


Building Awareness of FDA FSMA Produce Safety:
Worker Training, Equipment and Facilities, Postharvest Water

On Farm Food Safety Workshop Series
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Petaluma



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Farm Workers are Food Handlers!

- Reported outbreaks related to food handlers
 - 89% at foodservice establishments
 - 60% caused by viral agents
 - 93% involved ill workers



Basic Expectations for Workers

- Requirements for health and hygiene include:
 - Prevent contamination of produce and food-contact surfaces by ill or infected persons
 - Workers notify supervisors if their health condition may result in contamination of covered produce or food contact surfaces
 - Using hygienic practices when handling covered produce or food-contact surfaces.
 - Taking measures to prevent visitors from contaminating covered produce and/or food-contact surfaces
- Farm workers who handle covered produce and/or food-contact surfaces, and their supervisors, must be trained on health and hygiene.
- Farm workers who handle covered produce and/or food contact surfaces, and their supervisors, are also required to have a combination of training, education and experience necessary to perform their assigned responsibilities

Tailgate-training and "Fitness to Handle Food" Observations



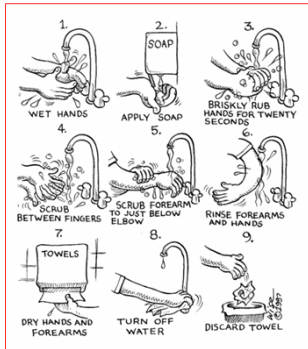
Hygiene and eating policy applies to visitors and inspectors



The Right Hand Washing Message

Teach Proper Hand washing

- Why
- How
- How Often



Effective trainers and training tools



How Long Is 20 Secs ?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18
- 19
- 20

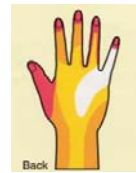


Proper Hand Washing

- ✓ *Happy Birthday to You* - twice
- ✓ *La Cucaracha* - twice



Map of areas frequently missed during hand washing



- Most frequently missed
- Frequently missed
- Less frequently missed



Fingernails are often missed
• hepatitis virus A and strawberries

Use a scrub brush to effectively clean nails

Image credit: Taylor, L.T., Nursing Times, 74, 54 (1978)

Gloves Are Not Essential for Food Safety

Dirty Gloves are no better than Dirty Hands

Effective training has been shown to satisfy risk reduction and food safety concerns for bare hand contact



Gloves Only Start Out Clean

- Gloves must NOT be used in place of proper handwashing
- Be just as aware of what you touch

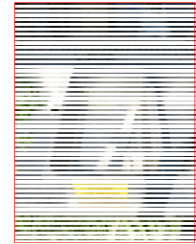


Gloves shouldn't go in back pockets or into bathrooms

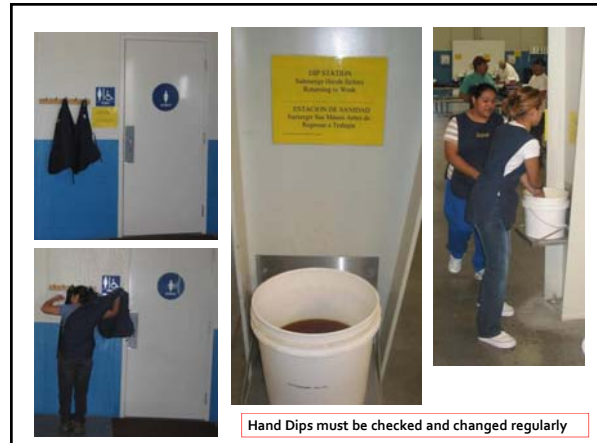
Long-standing Practices must be "unlearned" – Perception or True Risk?



Follow sanitation Best Practices



Worker Training Coupled with Practical Steps to Facilitate and Ensure Compliance is Essential



It's not just about hands!

Think of all packing and container surfaces as food contact surfaces



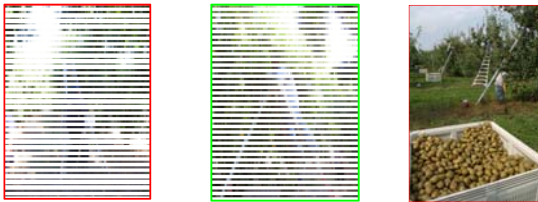
Long-standing Practices must be “unlearned” – Perception or True Risk?



