Cooperative Extension

Your local door to resources of the University of California

Food Safety Meeting
June 4, 2012
Advisors collaborate with Specialists & AES Scientists
UCCE Food Safety Team
On-farm Produce Food Safety

<table>
<thead>
<tr>
<th>We will cover:</th>
<th>We won’t cover:</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCE</td>
<td>Food preparation</td>
</tr>
<tr>
<td>✓ Growing</td>
<td>– Fresh cut produce</td>
</tr>
<tr>
<td>✓ Harvesting &amp; Packing</td>
<td>– Processing</td>
</tr>
<tr>
<td>✓ Transporting</td>
<td>– Food preservation</td>
</tr>
<tr>
<td></td>
<td>Meat, eggs &amp; dairy</td>
</tr>
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</table>
UC Food Safety Home

Welcome to the University of California Food Safety website. Research and Extension faculty at UC (Drs. Linda Harris and Trevor Suslow) are the hosts for this site but current information from all disciplines will be included. From here link to presentations, publications, and other websites with information on all aspects of the production, harvest, and processing of foods. The emphasis is on microbial food safety but subjects related to food such as biotechnology, food quality and food security are also addressed.

Newly Added to Website - April 2012

The Bad Bug Book (FDA, 2nd edition)

USDA.gov Flickr Photostream

Calendar

<table>
<thead>
<tr>
<th>Event Name</th>
<th>Date</th>
</tr>
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<tbody>
<tr>
<td>Microbial Challenge Testing for Foods Workshop</td>
<td>5/1/2012</td>
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</table>
ANIMAL HEALTH AND FOOD SAFETY SERVICES (AHFSS)

1220 N Street, Sacramento, California 95814 • 916-960-5000 • Fax: 916-960-5332

We serve the citizens of the State and consumers of California agricultural products to assure the safety, availability and affordability of agricultural products by promoting California agriculture, protecting public and animal health while enhancing stewardship of the environment.

AHFSS Protects....

- The safety and security of meat, poultry, dairy products, and other foods of animal origin
- Public and animal health through the prevention, detection, and eradication of livestock and poultry diseases and dairy contamination incidents
- Cattle owners against loss of animals by theft, straying or misappropriation through ongoing inspections and investigative services
Developed by the California egg and poultry meat industries in cooperation with the California Department of Food and Agriculture; U.S. Department of Agriculture; University of California Cooperative Extension; California Veterinary Diagnostic Laboratory System; California Department of Health Services; and the U.S. Food and Drug Administration.

The California Egg and Poultry Meat Quality Assurance Plans are voluntary producer oriented animal production food safety programs designed to ensure the highest quality and safety of poultry and poultry products. These programs utilize Hazard Analysis Critical Control Points (HACCP) principles on the farm to maintain a safe and wholesome product. Training, record keeping, testing and research are integral components in documenting the success of the plan.

Each farm participant designs their own monitoring plan applicable to their specific operation. Farms and processing facilities are periodically reviewed by California Department of Food and Agriculture veterinarians to ensure compliance with all program requirements.

The California Egg and Poultry Meat Quality Assurance Plans enjoy a high level of participation. The enrolled farms in California produce about 95 percent of the state’s egg and poultry meat production. No other state or national voluntary quality assurance programs enjoy that level!
FOOD SAFETY: SALE OF MEAT, MILK AND EGGS
April 2012

- **MEAT** - two linked papers:
  ANR publication "Selling Meat and Meat Products".
  "Livestock Slaughter and Meat Processing Requirements in CA" (from Marin UCCE)

  These outline the requirements for selling red meat and poultry. Basically, red meat animals
  must be slaughtered and processed in USDA inspected plants. Poultry, other fowl and
  rabbits must be slaughtered in processed in CDFA inspected plants.

- **MILK** – Per CDFA “A person shall not engage in any of the following businesses unless he
  has obtained a license from the secretary for each separate milk products plant or place of
  business:
    - Dealing in, receiving, manufacturing, freezing, or processing milk, or any product of
      milk.
    - Manufacturing, freezing, or processing imitation ice cream or imitation ice milk.”

  Licensing is required for sale of all milk and milk products from the CDFA:
  [http://www.cdfa.ca.gov/ahfss/Milk_and_Dairy_Food_Safety/Milk_Product_Licenses.html](http://www.cdfa.ca.gov/ahfss/Milk_and_Dairy_Food_Safety/Milk_Product_Licenses.html)

- **EGGS** – Sale of eggs in California requires an Egg Handler Registration Form - this is
  basically a tracking device:
  [http://www.cdfa.ca.gov/ahfss/mpes/pdfs/In_State_Egg Handlers Registration Form.pdf](http://www.cdfa.ca.gov/ahfss/mpes/pdfs/In_State_Egg Handlers Registration Form.pdf)
  This form can be turned into the County Ag Commissioners office.

Some of the requirements for egg handlers are:
From CDFA [http://www.cdfa.ca.gov/ahfss/mpes/esqm.html](http://www.cdfa.ca.gov/ahfss/mpes/esqm.html)

  - **Labeling**: Consumer-grade packages or containers of eggs must state all of the
    following: name, address, zip code, size, grade, quantity, the words "keep
    refrigerated," and either the USDA plant of origin code number, the USDA Shell
    Egg Surveillance number, (if applicable) or California state handler code, sell-by
    date, Julian date of pack (the consecutive day of the year that the eggs were packed,
    in Julian date format. Example-The Julian date for January 1 is 001, the Julian date
    for December 31 is 365).

  - **Quality**: All shell eggs shall be graded and sized. The established grades of eggs are:
    First, second, and egg production standards are used to determine egg quality.
Is there anything more boring than safety?

