The Potential Impact of Consumer Trends on Quality and Safety of our Food Supply

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Global Problem

- By 2050, there will be 9.6 billion people in the planet
- Food production has to increase at least 2 times
Global Issues

- Climate change
- Food loss and waste
- Water shortage
- Arable land
- Obesity epidemics
- Demographic trends
- Consumption trends

Role of Global Food Consumption Patterns, UNEP, 2012
Global Issues

- Food loss and waste

![Graph showing per capita food losses and waste (kg/year) for different regions](image-url)
Global Issues

Demographic changes – Middle class

Population (millions)

- North America
- Europe
- Latin America
- Sub-Saharan Africa
- Middle East/North Africa
- World

Role of Global Food Consumption Patterns, UNEP, 2012
Global Issues

- Consumption trends – animal foods
Consumer preference trends

Technological foods

Natural foods
Trends Polarization

Driving consumer preferences and marketing
Trends Polarization

Technological foods
- Processed
- Conventional
- Large farms
- GMOs
- Irradiation
- Pesticides
- Food additives
- Antibiotics
- Hormones
- Pasteurization
- Imported foods

Natural foods
- Organic
- Local
- Sustainable
- Grass-fed
- Raw
- Fresh
- Small farms
- Family farms
- Farmer markets
- Urban agriculture
Organic Food Production


Organic Acreage vs Organic Food Sales

Taken from the State of the Industry, Organic Trade Organization, 2015
Drivers of Food Trends

- Health concerns
- Environmental concerns
- Social concerns
- Ethical concerns
- Economic concerns
Definitions

- **Food Security**
  - Food Protection
    - Safety
    - Defense

- Access to adequate food supply
  - Minimization of natural risks
  - Minimization of intentional risks
Definitions

- **Hazard** = *an agent that has the potential to cause adverse health effects*

- **Risk** = *probability of a hazard and its magnitude*
Type of Risks

- **ACUTE** - rapid response in short time - eg vomiting or diarrhea

- **CHRONIC** - long term - eg cancer, diabetes, obesity
Risks in the Food Supply

**Foodborne Diseases**

- Intoxications
  - Chemical Poisoning
  - Poisonous Plants and Animals
  - Microbial Intoxication

- Infections
  - Toxicoinfections
  - Invasive Infections

- Sensitivities
  - Allergies
What is a safe food?

- One that does not exceed an acceptable level of risk

(Nestle, M. 2003. Safe Food. Bacteria, Biotechnology and Bioterrorism)

How do you determine “an acceptable level of risk”? 
Example: tolerance levels in some foods
How do you determine “an acceptable level of risk”?

- Science
- Opinions
- Perception
- Values
Who does determine “an acceptable level of risk”?  

- Industry  
- Government  
- Consumers
Drivers of Food Polarization

- Health concerns
- Environmental concerns
- Social concerns
- Ethical concerns
- Economic concerns
Different Food Safety Priorities

Consumer perspective

- Concerned about chronic diseases and unknown effects
  - No pesticides
  - No hormones
  - No antibiotics
  - No preservatives
  - No GMOs
  - No irradiation
Health Concerns Related to Technological Foods

1. Cancer
2. Obesity
3. Type-2 diabetes
4. Allergies
5. Cardiovascular diseases
6. Unknown long-term effects
7. Other
Different Food Safety Priorities

Public health perspective

- Concerned about acute effects
  - Pathogens
  - Toxins
  - Antibiotic resistance

- Minimize risk due to
  - Pesticides
  - Hormones
  - Preservatives
  - Irradiation
  - GMOs
Factors Linked to Enhanced Consumer Health Concerns

1. Seeking solutions
2. High profile scares and scandals
3. Suspect regulatory systems
4. Distrust of large and mainstream food industry
5. Lack of trust in science and technology related to agriculture
Factors Linked to Enhanced Consumer Health Concerns

6. Excess of misinformation – media and Internet

7. “Eating right” multi-billion media industry

8. The new “Eating righteously” morality

9. Poor quality published scientific literature

10. Right to choose

11. Poor communication from experts and scientists
Lack of Trust

- In elected officials

Pew Research Center, 2014
Lack of Trust

- In government and industry

Low levels of trust in government and advertisers

Among adults ages 18 and older

How often do you trust ___ to do the right thing?

