# Cleaning & Sanitizing:
# Labeled Sanitizers for Produce, FDA C&S Workshop, C&S on Farms

Produce Safety ALLIANCE

# EPA-Labeled Sanitizers for Produce: A look at the Updated PSA Sanitizer Webtool

February 21, 2024

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# Agenda for Today

- Review the purpose of using sanitizers in the postharvest setting
- Considerations when selecting a sanitizer
  - EPA labeling
- Introduction to the Improved PSA Sanitizer Tool

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# What is a Sanitizer?

- A substance that reduces the amount of microorganisms to acceptable levels
- Generally part of a broader group of substances called antimicrobial pesticides
- Focus on sanitizers used for two purposes:
  - Food contact surfaces
  - Fruit and vegetable wash water

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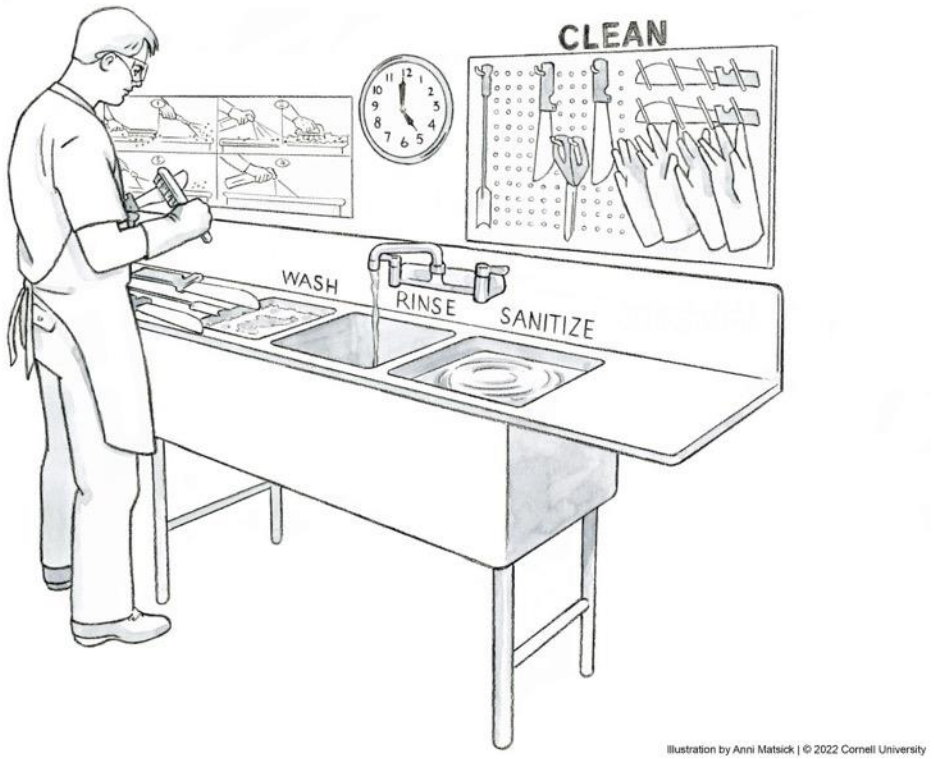
# Sanitizer Use: Food Contact Surfaces

- Part of the cleaning and sanitizing process for food contact surfaces
  - Treatment of a cleaned surface to reduce or eliminate microorganisms
  - Harvest knives, bins, tables



# Sanitizer Use: Fruit and Vegetable Wash Water

- Maintain quality of postharvest water
  - Reduces risks of cross-contamination from dirty water and contaminated food contact surfaces
  - NOT intended to “wash” the product
- Reduces plant pathogens that impact shelf life and rot

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# Choosing an Antimicrobial Product, Including Sanitizers

- Chlorine sanitizers are commonly used
  - Affordable and available
  - Corrosive, highly reactive
- Many non-chlorine chemical options
  - Ozone, peroxyacetic acid, hydrogen peroxide, etc.
- Organic formulations are available
  - Tsunami, Spectrum, Sanidate, VigorOx 15 F&V, etc.
  - Check with organic certifier
- Must be labeled for use

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# Selecting an Appropriate Sanitizer: EPA Labels

- All pesticides (including sanitizers) are regulated by the EPA through the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
  - Ensures that using a product correctly will limit the product's risk to humans and the environment
- Pesticides (including sanitizers) must be registered and contain an EPA number