![Bar chart showing the perceived difficulty of falling asleep in different circumstances: In Class (highest), At Work, and In bed actually trying to sleep.](chart.png)
Is this safe to eat?
Is there anything more important than safety?
Number of Sickened People - *Salmonella* Saintpaul by state, as of August 19, 2008

[Map showing the number of sickened people by state for *Salmonella* Saintpaul as of August 19, 2008. Each state is color-coded to indicate the number of cases: 1-4 cases, 5-25 cases, 26-75 cases, and 76 or more cases.]
“Small Farms” May Be Responsible for Large Multi-State Outbreaks
Local Fresh Strawberries Tainted With E. coli O157:H7 Sicken 14, One Dies

• Locally grown berries in NW Oregon, 2011
• Sold at U-pick, farm stands, farmers markets
• Consolidated berries from several farms
Reported outbreaks linked to FDA-regulated foods, by agent, 1996-2009 (N=532 outbreaks)

- Bacterial: 70.1%
- Chemical/Toxin: 17.5%
- Parasitic: 4.3%
- Viral: 4.1%
- Unknown: 4.0%

Source Credit: FDA/CFSAN 2011
Reported outbreaks linked to FDA-regulated foods, by vehicle, 1996-2009 (N=532 outbreaks)

- Produce: 39.3%
- Seafood: 26.5%
- Dairy: 8.1%
- Egg: 5.8%
- Processed foods: 3.9%
- Sprouts: 16.4%

Source Credit FDA/CFSAN 2011
Types of produce Associated with Outbreaks, 1996-2009 (N=87)

- Berries: 65.5%
- Leafy greens: 32.2%
- Tomatoes: 17.2%
- Melons: 16.1%
- Green onions: 10.3%
- Herbs: 6.9%
- Others: 3.4%
- Unknown: 10.3%

Source Credit FDA/CFSAN 2011
**Salmonella and E. coli:**

30 minute doubling time at 80°F

<table>
<thead>
<tr>
<th>Time</th>
<th>Cells</th>
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<td>8 am</td>
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<td>9 am</td>
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<td>10 am</td>
<td>16 cells</td>
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<td>11 am</td>
<td>64 cells</td>
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<td>12 pm</td>
<td>256 cells</td>
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<td>1 pm</td>
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<td>262,144 cells</td>
</tr>
<tr>
<td>6 pm</td>
<td>1,048,576 cells</td>
</tr>
</tbody>
</table>

- **Fast growth rate**
- **Medium growth rate**
Why is produce getting so much attention now?

• Produce-related outbreaks in mid-’90s

• 1998: FDA created voluntary guidelines “Good Agricultural Practices” (GAPS)


• 2010: Federal legislation passed by Congress
The New FDA Food Safety Modernization Act (FSMA)

The FDA Food Safety Modernization Act (FSMA), the most sweeping reform of our food safety laws in more than 70 years, was signed into law by President Obama on January 4, 2011. It aims to ensure the U.S. food supply is safe by shifting the focus from responding to contamination to preventing it.

Get FSMA Updates by E-mail

Focus on Sprout Producers

Through the new Sprouts Safety Alliance, FDA is helping producers identify and implement best practices in the safe production of sprouts.

More >
**Food Safety Modernization Act (FSMA)**

- Passed by Congress in 2010
- Applies to fruits, vegetables, & processed food
- Does not apply to meat, poultry or dairy

- FSMA draft regulations were due out in January, 2012, but could now be delayed until after November elections

[http://www.fda.gov/Food/FoodSafety/FSMA/ucm298665.htm](http://www.fda.gov/Food/FoodSafety/FSMA/ucm298665.htm)
Food Safety Modernization Act

Three key areas of FSMA:

1. Practices for fruit and vegetable production & harvest
2. Food facility registration (*more to come*)
3. Traceability & Recordkeeping (*more to come*)
FSMA’s Small Farm Exemption

• FSMA exempts “small farmers” from food safety regulations, if they meet ALL of the following criteria:
  – 50% direct marketed to consumers, stores and restaurants
  – Direct market in the same state or within 275 miles
  – Total farm sales less than $500,000
  – Name, address and phone # provided to customer
Local & State Food Safety Requirements

BUT: Farms exempt from FSMA must meet local and state requirements:

– County Environmental Health Department
– CDFA
– CA Department of Public Health
Many customers require that produce suppliers have 3rd party food safety certification (CDFA, Primus Labs, NSF Agriculture)

Recently, insurance companies have cancelled policies or increased premiums for some smaller farms that direct market leafy greens
Probable Future Requirements

- **Schools**
- **Farmers Markets**
- **Grocery Stores**
- **Donations to Food Banks**
Key Food Safety Areas for All Scales of Farming and Shipping

- **Water**: Pre- & Post-harvest
- **Workers**: Hygiene & Training
- **Waste**: Manure & Compost
- **Wildlife**: Intrusion & Fecal
- **Record-keeping**
- **Traceability**
Commodity-Specific GAPs and Food Safety Audit Checklists

- Melon
- Tomato
- Stone fruit
- Mushroom
- Lettuce & Leafy Greens
- Culinary Herbs
- Green Onions
- Sprouts
- Almond
- Citrus
- Strawberry
- Watermelon
- Blueberries
- Asparagus
How much should I do?

• Use common sense “good agricultural practices”
• Develop a food safety plan for your farm
• Conduct a self audit (Self Certification)
• Become certified by a 3rd-party auditing company
Soils, Previous Land Use

Previous Land Use Assessment

- Write down what the land has been used for previously; and if manures were applied.
  - crop land
  - fallow
  - dairy, livestock, poultry farms (possible contamination)

- Discuss what you have done to resolve contamination
  - had the soil tested for coliforms and E. coli

- Discuss what you do to reduce the risk if there is flooding or runoff from neighbors horse pasture, hilly ground, etc.
  - dug a trench or put up a berm of soil on 2 sides of my farm
Horses adjacent to a farm

Make a trench or berm
Mapping a farm

• **Field map:** Record activities within & adjacent to your property.

• Map should include:
  • Crops
  • Roads
  • Wells and other water sources
  • Lakes, rivers, ponds, reservoirs
  • Ditches
  • Buildings, including semi-permanent portable toilets and break areas
  • Neighboring property features
Creating a map...

