Global Food Traceability: What’s Next?

William Fisher
Vice President, Institute of Food Technologists
Executive Director, Global Food Traceability Center
2015 Food Summit, Dalian, October 22, 2015
Agenda

- IFT and Traceability
- Defining Food Traceability
- Importance of Traceability
- Benefits
- Challenges
- Laws, Regulations, and Standards
- Food Traceability on the Horizon
- The Global Food Traceability Center
## IFT and Traceability

<table>
<thead>
<tr>
<th>Year</th>
<th>Traceability Efforts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>FDA Task Order - Mock tomato traceback pilot using technology solutions</td>
</tr>
<tr>
<td>2010</td>
<td>National Center for Food Protection &amp; Defense (NCFPD) Traceability Project</td>
</tr>
<tr>
<td>2011</td>
<td>IFT Traceability Improvement Initiative (TII) – Traceability Summits</td>
</tr>
<tr>
<td>2012</td>
<td>FDA FSMA Product Tracing Pilots</td>
</tr>
<tr>
<td>2013</td>
<td>Global Food Traceability Center</td>
</tr>
</tbody>
</table>
Defining Food Traceability
Definitions: Traceability

- **Food Protection**
  - Holistic Approach

- **Food Defense**
  - Intentional Contamination

- **Food Safety**
  - Unintentional Contamination

- **Food Sustainability**
  - Food productivity

- **Food Security**
  - Food accessibility
What is Traceability?

- Traceability *is just not* about data, identifiers, bar codes, RFID, tags, and any information that needs to be linked together to make traceability possible.

- Traceability *is* about systematic ability to access any or all information relating to a food under consideration, throughout its entire life cycle, by means of recorded identifications.
Defining Traceability

Traceability
Categories of Traceability

- **Internal traceability**
  - Ability to follow the movement WITHIN

- **External traceability**
  - Ability to follow the movement BETWEEN.
3 Basic Information Elements Required

- What is the product?
- Where did the product originate or go to?
- When did it move?
The Importance of Traceability
Traceability: Relevance to Food Safety

- Causality
- Trust
- Visibility
- Agility

Prevention — Preparedness

Food Safety and Defense

Response — Recovery
Key Stakeholders

Government:
- FDA
- USDA
- CDC
- DHS
- EPA
- Others

Industry:
- Farmers
- Ingredient Suppliers
- Processors
- Distributors
- Wholesalers
- Retailers

Academia:
- Education
- Extension
- Research
- Centers of Excellence
### Selected History of Traceability

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1700 BC</td>
<td>Mesopotamia shepherds mark animals with colors</td>
</tr>
<tr>
<td>350 BC</td>
<td>Alexander the Great’s horse</td>
</tr>
<tr>
<td>7th century</td>
<td>China tattoos breed horses</td>
</tr>
<tr>
<td>1275</td>
<td>First documentation of diseased ewe (France)</td>
</tr>
<tr>
<td>1348</td>
<td>Link of animal welfare to human health</td>
</tr>
<tr>
<td>1556</td>
<td>Naples/Venice hire inspectors</td>
</tr>
<tr>
<td>17th century</td>
<td>Persian royal stables marks horses</td>
</tr>
<tr>
<td>1711</td>
<td>200M head of cattle perish in Europe</td>
</tr>
<tr>
<td>1714</td>
<td>France outlaws un-inspected meat</td>
</tr>
<tr>
<td>1740-90</td>
<td>Various decrees to protect health (UK)</td>
</tr>
<tr>
<td>1862</td>
<td>USDA formed – First labs of the future FDA</td>
</tr>
<tr>
<td>1875</td>
<td>Marking of live animals with tags</td>
</tr>
<tr>
<td>1904</td>
<td>Typhoid Mary Mallon (USA)</td>
</tr>
<tr>
<td>1960</td>
<td>HACCP developed with NASA</td>
</tr>
<tr>
<td>1999</td>
<td>Dioxin in animal feed (Belgium)</td>
</tr>
<tr>
<td>2002</td>
<td>General Food Law adopted in Europe</td>
</tr>
<tr>
<td>2003</td>
<td>BSE identified in Canadian beef herd</td>
</tr>
<tr>
<td>2005</td>
<td>Sudan1 colorant contamination (UK)</td>
</tr>
<tr>
<td>2009</td>
<td>Peanut Corporation of America</td>
</tr>
</tbody>
</table>
Global Food Supply Chain

