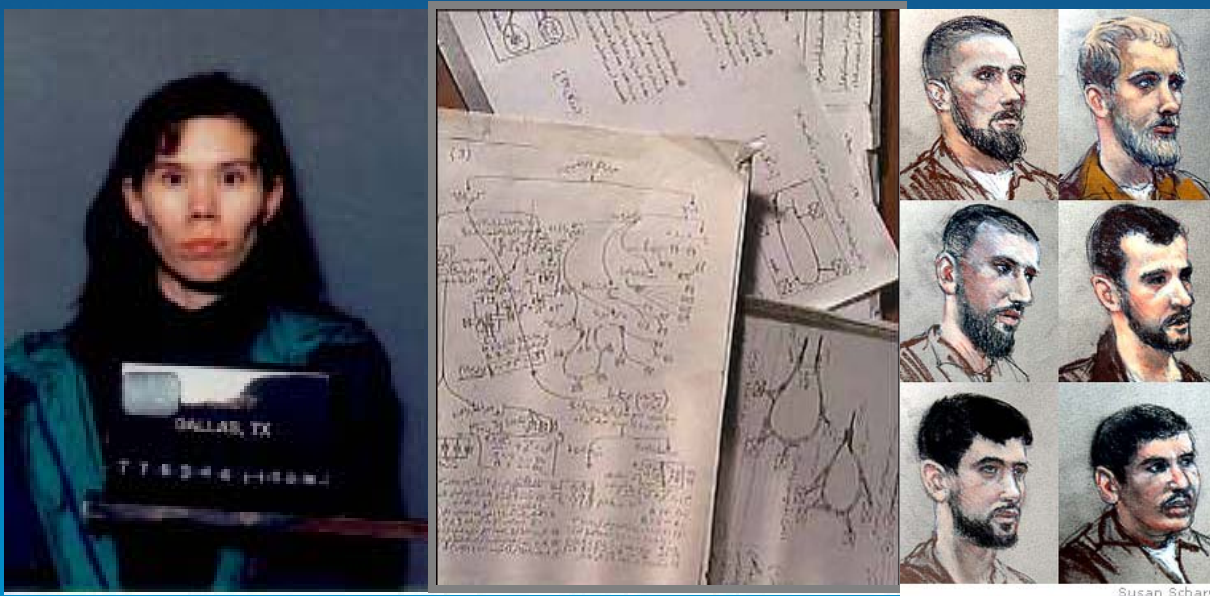


# Consequence Management System: Food Defense and Safety Vulnerability Assessment



August 1, 2007

IFT Global Food Safety & Quality Conference

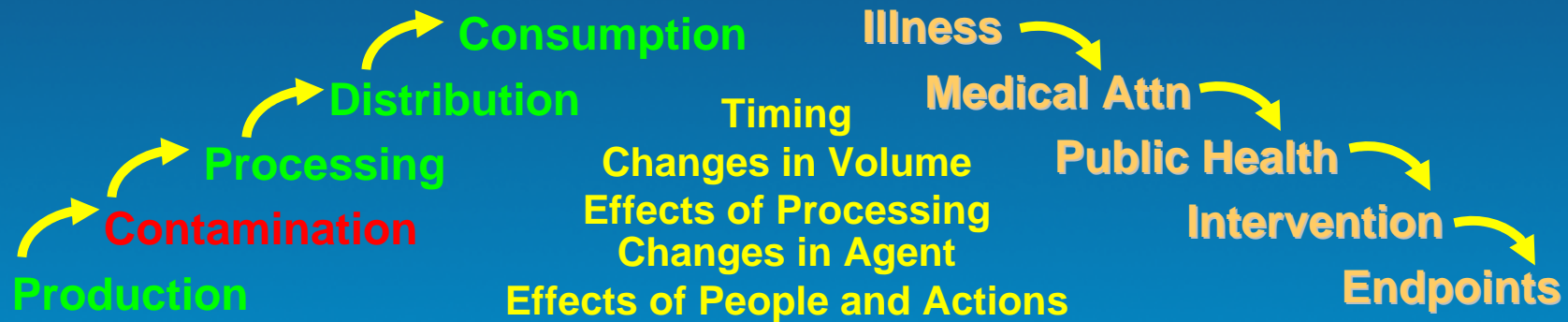
**BT Safety LLC**

# Consequence Management System (CMS)

A predictive model to help **plan**, **inform** and **optimize** the response of government and industry to intentional and unintentional food contaminations

# CMS Outbreak Pathway Modeling

- Portrays the evolution of food contaminations for specific products and agents geographically and temporally
- Analyses and depicts the entire pathway of an outbreak

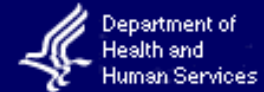


- Quantifies the timing and consequences of events and interventions on consumers, hospitals, businesses, public, etc.

