

# Good Agricultural Practices

## A Self-Audit for Growers and Handlers



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Audit questions designated by \* are the most vital GAP considerations. Compliance with these issues is absolutely essential in controlling microbial risk, or to comply with Federal, State and local laws and codes.

## Introduction

### **Key Points of Control and Management of Microbial Food Safety For Growers, Packers, and Handlers of Fresh-Consumed Horticultural Products**

#### **Introduction:**

The majority of fresh consumed fruits and vegetables in the United States are wholesome and free of microorganisms that could result in illness under common and sensible handling and food preparation practices. In addition, many fruits and vegetables have natural barriers that minimize the chance that any surface contamination could be transferred to the internal edible portions, up to the point of harvest. These same barriers may also increase the effectiveness of removal of contamination during washing combined with light to vigorous brushing, depending on the sensitivity of the item. For some tolerant commodities, dry brushing in combination with a volatile antimicrobial treatment and rapid drying is an effective method for surface microbial reduction.

Contamination by microbial pathogens can only result, ultimately, from an external environmental source at some point from production to food preparation. Nonetheless, as with all fruits and vegetables consumed without a cooking step, the best approach to maintaining the wholesome nature and safe consumption of edible horticultural products is to be aware of the potential risks and to systematically identify and establish management practices to minimizing the chance of external and internal contamination at every step from growing to selling. The industry must continue to take a proactive role in delivering this same message to the public in order to assist them safe food handling and preparation.

#### **Background:**

Whether domestically produced or imported, four key events have brought focus and concern for the microbial food safety of fresh fruits, vegetables, nuts and other edible horticultural foods:

1. Recent reoccurring outbreaks linked to consumption of imported and domestic products.
2. Positive detection and recovery of human pathogens from random survey sampling of both imported and domestically produced produce.
3. Recent reports from several researchers documenting the difficulty of cleaning and disinfecting produce surfaces.
4. Recent reports from several researchers documenting the potential for internalization of pathogens during postharvest handling

Based on the overall consumption of fresh produce, illness definitively associated with contamination that occurs prior to food preparation is a very low probability event. However, it is equally clear that outbreaks linked to fresh produce from various production areas have occurred and have impacted large numbers of individuals across many states and into Canada. While most individuals can recover from foodborne illness without complications or the need for medical attention, some individuals such as the very young, the very old and those who may be otherwise immuno-compromised may suffer complications, including those resulting in death.

This will provide a brief outline of the fundamental components of microbial food safety that should be part of any comprehensive management plan for growers, specialty crop producers, harvest service operators, distribution and wholesale handlers, direct marketers, and fresh cut processors. The diversity of environments, crop management practices, and handling practices

make a single approach to food safety planning unrealistic; therefore, this quick reference guide will focus on the key guiding principles of prevention of contamination, reduction of survival, and prevention of cross-contamination for each step, up to consumer handling. Individual food safety planning and management programs may be derived from the application of these principles that are the combined outcome of specific research and practical experience with diverse commodities and crop management systems.

Many of these same principles may be applied to planning for food security and prevention of intentional food contamination. Resources helpful in counter-bioterrorism planning are provided at the end of this document.

### **What are the Guiding Principles of Food Safety for Fresh Produce?**

- Once contaminated, removing or killing pathogens on produce is very difficult.
- Prevention of microbial contamination at all steps from production to distribution is strongly favored over treatments to eliminate contamination that may have occurred.
- Documentation of implementation of prevention programs and food safety awareness training for workers at all levels of the agricultural and packing environments are key signatures of a credible food safety program.

### **Guiding Principles for Crop Production Water**

*Wherever water comes into contact with fresh produce, its quality may directly determine the potential for persistent pathogen contamination.*

- Become familiar with the routes and handling of surface water sources, seasonal influences on quality, and any microbial monitoring programs of the supplier (for delivered water from public or private irrigation districts).
- Identify potential sources of contamination that affect your water, especially those that are within your ability to control in a manner that will protect its quality.
- Ensure that wells are designed and maintained in a manner that prevent surface run-off or soil infiltration from contaminating the water supply.
- Water used for all foliar applications should be from a pathogen-free source.
- Until more research data is available, it is strongly recommended that any foliar applications within two weeks of harvest be from a potable water source.

### **Guiding Principles for Manure and Municipal Biosolids**

*Properly composted manures or municipal biosolids are not a source of microbial pathogens on fresh produce.*

- Become informed about proper compost management for pathogen reduction and document the method of pathogen elimination of applied manure.
- Document or obtain documentation about the specific compost management for each lot.
- Maximize the time between application of manure to production areas and harvest.
- If the use of multi-season drip irrigation is practiced, spreading of manure without incorporation into the soil requires careful attention to ensure that pathogen reduction practices have been met and documented.

## **Guiding Principles for Minimizing Animal Fecal Contamination**

*It is not possible, or may not be permissible, to eliminate all animal influences from production fields. However, steps to minimize their presence or activities should be determined.*

- Domestic animals should be excluded from fields during the growing and harvesting season.
- Evaluate the need for bare soil buffers to adjacent land that may encourage high populations of reptiles, amphibians, rodents, birds or other potential sources of contamination.
- Minimize the presence of vector attractants (such as cull piles) within a production field.

## **Guiding Principles for Worker Health and Hygiene**

*There is no substitute for awareness, training, and constant reinforcement of the importance of personal hygiene and sanitation as critical to sustainable business and employment.*

- Follow all OSHA and CAL OSHA requirements for sanitary facilities.
- Establish a training program including proper hand washing techniques and the importance of using toilet facilities.
- Establish and communicate a clear policy that will allow workers, who report or are observed to have symptoms of illness or diarrhea, to be reassigned to activities that do not involve food or food surface contact. In the absence of such a policy, it is probable that a worker will not report an illness to prevent loss of wages.
- Carefully inspect areas frequented by unsupervised workers (such as night irrigators) for signs that additional training is needed.
- Provide bandages or other protective coverings to workers with cuts or lesions on parts of the body that may make contact with fresh produce.
- If gloves are used, provide instruction on proper use to prevent pathogen transfer to fresh produce.
- Use caution when servicing portable toilets to prevent leakage into a field.
- Provide physical diversion and containment in the event of waste spillage. Have a plan for product isolation and destruction in the event of a spill.

## **Guiding Principles for Field and Harvest Sanitation**

*All surfaces and implements that touch fresh produce must be treated as food contact surfaces.*

- Clean all food contact surfaces and harvest containers or bins prior to use.
- Ensure that harvest contractors and crews are aware of microbial food safety risk reduction principles and adhere to established safe food practices.
- Develop and document a system of cleaning and sanitizing food contact surfaces.
- Minimize the opportunity for vectors to contaminate packing surfaces and materials.
- Minimize the access or attraction of vectors to harvest equipment kept in the field (such as no damaged fruit left on belts or grading tables).

## Guiding Principles for Packing Facilities

*Well -designed and operated centralized packing facilities and packing systems have the potential to contribute to the reduction of pathogen contamination. Lapses in facility or system management have the potential to amplify localized contamination, broadly re-distribute pathogens, or create opportunities for pathogen contamination within the facility.*

- Design and maintain packing surfaces and equipment to minimize injury to produce and to maximize accessibility by cleaning or sanitizing crews.
- Establish routine cleaning and sanitizing programs for all food contact surfaces.
- Remove as much dirt as practicable from harvest containers, trailers, or gondolas between harvest uses. This should be done outside the packing facility and isolated from any water source used for postharvest handling.
- Clean pallets, containers, or bins before use.
- Establish and maintain a pest control program.
- Prevent birds or other vectors from contaminating packing equipment surfaces, packing areas, and storage areas.
- Store unformed or empty containers off the floor or bare soil surface and in a way that protects them from contamination.

## Guiding Principles for Postharvest Water During Packing

*The quality of postharvest water that contacts fresh produce during cleaning, grading, cooling, and application of surface treatments is widely recognized as the essential control point for fresh produce.*

- Follow programs typical of Good Manufacturing Practices (GMP) to ensure that all water is of adequate quality throughout all packing operations from start-up to the last packed unit.
- Antimicrobial chemicals help minimize the potential for microbial contamination to be spread by packing operation water; levels of antimicrobial chemicals must be routinely monitored and recorded to ensure they are maintained at appropriate levels.
- Special attention to water quality is required for dump tank systems and re-circulated water.
- Keep air-cooling and chilling equipment clean and sanitary.
- Transport, store, and use ice under sanitary conditions.

## Guiding Principles for Transportation

*Limited control is possible beyond the shipping dock, but the consequences of cross-contamination during transportation and distribution will find a direct link back to the handler and grower.*

- Inspect transportation vehicles for cleanliness, odors, obvious dirt and debris before loading. Insist on trailer or container clean-out before loading, if needed.
- Ensure that transporters, distributors and retailers maintain the integrity of the positive lot identification and traceback systems that are being used.

## Guiding Principles for Storage and Distribution

*Well-designed and operated wholesale distribution, load consolidation, and cross-docking facilities have the potential to maintain the integrity of a pathogen-free product. Lapses in facility sanitation or system management have the potential to amplify localized contamination, promote internalization of pathogens into products and broadly re-distribute pathogens.*

*Mixed storage and mixed load distribution has the potential to transfer contamination from one lot or product to a previously non-contaminated produce item, especially where pallet-stacking, ice injection, or top-icing is involved.*

- Be aware of the potential for cross-contamination.
- Separate dry and wet product and place water-repellant shipping barriers between mixed loads.

## Guiding Principles for Fresh-cut or Value-added Processing

*Well -designed and operated processing facilities have the potential to contribute to the reduction of pathogen contamination. Lapses in facility or system management have the potential to amplify localized contamination, broadly re-distribute pathogens to the edible flesh, or contaminate pathogen-free melons from within the facility during handling.*

*Washing, in combination with a disinfectant treatment, will reduce but not eliminate microbial contamination. Greater microbial reductions are achieved on smooth, waxy produce than on rough textured or porous products.*

*For produce such as cantaloupe, mechanical removal by brush-washing in combination with an approved antimicrobial agent is essential prior to cutting and rind removal.*

*Proper temperature management (cold chain control) is important for quality and safety management but cannot be relied upon, alone, to provide sufficient consumer protection from potential food borne illness.*

- Use only good quality fruit, free from open wounds or defects that may have allowed bacteria to become internalized. Avoid fruit that have visible sunken areas or areas of mold or decay.
- Product flow should be linear; incoming product should not cross paths or be stored next to cleaned or processed product. Ideally, packing areas should be physically separated from receiving and processing areas.
- Worker traffic flow and activities should not move between packing and receiving.
- Develop specific worker training programs for fruit handling and processing to prevent bare-hand or gloved-hand contact of non-cleaned fruit rind and cut fruit flesh, in sequence, by the same individual.
- Antimicrobial chemicals help minimize the potential for microbial contamination to be spread by process water; levels of antimicrobial chemicals must be routinely monitored and recorded to ensure they are maintained at appropriate levels.
- Special attention to water quality is required for common wash tank or flume systems and any re-circulated water.

