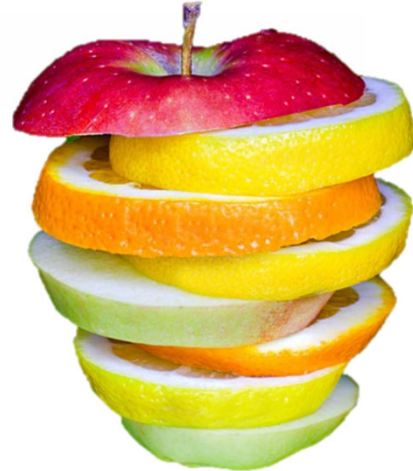


# Food Safety



Mark Ritenour

Indian River Research and Education Center,  
Fort Pierce

Jeff Brecht

Horticultural Science Department, Gainesville



1

## Food Quality vs. Food Safety



- **Food Quality** – Negotiable
  - Internal (i.e., Brix, acids, juice content, etc.)
  - External (blemishes, diseases & disorders)
  - If not perfect, can often still sell but at a lower price
- **Food Safety** – Not negotiable. All or nothing!
  - Everyone is entitled to a product that is safe to consume



2



## Why is Sanitation & Food Safety Important?

- Unsanitary conditions increase inoculum of decay causing organisms
  - Increased product loss to decay
- Unsanitary conditions promote contamination by human pathogens
  - e.g., *E. coli*, *Salmonella*, *Cyclospora*, etc.
- **Good Sanitation** practices improve **BOTH** food **Quality** and **Safety**



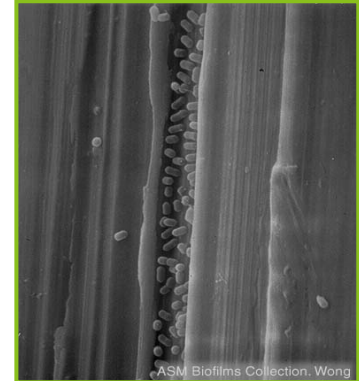
## Hazards

- Biological
- Chemical
- Physical
- Now also includes undeclared allergens



## Importance of Good Food Hygiene

- **Millions of microorganisms may be on the product surface**
  - Most are not harmful to people and will not cause fruit decay
- **Packinghouse procedures do not remove all microorganisms or chemicals**
  - Even if 99.99% is removed, hundreds will remain
- **Thus, minimizing contamination with human pathogens is still important!**



<http://www.asmsusa.org/edusrc/biofilms/hires/044h.jpg>

## Possible Sources of Microbiological Contamination

- **Animals** that have access to the field and produce-handling areas
  - Birds, insects, rodents, etc.
  - Animal feces - a main source for pathogenic organisms
- **Contaminated water**
- **Poor hygiene** of harvesters and field workers
- Contaminants from **nearby or previous loads** – e.g. frozen or chilled meats





## Possible Sources of Chemical & Physical Contamination

- Foreign materials or debris
  - Soil, metal, glass, wood fragments, etc.
- Agricultural chemicals, insecticides, fungicides, fertilizers
  - Also see maximum residue limits for the U.S. and important export markets
- Cleaning/sanitizing chemicals
- Misused food chemicals (preservatives, additives, etc.)



7



## Many Food Safety Requirements

- **Buyer Imposed Standards** – Food safety/hygiene standards imposed by various domestic and international buyers. Examples include:
  - GLOBALG.A.P.
  - Safe Quality Food
  - British Retail Consortium
  - Primus Global Food Safety Initiative (GFS)
  - USDA Harmonized Food Safety Standard for Field & Harvesting
  - Etc.
- **Federal Regulations** – Food Safety Modernization Act (FSMA)
  - Produce Safety Rule (PSA)
  - Preventive Controls Rule (FSPCA)