FDA and State Public Health will be looking for ‘uncleanable’ food contact surfaces in inspections and on-farm investigations

Soil to Shoes to Rungs to Hands to Fruit?

- Is this a significant risk?
- What could change your answer?
- Practical solution?



Common Challenges in Implementation

Education and Training

- On-going Education for Food Safety Professionals
- On-going Training for Owners and Employees
- Science-based Materials
- Credible Sources
- Materials Appropriate for Target Audience
 - Level of Education
 - Language
 - Graphics
 - Interactive (Learn-by-Doing vs. Lecture Only)



Even Spanish is not “Spanish” and college-spanish doesn’t translate well



Main Labor Force in CA Communicate in Many Languages and Dialects Besides Mexican

- Mixtec
 - Oaxaqueño
 - Zapoteco
 - Trique
 - Chatino
 - Nauhatl
 - Mayan
- Other Farm Communities**
- Hmong
 - Minh
 - Lao
 - Khmer
 - Chinese
 - More...



Conforms to Intended Purpose?



Be Prepared to Use Your Training to Speak with Auditors



Key take home messages

- Worker's training and education are the foundation for the effective implementation of a comprehensive food safety program
 - Adequate facilities
 - Education
 - Training
 - Reinforcement
- Simple strategies can prevent that food gets contaminated with pathogens
 - Hand washing
 - Clean garments
 - Ill-worker program

Equipment, Tools, Buildings and Sanitation

- Requirements include:
 - Equipment/tools: designed and constructed to allow adequate cleaning and maintenance.
 - Food contact surfaces of equipment and tools must be inspected, maintained, cleaned, and sanitized as necessary.
 - Buildings: size, design and construction must facilitate maintenance and sanitary operations.
 - Toilet and hand-washing facilities must be adequate, and readily accessible during covered activities.

What is required...

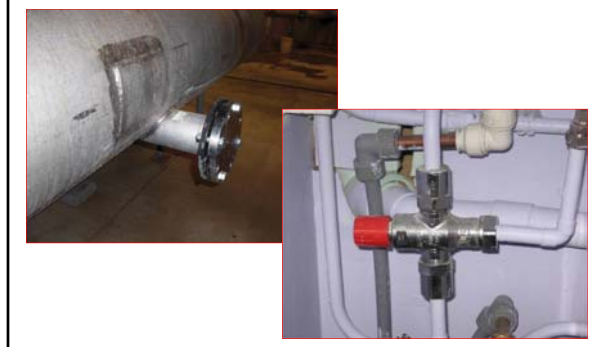
Equipment, Tools, Buildings, and Sanitation

- Animal/pest control
- Adequate, readily accessible toilet facilities
- Hand-washing station in sufficiently close proximity to toilet facilities, with soap, running water and adequate drying devices
- Appropriate disposal of waste
- May not use hand antiseptic/sanitizer or wipes as a substitute for soap and water
- Sewage and septic systems
- Backflow and cross connections; Dead legs; Dead zones in dumps and flumes
- Preventive controls for cull accumulators
- Trash, litter, and waste disposal

Risks that have been tolerated or ignored in the past won't pass



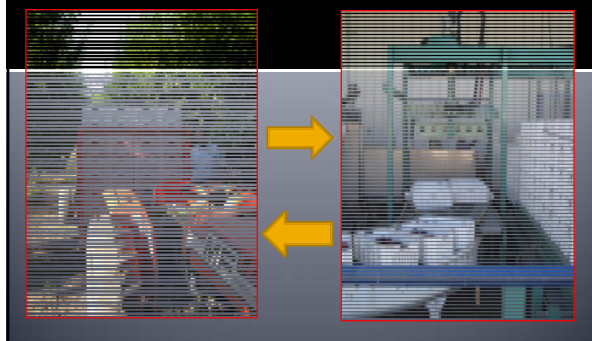
**Dead-legs in Dump and Wash Systems
Accumulate Sediments and Biofilms**



