



**KEEP  
YOUR  
PACKINGHOUSE  
CLEAN**

**2023 PICK TN  
CONFERENCE**

**ALEXIS  
HAMILTON**  
ASSISTANT  
PROFESSOR AND  
EXTENSION  
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# AGENDA

1

How cleaning fits  
in a food safety  
program

2

How to clean

3

How to monitor  
cleaning efficacy





# HOW CLEANING FITS IN A FOOD SAFETY PROGRAM

**Farm food  
safety plan**

**Food safety  
program**

**Pre-requisite  
programs**

**Sanitation  
program**

**Cleaning**



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# WHAT IS CLEANING?

- Removal of debris from surfaces
- Different from sanitizing
  - Must be done ***first!***
- Steps to cleaning:
  - Rinse
    - No generic *E. coli*
  - Detergent
    - Based on soil and surface
  - Scrub
    - Mechanical action
    - Lather
  - Rinse
    - No generic *E. coli*



# WHY SHOULD I CLEAN?

- Maintain quality of fresh produce
- Support consumer safety
- Prolong integrity of equipment and materials
- Required for covered farms under the Produce Safety Rule (PSR)

# A QUICK GUIDE TO CLEANING AND THE PSR

- Do I have to clean? How often?
  - 21 CFR 112.123(d)(1)
- What do I have to clean?
  - 21 CFR Subparts K and L
- How do I have to clean?
  - 21 CFR 112.44
- Do I have to train about cleaning?
  - 21 CFR 112.21
- Do I have to keep records about cleaning?
  - 21 CFR 112.140(b)(2) and others
- How long do I have to keep cleaning records?
  - 21 CFR 112.164

# DO I HAVE TO CLEAN? HOW OFTEN?

Short answer: yes

"You must inspect, maintain, and **clean** and, when necessary and appropriate, sanitize all food contact surfaces of equipment and tools used in covered activities **as frequently as reasonably necessary to protect against contamination of covered produce.**"





# WHAT DO I HAVE TO CLEAN?

- Zone 1 direct food contact surfaces
  - Equipment/Building
    - Reusable containers (harvest bins, lugs)
    - Packaging materials
    - Packing line surfaces
  - Tools
    - Harvest tools (gloves, clippers)
- Zone 2 non-food contact surfaces
- Zone 3 non-food contact surfaces
- Zone 4 non-food contact surfaces



# WHAT DO I HAVE TO CLEAN?

- Zone 1 direct food contact surfaces
- Zone 2 non-food contact surfaces
  - Equipment/Building
    - Side of washer, packing line
    - Opposite side of splash guards
  - Tools
    - Tool box or storage kits
- Zone 3 non-food contact surfaces
- Zone 4 non-food contact surfaces



# WHAT DO I HAVE TO CLEAN?

- Zone 1 direct food contact surfaces
- Zone 2 non-food contact surfaces
- Zone 3 non-food contact surfaces
  - Equipment/Building
    - Floors, drains
    - Moveable equipment (forklift, vehicles)
  - Tools
    - Maintenance tools
- Zone 4 non-food contact surfaces



# WHAT DO I HAVE TO CLEAN?

- Zone 1 direct food contact surfaces
- Zone 2 non-food contact surfaces
- Zone 3 non-food contact surfaces
- Zone 4 non-food contact surfaces
  - Equipment/Building
    - Storage areas
    - Restrooms



# HOW DO I HAVE TO CLEAN?

In a way that prevents product  
or surface contamination

"You must ensure there is **no  
detectable generic E. coli in 100  
milliliters**" of postharvest water



# DO I HAVE TO TRAIN ABOUT CLEANING?

Short answer: yes

"All personnel...must receive **adequate training, as appropriate to the person's duties**, upon hiring, and periodically thereafter, at least once annually"



# DO I HAVE TO KEEP RECORDS ABOUT CLEANING?

Short answer: yes

- Employee training
- Postharvest water quality
- Date/method cleaning



# HOW LONG DO I HAVE TO KEEP CLEANING RECORDS?

"You must keep records required by this part for **at least 2 years** after the record was created."





