



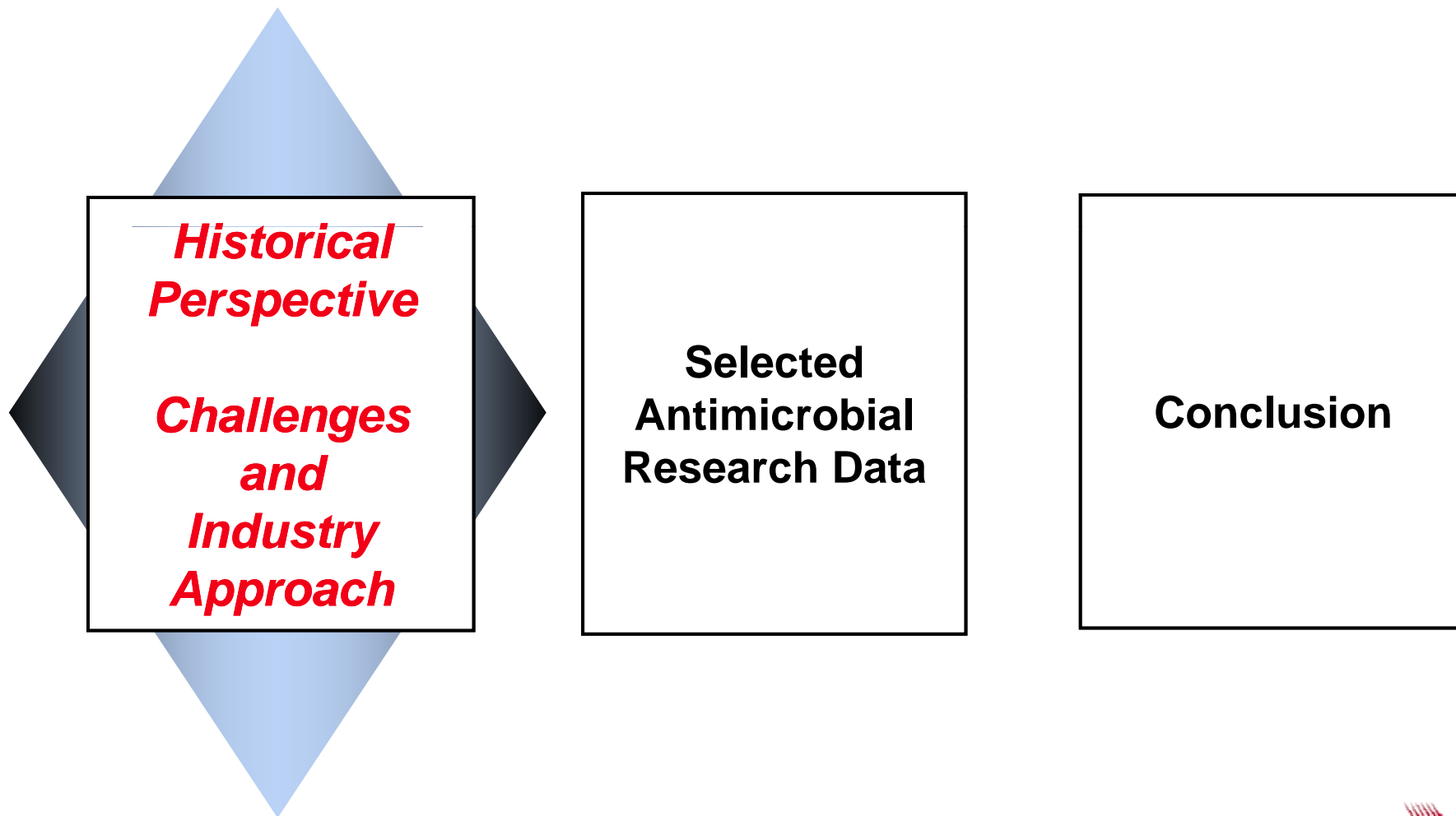
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CMC - E.coli O157:H7 Policy Workshop
June 11, 2008 – Toronto, Ontario

www.vantagefoods.net



Presentation Outline



Canadians understand the issue of “adulteration,” and recognized very early the need to safeguard public health . . .