**Getting Started: Resources to Understand and Minimize Microbial Risks to Fresh Produce**

Production and Postharvest

On-Farm Food Safety Self Audit and Resource CD-ROM

<http://vric.ucdavis.edu>

Food Safety Begins On-the-Farm Brochure

(English and Spanish)

<http://www.gaps.cornell.edu>

Overview of Good Agricultural Practices

Final Guidance: Guide to Minimize Microbial Food

Safety Hazards for Fresh Fruits and Vegetables

(FDA 1998)

<http://www.foodsafety.gov/~dms/prodguid.html>

System-wide Biosecurity

Food Security and Bioterrorism Checklist - Food Safety and Terrorism

<http://www.cfsan.fda.gov/~dms/fsterr.html>

Food Security Guidance, Federal Register Notice of  
Availability (2002)

<http://www.cfsan.fda.gov/~lrd/fr020109.html>

Guidance for Industry - Food Producers, Processors, Transporters and Retailers: Food Security  
Preventive Measures Guidance

<http://www.cfsan.fda.gov/~dms/secguid.html>

Guidance for Industry - Importers and Filers: Food Security Preventive Measures Guidance

<http://www.cfsan.fda.gov/~dms/secguid2.html>

## Water

YES

NO

### **\*Is the best water quality reserved for post-harvest operations?**

It is important to use the best quality water for operations that involve direct water-to-fruit contact, and to use the lesser quality water where there is less direct contact or contact occurs prior to fruit set. At this time there is no evidence to suggest fruit can be contaminated internally prior to harvest due to foliar contamination, under California conditions. For this purpose, and the demonstrated potential for plants to internalize pathogens, field operations should be divided into “agricultural” and “post-harvest” operations. Post-harvest operations should use the highest water quality, due to its high water-to-produce contact. While no comprehensive microbial standards for agricultural or post-harvest water have been established, state regulations require that reclaimed sewage water used for irrigation does not exceed 2.2 total coliforms per 100 mL of water. Reclaimed water is water that has been recovered from the end of one process and is used for another – in this case, reclaimed sewage water is being used to irrigate growing crops after it has been treated. The scarcity of water in the west and the rising importance of water conservation has increased the reuse of wastewater for irrigation. In CA, over 260 million gallons of reclaimed water per day are used for noncrop and crop irrigation. “Reclaimed water”, also called recycled or recaptured water, means water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur. Recirculated water refers to water that is recovered within a cooling or packing operation and used for another part of the same operation. For example, the water from the rinse stage in a packing or processing plant is, typically, filtered and directed back to a hydrocooler or used directly for water in the dump tank and flume system. World Health Organization (WHO) guidelines specify less than 1000 fecal coliforms per 100 mL of water as acceptable. Although atypical in the U.S., there are cases where animals are used in the field as part of farm labor (oxen, horses, etc.). It is very important to exclude animal waste from crop or soil contact. This may mean attaching an implement to the animal to collect waste, or at least going through the field after the horse to ensure that waste isn’t left in the field. The grower should develop procedures that fit the field’s needs, keeping in mind that raw animal waste should never come into contact with edible produce.

Post-harvest operations involve frequent produce-to-water contact due to water-fluming, washing and rinsing, as well as other post-harvest operations. In addition to using potable water, the addition of antimicrobials to the water is strongly advised, to ensure that it is of the highest quality.



YES

NO

**\* Is contact minimized between irrigation water and the edible plant parts?**

Irrigation procedures that expose produce to contaminated water increase the risk of microbial contamination, especially if irrigation takes place close to harvest. In order to reduce this risk, it is important to minimize direct contact between irrigation water and produce within the period when survival of pathogens could be expected. This includes favoring drip or furrow irrigation over spray irrigation. If overhead irrigation must be used, it is recommended that the grower use water with less than 2.2 *E.coli* per 100 mL water. Using a low volume irrigation system may also help to limit the contact between water and produce, in addition to increasing water efficiency. Although field data is scant, avoiding overhead irrigation at least 5 days prior to harvest, under arid conditions, will greatly reduce residual pathogens on plant surfaces.



In the case of spray irrigation, it is very difficult to control the aerosol, and consequently the contamination, created by spraying. When using secondary, tertiary, recirculated, or reclaimed wastewater for pre-planting spray irrigation, it is recommended that the grower create a buffer zone around the area that is being sprayed in order to avoid contaminating crops in adjacent fields. The size of this buffer zone should be a function of the level of contamination of the water. The table below offers a guide for how great a buffer distance is recommended for the level of microbial contamination, described here as total *E.coli* (Most Probable Number)/100 mL water.

**Recommended Buffer Zone Distances for Pre-Plant Spray Irrigation with Secondary, Tertiary, Recirculated Water, and All Surface Water**

Total <i>E.coli</i> (MPN/100 mL Water)	Distance to Existing Crops (feet)
2.2	0
23	75
200	100
1000	150

For example, water that contains 200 total *E.coli* per 100 mL of water and is used for pre-planting spray irrigation should allow a buffer zone of about 100 feet, from where the water is applied to the soil to the nearest edible crop. If a grower uses water from these types of sources which has not been tested, the grower may use these recommendations as a guide.

Practices such as irrigating at night or when the facility is closed may help to control the risk to public health that agricultural water may present.

YES

NO

**Are wells constructed optimally for water protection?**

Major considerations for an optimally designed well:

a) Location, Location, Location!

Be sure that surrounding land or an elevating structure like a concrete pad encourages drainage away from the water source or well. It is also important to put as much distance as possible between the water source and potential contaminants: septic tanks, drain fields, chemical storage, gas tanks, manure piles, etc.

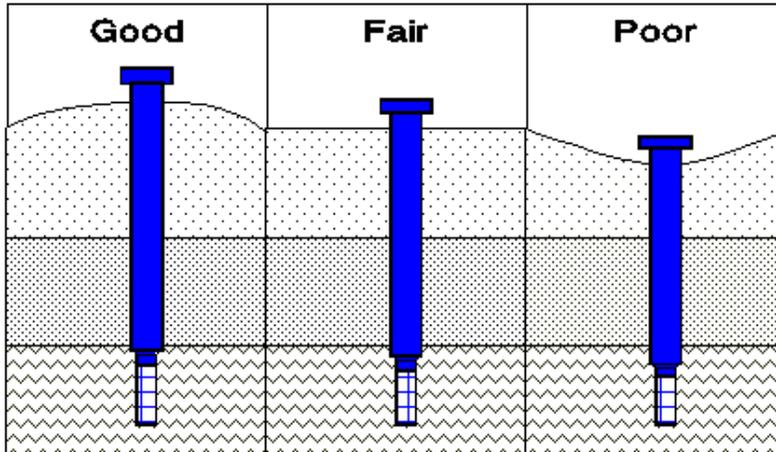
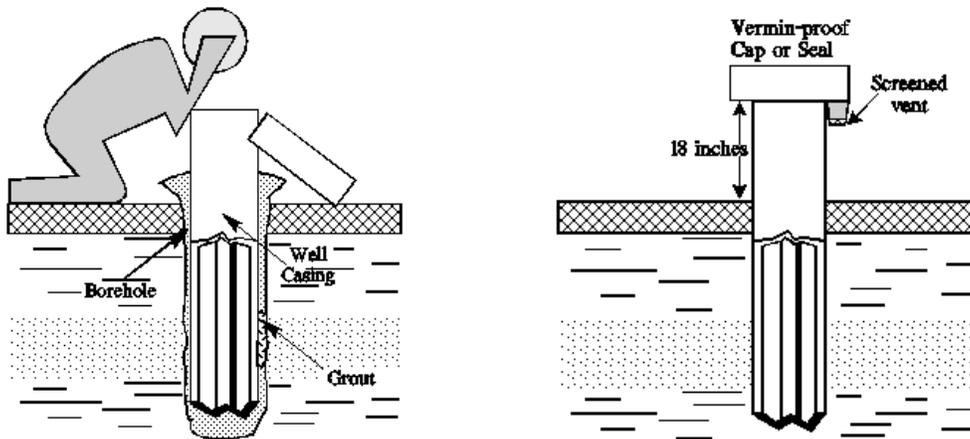


Diagram courtesy of R. L. Mahler and K. A. Loeffelman, Soil Science Division, University of Idaho, Moscow, Idaho 83844

b) Well Construction

The second hurdle to protecting your water is to keep the well sealed from contaminants that may be near the well. A well is constructed of a casing and a well cap. The casing is a pipe made of steel or plastic that gives firm structure to the hole dug for the well. The space between the casing and the soil around the hole should be sealed with grout as an extra layer between the well and possible contaminants. The well cap is a seal at the top of the well hole to keep contaminants out from the top. The well cap should fit firmly with screens over the vents. When inspecting the well, the sound of water running into the well is an indication of leaks in the well casing. The well casing should extend below the water levels and 1-2 feet above the surround land.



Diagrams courtesy of R. L. Mahler and K. A. Loeffelman, Soil Science Division, University of Idaho, Moscow, Idaho 83844

- ❖ [Risk assessment of irrigation practices](#)
- ❖ [California reclaimed water use](#)
- ❖ [California regional water quality control boards](#)
- ❖ [Municipal waste water reclamation survey](#)

YES

NO

### Is the water source protected from run-off and flooding?

Water sources for crop irrigation can be either surface water sources (lakes, ponds, rivers, streams, canals) or ground water. Typically, ground water is found in large underground rock formations called aquifers. In some areas, very high water tables bring water close to the root zone. Wells are drilled into aquifers to draw the water up to the surface for use. Both surface water and ground water may be influenced by point and non-point source contamination, particularly during storms. Prevention of water contamination is a top priority in even the most basic safety plan because once contaminated, water can be difficult to clean up.

Topological elements surrounding the water source such as slopes and depressions may lead to flooding or run-off from an adjacent field. This, in turn, may lead to the introduction of contamination from the adjacent field. Run-off structures, waterways, diversion berms and buffer areas may be able to divert run-off away from surface water sources or a well. Be sure that well casings extend more than 12 inches above the land surface, and that flood water does not reach the well. Observe the local rain patterns to determine its effect on run-off from adjacent farms or animal feeding operations to your water source.

YES

NO

### \* Is water source protected from animal contamination?

Animal production nearby may pose risks due to the high volume of animal waste or the possibility of animal grazing near the water source. The use of fences or gates may be able to keep animals out. Percolation into shallow ground water or inadequately-protected wells has been shown to be involved in outbreaks of *E. coli* O157:H7. The storage or application of non-composted manure may also contribute to microbial contamination of the water source.

Wild animals can pose the same contamination risks as domestic or farm animals. A large wild animal population may also necessitate fences or gates, or selection of an alternate water source during specific periods.

Recommendations for the distance between potential contaminants and a water source range from 30 to 400 feet. Growers should take the risks of the potential contaminant into consideration when deciding how far away a well should be situated from a potential source of contamination. Sources such as an animal feedlot or animal waste storage facility carry a very high risk, whereas the risk of a storage facility for treated compost is much lower. Wells should be located in an elevated area that is up-slope of potential sources of contamination.



YES

NO

### Is potable water used in dust-control operations?

Water sprayed onto dirt roads in order to control dust must be potable because of the difficulty in controlling the spread of contamination to the plants and field by aerosol. Crops, especially those that are close to the road or path being sprayed, may be especially susceptible to contamination from the water if it is not of high quality.

 YES NO

**\* Are wells maintained and repaired regularly?**

For underground water sources, it is important to maintain wells in good working order. This includes having well casings inspected regularly and repaired as needed. The well casing must extend to the water level in the well, and have a grout seal. Also consider the condition of older or shallow wells – they may be more easily influenced by surface water sources. They may have a thinner or corroded casing, as well as more likely to leak lubrication oils. Older wells tend to be situated at the center of a farm operation, surrounded by potential contaminants. A “sanitary well sleeve” may be installed to protect against flood contamination. Growers who rely on wells for their water source should have the well inspected annually by a water quality expert. Samples should be taken and sent to a qualified lab at least two weeks before risk-prone irrigation or post-harvest use. Good well maintenance includes preventing backflow into the well. Use anti-backflow devices when filling pesticide sprayer tanks, as well as on faucets with hose connections.

❖ [Collecting a water sample](#)

❖ [Shock chlorination of water sources](#)

 YES NO

**Are all unused wells properly shut down?**

Unused or wells inadequately maintained wells can provide a direct path for contaminants to enter ground water sources. Hire a licensed, registered well driller or pump installer to retire wells that are not being used

 YES NO

**Are devices in place to prevent back-siphonage in all water lines?**

It is important to ensure that there aren't any cross-connections between potable water sources and contaminated sources. This will prevent back-siphonage, which can cause contamination of one water source by another. However, if the lines must be connected, the grower should install valves, legal air gaps or other mechanisms that will prevent back-siphonage in the irrigation pipes and other water lines.