**Measurable and Verifiable
Sanitation Programs**



**How do you Clean & Sanitize?
How Often?**

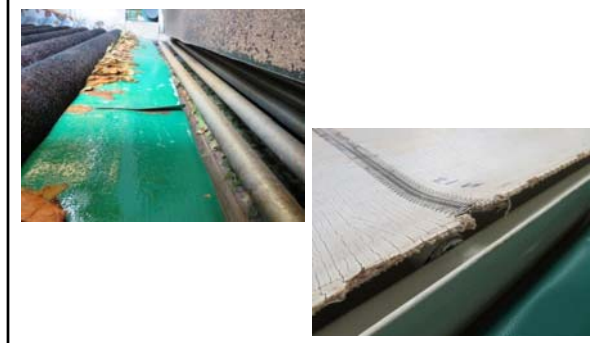


**Harvest Implements and
Equipment Sanitation**

- Clean
- Sanitize.....Store
- RinseRe-use

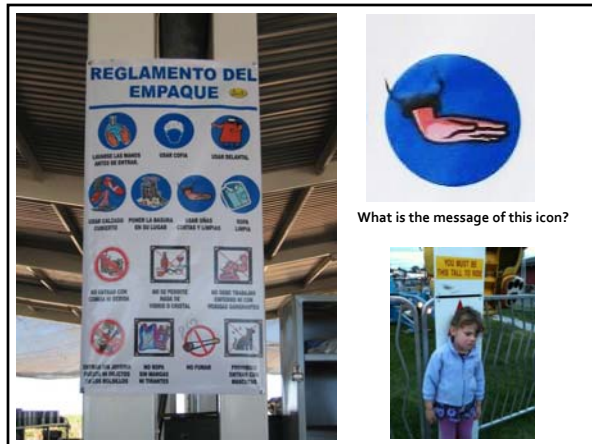
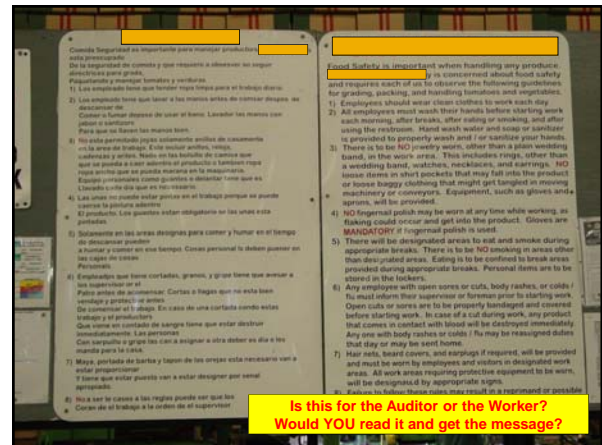
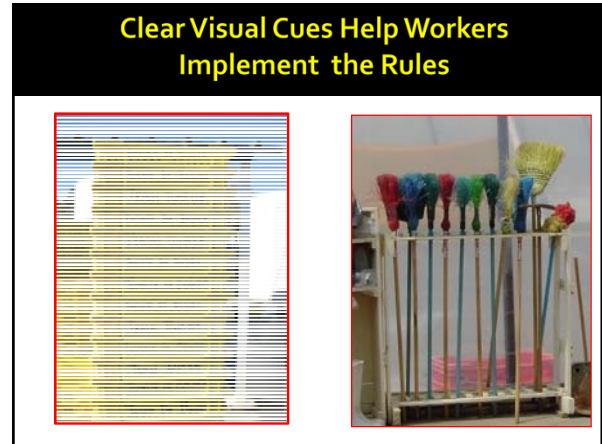


**These lines would not meet the criteria
for prevention of entrapment?**



Pre-startup Inspection found this...





Goal of water disinfection

- The role of process water disinfection is to prevent and to minimize the redistribution of plant and human pathogens from incoming produce into the water



- **Prevent cross-contamination**

The reduction of the microbial load on plant and fruit surfaces is a secondary consequence

The Problem

What is the right treatment level?