- The history behind adulteration
- Inland Revenue Act - 1876: For the prevention of the adulteration of Food, Drink, and Drugs
- In reality, it was the adulteration of liquor that was of concern with respect to the **“evils of strong drink”** (where adulterated liquor may contain table salt, opium, Indian hemp, Indian Berry, etc.)
- In the USA, E.coli O157:H7 was declared as an adulterant in 1994 in ground beef, though the pathogen was first recognized as a disease-causing agent in 1982

. . . through the passage of the “Adulteration Act” in 1884, which was later repealed to become the modern day “Food and Drug Act” in 1920.

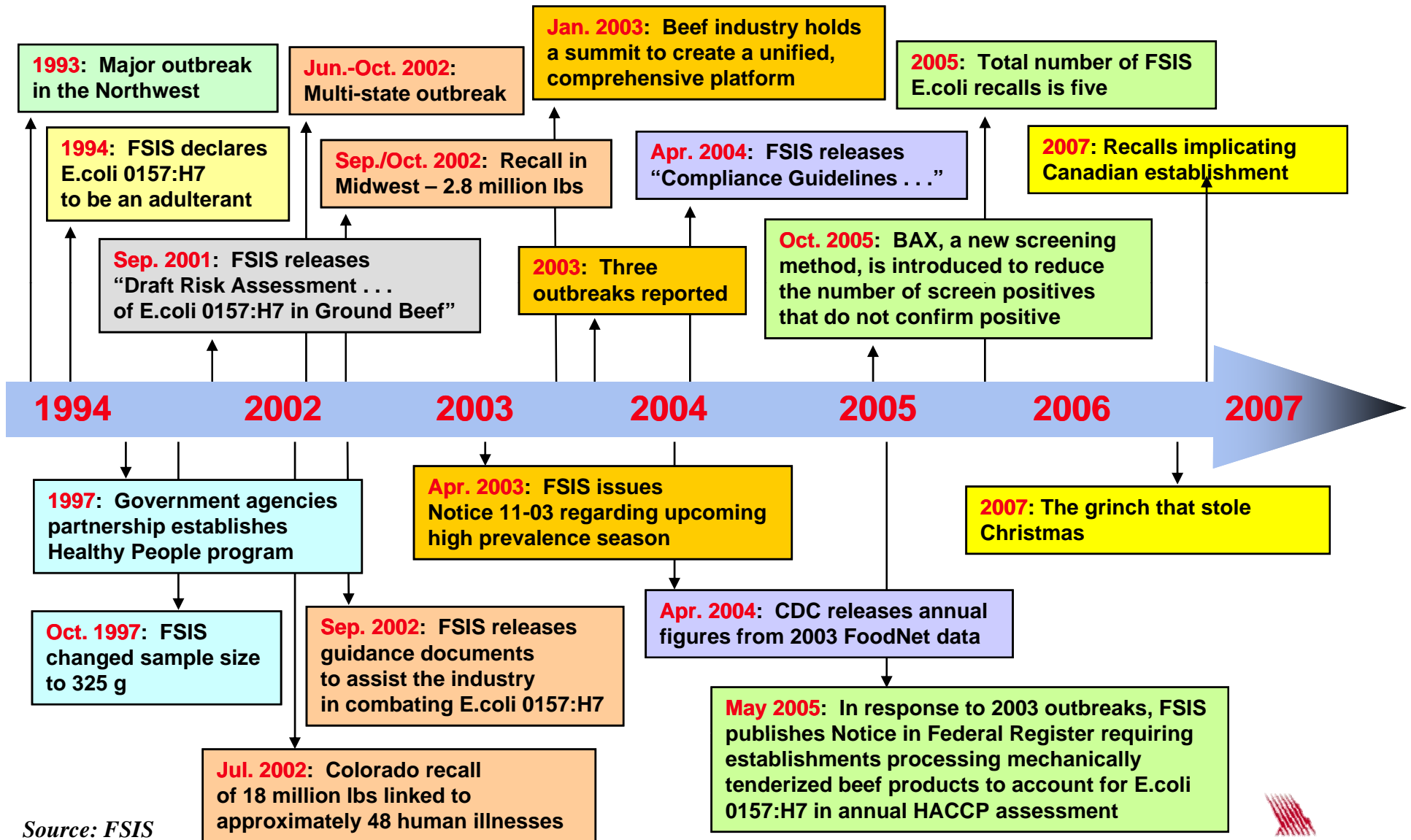
Canada unveiled a new Consumer Product Safety Act and the modernization of the Food and Drugs Act- April 8, 2008