# HOW TO CLEAN

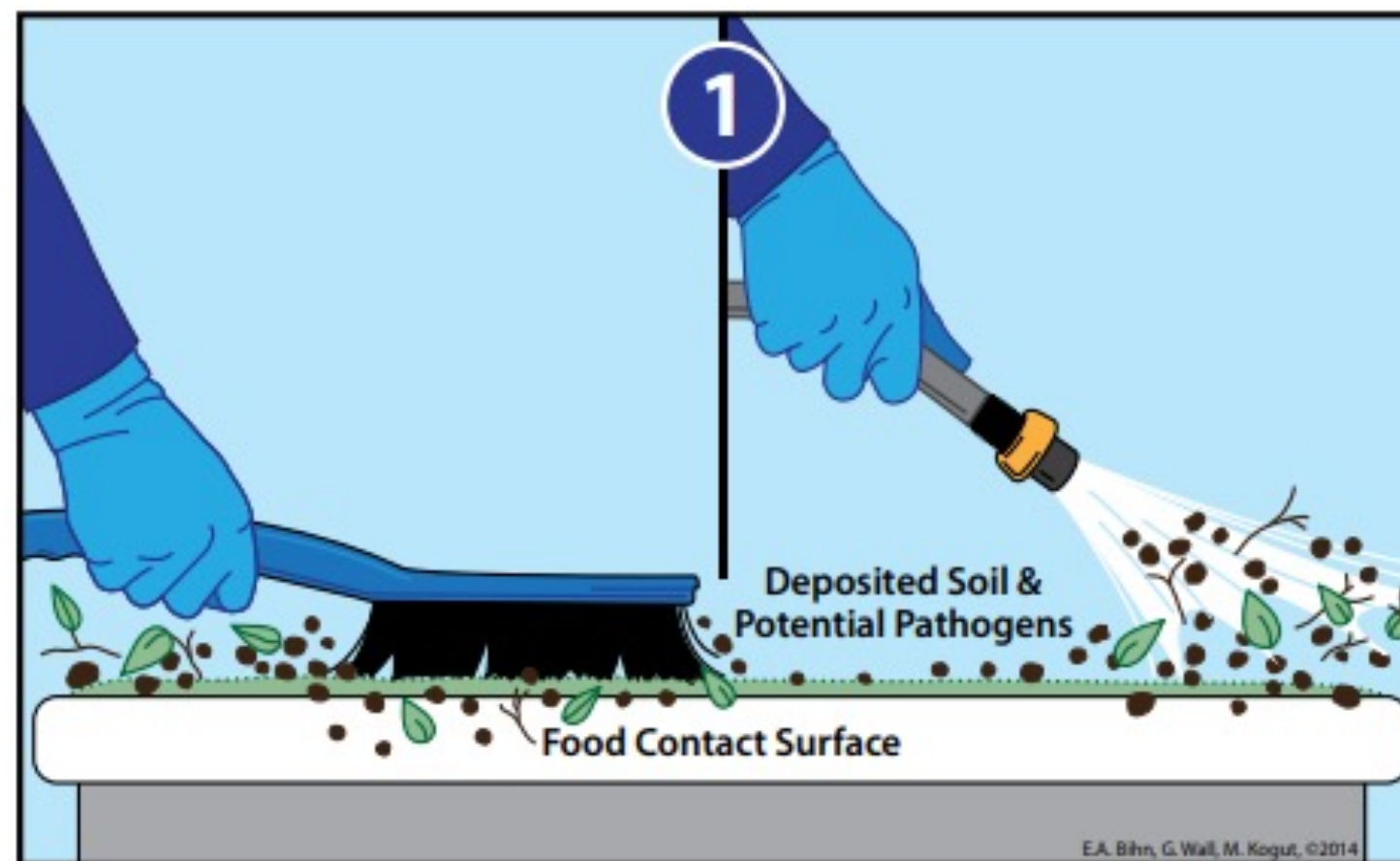


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# STEP 1: RINSE

## Step 1: Remove any obvious dirt and debris from the food contact surface

- First, remove any obvious dirt and debris from the food contact surface. This can be done using a brush to sweep, air to blow off, or water to rinse off debris. The right pressure is important.
  - Avoid cleaning with high pressure washers or air compressors, as this could spread pathogens and other debris over a large area.
  - Overly low pressure water or air may not effectively remove soil and debris from surfaces.
  - Use just enough pressure to remove the debris.
- Tools should have a designated area for use. This can be achieved through color coding. For instance, black handles can designate use on floors only and blue handles can designate use on food contact surfaces such as conveyor belts.