1. Hand draw the map

2. Obtain one from:
   - Download one from the internet (e.g., Google maps, or Google earth)
   - Contact your NRCS office for a map

3. Re-use one previously submitted to Ag Commissioner
Google Earth map

- School Yard
- Portable Toilets
- Well
- Break Area

Legend:
- ▲ Portable Toilets
- Road
- ◇ Well
- ★ Break Area
Another map

Source: U of FL IFAS Extension. Small Farm Food Safety, Fresh Produce, Part 4: Farm Map Activity. FCS8845
Food Safety: Water, Waste, Wildlife, Workers

Agricultural Water
Usually ag water comes from:
* Surface sources – canals, rivers, streams
* Reservoirs – open or capped
* Wells
* Municipal sources
Know source of water
Know what’s upstream and intended use
Know seasonal variation (does source change?)

Source: NRCS
Irrigation Source ?
2006
E. coli O157.H7 contamination of irrigation water by feral pigs or possibly deer - 276 sick, 3 dead from eating raw spinach
Case: Fillmore, CA.

Peppers initially irrigated with well water, then toward harvest, river water was delivered, contaminated with bacteria.
Ensure that wells are designed and maintained in a manner that prevents contamination.

Back Flow Preventer
Animal burrow at well head
Potential Fertilizer Contamination
Potential Fertilizer Contamination
Ground water may be contaminated by a variety of biological and chemical hazards

*Bacteria and viruses  *Domestic waste  *Nitrate nitrogen  
*Synthetic organic chemicals  *Heavy metals  *Petroleum residues  
*Combustion products from roadways
Microbiological Testing

**Water Test**

Bacteria are most important

Keep records in case of a microbiological outbreak investigation
Bacteria in Water

- **Total Coliform** = Environmental Contamination
- **Fecal Coliform** = Fecal Contamination
- **E. Coli (generic)** = Fecal Contamination
- **E. Coli 0157:H7** = Fecal Contamination with known human pathogen
Water Source Will Determine the Possible Frequency of Testing

If water source is:  
Closed source – well  
Canal, pond, river  
Municipal water  

Then testing frequency is:  
Annually at beginning of season  
Every 3 months during season  
Keep records from district  

* Obtained from California Strawberry Commission (1998) Quality Assurance Program
Until a suitable indicator or group of indicator bacteria are identified, nonpathogenic Escherichia coli (E. coli) remain the practical indicator of microbial water quality in produce production systems. Despite the functional significance of E. coli as an indicator, there is no established or recognized limits or standards, at this time. The best available standards that might be applied to irrigation water quality are those established by the U.S. Environmental Protection Agency (EPA-823-R-03-008 revised June 2003) [http://water.epa.gov/type/oceb/beaches/local_index.cfm](http://water.epa.gov/type/oceb/beaches/local_index.cfm).

US EPA Bacterial Water Quality Standards for Recreational Waters:
126 CFU E. coli /100 ml sample . . . . . . or 33 Enterococcci CFU/100 ml sample
# Bacteriological Water Analysis

**Univ of Calif Coop Ext %Richard Molinar**

**1720 S. Maple**

**Fresno, CA 93702**

---

**Lab No.** 157969  
**Sample Date** 6/15/2011  
**Sample Time** 13:30  
**Sampler**  
**Submitted Date** 6/15/2011  
**Submitted by** Michael Yang  
**Report Date** 6/16/2011  
**Location/Project**  
**Copy To**  
Fax (559) 456-7575  
email rhmolinar@ucdavis.edu

---

## Results

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Time Started</th>
<th>Rec'd Temp °C</th>
<th>Coliform per 100 ml</th>
<th>E-Coli per 100 ml</th>
<th>Residual Chlorine mg/L</th>
</tr>
</thead>
</table>

---

001 McCall & Kings Canyon  
6/15/2011 15:36 28.4 83.6 <1

---

Coliform is a generalized category of bacteria that is a moderate health risk. Warnings are marked in **Orange Color**.

E-Coli is a specific strain of bacteria and is a severe health risk. Warnings are marked with **Red Color**.

When coliform bacteria is detected a full chlorination of the drinking water system is required.

If E-Coli bacteria is detected, all human consumption should stop immediately (unless boiled). An immediate chlorination of the drinking water system must occur with retesting prior to allowing human consumption.

**MPN** _Most Probable Number_. This is a statistical number to represent the number of bacterial colonies found in a random sample of this water. The higher the number, the greater the amount of bacteria in the sample.

**MPN Coliform Description of terms:**
- No Bacterial Contamination Found = <1
- Bacterial Contamination Detected = greater than 1
### Bacteriological Water Analysis

**Univ of Calif Coop Ext %Richard Molinar**
1720 S. Maple
Fresno, CA 93702
2652
50

<table>
<thead>
<tr>
<th>Material Submitted:</th>
</tr>
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<tbody>
<tr>
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**Lab No.** 154376  
**Sample Date** 4/6/2011  
**Sample Time** 10:30  
**Sampler** Richard Molinar  
**Submitted Date** 4/6/2011  
**Submitted by** Richard Molinar  
**Reported Date** 4/8/2011  
**Location/Project**  

**Copy To** KMB  
**Fax** (559) 456-7575  
**email** rhmolinar@ucdavis.edu

<table>
<thead>
<tr>
<th>Date Started</th>
<th>Time Started</th>
<th>Rec'd Temp</th>
<th>MPN Coliform per 100 ml</th>
<th>MPN E-Coli per 100 ml</th>
<th>Residual Chlorine mg/L</th>
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<td>4/6/2011</td>
<td>16:23</td>
<td>12.6</td>
<td>&lt;1</td>
<td>&lt;1</td>
<td>Field test</td>
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</tbody>
</table>

**Analysis Date:** 4/6/2011  
**Strawberry Farm**  

**Note:** ND = None Detected  
Records retained for 5 yrs.

**mg/L = ppm**  

---

**Approved By:**

---

**ELAP Certification #1595**
**Certificate of Analysis**

Report Issue Date: 03/21/2012 14:39  
Received Date: 03/13/2012  
Received Time: 10:42