8

## FSMA Foundational Rules

Regulation	Proposal	Final (consent decree)
Preventive Controls (Human Food)*	Jan. 16, 2013	Sept. 17, 2015
Preventive Controls (Animal Food)*	Oct. 29, 2013	Sept. 17, 2015
Produce Safety*	Jan. 16, 2013	Nov. 27, 2015
Foreign Supplier Verification Program*	July 29, 2013	Nov. 27, 2015
Third Party Accreditation	July 29, 2013	Nov. 27, 2015
Sanitation Transport	Feb. 5, 2014	April 6, 2016
Intentional Adulteration	Dec. 24, 2013	May 27, 2016
Traceability (pending)	Sept. 2020	

\*Supplemental proposals published September 2014



9

## Produce Safety Rule Training Requirements

- At least one person at each company must complete training recognized as adequate by the Food and Drug Administration
- All:
  - Principle of Food Hygiene & Food Safety
  - The importance of health and personal hygiene
  - Training specific for their particular job responsibility
- Harvesters:
  - Recognize what produce must NOT be harvested
  - Inspecting harvest containers & equipment
  - Correcting problems



10

## Worker Health & Hygiene

- Reassignment of ill workers
- Personal cleanliness
- Avoid animal contact
- Hand washing
- Visitor policy



11

## Agricultural Water

- Untreated water that directly contacts the harvested produce preharvest:
  - Subpart E is currently being revised
  - **Until the revision is finalized, aspects of this rule are under enforcement discretion**
- Untreated water that directly contacts the harvested produce during harvest or postharvest:
  - no detectable *E. coli* in 100 mL



12



## Equipment, Tools, And Buildings

- Design must allow adequate cleaning and maintenance
- Storage should prevent contamination and harborage of pests
- Clean and sanitize as necessary
- Adequate drainage of discharge in and near buildings
- Restrooms & hand washing facilities



## Equipment, Tools, And Buildings

- Likely to contact covered produce:
  - Knives, implements, containers, bins, packing material, dump tanks, flumes and other equipment used for transport, harvesting, waxing, cooling, packing, etc.



## Harvest & Transport to the Packinghouse

- Do not harvest product that may have been contaminated
- Do not place product in contact with potentially contaminate equipment (bins, totes, etc.)
- Avoid bruises or cuts to fruits that may allow internal contamination



15

## Packinghouses

- Produce from **many** fields pass through packinghouses!
  - Any errors preharvest, can contaminate clean fruit at the packinghouse
  - Errors at the packinghouse are amplified



16



## Packinghouse Hazards

- Packing and storage facilities should always be maintained in a clean condition
  - Water sanitation
  - Equipment sanitation
  - Animal exclusion
  - Employee sanitation practices



## Packinghouses Operations

- Handle produce carefully to prevent wounds
- Remove injured product from the facilities
- Discard fruit that fall on the floor
- Remove cull fruit and debris promptly



## ■ ■ ■ Packinghouse Operations

- Keep dirty produce from the field separated from the clean, packed produce
  - When possible, remove dirt in the field
  - Wash dirty produce outside the packinghouse



19

## ■ ■ ■ Packinghouses Operations

- Keep dirty fruit from the field **separated** from the clean, packed fruit
- Start off with high-quality water (**no detectable E. coli**) & use an **approved sanitizer**



UNIVERSITY OF  
IDAHO  
IFAS

20

## ■ ■ ■ Packinghouses Operations

- Clean and sanitize packing areas, storage rooms, fruit bins, and equipment. Prime sites for pathogen growth are:
  - Areas that remain wet (brush/sponge rolls; floors)
  - Plant debris left on the line or packinghouse floor



21

## ■ ■ ■ Sanitation in the Packinghouse

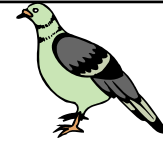
- Sanitize facilities & equipment regularly
  - More frequently (i.e., daily): Change dump tank water; packing line equipment (particularly areas that remain wet); floors; drains; breakrooms/bathrooms
  - Less frequently (i.e., monthly): Ripening, degreening, cold room - floors, walls, ceilings, refrigeration coils, doors, and curtains