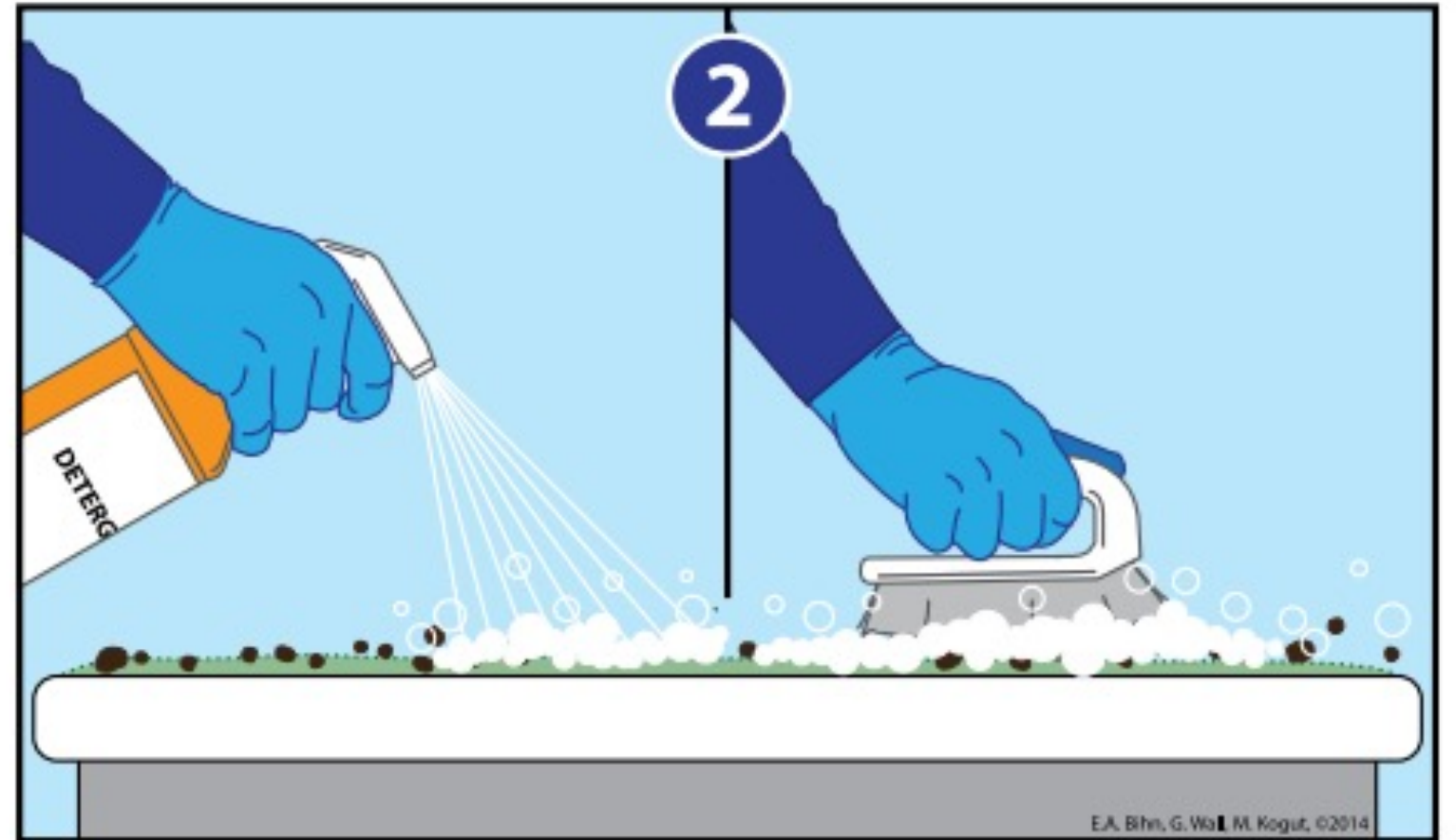




# STEP 2: SCRUB

## Step 2: Apply a detergent and scrub the surface

- Be sure to use a detergent effective on the type of soil that needs to be removed. Some detergents are designed to remove fats (e.g., from animal slaughter) while others may be more effective at removing carbohydrates (e.g., sugars from fruit), or proteins, so select the detergent that removes the type of soil that is present.
- Detergents should be appropriate for use on food contact surfaces.
- Apply the detergent at the level recommended on the label and physically scrub the surface to remove any soil.
  - Removing the soil and other organic build-up can help minimize the formation of biofilms.

