FOOD SAFETY
HANDLING OF FRESH & PROCESSED FOODS AT THE MARKET

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Food Science, Nutrition and Health Promotion

Mississippi Department of Agriculture & Commerce

Mississippi State Department of Health

Mississippi Fruit and Vegetable Growers Association
Introduction

• Each year 1 in 6 Americans (or 48 million people) get sick
  • 128,000 are hospitalized
  • 3,000 die of foodborne illnesses.

• Foodborne Illness
  • Disease transmitted to humans by the consumption of contaminated foods.

• Outbreak
  • When two or more people experience a similar illness after ingestion of a common food.
Pathogens and foods implicated in foodborne illness

Top 5 Pathogens

Foods

E. coli 0157:H7 – 4% of hospitalizations a year
Products sold at FM

1. Raw agricultural products
2. Prepared foods (cakes, cookies)
3. Processed foods (canned salsa, pickles, jellies).
Do you think people can get sick from buying fresh produce at FM?

While few pathogen outbreaks have been linked to farmers markets, most sources of foodborne illness are never identified, and small outbreaks often go unreported.

For instance, for every confirmed case of salmonellosis, at least 29 cases go unreported, according to federal estimates.
Farmers' market outbreaks

- In 2000, *Escherichia coli* O157:H7 linked to samples in Fort Collins, CO
  - 14 illnesses, two hospitalizations

- In 2010, *Salmonella* Newport linked to guacamole, salsa and uncooked tamales in east-central Iowa
  - 44 illnesses

- In 2011, *Escherichia coli* O157:H7 linked to strawberries sold at multiple farm stands and farmers' markets in Oregon
  - One death, 15 illnesses, and seven hospitalizations

Oregon Health Authority, 2011; Iowa Department of Public Health, 2010; Bridges, 2000
Note: Sprouts have been associated with many foodborne outbreaks
**Major Human Pathogens in Produce**

1. **Cyclospora**
   - contaminated water used for irrigation and pesticide application, poor worker hygiene
2. **Hepatitis A virus**
   - is transmitted by the fecal-oral route, which include consumption of contaminated food.
3. **Noroviruses**
   - Cause acute gastroenteritis in humans. Norovirus is transmitted by the fecal-oral route most commonly via contaminated water or contaminated foods by people.
4. **Salmonella**
   - is associated with animals including birds, reptiles, insects, cattle, humans.
5. **Shigella spp.**
   - Humans are a natural reservoir for *Shigella* spp.; transmission of the organism is by the fecal-oral route.
6. **E. coli O157:H7** and non O157:H7
   - associated with animals, animal manure
7. **Listeria monocytogenes**
   - is widespread in the environment (i.e., in soil, water, and decaying vegetation) and has been isolated from domestic animals, humans, raw produce, food processing environments. Specially trouble in RTE foods
8. **Clostridium botulinum**
   - Widespread in the environment (soil, water), very heat stable, **associated with many home canned foodborne outbreaks**
Contributing factors to foodborne illness

- Improper Holding Temperatures: 37%
- Poor Personal Hygiene: 19%
- Inadequate Cooking: 16%
- Contaminated Equipment: 11%
- Food From Unsafe Source: 11%
- Other: 6%

(Centers for Disease Control and Prevention)
Fresh Produce

Prevention from contamination

1. GAPs
2. GHPs
3. Farmers Market handling
Fresh Produce- Prevention from contamination

July 2009
Good Agricultural & Manufacturing Practices- what can we do?

1. Site and surroundings
2. Water
3. Animal intrusion (wild, pets)
4. Manure /compost
5. Pesticide handling / application
6. Worker health and hygiene
7. Field sanitation
8. Harvest
9. Post-harvest handling
10. Transportation
11. Documentation and traceability
Contaminated water sources used to irrigate and wash produce crops have been implicated in a large number of outbreaks (Hanning IB, Nutt JD, Ricke SC., 2009)
Washing as a means to disinfect fruit?

Z. Luksiene, E. Paskeviciute, 2012 (packaging)
What you cannot see can cause foodborne illness
Only 5 % Among Us Wash Hands Correctly

http://msutoday.msu.edu/news/2013/eww-only-5-percent-wash-hands-correctly/

- Did not wash hands: 15% men, 7% of women (after visit to restroom.

- Use soap: 50% men, 78% women

- Dirty sink: Less likely to wash hands

- Early day: washing more prevalent

- Signage increases % washing
Health & Hygiene (disinfectant w/o soap?)