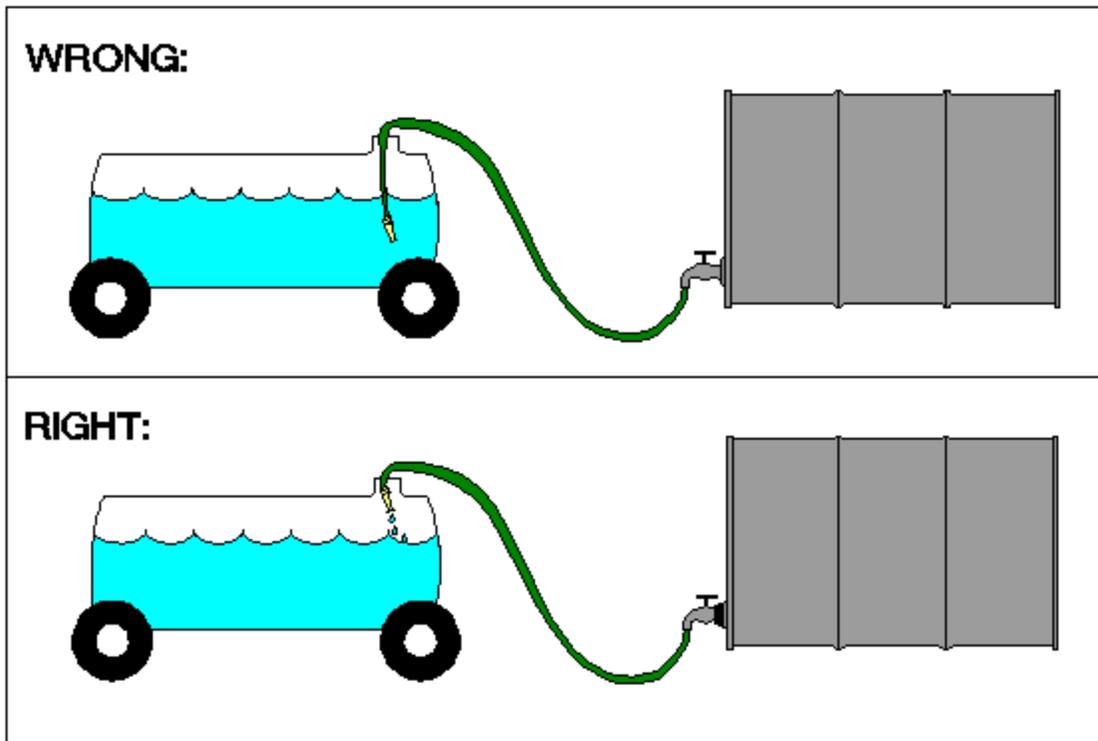


Diagram courtesy of R. L. Mahler and K. A. Loeffelman, Soil Science Division, University of Idaho, Moscow, Idaho 83844

YES

NO

**Is the water used to deliver chemicals and other amendments to plants of post-harvest quality?**

When water is used to deliver foliar treatments (e.g. pesticides, growth regulators, nutrients, etc.), it is important that the water be of post-harvest quality since the water may be coming into direct contact with the edible portion of the plant. This is an example of *preventing* microbial contamination instead of relying on clean-up measures. Using contaminated water directly on the fruit and hoping to remove contamination with the passage of time or washing procedures is not recommended. Pre-harvest contamination may compromise the product since washing procedures are generally inadequate for many commodities, or in the case that the microorganisms are taken up into the flesh.



YES

NO

**\* Is post-harvest water clean and sanitary?**

Post-harvest water must be clean and sanitary, so as not to contaminate the product. Water used in post-harvest operations has several uses, including transferring harvested product to field bins or trailers, gently floating easily-bruised product from the field bins (e.g. some apples), removing soil and debris, and removing initial field heat. The water quality must be reliably able to minimize cross-contamination and contribute to partial removal of microorganisms from the surface.

YES

NO

### Are standard operating procedures (SOPs) in place for changing water in post-harvest operations?

Water used in post-harvest operations must be changed as often as necessary for the particular operation. Water used in the first dump tank, for example, may need to be changed more frequently than the water used in the last washing step. Standard Operating Procedures (SOPs) should be adopted and include a schedule for changing water, monitoring quality, cleaning and sanitizing contact surfaces.

YES

NO

### \* Is the equipment used to maintain post-harvest water quality inspected and repaired regularly?

Equipment used to maintain the integrity of post-harvest water should be inspected regularly and repaired as needed. This may include chlorine injectors, filters, backflow devices, calibrated test kits or automated control systems.



YES

NO

### \* Is the dump tank water properly maintained?

Since dump tanks function, in part, to remove surface dirt, the water should be changed frequently and include the addition of an antimicrobial agent. Dump tanks are also frequently relied upon to provide initial cooling. These two functions of the dump tank are often conflicting because the removal of surface dirt adds turbidity and adds a significant number of microorganisms to the dump tank water.

Flume and dump tanks should use water that is slightly warmer than the produce (by 10°F), if possible. Research has shown that produce may take up water into the fruit if the water is cooler than the fruit temperature. This means that microorganisms that reside either on the surface of the fruit or in the wash water can be internalized, making subsequent wash and sanitizing treatments ineffective. This may be prevented by heating the water or air-cooling the produce before immersion - the important thing is that the water be slightly warmer than the produce. If neither of the procedures is practical for a grower's operation, good manufacturing practices may be able to compensate. This may include using a spray-washer instead of immersion, maintaining effective antimicrobial levels in the wash water, and making sure both the produce and the water are clean before the fruit is submerged.

YES

NO

### Are appropriate wash methods used for produce?

Washing may be carried out by submersion or spraying. Submersion is more likely to spread contamination directly, but spraying can spread microorganisms by direct contact or when an aerosol is created. As with submersion, these risks can be managed if the operator seeks to minimize aerosol in the case of spraying, and is vigilant about the quality of wash water. If brushes are used, be sure to clean and sanitize the brushes frequently. Microbial swabs can be used to verify cleaning procedures.



YES

NO

**Is the wash water used efficiently?**

Wash water may reduce microorganisms, but will not eliminate them from the produce surface. Usually a 10-200 fold reduction is attained with each wash. The operator may consider using a series of washes instead of just one wash to maximize efficiency. Washing efficiency increases with water quality; the operator should seek to maximize microbial reduction by monitoring the quality of the wash water.

YES

NO

**\* Are antimicrobials used properly in post-harvest water?**

It is important to remember that sanitized water is not sterile. The grower must also consider that the effectiveness of antimicrobials relies upon parameters such as pH, temperature and contact time. Chlorine is typically used at a concentration of 50-200 ppm of active chlorine at a pH of 6-7.5 and a minimum contact time of 1-2 minutes. If pH is not kept within this range, for example, the chlorine will be mostly in an inactive form. Read the manufacturers' directions for the most effective use of an antimicrobial, and be sure to use all chemicals in accordance with FDA and EPA rules. If the manufacturer or government standards are exceeded, the chemical may damage equipment or produce and harm workers or consumers. Be sure to check if the antimicrobial requires a clean-water rinse afterwards for safety and compliance.

Antimicrobial levels should be monitored to ensure effectiveness. Standard Operating Procedures (SOPs) should be developed to monitor antimicrobial levels, pH, temperature and other conditions that affect the antimicrobial.

Organic material and microbial load affect the performance of antimicrobials. The operator should consider a settling and filtering system or a system to manually remove extra plant material from post-harvest water.

YES

NO

**\* Is water reused counter to the production line?**

While reusing post-harvest water can be efficient, it also poses the risk of uncontrolled microbial load. Every time water is reused, another load of microorganisms and organic matter builds up in the water, increasing the risk of cross-contamination. If an operator chooses to reuse water, it is best to reuse the water counter to the production line. For example, the water used in the final rinse must be of the highest quality, while the water used to remove field soil from the product need not be as high of quality. Therefore, it is safer to move recaptured water from the final rinse to the dump tank, using a single, common return system. The systems responsible for recycling and re-circulating water should be EPA-approved.



YES

NO

**Are cooling temperatures maintained properly?**

Maintaining temperatures that are optimal for produce quality is a primary defense against microbial contamination. Produce kept at its highest quality is most resistant to microbial contamination and multiplication.

YES

NO

**Is cooling equipment maintained properly?**

Clean and inspect equipment regularly – breaches or leaks in cooling equipment can be a harboring site for microorganisms, such as *Listeria monocytogenes*. Be sure that possible sources of contamination are not located next to air intakes in the case of forced-air cooling operations.



YES

NO

**\* Is cooling medium maintained properly?**

Be sure the water used to cool the product is sanitary. Ensure that air filters and evaporator coils are properly cleaned and maintained. Antimicrobials should be used in the cooling water. Cooling water is a vulnerable spot for contamination because it is often made up of reused water and can be one of the first steps in the processing line. However, it is a better manufacturing practice to concentrate on precautions against contamination in the first place, and then supplement these procedures with testing if desired. Unless using a municipal source, cooling water should be tested frequently for disinfection. In some situations, hourly monitoring is advisable.

Use high quality water to make ice used for cooling. Antimicrobials should be used in the ice water. Unless using a municipal source, ice water should be tested frequently for disinfection.

YES

NO

**Have any adverse water testing results been acted upon?**

Any chemical or microbial water results that show that the water may be unsafe and/or unfit for its purpose should be treated under the guidance of an expert. It is also important to note that your supply may be free of *E. coli* at some times of the year and contaminated at others. This is why it is important for a grower to sample the water regularly and consistently if he or she is going to use the test results to make decisions about water use

- ❖ [Introduction to ORP \(Oxidation Reduction Potential\)](#)
- ❖ [Postharvest chlorination](#)
- ❖ [La Cloronización postcosechadel](#)
- ❖ [Inactivation of \*E. coli\*](#)

## Soil Amendments

 YES NO

### **Is the water used to deliver soil amendments sanitary?**

When water is the vehicle for distributing soil amendments to the field, it is important that the water be free of persistent pathogens. If the grower is using contaminated water for this purpose, contact with the pre-existing crops must be avoided.

 YES NO

### **\* Is only properly-composted or adequately-aged manure used on the fields?**

In the Code of Federal Regulations, the EPA defines “properly composted” manure (40 CFR 503.32) as the following:

- Manure must have attained temperatures of 131°F-149°F for at least three days
  - Manure must be turned at least 5 times
- OR
- Microbial tests at the final compost must yield *E. coli* levels less than 1,000 Most Probable Number (MPN)/gram compost and *Salmonella* levels less than 3 MPN/4 grams compost.

 YES NO

### **\* Is aged manure applied only prior to planting?**

Aged manure should not be applied within 60 days of harvest (EPA rule 503). It is advisable to apply manure after the final harvest of the year. This acts to maximize the time between compost application and harvest, and also can minimize erosion and nutrient loss. It is also advisable to mix the manure into the soil when it is applied, so that it won't be as likely to have direct contact with growing crops. Manure should never be applied to growing food crops.

 YES NO

### **\* Are only reputable compost suppliers used?**

Compost suppliers should comply with approved “aging” procedures. The grower should obtain documentation of this compliance, such as copies of the manure supplier's SOPs.

 YES NO

### **\* Are all compost applications documented?**

Each compost application should be documented with supplier information, including lot number. Growers should obtain a specification sheet from suppliers, which may include information on the sources of the compost material (e.g. percentage of vegetable material, animal manure, etc.), time:temperature treatments, number of turnings, clay:soil ratio, watering frequency, carbon dioxide concentrations, and ammonia concentrations.

YES NO**Are the supplier's records reviewed regularly?**

For composted material, supplier records (including temperature logs, microbial testing and turn frequency) should be reviewed periodically to ensure compliance with approved composting procedures.

 YES NO**\* Is compost stored in an appropriate manner?**

It is important to handle compost in a controlled manner so that it does not contaminate other fields, water supplies, harvested produce, etc. It is equally important that treated compost is not re-contaminated by untreated compost. Compost piles should be covered with a plastic tarp, and stored in a location that does not encourage run-off to other areas. Run-off from compost piles can be controlled with the use of physical barriers such as flood-gates, fences, diversion berms, etc. Treated compost should be stored away from untreated compost, and all compost should be stored away from fresh produce and packing operations.

 YES NO**Is the crop considered before manure application?**

Many manure application concerns are crop specific, so the grower should take the crop into consideration before applying manure. For example, growing leafy vegetables in a field adjacent to a manure application should be avoided. Leafy vegetables have a large surface area, which is difficult to clean after contamination has taken place. Manure should be applied to perennial crops only during the dormant or non-harvest season – this will take advantage of the long period of time between application and harvesting.

**Growers that operate their own composting operations:** YES NO**Are the proper minimum standards followed and permits obtained?**

- ❖ [Regulatory tiers](#)
- ❖ [Regulatory tier chart](#)

## Physical Location

 YES NO

### **Do topographical features (slopes, depressions, swales, etc.) exist near the field that might encourage run-off?**

Topographical features such as strong slopes can encourage contamination from adjacent fields and water sources by rain or flooding. If the ground slopes toward the crop, it may be necessary to develop or erect physical barriers like trenches or ditches.

 YES NO

### **\* Does the field have a well-documented land history?**

Do not plant in a field that does not have a well-documented land history. Begin site assessment with documentation of the land history. Record a physical description of the soil type in each field, the crop history and soil amendment history. Growers should make sure that their land has not been previously used for animal husbandry or biosolid disposal, or have soil tested for persistent pathogen populations. If the land has been used for animal husbandry, allow a buffer time of 3 years before using the field for edible crop cultivation, since most serious pathogenic microorganisms cannot survive in the soil for longer than this.