- Multiple chemical choices
- Multiple product types
- Diverse microbe types
- Different load throughput
- Varying wash/cooling conditions
- Different equipment designs
- Different retention times

Examples of Chemical Disinfection Options

Chlorination
Hypochlorous Acid (HOCl) + ROS
Chlorine Gas
Sodium Hypochlorite
Calcium Hypochlorite
Chlorine Dioxide
Chlorobromination
Peroxyacetic Acid or Hydrogen Peroxide
Ozone
Copper ions + low HOCl (+ Silver ions)

Chlorination Advantages

- Sodium Hypochlorite (liquid)
- Most widely used method
 - Relatively inexpensive
 - Readily available and flexible
 - Easy to adopt for small-scale
 - Broad spectrum of activity (yeasts, molds, bacteria, algae, many viruses)
 - Less effective for parasite cysts, some fungal spores

Chlorine is Strongly Impacted by pH

Total Chlorine

Combined Chlorine

Free Chlorine

pH	HOCl	OCl ⁻
6.5	95%	5%
7.0	80%	20%
7.5	50%	50%
8.0	20%	80%

NaOCl Disadvantages

- ❖ Potential for toxic chlorine gas formation
- ❖ Poor penetration of biofilms and scale
- ❖ Corrosive
- ❖ Irritation (eye, respiratory, mucus membrane)
- ❖ Unstable (pH < 4, high temp), short half-life
- ❖ Formation of potentially toxic by-products
 - ❖ (THM's, chloramines)
- ❖ Potential for sodium injury (ex. some apples)



PUBLICATION 8198

Making Sense of Rules Governing Chlorine Contact in Postharvest Handling of Organic Produce

TREVOR SUSLOW, University of California Cooperative Extension Postharvest Specialist, Department of Plant Sciences, University of California, Davis


Compliance with National Organic Program (NOP) standards for postharvest chlorination has become a battle zone between packers on the one hand and certifiers and third-party auditors on the other. Wholesale and foodservice buyers of organic produce, both whole and minimally processed, have not taken a strong or consistent position regarding compliance with NOP restrictions on chlorine dose. A good deal of confusion has developed over varying perspectives regarding the interpretation of comments embodied in the National Organic Substances List regarding the absolute dose limits, monitoring, and measurement of chlorine residual compounds in organic postharvest handling and minimal processing (fresh-cut produce) operations.

<http://ucfoodsafety.ucdavis.edu>

Chlorine Dioxide ClO₂

- Oxidizer 2.5x "more effective" than chlorine
- Low Sodium, Low Chlorite
- Does not form by-products THMs /DBP's
- Does not form chloramines
- Effective at wide pH ranges
- Good biofilm penetration

Ozone (O₃)



- ❖ Highly effective oxidizer
- ❖ No residual concerns
 - ❖ converts to Oxygen
- ❖ Negligible DBP's
- ❖ Kills pathogens Cl doesn't

Ozone (O₃) Disadvantages

- ❖ Unstable (short half life)
- ❖ Low solubility; best in cold water
- ❖ Difficult to monitor concentrations
- ❖ Difficult to adjust needs based on demand
- ❖ May require use of secondary disinfectant
- ❖ Must be generated on site
- ❖ Worker Safety Issues, Toxicity
- ❖ Highly Corrosive and Degenerative

Peroxyacetic Compounds

$$\text{H}_2\text{O}_2 + \text{CH}_3\text{COOH} \rightleftharpoons \text{H}_3\text{COOH}$$

Hydrogen Peroxide

Acetic Acid

Peroxyacetic Acid

Peroxyacetic Acid Disadvantages

- ❖ Corrosive to soft metals and skin
- ❖ Strong, pungent odor of concentrate and dilute forms (worker discomfort & safety)
- ❖ Varied activity against fungi
- ❖ Build up of acetic acid in water; translucency
- ❖ Need to monitor water turn-over closely
- ❖ Prolonged exposure may cause product damage

Simple Dose Chart for SaniDate 5.0

Wash Water Basin or Tank (gallons)	Target Dose (values are fully-rounded* ounces of SaniDate 5.0/tank working volume)					
	20 (Common treatment for ag-chemical spray tanks)	30	40 (Common wash water dose)	50	60	85 Maximum label dose
5	0.3	0.5	0.75	1.0	1.25	1.5
10	0.5	0.75	1.0	1.25	1.75	2.0
25	1.5	2.0	2.0	2.5	3.0	4.0
50	2.5	3.0	4.0	5.0	5.5	8.0
100	5.0	6.0	8.0	9.0	11.0	16.0

* For simplicity in measuring, the volumes to be added to the tank mix are rounded-up to an even number. The values provided are not intended to achieve a precise dose but, rather, make routine additions on small-farm and packing facility operations easy and reproducible.