# Development of the CMS is funded by FDA and DHS through the NCFPD and NBACC



U.S. Food and Drug Administration



NATIONAL CENTER FOR  
**FOOD PROTECTION AND DEFENSE**  
A HOMELAND SECURITY CENTER OF EXCELLENCE



**National Biodefense  
Analysis and Countermeasures  
Center**

# Key collaborators include:



Homeland Security



**NUMEROUS  
FOOD  
COMPANIES**



United States Department of Agriculture

NATIONAL CENTER FOR  
**FOOD PROTECTION AND DEFENSE**  
A HOMELAND SECURITY CENTER OF EXCELLENCE



**CIDRAP**



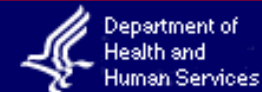
**Health Services**  
LOS ANGELES COUNTY

*Minnesota Department of Health*  
*Protecting, maintaining and improving the health of all Minnesotans*

**Trade Associations**



**U.S. Food and Drug Administration**



**ERS** ECONOMIC RESEARCH SERVICE  
United States Department of Agriculture  
*The Economics of Food, Farming, Natural Resources, and Rural America*



Department of Health and Human Services  
**Centers for Disease Control and Prevention**

# Design of CMS

A tool to model the evolution of all types of food outbreaks

- **Easy-to-use** – useable by inexperienced users
- **Data-centric** – built on real data
- **Visual** - easily visualize and assess the impact of decisions
- **Flexible** - accommodate all reasonable scenarios
- **Practical** – operates when some attributes are unknown or imprecise
- **Extensible** – designed for easy inclusion of improved data and models as they become available
- **Self-Validating** – built on actual data and historical

# Uses of CMS

- **Predict and visually display the evolution of outbreaks**
- **Determine the likely size, scope, and timing of outbreaks for various contamination points**
  - **Estimate vulnerabilities**
  - **Evaluate and cost justify investments in prevention**
- **Risk rank agents, food groups and combinations**

## Uses of CMS (cont)

- **Identify the differential impact on vulnerable subpopulations (age, immune compromised, etc.)**
- **Evaluate effectiveness of interventions (media, company, government agency)**
- **Project the economic consequences of various outbreaks**
- **Estimate surge requirements of public health infrastructure**