✓ Animal Agriculture
✓ Good Ag Practices
✓ Food Processing
✓ Storage & Distribution
✓ Transportation
✓ Domestic Regulations
✓ International Regs.
✓ Multiple Standards
✓ Varied Enforcement
✓ Differing Scientific Views
✓ Consumer Trends
✓ Changing Habits
✓ Health Drivers
✓ New Threats
✓ Media

Adapted from Wall. 2010
Global Supply Chain Complexity

- Soy flour
- Baking soda
- Wheat gluten
- Calcium propionate
-酶
- Mono- and diglycerides
- Diacetyl
- Tartaric acid
- Esters
- Ethanol
- Sorbitol
- Polysorbate 20
- Potassium
- Propionate
- Sodium stearoyl lactylate
- Corn starch
- Ammonium chloride
- Ammonium sulfate
- Calcium peroxide
- Ascorbic acid
- Azodicarbonamide

- Milk
- Milkfat
- Water
- Cream
- Sodium citrate
- Salt
- Sodium phosphate
- Sorbic acid
- Artificial color
- Cheese
- Culture
- Acetic acid
- Soy lecithin
- Enzymes
- Starch

- Cucumbers
- Water
- Vinegar
- Salt
- Calcium chloride
- Alum
- Natural flavorings
- Polysorbate 80
- Turmeric

- USDA inspected beef

- Soybean oil
- Pickles
- Distilled vinegar
- Water
- Egg yolks
- HF corn syrup
- Sugar
- Onion
- Powder
- Corn syrup
- Spice
- Spice
- Extractives
- Salt
- Xanthan gum
- Mustard
- Prop. glycol
- Alginate
- Sodium benzoate
- Potassium sorbate
- Turmeric
- Calcium disodium EDTA

- Grill Seasoning
- Cottonseed oil
- Soybean oil
- Salt
- Pepper

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Globalizing the Cheeseburger

**Vinegar**
- Argentina
- Australia
- Austria
- Belgium
- Brazil
- Canada
- China
- Chile
- Colombia
- Denmark
- France
- Germany
- Greece
- Hong Kong
- Israel
- Italy
- Japan
- S. Korea
- Lebanon
- Peru
- Poland
- Portugal
- Serbia
- Philippines
- Russia
- S. Africa
- Singapore
- Spain
- Sweden
- Turkey
- Taiwan
- U.K.

**Garlic Powder**
- Brazil
- Canada
- China
- Germany
- India
- Israel
- Japan
- S. Korea
- Mexico

**Tomatoes**
- Belgium
- Canada
- China
- Colombia
- Costa Rica
- Guatemala
- Israel
- Morocco
- Mexico
- Netherlands
- New Zealand
- Poland
- Spain

**Beef**
- Australia
- Canada
- Chile
- Costa Rica
- Honduras
- Japan
- Mexico
- Nicaragua
- New Zealand
- Uruguay

**Wheat Gluten**
- Australia
- Belgium
- Canada
- China
- Czech Rep.
- France
- Germany
- Kazakhstan
- Lithuania
- Netherlands
- Poland
- Russia
- Switzerland
- Thailand
- U.K.

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The rising concerns about safety and quality of food

- **Increasing concern about health and safety risks in the global food supply chain due to:**
  - More foodborne illness: high visibility cases of E.coli, Listeria, Salmonella, etc.
  - Higher number and visibility of recalls
  - Rise in fraudulent activities in the food chain and counterfeit products
  - More products coming from countries with lower health and safety standards
  - Higher risk of contamination or spoilage due to long, complex supply chains
  - Increased threat of terrorism

- **Impact of above:**
  - Economic loss from negative impact of recalls
  - Rising distrust of the food supply and fragile consumer confidence
  - Greater demands for proof of food product claims
  - Increased demands for regulation and guidelines
  - Increased business costs to comply with regulations
Why is Traceability Important?

- Public Safety / Public Good
- Business risk management and mitigation
- Supply chain efficiencies
- Market and consumer access
Cost Impact of Recalls

What do you estimate the financial impact (sales losses, direct recall costs, etc.) to your company was a result of the recall?

