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

Frank Yiannas
Vice President - 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
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
Emergence of non-typhoid *Salmonella* infections

USA, 1920-1997

Source: CDC, National surveillance data
147 Cases
33 Deaths

3,930 Cases
53 Deaths
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>😞 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>😞 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>😞 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>😞 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>😞 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>😞 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

Won’t Get Us THERE

2014

2020
Challenges to the Food Safety

- Changing Food System
- Foodborne Surveillance
- Global Population
- Emerging Pathogens
- Human Behavior
- Social Media
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.
Information Technology
Using Information Technology
Rotisserie Chicken Example

4% Salmonella
71% Campylobacter

### Daily Temperature Log

<table>
<thead>
<tr>
<th>Club/Store</th>
<th>Daily Temperature Log</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date: / / 20</td>
<td></td>
</tr>
</tbody>
</table>

#### Cook Temperatures

<table>
<thead>
<tr>
<th>Item</th>
<th>Time</th>
<th>Temp</th>
<th>Initial</th>
<th>Item</th>
<th>Time</th>
<th>Temp</th>
<th>Initial</th>
<th>Item</th>
<th>Time</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1</td>
<td>1:00 pm</td>
<td>120°F</td>
<td>Initial</td>
<td>Item 2</td>
<td>2:00 pm</td>
<td>130°F</td>
<td>Initial</td>
<td>Item 3</td>
<td>3:00 pm</td>
<td>140°F</td>
<td>Initial</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>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00 pm</td>
<td>100°F</td>
<td>Initial</td>
<td>1:00 pm</td>
<td>130°F</td>
<td>Initial</td>
<td>2:00 pm</td>
<td>140°F</td>
<td>Initial</td>
<td></td>
<td></td>
<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>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 am</td>
<td>80°F</td>
<td>Initial</td>
<td>11:00 am</td>
<td>90°F</td>
<td>Initial</td>
<td>12:00 pm</td>
<td>100°F</td>
<td>Initial</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Manager Verification

<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>
<th>Time</th>
<th>Item</th>
<th>Temp</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:00 pm</td>
<td>110°F</td>
<td>Initial</td>
<td>2:00 pm</td>
<td>120°F</td>
<td>Initial</td>
<td>3:00 pm</td>
<td>130°F</td>
<td>Initial</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**VISUALLY OBSERVE TO ANSWER ALL QUESTIONS**

1. **High Temp #1:** Did glass be heated?
   - Yes
   - No
   - Not applicable

2. **High Temp #2:** Was the temperature at least 140°F at high temp?
   - Yes
   - No
   - Not applicable

3. **High Temp #3:** Was the product served at a temperature of at least 140°F?
   - Yes
   - No
   - Not applicable

4. **High Temp #4:** Was the product stored at a temperature of 10°F or less?
   - Yes
   - No
   - Not applicable

5. **High Temp #5:** Did the product meet the specification?
   - Yes
   - No
   - Not applicable

6. **High Temp #6:** Was the product served at a temperature of at least 10°F?
   - Yes
   - No
   - Not applicable

7. **High Temp #7:** Did the product meet the specification?
   - Yes
   - No
   - Not applicable

**Corrective Actions**

- Implement additional cooling measures.
- Recheck temperature records.
- Train staff on proper handling.

**Closing Manager Signature:**

[Signature]

*Place Log Here*

See instructions page.
“Data on a piece of paper is a dead end; data in digital form is the start of meaning action.”

- Bill Gates
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)
0.5% 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

All-Sourcing

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

$n = 5,000$

0.1% defect rate

Source: ICMSF
New & Real-Time Tests for New Times
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The Way Forward?
Food Safety Leadership
Food Safety Management vs Food Safety Leadership
Behavior
Number of Foodborne Disease Outbreaks by Contributing Factor, CDC, U.S.
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
Innovation
Food Safety Innovation: a new idea, practice, or product that results in safer food, reduces the burden of foodborne illness, 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

on twitter @frankyiannas