Maize to Milk: An Analysis of the Traceability Systems of Bulk Commodities

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June 29, 2009
Presentation Outline

- Terminology
- Standards and Regulations
- Current Affairs
- Project Description
- Project Objectives
- Methodology
- Results
- Conclusions
- Future Work
- Acknowledgements
Traceability
Terminology

- Traceability: the ability to track any food, feed, food-producing animal or substance that will be used for consumption, through all the stages of production, processing, and distribution (Official Journal of the European Union, 2002).

- Traceability system: totality of data and operations that is capable of maintaining desired information about a product and its components through all or part of its production and utilization chain. (International Organization of Standardization, 2007).

- Tracking: is the capability to follow the path of a specified unit and/or lot of trade items downstream through the supply chain as it moves between trading partners. (Can-Trace, 2004).

- Tracing: is the capability to identify the origin of a particular unit located within the supply chain by reference to records help upstream in the supply chain. (Can-Trace, 2004).
Terminology continued...

- Internal Traceability: monitors a product as it is delivered, processed, combined, packaged, within a facility.
- External Traceability: monitors a product from raw ingredients through processing to the consumer.
Standards and Regulations

- **United States**
  - Public Health Security and Bioterrorism Preparedness Act (June, 2002).

- **European Union**
  - EC 1829/2003 GM Food and Feed (September, 2003).

- **Canada**

- **Internationally**
  - ISO 22000 (September, 2005).
  - ISO 22005 (July, 2007).
Current Affairs

Bovine Spongiform Encephalopathy
“Mad Cow Disease”

Aflatoxin

E. Coli O157:H7

Salmonella

Melamine

Salmonella
What’s Next

Internal Traceability

External Traceability

Bulk Commodities

Corporate Interest
1. Analyze internal traceability system currently in place by each respective entity.

2. Analyze external traceability system among all participants.

3. Analyze information exchange between each entity.
Aflatoxin

- Aflatoxins are toxic metabolites produced by certain fungi in/on foods and feeds, especially tree nuts, peanuts, corn, and cottonseed.

- Aflatoxin B1, the most toxic and carcinogenic can be metabolized when ingested by dairy cattle and shows up as M1 in milk.

- Ethanol can be produced with aflatoxin contaminated corn.

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn for interstate movement</td>
<td>20 ppb</td>
</tr>
<tr>
<td>Corn for lactating cows</td>
<td>20 ppb</td>
</tr>
<tr>
<td>Milk</td>
<td>0.5 ppb for fluid milk</td>
</tr>
<tr>
<td>Corn for breeding beef cattle/swine or mature poultry</td>
<td>300 ppb</td>
</tr>
<tr>
<td>Corn for finishing swine &gt; 100 lbs</td>
<td>200 ppb</td>
</tr>
<tr>
<td>Corn for finishing beef cattle</td>
<td>300 ppb</td>
</tr>
</tbody>
</table>
Aflatoxin Risk Example

- Ground Corn
- Wet Corn Gluten
- Corn Silage
- DDGS
- Dairy Farm
- Tankers
- Silos
- HTST
- Milk Only
- Ethanol Plant
- School Lunch Programs
- School Breakfast Programs
- WIC
- Grocery Stores
Project Objectives

- Create a model/map for tracing these commodities from corn to milk.

- Identify gaps in the traceability systems.

- Provide quality control/quality management strategies and recommendations to improve the external traceability system.
Methodology

- Selection of a dairy processor
  - Kick off meeting
- Interview and tour series
  - Quality Assurance Director
  - Assistant Director of Plant Operations
  - Dairy Farm Owner
  - Dairy processing facility tour
  - Dairy farm tour
- Assessment and data analysis
Demographics

- **Dairy Processor**
  - Regional
  - 300+ milk and dairy products
  - 387 miles, 4 states

- **Dairy Farm**
  - Milks 2300 cows/day
  - Provides processor with 17,000+ lbs/day of milk

- **Feed Network**
  - 1 ethanol plant
  - Corn suppliers all within 5 miles of dairy farm
  - Feed ingredients originate in at least 5 states
Interview & Tour Series

- Semi-structured interview style
  - Traceability Systems
  - Regulations & Standards
  - Data Management Practices
  - Product Standards
  - Standard Operating Procedures
  - Approximate number of suppliers

- Documentation
  - HACCP Procedures
  - Product Movement Records
  - Pasteurization Charts
  - Bills of Lading
Assessment

ISO 22005

Processing Facility

Objectives

Products/Ingredients
Flow of Materials
Information Requirements
Documentation Requirements
Establishment of Procedures
Feed and food chain coordination

Regulatory/Policy Requirements
Position in the feed food chain

HACCP
Electronic Data Capture
GMP’s
Pre requisite Programs
Product Flow Diagram
Supplier Guarantee Program
Quality Testing
Biological Testing
Paper Data Capture
Quality Control Procedures

Compatibility Table
Results

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Supply Chain Mapping

Supply Chain Diagram
Results

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Identified Gaps

- Date Received
- Supplier
- Bill of Lading
- Operator
- Silo
- Destination
- Silo Level

- Silo Source
- Product
- Product Total
- Product Destination
- Cream Destination
- Cream Total

- Filler ID
- Product Description
- PT Tank Source
- Date Received
- UPC Number
- Sell By Date
- Cooler Location
- Pallet ID
- Quantity
- Product Destination
- Route ID
- Order Number
Identified Gaps

- Inconsistent capture of data, both electronic and paper.
- Lack of a product recall procedure.
- Lack of objectives, the foundation of an ISO 22005 traceability system.
- Inconsistent method of data capture.
Results

- Create a model/map for tracing these commodities from corn to milk.

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- Provide quality control/quality management strategies and recommendations to improve the external traceability system.
Quality Control/Quality Management Strategies

- Standardization of data collection methods and adoption of uniform data format.

- Implementation of product standards at the processor level that will subsequently affect the entire supply chain.

- Requirement of all suppliers to develop and implement defined traceability systems to achieve feed and food chain coordination.

- Implementation of monitoring and verification systems to ensure supplier compliance with company standards.
Conclusions

- Efficient and effective chain of custody system.

- After developing objectives, a traceability system can be developed by integrating additions and alterations to existing quality and safety programs.

- Through consistent data collection, communication, and coordination it is possible to identify the origin of feed ingredients that contribute to a processed milk product found on a local grocery store shelf.
Future Work

- Work with management to develop recall policy.

- Implement traceability concepts in already established quality assurance and HACCP procedures.

- Eventually, develop a defined traceability system based on ISO 22005 standards.

- Implement/ update training to educate employees on basic concepts of traceability and its importance and well as to refresh employees on processes and procedures.
Acknowledgements

Dr. Charles R. Hurburgh Jr.
Dr. Sam Beattie
Dr. D. Raj Raman
Howard Shepherd

Department of Agricultural and Biosystems Engineering
Thank You!