# CMS event selection screen

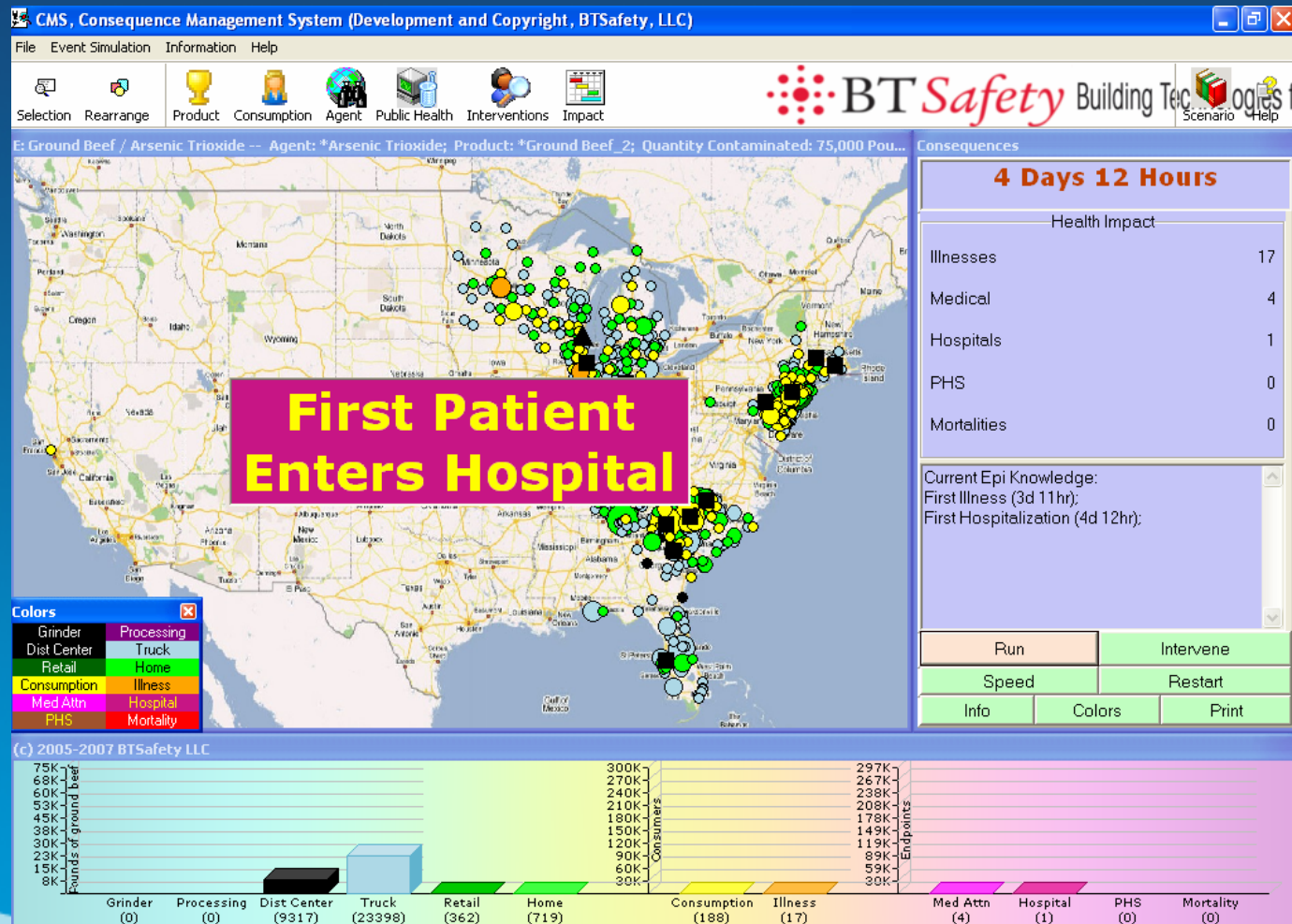
The screenshot displays the CMS event selection interface. At the top, the window title is "CMS, Consequence Management System (Development and Copyright, BTSafety, LLC) - [Event Selection]". The menu bar includes "File", "Event Selection", "Information", and "Help". The toolbar contains icons for "Selection", "Rearrange", "Product", "Consumption", "Agent", "Public Health", "Interventions", and "Impact". The BT Safety logo and "Building Technologies for Safety" text are visible in the top right.

The main interface is divided into several sections:

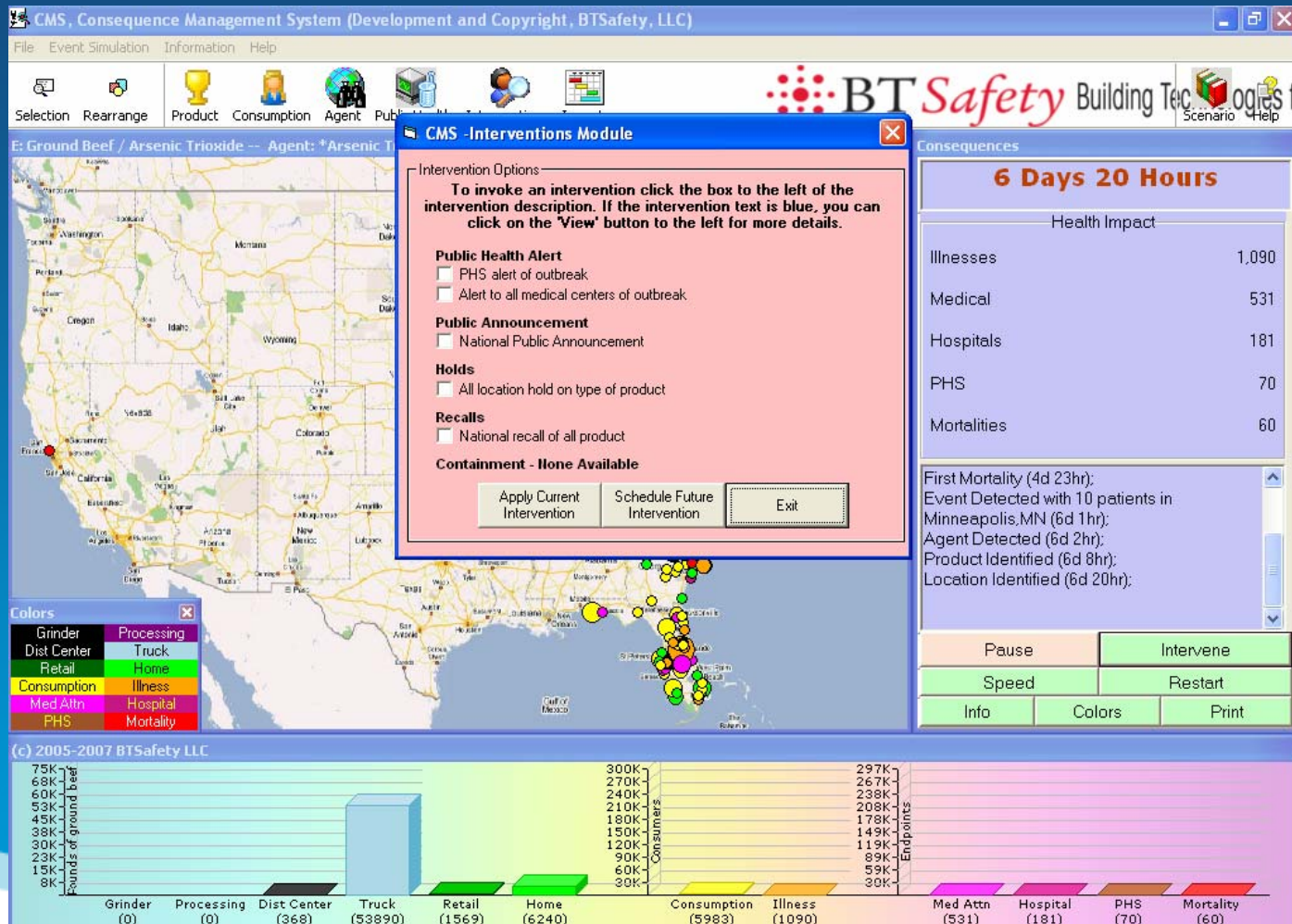
- Navigation Buttons:** "Create New Event", "Assign Selections", "Run Event" (highlighted in green), "Archived Events", "Archive Event", and "Delete Event".
- Event Selection:** A dropdown menu shows "Ground Beef / Arsenic Trioxide" selected. Below it, other options include "Ice Cream / Botulinum toxin (Intentional)" and "Bottled Water (1/2 liter PET) / E Coll O157:H7".
- Profile of the Food:** A tree view on the left lists categories like "Fats and oils", "Fish products", "Fresh eggs", "Fresh fish", "Fresh fruits and fruit juices", and "Fresh meats". Under "Fresh meats", "\*Ground Beef" and "\*Ground Beef\_2" are listed. Below the tree, the selected item is "Ground Beef".
- Profile of the Agent and Event (Intentional):** A tree view on the right lists "Chemical Agents" such as "Water soluble, heat stable", "\*Arsenic Trioxide", "Cyanide", "\*Ricin", "Saxatoxin", "Organophosphate pesticides", "Fluoroacetic acid", and "Amanitin". The selected agent is "ArsenicTrioxide".
- Form Fields:** Below the food profile, there are dropdown menus for "Season" (set to "All"), "Food Source" (set to "Milwaukee, WI"), "Distribution Channel" (set to "Retail"), and "Contamination Point" (set to "Grinder"). A text field for "Quantity of product at point of contamination (in Pounds)\*" is set to "100,000".
- Scenario Options:** Checkboxes for "Run the representative scenario" (checked) and "Fixed scenario". A checkbox for "Uniform shipments" is unchecked. A "Last day: 25" field and an "Est. Run Time" field with the value "2" are present.
- Agent Profile Form:** A green-shaded area contains dropdown menus for "% of Product Contaminated\*" (75%), "Average Contamination Level (at point of consumption)" (1 LD50 per serving), "Public Health Response Time\*" (2 - 5 days), "Impact Metric" (Health Impact), and "Affected Subpopulations" (General Public).