Lab Sample ID: A2C0852-01  
Sample Date: 03/13/2012 10:42  
Sample Type: Routine  
Sample Control Qualifiers: SC02  
Sample Description: Water Canal MID

**Microbiology**

<table>
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<th>Analyte</th>
<th>Method</th>
<th>Result</th>
<th>RL</th>
<th>Units</th>
<th>Batch</th>
<th>Prepared</th>
<th>Qual</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Coli by 1x10 MTF</td>
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<td></td>
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<tr>
<td>E. Coli</td>
<td>SM 9221</td>
<td>&gt;23</td>
<td>1.1</td>
<td>MPN/100 mL</td>
<td>A202592</td>
<td>03/13/12 15:18</td>
<td></td>
</tr>
</tbody>
</table>
Spray Water Quality

• Make sure spray water quality is safe
• Keep spray & water quality records
• Low water volumes reduce risk
Evaluate Irrigation Method
Drip—Spray—Furrow—Flood

Water with less chance to contact plants has fewer problems of contamination
Food Safety: Water, **Waste**, **Wildlife**, Workers

- Agricultural products can become contaminated at any point along the farm-to-table food chain.

- A major source of microbial contamination is associated with **animal feces**.

- Growers need to identify obvious sources of fecal matter that could be a source of contamination.
Potential Sources of Contamination

- Untreated or improperly treated manure
- Manure composting or storage areas
- Livestock or poultry operations
Potential Sources of Contamination

Nearby municipal wastewater or biosolids storage, treatment or disposal areas
Potential Sources of Contamination

High concentration of wildlife

Even Domestic Pets
Livestock nearby = runoff
Pasture runoff after a rain to ???
Potential Sources of Contamination

Worker hygiene & Sanitary Facilities
Handling and application

• As far as possible from production/handling areas
• Use barriers or physical containment
• Properly made compost - mature
• Maximize time between application and harvest
• Incorporate manure 2 weeks prior to planting  OR
  Prior to harvest: (>45 days for composted and 120 days for un-composted manure—CAFF GAPs & SOPS p: 7, 9)
Compost Application

45 days prior to harvest
Livestock in the field

120 days prior to harvest
What can Farmers Do?

- **Prevention**: If possible avoid growing crops that are eaten raw near animal facilities, in areas where birds perch over the crop, or too close to wildlife habitat.

  - Keep dogs in the yard – not roaming
  - Reduce mouse habitat
What can Farmers Do?

• **Monitoring:** monitor fields for wildlife intrusion and define a no-harvest zone if fecal matter present.
What can Farmers Do?

• Exclusion: If problem persists, fences, netting or other physical barriers can be used to exclude wildlife
What can Farmers Do?

- **Management:** Deter wildlife with scare devices, attractants, or other tools which may be effective.
  - trapping (mouse)
  - baits (squirrels)
  - AV Alarm to scare birds
Management
What can Farmers Do?

• **Removal**: If possible and allowed, hunt or physically remove wildlife.
Some things you can’t control

But monitor for presence of fecal material
USDA Video

United Fresh News
- Press Releases

Policy and Regulatory Issues
Agriculture Policy & Programs
- 2008 Farm Bill
- Specialty Crop Block Grants
- International Trade
- Country of Origin Labeling

Food Safety Policy, Technology & Regulatory Affairs
- Audits & Compliance
- Food Defense
- Education & Outreach
- Food Safety: Produce Outbreak Information
- Produce Traceability Initiative

Produce GAPs Harmonization Initiative
Worker health and hygiene
How do workers pose a risk?

• Human bodies carry a variety of bacteria and viruses, greatest risk is human feces

• Even if somebody is not sick, they may still be able to contaminate produce and others

• Workers often must have close contact with produce as part of their job
## Some outbreaks associated with infected workers

<table>
<thead>
<tr>
<th>Date</th>
<th>Produce</th>
<th>Pathogen</th>
<th># of cases</th>
<th>Produce origin</th>
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<tr>
<td>1987</td>
<td>raspberries</td>
<td>Hepatitis A virus</td>
<td>92</td>
<td>United Kingdom</td>
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<tr>
<td>1990</td>
<td>strawberries</td>
<td>Hepatitis A virus</td>
<td>53</td>
<td>United States</td>
</tr>
<tr>
<td>1994</td>
<td>green onions</td>
<td>Shigella</td>
<td>72</td>
<td>CA</td>
</tr>
<tr>
<td>1996</td>
<td>leaf lettuce</td>
<td>E. coli 0157:H7</td>
<td>49</td>
<td>United States</td>
</tr>
<tr>
<td>1997</td>
<td>strawberries</td>
<td>Hepatitis A virus</td>
<td>250</td>
<td>CA</td>
</tr>
<tr>
<td>1997</td>
<td>green onions</td>
<td>Cryptosporidium</td>
<td>55</td>
<td>United States</td>
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<tr>
<td>1997</td>
<td>basil</td>
<td>Cyclospora</td>
<td>341</td>
<td>United States</td>
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<tr>
<td>1998</td>
<td>green onions</td>
<td>Hepatitis A virus</td>
<td>43</td>
<td>United States/CA</td>
</tr>
<tr>
<td>1999</td>
<td>parsley</td>
<td>Shigella</td>
<td>486</td>
<td>United States</td>
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<tr>
<td>2003</td>
<td>parsley</td>
<td>enterohemorrhagic E. coli</td>
<td>77</td>
<td>United States</td>
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</table>
Worker Illness

- 93% of outbreaks related to food handlers involved sick workers
- Sick workers must tell supervisor; supervisor may give alternative work or ask them to stay home
  - Vomiting
  - Diarrhea
  - Jaundice (yellow skin or eyes)
  - Fever
  - Sore throat
First aid/ open cuts

Train workers on:

• First aid kit location
• First aid for cuts and other injuries
• Wounds must be properly covered or worker should be reassigned to another job
• Throw away produce that could have been contaminated by blood or other body fluids
Follow OSHA regulations regarding toilet facilities