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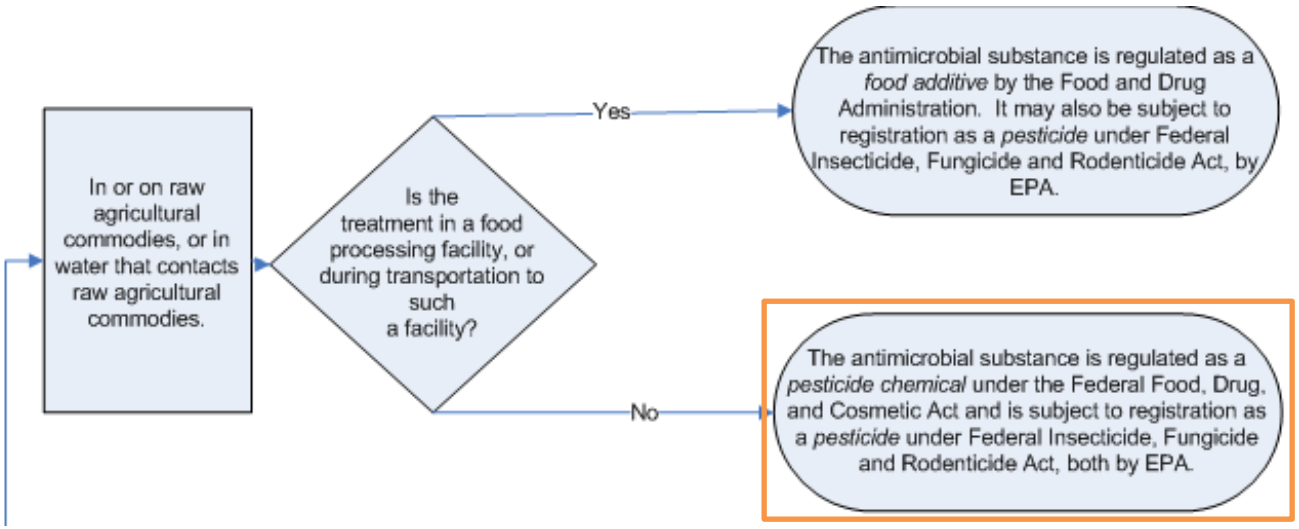
# Why use EPA-labeled sanitizers?

- FSMA PSR requires that

  "Any method you use to treat agricultural water (such as with physical treatment…; EPA-registered antimicrobial pesticide product; or other suitable method) must be effective to make the water safe and of adequate sanitary quality for its intended use" (§ 112.43)

- FDA maintains a decision tree on whether antimicrobials are regulated by EPA or FDA



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- Using an EPA-labeled sanitizer is highly recommended
  - Inspectors are trained to look for EPA-labeled sanitizers
  - Instructions and efficacy data are based on agricultural use scenarios
- Food additives are regulated under FDA
  - Relevant for food processors, not farms

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# Follow the Label!

- Always read and follow label instructions
- You must use the product only as labeled
  - Direct contact with produce vs. food contact surface
  - Target organisms (*E. coli*, spoilage organisms, etc.)
- You should use the correct amount of antimicrobial product (in ppm or other measurement)
- Understand factors that affect efficacy
  - Temperature, pH, sunlight, and how it is affected by organic load

ULTRA CLOROX® BRAND REGULAR BLEACH (EPA Reg. No. 5813-50)
[REGISTERED AS Clorox® Regular Bleach]
FOR FRUIT & VEGETABLE WASHING
It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Thoroughly clean all fruits and vegetables in a wash tank. Prepare a sanitizing solution of 25 ppm available chlorine. After draining the tank, submerge fruit or vegetables for 2 minutes in a second wash tank containing the recirculating sanitizing solution. Spray rinse vegetables with the sanitizing solution prior to packaging. Rinse fruit with potable water only prior to packaging.

§

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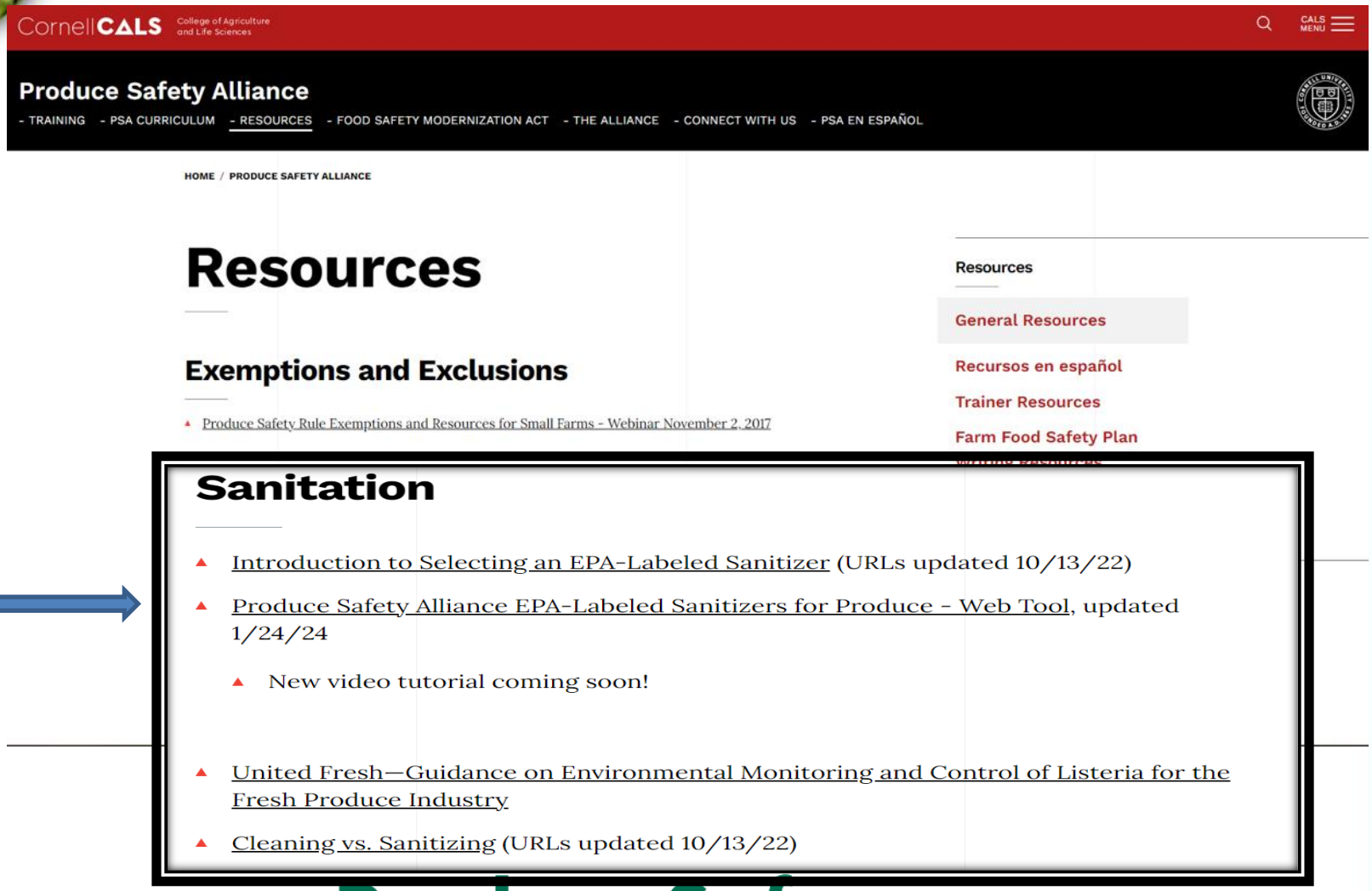
# What's in a Label?

