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Ensuring good sanitation in the field, packing facility and throughout all phases of transportation can help reduce the potential for microbial contamination of fresh produce from the field to the consumer. An effective tracking system complements good agricultural and management practices intended to keep fresh fruits and vegetables safe for consumers.

Field Sanitation

Microbial Hazards

Pathogens can come into contact with fresh produce during preharvest and harvest activities through varied sources. These include soils, fertilizers, water, workers and harvesting equipment.

Control of Potential Hazards

General Harvest Considerations

- **Clean and sanitize harvest storage facilities before use.**



It is best to use only new, clean packing containers.

- **Eradicate and exclude pests, such as rodents, birds, and insects, from storage facilities.**
- **Discard damaged containers that can no longer be cleaned and sanitized.**
- **Clean containers or bins before each use.** Containers that are used to transport ready-to-eat produce should be routinely cleaned and sanitized before each use.
- **Ensure that field-packed produce is not contaminated in the packaging or cooling processes.** Contact with manure or biosolids, poor quality water, workers with poor hygiene and unclean packaging or packing boxes can greatly increase the risk of microbial contamination.
- **Remove dirt and mud from produce before it leaves the field.** If this is not practical or possible because of muddy fields, include an extra step at the packing shed to do so before sorting, grading and packing.



Reusing containers may introduce pathogens.

Equipment Maintenance

Field equipment, such as harvesting machinery, knives, containers, tables, baskets, packaging materials, brushes and buckets can be sources and vectors for pathogens. Consider the following guidelines to help minimize the risk of microorganisms spreading from equipment to fresh produce:

- **Use harvest and packing equipment only for handling fresh produce, and keep it clean.** If equipment is used to haul garbage, manure or other debris, it should not be used to haul fresh produce or come in contact with containers or pallets used for fresh produce without first being carefully cleaned and sanitized.
- **Keep harvest containers clean to prevent cross-contamination of fresh produce.** Containers used repeatedly during harvest should be cleaned after each load is delivered. If containers are stored outside, they should be cleaned and sanitized before hauling fresh produce.
- **Place one person in charge of equipment maintenance.** This person should track equipment use throughout the day, ensure that all is functioning properly, and that all is properly cleaned and sanitized when needed.

Packing Facility Sanitation

Microbial Hazards

Poor sanitation in packing operations can significantly increase the risk of contamination to fresh produce and the water used on produce. Pathogens can be found on floors, in drains and on all handling surfaces of sorting, grading and packing equipment. Packing operations should employ good sanitation practices as a standard operating procedure. A good sanitizing solution is a 1:10 solution of 5% chlorine bleach in water (1 gallon of bleach to 10 gallons of water).

Control of Potential Hazards

General Packing Considerations

■ Remove as much dirt and mud as practicable from fresh produce while in the field and outside the packing facilities. Protect fresh field-



Use only new containers for field packing produce.

packed produce from possible contamination from soil harboring manure or animal fecal material. For open packing facilities, be aware of potential contamination from airborne contaminants from nearby livestock or poultry areas, manure storage or treatment facilities.

- Repair or discard damaged containers that could harbor microbes.
- When in storage, protect new and used, cleaned packing containers from contamination.
- Clean and sanitize pallets, containers or bins before using to transport fresh produce.

Facility Maintenance

- Clean daily, and sanitize regularly all equipment that comes in contact with produce. This includes all sorting, grading, packing and processing equipment, in addition to knives, saws, blades, boots, gloves, smocks and aprons.
- Clean packing area at the end of each day.
- Maintain and inspect daily the cooling system and all cooling equipment.
- Clean product storage areas regularly to minimize free-floating dust and other airborne contaminants.

Pest Control

All animals, including mammals, birds, reptiles and insects, can be a potential source of contamination in produce environments because they

can harbor or be a vector for pathogens. Consider the following guidelines to help minimize pest problems in or around packing facilities:

- Establish a pest control system to reduce the risk of contamination.
- An established program should include regular and frequent inspections of affected and treated areas.
- Maintain your operation in good condition to minimize a pest habitat.