- 48% for Less than $9M
- 29% for $10M to $29M
- 9% for $30M to $49M
- 9% for $50M to $99M
- 5% for Over $100M

Source: Grocery Manufacturers Association, 2011
Business Benefits of Traceability
Traceability Benefit Categories

Operational Efficiencies

Market Access

Risk Management

Compliance
## Operational Efficiency Benefits

<table>
<thead>
<tr>
<th>Category</th>
<th>Specific Interest</th>
<th>Benefits that are Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operational Efficiencies</strong></td>
<td>Improved Supply Chain Management</td>
<td>• Increased inventory accuracy that allow firms to meet customer demand more efficiently.</td>
</tr>
<tr>
<td></td>
<td>Increased Supply Chain Confidence</td>
<td>• More efficient recalls. As a result, supply chain participants increasingly demand improved product tracing performance from trading partners</td>
</tr>
<tr>
<td></td>
<td>Process Improvements</td>
<td>• Improvements in product tracing often results in decreased error rates, increased product selection accuracy, and streamlined document management.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More effectively manage and maximize work flow.</td>
</tr>
<tr>
<td></td>
<td>Decreased Spoilage/Waste and Shrinkage</td>
<td>• Improved product tracing often results in more accurate inventory management. Thus reduced ‘shrinkage’ costs and food waste.</td>
</tr>
</tbody>
</table>
## Market Access Benefits

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<thead>
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<th>Benefits that are Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Access</td>
<td>Improved Brand Reputation</td>
<td>• Product tracing systems support decisions that impact brand reputation. Improving product tracing improves decision making ability</td>
</tr>
</tbody>
</table>
|                      | Increased Consumer Confidence            | • Proof that the product has specific attributes as claimed  
• While product tracing may be considered a normal cost of doing business, not having traceability negatively impacts consumer confidence and customer loyalty for many firms |
|                      | Expanded Markets/New Customers           | • Market entry requirement  
• Recall and traceback risk mitigation requires trading partners to meet minimum tracing standards.                                                        |
## Risk Mitigation Benefits

<table>
<thead>
<tr>
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<th>Specific Interest</th>
<th>Benefits that are Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk Mitigation</td>
<td>Insurance/Liability Cost Reduction</td>
<td>• Some insurance providers require product tracing capability before they underwrite certain insurance policies for firms within the food industry</td>
</tr>
<tr>
<td></td>
<td>Reduced Recall Costs</td>
<td>• Reduced time to access critical data in the event of a recall /withdrawal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reduce the scope of recall/withdrawal</td>
</tr>
<tr>
<td></td>
<td>Return to Business as Usual</td>
<td>• Faster recovery of normal business activities after a significant recall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Faster verification that the business is NOT implicated in a recall</td>
</tr>
</tbody>
</table>
Other Reasons to Invest in Global Traceability

- Ease of compliance with global regulations
- Improved recall process \(\rightarrow\) Lower costs
- Greater inventory visibility \(\rightarrow\) Faster order-to-cash
- More timely and accurate upstream and downstream data \(\rightarrow\) Reduced working capital
- Improved returns process \(\rightarrow\) Reduced risk
Should Developing Countries Invest in Traceability?

- Yes! And here’s why
  - Can affect all domestic sectors
  - Import and exports
  - Reinforces trust
  - Access to capital
  - Overall operational efficiencies
  - No need to reinvent the wheel
Final Thoughts on Importance & Benefits

- Traceability is about much more than recalls and animal health; it lowers costs, improves value chain efficiencies and strengthens brand equity.

- Traceability has more to do with business processes than just gathering data and storing it.

- Quality and food safety principles can be used to plan and implement traceability.

- Traceability needs to be a key component of an overall food protection plan.
Traceability Challenges
Traceability Challenges

- Consumers being more vocal
  - Demand ready access to reliable and relevant information
  - More sensitive to issues of waste, nutrition, and the environment
Traceability Challenges

- Overlapping and conflicting demands from national regulators
Traceability Challenges

- Lack of unifying requirements
  - Changing regulatory demands around the world
  - Multiple proprietary requirements
  - Terminology
Traceability Challenges

- Traceability varies by industry and product
  - Agriculture/Farming/Fishery
  - Food
    - Manufacturers/Processors
  - Transportation & Distribution
  - Retail and Food Service
Traceability Challenges

- Lack of records
  - Data is simply not available, or is difficult to collect

- Is the data
  - Reliable?
  - Relevant?
  - Rapidly accessed?
Traceability Challenges