 YES NO

### **\* Do adjacent fields present microbial risks?**

The field should not be near animal feedlots or other points where the movement of animal waste (run-off, wind dispersal) off-site, by any means, will contaminate the field. The grower should obtain records of wind pattern and run-off seepage patterns for the possibility of movement from adjacent fields. Physical barriers such as fences, diversion berms or ditches should be erected to prevent run-off. If manure must be applied to nearby fields, it should be covered while stored, and applied on a schedule that does not interfere with the produce-growing schedule. Maintain these coverings, containers and barriers regularly.

YES

NO

**\* Is movement of animals controlled to prevent microbial contamination?**

The movement of animals in the growing field should be prohibited, and controlled in adjacent fields. Fecal contamination from animals carries the same risks as raw manure treatments in a field. Restrict animals from the field with physical barriers such as gates or fences. Although atypical in the U.S., there are cases where animals are used in the field as part of farm labor (oxen, horses, etc.). It is very important to exclude animal waste from crop or soil contact. This may mean attaching an implement to the animal to collect waste, or at least going through the field after the horse to ensure that waste isn't left in the field. The grower should develop procedures that fit the field's needs, keeping in mind that raw animal waste should never come into contact with edible produce.



YES

NO

**Does the area have a continual or periodic high bird population?**

Birds are an important consideration in pathogen concerns because of their ability to carry bacteria over large areas. Effective practical methods to prevent their activities have not been identified. At some level, bird movement in the field is minimized by effective insect control programs. Growers may also opt to include the use of reflective tape and/or random shotgun simulators.

## Personnel

YES

NO

### \* Are employees properly trained in personal hygiene and the prevention of microbial contamination of produce?

Workers should understand the consequences of poor sanitation for their own health and the potential for spreading foodborne illness to others. The grower should clearly outline sanitation policies. These policies should apply to anyone with direct contact with the produce, in addition to equipment operators, pest control operators and potential buyers. Personnel must understand that these policies exist for a reason and their implementation is essential to protect the reputation of their company and sustainability of their employment.

One helpful philosophy to adopt when training personnel is to assume that the trainer must demonstrate all procedures. In some cases, differences in cultures may lead a trainer to assume that workers are familiar with a particular procedure or how to carry out the procedure effectively. The trainer should demonstrate everything, from washing hands correctly, to the sanitation of outer garments. It is important to conduct training in a way that all employees can understand the information. This includes giving instructions in straightforward terms, and also providing bilingual instructions and visual tools if necessary.

While it is important to train all new employees on sanitation policies and practices, it is equally important to conduct routine “refresher” training for experienced workers. Personnel may have adopted habits that neglect the grower’s sanitation policies, and it is useful to schedule a time when they may be reminded of standard sanitation and hygiene policies, in addition to any new policies. Signs can be posted in work areas and restroom facilities that remind workers of sanitation policies. These signs should be in languages and graphics that can communicate to all workers.



YES

NO

### \* Do employees feel responsible for food safety?

It may be beneficial to the grower to train employees in how to identify possible food safety hazards, and to notify supervisors of these hazards. Not only does this provide an extra safety net for detecting hazards, but it also aids in demonstrating to the employees how important the grower’s sanitation procedures are and the reason for some of the practices that may seem insignificant to them. If personnel understand why these policies were instituted, they will be much more likely to feel personal responsibility to see that they are carried out. Recognition and reward for food safety performance has been a useful incentive for growers and shippers.

YES

NO

### Are training schedules, sanitation policies, and personal hygiene policies documented and accessible to employees?

It is important to document all Standard Operating Procedures, sanitation policies and personal hygiene policies, including training. They must be written and available to the employees in case they have questions or require clarification. Included in this written policy should be a copy of the grower’s medical leave and illness reporting policy. Workers who are ill may pose a greater risk to the safety of the produce: Therefore, it is to the grower’s benefit to have a policy for medical leave and reporting illness, and for personnel to be familiar with these policies.

YES

NO

**\* Are employees with illness and open wounds prohibited from handling produce?**

It is imperative that employees having direct contact with produce and produce-contact surfaces have a system for reporting illness and open wounds. People with vomiting or diarrhea symptoms, if known by the supervisor, should not handle food or any surface that comes into contact with food because it is very likely that they will contaminate the product. Similarly, open wounds are likely sites of contamination, and if they cannot be adequately covered with a waterproof covering, the worker should be transferred to duties that do not involve contact with produce or food contact surfaces.

YES

NO

**\* Are employees trained in proper hand-washing techniques?**

It is difficult to ensure that all workers wash their hands as often as necessary. It is even more difficult to make sure they are washing their hands properly. Hand-washing training and periodic refresher training can help ensure employees know how to properly wash their hands. Hand-washing should be done with warm running water with soap. Hands should be scrubbed with soap for at least 15 seconds, paying careful attention to areas that are difficult to clean such as around and under nails. Hands should be rinsed with warm running water and dried with single-use paper towels. Hand-washing should take place before starting work, after any absence from a work station, after blowing the nose or touching the face or hair, after restroom use, after breaks, after handling dirty or raw materials, after performing maintenance on equipment and after picking up objects from the floor.

YES

NO

**\* Are restrooms adequate and available to employees?**

It is important that the grower provide adequate and convenient restroom facilities to the workers. Personnel relieving themselves in the field is extremely hazardous to food safety, and having convenient restrooms will help to dissuade these practices. Convenient locations may include setting up latrines in the field. If harvesting takes place in constantly changing locations, the grower may elect to set up portable latrines in the areas of the field where harvesting is currently taking place, and move them as needed.



YES

NO

**Are head coverings and hair restraints used as necessary?**

Loose hair may contribute food safety hazards if it comes into contact with the produce during harvest. The grower may wish to institute policies that require the use of hairnets, headbands, caps, beard covers or other hair restraints in the packing environment. These policies are most appropriate in the packing shed and should be mandatory in a fresh-cut operation.

YES

NO

**Do employees wear clean garments every day?**

Workers should wear clean garments every day. Sweat, soil and other contaminants from the previous work day may pose a food safety hazard. The grower may provide clean outer garments such as aprons, especially in a packing shed. Outer garments sometimes come into contact with produce, so it is very important for these garments to be clean. These should be sanitized, along

with personal hand tools, according to standardized procedures. Outer garments should be stored outside toilet facilities while the worker is using them, and outside break rooms or lunchrooms while the employee is inside.

YES

NO

**\* If gloves are used, are they used appropriately?**

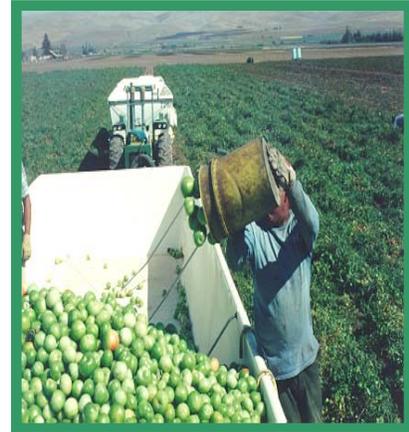
If gloves are used, it is important that as much attention is given to changing them and keeping them clean as would be given to keeping hands clean. Gloves can be as much a vehicle of contamination as dirty hands if they are not changed frequently. Gloves should be changed with the same schedule as washing hands: before starting work, after an absence from the work station, after blowing the nose or touching the face or hair, after restroom use, after breaks, after handling dirty raw materials, after performing maintenance on equipment and after picking up objects from the floor. Gloves should be made of waterproof material and kept clean and in good shape.

YES

NO

**\* Does the grower have hygiene policies in place for the fields?**

Activities such as eating and drinking should be prohibited in the field, both because of hygiene concerns and because extra food and drink in the field attract pests. Smoking in the field also should be forbidden. Personnel should not stand in bins during harvest because shoes and garments may spread contamination to the bins. Workers should not use fingernails to clean the produce. Fingernails often harbor bacteria and/or viruses, and using fingernails on produce may inoculate microorganisms into the produce flesh.



YES

NO

**Are field workers provided a separate area for breaks and meals?**

The issue of preparing and consuming foods in the field during harvest operations is a sensitive and difficult issue. Farm laborers deserve all due consideration for comfort, familial and cultural normalcy and morale. However, temporary storage of foods on harvest equipment, handling, preparation, and consumption of meats, seafood, eggs, dairy products, or other potential sources of human pathogens is not consistent with a comprehensive prevention program. Policies need to be formulated, with employee participation, to ensure proper hygiene in the field.

❖ [21CFR110.10 – General Provisions: Personnel](#)

❖ [Focus on hand hygiene](#)

❖ [Options for handwashing](#)

## Sanitary Facilities

YES

NO

**\* Is there 1 toilet facility for every 20 workers of each sex, or fraction thereof?**

The Code of Federal Regulations and Cal-OSHA stipulate that there must be 1 toilet facility and 1 hand-washing facility for every 20 workers of each sex, or any fraction of 20. For example, for 30 workers, the grower would be required to supply two toilet facilities. Urinals may be installed in rooms used only by men, but the number of toilets can not be less than 2/3 the minimum number.

In addition, Cal-OSHA states that where there are less than five employees, separate toilet rooms for each sex are not required.



YES

NO

**\* Is there 1 hand-washing facility with single-use towels for every 20 employees?**

Hand-washing facilities should exist in the same quantity as toilets. These stations must provide potable water, soap and single-use hand towels. The soap should be dispensed from a dispenser rather than a soap bar in order to prevent cross-contamination. Paper towels or a similar single-use-drying towel should be available from a dispenser for hand-drying.

The containers used to store and transport the water for hand washing should be emptied, cleaned, sanitized and refilled with clean water routinely. These containers should have a minimum capacity of 15 gallons of water.

If possible, there should be a mechanism for collecting and properly disposing of the dirty water from hand washing, rather than letting it fall on the ground.



YES

NO

**\* Do toilets lock from inside?**

The code also states that toilet rooms must be able to be locked from inside to ensure privacy.

YES

NO

**\* Is toilet paper held on a dispenser?**

Toilet paper must be held on a toilet paper holder or dispenser to keep it from being set on the floor or another place where it could become contaminated. Growers must install toilet paper dispensers in the restrooms.

YES

NO

**\* Are toilets easily accessible, and can employees use them whenever they need to?**

The placement of sanitary facilities is important both to employee access and in preventing field contamination. The toilet facilities should be within 1/4 mile from each workers' place in the field. These facilities should not be located near an irrigation water source, or in a location where heavy rains could cause sewage to run into the fields. The doors to a toilet facility should not open into a room or area where food is exposed, in order to avoid contamination.

It is imperative that the employees be able to use the toilet facilities whenever they need it, rather than only during breaks. This will decrease the likelihood of employees relieving themselves in or near the fields, which can lead to contamination of the food product.



YES

NO

**\* Are toilet facilities maintained in a clean condition?**

Toilet facilities must be maintained in a sanitary condition and cleaned as often as necessary, preferably daily. Personnel assigned to cleaning the bathroom facilities should wear goggles and other protective clothing to protect them from bathroom contamination. Below a recommended cleaning procedure is listed:

1. Unplug all electrical equipment.
2. Remove all supplies from the area that is to be cleaned.
3. Pick up all trash from the floor and take it to the dumpster.
4. Rinse toilets, urinals, sinks and floors to remove surface dirt.
5. Use a cleanser on surfaces such as toilets, sinks, floors and walls. Follow directions on the chemical label. DO NOT mix chemicals without first consulting the company.
6. Apply cleaner to the surfaces, including drains.
7. Rinse surface areas.
8. Apply sanitizer to surface areas.
9. Remove water by squeegee or other method.

It is important to clean the bathrooms with utensils that have been exclusively dedicated to this purpose – they should not be used for anything else. These tools should be washed and sanitized frequently.

YES

NO

**\* Is sewage disposed of properly?**

Raw sewage can contaminate fields and water source, in addition to everything else it comes into contact with, if not managed properly. Plumbing should be able to properly transport sewage and liquid waste away from the field and/or packing shed. It is imperative that the grower does everything necessary to give sewage transport trucks direct access to the facilities in order to properly dispose of sewage. Systems should be in place to prevent drainage of sewage into the field, and to protect crops in the event of a spill or leak. Growers should contact state septage coordinators for assistance in complying with state regulations for sewage disposal. Contact information is provided in the appendix.

YES

NO

**\* Are portable toilets handled appropriately?**

For some farms, it is not practical to set up the appropriate number of toilet facilities in each field when work is done in the fields at irregular intervals. Most growers elect to use portable toilet facilities so that they can be moved within the field to where the work is being done at that time. The grower must be careful to provide the proper tanks for holding sewage waste to avoid drainage into the field. The nature of these units also requires the grower to be meticulous about their transfer to other parts of the field. It is important that the units be removed from the field for sewage collection, cleaning and servicing by a qualified and reputable service. Conducting these activities in the field poses a microbial hazard due to the risk of a spill or leak.