Provide toilets: 1-male and 1-female for every 20 employees

For less than 5 employees, 1 lockable toilet is OK

Supplied with toilet paper

Cleaning dates posted

Toilet must be located within ¼ mile or no more than 5 minutes walk from the work site
Don’t allow toilets to become a source of contamination

• They must be cleaned on a regular schedule

• If you have toilet cleaning equipment, then it must be labeled and stored separately

• Have a plan in the event of a leak or spill
Nice and Clean at all times
Located where water for cleaning does not get into the field
Handwashing facilities

- Near toilet facilities
- Potable water only
- Liquid soap dispensers, Single-use paper
- Containers need to be emptied, cleaned and sanitized regularly
- Collection of drain water
- Trash can with lid
Hand washing policy

• Before starting work
• After breaks
• After using toilet
• After handling garbage
• After working with soil or rotten produce
• After sneezing or coughing on hands
Proper Handwashing Technique

Sanitizers may be used in addition, but not instead of soap and water.
Proper use of gloves

- Gloves are **not** a substitute for proper handwashing
- Wash hands before putting on gloves
- Change gloves anytime they might have gotten dirty (i.e. anytime you would wash your hands)
- For reusable gloves, clean/sanitized pair should be issued to employee as needed
Break areas

• Designated area away from where produce is being handled
• Handwashing facilities close by
• Marked on farm map
• Cleaned regularly so rodents do not become attracted to the area
• No smoking, chewing tobacco or gum, or eating outside break area
Other worker and hygiene issues

• Have a policy which limits jewelry
• No false nails, nail polish, keep pockets empty above the waist
• Request nails be trimmed short, wear clean clothes, bathe daily
• Drinking water containers: empty, clean and sanitize daily
Worker training

• Train everyone!
• Training materials (videos, posters – see resource list)
• Topics:
  – Health and hygiene
  – Illness and accidents
  – Pesticide safety
Training and recordkeeping

- Documentation of worker trainings
- Record maintenance of toilet and handwashing facilities
- Records of illness and injuries
Easy things to reduce risk

• Keep toilet and handwashing facilities clean and easily accessible

• Training and signs showing proper procedures

• Do not allow sick employees to handle produce
FOOD SAFETY

Field Harvesting and Transportation

Post Harvest Water Use
Worker health & hygiene

During harvest, worker health and hygiene policies should be strictly enforced.
Potable drinking water in clean containers
During Harvest

• Keep equipment clean and free from oil, grease, broken glass or other contamination
• All contaminated produce is thrown away
• Inspect field and remove glass, metal, dead animals or any other toxic items
Cleaning and sanitizing harvest bins

- See handout for sanitizing procedure
Clean Field Harvesting Equipment
with 1 Tbs. chlorine bleach(5.25%)/gallon

- **Step 1:** Place harvest containers next to sanitized surface (plastic) that has been pre-rinsed, scrubbed with detergent, rinsed & sanitized.
- **Step 2:** All buckets are pre-rinsed to remove visible soil.
- **Step 3:** Buckets will be scrubbed with detergent and rinsed.
- **Step 4:** Scrub buckets and dip in bleach then air-dried and stack.
- **Step 5:** Check water with chlorine test strips for proper strength.

- Dispose of wastewater daily away from production areas.
- All cleaning is labeled “Harvest Equipment Only”.
- Workers must wear waterproof aprons, rubber gloves, & goggles.
- Maintain a written Farm Cleaning Record
Wash Water
Washing Produce

• Water must be potable or microbially safe
• Wash tanks, tubs and food contact surfaces are cleaned and sanitized regularly
• Chlorine will not sterilize produce
Washing Produce with chlorine solution

$\frac{1}{2}$ tsp. bleach (5.25%) in 6 gallons of water $= 5$ ppm Use chlorine test strips to determine chlorine content

- Start with potable water - pH of between 6 and 7.5
- Use pH test strips to determine pH
- Change water in the dump tanks at least daily
- Change water when chlorine content is below 5ppm
- Rinse produce with potable water before packaging
Produce Sanitizers

Trevor Suslow
Department of Plant Sciences
Center for Produce Safety Advisory Board & Technical Committee
tvsuslow@ucdavis.edu 530-754-8313
Use of Chlorine on Organic Produce

• Organic growers, shippers, and processors may use chlorine within specified limits

• All forms of chlorine are restricted materials as defined by existing organic standards

• California Certified Organic Farmers (CCOF) recently modified the threshold to permit 10 ppm residual chlorine measured downstream of the wash step

• Growers certified by other agencies should check with their certifying agent
Peracetic Acid
Processing

Identification

Chemical Name(s):
peroxyacetic acid, ethaneperoxic acid

Other Names:
per acid, peracetic acid, PAA

CAS Number:
79-21-0

Other Codes:
NIOSH Registry Number: SD8750000
TRI Chemical ID: 000079210
UN/ID Number: UN3105

Summary Recommendation

<table>
<thead>
<tr>
<th>Synthetic / Non-Synthetic:</th>
<th>Allowed or Prohibited:</th>
<th>Suggested Annotation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synthetic (consensus)</td>
<td>Allowed (consensus)</td>
<td>Allowed only for direct food contact for use in wash water. Allowed as a sanitizer on surfaces in contact with organic food. (consensus) From hydrogen peroxide and fermented acetic acid sources only. (Not discussed by processing reviewers—see discussion of source under Crops PAA TAP review.)</td>
</tr>
</tbody>
</table>

Characterization

Composition:
C₂H₄O₃. Peracetic acid is a mixture of acetic acid (CH₃COOH) and hydrogen peroxide (H₂O₂) in an aqueous solution. Acetic acid is the principal component of vinegar. Hydrogen peroxide has been previously recommended by the NOSB for the National List in processing (synthetic, allowed at Austin, 1995).