—Keep grass and weeds around the facility trimmed.

—Keep grounds around facility free of litter, waste and garbage.

—Remove old and inoperable equipment from facility grounds to eliminate areas that harbor rodents and insects.

—Clean daily to remove produce and product waste that attracts pests in and around the packing or storage facilities.

—Have in place and maintain good surface drainage to minimize a pest habitat.

—Regularly monitor and maintain facilities.

—Inspect for and minimize sources of food and water for pests.

—Remove pests that are either dead or trapped.

—Eliminate possible nesting and hiding places

for pests.

—Clean surfaces soiled by pests, such as birds or other wildlife.

- Exclude pests from enclosed buildings. Block holes in walls, doors, flooring, etc., and block vents. Consider using screens, traps and wind curtains.
- Keep a pest control log. Include inspection dates, inspection reports and control measures taken.

Transportation

Proper transport practices can help reduce the potential for microbial contamination. Transportation is an important part of the food chain, as it involves transport of fresh produce from the field to the cooler, packing facility, and on to distribution and wholesale terminal markets or retail centers.

Microbial Hazards

Cross-contamination from other food or non-food sources is the biggest concern when transporting fresh produce. There is potential for more exposure to contaminated surfaces during loading, unloading, storage and transportation operations.

Control of Potential Hazards

Sanitation conditions need to be evaluated wherever produce is transported and handled. Transporters should keep fresh produce separate from food and nonfood pathogen sources to help prevent contamination.

General Considerations

- Workers who load and unload produce should use good personal hygiene and sanitation practices.
- Produce buyers, inspectors, and other persons involved should also practice good hygiene, such as thoroughly washing hands prior to inspecting produce.

General Transport Considerations

Operators from all phases of the fresh produce transportation chain should help ensure that sanitation measures for vehicles and trailers are



Decaying and diseased produce should be disposed of properly to keep from attracting pests.







Dedicate a vehicle for delivering packed produce.

met. Some specifics to consider:

- Inspect vehicles and transport cartons for cleanliness and odors before loading produce.
- Keep vehicles clean and know prior load use.
- Maintain proper temperatures to ensure both the quality and safety of produce.
- Be sure transporters are aware of produce temperature requirements. Avoid those hauling mixed loads with incompatible refrigeration requirements.
- Use trucks and transport cartons that minimize damage to produce.
- Load produce to minimize physical damage, and maximize flow of cold air. These factors can help reduce the potential for contamination during transport.

Traceback

Traceback is the ability to track food items, including fresh produce, back to their source (growers, packers, etc.). A system to identify the source of fresh produce cannot prevent the occurrence of a microbiological hazard that may lead to an initial outbreak of foodborne disease. However, the ability to identify the source of a product through traceback can serve as an important complement to good agricultural and management practices intended to prevent the occurrence of food safety problems. Information gained from traceback in-

vestigation may also be useful in identifying and eliminating a hazardous pathway.

Overview of the Traceback Process

When an outbreak is identified, public health officials:

- Conduct scientific studies to determine common food items that were consumed during the period of infection for the pathogen.
- If a particular food product is identified and other contributing causes such as cross-contamination, ill food workers, etc., are ruled out, they:
- Obtain the following information about the suspected product from the establishment where the product was sold or processed:
 - Product type
 - Packaging
 - Labeling
 - Lot number
 - When the product was sold or processed
 - When the product was received
 - When the stock was rotated
 - Inventory
 - Handling and shipping procedures
- Records that reflect the entire shelf life of the implicated product are collected about suppliers and shipments to the establishment.
- Distribution data are analyzed using lot numbers to identify suspected shipments that fit the proper time frame.
- Distributor interviews, data collection and analysis for each level of distribution are repeated until the source of contaminated produce is determined.