22

## ■ ■ ■ Packinghouse Pest Control

- Maintain an effective animal & pest control program
  - Maintain **good records**
- No animals in packinghouse (domestic or otherwise)
- **Remove dead or trapped animals** (e.g., rats, birds, etc.) promptly
- Prepare cartons only as needed



UNIVERSITY OF  
FLORIDA  
IFAS

23

## ■ ■ ■ Temperature Management

- Low temperatures supplement good sanitation practices
  - Most human pathogens grow slowly or not at all below 45°F (7°C)
    - *Listeria monocytogenes* is a special concern in refrigerated environments
  - Low temperatures extend pathogen survival, but reduce proliferation



UNIVERSITY OF  
FLORIDA  
IFAS

24

## Traceback: proper labeling ensures that the crop can be tracked back to the grower



– This label on the packed crop links it back to harvest information on the field lug



25

## Transportation

- Watch for incompatibilities of previous or current mixed loads
  - Use separate shipping containers for animal products and produce
- Thoroughly clean, sanitize and rinse product environment
  - Shipping containers – incl. floor ducts and evaporator coils
  - Product loading and receiving areas
  - Prevent recontamination (e.g. from rodents, birds, etc.)

<http://imomus.com/dailyphoto161200.jpeg>

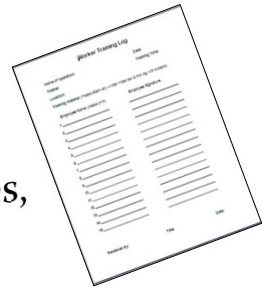


26

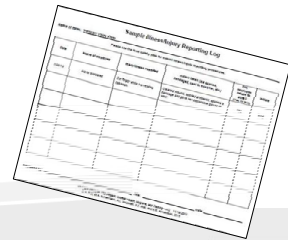


## Recordkeeping

- Recordkeeping includes documenting practices, monitoring, and corrective actions
- There are many templates available
- Recordkeeping should be **convenient**, or else it will not get done
- Records must be **signed and dated** after they are reviewed
- Keep all records for at least 2 years



A tilted form titled "Water Sampling Log". It includes fields for "Date", "Time", "Location", "Depth", "Temperature", "pH", "Dissolved Oxygen", "Salinity", "Turbidity", "Total Suspended Solids", "Total Phosphorus", "Total Nitrogen", "Ammonia Nitrogen", "Nitrate Nitrogen", "Nitrite Nitrogen", "Chlorophyll a", "Chlorophyll b", "Chlorophyll c", "Chlorophyll d", "Chlorophyll e", "Chlorophyll f", "Chlorophyll g", "Chlorophyll h", "Chlorophyll i", "Chlorophyll j", "Chlorophyll k", "Chlorophyll l", "Chlorophyll m", "Chlorophyll n", "Chlorophyll o", "Chlorophyll p", "Chlorophyll q", "Chlorophyll r", "Chlorophyll s", "Chlorophyll t", "Chlorophyll u", "Chlorophyll v", "Chlorophyll w", "Chlorophyll x", "Chlorophyll y", "Chlorophyll z".



A tilted form titled "Sample Receipt/Inventory Form". It includes fields for "Sample ID", "Date", "Time", "Location", "Depth", "Temperature", "pH", "Dissolved Oxygen", "Salinity", "Turbidity", "Total Suspended Solids", "Total Phosphorus", "Total Nitrogen", "Ammonia Nitrogen", "Nitrate Nitrogen", "Nitrite Nitrogen", "Chlorophyll a", "Chlorophyll b", "Chlorophyll c", "Chlorophyll d", "Chlorophyll e", "Chlorophyll f", "Chlorophyll g", "Chlorophyll h", "Chlorophyll i", "Chlorophyll j", "Chlorophyll k", "Chlorophyll l", "Chlorophyll m", "Chlorophyll n", "Chlorophyll o", "Chlorophyll p", "Chlorophyll q", "Chlorophyll r", "Chlorophyll s", "Chlorophyll t", "Chlorophyll u", "Chlorophyll v", "Chlorophyll w", "Chlorophyll x", "Chlorophyll y", "Chlorophyll z".