Properties:
It is a very strong oxidizing agent and has stronger oxidation potential than chlorine or chlorine dioxide. Liquid, clear, and colorless.
PEROXYACETIC ACID

\[ \text{H}_2\text{O}_2 \ + \ \text{CH}_2\text{COOH} \quad \leftrightarrow \quad \text{H}_3\text{COOH} \]

- Hydrogen Peroxide
- Acetic Acid
- Peroxyacetic Acid

- Break-down products: acetic acid, O\(_2\), CO\(_2\), H\(_2\)O

- Permitted dosage (FDA):
  - Cleaning surfaces 85 – 300 ppm
  - Contact with food 85 ppm maximum
    - Typical rates 30-35 ppm
Peroxyacetic Acid (PAA) - Advantages

• Less impacted by organic matter and soil
• Low foaming
• Very good biofilm penetration
• Very good on molds and spores
Peroxyacetic Acid - Disadvantages

- More expensive than hypochlorite at effective dose
- Corrosive to soft metals and skin
- **Strong, pungent odor of concentrate and dilute forms** (worker discomfort & safety)
- Varied activity against fungi
- Prolonged exposure may cause product damage
  - build up of acetic acid in water
  - may cause sliming, browning, translucency
- Need to monitor water turn-over closely
Transporting Produce

- Vehicles have not carried sewage, manure or hazardous materials
- Keep vehicles clean
- Keep pallets, scales, carts, & forklifts clean
Standard pack = new box
Traceability
Why is **Traceability** important?

- Reduces public health risk by pinpointing the source of contamination
- So that it can be removed from the food chain
• G-1 Documented traceability program has been established
• G-2 Operation has performed a “mock recall” that was proven to be effective
• 1-26 Each production field is identified to enable traceability in event of a recall
• 2-21 Product moving out of the field is uniquely identified to enable traceability in event of recall
How to ensure traceability

- When direct marketing, traceability requires:
  - 1 link back (suppliers)
  - 1 link forward (customers)
- Record harvest date on every harvest bin as crop is harvested
- If multiple fields of same crop, also record field # & harvest crew
Automated Data Collection & Tracking

GPS Mobile Printing System

Harvest
On Demand Labeling of Items & Containers in Exact Location
Without Electricity or Cell tower or Network Available!!

1) Enter Info - Key In & Drop Down Menus
2) Select Quantity
3) Press Print Button

4) Poly Label with 2D barcode is printed in Seconds

* Easily & Quickly enter info – ANYWHERE in world
* SmartPDA Automatically prints very accurate GPS coordinates, date and time plus user info.
* Durable poly label is easy to read & has UNIQUE SN
* Every Container is NOW uniquely marked for traceback
* Special adhesive enables label to stick to any container
* Multiple counterfeit prevention functions

5) Affix Label to container
Traceability & Your Farm Map

- Have map of farm showing fields & crops
- Keep map updated
- Ensure that all farm personnel (particularly harvest crews) know codes for different fields
- Field number should be recorded on each harvest bin
Traceability for Farmers Markets

• When selling at farmers market, record:
  – harvest date (& field number, if harvest crop from 1+ fields)
  – crops sold
  – market name & date

• Consumers more likely to remember you if your stall signage is prominent

• Usually impractical to give receipts at farmers markets, but you can have business cards or stickers
  – Some farmers have bags with name & contact information
Traceability for a CSA

• CSA customers have your contact information
• Crops from multiple fields: record harvest date & field number on box, & keep a record by CSA delivery date
• Sourcing from other farms: record source farm by crop and CSA delivery date
Traceability for Farmstands

• Put your name & contact information on receipt
• Record harvest date & field# for crop
• Sourced products: record date & source farm for each crop sold
Traceability For Wholesale

- In California, produce sold through wholesale channels must have:
  - standard container for particular crop
  - farm name & location (printed or sticker)
  - date stamp (actual date or Julian date)
  - required crop name, pack, grade & size
  - can be hand written, printed on stickers, or stamped on box w/hand-held labeling gun
12/2 Bags

Amount and weight of bags

Type of cherry

Row Size

Federal State Inspection lot

Net Weight
Traceability For Wholesale

• Placing a label on wrapped pallet is not sufficient.
• Use hand-held labeling gun to code each box: e.g., lot code – 020-16756170 indicates:
  – 020 = box number
  – 167 = (date harvested) Julian calendar date (such as 167 for June 13) or use the calendar date 613--reserves the first 3 digits for dates
  – 5 = grower
  – 6 = field picked or picker
  – 170 = packing date
Traceability For Wholesale

• At end of each packing day, record beginning & ending box numbers in book
• Code for these numbers needs to be recorded once & filed
• When you ship products, keep log by box number of which box was shipped where, with shipping date
Can this be traced back to a specific farm, specific field, and specific date?
Safety: From Field to Table
Self Certification
Farm Safety Manual

Table of Contents

General Farm Description 2
Traceability 2
Worker Health and Hygiene 3
Illness and accident procedures 3
General sanitation 3
Chemicals and Pesticides 4

Farm Review:
Water Assessment 4
Wildlife and Livestock 5
Manure and Biosolids 6
Land assessment and soil 6

Field Harvest and Packing
Worker sanitation 7
Equipment 7
Transportation 7
Forms 9+
Map
Training
Visitor Sign In
4 levels of Safety Plan

1. Use common sense “good agricultural practices”
2. Develop a food safety plan for your farm
3. Conduct a self audit (Self Certification)
4. Become certified by a 3rd-party

USDA Good Agricultural Practices Good Handling Practices Audit Verification Checklist
USDA Good Agricultural Practices Good Handling Practices
Audit Verification Checklist

This program is intended to assess a participant’s efforts to minimize the risk of contamination of fresh fruits, vegetables, nuts and miscellaneous commodities by microbial pathogens based on the U.S. Food and Drug Administration’s “Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables,” and generally recognized good agricultural practices.