YES NO**\* Is drinking water provided for employees?**

Drinking water must be provided for employees, and should be suitably cool and in sufficient amounts, taking into accounts the heat and humidity. Providing water for the personnel will help to dissuade the workers from bringing drinks into the field, packinghouse, or other place where the safety of produce could be compromised due to cross-contamination and the attraction of pests. Water should be dispensed either by fountains or in single-use drinking cups. A shared “dipper” or other common source must be prohibited.

 YES NO**Are the grower’s sanitation policies documented?**

Included in the grower’s policies should be a written description of the field sanitation facilities, including the number of bathrooms and the number of employees. The grower should document schedules for cleaning restrooms; stocking paper towels, toilet paper and drinking cups; cleaning and refilling water tanks for hand-washing and drinking; testing the water quality.

**Occupational Safety & Health Administration regulations:**

- ❖ [29CFR1910.141](#) – General Environmental Controls: Sanitation
- ❖ [29CFR1928.110](#) - General Environmental Controls: Field Sanitation

## Field Sanitation

YES

NO

### \* Are appropriate containers used?

Non-washable materials such as wood, burlap, and reused corrugated fiberboard can pose a food safety hazard because their porosity provides sites that harbor microorganisms. It is important to gradually replace these materials with ones that are washable, like plastic.

All containers should be made of non-toxic materials and free of loose materials such as nails, splinters, staples, etc. All bins and containers must be approved for use by the Food and Drug Association (FDA) or the United States Department of Agriculture (USDA). Recondition, repair or dispose of all damaged containers.



YES

NO

### Are containers inspected and replaced regularly?

Regardless of the material, it is important to implement an inspection policy of all containers and bins. This policy must be documented, along with documentation of the inspection schedule and evaluations. All bins and containers should be kept clean and in good shape.

YES

NO

### \* Are containers cleaned and sanitized according to a standard procedure?

Containers should be cleaned and sanitized regularly under a standard procedure:

1. Clean with a detergent
2. Rinse
3. Sanitize with a sodium hypochlorite solution, preferably with a high-pressure hose

Bins should be stored in the full sun when possible because rapid drying and ultra-violet (UV) light can help to kill pathogens. Standing in bins should be prohibited because the contamination on shoes is difficult to manage.



YES

NO

### Is farm equipment cleaned and sanitized routinely?

The grower should be conscientious of farm equipment because it is often neglected as a potential source of contamination. Consequently, the equipment does not get cleaned and sanitized as frequently as it should. A standard cleaning schedule should be followed and documented. This includes all large farm equipment, tables, baskets, packaging materials, buckets, brushes and personal hand tools. Always be sure to carefully clean and sanitize equipment before using on fresh produce, especially if the equipment was previously used for garbage, debris or manure. However, it is not recommended to share the same equipment between these chores.

Lubricants, especially from large farm equipment, can be a source of microbial contamination. Use lubricants that contain an antimicrobial such as sodium benzoate, especially if the lubricant is likely to come into contact with the fresh produce.

 YES NO

**Are storage facilities cleaned and sanitized regularly, kept free of pests?**

Clean and sanitize the harvest storage facilities before using. Be sure to inspect for rodents, birds and insects. These pests can pose a food safety hazard, and should be dealt with before the facility is used to store food. Growers and handlers should set traps or use a pest-control service.

❖ [29CFR1928.110](#) – General Environmental Controls: Field Sanitation

## Packing Shed Sanitation

 YES NO

### **Is the building designed to prevent cross-contamination?**

The overall design of the facility is important because this can help eliminate problems that lead to cross-contamination. The building should be designed so that the product flow is linear – unwashed produce should enter at one end of the shed and proceed in a straight line, emerging at the other end as a finished product. Finished and unfinished products should be kept separate, never coming into contact with the same surfaces or with each other.

Floors should be properly sloped to allow drainage. Floor drains should have removable covers or grates so that they can be cleaned and sanitized. Cracks or depressions in the floors should be repaired immediately to prevent accumulation of microorganisms and debris.

Drains and pipes should be corrosion-resistant, covered with plastic or concrete. Exposed pipes and drain lines should be low enough from the ceiling to allow for cleaning around them.

The maintenance area should be physically separated from the processing area. If repairs must be conducted on-line, the appropriate shields and coverings must be employed to contain contamination. The area should be cleaned and sanitized after on-line repairs are conducted.

Entrance and exits to the processing room should be kept to a minimum. Limiting access to this area will help to control the opportunities for microbial contamination.

 YES NO

### **Are bins and containers inspected regularly?**

It is important to develop a program to inspect bins and holding containers. Bins and containers made of materials like wood and corrugate should be inspected meticulously on a regular basis and replaced with washable ones as soon as possible.

 YES NO

### **Is this schedule documented?**

This program must be documented, including a schedule for inspecting the containers and replacing them as necessary.

 YES NO

### **\* Are bins and containers washed and sanitized regularly?**

Bins and containers are a risk to food safety because they may hold the food product for long periods of time, and they are often reused several times throughout the day. It is important to wash these bins and containers often, between every load if possible. They should be constructed of washable materials like plastic. Personnel should remove liners from containers before cleaning, and give special attention to cleaning the lids. Containers should be color-coded according to their function; those that hold finished products, soiled products or waste should never be exchanged.

 YES NO

### **\* Are packing shed personnel trained in minimizing microbial risk?**

As in all areas of the food safety chain, a grower's food safety plan has the greatest chance of success if employees are well informed, understand the goals, and feel personally invested in food safety precautions. Growers, operators and managers should make efforts to emphasize and explain food safety policies and practices, whenever the opportunity presents itself. Soliciting advice and feedback from personnel on how best to incorporate GAPs is an excellent tool for growers to tailor general recommendations to their operation. It is important that packing shed personnel be meticulous about personal hygiene. Hand-washing stations should be convenient and accessible to employees. Suitable shoes or rubber boots should be worn in the packing shed. It is recommended that these shoes be dedicated to work done in the packing shed. Shoes should be sanitized frequently, especially after being worn outside the packing shed.

YES

NO

**\* Is processing water clean and sanitary?**

Water used in the packing shed is considered processing water, and must be sanitary. Be sure to change water frequently or install a filter to remove large particles. Dirty wash water gradually renders a sanitizer ineffective. Do not rely on a sanitizer to "clean" water where there is visible dirt. When adding sanitizer, be sure to add the correct amount of it to the correct amount of water.



YES

NO

**\* Is food protected from contamination by the equipment?**

It is important to protect the food product from equipment contamination. All motors should be protected with catch pans, and should not be installed over product surface areas. Catch pans and drain tubes must be maintained properly with regular cleaning and repair. Solid forms of sanitizers may be placed in drip pans to control microbial growth.

YES

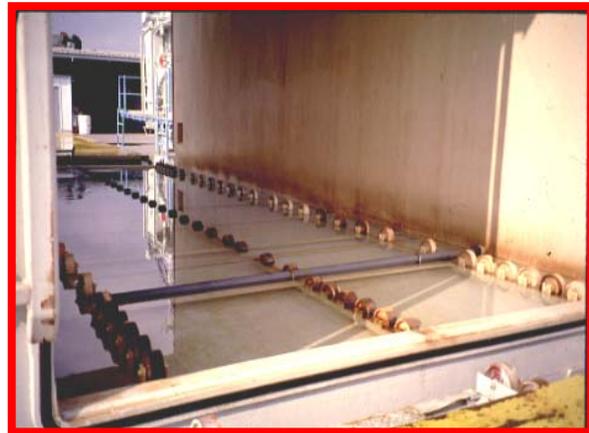
NO

**\* Is equipment designed to be easily cleaned?**

Conveyor guides, splash-guards and safety guards should be designed for easy cleaning. Conveyors must not have roll-under edges, creases, gaps or open seams. All welding work must be smooth and continuous to prevent the accumulation of debris. The equipment line should not have dead ends where product can accumulate. Tools and equipment should be designed so they are easily disassembled for cleaning and inspection. Equipment that is damaged, pitted, corroded or cracked should be repaired or replaced, since these defects can provide a hiding place for microbes. Equipment should be installed at least six inches off the floor to facilitate cleaning.

Pallets and bins should be kept smoothly-sanded, and should be maintained in a clean, dry state to prevent the growth of microorganisms. Liners should be removed before cleaning.

Personnel and supervisors should be aware of common bacteria-harboring sites: cracked hoses, hollow framework, poorly maintained filters, standing water, open bearings within pieces of equipment, porous conveyor belts, damp insulation, rubber seals around openings in the shed, light switches, roller guards and hollow rollers. These places should be maintained and/or repaired where appropriate.



YES

NO

**Are racks and forklifts inspected and cleaned regularly?**

Racks and forklifts may come into contact with food products, so it is important that these be included in the grower's food safety plan..

YES

NO

**Is the garbage kept covered?**

Open garbage piles will attract insects and rodents.

YES NO**Is there a space of at least 18 inches between racks or pallets and the wall?**

There must be sufficient space between equipment and the wall in order to be able to inspect for rodents tracks and droppings.

 YES NO**\* Is equipment cleaned and inspected according to a schedule and standard procedure?**

Packing shed equipment is at risk for accumulation of contaminants, especially in hard-to-reach areas. It is important to consider that any area where bacteria are able to establish themselves will become a contamination point for all the products and water that pass through it. This results in contamination of everything downstream of this point. Therefore, it is imperative to establish an effective sanitation program. This program should be documented, and include a sanitation schedule and specific cleaning instructions, including the types of cleansers used. Sanitation procedures should always follow a clean-rinse-sanitize sequence in order to be the most effective. Equipment and equipment parts must never be placed on the floor during cleaning.

Packing-line belts, conveyors and food contact surfaces should be washed, rinsed and sanitized at the end of each day in order to avoid microbial buildup. The movable parts should also be dismantled and the electrical components should be covered before cleaning. The removable parts of the wash tank conveyor should be also disassembled before cleaning. Connection points should be inspected and the flumes flushed. Whenever used equipment is introduced to the shed, it should be cleaned, rinsed and sanitized.

 YES NO**\* Is a sanitizing step always preceded by a cleanser step?**

Sanitizers are often inactivated by the presence of excessive organic material. Therefore, it is important to maximize the sanitizers effect by removing surface debris with a cleanser before attempting to sanitize the surface.

 YES NO**\* Are cleaning tools cleaned and sanitized regularly?**

The sanitation program should also specify how often cleaning brushes, tools and utensils should be cleaned and sanitized. Cleaning tools should be sanitized with a high concentration of sanitizer (600-1000 ppm chlorine or quaternary ammonium sanitizer) and should be stored dry.

 YES NO**\* Are cleaning tools kept separate according to their function?**

Utensils and equipment should not be interchanged between the incoming product area and the finished product area. This will help prevent re-contamination of the final product. Hand tools such as gloves and knives should be cleaned and sanitized at the end of every day before being stored.

 YES NO**Are food-grade lubricants used?**

In order to protect the produce from chemical contaminants, equipment lubricants should be food-grade. Avoid excessive lubrication of equipment, especially above the packing line. Lubricants can be harboring points for microorganisms. Use a food-grade lubricant that contains an antimicrobial, such as sodium benzoate.

YES

NO

**Are pests properly controlled according to a schedule and SOP?**

Pests should be excluded from the packing shed, including rodents, birds and insects. A pest-control program should be documented, including inspection schedules and reporting procedures. The packing shed should be closed to the outdoors as much as possible, with tightly-sealed doors and windows, fine mesh screens. Cracks and holes should be repaired promptly, including leaks in the roof.

YES

NO

**\* Is environmental sanitation carried out according to a documented schedule?**

Environmental sanitation refers to the cleaning plan for the general stationary environments: the rooms and their permanent fixtures. Environmental sanitation should be included in the master sanitation schedule and documented. Floors, walls, ceilings and drains should be included in the plan.

**❖ Packing shed schedule**

YES

NO

**\* Is environmental sanitation carried out according to a Standard Operating Procedure?**

Successful control of microorganisms requires consistent, thorough cleaning procedures. Daily cleaning of the packing area will help to minimize the risk of establishment of a microbial population:

- Dry clean by sweeping floors and wiping down equipment
- Pre-rinse the equipment
- Visually inspect the equipment surfaces
- Apply cleanser and/or foam, scrub equipment from top, downward – do not allow the detergent to dry on the equipment
- Never place equipment on the floor to clean it
- Rinse from top to bottom
- Visually inspect equipment surfaces
- Clean floors with appropriate cleanser
- Sanitize equipment and floors

Some operators have found the following sanitation procedure to be effective:

-Apply a high level of sanitizer (e.g. 800 ppm chlorine or quat). Allow to stand for 20 minutes, rinse.