3-main areas of the new- Canada Consumer Product Safety Act:

- a) Active Prevention- better safety information to consumers**
- b) Targeted Oversight- safety test to fully understand targeted areas**
- c) Rapid Response- faster action to protect the public (+ near-misses)**

Timeline of Events Related to E.coli 0157:H7



Source: FSIS

*Breakdown of Beef related E.coli recalls in the **US in 2007** according to the Size of Establishments Producing the Implicated Beef Products*

➤ **Very Small: None**

– **Very Small: <10 employees**

➤ **Small: 10 of 11 implicated establishments**

– **Small: 10-499 employees**

➤ **Large: 1 of 11 implicated establishments**

– **Large: 500 or more employees**

a) A very high proportions of the recalls involved frozen beef products;
b) Willingness of the establishment to receive shipment that previously tested positive for the pathogen

According to the FSIS source- In CY 2007 FSIS Recall associated with E.coli O157:H7 are:

- **21 class I recalls due to *E. coli* O157:H7**
- **Total meat affected for the 21 cases was approximately 33,358,521 lbs.**
- **Primarily involved ground beef, but other products were involved, e.g. pepperoni pizza and mechanically tenderized steaks.**

Adapted from K. Petersen (FSIS)

General Categories of Control Measures

- **Process control – GMP, Training, Sanitation, etc.**
- **Chemical (e.g. organic acids, oxidizing agents, bacteriocins)**
- **Physical (e.g. heat, steam, electron irradiation, high pressure, UV light)**
- **Gas – MAP system (e.g. modified atmospheres)**
- **Biological (e.g. bacteriophage, competitive exclusion bacteria)**

**With varying degree of success on the target pathogens
and the food/meat matrices**

Challenges to applying control measures?

- **Meat Intrinsic Considerations:**
 - *Neutral pH*
 - *Composition*
 - *Interaction of antimicrobials with components*

- **Nature of the target Microbial aspects:**
 - *Location of microorganisms*
 - *Non-homogeneity of contamination*

- **Processing environment**
 - *Safety: Employees, Products, and Environment*

- **Regulatory approval process**

Labeling: which one do you prefer?

**INGREDIENTS: Water, Beef,
Enriched Flour, Sucrose, Salt, Spices
ALLYL ISOTHIOCYANATE**

**INGREDIENTS: Water, Beef,
Enriched Flour, Sucrose, Salt, Spices
HORSE RADISH EXTRACT**

*Industry and Scientific community working together to **evolve** Beef Best Practice approaches.*

Coordinated Through Beef Industry Food Safety Council (BIFSCO)

- **Best practices for:**
 - *Beef Slaughter*
 - *Vacuum-Packed Sub-Primals*
 - *Raw Ground Beef Products*
 - *Non-Intact Tenderized Products*
 - *Non-Intact Enhanced Products*
 - *Sampling and Testing*
 - *Holding Tested Product (Test-and-Hold)*

- **CMC, AMI, NAMA, Bifsco.org, NMA, and others**

Ground Beef Best Practices

Formulation Control

- Lot control – sub-lotting to smaller units (size/time)
- Material source: external vs. bench-trim
- Rework control – avoid carryover of product from day-to-day
- Have product hold procedures:
 - *Clean up to clean up not the rule any more*
 - *Challenge your operational system – continuously to ensure that you still meet the needs*



Blade Tenderization Best Practices

- **Cold Chain Management – a must throughout**
- **Raw Material Audit – know your suppliers' BIC practices**
- **Interventions – What, when, and how; and the efficacy?**
- **Blade Tenderization – Types: straight blade or enhanced:**
 - *Sanitation program to compliment the process*
 - *Train your employees to know and work your process*
- **Develop a comprehensive Traceability Program:**
 - *Data capturing (real-time and PC-base)*
 - *Log and documentation record*
- **Do not wait till the recall time for process evaluation**

