Global Food Traceability: What’s Next?

Microal – October 14, 2014
William Fisher
Vice President, Institute of Food Technologists
Executive Director, Global Food Traceability Center
Agenda

- Who is IFT?
- IFT and Traceability
- Defining Food Traceability
- Importance of Traceability
- Benefits
- Challenges
- Laws and Regulations
- FDA Pilot Study
- Food Traceability on the Horizon
- The Global Food Traceability Center
The Institute of Food Technologists - IFT
Who We Are

- For more than 75 years, IFT has unlocked the potential of the food science community by creating a dynamic global forum where members from more than 100 countries can share, learn and grow.
Our Strategic Focus

▪ Mission
  Â The Institute of Food Technologists (IFT) exists to advance the science of food. Our long-range vision is to ensure a safe and abundant food supply contributing to healthier people everywhere.

▪ Our Commitment
  Â We strive to provide an inclusive and welcoming community for all food science and technology professionals and the knowledge and tools they need to enhance their professional capacity and competency.
IFT Membership

- More than 18,000 members worldwide
- Members come from industry (81%), academia (15%), and government (4%)
- 18% of IFT members are international in more than 100 countries
IFT Members Come from Many Roles

- Industry Research
- Academic Research
- Product Development
- Product Management
- Packaging Development
- Purchasing
- Lab Management
- Executive Management
- Sales and Marketing
- Food Engineering
- Regulatory
- QA/QC
- Food Safety
- Consumer Insights/Sensory Evaluation
- Public Relations
What We Do

- IFT Annual Meeting & Food Expo
- Publications
  - Journal of Food Science
  - Journal of Food Science Education
  - Comprehensive Review in Food Science and Food Safety
  - Food Technology
  - IFT Press Books
  - Newsletters

- Continuing Education and Professional Development
  - Webinars
  - Short courses
Plan now to join us to celebrate our 75th annual conference. **It’s going to be an event not to miss!**
## 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>
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</tbody>
</table>
Defining Food Traceability
Food Traceability Drivers

<table>
<thead>
<tr>
<th>Food Protection</th>
<th>• Holistic approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Defense</td>
<td>• Intentional contamination</td>
</tr>
<tr>
<td>Food Safety</td>
<td>• Unintentional contamination</td>
</tr>
<tr>
<td>Food Security</td>
<td>• Accessibility and availability</td>
</tr>
</tbody>
</table>

Food Traceability
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

Traceañabilityò  TpNetraceòability  Traceabiñityò
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
Key Stakeholders

Government
- FDA
- USDA
- CDC
- EPA
- Others

Industry
- Farmers
- Processors
- Wholesalers
- Ingredient Suppliers
- Distributors
- 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
Globalizing the Cheeseburger

Vinegar
- Argentina
- Australia
- Austria
- Belgium
- Brazil
- Canada
- China
- Chile
- Colombia
- Denmark
- Dom. Rep
- 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:
  - 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
  - Threat of terrorism

- Impact of above:
  - Economic loss from negative impact of recalls
  - Rising distrust of the food supply chain. Fragile consumer confidence
  - 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?

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

Source: Grocery Manufacturers Association, 2011
Traceability Benefits
Traceability: Relevance to Food Safety

- Causality
- Trust
- Visibility
- Agility

Prevention | Preparedness
---|---
Food Safety and Defense
---
Recovery | Response
Reported Record Keeping Benefits

- Expanded markets
- Improved supply chain management
- Insurance cost reduction
- Decreased spoilage
- Process improvement
- Cost of recalls reduced
Market Access Benefits

- Focuses on revenue growth and margin improvement

- Different markets demand different product attributes
  - Organic products/ locally grown/ sustainable/ etc.
  - Premium products — feed, specialty grains, handling
  - Non-genetically modified

- Market entry requirement — prove the product has specific attributes
  - Traceability provides tools to support claims
Risk Mitigation

- Significantly lower costs of business
  - Reduce the time to trace suspected products
  - Correctly identify affected products and companies
  - Reduce the scope of recall or withdrawal
  - Decrease risk & liability → lower insurance costs
  - Reduce potential fraud and counterfeit products
Other Reasons to Invest in Global Traceability

- Ease compliance with global regulations
- Improved recall process — Lower costs
- Greater inventory visibility — Faster order-to-cash
- More timely and accurate upstream and downstream data — Reduced working capital
- Improved returns process — Reduced risk
Summary

- 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 gathering data and storing it.