Firm Name: 
Contact Person: 
Audit Site(s): 
Main Address: 
City: State: Zip: 
Telephone No: Fax: 
E-mail: 
Auditor (s): (list all auditors with the lead listed first) 

USDA or Fed-State Office performing audit:
Arrival Date: Time: 
Departure Date: Time: 
Travel Time Code 
Person(s) Interviewed (use back of sheet if necessary to list all persons interviewed)
SUNNYSIDE PACKING COMPANY

TRACEBACK POLICY AND PROCEDURES

All product from ranch # 999, is marked with a grower number stamp representing the ranch.

The company, commodity, size, and weight are clearly marked on the carton or container.

Individual labels are adhered in the field that represents the labor crew, julienne date, ranch field ID. These labels are adhered to each carton or container.

The product is delivered to Sunnyside Packing Company’s shed. A grower receipt is given detailing the grower name, grower number, date received, commodity, size and quantity received.

Pallet tags and GTIN labels are adhered to each pallet and container for further trace and recall in the case of product contamination. Pallet tags and GTIN can be recalled in the computer database immediately for further traceback.
All paperwork in order?
## Worker Health & Hygiene

<table>
<thead>
<tr>
<th>Questions</th>
<th>Points</th>
<th>Yes</th>
<th>NO</th>
<th>N/A</th>
<th>Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-3 Potable water is available to all workers.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>G-4 All employees and all visitors to the location are required to follow proper sanitation and hygiene practices.</td>
<td>10</td>
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</tr>
<tr>
<td>G-5 Training on proper sanitation and hygiene practices is provided to all staff.</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>G-6 Employees and visitors are following good hygiene/sanitation practices.</td>
<td>15</td>
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<tr>
<td>G-7 Employees who handle or package produce are washing their hands before beginning or returning to work.</td>
<td>15</td>
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<tr>
<td>G-8 Readily understandable signs are posted to instruct employees to wash their hands before beginning or returning to work.</td>
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</tr>
<tr>
<td>G-9 All toilet/restroom/field sanitation facilities are clean. They are properly supplied with single use towels, toilet paper, hand soap or antibacterial soap, and potable water for hand washing.</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>G-10 All toilet/restroom/field sanitation facilities are serviced and cleaned on a scheduled basis.</td>
<td>10</td>
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<td>R</td>
</tr>
<tr>
<td>Questions</td>
<td>Points</td>
<td>Yes</td>
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<td>N/A</td>
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<td>G-11</td>
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<tr>
<td>Smoking and eating are confined to designated areas separate from where product is handled.</td>
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<td>G-12</td>
<td>15</td>
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<tr>
<td>Workers with diarrheal disease or symptoms of other infectious diseases are prohibited from handling fresh produce.</td>
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<td>G-13</td>
<td>15</td>
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<tr>
<td>There is a policy describing procedures which specify handling/disposition of produce or food contact surfaces that have come into contact with blood or other bodily fluids.</td>
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<td>G-14</td>
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<tr>
<td>Workers are instructed to seek prompt treatment with clean first aid supplies for cuts, abrasions and other injuries.</td>
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<td>G-15</td>
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</tr>
<tr>
<td>Company personnel or contracted personnel that apply regulated pre-harvest and/or post harvest materials are licensed. Company personnel or contracted personnel applying non-regulated materials have been trained on its proper use.</td>
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</tr>
</tbody>
</table>
### Part 2 - Field Harvest and Field Packing Activities

#### Field Sanitation and Hygiene

<table>
<thead>
<tr>
<th>Questions</th>
<th>Points</th>
<th>Yes</th>
<th>NO</th>
<th>N/A</th>
<th>Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1 A documented pre-harvest assessment is made on the crop production areas. Risks and possible sources of crop contamination are noted and assessed.</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>2-2 The number, condition, and placement of field sanitation units comply with applicable state and/or federal regulations.</td>
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<tr>
<td>2-3 When question 2-2 is answered &quot;N/A&quot; (sanitation units are not required), a toilet facility is readily available for all workers</td>
<td>10</td>
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<tr>
<td>2-4 Field sanitation units are located in a location that minimizes the potential risk for product contamination and are directly accessible for servicing.</td>
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<tr>
<td>2-5 A response plan is in place for the event of a major spill or leak of field sanitation units or toilet facilities.</td>
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</tr>
</tbody>
</table>
## Field Harvesting and Transportation

<table>
<thead>
<tr>
<th>Questions</th>
<th>Points</th>
<th>Yes</th>
<th>NO</th>
<th>N/A</th>
<th>Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-6 All harvesting containers and bulk hauling vehicles that come in direct contact with product are cleaned and/or sanitized on a scheduled basis and kept as clean as practicable.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>2-7 All hand harvesting equipment and implements (knives, pruners machetes, etc.) are kept as clean as practical and are disinfected on a scheduled basis.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>2-8 Damaged containers are properly repaired or disposed of.</td>
<td>5</td>
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</tr>
<tr>
<td>2-9 Harvesting equipment and/or machinery which comes into contact with product is in good repair.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>2-10 Light bulbs and glass on harvesting equipment are protected so as not to contaminate produce or fields in the case of breakage.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>Questions</td>
<td>Points</td>
<td>Yes</td>
<td>NO</td>
<td>N/A</td>
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<td>---------------------------------------------------------------------------</td>
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<tr>
<td>2-11 There is a standard operating procedure or instructions on what measures should be taken in the case of glass/plastic breakage and possible contamination during harvesting operations.</td>
<td>5</td>
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</tr>
<tr>
<td>2-12 There is a standard operating procedure or instructions on what measures should be taken in the case of product contamination by chemicals, petroleum, pesticides or other contaminating factors.</td>
<td>5</td>
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</tr>
<tr>
<td>2-13 For mechanically harvested product, measures are taken during harvest to inspect for and remove foreign objects such as glass, metal, rocks, or other dangerous/toxic items.</td>
<td>5</td>
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<tr>
<td>2-14 Harvesting containers, totes, etc. are not used for carrying or storing non-produce items during the harvest season, and farm workers are instructed in this policy.</td>
<td>5</td>
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<tr>
<td>2-15 Water applied to harvested product is microbiologically safe.</td>
<td>15</td>
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</tr>
<tr>
<td>2-16</td>
<td>Efforts have been made to remove excessive dirt and mud from product and/or containers during harvest.</td>
<td>5</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>2-17</td>
<td>Transportation equipment used to move product from field to storage areas or storage areas to processing plant which comes into contact with product is clean and in good repair.</td>
<td>10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-18</td>
<td>There is a policy in place and has been implemented that harvested product being moved from field to storage areas or processing plants are covered during transportation.</td>
<td>5 P</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-19</td>
<td>In ranch or field pack operations, only new or sanitized containers are used for packing the product.</td>
<td>10 D</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-20</td>
<td>Packing materials used in ranch or field pack operations are properly stored and protected from contamination.</td>
<td>10</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2-21</td>
<td>Product moving out of the field is uniquely identified to enable traceability in the event of a recall.</td>
<td>10 D</td>
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</tbody>
</table>
# USDA Audit Verification