- Personal and employee health
- Personal and employee hygiene
- Hand washing often
- Knowledge/training and Facilities

<table>
<thead>
<tr>
<th>Wash method</th>
<th>Reduction (log CFU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WW + soap</td>
<td>2.14</td>
</tr>
<tr>
<td>CW + soap</td>
<td>1.88</td>
</tr>
<tr>
<td>WW + antib soap</td>
<td>1.51</td>
</tr>
<tr>
<td>Antiseptic hand wipes</td>
<td>0.57</td>
</tr>
<tr>
<td>OH hand rubs</td>
<td>0.06</td>
</tr>
</tbody>
</table>
Cooling reduces microbial growth rate (Milk, eggs, others allowed)

www.fao.org

http://www.danmonitoring.com/case-studies/food-processing
“Risky” Raw F&V

- Leafy greens, green onions, herbs
- Cantaloupes
- Some berries
- Tomatoes
“Risky” F&V

• Sprouts - high risk

• Fresh-cut fruit

• Home canned vegetables, pickles, meats, fish…
AND...

Teas..
Must be on the GRAS list at:

http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=786bafc6f6343634fbf79fcdca7061e1&rgn=div5&view=text&node=21:3.0.1.1.13&idno=21
Low-risk vs. High risk

Low-risk:
- Baked goods without cream, custard, or meat fillings, such as breads, biscuits, cookies, pastries, and tortillas.
- Candy, Chocolate-covered nonperishable foods, such as pretzels, nuts, and dried fruit.
- Dried fruit, Dried pasta, Dried spices
- Dry baking mixes, Granola, cereal, & trail mixes, Dry rubs
- Fruit pies
- Standardized Jams, jellies, preserves
- Nut mixes and nut butters
- Popcorn
- Vinegar and mustard
- Waffle cones
- Acidified products* (salsa, pickles)

High risk:
- Foods NOT allowed (some) unless refrigerated/frozen:
  - meat, fish, poultry,
  - dairy products (incl. custard pies),
  - eggs (other than air-dried hard cooked eggs with intact shell),
  - cooked vegetables,
  - raw seed sprouts,
  - sliced melons/fruit, fruit juices
  - garlic and other fresh herbs in oil,
  - cooked potatoes, legumes, beans, and rice, pasta.
  - Low-acid canned foods (vegs, meats, seafood, w pH >4.6)
  - Smoked fish, vacuum packed
  - Pasteurized & precooked foods.
Raw or heated cow milk consumption: Risks and benefits

Claeys et al, 2013

Overview of the risks & benefits related to the consumption of raw/heat-treated milk.

<table>
<thead>
<tr>
<th></th>
<th>Raw milk</th>
<th>Heating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathogens</strong></td>
<td>Elevated risk, especially for Campylobacter jejuni &amp; E. coli</td>
<td>Pasteurization: Inactivation of vegetative pathogens, survival of bacterial spores, no reduced activity of bacterial toxins UHT: commercially sterile product, destruction of relevant bacterial toxin activity</td>
</tr>
<tr>
<td><strong>Nutritive value</strong></td>
<td>(Purported) benefits (or detrimental effects caused by heating) Important source of calcium, phosphor, essential amino acids (especially lysine), and the vitamins B₁ and B₂.</td>
<td>+</td>
</tr>
<tr>
<td><strong>Aminomicrobial systems</strong></td>
<td>Limited activity of most aminomicrobial enzymes at the refrigeration temperature used to store raw milk.</td>
<td>+</td>
</tr>
<tr>
<td><strong>Lactic acid bacteria</strong></td>
<td>Limited growth at refrigeration temperature used to store raw milk</td>
<td>–</td>
</tr>
<tr>
<td><strong>Probiotic bacteria</strong></td>
<td>Growth is too limited to have beneficial effects</td>
<td>n/a</td>
</tr>
<tr>
<td>“Beneficial” milk enzymes</td>
<td>“Beneficial” effect has not been found in literature</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Lactose destruction</strong></td>
<td>Lactose content of raw and pasteurized milk are similar</td>
<td>+</td>
</tr>
<tr>
<td><strong>Milk allergy &amp; lactose intolerance</strong></td>
<td>Presence of allergic components as well as of lactose (amount of lactic acid bacteria and their lactate production is very limited at storage temperature)</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Increased immunity</strong></td>
<td>Scientific evidence to support this claim is arguable (on the contrary, raw milk borne diseases have been reported)</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Diabetes, osteoporosis, arthritis</strong></td>
<td>Data in support are very limited to existent and controversial</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Organoleptic profile</strong></td>
<td>Perception factor: marketed whole milk is standardized and has generally a lower fat content than farm milk</td>
<td>+</td>
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</tbody>
</table>