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

- Traceability is free, but it is not a gift; it does require work.
Traceability Challenges
Traceability Challenges

- Consumers are more vocal
  - Demand for rapid access to reliable and relevant information whenever they need it
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
  - Retail and Food Service
  - Transportation & Distribution
Traceability Challenges

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

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

- Lack of technology
  Technology is not the problem but it can be a solution
Traceability Laws & Regulations
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)
Traceability Laws, Regulations and Standards

- Global Food Safety Initiative
- European Food Safety Act
- Safe Food for Canadians Act
- FSMA
Food Safety Modernization Act

- Law passed January 4, 2011
- Most expansive changes since 1938 Act
- Ambitious schedule for increased inspections
- Substantial new regulatory requirements
- Major new program activities for FDA
- Exacting new food import requirements
- Sweeping new enforcement authorities
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
FSMA Section 204
Key Requirements

- Pilot projects
- Report to congress
- Designation of "high risk" foods
- Proposed rule
- Public meetings
- Final rule
- Guidance
Pilot Requirements and Scope

- Conduct two food product tracing pilot projects in coordination with the
  - (1) processed food / ingredient sector
  - (2) produce sector
  - Include at least two different types of FDA-regulated foods that have been the subject of significant outbreaks between 2005 and 2010

- Reflect the diversity of the food supply and consider / address confounding factors, such as commingling and trans-shipment

- Develop and demonstrate methods for rapid and effective tracking and tracing of these selected foods that are practical for facilities of varying sizes, including small businesses

- Assess the costs and benefits of the methods for rapid and effective tracking and tracing of the selected foods and key ingredients
Recommendation 1
Overarching

- FDA should establish a uniform set of recordkeeping requirements for all FDA-regulated foods
  - No exemptions based on risk classification
  - Guidance documents need to be created by FDA defining these requirements
Pilot Recommendation 2

- FDA should require all firms in the supply chain to identify and maintain records for all Critical Tracking Events (CTEs) and corresponding Key Data Elements (KDEs) as defined by FDA.
  - Should be based on input from the food industry.
Pilot Recommendation 3

- FDA should require each member of the food supply chain to develop, document, and exercise a product tracing plan

*Sec 103 - FDA can require a recall plan
Pilot Recommendation 4

- FDA should encourage and support existing industry-led initiatives for the development of implementation guidelines and should seek targeted stakeholder input via several input mechanisms.
Pilot Recommendation 5

- FDA should clearly and more consistently articulate and communicate to industry the information needed during a product tracing investigation
Pilot Recommendation 6

- FDA should develop standardized, structured, and electronic mechanisms for industry to provide the Agency CTE and KDE product tracing data when requested during a specific food safety investigation
Pilot Recommendation 7

- FDA should accept CTE and KDE data sent in summary form through standardized and structured reporting mechanisms and initiate investigations based on this data
  - Need to balance speed vs accuracy
  - Reliability, relevance, rapid access
Pilot Recommendation 8

- If available, FDA should request CTE and KDE data for more than one up - one back in the supply chain
Pilot Recommendation 9

- FDA should pursue the adoption of a technology platform to allow the Agency to efficiently aggregate and analyze data reported in response to a specific regulatory request.
Pilot Recommendation 10

- FDA should coordinate traceback investigations and develop response protocols between and among state and local health and regulatory agencies using existing commissioning and credentialing processes.

  FDA should formalize the use of industry Subject Matter Experts (SMEs) to address FDA’s general questions about the characteristics of a particular supply chain at the outset of an investigation.
Next Steps

- For FDA: Food Safety Modernization Act (FSMA)
  - Report to Congress
    - Will include IFT’s Report
  - Establishment of High Risk Foods
    - Proposed rule will only apply to high risk foods
  - Proposed Rule for Additional Recordkeeping Requirements
    - Will hold 3 public meetings for input
  - Final Rule
    - Waiting for proposed rule to be published
  - Implementation and compliance
    - Probably tiered for very small to large firms
Food Traceability: On the Horizon
On the Horizon

Â Consumers
- Conscious consumers
- Individualized Needs
- Citizen science

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

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

- Insecurity
- Food
- Water
- Energy
- Health
- 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

Â Consumers
  ã Conscious consumers
  ã Citizen science
  ã Individualized Needs

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

Â Technology
  ã System of systems
  ã Ubiquitous
  ã Smart versus artificially intelligent
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.
Food: Revolutionary versus Evolutionary

What are the food safety implications?
What are the regulatory implications?
What are the economic implications?