## Washing/Packing Line

<table>
<thead>
<tr>
<th>Questions</th>
<th>Points</th>
<th>Yes</th>
<th>NO</th>
<th>N/A</th>
<th>Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-3 Source water used in the packing operation is potable.</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>3-4 If applicable, the temperature of processing water used in dump tanks, flumes, etc., is monitored and is kept at temperatures appropriate for the commodity.</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>3-5 Processing water is sufficiently treated to reduce microbial contamination.</td>
<td>10</td>
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</tr>
<tr>
<td>3-6 Water-contact surfaces, such as dump tanks, flumes, wash tanks and hydro coolers, are cleaned and/or sanitized on a scheduled basis.</td>
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<tr>
<td>3-7 Water treatment (strength levels and pH) and exposure time is monitored and the facility has demonstrated it is appropriate for the product.</td>
<td>10</td>
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</tr>
<tr>
<td>3-8 Food contact surfaces are in good condition; cleaned and/or sanitized prior to use and are maintained.</td>
<td>15</td>
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<tr>
<td>3-9 Product flow zones are protected from sources of contamination.</td>
<td>10</td>
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</tr>
<tr>
<td>3-10 The water used for cooling and/or to making ice is potable.</td>
<td>15</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3-11 Any ice used for cooling produce is manufactured, transported and stored under sanitary conditions.</td>
<td>10</td>
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<td>R</td>
</tr>
</tbody>
</table>
### USDA Audit Verification

#### Transportation

<table>
<thead>
<tr>
<th>Questions</th>
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<th>NO</th>
<th>N/A</th>
<th>Doc</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-24 Prior to the loading process, conveyances are required to be clean, in good physical condition, free from disagreeable odors, and from obvious dirt/debris.</td>
<td>10</td>
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<tr>
<td>4-25 Produce items are not loaded with potentially contaminating products.</td>
<td>10</td>
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</tr>
<tr>
<td>4-26 Company has a written policy for transporters and conveyances to maintain a specified temperature(s) during transit.</td>
<td>10</td>
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<td>P</td>
</tr>
<tr>
<td>4-27 Conveyances are loaded to minimize damage to product.</td>
<td>5</td>
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</tr>
</tbody>
</table>
Companies and Agencies that will do 3rd Party Audits

Good Agricultural Practices (GAP’s)

- California Department of Food and Agriculture - Inspection and Compliance
  Dinuba, California  Telephone: 559-595-8000

- AIB International – Kansas, Telephone 800-633-5137

- NFS Davis Fresh Technologies – Watsonville, CA  Telephone 831-768-7951

- Primus Labs – Santa Maria, CA  Telephone (805) 922.0055

- Scientific Certification Systems – Emeryville, CA  Telephone 510.452.8024
Napa County Best Management Practices Agreement for a Garden to Become an “Approved Source”

Locally grown, fresh fruit and vegetables benefit the consumer, the environment and the community as a whole. Most fruits and vegetables consumed in the United States are wholesome and free of pathogens (microbes that cause foodborne illness). Many fruits and vegetables have natural barriers, such as skins and rinds that protect the internal edible parts from contamination. However, contamination of fruits and vegetables can occur any time from planting through food preparation. Most pathogens can be killed by cooking, but they can be difficult to remove by washing when foods are eaten raw. Prevention of microbial contamination is the most effective way to maximize the safety of fruits and vegetables. The best approach to maintaining the wholesome nature of your culinary garden’s harvest is to be aware of potential risks and to establish and implement commonsense practices that will minimize contamination.

Program Criteria

- Operator shall ensure that water used for irrigation is from a clean, potable source. If a question arises regarding the quality of water to be used, it must be tested to ensure it is free of pathogens. Surface water is much more susceptible to contamination. Gray water is not an approved water source for culinary gardens.
- Operator shall identify the effect of rain fall and resultant drainage pathways to minimize runoff through the garden that may contaminate the site.
- Operator shall ensure that all produce is washed with a pathogen-free source before being served, as required by the California Retail Food Code.
- Operator shall ensure that produce and harvest equipment are stored in a sanitary location, protected from vectors, such as rodents and insects, that can spread disease.
- Gardens shall not be planted over or within 10 feet of a septic system or leach field.
- All organic matter will be fully composted, and raw manure will not be used. Composted manure will only be used if purchased from a commercial...
Sonoma County Approved Produce Grower Certificate *DRAFT*
3.29.12

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Resources

FREE PUBLICATIONS

• Good agricultural practices (GAPs) http://ucanr.org/uc_gaps
• Las Publicaciones en Español (in Spanish) http://ucanr.org/gaps_espanol
• Post-harvest chlorination http://ucfoodsafety.ucdavis.edu/files/26414.pdf
• Water disinfestation for pre-harvest and post-harvest applications http://anrcatalog.ucdavis.edu/pdf/7256.pdf
Postharvest Handling and Safety of Perishable Crops
Trevor Suslow, Elizabeth Mitcham, and Marita Cantwell

Postharvest Handling for Organic Vegetable Crops
Trevor Suslow