MEGA Trends in Food Safety

Walmart
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VP – Food Safety

@frankyiannas
The History of Food Processing

• 2000 B.C. - Here, eat this food quickly before it spoils.
• 500 B.C. - That food spoils fast. Here, salt it.
• 1845 A.D. - That salt tastes bad. Here, place that food on ice.
• 1850 A.D. - That ice melts fast. Here, place that food in a refrigerator.
• 1864 A.D. - That food still spoils. Here, pasteurize it.
• 1980 A.D. - That pasteurized food doesn’t last long enough. Here, irradiate it.
• 1997 A.D. - That irradiated food is bad for you. Here, eat this “all natural fresh” stuff.
• 2000 A.D. - That “all natural fresh” stuff goes bad. Here, eat this food quickly before it spoils.
Are we WINNING the battle against foodborne disease?
Infectious Disease Mortality, U.S., 1900-1996

Source: Armstrong et al, JAMA 1999
Foodborne Pathogens 1900 - 1939

- Amoebiasis
- Botulism
- Brucellosis
- Cholera
- Hepatitis
- Salmonellosis
- Scarlet fever (streptococcus)
- Staphylococcal food poisoning
- Tapeworms
- Trichinosis
- Tuberculosis, bovine
- Typhoid fever

Source: CDC, US
Are we ‘currently’ winning?

### 2015 FOOD SAFETY REPORT
Measuring progress toward Healthy People 2020 goals

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Healthy People 2020 Target Rate*</th>
<th>2015 Rate</th>
<th>Change Compared with 2006-2008*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>8.5</td>
<td>12.97</td>
<td>9%</td>
</tr>
<tr>
<td>E. coli O157a</td>
<td>0.6</td>
<td>0.95</td>
<td>30%</td>
</tr>
<tr>
<td>Listeria</td>
<td>0.2</td>
<td>0.24</td>
<td>No change</td>
</tr>
<tr>
<td>Salmonella</td>
<td>11.4</td>
<td>15.89</td>
<td>No change</td>
</tr>
<tr>
<td>Vibrio</td>
<td>0.2</td>
<td>0.39</td>
<td>34%</td>
</tr>
<tr>
<td>Yersinia</td>
<td>0.3</td>
<td>0.29</td>
<td>No change</td>
</tr>
</tbody>
</table>

*Per 100,000 population
*Culture-confirmed infections per 100,000 population
*2006-2008 were the baseline years used to establish Healthy People 2020 targets
*Shiga toxin-producing Escherichia coli O157

For more information, visit [www.cdc.gov/foodnet](http://www.cdc.gov/foodnet)
“A problem well defined is half-solved.”

- Charles Kettering
Foodborne Disease Surveillance

PulseNet USA

The National Molecular Subtyping Network for Foodborne Disease Surveillance
In the News

Listeria deaths rise to 29 in cantaloupe outbreak

Caramel apples linked to fatal listeria outbreak

When ice cream kills

Another E. coli outbreak linked to flour in Canada
Estimate of Foodborne Disease per Year in the U.S.

- 48 million cases
- 128,000 hospitalizations
- 3,000 deaths
- 1 in 6 people annually

Source: Food Related Illness and Death in the U.S., CDC
PFGE, Credit Cards, & Google

COVER STORY: ANATOMY OF AN OUTBREAK: How salmonella sleuths solved a deadly mystery
By Moni Basu, Michele E. Shaw
The Atlanta Journal-Constitution
Sunday, March 15, 2009

Credit cards led investigators to source of E. coli outbreak
Published Mar 26, 2009

Online tools may have warned of listeriosis outbreak: study
Last Updated: Thursday, March 12, 2009 | 5:07 PM ET
Whole Genome Sequencing
Blue Bell announces a recall.
Click here for more information
“Food safety is not what it used to be.”