Image Sources: http://www.huffingtonpost.com/2013/05/21/3d-printed-food-nasa_n_3313363.html
Presentation Outline

Â Consumers
  í Conscious consumers
  í Citizen science
  í Individualized Needs

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

Â Technology
  í System of systems
  í Ubiquitous
  í 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: 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
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

Founding Sponsors
- Advisory Council

Key Stakeholders
- GFTC

Contributing Partners
- Project Working Groups

GFTC
- Research
- Education and Training
- Protocols and Standards
- Technology Transfer
GFTC Sponsors

Logos are the copyright of their respective organizations and are used here for illustrative purposes only.
Our approach will be to engage stakeholders in the development of solutions, as well as in their delivery.
Initial Launch Projects

- Protocols & Standards
  - Benchmark international standards and requirements for harmonization

- Research
  - Develop best practices guidance document

- Education & Training
  - Food traceability courses on principles and systems

- Seafood Traceability
  - Grant from the Moore Foundation
Moore Foundation Grant

- **Enhancing Seafood Value Chain Traceability**
  - Project Lead: Brian Sterling

- **Purpose:** to strengthen the performance and proficiency of the industry through the impact of traceability on reduction of waste, enhancement of consumer trust, and increase of business efficiencies. Additionally, to provide tools to better understand the return on investments (ROI) in traceability solutions.

- **Expected Outcomes:** To understand the links between traceability and (1) enhancing consumer confidence, and (2) reducing food loss/waste; also develop a decision support software tool to help ROI business cases for traceability investments and improvements.
Seafood Traceability Assessment

- Heightened interest and urgency in traceability . . . Why?
  - Seafood industry in huge transition
  - Brand equity and consumer perceptions
  - Fraud
  - Increasing complexity
  - Sustainability / Waste

- Gordon & Betty Moore Foundation Project
  - Address reduction of waste, consumer trust
  - How does traceability affect value chain and business vitality?
  - ROI software application tool for traceability investments

- Publication in early 2015
Traceability is a Global Challenge

Local Solutions
www.globalfoodtraceability.org

Thank you.
Characteristics of a Traceability System

- Provide access to all traceability-related properties of a food product, not just those verifiable by analysis
- Provide access to properties of a food product or ingredient in all its forms, in all links of the chain
- Facilitates traceability of food product backwards (where it came from) and forwards (where it went)
- Based on systematic recording and exchange of these properties
- Unit identification or numbering system is present and links to the properties
Recent 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)
FSMA: Rulemaking Process

- Proposed rule published
- Comments requested
- Public meetings
- Comments considered
- Final rule published
- Industry compliance
- Guidance Documents

Adapted from FDA's FSMA Website: http://www.fda.gov/fsma
Advisory Council Members

- Cargill Inc.
- Centers for Disease Control
- Center for Science in the Public Interest
- Cornell University
- Eurofins Laboratories Inc.
- FMI Foundation
- Global Cold Chain Alliance
- Global Food Safety Partnership (World Bank)
- GS1-US
- International Association for Food Protection
- Intertek Group
- Lyngsoe Systems A/S
- Mars Inc.
- National Center for Food Protection & Defense
- NFI Seafood Industry Research Fund
- Ontario Ministry of Agriculture & Food
- Pepsico
- Produce Marketing Association
- Trace One
- The Acheson Group
- University of Guelph
- USDA
- US Commerce Department
- Wal-Mart Inc.
- Wegmans Food Markets
- Dr. Angie Siemens
- Dr. Ian Williams
- Caroline Smith DeWaal
- Dr. Robert Gravani
- Dr. Douglas Marshall
- Dr. Hilary Thesmar
- Lowell Randel
- Amy Evans
- Angela Fernandez
- Dr. Don Schaffner
- Arash Eskandari
- Robert Lynn
- David Crean
- Dr. Frank Busta
- Steven Mavity
- George McCaw
- Greg Buckley
- Ed Treacy
- Doug MacDonald
- Dr. Jennifer McEntire
- Dr. Sylvain Charlebois
- Kenneth Petersen
- Corey Wright
- Frank Yiannas
- Gillian Kelleher
Strengthen the Food System

- International Scope
- Increased Responsiveness
- Greater Collaboration
- Improved Understanding
- Pragmatic Implementation