<table>
<thead>
<tr>
<th></th>
<th>Government</th>
<th>Advertisers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just about always</td>
<td>2%</td>
<td>1%</td>
</tr>
<tr>
<td>Most of the time</td>
<td>16%</td>
<td>11%</td>
</tr>
<tr>
<td>Only some of the time</td>
<td>67%</td>
<td>71%</td>
</tr>
<tr>
<td>Never</td>
<td>14%</td>
<td>16%</td>
</tr>
</tbody>
</table>


PEW RESEARCH CENTER

Pew Research Center, 2014
Lack of Trust

- In scientists

Opinion Differences Between Public and Scientists

% of U.S. adults and AAAS scientists saying each of the following

<table>
<thead>
<tr>
<th>Biomedical sciences</th>
<th>U.S. adults</th>
<th>AAAS scientists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe to eat genetically modified foods</td>
<td>37%</td>
<td>88%</td>
</tr>
<tr>
<td>Favor use of animals in research</td>
<td>47%</td>
<td>89%</td>
</tr>
<tr>
<td>Safe to eat foods grown with pesticides</td>
<td>28%</td>
<td>68%</td>
</tr>
<tr>
<td>Humans have evolved over time</td>
<td>65%</td>
<td>98%</td>
</tr>
<tr>
<td>Childhood vaccines such as MMR should be required</td>
<td>68%</td>
<td>86%</td>
</tr>
</tbody>
</table>

Pew Research Center, 2015
Who to Trust

Social media

Social networking site use by age group, 2005-2013

% of internet users in each age group who use social networking sites, over time

Social media sites, 2012-2014

% of online adults who use the following social media websites, by year

Source: Latest data from Pew Research Center’s Internet Project Library Survey, July 18 – September 30, 2013. N=5,113 internet users ages 18+. Interviews were conducted in English and Spanish and on landline and cell phones. The margin of error for results based on internet users is +/- 1.6 percentage points.

Pew Research Center, 2014
Who to Trust

Top Twitter organic food bloggers

1. Naomi Starkman - Civil Eats - 20,533
2. Paula Crossfield - Civil Eats - 18,796
3. Lisa Leake - 100 Days of Real Food - 15,898
4. Sara Forte - Sprouted Kitchen - 12,247
5. Diana Hoffmaster - Turning the Clock Back - 10,633
6. Susan Powers - Rawmazing - 10,543
7. Shaina Olmanson - Food for my Family - 8,894
8. Krista Bainbridge - Savory Savings - 8,883
9. Jennie Lyon - Sweet Greens - 4,711
10. Carrie Vitt - Deliciously Organic - 4,482

Sylvia Burgos Toftness, 2015
Media Impact on Enhanced Health Concerns

“Forget the truth, I want a headline!”

Dr. Richard Raymond, Meatingplace.com
Multi-billion Dollar Eating Right Industry
“... switching a cow’s diet from corn to hay or grass for a few days before slaughter reduces the population of *E. coli* O157:H7...”


“... so you feed corn to cattle, and *E. coli* which is very common but evolves and a certain mutation occurs and then a strain called O157 appears, then it is a product of the diet....”

(Michael Pollan, ‘Food, Inc.’, 2009)
Major Food Consumer Trends

Taken from the 2015 Nutrition Business Journal’s Special Diets Report
Changes to Foods to Satisfy Consumer Trends

Reduction of functional ingredients
- Preservatives
- Stabilizers
- Antioxidants
- Flavors and colors

- Elimination of processing steps
  - Thermal processes (pasteurization, UHT, canning)

- Reduction of chemical sanitizing

- Adoption of questionable practices
  - Raw animal food consumption
1. Increased risk of foodborne disease

2. Increased food waste
   - Faster microbiological spoilage
   - Shorter shelf-life
   - Greater consumer rejections due to quality and aesthetics defects
Consequences to Food Safety, Quality and Security

Danger and Opportunity
Consequences to Food Safety, Quality and Security

Opportunity

- Wide adoption of Gluten-free products by multiple brands
- Non GMO-pledge and verification initiatives
- Grass-fed claim
- Non-hormone treated cattle program (NHTC)
- Cage-free claim
Consequences to Food Safety, Quality and Security