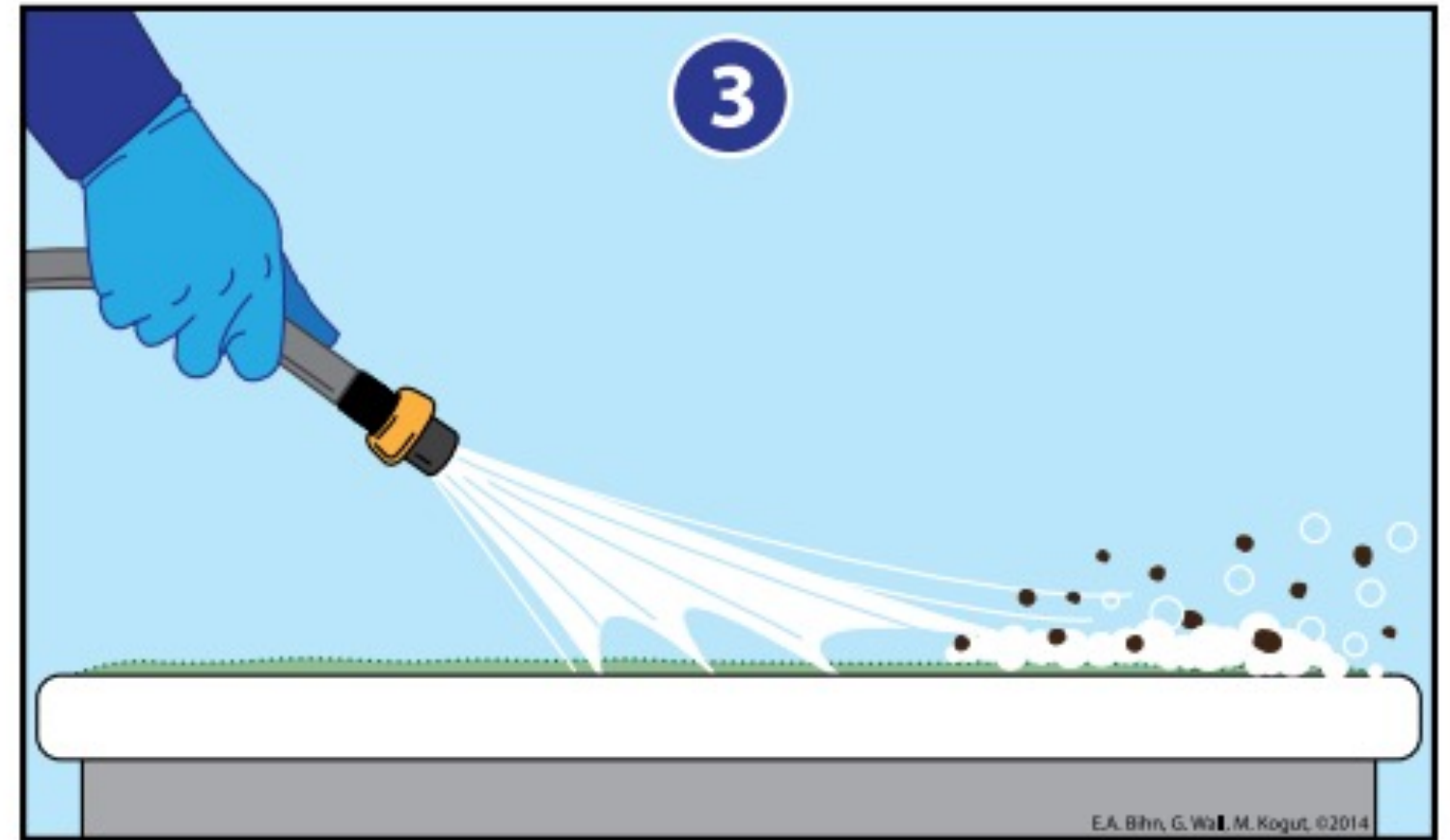




# STEP 3: RINSE

**Step 3: Rinse the surface with clean water, making sure to remove all the detergent and soil**

- Rinse the surface with clean water that has no detectable generic *E. coli* in a 100 mL sample.
- Make sure all of the detergent and soil is removed.
- Avoid rinsing with high pressure washers as this could spread pathogens over a large area, recontaminating areas that may have already been cleaned.
- Minimize splashing or aerosolizing to prevent the spread of contamination from one surface (e.g., floors, floor drains) to another by using high volume, low spray water.



# IS IT CLEAN?



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PHOTO CREDIT: DR. BETSY BIHN



# IS IT CLEAN?



Image:  
Polyester  
nylon brush  
roller



# IS IT CLEAN?





# IS IT CLEAN?



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PHOTO CREDIT: GRETCHEN WALL



# IS IT CLEAN?



Image: PVC  
rollers on  
mixed crop  
packing line





# HOW TO MONITOR CLEANING EFFICACY

# VISUAL INSPECTION



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# ATP



# VISUAL INSPECTION



- View the surface/area to see if clean enough
- Equipment: none
- Qualitative results
  - Clean vs. not clean

- Adenosine triphosphate
- Energy molecule in all living things
- Cotton-tipped swab with squeezable solution for self-contained reaction
- Equipment: luminometer
- Quantitative results
  - Threshold



# ATP







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