- EPA registration number to identify the product
- Labeled use(s) for the sanitizer
  - Food Contact Surface
    - Nonporous surfaces
  - Processing water
- What type of organisms the product can kill (*E. coli,* spoilage organisms, etc.)
  - Efficacy statement
- Instructions to guide the use of the product
- PPE instructions

# PSA Sanitizer Web Tool

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# PSA EPA-Labeled Sanitizers for Produce

- Tool was designed as a resource to help produce growers (and those who support them) review and select sanitizers based on their EPA label
  - Originally released in 2017 as an Excel file; limitations on usability
- Adapted the resource into a web tool
- Funded in part by the Local Food Safety Collaborative (LFSC)
- https://resources.producesafetyalliance.cornell.edu/sanitizer/

Total results found: 105

Type to search (e.g., product name, active ingredient)

Compare | Reset

| | | | | EPA Master Label Details | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | EPA Master Label | | Preharvest Labeled Uses | Postharvest Labeled Uses | | | Efficacy Statement | Product Information | | | |
| Compare | Product Name | Name on EPA Master Label | Active Ingredient (% Strength) | EPA Registration Number | Labeled Use Info Based on Version Date | Labeled For Use in Irrigation Water Systems | Labeled For Use on Non-Porous Food Contact Surfaces | Labeled For Use on Postharvest Water Distribution Systems | Labeled for Use in Fruit and Vegetable Wash Water | Labeled to Control Human Pathogens | Organic Materials Review Institute (OMRI) Listing | Quantity Purchasable per EPA Label | Manufacturer/ Distributor | Notes |
| ☐ | Agchlor 310 | Agchlor 310 | Sodium hypochlorite (12.5%) | 2792-62 | 5/23/12 | No | Yes, see page 7 | No | Yes, see page 7 | No | Not listed | Gallons: 55 | Decco US Post-harvest, Inc. | None |
| ☐ | Alpet D2 Surface Sanitizer | Alpet D2 | Isopropyl Alcohol (58.6%); Quaternary Ammonium (0.0075%, see label) | 73232-1 | 4/21/20 | No | Yes, see page 6 | No | No | For Food Contact Surfaces | Not listed | Information not available | Best Sanitizers, Inc. | None |
| ☐ | Alpet D2 Quat-Free Surface Sanitizer | Alpet D2 Quat-Free Surface Sanitizer | Ethanol (62.5%); Isopropanol (7.5%) | 73232-4 | 8/16/21 | No | Yes, see page 5 | No | No | For Food Contact Surfaces | Allowed with restrictions | Information not available | Best Sanitizers, Inc. | None |
| ☐ | Anthium Dioxcide | Anthium Dioxcide | Chlorine dioxide (5.0%) | 9150-2 | 4/6/20 | Yes, see page 22 | Yes, see page 23 | Yes, see page 12 | Yes, see page 9 | No | Not listed | Information not available | International Dioxcide, Inc. | None |
| ☐ | Antimicrobial Fruit & Vegetable Treatment | Antimicrobial Fruit and Vegetable Treatment | Lactic Acid (17.3%); Quaternary Ammonium (1.2%, see label) | 1677-234 | 10/31/17 | No | No | No | Yes, see page 6 | For Washing Fruits and Vegetables | Not listed | Ounces: 4, 64, 96 Gallons: 1, 2.5, 4 | Ecolab, Inc. | None |