- Verification/Validation of records
  - Data can be missing and unreliable
  - Few certification schemes to ensure data can be trusted
    - Who? When?
    - Where? How?
    - Accurate?
    - Proofs?
Traceability Challenges

- Lack of technology
  - Technology is not the problem but it can be a solution
  - Lack of common blueprint weakens interoperability & drives up costs
  - The need for a traceability architecture
Technology Architecture: The Concept

- Technology architecture is akin to a blueprint for a global traceability system

- Purpose
  - A unified picture that will enable stakeholders (businesses, industry, regulators) to see how their own unique traceability practices and systems can contribute to more effective global food traceability
  - Designed for multiple uses and constructed on a common set of requirements, much like the telecommunications, financial, and information technology requirements used for other networks today
Traceability Laws, Regulations, and Standards
Notable Laws, Regulations and Standards

• EU Food Regulation
• Safe Food for Canadians Act
• Food Safety Law of China
• Global Food Safety Initiative
• GS1 GTS
• ISO 22000
• Codex
• U.S. Bioterrorism Act
Recent U.S. History: Bioterrorism Act of 2002

- Established recordkeeping requirements
  - Manufacturers/processors
    - Record shipment and receipt information
    - Capture incoming lot numbers as possible
    - Link ingredients to finished product to extent practical
  - Non-manufacturers
    - Contact information for who it came from and went to
  - Exemptions at supply chain ends
- “1 up / 1 down” redundant system
- Form of recordkeeping not specified
  - Combinations of paper and electronic records (even within a facility)
Forthcoming Laws, Regulations and Standards

• Numerous **New** National Laws, Regulations and Standards
• Continual **Updating of Existing** Laws, Regulations and Standards
• U.S. Food Safety Modernization Act
FSMA: Main Themes of the Legislation

- Prevention
- Inspections, Compliance, and Response
- Enhanced Partnerships
- Import Safety
FSMA: Key Provisions/Sections

- Section 101: Inspection of Records
- Section 102: Registration of Food Facilities
- Section 103: Hazard Analysis and Risk Based Preventive Controls
- Section 104: Performance Standards
- Section 105: Standards for Produce Safety
- Section 106: Protection Against Intentional Adulteration (Food Defense)
- Section 107: Authority to Collect Fees
- Section 111: Sanitary Transportation of Food
FSMA: Key Provisions/Sections

- Section 201: Inspections of Facilities
- Section 202: Laboratory Accreditation for Analyses of Food
- Section 204: Enhancing Tracking and Tracing
- Section 206: Mandatory Recall Authority
- Section 207: Administrative Detention of Food
- Section 211: Improving the Reportable Food Registry
FSMA: Key Provisions/Sections

- Section 301: Foreign Supplier Verification Program
- Section 302: Voluntary Qualified Importer Program
- Section 303: Import Certifications for Food
- Section 304: Prior Notice of Food Shipments
- Section 307: Accreditation of Third Party Auditors
Food Traceability: On the Horizon
On the Horizon

Consumers
- Conscious consumers
- Individualized Needs
- Citizen science

Food
- Globalized supply chains
- Complexity of constituents
- Revolutionary versus evolutionary

Technology
- System of systems
- Ubiquitous
- Smart versus artificially intelligent
Conscious Consumers

- Food
- Water
- Energy
- Health
- Insecurity
- Illness and Disease
- Scarcity
- Climate Change
Individualized Needs

Source of images: Bing
Citizen Science

- Social media
- Celebrity science
- Beliefs versus facts versus wishful thinking
- Most importantly, empowered to impact change!
Presentation Outline

Consumers
- Conscious consumers
- Citizen science
- Individualized Needs

Food
- Globalized supply chains
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- System of systems
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A Global Supply Chain

Tomatoes
While the U.S. produces the most tomatoes, Mexico accounts for 71% of tomato imports, and Canada accounts for 27%.

Anchovies
56% of our anchovies are produced in Peru, while pizza anchovies come from Argentina, Croatia, Spain, and Italy.

Cheese
14% of the raw buffalo milk used for mozzarella is made in Italy while 86% of buffalo milk is produced in Asia.

Mushrooms
China produces 47% of our mushrooms across the globe, followed by the U.S which produces only 11%.

Spices
11.5% of India’s spices are exported to United Arab Emirates, the U.S., the EU, and Malaysia.

Peppers
95% of unprocessed peppers are exported through India, China, and the U.S.

