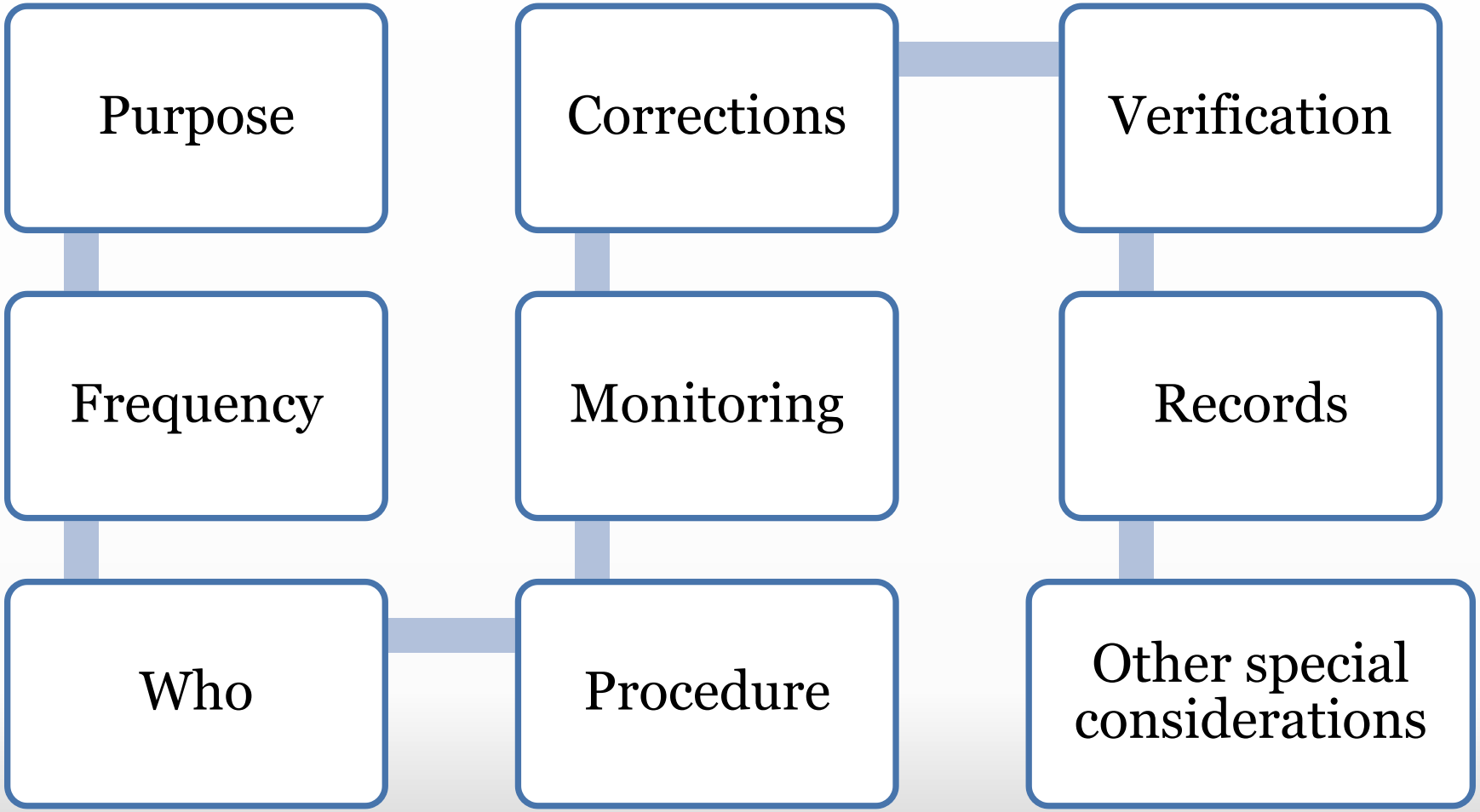
Five log reduction
99.999%

Documenting Sanitation Preventive Controls

- Document procedures, practices and processes to control identified hazards, including:
  - Cleanliness of food-contact surfaces
  - Prevention of allergen cross-contact and cross-contamination from:
    - Insanitary objects
    - Personnel to food, food packaging material, food-contact surfaces
    - Raw product to processed product
- Documentation required only for hazards a requiring preventive control

Cleaning and Sanitizing Procedures

Should identify:



Sanitation Monitoring

- Definition – Monitor
  - To conduct a planned sequence of observations or measurements to assess whether control measures are operating as intended.
    - 21 CFR 117.3 Definitions
- Monitoring critical elements of the sanitation process
- Monitoring implementation for other controls, as relevant, such as hygienic zoning

Sanitation Verification

- Activities that demonstrate that sanitation procedures are operating as intended
- Methods used can vary significantly depending on the food, the facility, and relevance in the food safety system
- Potential examples
  - Measuring chemical concentrations
  - ATP swabs, contact plates, microbial count swabs
  - Environmental monitoring for environmental pathogens
  - Record review

Environmental Monitoring

- If applicable, required to verify the effectiveness of preventive controls for environmental pathogens
  - E.g., facilities where ready-to-eat product is exposed to the environment
- Must be tailored to each facility
- A useful program diligently ***tries to find*** the organism and addresses issues identified!
- See Appendix 6 for more information

Sanitation Preventive Controls Summary

Hazard analysis identifies hazards requiring a preventive control such as:

- Environmental pathogens when RTE food is exposed to the environment prior to packaging
- Pathogens transferred through cross-contamination
- Allergens transferred through allergen cross-contact

Sanitation preventive controls focus on:

- Cleanliness of food-contact surfaces
- Prevention of cross-contamination and allergen cross-contact

Sanitation preventive controls describe:

- Monitoring activities and frequency
- Corrections to make when requirements are not met and corrective actions that apply for allergens and environmental pathogens
- Verification activities appropriate to the facility

Major Sanitizer Classes

Quaternary Ammonia Compounds (QACs or Quats)

Oxidizers

-Peroxyacetic Acid
-Chlorine Dioxide
-Sodium hypochlorite
-Ozone

Acid Anionics

Iodophors

Sodium hypochlorite (Bleach)

Sodium hypochlorite: very common and often referred to as "bleach." Bleach is available in liquid and granular forms. Make sure the product is food grade and not household bleach with fragrances and other additives.

- Bleach should be used in water with pH range of 6-7.5. Below this pH can start to generate dangerous chlorine gas.
- A common misperception is that chlorine content can be inferred from smell. Do not confuse the smell of chlorine with free chlorine available for killing microbes.
- Test kits should be used to determine the amount of free chlorine. Follow all guidelines to make sure the bleach concentration is in the appropriate range.

Sodium hypochlorite (Bleach)

Advantages:

- Bleach is effective a low temperatures and in hard water.
- Bleach has a very broad killing spectrum.
- Efficacious against bacteriophages.
- Inexpensive

Disadvantages:

- Corrosive. Don't apply to soft metals.
- Solutions have very short shelf-life.
- Some safety/handling issues – strong irritant.
- Efficacy is limited by organic matter.

Chlorine Dioxide (ClO_2)

ClO_2 possesses strong oxidizing properties, and is significantly more effective compared with just chlorine. ClO_2 works by disrupting cell members, oxidizing chemical bonds and denaturing proteins.

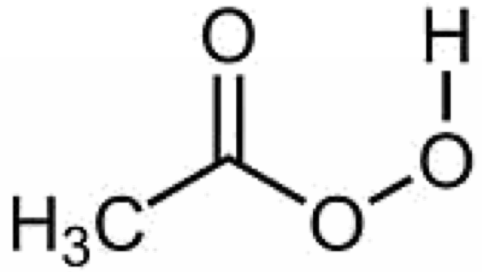
Advantages:

ClO_2 can be effective on addressing biofilms.	Non-corrosive to stainless steel at label uses.	Broad spectrum efficacy against pathogens.

Disadvantages:

It must be generated onsite.	Short shelf-life of active solution.	Potential to generate chlorine gas.

Peroxyacetic/Peracetic Acid (PAA)



PAA is widely used and has many diverse applications given its broad spectrum killing capabilities. First registered in 1985, PAA is used in medical, agricultural and processing facilities.

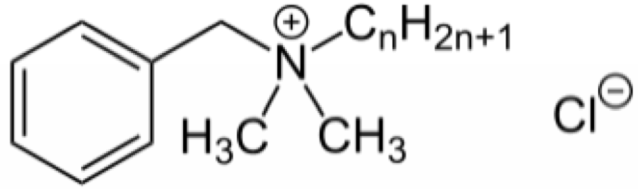
Advantages:

Approved for organic use.	Excellent cold water killing capabilities.	One step acid rinse + sanitation.	Efficacious against bacteriophages.

Disadvantages:

Corrosive. Don't apply to soft metals.	Some safety/handling issues – strong irritant.

Quats (Quaternary Ammonium Compounds)



Many quats are available for food processing facilities. These include ADBAC and DDACs. They are positively charged compounds that disrupt cell membranes and have many uses in society.

Advantages:

Quats are non-corrosive and appropriate to use on soft metals.	They have excellent foaming properties.	Quats leave a bacteriostatic film.

Disadvantages:

Quats are not compatible with negatively-charged surfactants.	Less efficacious against biofilms.	Quats cannot be used on food-contact surfaces in organic production.

Iodophors

Iodophors are neutrally charged surfactants that have iodine and phosphoric acid. These water-soluble mixtures release iodine to attack microbes. Solution should be left on equipment for at least 2 minutes.

Advantages:

Broad spectrum killings (but not bacteriophages and endospores).	Efficacy is robust in high organic loads and hard water.	Suitable for sanitizing utensils and for hand dips.

Disadvantages:

Iodophors are inactivated by proteins at pH > 4 and temperature > 50°C	Iodine causes staining on some materials.

How to Choose your Sanitizer

There are no perfect antimicrobials for every situation. Understanding the limitations and strengths of different products is critical. Chemical sales representatives can be very helpful.

When making a product decision, consider:

- Efficacy claims
- Worker safety issues
- Organic vs. conventional production
- Material composition
- Environmental factors (temp, humidity, water)
- Application methods

Word of Caution

Be careful if you turn your sanitation program over to people other than your supervisors. Many people don't take the time to read the container label or have a hard time comprehending the instructions for dilution and use.

The manufacturer recommends dilutions for precise reasons: ease of cleaning, efficacy, etc. However, there are always a few "chemists" who think more is always better or "mixologists" who want their own concoction. These can lead to trips to the ER or courtroom.

With any chemical, be judicious and attentive!

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