Lot numbers and grower identifications are not always used or recorded on shipping records, so it is often difficult to pinpoint the cause of an outbreak. There can be wide variations in the reliability of the data obtained from such studies because records may be incomplete and interviews rely on people who may have imperfect memories.

Challenges of Implementing an Effective Program

- Fresh produce has a relatively short shelf life, so it is often gone before an outbreak is reported or investigated.
- Recycling of shipping crates and co-mingling with produce from other sources makes identification difficult.
- The source of contamination may no longer be present when investigators arrive on the scene, a field or packing facility, for example. This wide variability can result in false accusations that are often not fully rectified.

Advantages of an Effective Traceback System

- A specific area, as opposed to an entire commodity group, can be identified.
- The speed and accuracy of tracing implicated food items back to their source can be improved, minimizing the number of people affected in an outbreak.
- Tracing implicated food items may also help identify and develop new and better methods to prevent and minimize contamination.

Instituting Effective Traceback Systems

Traceback systems may be easier to implement for certain types of commodities and for larger operations that have more control of produce

from field to consumer. But this should not deter others from developing systems.

Current company procedures should be examined and systems developed to track individual containers from the farm, to the packer, distributor, and retailer in as much detail as possible. At a minimum, an effective traceback system should include documentation to indicate the source of a product and a mechanism (such as a bar code, stamp, sticker, tag, etc.) that can identify and follow the product from the farm to the consumer. Documentation should include date of harvest, farm identification and who handled the produce from grower to receiver.

Reference

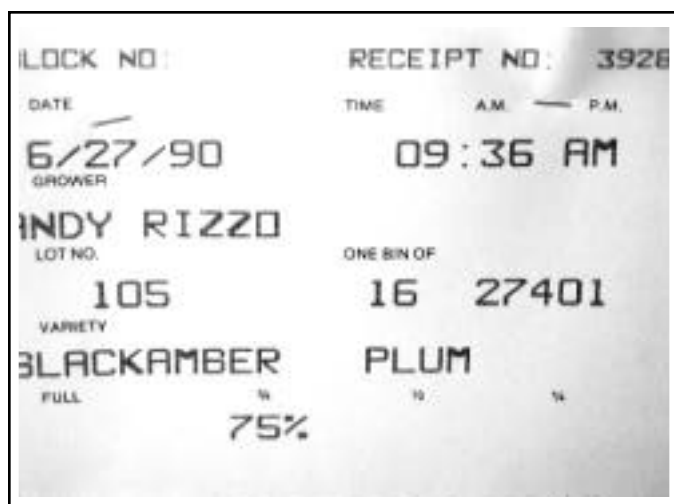
Guide to Minimize Microbial Food Safety Hazard for Fresh Fruits and Vegetables: U.S. Food and Drug Administration. Available on the Web at: <http://vm.cfsan.fda.gov/~dms/prodguid.html>.

How to obtain EPA regulations

U.S. EPA. Ambient Water Quality Criteria for Bacteria, EPA Office of Water Regulations and Standards, EPA 832-B-92-005, January 1986.

Obtain by contacting the U.S. EPA / NCEPI, P.O. Box 42419, Cincinnati, OH 45242-2419. Telephone: 1-800-490-9198; FAX (513) 489-8695. You must give the EPA catalog number for the publication.

Electronic versions of additional EPA documents, such as criteria and supporting documents, are available at: <http://vm.cfsan.fda.gov/~dms/prodguid.html>.



This is a typical label for a produce carton.



This material is partially funded through the Cooperative State
Research, Education and Extension Service of the U.S. Department
of Agriculture, Project Number 99-41563-0675.

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Kim Holt, *Minimizing Microbial Hazards for Fresh Fruits and Vegetables, Sanitation and Traceback*, Kansas State University, December
2000.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

MF-2482

December 2000

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