Good Agricultural Practices
Farm to Table Food Safety for Colorado Producers

PART 3: Minimizing Risks During Harvest & Post-Harvest
Washing & Packing, Cooling & Storage, Transportation & Traceback
Presenters & Agenda

• Speakers:

  Gretchen Wall  
  Graduate Research Assistant  
  Department of Food Science & Human Nutrition  
  Colorado State University

  Ryan Friedman  
  Project Manager at Sensitech Inc.  
  Graduate Student - Food Safety

• Topics
  • Post-Harvest Operations
  • Packing Shed Considerations
  • SSOPs
  • Cooling/Wash Water
  • Cooling and Transportation
  • Traceback

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Review of Webinars 1 & 2

March 16
• General On-Farm Food Safety
• Regulatory Landscape
• 3rd Party Audits
• Worker Hygiene and Health

March 23
• Manure Management
• Composting Techniques
• Irrigation Water Sources
• Methods of Application
• Water Quality Standards and Testing

Recordings posted on:
http://farmtotable.colostate.edu/gap-ghp.aspx
Good Agricultural Practices (GAPs)

• **GAPs (Good Agricultural Practices):** agricultural industry’s guide to minimize and prevent contamination of fresh fruits and vegetables on the farm.

• **GHPs (Good Handling Practices):** focuses on best practices for packing and storing facilities, cleaning and sanitation, and transportation.
Good Handling Practices (GHPs)

- Maintain quality
- Protect food safety
- Reduce losses
Good Agricultural Practices (GAPs)

- Part 1: Farm Review
- Part 2: Field Harvesting and Field Packing Activities
- Part 3: House Packing Facility
- Part 4: Storage and Transportation
- Part 5: Vacant
- Part 6: Wholesale Distribution/Terminal Warehouses
- Part 7: Preventative Food Defense Procedures
Field Sanitation Practices at a Glance

Pre-harvest Assessment
• Sources of contamination

Sanitation Units
• Placement, number, location

Containers
• Material, condition, cleaning

Farm Equipment
• Maintenance, cleaning

Receiving
• Proper storage
Harvest Tools and Containers

• Wash, rinse, and sanitize all containers prior to each use

• Separate tools used for handling manure and tools for harvest

• Store packing materials in a covered location

• Do not stand in harvest bins or containers

• Remove dirt and debris from containers before stacking
Harvest Methods

- Harvest method depends on characteristics of commodity and resources available
- **Manual**
  - Delicate commodities
  - Direct contact with hands or harvest tools
  - *Employee hygiene training essential*

- **Mechanical**
  - Commodities can withstand rougher handling
  - Less human contact
  - *Rigorous SSOP for mechanical harvest*
Packing Shed

Major Sources of Packing Shed Contamination
1. Water/Ice
2. Workers
3. Animals, birds, insects
Employee Field and Pack House Practices

- Do not stand in produce containers while harvesting
- Use proper restroom and hand washing facilities
- Wash hands after using the restroom, eating, or smoking
- No eating, drinking, or smoking while handling fresh produce
- Aprons are not worn to the restroom or outside
Pest Management

• Inspect storage and packing facilities weekly for rodents, birds, and insects

• Use pest control procedures (traps, screening, and doors)
  - Only spring loaded traps to be used inside facility
  - Bait traps may be used outside the facility
  - Apply chicken wire or netting air intake and exhaust to prevent birds

• Document pest management plan and service reports
Packing Shed Design & Flow

- **Design**
  - Reduces the chance for cross contamination
  - Minimal clutter
  - Smooth surfaces
  - Floor drains
  - Pressure washing capabilities
Sanitation Standard Operating Procedures (SSOPs)

• **Purpose**
  - Describe basic sanitary practices
  - Provide a schedule for key activities
  - Serve as a basis for training employees

• **Sanitation Standard Operating Procedures**
  - Broadly defined for the fruit & vegetable industry to incorporate into GAPs & GMPs
  - Includes:
    • Title
    • Statement of purpose
    • Individual responsible
    • List of materials, equipment, tools
    • Actual procedures (numbered)
    • Appropriate record sheets
Example SSOP: Water Log

**Processing / Packing Line Water Log**

Please see the food safety plan for overall processing/packing line water control procedures.

<table>
<thead>
<tr>
<th>Date</th>
<th>Cleaning List (check each)</th>
<th>Date Cleaned</th>
<th>Treatment</th>
<th>Cleaned By (name)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contact Surface</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dump Tanks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flumes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wash Tanks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydro Cooler</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Reviewed by:**

**Title:**

**Date:**

Example record keeping logs available at:
Cornell GAPs: http://www.gaps.cornell.edu/rks.html
Sanitation Considerations

- Potable water/ice use and storage
- Water temperature monitoring and treatment
- Cleaning/sanitizing food contact surfaces
- Employee facilities and policies
- Approved food grade machine lubricants
- Chemical storage
Cooling & Wash Water

✓ Use potable water for final washes

✓ Sanitize and change water daily

✓ Chlorinate wash water
  • Monitor free chlorine levels
  • Maintain 100-150 ppm chlorine concentration
  • Maintain water pH at 6.0-7.0