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5	8	10	12	14	16	24
10	15	18	21	27	30	45
25	35	42	53	70	85	115
50	70	80	110	135	160	230
100	140	160	215	270	325	460

* For simplicity in measuring, the volumes to be added to the tank mix are rounded-up to an even number. The values provided are not intended to achieve a precise dose but, rather, make routine additions on small-farm and packing facility operations easy and reproducible.

Measurement

- Spot Checking
 - Chemical Test Kit
 - Chemical Test Strips
 - Colorimeter
 - Direct Measurement
- Portable ORP and pH Meter
- Fixed Continuous Meter
 - ORP and pH Meter
 - Direct Ion Sensor




Test Strips



- ❖ Fast Spot Checking
- ❖ Simple "Dip & Read" 1 Step
- ❖ Colorimetric Analysis
- ❖ Visual Reading
- ❖ Low Cost

Have you seen a small farm wash system that is worth a look?



Lactic Acid & Phosphoric Acid

- Needs adequate contact time
- Combined with plant extract surfactants

Small grower selected this simple system for recent upgrade to washing



Diversey
Suma® Eden™ D4.4
Antimicrobial Fruit & Vegetable Wash

**However!!!
Read the label carefully for your state**

Suma® Eden™ D4.4
Antimicrobial Fruit & Vegetable Wash



Ultra Easy Directions

- This product is designed to be used on fruit and vegetables processed by chopping, slicing, cutting, peeling, etc.
- Before processing, produce may be rinsed with potable water to remove gross soils. **Do not use on raw agricultural commodities.**
- This product dilutes at a rate of 1 oz to 7.6 gallons of water (1.0 mL/L).
- No rinsing is required after use.
- To test for proper strength, place an appropriate "short range pH test paper" in a sample solution for 30 seconds. Compare the test strip to the color indicator chart. If the pH is 3.0 or less, the solution will be effective.

Designed to remove surface microorganisms and contamination from processed fruit and vegetables.

Effective

- Reduces microbial concentration of processed produce when used as directed.
- Removes residue does not alter the taste or aroma of treated produce.
- Strong organic acid based formulation allows solutions to be used for up to eight hours.

Easy to Use

- Concentrated formula dilutes economical in use costs.
- Part of closed product delivery system to ensure optimal safety for employees.

Not all state Department of Public Health will ignore this discrepancy

Keystone Antimicrobial Fruit & Vegetable Treatment

All components are Generally Recognized As Safe (GRAS) or have been cleared by the FDA for the intended use in a no-rinse application.




Keystone Antimicrobial Fruit & Vegetable Treatment

Keystone Antimicrobial Fruit & Vegetable Treatment reduces 99.9% of the pathogens E. coli, Listeria and Salmonella* in produce wash or process water.** EPA Reg. No. 1677-234. Not approved for use in CA.

Active Ingredients: Dodecylbenzenesulfonic acid, sodium salt 1.23% Lactic Acid 17.29%
Other Ingredients:..... 81.48% Total: 100.00%



Add to washing/processing vessel according to the table submerge and agitate fruits and vegetables for a **minimum of 90 seconds**. Drain thoroughly and allow to air dry. No rinse required.



370 Wabasha Street N St. Paul, MN 55102
www.ecolab.com 1 800 35 CLEAN

ANR 3526 • Small Farm Handbook • Chapter 8

Postharvest Handling and Safety of Perishable Crops
Trevor Suslow, Elizabeth Mitcham, and Marita Cantwell

Faber, B. and L. Tourte (eds). In press. Small Farm Handbook. University of California, Division of Agriculture and Natural Resources, Oakland, CA. Publication 3526.