-Apply a normal level of sanitizer (e.g. 200 ppm chlorine or quat). Rinse.

-At the end of the production week, the high level sanitizer can be left on until right before start-up at the next production day. This is rinsed off and a normal level is applied and rinsed off.

- Dry floors
- Clean and put away supplies

Some areas may not require daily cleaning.

Floors should be kept dry. In the event of a drain back-up, the packing area should be shut down, cleaned, rinsed and sanitized before starting up again. A high- pressure hose should never be used to clear the drain. This may create an aerosol and spread contamination throughout the room.

YES

NO

**Are samples for testing taken properly?**

If produce samples are taken to test for contamination, samples should be taken at random areas and should be representative of the processing area.

- Cross-contamination must be prevented when retrieving the samples. When contamination is introduced during sample collection, the results of the sampling are useless because we cannot attribute the contamination to a particular area. The person taking the sample should wear clean, sterile, disposable gloves and clean outer garments. Sterile utensils should be used, and the samples should be placed in a sterile container.
- The samples should be tested as soon as possible after sampling. Maintain the sample at refrigeration temperatures until testing. It is important that the sample and the microbial population in it remain as close to what was originally obtained as possible. Refrigerating the sample will help prevent the population from multiplying in the container.
- The number of samples tested should be in proportion to the amount of produce processed.
- 



YES

NO

**\* Are packaging materials stored in a sanitary manner?**

Packing materials must be stored and used in a sanitary manner. They must be stored in a dry area away from the processing room. Any of these materials should be removed from the processing room before the room is cleaned and sanitized. Non-disposable packing materials should be cleaned and sanitized according to a documented policy, including a cleaning schedule. It is important that all sanitation procedures follow a cleanser-rinse-sanitizer sequence. One should never be substituted for the other.

YES

NO

**\* Are cooling rooms and units cleaned and sanitized appropriately?**

Room coolers are especially susceptible to microbial accumulation because they are cleaned so infrequently. A sanitation program should be established and documented for cleaning of walls and ceiling of the cooling room, in addition to the cooling unit. Coolers should be emptied and cleaned, rinsed and sanitized once a month. Incorporating quaternary ammonia sanitizers in the sanitation procedure can help control *L. monocytogenes*, a major concern in a refrigerated environment. The cooling unit in the cooler should have a dehumidifying function to limit excessive moisture in the environment, and should be cleaned and sanitized regularly. Floors should be kept clean and dry.



YES

NO

**\* Are cooler temperatures properly maintained?**

Refrigerator temperatures should be maintained at or below 45°F.

YES

NO

**Is the outside property maintained in a clean condition?**

Maintaining sanitary conditions outside of the shed is important because it deters rodents from entering the building and limits the risk of contamination being brought in from outside the building. The exterior walls, grounds and landscaping should be included in a sanitation program, and the grower should maintain schedules and documentation of this program.

YES

NO

**\* Do conditions at the loading dock minimize microbial risk?**

The grower should remember that the first line of defense against microbial growth on produce is to keep the fruit at their optimum storage conditions. Time and temperature conditions must be closely managed during staging to help control the proliferation of microorganisms. Domestic animals should be controlled in this area with gates and other physical barriers.

Loading dock personnel should be especially conscientious when double-stacking pallets; pallets that have been placed on the floor and then stacked upon other pallets can introduce soil, chemicals and microorganisms to the produce below. The cartons that the produce are packaged in can provide some protection from risks at the loading dock, but these containers should not be the only line of defense.



YES

NO

**\* Are cross-contamination conditions minimized in the transport truck?**

Even at the product shipping stage, the grower still has some control over the food safety chain. Contamination on the inside of the truck can lead to contamination of the product. Growers should inquire as to the prior hauling uses of the truck, especially if the truck has been used to haul live animals or meat with vital fluids. The truck's interior should be carefully cleaned, rinsed and sanitized before hauling fresh produce if it has previously hauled animals. Mixed loads of different produce can also pose cross-contamination hazards; it is important to use dividers to control the contact between different commodities. The truck should be subjected to a documented sanitation program. The grower should ask the shipper how often the trailers are cleaned and what other items are hauled in the trucks. Be sure that the trucks are cleaned frequently, and are especially cleaned and sanitized after hauling animals.

❖ **[Controlling \*Listeria monocytogenes\*](#)**

**US Department of Food & Agriculture regulations:**

- ❖ **[21CFR110.20](#)** – Buildings & Facilities: Plants & Grounds
- ❖ **[21CFR110.35](#)** – Buildings & Facilities: Sanitary Operations
- ❖ **[21CFR110.40](#)** – Equipment: Equipment & Utensils
- ❖ **[21CFR110.80](#)** – Production & Process Controls: Processes & Controls



## Cleansers and Sanitizers

 YES NO

### **Are appropriate water temperatures used for cleaning and sanitizing?**

Be sure to use the water temperature suggested by the manufacturer on the label, keeping in mind the water quality at the shed. Hotter water is not always more effective, as in the case of hard water. At 177°F, maximum precipitation of hard water salts occurs, which can cause scale build-up when the salts are deposited on the equipment. Temperatures between 140-160°F are most effective for cleaning and safer for employees.

 YES NO

### **\* Is a surface cleanser always used before a sanitizer?**

Removal of surface debris with a cleanser must always precede the sanitizing step. Organic material gradually renders a sanitizer ineffective, so it is important to remove it first with a cleanser that is appropriate for the job.

 YES NO

### **Is there a method to test sanitizer concentration?**

Tools such as chlorine test strips or chemical test kits are available to test the concentration of the sanitizer. It is important that the sanitizer is used at the correct concentration so that it remains effective.

 YES NO

### **Are employees properly trained how to use chemical cleansers and sanitizers?**

The grower must ensure that cleaning and sanitizing procedures follow the manufacturer's instructions. Chemicals should never be mixed without consulting the manufacturer of the chemical.

Be sure that employees are properly trained how to handle cleaning chemicals, and know how to dispose of them properly. There are certain hazards associated with every type of cleanser and sanitizer. Most compounds are divided into two groups, acid and alkaline. The hazards associated with each are:

- Acid

Acids can be corrosive to the skin, eyes and mucous membranes. Vapors can especially cause damage to the respiratory tract.

- Alkaline

Bases are corrosive to the skin and may cause burns and scarring. Most bases react violently with water and will release heat and hazardous vapors and gases.

The grower must be sure that personnel understand:

- Where to apply the cleanser or sanitizer
- The procedure for application, including the use of personal protective equipment
- When to apply the agent and procedure
- Which agent and procedure to use
- Why the procedure must be done

A Material Safety Data Sheet (MSDS) should be kept in a designated spot so employees can easily access the information.

YES NO**Are all chemical hazards and risk areas clearly indicated?**

Chemical hazards should be indicated to employees by signs, pictures and/or labels in the chemical storage area, cabinet or other place that is effective.

 YES NO**Are chemicals safely stored?**

Cleaning chemicals should be stored away from a high traffic area and at moderate temperatures and humidity. The area should be kept locked, if possible. Chemicals should be stored on pallets or racks, not on the bare floor or shelf.

- ❖ [Sanitizer chart](#)
- ❖ [Sanitizer categories](#)

**Occupational Safety & Health Administration regulations:**

- ❖ [29CFR1910.141](#) – **General Environmental Controls: Sanitation**

## Documentation

YES

NO

**Are Standard Operating Procedures (SOPs), policies and schedules documented and kept where employees have access to them?**

**All documentation must have a place for verification by a supervisor.  
All records should be kept on file a minimum of 2 years.**

**SOPs and schedules should be available for cleaning and sanitizing:**

- |     |     |   |
|-----|-----|---|
| ___ | ___ | Ceilings, overhead lamps and pipes            |
| ___ | ___ | Drains  |
| ___ | ___ | Forklift                                      |
| ___ | ___ | Waste hopper                                  |
| ___ | ___ | Boxes, bins, etc.                             |
| ___ | ___ | Waxing equipment                              |
| ___ | ___ | Conveyors and belts                           |
| ___ | ___ | Cooling units                                 |
| ___ | ___ | Facility floors and walls                     |
| ___ | ___ | Wash tanks and immersion tanks                |
| ___ | ___ | Warehouse and other storage rooms             |
| ___ | ___ | Packing materials                             |
| ___ | ___ | Restrooms                                     |
| ___ | ___ | Water tanks for washing and drinking (refill) |
| ___ | ___ | Hand tools                                    |
| ___ | ___ | Farm equipment                                |

**SOPs and schedules should be available for the following tasks:**

- |     |     |  |
|-----|-----|--|
| ___ | ___ | Stocking paper towels, toilet paper, drinking cups     |
| ___ | ___ | Container inspection                                   |
| ___ | ___ | Testing water quality                                  |
| ___ | ___ | Changing postharvest water (dump tanks, cooling, etc.) |
| ___ | ___ | Sewage disposal  |
| ___ | ___ | Container inspection                                   |
| ___ | ___ | Pest control   |

**Schedules should be available for the following tasks:**

- |     |     |                                   |
|-----|-----|-----------------------------------|
| ___ | ___ | Review of manure-supplier records |
|-----|-----|-----------------------------------|

**Logs should be maintained for the following operations:**

- |     |     |   |
|-----|-----|---|
| ___ | ___ | Wash water (include disinfectant concentration, pH)   |
| ___ | ___ | Immersion wash (include disinfectant concentration, oxidation-reduction potential, pH, temperature) |
| ___ | ___ | Master sanitation schedule  |
| ___ | ___ | Daily pre-inspection log  |

**The following must be documented:**

- \_\_\_ \_\_\_ Manure application (supplier, lot number, composition)
- \_\_\_ \_\_\_ Land history (physical description of the soil, crop history, soil amendment history)
- \_\_\_ \_\_\_ Field and shed sanitation policies
- \_\_\_ \_\_\_ Personal hygiene policies
- \_\_\_ \_\_\_ Training schedule
- \_\_\_ \_\_\_ Medical leave and reporting policy

❖ [Master sanitation schedule](#)

❖ [Daily pre-inspection log](#)

## **Appendix**

### **Key “Good Agricultural Practices” Websites**

Cornell Good Agricultural Practices Project: <http://www.gaps.cornell.edu/>

FDA “Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables”:  
<http://vm.cfsan.fda.gov/~dms/prodguid.html>

International Association of Food Protection: <http://www.foodprotection.org>

University of California – Davis: Vegetable Research Information Center:  
<http://vric.ucdavis.edu/>

### **Other Websites**

#### **Federal**

2001 FDA Food Code: <http://vm.cfsan.fda.gov/~dms/fc01-toc.html>

Center for Disease Control and Prevention: <http://www.cdc.gov/>

Foodborne Illness statistics: [http://www.cdc.gov/epo/mmwr/mmwr\\_ss.html](http://www.cdc.gov/epo/mmwr/mmwr_ss.html)

Pathogens fact sheet: <http://www.cdc.gov/ncidod.diseases/diseases.htm>

Center for Food Safety and Applied Nutrition: <http://vm.cfsan.fda.gov/list.html>  
1997 Food Code  
The Bad Bug Book  
Produce and Import Initiative

Code of Federal Regulations (searchable): <http://www.access.gpo.gov/nara/cfr/>

Current Good Manufacturing Practices (GMPs) regulations 21 CFR 100-169:  
<http://cm.cfsan.fda.gov/~lrd/part110t.txt>

Copies also available from:  
Superintendent of Documents  
U.S. Government Printing Office  
Washington, D.C. 20402  
(202) 783-3238

Environmental Protection Agency: [www.epa.gov](http://www.epa.gov)  
Water quality issues  
Information on specific watersheds

FDA Juice HACCP Regulations (January 19, 2001):  
<http://www.foodsafety.gov/~dms/fs-toc.html#juice>

Federal Code of Regulations: <http://www.access.gpo.gov/nara/cfr/>

Food and Drug Administration: [www.fda.gov](http://www.fda.gov)

National Agriculture Library: <http://www.nal.usda.gov/>

USDA Food Safety and Inspection Service: <http://www.fsis.usda.gov/>

USDA/FDA Foodborne Illness Education Information Center:  
<http://www.nal.usda.gov/foodborne/index.html>