# PSA EPA-Labeled Sanitizers for Produce Web Tool

- Updates include:
  - Addition of product labels, when available
    - More accurate in identifying labeled uses for each sanitizer product
  - Hyperlink to manufacturer/distributor contact information
  - Search bar
  - Compare function
- Video tutorial and factsheet coming soon
- Plan to highlight the tool (and lessons learned during development) in the March Produce Safety Educators' Call

Total results found: 105

Type to search (e.g., product name, active ingredient)

Compare | Reset

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| Compare | Product Name | Name on EPA Master Label | Active Ingredient (% Strength) | EPA Registration Number | Labeled Use Info Based on Version Date | Labeled For Use in Irrigation Water Systems | Labeled For Use on Non-Porous Food Contact Surfaces | Labeled For Use on Postharvest Water Distribution Systems | Labeled for Use in Fruit and Vegetable Wash Water | Labeled to Control Human Pathogens |
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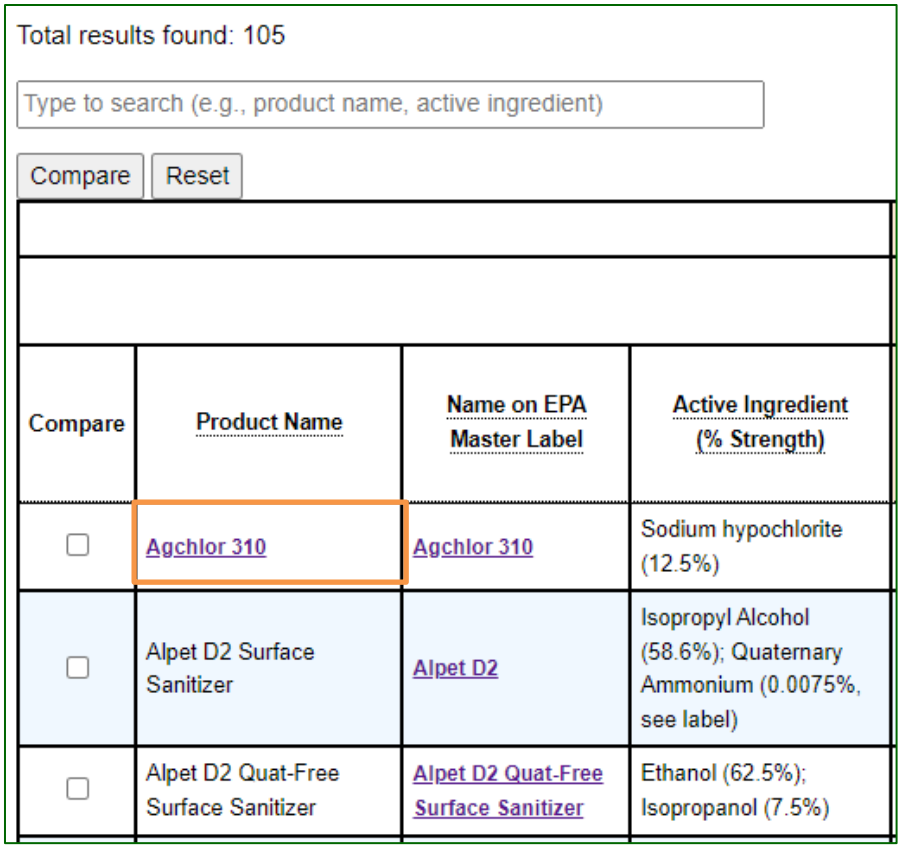
# Walkthrough of the Tool

- Tool is divided into three sections, all viewable from one screen
- First section includes
  - Product name
  - Name on EPA Master Label
  - Active Ingredient (including the % strength for each)
- Both product labels and EPA labels are clickable hyperlinks (when available)


Total results found: 105

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| Compare | Product Name | Name on EPA Master Label | Active Ingredient (% Strength) |
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# Label Details and Product Information

- Content of the tool still centers around EPA Master label details and uses
- 'Postharvest Water Distribution System' is a new label use category
- Manufacturer/Distributor contact information is hyperlinked, when available
  - Intent is to make accessing information easy for the user

| EPA Master Label Details | | | | | | |
|---|---|---|---|---|---|---|
| EPA Master Label | | Preharvest Labeled Uses | Postharvest Labeled Uses | | | Efficacy Statement |
| EPA Registration Number | Labeled Use Info Based on Version Date | Labeled For Use in Irrigation Water Systems | Labeled For Use on Non-Porous Food Contact Surfaces | Labeled For Use on Postharvest Water Distribution Systems | Labeled for Use in Fruit and Vegetable Wash Water | Labeled to Control Human Pathogens |
| 2792-62 | 5/23/12 | *No* | Yes, see page 7 | *No* | Yes, see page 7 | *No* |
| 73232-1 | 4/21/20 | *No* | Yes, see page 6 | *No* | *No* | For Food Contact Surfaces |

| Product Information | | | |
|---|---|---|---|
| Organic Materials Review Institute (OMRI) Listing | Quantity Purchasable per EPA Label | Manufacturer/ Distributor | Notes |
| Not listed | Gallons: 55 | Decco US Post-harvest, Inc. | None |
| Not listed | Information not available | Best Sanitizers, Inc. | None |

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# See for Yourself!