✓ Avoid tank water temperatures more than 10°F cooler than produce temperature

✓ Ice must be made from potable water
Cooling & Wash Water

Photo credits: Jack Guzewich, R.S., M.P.H., U.S. Food and Drug Administration
Quiz!
Post Harvest Cooling Methods

<table>
<thead>
<tr>
<th>Cooling Type</th>
<th>Contamination Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forced Air</td>
<td>Low</td>
</tr>
<tr>
<td>Vacuum</td>
<td>Low</td>
</tr>
<tr>
<td>Room Cooling (Walk-in)</td>
<td>Low</td>
</tr>
<tr>
<td>Hydro-cooling</td>
<td>High</td>
</tr>
<tr>
<td>Icing</td>
<td>High</td>
</tr>
</tbody>
</table>

1. Cooling is important to stop post harvest *breakdown* and *preserve* food quality and safety

2. Postharvest cooling should bring the product temperature to the *ideal* temperature

3. Transportation should simply *maintain* temperature
Cooling Considerations

✓ What is your product?
  • Is it chilling sensitive?
  • What is the shelf life?
  • Other special considerations

✓ Who is the end buyer?
  • Restaurant, school district, market
  • What requirements do they have?

✓ What are your capabilities?
  • Equipment, resources, etc.

✓ How far are your products traveling?
  • Multiple stops
  • Route planning for efficiency

Cold Storage for Small Farms
http://www.youtube.com/watch?v=Pkwgz-jmmP0
Pathogen Survival During Transport

Cooler Temperatures $\rightarrow$ Slower/No Bacterial Growth

Transportation

• Inspect for cleanliness, odors, debris

• Document physical condition
  - Chutes
  - Door Seals
  - Floor channels

• Loading Practices
  - Pre-cooling
  - Docks
  - Air circulation

• Never transport fresh produce uncovered or in a vehicle that is unsanitary
  - Ex. Pick-up trucks hauling manure, then used for product delivery
Traceability

✓ Record keeping system designed to track the flow of product or product attributes through the production process or supply chain

Documenting Traceability on the Farm

1.) Map all production fields or greenhouses
2.) Assign numbers to identify specific growing areas
3.) Mark all packages with date, location, and crew members
4.) Put the harvest date and location ID on each invoice

Product: Tomatoes
Sunny Farms
123 Sunny Ln.
Fort Collins, CO
80521
Net Wt.: 16 oz.
ID: 33011-2-3

Crew
Field Number
Date (3/30/2011)
The Consumer Connection

✔ Educate Consumers
  • Washing produce
  • Hand washing
  • Proper storage
  • Preservation
  • Sampling

Local Food Safety

Produce Fact Sheets
http://farmtotable.colostate.edu/know-your-farmer.aspx

Offering Samples
http://farmtotable.colostate.edu/food-regulations.aspx
Case Study: *Salmonella* Panama Outbreak

**Date:** March 23, 2011  
**Food Item Affected:** Cantaloupes  
**Confirmed Cases:** 12 - OR, WA, CA, MD  
**Source:** Guatemala  
**Possible Contamination Source:** Packing house/processing water, contaminated irrigation, improper employee hygiene

**Guidance:** [Commodity Specific Food Safety Guidelines for the Melon Supply Chain](http://www.cdc.gov/salmonella/panama0311/032211/index.html#investigation)  
[Guide to Minimize Food Safety Hazards of Melons](#)

![Graph showing number of persons affected by Salmonella Panama outbreak.](#)

Source: [http://www.cdc.gov/salmonella/panama0311/032211/index.html#investigation](http://www.cdc.gov/salmonella/panama0311/032211/index.html#investigation)
Resources

USDA Audit Check List
http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5050869

National Good Agricultural Practices Network for Education and Training, Cornell University
http://www.gaps.cornell.edu/

Postharvest Technology Research and Information Center
http://postharvest.ucdavis.edu/

UC Davis Post Harvest Chlorination
http://ucanr.org/freepubs/docs/7256.pdf

Cold Storage for Small Farms
http://www.youtube.com/watch?v=Pkwgz-jmmP0

CSU Farm to Table Food Safety
http://farmtotable.colostate.edu/
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Additional Info: Chlorinating Water Calculation

Volume of NaOCl to add =

(desired ppm of free chlorine) X (total tank volume)  
(% NaOCl in concentrate) X 10,000

EXAMPLE

- Using 5.25 % NaOCl concentrate.
- Desire 100 ppm Cl solution.
- Total tank volume 500 gallons

Volume of NaOCl to add =

100 ppm of free chlorine X 500 gallons  
5.25 NaOCl X 10,000

= 0.95 gallons

Add 0.95 gallons of 5.25% NaOCl solution to 500 gal tank
### Additional Info: Chlorinating Water Calculation

<table>
<thead>
<tr>
<th>Desired ppm of Free Chlorine</th>
<th>Pints of 5.25% NaOCl Solution per 100 gal. of water</th>
<th>Pints of 12.75% NaOCl solution per 100 gal. of water</th>
<th>Ounces of 65% Ca(OCl)2</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0.8</td>
<td>0.3</td>
<td>1</td>
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<tr>
<td>75</td>
<td>1.1</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
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<td>1.5</td>
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<td>2.1</td>
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<tr>
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<td>1.9</td>
<td>0.8</td>
<td>2.6</td>
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<tr>
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<td>2.3</td>
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