Opportunity
Examples of Trend Dangers

1. Raw milk consumption

2. Listeria monocytogenes control in ready-to-eat meats
The Case of Raw Milk
Pasteurization efficacy & limitations

- Kills pathogens in milk that have caused outbreaks in raw milk (>5 log CFU/ml):
  - *Salmonella*
  - *Listeria monocytogenes*
  - *Escherichia coli* O157:H7
  - *Campylobacter jejuni*
  - *Yersinia enterocolitica*
  - *Coxiella brunetti*
  - *Brucella*

- Does not destroy all organisms (e.g., spores)

The Pasteurized Milk Ordinance

- Established in 1924
- Requires pasteurization
- Adopted by most State governments to regulate milk within their borders
Is pasteurization helping?

- Yes, milk-borne illness rates in the U.S. dropped
  - 1938
    - Milk was associated with 25% of all disease outbreaks due to contaminated food
  - Now
    - Milk products are associated with <1% of such outbreaks

Ref. (FDA CFSAN 2003)
State laws

- 29 states allow raw milk sales
- 17 states only allow the sale at the farm
- Extent varies (local retailers, farms, etc.)
- 5 states have laws explicitly allowing the retail sale of raw milk: AZ, CA, PE, NH, VE
- Other states allow the sale of raw milk via Agricultural Department policies

(Kennedy 2004; Associated Press 2008)
Campylobacter Foodborne Outbreak Incidence

Number of outbreaks

(CDC, 2015)
### Foods implicated with *Campylobacter* outbreaks

<table>
<thead>
<tr>
<th>Food</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw milk</td>
<td>5</td>
<td>7</td>
<td>8</td>
<td>5</td>
<td>12</td>
<td>15</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Other dairy products</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Chicken and turkey</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Fruits and vegetables</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other foods</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Seafood</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Unknown foods</td>
<td>11</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>8</td>
<td>10</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>23</td>
<td>23</td>
<td>14</td>
<td>27</td>
<td>25</td>
<td>39</td>
<td>30</td>
</tr>
</tbody>
</table>

(CDC, 2015)
Methods to Control *Listeria monocytogenes* in Ready-to-Eat Foods

- In 2003, USDA issued a regulation for *Listeria monocytogenes* control in RTE meats (Final rule as 9 CFR Part 430)

- Set three alternatives or monitoring levels based if:
  - The product included an antimicrobial treatment
  - The process involved a post-lethality step

1. Alternative 1 – both
2. Alternative 2 – one of them
3. Alternative 3 – none
Methods to Control *Listeria* Contamination in Ready-to-Eat Foods

- Thermal processing
  - Pasteurization
  - Cooking
- Sanitation and environmental testing
- In product
  - Mild thermal process (frankfurters)
  - High hydrostatic pressure processing
  - Antimicrobial ingredients
    - Sodium diacetate/lactate combinations
Antimicrobial treatments against *Listeria monocytogenes*
Recalls due to *L. monocytogenes*

<table>
<thead>
<tr>
<th>Year</th>
<th>Count</th>
<th>Percentage</th>
<th>Category</th>
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</thead>
<tbody>
<tr>
<td>2000</td>
<td>69</td>
<td>22%</td>
<td>Fresh Produce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39%</td>
<td>Deli meats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14%</td>
<td>Dips/spread</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14%</td>
<td>Seafood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10%</td>
<td>Poultry &amp; Eggs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3%</td>
<td>Dairy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13%</td>
<td>Seafood</td>
</tr>
<tr>
<td>2010</td>
<td>36</td>
<td>22%</td>
<td>Fresh Produce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39%</td>
<td>Deli meats</td>
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<td></td>
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<td>Dips/spread</td>
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<td>10%</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>3%</td>
<td>Dairy</td>
</tr>
<tr>
<td>2012</td>
<td>65</td>
<td>12%</td>
<td>Fresh Produce</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39%</td>
<td>Deli meats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20%</td>
<td>Dips/spread</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18%</td>
<td>Seafood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10%</td>
<td>Poultry &amp; Eggs</td>
</tr>
</tbody>
</table>

Future food security will be depending on our ability to solve multiple challenges.

It is uncertain whether current consumer trends would have a major impact on food security.

Consumer preferences for less preserved foods may lead to foodborne risks and increased food waste.

Current trends poses opportunities for creativity and business.
Questions?