Latest Raw Milk Outbreak Blamed on Minnesota Dairy Farm- 6 cases (Campylobacter) By Dan Flynn | June 26, 2013

Raw milk consumption spurs illnesses in East Tennessee- 8 children (E. coli 0157:H7) http://www.timesfreepress.com; 11/6/13
Acidified Canned Foods & Others

- Can be high-risk if not properly done
  - Formulation/recipe
  - Acidification process
  - Heating process
  - Records
  - Verify product equilibrium (final) pH and process
- Strongly encouraged to take course and be certified
- Follow recipe, acidification and process

- Others:
  - Raw milk is prohibited
  - May require license/permit
  - Refrigeration
  - Check w/ MSDH &/or MDAC

Keep records!!!!!
Some processed foods

- Preserves (jellies, jams…)
  - Standardized foods
    - (>65% SS), 21CFR150
    - 55 parts sugar/45 parts FJI
  - High acid, high solids
  - Low-sugar or artificially sweetened preserves
    - Fruit juice ingredient not less than 55% by wt. of finished food.
    - Preservatives <0.1% of final wt.
From Acidified to Low-Acid
### Other Foods that are regulated

http://www.mdac.state.ms.us/departments/ms_farmers_market/permit.htm

#### Muscle Foods
- **Meats**
  - MDAC
  - Processed in inspected/approved facility
  - Mechanical refrigeration
- **Seafood**
  - Have license/permit
  - MSDH/MDMR

#### Others
- **Milk**
  - MSDH/MDAC
  - Mechanical refrigeration
- **Eggs**
  - License from MDAC
  - Keep at <45F (Mechanical refrigeration)
- **Honey**
  - No permit if <500 gal
- **Bakery items**
  - Processed
  - Food permit if needed
Kitchen FS recommendations

- Water from approved sources
- Proper sewage
- Sanitary facility
- Adequate hand washing and dish washing
- Food supplies should be separate from home supplies
- Toxic items properly used and stored

- Minimize traffic to other rooms while cooking
- Food handler free of disease, follow hygienic practices
- No tobacco, gum, hair restraint, no jewelry
- Do not cook for home and for sale at same time
- No pets at anytime
- No evidence of pests/insects/rodents
Recommendations for the Kitchen

- Cool foods from 135°F to 70 °F in 2 hours and then to 41°F in a total of 6 hours.
- Hold hot food at 135°F or above
- Keep cold foods at 41°F or colder
- Provide all hot and cold holding units with thermometers
- Clean and sanitize surfaces, equipment and utensils
- Keep raw animal food separate from ready-to-eat foods
Handle Food properly & Keep records

CHECK YOUR STEPS: FOUR SIMPLE STEPS TO FOOD SAFETY

- **Step 1**: Clean
- **Step 2**: Separate
- **Step 3**: Cook
- **Step 4**: Chill

### Fridge/Freezer Temperature Record

<table>
<thead>
<tr>
<th>Date of check</th>
<th>Checked by (name)</th>
<th>Times</th>
<th>Cabinet temperatures °C</th>
<th>Action required</th>
<th>Action completed</th>
<th>Supervisor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
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</table>

- Monday
- Tuesday
- Wednesday
- Thursday
- Friday
- Saturday
- Sunday

*Standards and Rules have been established and must be met by all. For any questions, please contact Toronto Environmental Health Services.*

*Please ensure that all records are accurately completed and signed.*
At the market
Displaying food samples

- Only for taste, not for sale
- Covered
- Cold or hot as/if needed
- Toothpick to take

NO
Cottage Food Law- MS

msdh.ms.gov/msdhsite/_static/resources/5375.pdf

- Cottage Food products: specific foods that you make in the kitchen of your private home.
- They must be non-potentially hazardous foods that do not require time and/or temperature controls for safety.
- Must store Cottage Food Products in home following safe food handling guidelines as per FDA Retail Food Code
- ≤ $20,000 in gross annual sales
- No web/media ads, no selling in other states
Examples of foods approved for sale by a cottage food operation:

- Candy
- Dried fruit (except melons)
- Dried pasta
- Dried spices
- Dry baking mixes
- Granola, cereal, and trail mixes
- Dry rubs
- Fruit pies
- Nut mixes
- Popcorn
- Vinegar and mustard
- Waffle cones