At the bottom, a note reads: "This is a 'Tree' of agents. Click any 'branch' to open it, then click the Agent name to select it. Agents that are preceded by an asterisk (\*\*) are illustrative."

# CMS event modeling screen



# Interventions can be invoked at various stages in the evolution of events



# Food list

- Lettuce
- Fluid milk
- Bottled water
- Dry milk-based infant formula
- Shrimp
- Fresh squeezed orange juice
- Chocolate bars



# Additional foods of interest

- Spinach
- Ice cream
- Peanut butter
- Liquid eggs
- Precooked eggs
- Tomatoes
- Ground beef
- Fresh chicken
- RTE meats
- Enhanced pork loins



# Agents

## Microorganisms

- *Bacillus anthracis*
- *Burkholderia mallei*
- *Burkholderia pseudomallei*
- *Cryptosporidium parvum*
- *Escherichia coli* O157:H7
- *Francisella tularensis*
- *Salmonella typhi*
- *Shigella dysenteriae* type 1
- *Vibrio cholera*
- *Yersinia pestis*

## Other

- BSE
- Norovirus

## Toxins

- *Clostridium botulinum* neurotoxin (A)
- Staphylococcal enterotoxin B
- Abrin
- Alpha-amanitin
- Ricin
- Saxitoxin

## Chemicals

- Cyanide
- Arsenic trioxide
- Fluoroacetic acid
- Aldicarb

# The CMS is a data intensive system

## Food Distribution

Sourcing  
Processing  
Distribution

## Consumption

Consumer demographics  
In-home handling practices  
Consumption patterns

## Disease Progression

Agent characteristics  
Food-agent interaction  
Dose response  
Secondary transmission  
Disease states  
Symptoms  
Patient response

## Public Health Response

Organizational structure  
Detection  
Reporting systems  
Recognition  
Type and speed of response

## Event Impact

Morbidity/mortality  
Clinical outcomes  
Economic impact  
QALYs  
Intervention impact

# **The system is only as good as the data**

**Significant efforts have been directed to  
developing comprehensive databases**

- **CDC – Expert support**
  - **Infectious Diseases**
  - **National Center for Environmental Health**
- **FDA – Expert support and data**
- **USDA – Expert support and recall data**

# Support for CMS development

- **Public Health Departments – Expertise and data**
- **Law firms – Data**
- **Practicing physicians – Expertise**
- **Clinical labs – Expertise and procedures**
- **Academia – Microbiology, Food Science, Public Health, Risk Communication**
- **Trade Associations – National Pork Board, International Bottled Water Association, United Fresh Fruit and Vegetable Association, etc.**

# **Industry participation has been critical to CMS development**

## **Partial list of participating companies includes:**

- **One of the largest foodservice distributors in the U.S.**
- **Four national produce suppliers**
- **Several dairy processors in Minnesota and California**
- **One of the nations largest suppliers of fresh chicken and ground beef**
- **3 of top 6 QSR's including hamburger, sandwich and fast casual**
- **3 of top 5 national chains in "casual dining" and one smaller new growth chain**

# Why does industry participate?

- **Because Industry members recognize it is the right thing to do!**
- **Helps inform government agencies with “actual” information**
- **Allows development of realistic scenarios with factual supporting information**
- **Dimensionalizes risks for industry sectors**
- **Helps industry decide on where defense dollars should be spent**
- **Helps minimize industry exposure when recognition and response is more rapid**

# Managing confidential data

- The data we request is considered highly confidential
- Identity of companies not disclosed
  - Data sanitized of all company references
  - Aggregate data used in the model
  - Original data destroyed or returned
- Secure data storage
  - Secure password protected server at BTSafety used exclusively for data storage (no internet connection)
- Information is not available through FOI
- Confidentiality agreements available

**Please contact us if you  
want to participate!**

**Susan Harlander**

**BTSafety LLC**

**612-845-2416**

**sharlander@btsafety.com**