People infected with the outbreak strains of *Listeria monocytogenes*, by month of illness onset*
The Race

Detection

Prevention
Changing Food System
Today’s Supermarket
How We Shop is Changing

Percentage of U.S. Consumers Buying Groceries Online

- 2015: 8%
- 2016: 19%
- 2017: 31%
- Projected 2025: 70%

Grocery Basket

80% retail grocery
20% online grocery

By 2025, could reach $100 Billion annually

Source: The Digitally Engaged Consumer, FMI & Nielsen
Changing Food System

Caramel apples linked to fatal listeria outbreak

Today
Another Inconvenient Truth

WHAT IS FOOD WITH INTEGRITY?

FOOD WITH INTEGRITY IS OUR COMMITMENT TO FINDING THE VERY BEST INGREDIENTS RAISED WITH RESPECT FOR ANIMALS, THE ENVIRONMENT AND OUR FARMERS.

Pathogen Free

GLUTEN FREE
LACTOSE FREE
GMO FREE
EGG FREE
SUGAR FREE
PEANUT FREE

Clean Labels: Public Relations vs Public Health?
Globalization
SARS, Melamine, & Tiramisu

Country received melamine contaminated products

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS) World Health Organization

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Cocoa Powder - Switzerland
Roasted Espresso Beans - Columbia
Mascarpone Cheese and Ladyfingers - Italy
Vanilla Beans - Madagascar
Chocolate - Belgium
Kahlua - Mexico
Mint Leaf - United States
Cream - United States
32,970 Food Miles
Multi-State Foodborne Outbreaks in the U.S. 1988 - 2007

Source: CDC
Local ≠ Safer

World’s Largest E. coli Outbreak

3,950 cases
53 deaths
Social Media

Google

Twitter

Facebook
Food Safety Concerns @ The Speed of Light

'Pink Slime': Tips for Checking Your Beef

Groundswell
Mentions of ‘pink slime’ on Twitter by month:

Source: PeopleBrowsr
The Wall Street Journal
The Surveillance Pyramid

Population
Person becomes ill
Person seeks care
Specimen obtained
Lab tests for organism
Culture-confirmed case
Reported to health dept or CDC
Online tools may have warned of listeriosis outbreak: study

Source: Use of unstructured event-based reports for global infectious disease surveillance. Emerg Infect Dis 2009 May
Yelp helped NYC find unreported food borne illness: report
Challenges to the Food Safety

- Changing Food System
- Foodborne Surveillance
- Globalization
- Ingredients
- Social Media
- New Food Vehicles
- Food Fraud
The Way Forward?
Strengthening & Accelerating Prevention

- Response
- Prevention
- Detection
Trans-Pacific Flight
Miracle on the Hudson
What Firefighters Can Teach Us About Food Safety

Source: Joung, Hesketh, & Neal (2006)
Foodborne Outbreaks – How are we doing?

2006: E. coli
2007: Salmonella
2008: Listeria
2009: E. coli
2010: Salmonella
2011: E. coli
2012: Salmonella
2013: E. coli
2014: Salmonella
2015: Listeria
2016: E. coli

Salmonella
Salmonella
Salmonella
Salmonella
Salmonella
Salmonella
Salmonella
“Doing the same thing over and over again and expecting different results.”
- Albert Einstein
### Cantaloupes