- Lets take a look at the improved tool:
  - https://resources.producesafetyalliance.cornell.edu/sanitizer/

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# Conclusions

- Many sanitizers are available for growers to use
  - Resources available to navigate decision-making
- Follow the labeled instructions!

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# Acknowledgements


- Thanks to Donna Clements, Produce Safety Alliance for input on label slides
- Huge thanks to the entire PSA team who work on the updates to the Sanitizer tool!


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# The PSA Website

English: producesafetyalliance.cornell.edu

Spanish: es.producesafetyalliance.cornell.edu


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Betsy Bihn (PSA Director): eab38@cornell.edu, 315-787-2625

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# FDA C&S Worshop

# FDA/STATE JOINT CLEANING AND SANITIZING WORKSHOP EXPERIENCES AND OVERVIEW

# Introduction

- The following states have hosted an FDA/State Joint Cleaning and Sanitizing Workshop and would like to share their experiences/the benefits the workshop had to growers in their state
- These states and their Extension partners can be resources to you if you are interested in hosting one of these workshops in your state
  - Alabama: November 1-2, 2022, August 8, 2023, August 22 – 23, 2023, February 14 – 15, 2024
  - North Carolina: March 16, 2023 & March 22, 2023
  - Mississippi: August 8, 2023
  - Florida: June 23, 2023

# Goals

- The Cleaning and Sanitizing Workshop aims to promote greater understanding of cleaning and sanitation practices that can be implemented on and around the farm to meet, and potentially exceed, the requirements of the Produce Safety Rule
- The primary focus is under Subpart L: Equipment, Tools, Buildings, and Sanitation, Subpart K: Growing, Harvesting, Packing, and Holding Activities, and Subpart A: General Provisions
- This workshop is designed to be interactive using presentations that encourage discussions, scenario-based small group breakouts, hands-on activities, and in-person demonstrations
- The workshop is structured to accommodate regional considerations within the content

# Learning Objectives

1. Understand the importance of food safety, the potential impacts of microorganisms on produce and the role of cleaning and sanitizing in controlling undesirable microorganisms.
2. Understanding the difference between and importance of cleaning and sanitizing.
3. Understand factors that influence the effectiveness of cleaning and how farm practices can influence cleaning effectiveness.
4. Understand factors that influence the effectiveness of sanitizing and how farm practices can influence sanitizing effectiveness.
5. Understand the applicable Produce Safety Rule requirements, as they apply to the produce industry.
6. Identify food safety hazards associated with farm environment, equipment, buildings, and tools.
7. Understand development of master schedules and cleaning and sanitizing standard operating procedures (SSOPs) to manage identified hazards and understand the importance of verification and the options for verification activities.

# Audience

- Farm personnel with cleaning and sanitizing responsibilities involved in growing, harvesting, holding or packing covered produce such as supervisors and managers with food safety responsibilities
- Personnel who lead or perform cleaning and sanitizing activities and those that address needs for operations with dedicated sanitation crews and/or employees that also conduct cleaning and sanitizing activities
- Produce safety extension specialists and educators; industry association representatives (specifically those that provide produce safety education to farms); and regulatory agency representatives

# Registration pt. 1

- Attendee cap, prerequisites, and cost
  - AL: No prerequisite course; registration originally capped at 50 to allow for group break out for discussion/ hands on activities; average of 20 in each workshop; no cost but will charge for future workshops
  - NC: PSA Grower Training Course prerequisite; registration capped at 30 attendees to promote discussion, allow optimal viewing of demonstrations, and allow for all attendees to participate in hands-on activities; had ~20 attendees in each workshop; $20 registration to cover lunch

# Registration pt. 2

- Attendee cap, prerequisites, and cost
  - MS: No prerequisites required to attend; registration cap was going to be 30 to allow for discussion and hands on activities; had 14 attendees; no cost but might charge at least a lunch fee moving forward
  - FL: Strongly encouraged prior PSA Grower Training; registration capped at 30; had 22 attendees; would have charged registration fee to cover food, but a farm sponsored the workshop utilizing USDA grant funds to cover up to $50/attendee including food and some transportation costs

# Location

- Audio/visual connections for PowerPoint presentations
- Seating, at desks/tables, for all attendees
- 2 additional separate areas for breakout sessions or packinghouse
  - AL: Had one large classroom for presentations and two additional separate classrooms for the breakout session rotations, worked extremely well
  - NC: Had classroom setting and moved to educational packinghouse for activities; packinghouse allowed for more visuals but not necessary
  - MS: Had one large classroom for presentations and the breakouts and activities were in the corners and sides of the room; it was a large enough room that we didn't have any space/noise issues
  - FL: Had classroom setting and moved to educational packinghouse for activities; felt limited to location options; would like to host in another location in the future

# Delivery Format pt. 1

- Option 1: Virtual option (7 modules, approx. 1.75 hours per module) with interactive activities, such as chats, polls, breakout sessions with problem-solving or critical thinking elements
- Option 2: 1.5 to 2 full day in-person option with presentations, activities, discussions, and demonstrations
- Option 3: 1 full day in-person hybrid option with virtual recordings, in-person presentations, activities, discussions, and demonstrations, and independent, self-led activities post-workshop