USDA National Organic Standards: <http://www.ams.usda.gov/nop>

Warning labels required on all untreated juices (September 8, 1998):  
<http://www.fda.gov/bbs/topics/NEWS/NEW00653.html>

## **State**

California Code of Regulations: <http://ccr.oal.ca.gov/>

California Department of Food and Agriculture: <http://www.cdffa.ca.gov/>  
Food safety issues: <http://www.cdffa.ca.gov/foodsafety>

California Department of Health Services: [www.dhs.cahwnet.gov](http://www.dhs.cahwnet.gov)

California Uniform Retail Food Facilities Law (CURFFL):  
[http://www.co.el-dorado.ca.us/emd/pdf/TFF\\_Flowchart.pdf](http://www.co.el-dorado.ca.us/emd/pdf/TFF_Flowchart.pdf)

## **Europe**

EUREPGAP: [http://www.eurep.org/sites/index\\_e.html](http://www.eurep.org/sites/index_e.html)

## **Academia**

Academic journal papers reference list: <http://www.cfsan.fda.gov/~comm/ift3refs.html>

Cornell Good Agricultural Practices Project: <http://www.gaps.cornell.edu/>

Food Safety Consortium at Iowa State University: <http://www.foodsafety.iastate.edu>

Iowa State University Extension Food Safety and Quality Homepage:  
<http://www.extension.iastate.edu/foodsafety/>

Kansas State University Food Safety Homepage  
<http://www.oznet.ksu.edu/foodsafety/>

North Carolina State University Food Safety Information Retrieval System  
<http://www.adec.edu/workshops/1998/aug04/whack/agentinf.htm>

Penn State Food Safety Homepage: <http://foodsafety.cas.psu.edu/>

University of California, Davis

Post-Harvest Technology Research and Information Center: <http://postharvest.ucdavis.edu/>

Center for Consumer Research: <http://ccr.ucdavis.edu/>

FoodSafe Program: <http://foodsafe.ucdavis.edu/homepage.html>

FoodSafe Resources Directory: <http://foodsafe.ucdavis.edu:591/barrett/dmbsearch.html>

Fruit and Nut Research Information Center: <http://fruitsandnuts.ucdavis.edu/>

Post-Harvest Outreach Program: <http://postharvest.ucdavis.edu/>

Vegetable Research Information Center: <http://vric.ucdavis.edu/>

University of Guelph's Food Safety Network: <http://www.foodsafetynetwork.ca/food.htm>

University of Nebraska Extension Publications on Food Safety and Nutrition:

<http://www.ianr.unl.edu/pubs/Foods/>

### **Food Industry, Trade/Professional Associations, etc.**

American Council on Science and Health: <http://www.acsh.org/food/index.html>

American Society of Microbiologists' Clean Hands Campaign: <http://www.washup.org>

Appropriate Technology Transfer for Rural Areas: <http://www.attra.org>

Canadian On Farm Food Safety Newsletter:

[http://www.cfa-fca.ca/english/programs\\_and\\_projects/coffsnews/feb02.htm](http://www.cfa-fca.ca/english/programs_and_projects/coffsnews/feb02.htm)

CAST publication "Foodborne Pathogens: Review of Recommendations:

<http://www.cast-science.org>

Center for Food Safety and Technology: <http://www.iit.edu/~ncfs/>

Center for Science in the Public Interest: <http://www.cspinet.org/foodsafety/index.html>

Consumers Union: <http://www.consumersunion.org/>

Dietary Managers Association, Food Protection Education Center:

<http://www.dmaonline.org/fppublic/index.html>

Fight BAC – And Education Campaign on Food Safety for Consumers: <http://www.fightbac.org>

<http://www.foodhaccp.com/>

Gateway to Government Food Safety Information: <http://www.foodsafety.gov/>

Hospitality Institute of Technology and Management:

<http://www.hi-tm.com/education.html>

Institute of Food Technologists: <http://www.ift.org>

International Association of Food Protection: <http://www.foodprotection.org>

International Food Information Council Foundation: <http://www.ific.org>

National Food Safety Database: <http://foodsafety.ifas.ufl.edu/>

Portable Sanitation Association International: <http://www.psai.org/>

## **Product information**

### **Bird repellents:**

Call your local garden supplier, or check on the internet:

Irri-tape from Pest Away Australia: <http://www.pestawayaustralia.com.au/irri-tape.html>

Orchard Valley Supply: <http://orchardvalleysupply.com/products/bird/1.html>

### **Horse manure bag:**

Search on internet for “manure bag”, “diaper” or “bun bag”.

[www.apolonia.net/GotchaCovered/bags2.html](http://www.apolonia.net/GotchaCovered/bags2.html)

[www.aaronmartin.com/600-700.html](http://www.aaronmartin.com/600-700.html)

[www.cyberhorse.net.au/stablemaid](http://www.cyberhorse.net.au/stablemaid)

[www.horsedriver.com](http://www.horsedriver.com)

### **Microbial swab or environmental testing materials and services:**

Search the internet under “microbial swabs” or “environmental testing”

Find services under “Laboratories – Analytical/Testing” in your yellow pages

### **Portable toilet vendors:**

<http://www.toilets.com/index.htm>

<http://www.stoneindustries.com/>

<http://www.readilite-barricade.com/>

### **Resource guide: Lab analysis**

This document provides a list of laboratories, their contact information and the type of analysis provided.

**USDA and Federal-State Inspection Service (FSIS) “Fresh Produce Audit Verification Program”:**

<http://www.ams.usda.gov/fv/fpbpilot2.htm>

## Publications

### California Strawberry Commission

“California Strawberry Commission Quality Assurance Manual”

Order at California Strawberry Commission

41 Hangar Way  
P.O. Box 269  
Watsonville, CA 94077-0269  
Phone: 408-724-2301  
Fax: 408-724-0660

### Cornell Good Agricultural Practices Program

“Food Safety Begins on the Farm – A Grower’s Guide”

607-254-5383 or email: [eab38@cornell.edu](mailto:eab38@cornell.edu)

### EPA

“Manual of Individual and Non-Public Water Supply Systems”

(EPA Publication # 570/9-91-004).

Order this or any EPA publication at [www.epa.gov/safewater/Pubs](http://www.epa.gov/safewater/Pubs) or from

U.S. EPA/NCEPI  
P.O. Box 42419  
Cincinnati, OH 45242-2419  
1-800/490-9198

### FDA

“Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables”, Food Safety Initiative Staff (HFS-32)/U.S. Food and Drug Administration /Center for Food safety and Applied Nutrition /200 C Street SW /Washington, DC 20204 or on the internet at

<http://vm.cfsan.fda.gov/~dms/prodguid.html>

Obtain copies of:

“Guidance for Industry: Reducing Microbial Food Safety Hazards for Sprouted Seeds”, October 27, 1999, Federal Register (Volume 64, Number 207)

and

“Guidance for Industry: Sampling and Microbial Testing of Spent Irrigation Water During Sprout Production”, October 27, 1999, Federal Register (Volume 64, Number 207)

at:

Center for Food Safety and Applied Nutrition  
Food and Drug Administration 200 C St. SW.,  
Washington, DC 20204  
(202) 205-4200  
<http://vm.cfsan.fda.gov/~lrd/hhsprout.html>

“Safer Processing of Sprouts” video

Developed in partnership with the California Department of Health Services, Food and Drug Branch. Purchase on-line for \$23.60 at

<http://www.foodsafety.gov/~dms/fs-toc.html#prod>

FDA Talk Paper “FDA Advises Consumers About Fresh Produce Safety”

<http://vm.cfsan.fda.gov/~lrd/tpproduc.html>

FDA Survey of Imported Fresh Produce (January 30, 2001)

<http://vm.cfsan.fda.gov/~dms/prodsur6.html>

FDA Bad Bug Book

<http://vm.cfsan.fda.gov/~mow/intro.html>

### **General Federal Government**

For copies of federal government regulations, (e.g. OSHA 3084: Chemical Hazard Communications Manual) go to:

<http://www.access.gpo.gov/nara/cfr>

or

Superintendent of Documents  
P.O. Box 371954  
Pittsburg, PA 15250-7954  
(202) 512-1800

International Fresh-Cut Produce Association

“Food Safety Guidelines for the Fresh-Cut Produce Industry”, by D. Zagory and W.C. Hurst (Eds.). Copies are available for purchase from:

International Fresh-Cut Produce Association  
1600 Duke Street Suite 440  
Alexandria, VA 22314  
Phone: 703-299-6282  
[www.fresh-cuts.org](http://www.fresh-cuts.org)

United Fresh Fruit and Vegetable Association (UFFVA)

“Food Safety Auditing Guidelines: Core Elements of Good Agricultural Practices for Fresh Fruits and Vegetables”

Available at:

[http://www.uffva.org/food\\_safety\\_docs.htm](http://www.uffva.org/food_safety_docs.htm)

or at please contact Anita Ragan

United Fresh Fruit & Vegetable Association  
727 North Washington Street  
Alexandria, VA 22314  
Phone: (703) 836-3410 ext. 114  
Fax: (703) 836-7745  
[aragan@uffva.org](mailto:aragan@uffva.org).

“Field Cored Lettuce: Best Practices” available at:

[http://www.uffva.org/news/fccb8\\_3a.pdf](http://www.uffva.org/news/fccb8_3a.pdf)

University of California – Davis

“Key Points of Control and Management of Microbial Food Safety”

A Series of Good Agricultural Practices brochures for:

Fresh market tomatoes  
Melons

Edible Landscape and Home Gardens  
Fresh-Consumed Horticulture Products

By Trevor V. Suslow, Extension Specialist and distributed by the Vegetable Research and Information Center. Requests should be directed to Kitty Schlosser at (530) 752-1748 or at [vric@vegmail.ucdavis.edu](mailto:vric@vegmail.ucdavis.edu)

Western Growers Association and the International Fresh-Cut Produce Association, in partnership with California Department of Health Services/Food and Drug Branch, California Department of Food and Agriculture, Arizona Department of Agriculture, USDA, and the U.S. Food and Drug Administration. To purchase (approximately \$25.00):

Western Growers Association  
17620 Fitch Street  
Irvine, CA 92614  
Phone: 714-863-1000

World Health Organization

“Surface Decontamination of Fruits and Vegetables Eaten Raw: A Review”, by L.R. Beuchat.  
Copies are available from:

World Health Organization Publications  
Distribution and Sales  
1211 Geneva 27  
Switzerland  
Fax: (+41 22) 791 48 57  
Email orders: [publications@who.ch](mailto:publications@who.ch)

## Contacts

California Integrated Waste Management Board  
1001 I Street  
P.O. Box 4026  
Sacramento, CA 95812-4025  
(916) 341-6000  
<http://www.ciwmb.ca.gov/>

Sewage disposal guidance:  
Regulatory Section  
Division of Water Quality  
State Water Resources Control Board  
P.O. Box 944213  
Sacramento, CA 94244-2130  
(916) 657-1056

Water Quality experts and Water Testing:

<http://foodsafe.ucdavis.edu/ResourceGuide>

or find them under “Laboratories-Analytical/Testing” in your yellow pages

Water shed information, local

<http://www.epa.gov/ebtpages/water.html>

## **“Food Safety Begins on the Farm: The National GAPs Program” State Collaborators**

### **ALASKA**

Meriam Karlsson, Ph.D.  
Associate Professor  
University of Alaska  
303 O'Neill Building  
PO Box 757200  
Fairbanks, AK 99775-7200  
Phone: 907-474-7005  
Fax: 907-474-1538  
E-mail: [ffmgk@uaf.edu](mailto:ffmgk@uaf.edu)

### **ARIZONA**

Ralph L. Price, Ph.D.  
University of Arizona  
Department of Nutritional Sciences  
Tucson, AZ 85721  
Phone: 520-621-1728  
Fax: 520-621-9446  
E-mail: [rprice@ag.arizona.edu](mailto:rprice@ag.arizona.edu)

Kai Umeda, M.S.  
University of Arizona Coop. Extension  
Maricopa County  
4341 E. Broadway  
Phoenix, AZ 85040  
Phone: 602-470-8086 x-314  
Fax: 602-470-8092  
Email: [kumeda@ag.arizona.edu](mailto:kumeda@ag.arizona.edu)

### **CALIFORNIA**

Trevor V. Suslow, Ph.D.  
Cooperative Extension Specialist  
Department of Vegetable Crops  
University of California  
One Shields Avenue  
Davis, CA 95616-8683  
Phone: 530- 754- 8313  
Fax 530- 752-4554  
E-mail: [tvsuslow@ucdavis.edu](mailto:tvsuslow@ucdavis.edu)

