Food Safety & The Way Forward: High Tech or High Touch?

Natalie Dyenson
Sr. Director, Int’l Food Safety
Walmart
“A safer future food system is not a matter of chance. It is a matter of choice.”

- Frank Yiannas
DIFSC 2014
Are we WINNING the battle against foodborne disease?
Infectious Disease Mortality, U.S., 1900-1996

Source: Armstrong et al, JAMA 1999
<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoebiasis</td>
<td></td>
</tr>
<tr>
<td>Botulism</td>
<td></td>
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<tr>
<td>Brucellosis</td>
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<tr>
<td>Cholera</td>
<td></td>
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<tr>
<td>Hepatitis</td>
<td></td>
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<tr>
<td>Salmonellosis</td>
<td></td>
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<tr>
<td>Scarlet fever (streptococcus)</td>
<td></td>
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<tr>
<td>Staphylococcal food poisoning</td>
<td></td>
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<tr>
<td>Tapeworms</td>
<td></td>
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<tr>
<td>Trichinosis</td>
<td></td>
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<tr>
<td>Tuberculosis, bovine</td>
<td></td>
</tr>
<tr>
<td>Typhoid fever</td>
<td></td>
</tr>
</tbody>
</table>

Source: CDC, US
Emergence of non-typhoid *Salmonella* infections

USA, 1920-1997

Source: CDC, National surveillance data
Are we ‘currently’ winning?

## FOOD SAFETY

### PROGRESS REPORT

**FOR 2013**

<table>
<thead>
<tr>
<th>Disease Agents</th>
<th>Percentage change in 2013 compared with 2006–2008</th>
<th>2013 rate per 100,000 Population</th>
<th>2020 target rate per 100,000 Population</th>
<th>CDC estimates that...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>![Sad] 13% increase</td>
<td>13.82</td>
<td>8.5</td>
<td>For every Campylobacter case reported, there are 30 cases not diagnosed</td>
</tr>
<tr>
<td>Escherichia coli O157</td>
<td>![Sad] No change</td>
<td>1.15</td>
<td>0.6</td>
<td>For every E. coli O157 case reported, there are 26 cases not diagnosed</td>
</tr>
<tr>
<td>Listeria</td>
<td>![Sad] No change</td>
<td>0.26</td>
<td>0.2</td>
<td>For every Listeria case reported, there are 2 cases not diagnosed</td>
</tr>
<tr>
<td>Salmonella</td>
<td>![Sad] No change</td>
<td>15.19</td>
<td>11.4</td>
<td>For every Salmonella case reported, there are 29 cases not diagnosed</td>
</tr>
<tr>
<td>Vibrio</td>
<td>![Sad] 75% increase</td>
<td>0.51</td>
<td>0.2</td>
<td>For every Vibrio parahaemolyticus case reported, there are 142 cases not diagnosed</td>
</tr>
<tr>
<td>Yersinia</td>
<td>![Sad] No change</td>
<td>0.36</td>
<td>0.3</td>
<td>For every Yersinia case reported, there are 123 cases not diagnosed</td>
</tr>
</tbody>
</table>

For more information, see [http://www.cdc.gov/foodnet/](http://www.cdc.gov/foodnet/)
Preliminary FoodNet 2013 Data
Improved Food Safety

What Got Us HERE

2014

Won’t Get Us THERE

2020
Challenges to the Food Safety

- Changing Food System
- Foodborne Surveillance
- Global Population
- Emerging Pathogens
- Human Behavior
- Social Media
High Tech

derived from the Greek word, *technologia*. It means technology that is at the cutting edge - the most advanced technology currently available.

High Touch

a term coined by Naisbitt in the 1980s. It refers to human and social elements instead of technology.
Using Information Technology
Rotisserie Chicken Example

DAILY NEWS
California Wholesale Store Recalls Rotisserie Chicken Products Due to Possible Salmonella Heidelberg Contamination

4% Salmonella
71% Campylobacter

### Daily Temperature Log

<table>
<thead>
<tr>
<th>Cook Temperatures</th>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Item</td>
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<td>Item</td>
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<td></td>
<td></td>
<td>Item</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

#### Hot Holding Temperatures

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Item</td>
<td></td>
<td></td>
<td>Item</td>
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<td></td>
</tr>
</tbody>
</table>

#### Time Check

<table>
<thead>
<tr>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

### Corrective Actions

**High Risk No. 1: Cook & Chill**
- Are proper cooking practices being followed?
- Are food items being cooked to proper temperatures?
- Are food items being used within the proper holding temperatures?
- Are food items being held at the correct temperatures?
- Are food items being chilled correctly?