# Delivery Format pt. 2

- AL: Did option 2 and 3; most success with option 2 since there was no way to confirm attendees viewed the recorded presentations prior to the in-person workshop
- NC: Did option 3, worked well
- MS: Did option 3, online modules had to be viewed to attend in person, received feedback that 1 person had connection issues for viewing the modules; overall feedback was positive- participants enjoyed being able to go at their own pace viewing the modules and having some online ahead of time helped reduce the time commitment to be able to attend in person
- FL: Did option 2, was able to condense to 1 full day with FDA approval

# Planning

- Reach out to your region's FDA CFSAN-PSN 6 months prior to when you would like to host the workshop.
  - The FDA PSN directory is available at the following link: https://www.fda.gov/food/food-safety-modernization-act-fsma/produce-safety-network
- An Educational Needs Assessment in **not** required for Joint Workshops provided:
  - You work directly with your CFSAN-PSN representatives, starting with planning, on obtaining existing materials and respective changes that might reflect regional considerations or hands-on opportunities for addition to and the culmination for delivery, and retention of these interactive workshops.
  - Your CFSAN-PSN will serve as the conduit for sharing of resources as these workshops are developed to allow for support, updates, and relevant information to evolve across the various partners nationally.
  - It is with this understanding and the meeting of these expectations that FDA believes the intended purposes of the ENA will be meet through this iterative development process and a written ENA is not required for FDA Joint Workshops.

# Timeline

- Work with the PSN to organize your group of instructors for the workshop
- 3 months prior to the workshop plan with and train instructors.
- beginning approximately 2 months prior to the workshop advertise the save the date
- 1 month prior to the workshop purchase and organize materials and print materials
- 6 weeks prior to the workshop  open registration
- 2 weeks prior to the workshop close registrations
- Host workshop
- Within 4 weeks after the workshop send FDA PSN pre-/post-test results, evaluation responses and any updated materials

# Duration for Hybrid Format

- Send introduction video upon registration
- 1 day, in-person
- Sign-in and pre-test begins at 8AM, welcome at 8:30AM
- Conclude at 4:45PM, with optional question and answer session until 6PM or all attendees have departed
- Take home activities are provided before departure
- Recommended for instructors to set up the day prior

# Implementation

Send out pre-workshop video, Module 1- Making the Connection: The Produce Safety Rule Relevant Cleaning and Sanitation Requirements

8:00AM: Sign-In and Pre-Test

8:30AM: Welcome and Introductions

9:00AM: Module 2- Food Safety Basics

9:35AM: Activity Rotation

10:00AM: Break

10:15AM: Module 3- Cleaning

11:15AM: Steps of Cleaning Activity

11:45AM: Activity Rotation

12:15PM: Lunch

1:15PM: Module 4- Sanitizing

2:15PM Steps of Sanitizing Activity

2:30PM: Activity Rotation

3:00PM: Break

3:15PM: Module 5- Developing a Cleaning and Sanitation Program

4:00PM: SSOP and Master Sanitation Schedule Template Review Activity

4:15PM: Module 6- Monitoring and Verification

4:45PM: ATP Activity, Post-test, and Evaluation

5:00PM: Optional Office Hours- Question and Answer Session

Post workshop: Send reminder about post-workshop activities, Module 7- Identification and Evaluation of Hazards

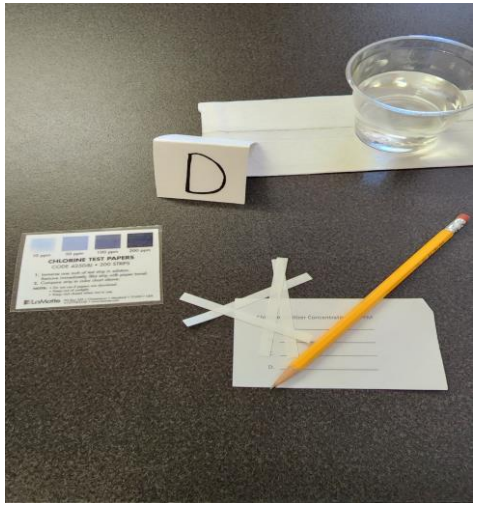
# Duration for In-person Format

- Sign-in and pre-test begins at 8:00 am
- Welcome/ Introductions at 8:30 am
- Conclude workshop at 5:00 pm
- Take home resources are provided before departure
- Allow time for extra questions at end of workshop before instructors pack up to leave.
- Recommended for instructors to set up the day prior

# Implementation

| | |
|---|---|
| 8:00am: Sign-in and Pretest<br>8:30am: Welcome/ Introductions<br>9:00am: Module 4- Produce Safety Rule Overview<br>10:00am: BREAK<br>10:15am: Module 1- Food Safety Basics<br>11:15am: Activity Rotation<br>11:45am: Lunch<br>12:30pm: Module 2- Cleaning<br>1:15pm: Activity Rotation<br>1:45pm: Module 3- Sanitizing<br>2:15pm: Activity Rotation<br>2:45pm: BREAK | 3:00pm: Module 5- Identification and Evaluation of Potential Hazards<br>3:45pm: Module 6- Establishing Cleaning and Sanitizing Program<br>*4:30pm: Group Activity*<br>*4:45:* Wrap up/ Dismiss |


