

Optimization of Food Safety Programs For Organic Post Harvest Handling of Foods

By

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Organic Food Sales

- 17 Billion sales in 2006, up from 13.8 billion in 2005, representing a 23% growth rate
- Fruit and vegetable sales are the largest category representing 39%
- Organic food sales now represent 2.5% of all food products sold in the US
- Source: Fresh Americas, The Organic Corner. Fall, 2007

Food Safety

- Most significant challenge to the food industry over the past decade
- Rising demand for fresh fruits and vegetables
- Globalization of the food supply
- Emergence of new pathogens
(1982-E. coli 0157:H7)

Socioeconomic Impact of Food Born Pathogens

- In US- 6 million cases with 350,000 hospitalizations and 9,000 deaths per year
- Generally outbreaks are in a decline from 1996 to 2005 but increased for Salmonella and E. Coli 0157
- Annual economic losses resulting from deaths, loss of work, loss of manpower, and product losses account for 8.4 to 23 billion dollars over the past 5 years

Major Factors Contributing to Increased Incidence of Food Borne Disease Outbreaks

1. Increased Surveillance and Reporting

- Better detection methods

2. Changes in Food Manufacturing and Agricultural Practices

- Distribution system is wider, multiple states
- More emphasis on minimally processed products
- Increased importation of fresh produce

3. Changes in Consumer habits

- More meals outside home
- Increased consumption of fresh produce
- Possible reduction in good kitchen practices

4. Increased at-risk populations

- Increasing elderly population
- Immuno compromised

5. Emerging pathogens with improved survivability in stressed conditions

Food Safety Starts At The Farm And Ends At The Table

Approaches to Reducing Risk Exposure

- Farm Level- Good Agricultural Practices
 - Field History
 - Fertilizers

Approaches to Reducing Risk Exposure (Continued)

- Water
 - Irrigation Water
 - Drinking Water
 - Produce Wash Water
 - Must meet State/Federal Requirements: Use of chlorine as sanitizer in storage tanks
 - Field Sanitation
 - Personnel hygiene/training
 - Equipment

From Field to Pre-Cooling

- Truck wash SOP's
- On farm removal of soil, mud from produce
- Damaged or muddy cartons repaired, cleaned or discarded as a function of handling operations

Pre-Cooling

- Pallet and bin washing
- Employee hygiene
- Storage, staging, packaging areas should be cleaned and monitored for animal and/or pest contamination

Sources of Contamination Pre-Cooling and Shipping

- 5 Areas of Concern
 - 1. Receiving incoming product
 - 2. Staging for pre-cooling
 - 3. Pre-cooling
 - 4. Cold room warehousing
 - 5. Shipping

- I. Receiving Incoming Product
 - Guidelines for bin/pallet/tray washing and container integrity
- II. Staging for Pre-Cooling
 - Use of disposable gloves in handling product
 - Free from animal/pest contamination
- III. Pre-Cooling
 - A. Vacuum cooling
 - Condensate drip on product
 - Tube cleaning/removal of debris on daily basis
 - Keep dust/dirt level down
 - Remove obvious contaminated product prior to cooling via inspection

(Pre-Cooling Cont.)

B. Hydrovac Cooling/Hydro cooling

- Condensate pan dripping on product
- Contamination from inside- removal o debris; SOP for cleaning and re-filling of fresh water n a daily basis
- Airborne contamination
- Cross contamination from material handling
- Water quality- must meet potable microbiological standards
- Employee hygiene

(Pre-Cooling Cont.)

C. Ice Injection

- Ice and water quality-potability
- Water reservoir- free from microbial contamination-
use of chlorine sanitizers
- Organic compliance point

D. Ice Manufacturing

Water quality

Equipment cleaning- free from contamination

Troughs and screws free from debris, oil, grease and
contaminants

IV. Cold Room Warehousing

- Storage of wet products must not be above dry products. (i.e., rack or pallet storage)
- Condensate water must not come in contact with product or packaging
- Daily cleaning to remove mud, dirt and debris
- Environmental sanitation
- Floors
- Walls
- Drains
- Cleaning schedule for fork lifts and racks

V. Shipping

- Truck loading- dry over set- insure sufficient air flow
- Truck inspection
- Documentation- temp. recorders
- Implement Good Housekeeping Practices
- Assignment of responsibility and enforcement

In Plant Processing of Fruits and Vegetables

- I. Development of SSOP's with assessment
- II. Water Quality- flume wash operations
- III. Equipment sanitation
- IV. Environmental sanitation

Water Quality

- 1. Municipal or well water
 - Chlorination at well head
- 2. Flume wash water if chlorinated via hypochlorite, chlorine dioxide or chlorine gas must be monitored on an available or free chlorine basis
- 3. Water quality assessment
- 4. If steam is used (I.e., blanching or steam cleaning of food contact surfaces; organic certification requires review of boiler additives
- 5. Volatile amine boiler additives are prohibited except in thermal filling/ lidding/ packaging operations

Volatile Amine Boiler Additives

1. Cyclohexylamine
2. Diethylamino Ethanol
3. Hydrazine
4. Morpholine
5. Octadecylamine

Sanitizers

<i>Type</i>	<i>Examples</i>	<i>Uses</i>
Chlorine	Sod./Ca Hypochlorite Chlorine gas	Food contact surfaces Flume washing
Iodine	Iodophor	Hand dips
Quats Quaternary Ammonium Compounds	Alkyldimthylbenzyl- ammonium chloride Alyldimethylethyl- Benzyl Ammonium Chloride	Floors, Walls, Process Equipment

Sanitizers (cont.)