Linda J. Harris, Ph.D.  
Cooperative Extension Specialist  
University of California-Davis  
Department of Food Science &  
Technology  
One Shields Avenue  
Davis, CA 95616-8598  
Phone: 530-754-9485  
Fax: 530-752-4759  
E-mail: [ljharris@ucdavis.edu](mailto:ljharris@ucdavis.edu)

Shantana Goerge  
Mann Laboratory  
University of California  
One Shields Ave.  
Davis, CA 95616  
Phone: (530)752-4501  
E-mail: [Goerge@vegmail.ucdavis.edu](mailto:Goerge@vegmail.ucdavis.edu)

**COLORADO**

Patricia A. Kendall, Ph.D.  
Colorado State University  
Dept. of Food Science & Human Nutrition  
200 Gifford Building  
Ft. Collins, CO 80523  
Phone: 970-491-1945  
Fax: 970-491-7252  
E-mail: [Pkendall@lamar.colostate.edu](mailto:Pkendall@lamar.colostate.edu)

**FLORIDA**

Ronald Schmidt, Ph.D.  
University of Florida  
Dept. of Food Science & Human Nutrition  
P. O. Box 110370  
Gainesville, FL 32611  
Phone: 352-392-1991  
Fax: 352-846-1157  
E-mail: [rschmidt@GNV.IFAS.UFL.EDU](mailto:rschmidt@GNV.IFAS.UFL.EDU)

Suzanne D. Thornsby, Ph.D.  
Assistant Professor  
University of Florida/IFAS  
2199 South Rock Road  
Fort Pierce, FL 34945-3138  
Phone: 561-468-3922  
Fax: 561-468-5668  
E-mail: [thornsbs@mail.ifas.ufl.edu](mailto:thornsbs@mail.ifas.ufl.edu)

**GEORGIA**

William C. Hurst, Ph.D.  
University of Georgia  
301 Food Science Building  
Athens, GA 30602  
Phone: 706-542-0993  
Fax: 706-542-9066  
E-mail: [bhurst@uga.cc.uga.edu](mailto:bhurst@uga.cc.uga.edu)

Darbie M. Granberry, Ph.D.  
Rural Development Center  
P.O. Box 1209  
Tifton, GA 31793  
Phone: 229-386-3410  
Fax: 229-386-7374  
E-mail: [granber@arches.uga.edu](mailto:granber@arches.uga.edu)

**HAWAII**

Aurora S. Hodgson, Ph.D.  
University of Hawaii  
Dept. of Food Science & Human Nutrition  
1920 Edmondson Road  
Honolulu, HI 96822  
Phone: 808-956-6564  
Fax: 808-956-8663  
E-mail: [hodgsona@hawaii.edu](mailto:hodgsona@hawaii.edu)

**ILLINOIS**

Mosbah M Kushad, Ph.D.  
Associate Professor  
Dept. of Natural Resources and  
Environmental Science  
University of Illinois  
279 EMRL  
1201 W. Gregory Dr.  
Urbana, Illinois 61801  
Phone: 217-244-5691  
Fax: 217-333-8816  
E-mail: [kushad@uiuc.edu](mailto:kushad@uiuc.edu)

**INDIANA**

Richard H. Linton, Ph.D.  
Purdue University  
1160 Food Science Building  
West Lafayette, IN 47907  
Phone: 765-494-6481  
Fax: 494-7953  
E-mail: [linton@purdue.edu](mailto:linton@purdue.edu)

**KANSAS**

Fadi M. Aramouni, Ph.D.  
Kansas State University  
ASI Food Science Program  
139 Call Hall  
Manhattan, KS 66506  
Phone: 785-532-1668  
Fax: 785-532-3132  
E-mail: [aramouni@ksu.edu](mailto:aramouni@ksu.edu)

Tom B. Lindquist, Ph.D.  
Kansas State University  
Dept. of Animal Sciences & Industry  
Rm 222, Call Hall  
Manhattan, KS 66506  
Tele: (785) 532-1667  
Fax: (785) 532-3295  
E-mail: [Tlindqui@oz.oznet.ksu.edu](mailto:Tlindqui@oz.oznet.ksu.edu)

**LOUISIANA**

Carl E. Motesvocker, Ph.D.  
Associate Professor  
Dept. of Horticulture  
Louisiana State University Ag Center  
137 JC Miller Hall  
Baton Rouge, LA 70803  
Phone: 225-578-1036  
Fax: 225-578-1068  
E-mail: [cmots@lsu.edu](mailto:cmots@lsu.edu)

**MICHIGAN**

Les Bourquin, Ph.D.  
Michigan State University  
Dept. of Food Science & Human Nutrition  
139 G. M. Trout  
East Lansing, MI 48824-1323  
Phone: 517-353-9664  
Fax: 517-353-8963  
E-mail: [bourqui1@msu.edu](mailto:bourqui1@msu.edu)

**MINNESOTA**

Jill Mackenzie, M.S.  
Assistant Extension Horticulturalist-Fruit  
University of Minnesota  
Dept. Of Horticultural Science  
162 Alderman Hall  
1970 Folwell Avenue  
St. Paul, MN 55108-6007  
Phone: 612-624-3478  
Fax: 612-624-4941  
E-mail: [macke020@umn.edu](mailto:macke020@umn.edu)

Nigatu Tadesse, Ph.D.  
Assistant Professor/Extension Educator  
New Immigrant Farm Program  
University of Minnesota  
Rosemount Research and Outreach Ctr  
1605 160th Street W  
Rosemount, MN 55068-6099  
Phone: 651-423-2413  
Fax: 651-423-1491  
E-mail: [tades002@umn.edu](mailto:tades002@umn.edu)

**MISSOURI**

Douglas L. Holt, Ph.D.  
University of Missouri  
122 Eckles Hall  
Columbia, MO 65211  
Phone: 573-882-4114

**NEW JERSEY**

Richard W. VanVranken  
County Agricultural Agent  
Rutgers Cooperative Extension of Atlantic  
Co.  
6260 Old Harding Highway  
Mays Landing NJ 08330  
Phone: 609-625-0056  
Fax: 609-625-3646

Donald W. Schaffner, Ph.D.  
Specialist In Food Science  
Food Science, Room 107  
65 Dudley Rd.  
Rutgers University  
State University of New Jersey  
New Brunswick, NJ 08901  
Phone: 732-932-9611 ext.214  
Fax: 732-932-6776

Wesley L. Kline, Ph.D.  
Cooperative Extension Agent  
Rutgers Coop. Ext. of Cumberland Co.  
291 Morton Ave.  
Millville, NJ 08332  
Phone: 856-451-2800  
Fax: 856-451-4206  
E-mail: [wkline@aesop.rutgers.edu](mailto:wkline@aesop.rutgers.edu)

## NEW MEXICO

Nancy C. Flores, Ph.D.  
Food Technology Specialist  
New Mexico State University  
Dept. of Extension Home Economics  
PO Box 30003 MSC 3AE  
Las Cruces, NM 88003-8003  
Phone: 505-646-1179  
Fax: 505-646-1889  
E-mail: [naflores@nmsu.edu](mailto:naflores@nmsu.edu)

George W. Dickerson, Ph.D.  
Extension Horticulture Specialist  
Plant Sciences Department  
New Mexico State University  
9301 Indian School Rd., NE #112  
Albuquerque, NM 87112  
Phone: 505-275-2576  
Fax: 505-292-9815  
E-mail: [abqhort@nmsu.edu](mailto:abqhort@nmsu.edu)

## NEW YORK

Elizabeth A. Bihn, M.S.  
Cornell University  
Department of Food Science  
11 Stocking Hall  
Ithaca, NY 14853  
Phone: 607-254-5383  
Fax: 607-254-4868  
E-mail: [eab38@cornell.edu](mailto:eab38@cornell.edu)

Janet E. Hawkes, Ph.D.  
Cornell University  
Department of Education  
408 Kennedy  
Ithaca, NY 14853  
Phone: 607-255-8122  
E-mail: [jeh34@cornell.edu](mailto:jeh34@cornell.edu)

Robert B. Gravani, Ph.D.  
Cornell University  
Department of Food Science  
11 Stocking Hall Ithaca, NY 14853  
Phone: 607-255-3262  
E-mail: [rbg2@cornell.edu](mailto:rbg2@cornell.edu)

Daryle E. Foster, Ph.D.  
Cornell University  
Department of Education  
420 Kennedy  
Ithaca, NY 14853  
Phone: 607-255-9253  
E-mail: [def4@cornell.edu](mailto:def4@cornell.edu)

Marvin P. Pritts, Ph.D.  
Cornell University  
Department of Horticulture  
119 Plant Science  
Ithaca, NY 14853  
Phone: 607-255-1778  
E-mail: [mpp3@cornell.edu](mailto:mpp3@cornell.edu)

Anusuya Rangarajan, Ph.D.  
Cornell University  
Department of Horticulture  
121 Plant Science  
Ithaca, NY 14853  
Phone: 607-255-1780  
E-mail: [ar47@cornell.edu](mailto:ar47@cornell.edu)

Donna L. Scott, M.S.  
Cornell University  
Department of Food Science  
9 Stocking Hall  
Ithaca, NY 14853  
Phone: 607-255-7922  
Email: [dls9@cornell.edu](mailto:dls9@cornell.edu)

## **OHIO**

Mary A. Donnell, M.S.  
Commercial Hort./Ag. Economic Dev.  
Ohio State University Extension Center  
Ag. Business Enhancement Center  
440 E. Poe Road, Suite 201  
Bowling Green, OH 43402-1351  
Phone: 419-354-6916 ext. 17  
Fax: 419-354-6416  
E-mail: [donnell.8@osu.edu](mailto:donnell.8@osu.edu)

## **OREGON**

Alexandra Stone, Ph.D.  
Assistant Professor  
State Vegetable Production Specialist  
Oregon State University  
4017 ALS  
Corvallis, OR 97331  
Phone: 541-737-5461  
E-mail: [stonea@bcc.orst.edu](mailto:stonea@bcc.orst.edu)

## **PENNSYLVANIA**

Luke F. LaBorde, Ph.D.  
Assistant Professor  
Dept. of Food Science  
Penn State University  
Phone: 814-863-2298  
Fax: 814-863-6132  
Email: [lf15@psu.edu](mailto:lf15@psu.edu)  
Web: <http://foodsafety.cas.psu.edu/>

**SOUTH CAROLINA**

James W. Rushing, Ph.D.  
Clemson University  
Coastal Research and Education Center  
2865 Savannah Highway  
Charleston, SC 29414-5332  
Phone: 843-766-3761  
Fax: 843-571-4654  
E-mail: [jrshng@clemson.edu](mailto:jrshng@clemson.edu)

**TEXAS**

Al B. Wagner, Jr.  
Texas A&M University  
225 Horticulture Forestry Building  
College Station, TX 77843-2134  
Phone: 979-845-7023  
Fax: 979-845-8906  
E-mail: [a-wagner@tamu.edu](mailto:a-wagner@tamu.edu)

**VIRGINIA**

Joyce G. Latimer  
Extension Specialist,  
Greenhouse Crops  
Virginia Tech  
Dept of Horticulture  
301B Saunders Hall  
Blacksburg, VA 24061-0327  
Phone: 540-231-7906  
Fax: 540-231-3083  
E-mail: [jlatime@vt.edu](mailto:jlatime@vt.edu)

Rob Williams, Ph.D.  
Extension Food Safety Specialist  
Virginia Tech  
Dept. of Food Science & Technology  
Food Science and Technology Bldg.  
Blacksburg, VA 20461-0327  
Phone: 540-231-4106  
Fax: 540-231-9293

Merle Pierson, Ph.D.  
Virginia Polytechnic Institute Department  
of Food Science & Technology  
Blacksburg, VA 24061  
Phone: 540-231-8641  
Fax: 540-231-9293  
E-mail: [Piersonm@vt.edu](mailto:Piersonm@vt.edu)

Tony Bratcsh, Ph.D.  
Extension Vegetable Specialist  
Virginia Tech  
Dept of Horticulture  
306 Saunders Hall  
Blacksburg, VA 24061-0327  
Phone: 540-231-1432  
Fax: 540-231-3083

## **WISCONSIN**

Teryl R. Roper, Ph.D.  
Professor  
Dept. of Horticulture  
University of Wisconsin  
1575 Linden Drive  
Madison, WI 53706  
Phone: 680-262-9751  
Fax: 680-262-4743  
E-mail: [trroper@facstaff.wisc.edu](mailto:trroper@facstaff.wisc.edu)