**High Risk No. 2: Wash & Rinse**
- Are utensils and equipment used properly?
- Are utensils and equipment sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?

**High Risk No. 3: Cool & Chill**
- Are proper cooling practices being followed?
- Are food items being cooled to proper temperatures?
- Are food items being held at the proper temperatures?
- Are food items being chilled correctly?
- Are food items being held at the proper temperatures?
- Are food items being chilled correctly?

**High Risk No. 4: Cook & Chill**
- Are proper cooking practices being followed?
- Are food items being cooked to proper temperatures?
- Are food items being used within the proper holding temperatures?
- Are food items being held at the correct temperatures?
- Are food items being chilled correctly?

**High Risk No. 5: Wash & Rinse**
- Are utensils and equipment used properly?
- Are utensils and equipment sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?

**High Risk No. 6: Cool & Chill**
- Are proper cooling practices being followed?
- Are food items being cooled to proper temperatures?
- Are food items being held at the proper temperatures?
- Are food items being chilled correctly?
- Are food items being held at the proper temperatures?
- Are food items being chilled correctly?

**High Risk No. 7: Cook & Chill**
- Are proper cooking practices being followed?
- Are food items being cooked to proper temperatures?
- Are food items being used within the proper holding temperatures?
- Are food items being held at the correct temperatures?
- Are food items being chilled correctly?

**High Risk No. 8: Wash & Rinse**
- Are utensils and equipment used properly?
- Are utensils and equipment sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?
- Are utensils and equipment being used properly?
- Are utensils and equipment being sanitized properly?
“Data on a piece of paper is a dead end; data in digital form is the start of meaning action.”

- Bill Gates
How SPARK Works
Paradigm Shift

- 10 regulatory inspections
- 100 3rd party food safety audits
- 1,400,000 SPARK rotisserie chicken temps

n = All
of the data that exists today was created in the last 2 years

Source: Forbes (2011)
of data is only currently analyzed

Big data: an all-encompassing term for any collection of data sets so large and complex that it becomes difficult to process using on-hand data management tools or traditional data processing applications.
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
Microbiological Testing
Changing Food Micro Laboratory
Microbiological Testing (N-60)

“A consuming public will always be more sensitive than a sampling plan.”
How Many Patties Do You Have to Test?
99% Confidence

Source: ICMSF

0.1% defect rate

n = 5,000
New & Real-Time Tests for New Times
The Way Forward?

High Tech
derived from the Greek word, *technologia*. It means technology that is at the cutting edge - the most advanced technology currently available.

High Touch
a term coined by Naisbitt in the 1980s. It refers to human and social elements instead of technology.
Food Safety Leadership
Food Safety Management vs Food Safety Leadership
Number of Foodborne Disease Outbreaks by Contributing Factor, CDC, U.S.

- Improper Holding Temperatures: 37%
- Inadequate Cooking: 16%
- Contaminated Equipment: 19%
- Food from Unsafe Source: 6%
- Poor Personal Hygiene: 11%
- Other: 11%
Food Safety = Behavior
Traditional Food Safety Strategies

- Training
- Inspections
- Micro Testing
“If the only tool you have is a hammer, you tend to see every problem as a nail.”

- Abraham Maslow
  Psychologist
  1908 - 1970
# Food Science + Behavioral Science

<table>
<thead>
<tr>
<th>Traditional Food Safety Management</th>
<th>Behavior-Based Food Safety Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Focuses on processes.</td>
<td>• Focuses on processes and people.</td>
</tr>
<tr>
<td>• Primarily based on Food Science.</td>
<td>• Based on Food Science, Behavioral Science, and Organizational Culture.</td>
</tr>
<tr>
<td>• Simplistic view of behavior change.</td>
<td>• Behavior change is complex.</td>
</tr>
<tr>
<td>• Linear cause and effect thinking.</td>
<td>• Systems thinking.</td>
</tr>
<tr>
<td>• Creates a food safety program.</td>
<td>• Creates a food safety culture.</td>
</tr>
</tbody>
</table>

Source: Yiannas, Food Safety Culture, 2008
Food Safety Innovation: a new idea, practice, or product that results in safer food, reduces the burden of foodborne disease, and improves the quality of life for consumers.
The Way Forward?

High Tech
- Information Technology
- Big Data & Social Media
- Food Micro Testing

High Touch
- Leadership
- Human Behavior
- Innovation
"In our view, the NASA organizational culture had as much to do with this accident as the foam."

- Columbia Accident Investigation Board (2003)
Future of Food Safety at a Crossroad