- Baked goods without cream, custard, or meat fillings, such as breads, biscuits, cookies, pastries, and tortillas.
- Chocolate-covered nonperishable foods, such as pretzels, nuts, and dried fruit (except melons).
- Jams, jellies, and preserves that comply with the standards (21CFR150)
- Acidified Foods as long as they are prepared in a safe manner and you can prove this.
Examples of foods **NOT** allowed under the Cottage Food law

- Foods that require temperature control for safety
- Low-acid canned foods (vegetables, meats, eggs, seafood)
- Cooked vegetables & potatoes, legumes, beans, and rice, garlic and other fresh herbs in oil
- Dried melons
- Nut butters
- Fruit/vegetable juices
- Raw seed sprouts
- Cut-fruit, sliced melons
- Meat, fish, poultry, dairy products (including custard pies), eggs (other than air-dried hard cooked eggs with intact shell) (only of permitted)
- Smoked fish, pasteurized and pre-cooked foods
Label for Cottage Foods (CF) products

- Name
- Name and address of the operation
- Ingredients in descending order by weight
- Net weight or volume
- Allergen information - federal labeling requirements
- The statement: “Made in a cottage food operation that is not subject to Mississippi’s food safety regulations.” In 10-point type, color contrast with label background
- If nutritional claim is made - Nutrition facts

Made in a cottage food operation that is not subject to Mississippi’s food safety regulations

Chocolate Chip Cookies
Ashley Bryant
2550 Kingston Lane
York, PA 17702

Ingredients: Enriched flour (Wheat flour, niacin, reduced iron, thiamine, mononitrate, riboflavin and folic acid), butter (milk, salt), chocolate chips (sugar, chocolate liquor, cocoa butter, buttermilk), soy lecithin, walnuts, sugar, eggs, salt, artificial vanilla extract, baking soda.

Contains: Wheat, eggs, milk, soy, walnuts

Net Wt. 3 oz.

Nutrition Facts
Serving Size 1 Chocolate Chip Cookie (3g)
Amount Per Serving

Calories 570
Calories from Fat 250
%Daily Value*

Total Fat 26g 39%
Saturated Fat 16g 80%
Trans Fat 0g

Cholesterol 86mg 28%

Sodium 220mg 9%

Total Carbohydrate 94g 28%
Dietary Fiber 9g 0%

Sugar 62g

Protein 3g

Vitamin A 10%  Vitamin C 0%

Calcium 0%  Iron 4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs:

Calories 2,000 2,500

Total Fat Less than 65g 80g
Saturated Fat Less than 20g 25g

Cholesterol Less than 300mg 300mg
Sodium Less than 2,400mg 2,400mg

Total Carb 300g 375g
Dietary Fiber 25g 30g
Labeling Cottage Foods- MS

- Name of the CF product
- Name and address of the CF operation
- Ingredients of CF product
- Net weight or volume of CF product
- Allergen information
- Statement, “Made in
- Nutrition Facts (if needed)
Recommendations

• Practice safe growing of produce
• Harvest and transport under safe handling practices
• Sell under shade or as cool as possible
• Minimize touching (prepack, advice)
• Wash hands
• Discard if questionable
• No pre-cut, no samples
• Resale products: know source
• Seek advice
Other issues...

*Food Prep On-site –OPTIONS*

*(NOT Farmers Market Permit…)*

1- **“REGULAR”** mobile unit permit (contact county inspector, meet requirements)

2- **“TEMPORARY”** permit –pay/inspection every two weeks, by county inspector (contact county)
Out of State vendors

- MSDH will accept a PERMIT (not certificate) from TN Dept of health or ag.

- The vendor will have to:
  1) Get a permit from their regulatory agency, and
  2) Have the market manager contact rick hill (rick.hill@msdh.state.ms.us) or wayne honeycutt (dewayne.honeycutt@msdh.state.ms.us) and have them clarify our acceptance of neighboring states permits.
Contact

Contact your local Health department

http://msdh.ms.gov/msdhsite/_static/4,0,204.html

- John Luke- Director, Food Protection Division
- Queen Swayze: Central MS area: 601-576-7689
- Suzette Bass: Gulf Coast area: 228-575-4026
- Susan Bates: NE MS
- Brenda Clark: NW MS
Muchas Gracias!

- Dr. Anna Hood, Dr. Taejo Kim, MSU
- MDAC: Paige Manning, Susan Head, Kevin Riggin, Andy Prosser

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