Beef
2.5 billion pounds of beef were exported this year to top markets like Canada, Japan, Mexico, South Korea, and Hong Kong.
What are the food safety implications?
What are the regulatory implications?
What are the economic implications?
Presentation Outline

Â Consumers
  Ī Conscious consumers
  Ī Citizen science
  Ī Individualized Needs

Â Food
  Ī Globalized supply chains
  Ī Complexity of constituents
  Ī Revolutionary versus evolutionary

Â Technology
  Ī System of systems
  Ī Ubiquitous
  Ī Smart versus artificially intelligent
Technology: System of Systems

Typical Food Supply Chain

- Ag Suppliers
- Producers
- Processors
- Further Processors
- Wholesalers/Distributors
- Retailers/Food Service
- Customers
Technology: Creating the Virtual Food Value Chain (VFVC)

- Virtual vs. physical value chains
- Value to companies
- Value to the industry
- Technology architecture
Technology: Ubiquitous
Technology: Smart versus AI

- DNA tracking
- Molecular tracking
- Radio-isotope tracking
- Most importantly, data versus understanding!
Conclusion

- A list of clichés
  - The future is coming
  - Nothing is permanent but change
  - Surprise is inevitable, being unprepared is not

- Drivers of innovations
  - Regulatory roadmaps
  - Industry innovations
  - Technology transformations

- Future of Traceability
  - In a revolutionary phase
  - Much more than keeping track of foods
  - Collaborative ubiquitous artificially intelligent system of systems
Global Food Traceability Center

Launched
September 2013
Vision

To become the global resource and authoritative voice on food traceability.

Mission

A program to serve the agriculture and food sectors, by providing applied research, objective advice, and practical expertise about data collaboration and food product traceability for business benefit and public good.
**Why a Traceability Center?**

- No single entity that brings together key stakeholders to collaborate on timely food traceability solutions → No go-to resource and authoritative voice on traceability.

- 1 in 6 Americans (48 million) gets ill from foodborne diseases each year → 128,000 are hospitalized; and 3,000 die (CDC)

- Total economic impact these illnesses estimated to be $152 billion annually

- Food recalls cost businesses $6 to $7 B per year → Waste & lost business

- Regulators are increasingly concerned about the time taken to respond to food related emergencies as the global food system becomes more complex

- Consumer confidence in food has become fragile & there is increasing skepticism of industry claims
Organizational Structure

- Food Industry
- Regulatory Agencies
- Consumers
- Academia
- National & International Organizations
- Foundations & Non-profits
- Solution Providers

Key Stakeholders

- Founding Sponsors
- Contribution Partners

Advisory Council

GFTC

Project Working Groups

Research

Education and Training

Protocols and Standards

Technology Transfer
Our approach will be to engage stakeholders in the development of solutions, as well as in their delivery.
Recent Projects

- Benchmark international standards and requirements for harmonization
- Develop best practices guidance document
- Food traceability courses on principles and systems
- Seafood Traceability
  - Grant from the Moore Foundation
New Projects and Activities

- Interoperable Traceability Architecture
  - Collaboration with Consumer Goods Forum & GS1

- Food Traceability and how it relates to an Overall Food Protection/Safety Plan

- Education and Training

- Seafood Traceability
Education and Training Programs

- On-demand Webcasts
  - Calculating the Payback from Seafood Traceability (30 minutes)
  - Food Traceability: Important for Food Safety, Imperative for Food Defense (90 minutes)
  - Global Food Traceability Systems: Today and Near Future (90 minutes)
  - The Challenges of Traceability (90 minutes)
  - The Fundamentals of Food Traceability (60 minutes)
  - Traceability Technology and How It Improves Your Bottom Line (60 minutes)
  - Profiting from Traceability

- In country workshops

- By-invitation events
In Summary

- **Change thinking:** Leads to game-changing actions
  - e.g. Traceability is more than risk insurance and recalls
  - Traceability is free . . . Reduce costs and increase sales

- **Traceability is an growing area of consumer concern**
  - Take advantage of findings and insights from others
  - All food sectors can benefit

- **Get engaged! Traceability is a tool for innovation**
  - Collaboration is essential
    - Internally / Externally with partners

- **GFTC is here to help**
  - Public-private partnership organization
  - Single go-to resource
    - Leverage the research and lessons learned
  - Focus is on practical solutions and aiding change
Traceability is a Global Challenge

Local Solutions