EXIT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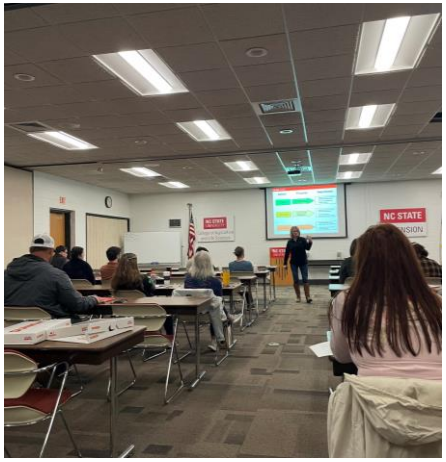
NC STATE



Learning Objectives

# Materials

- For each attendee: binder of printed PowerPoints; handouts; activities; pen; highlighter; name tag; pre- and post-test; evaluation; and a copy of the Produce Safety Rule
- For demonstrations and activities: personal protective equipment; harvest buckets; harvest tools; detergents; sanitizers; cleaning tools; hydro-foamer; tarp; mixing station; cups; test strips; titration kits; ATP meter; ATP swabs; swabbing templates
- Optional: door prizes for attendees to receive as incentive to attend and implement practices following the workshop: thermometers, test strips, hand washing station, Glo Germ kit, pamphlets/signs, etc.

# Developed Materials Available

- PowerPoints
- Pre-/post-test with answer key
- Activity sheets/instructions with answer keys
- Demonstration discussion guides for instructors
- Resources and templates
- Agenda
- Evaluation packet
- Certificate of attendance

# Cost

- Binders
- Name tags
- Pens
- Highlighters
- Printing
- Demonstration materials
  - Extension/university/other states may have these materials available for borrowing free of charge
- Training room/restroom facility rental

# Subject Matter Experts

- Considerations
  - The science and details of the cleaning and sanitation detergents, chemicals, and processes can be quite technical
- Identification of SMEs
  - A variety of SMEs helped develop, deliver, and modify the Cleaning and Sanitation Workshop content through its pilot phases
  - All of those SMEs are available to reach out to for assistance with future Cleaning and Sanitation Workshops
  - States can host these workshops jointly with neighboring states
  - The authors of the resources associated with the content are also valuable SMEs

# Benefits

- Extremely beneficial to have FDA SME input for content alignment to the Produce Safety Rule throughout workshop planning
- Attendees appreciated having FDA at the workshop to directly ask questions to regarding references to the Produce Safety Rule
- Positive evaluations and feedback from attendees
  - High appreciation for the hands-on activities, discussion, and additional resources provided
  - Appreciation for the self-paced modules during the hybrid/remote option

# Benefits

- NC analyzes their inspection data and OFRR data plus has done a needs survey and cleaning, and sanitation practices continue to be at the top of the list for what folks want/need additional education on
  - Received feedback that this workshop helped answer question/clarify information regarding cleaning and sanitation
- AL analyzes inspection data along with surveys from grower trainings and needs surveys that are sent to farmers. Cleaning/sanitation continues to be at the top of the list. We have seen better inspections after growers attend the workshops.
  - Farmers are excited going back to their farm to share 'new' ways to clean/sanitize to their staff

# Benefits

- Certificate issued at the conclusion of the workshop to account for the grower's attendance

This certifies that

has successfully completed the

***Alabama Produce Safety Rule***
***Cleaning & Sanitizing Workshop***

and is herewith awarded this

***Certificate of Participation***

on November 2, 2022

**Rick Pate, Commissioner**
**Alabama Department of Agriculture & Industries**

FDA U.S. FOOD & DRUG ADMINISTRATION

eXtension ALABAMA A&M & AUBURN UNIVERSITIES

# QUESTIONS?

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Sarah Cope: Sarah.Cope@ncagr.gov

Davis Edwards: Davis@mdac.ms.gov

Kirby Quam: Ryan.Quam@fdacs.gov

# C&S on Farms

# Cleaning and Sanitizing on Produce Farms in the Southern States

Southern Region Integrated Produce Safety Conference

Greenville, SC

Feb 2024

# Method

Produce farm sanitation questionnaire distributed to regulatory and extension personnel in each of the 13 states.

# Sanitation Practices

Specific machines

Repurposed equipment

Standard cleaning implements

Unique items for the produce industry

# Specific Machines


# Specific Machines

# Specific Machines

# Built-in Cleaning

# Repurposed Equipment

# Wet and Dry Methods

# Handheld tools for harvesting
## Knives, Clippers, Small Buckets

Who is doing it/responsible?
- Farm
- Crew leader
- Harvest crew
- Each employee is responsible for their tool

Where?
- Truck bed
- In the field
- Worker bus
- Packing shed
- Concrete pad
- Personal home
- Worker housing

