Food Safety = Behavior

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Global Trends in Food Safety

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>Foodborne Pathogens 1900 - 1939</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoebiasis</td>
</tr>
<tr>
<td>Botulism</td>
</tr>
<tr>
<td>Brucellosis</td>
</tr>
<tr>
<td>Cholera</td>
</tr>
<tr>
<td>Hepatitis</td>
</tr>
<tr>
<td>Salmonellosis</td>
</tr>
<tr>
<td>Scarlet fever (streptococcus)</td>
</tr>
</tbody>
</table>

Source: CDC, US
In the News

Popular cheese recalled over health and safety risk

Del. cheese company pleads guilty in listeria outbreak

One dead, 24 sick from multi-state Listeria outbreak linked to soft cheeses

FDA issues new statement on wood-aged cheese
consumer trust bust
PFGE, Credit Cards, & Google

COVER STORY: ANATOMY OF AN OUTBREAK: How salmonella sleuths solved a deadly mystery
By Momi Basu, Michelle 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 | Comments & Recommendations
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
Foodborne Surveillance
Emerging Pathogens
Immunocompromised
New Food Vehicles
Social Media

Challenges to the Food Safety
Are we ‘currently’ winning?

### 2014 Food Safety Progress Report

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Healthy People 2020 target rate</th>
<th>2014 rate*</th>
<th>Change compared with 2006-2008*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>8.5</td>
<td>13.45</td>
<td>13% increase</td>
</tr>
<tr>
<td>E. coli O157&lt;sup&gt;h&lt;/sup&gt;</td>
<td>0.6</td>
<td>0.92</td>
<td>32% decrease</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>15.45</td>
<td>No change</td>
</tr>
<tr>
<td>Vibrio</td>
<td>0.2</td>
<td>0.45</td>
<td>52% increase</td>
</tr>
<tr>
<td>Yersinia</td>
<td>0.3</td>
<td>0.28</td>
<td>22% decrease</td>
</tr>
</tbody>
</table>

*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)
Retail Food Deli Departments
Percent Observations Out-of-Compliance

- Food From Unsafe Sources: FDA Baseline 1998 - 2.8, FDA Baseline 2003 - 4.0, FDA Baseline 2008 - 4.3
Outbreaks attributed to cheese: differences between outbreaks caused by unpasteurized and dairy products, United States, 1998-2011.

Gould LH1, Mungai E, Behravesh CB.

Abstract

INTRODUCTION: The interstate commerce of unpasteurized fluid milk, also known as raw milk, is illegal in the United States, and intrastate sales are regulated independently by each state. However, U.S. Food and Drug Administration regulations allow the interstate sale of certain types of cheeses made from unpasteurized milk if specific aging requirements are met. We describe characteristics of these outbreaks, including differences between outbreaks linked to cheese made from pasteurized or unpasteurized milk.

METHODS: We reviewed reports of outbreaks submitted to the Foodborne Disease Outbreak Surveillance System during 1998-2011 in which cheese was implicated as the vehicle. We describe characteristics of these outbreaks, including differences between outbreaks linked to cheese made from pasteurized versus unpasteurized milk.

RESULTS: During 1998-2011, 90 outbreaks attributed to cheese were reported; 38 (42%) were due to cheese made with unpasteurized milk, 44 (49%) to cheese made with pasteurized milk, and the pasteurization status was not reported for the other eight (9%). The most common cheese-pathogen pairs were unpasteurized queso fresco or other Mexican-style cheese and Salmonella (10 outbreaks), and pasteurized queso fresco or other Mexican-style cheese and Listeria (6 outbreaks). The cheese was imported from Mexico in 38% of outbreaks caused by cheese made with unpasteurized milk. In at least five outbreaks, all due to cheese made from unpasteurized milk, the outbreak report noted that the cheese was produced or sold illegally. Outbreaks caused by cheese made from pasteurized milk occurred most commonly (64%) in restaurant, delis, or banquet settings where cross-contamination was the most common contributing factor.

CONCLUSIONS: In addition to using pasteurized milk to make cheese, interventions to improve the safety of cheese include limiting illegal importation of cheese, strict sanitation and microbiologic monitoring in cheese-making facilities, and controls to limit food worker contamination.
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 Safety = Behavior
“Behavior change is complex.”

- B.F. Skinner
# 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
Behavior Change Theories & Models

• Behavioral Theory
• Social Cognitive Theory
• Health Belief Model
• Theory of Reasoned Action
• Transtheoretical Model
• Social Marketing
Consistency & Commitment
Reducing Reservation “No-Shows” at a Chicago Restaurant

“Will you please call if you’re going to cancel your reservation?”
Foot in the Door Technique

Source: Freedman & Fraser (1966)
What Does This Mean for Food Safety?
Completion vs. Commitment

Safety Beliefs

We believe...

- There is nothing more important than safety. Safety ensures our ability to deliver secure, short, and efficient.
- Gas injuries do not happen by accident. Every incident is preventable.
- Safety Begins With Me! I begin with safety. I think about safety first.
- I am responsible for my safety and the safety of others.
- Safety requires the courage to raise issues and find solutions.
- Safety is worth it in all aspects of my life.
- Safety can’t wait!
Birds of a Feather
Influence
Food Safety for Better
Homophily

People of similar characteristics tend to befriend each other.
Adoption of an on-line Diet Diary

Homophilous vs Unstructured Groups

Source: Centola (2011)
Many Forms of Homophily
What Does This Mean for Food Safety?

ACS

2016
Make Food Safety the Social Norm
Solomon Asch 1958 Experiment on Conformity

Exhibit 1

Exhibit 2

A  B  C
Conformity in an Elevator

https://www.youtube.com/watch?v=BgRoiTWkBHU
Personal Protective Equipment

Source: Olson & Others (2009)
What Does This Mean for Food Safety?
ASM Handwashing Survey

Observational Study Finds One-third of Men Don’t Wash Hands in Public Restrooms
Making Hand Washing the Social Norm

86% of Males Wash Their Hands

4 out of 5 Males Wash Their Hands

Source: Lapinski, Maloney, Braz, & Shulman (2013)
Learning from the Right Way or the Wrong Way
Trans-Atlantic Flight
Miracle on the Hudson
What Firefighters Can Teach Us

Source: Joung, Hesketh, & Neal (2006)
What Does This Mean for Food Safety?
Learning from the Mistakes of Others

Hundreds sickened in U.S. from salmonella outbreak linked to raw chicken
Complacency: a feeling of quiet security, often while unaware of some potential danger or defect that lurks ahead.

Complacency = Over Confidence + Poor Metrics
In Summary

1. Consistency & Commitment
2. Principle of Homophily
3. Make Food Safety the Social Norm
4. Learning from Right Way or Wrong Way
Providing safe and affordable food, so people can live better.