<table>
<thead>
<tr>
<th>No.</th>
<th>Year</th>
<th>State(s)</th>
<th>Confirmed Illnesses</th>
<th>Pathogen</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>1985</td>
<td>Wisconsin</td>
<td>16</td>
<td><em>Campylobacter</em></td>
<td>Melon or cantaloupe</td>
</tr>
<tr>
<td>2.</td>
<td>1990</td>
<td>30 States</td>
<td>245</td>
<td><em>Salmonella</em></td>
<td>Cut cantaloupe at salad bars</td>
</tr>
<tr>
<td>3.</td>
<td>1991</td>
<td>International, including U.S.</td>
<td>400</td>
<td><em>Salmonella</em></td>
<td>Mexican cantaloupe</td>
</tr>
<tr>
<td>4.</td>
<td>1997</td>
<td>California</td>
<td>24</td>
<td><em>Salmonella</em></td>
<td>Mexican cantaloupe</td>
</tr>
<tr>
<td>5.</td>
<td>1998</td>
<td>Ontario, Canada</td>
<td>22</td>
<td><em>Salmonella</em></td>
<td>Cantaloupe</td>
</tr>
<tr>
<td>6.</td>
<td>1999</td>
<td>Iowa</td>
<td>61</td>
<td><em>Norovirus</em></td>
<td>Restaurant, cantaloupe or melon</td>
</tr>
<tr>
<td>7.</td>
<td>2000</td>
<td>California, Oregon, Colorado, Washington, New Mexico, Nevada</td>
<td>47</td>
<td><em>Salmonella</em></td>
<td>Mexican cantaloupe</td>
</tr>
<tr>
<td>8.</td>
<td>2001</td>
<td>California, Arizona, New York, Minnesota, Oregon, Washington, Hawaii, Georgia, Nevada</td>
<td>50</td>
<td><em>Salmonella</em></td>
<td>Viva Brand cantaloupe</td>
</tr>
<tr>
<td>10.</td>
<td>2003</td>
<td>New York, Ohio, New Mexico, Massachusetts, Connecticut, Missouri</td>
<td>58</td>
<td><em>Salmonella</em></td>
<td>Day care center and private homes, cantaloupe/honeydew melon</td>
</tr>
<tr>
<td>11.</td>
<td>2006</td>
<td>Multi-State and International</td>
<td>41</td>
<td><em>Salmonella</em></td>
<td>Cantaloupe cut at processing facility in Canada</td>
</tr>
<tr>
<td>12.</td>
<td>2007</td>
<td>California</td>
<td>11</td>
<td><em>Salmonella</em></td>
<td>Private home cantaloupe</td>
</tr>
<tr>
<td>13.</td>
<td>2008</td>
<td>15 States</td>
<td>53</td>
<td><em>Salmonella</em></td>
<td>Agropecuaria Mobilibano cantaloupe, from Honduras</td>
</tr>
<tr>
<td>14.</td>
<td>2008</td>
<td>California</td>
<td>23</td>
<td><em>Norovirus</em></td>
<td>Restaurant, melon and cantaloupe</td>
</tr>
<tr>
<td>15.</td>
<td>2011</td>
<td>11 States</td>
<td>20</td>
<td><em>Salmonella</em></td>
<td>Del Monte cantaloupe</td>
</tr>
<tr>
<td>16.</td>
<td>2011</td>
<td>28 States</td>
<td>147</td>
<td><em>Listeria</em></td>
<td>Jensen Farms cantaloupe</td>
</tr>
<tr>
<td>17.</td>
<td>2012</td>
<td>21 States</td>
<td>178</td>
<td><em>Salmonella</em></td>
<td>Indiana Farm cantaloupe</td>
</tr>
</tbody>
</table>
Learning from the Mistakes of Others

Hundreds sickened in U.S. from salmonella outbreak linked to raw chicken
A Case Study (2014)

- Consumers in U.S. shifting from beef to poultry
- Poultry-related outbreaks & recalls affecting consumer trust (CDC & USDA)
- Increased stakeholder interest & media scrutiny
- Purchase patterns changing (whole birds vs chicken parts)
- Contamination rebounds on chicken parts (26%)
- USDA (public) data used to create new Walmart poultry safety specifications
The Nationwide Microbiological Baseline Data Collection Program: Raw Chicken Parts Survey

January 2012–August 2012

<table>
<thead>
<tr>
<th>Pathogenic Organism</th>
<th>End of Production Line</th>
<th>End of Production Line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella(3)</td>
<td>2,496</td>
<td>657 (3)</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>2,496</td>
<td>534 (4)</td>
</tr>
</tbody>
</table>