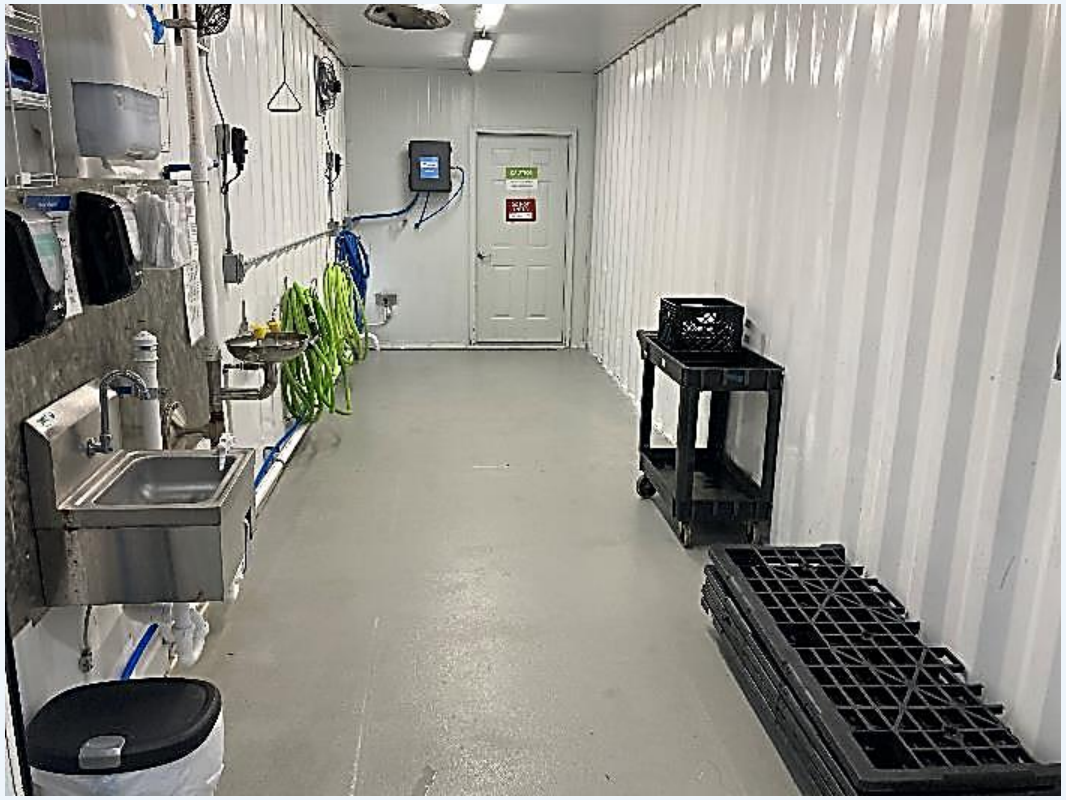
# Reusable Plastic Containers (RPCs), Plastic Lugs

Who is doing it/responsible?

- Farm
- 3rd party
- Harvest crew
- Packing shed crew

Where?

- In the field
- Packing shed
- Off site location-3rd party



# Large Bins, trailers, Mechanical Harvesters

Who is doing it/responsible?

- Farmer
- 3rd party
- Packing shed crew

Where?

- In field
- Parking lot
- Packing shed
- Off site location-3rd party

# Packing Shed Equipment
# Conveyers, Rakes, Paddles




# Handwashing Stations



# Handwashing Stations

# Handwashing Stations

# Handwashing Stations


# Less Than Ideal

# Inadequate Sanitation


# Inadequate Sanitation Practices


# Inadequate Sanitation Practices

# Good Practices Evolving

Conservation efforts

Farms have written policies

Providing training for workers

Packing shed equipment and documentation are consistent

# Improvements

Reading labels

Updating equipment

Farms are willing to learn

Attending classes when offered

# Common Misconceptions

3rd party audits

None are organic

No expiration date

Hot water will kill anything

You can pour/mix then spray

Cleaning/Sanitizing is one step

Mixing soap and bleach is effective

All sanitizers/detergents are food grade

# Challenges

Training

Scheduling

Consistency

Accountability

Documentation

# Barriers

Time

Labor

Mindset

Financial

Language

END

# Cleaning and Sanitizing Group

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# Questions we asked the states.

1. What are the different types of machines, what are they washing?
2. What are the farms missing or where are the deficiencies related to sanitation?
3. What are the different handwashing set ups you've seen?
4. What kind of produce operations do you see using wet vs dry cleaning methods?
5. Do you see any equipment with built in cleaning?
6. Where are the farms conducting the cleaning and sanitation? Who is doing it/responsible?
7. Does you have pictures of the any of the above?
8. Other interesting observations?
9. What are the farms doing really well or where are they making improvements related to sanitation?
10. What are the biggest barriers farmers have for cleaning and sanitizing?

# Dry Ice Blasting

You can use it while the line is still running

Does not damage electric components

Cleaning only, mot sanitizing

Not for small tubing/piping

Made from harvested CO2

Sublimates

3 log reduction

Runs with compressed air

Good for stainless steel but not carbon steel

# AZS Rinse Conveyor

3 Wash stages

Runs on gas or electric

Made by AZS brusher equipment in PA

# Field Sanitation Article

Pena AA, Teather-Posadas ER. Field Sanitation in U.S. Agriculture: Evidence from NAWS and Future Data Needs. *J Agromedicine.* 2018;23(2):123-133. doi: 10.1080/1059924X.2018.1427642. PMID: 29648953; PMCID: PMC7050297.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7050297/.