<i>Type</i>	<i>Examples</i>	<i>Uses</i>
Acid	Peroxyacetic Acid	Flume wash operations, Food contact surfaces
Hydrogen peroxide	3-6% Solution	Surface, equipment, floors, belts, food packaging equipment
Ozone	(Gas, unstable) Soluble in water; ozonated water	Food contact surfaces, flume wash operations

Sanitizer Removal From Food Contact Surfaces

<i>Type</i>	<i>Testing</i>
Hypochlorite	Chlorine test on surface and/or rinse water depending on type and temperature
Iodine	Iodine test on surface
Quats	Quat test on surface
Peroxyacetic acid	None
Hydrogen peroxide	None
Ozone	None

Sanitation Audits

Development of assessment tools- written procedures, for internal audit

Visual inspection- pre-operational inspections

Microbial monitoring

- Evaluate efficiency of SSOP's
- Microbial enumeration in relation to difficulty of cleaning/sanitizing
- Identification of potential contamination points which may reduce shelf life or increase risk of pathogen contamination

HACCP analysis implementation

Third party audits

Sanitation Assessment

- 1. Assessment of SSOP's- effectiveness of microbial reduction of food contact surfaces, environment (floors, wall, drains) and air
- 2. Risk will vary depending on specific products handled or processed
- 3. Assessment should include employee boots/shoes to determine effectiveness of food baths and sanitary dips effectiveness in preventing migration of bacteria
- 4. Environmental hygiene monitoring
 - Considered a major source of contamination floors, frame work, insides of guards and conveyors
 - Potential of contamination migration
- 5. Overall SSOP Program

Assessment Methods

- Rapid tests for verification; verification of efficacy of cleaning and sanitizing is an essential component

A. ATP Bioluminescence

Advantages

- Very fast; requires little time and labor; hand held format
- Very good to detect microbial residues which could lead to biofilms in tanks, sanitary piping, pumps, hoppers , extruders, heat exchangers

Disadvantages

- Will tell you only that you have contamination on surface
- Measures ATP from bacteria and food. Therefore not conclusive micro assessment

B. 3M Petri film

- Swab followed by inoculation on 3M plates
- Specific plates for APC, yeast and mold, coliforms

Employee GMP's

- Employees with colds/flu symptoms should not be allowed to handle foods
- Use of disposable gloves
- Employees should wear clean outer garments I.e., disposable smocks
- Hand/wash stations- alcohol or chlorine/iodine based
- Hair nets, beard nets
- Removal of jewelry
- Eating, drinking, chewing gum, use of tobacco should be prohibited in process and handling area
- Employee training of GMP's
- Management promotion of good sanitary practices

Fresh Produce Storage and Distribution System

- Storage of finished product
- Storage area sanitation programs in refrigerated warehouses
- Importance of environmental sanitation
- Loading dock areas
- Effective product traceability system from on farm field number to finished product
- First in- First out
- Temperature control 24-7 monitoring to insure 31041°F temperature
- If product is loaded onto customer owned transport, customer now assumes responsibility until ultimate retail sale of product

Product Tracking

- Farm ⊗ Field number, date of harvest
- Weight certificate ⊗ Field no., wt. cert. no.
- Receiving log ⊗ Wt. cert. no., grower name, field number date of receiving
- Production report ⊗ Date, field no., or lot no.
- Packaging report ⊗ Date of production/packaging
- Invoice to customer product code, bar coding, RFID

Product Code

06-	12-	2007	16A
i	i	i	i
Month	Day	Year	Field no.

Food Safety at Farmer's Markets, Restaurants, Product Markets

- Street HACCP
- Concept- Simple identification of hazards and implementation of measures to reduce risk
- Reduction of risk- not prevention
- Major risk areas or critical control points
- 1. Inadequate refrigeration
- 2. Improper hand washing
- 3. Unclean equipment
- 4. Inadequate hot holding or improper cooking

Continuum of Control at the Processing Level

Sanitary Design + Effective sanitation

+ Product traffic pattern + GMP's

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Reduction of risk exposure

to food born pathogens

Pest Management Guidelines

1. Prevention, prevention

2. Storage facilities

3. Physical control measures in plant

Glue boards, Insect electrocuters, Air doors

Katchalls traps, Building maintenance,

Pheromone traps, Prevention

4. Around perimeter of plant

Bait boxes, Tin cats, Perimeter maintenance

New Developments for Risk Exposure Reduction of Food Borne Diseases

1. Produce irradiation

2. ISAN Technology, Ioteq LTD Sydney, Australia

- Use of iodine
- Automated with computer dosing to insure stable iodine levels
- No disinfection by-products identified to date
- Non-corrosive
- Approved for use in Australia, New Zealand, Japan, Spain
- Closed loop system with potential flume water re-use

Conclusions

1. Organic product risk exposure should be no greater than for nonorganic products
2. Sanitation is a science and must be understood by all employees
3. Management must be supportive of continuous employee training and attendance at short courses
4. Risk exposure reduction requires continuous assessment and optimization of food handling and sanitation programs