26.32%  
21.39%

Table 2. Distribution of Quantified Salmonella Samples in the RCPBS

<table>
<thead>
<tr>
<th>Range, MPN/ml</th>
<th>Number of Samples(1)</th>
<th>Percent of Total</th>
<th>Cumulative Number</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0.030</td>
<td>201</td>
<td>30.6%</td>
<td>201</td>
<td>30.6%</td>
</tr>
<tr>
<td>0.030 - 0.30</td>
<td>316</td>
<td>48.1%</td>
<td>517</td>
<td>78.7%</td>
</tr>
<tr>
<td>0.301 - 3.00</td>
<td>102</td>
<td>15.5%</td>
<td>619</td>
<td>94.2%</td>
</tr>
<tr>
<td>3.01 - 30.00</td>
<td>38</td>
<td>5.8%</td>
<td>657</td>
<td>100.0%</td>
</tr>
<tr>
<td>&gt; 30.01</td>
<td>0</td>
<td>0.0%</td>
<td>657</td>
<td>100.0%</td>
</tr>
<tr>
<td>Total</td>
<td>657</td>
<td>100.0%</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

LOD < 0.030 MPN/ml
(1) Only positive samples are included regardless if under LOD
Poultry Safety Initiative
Consultation, Collaboration, & Stakeholder Summit

The University of Georgia
Chicken Supply Chain

Cobb-Vantress (a Tyson subsidiary) provides grandparent and parent breeding stock.

Pullet Farm: Pullets (parents) grown to 20 weeks.

Breeder Farm: Pullets begin laying eggs at 26 weeks.

Hatchery: Eggs are in hatchery for 21 days.

Broiler Farm: Broilers reach market weight in about 46 days.

Processing / Further-Processing Plant.

Distribution.

Feed Mill produces scientifically formulated feed for pullets and broilers.

Source: Cobb-Vantress
Poultry Safety Initiative

• **Primary Breeder Stock**
  • Reduce vertical transmission of Salmonella to broiler flocks
  • National Poultry Improvement Plan (USDA)

• **Bio Control Measures**
  • Vaccinations of Broiler/Breeder Flocks
  • Disease Prevention Best Practices

• **Whole Chicken Process Control**
  • Regulatory Approved Intervention(s) to achieve $4 \log_{10}$ reduction of *Salmonella* spp

• **Chicken Parts Intervention**
  • Approved Intervention(s) to achieve $1 \log_{10}$ reduction of *Salmonella* spp
% Chicken Parts Positive for Salmonella

Chicken Parts National Average, 2012

New USDA Performance Standard, 2016

Oct 14  |  Aug 15  |  Jan 16  |  Mar-16  |  Jun-16
---     |  ---     |  ---     |  ---     |  ---
17%     |  12%     |  5%      |  11%     |  2%

All Walmart Suppliers (Avg.)
Enumeration of Salmonella
Chicken Parts (MPN/g)

- <0.03
- 0.03 - <0.3
- 0.3 - <3.0
- 3.0 - <30

Walmart Data
USDA Baseline Study 2012
Call to Action

1. Adopt a Systems Thinking Mindset
2. Assemble a multi-disciplinary Investigation Team
3. Include Product & Process Experts
4. Look for Contributing Factors – Not Just the Agent & Food Vehicle
5. Question Processes & Assumptions
6. Make Investigation Reports Actionable
7. Disseminate Findings
Rhyming Helps Us Remember & Believe

Rhyming Mnemonics

- A form of word association where you rhyme a word you want to learn with a word you already know.

- EX: Columbus sailed the ocean BLUE in fourteen hundred ninety-TWO

(This teaches the students the date that Christopher Columbus discovered America)

Food Safety Rap
Providing safe and affordable food, so people can live better.