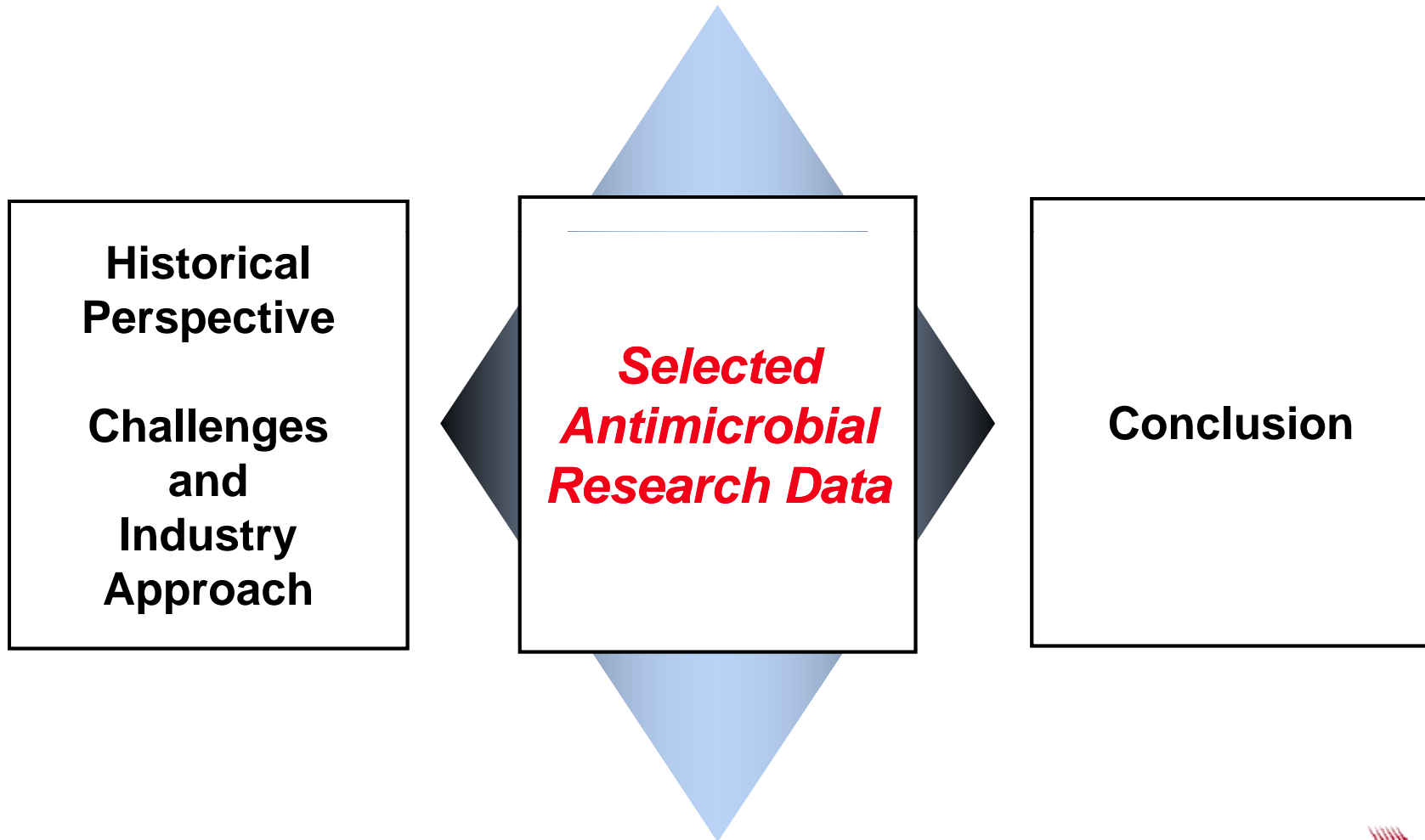
3-Cases of bad judgment and failure to adhere to fundamental process control led to adulteration of tenderized beef products

- **August 2000: The pathogen was contracted from eating at a local restaurant steakhouse in Michigan**
 - The producer of the meats had poor sanitation practices around the process. Agreed to re-assess including sanitizing the needle

- **June 2003: In Minnesota; Boneless beef filet bacon-wrapped steak was the vehicle. It was injected with marinade---- The establishment only **breakdown Equipment, clean, and sanitize 1x/week**. Since then it too re-assessed and does SOP of the cleaning daily???**

- **October 2004- Colorado Dept PH isolated the pathogens from patients all had common meal- marinated steaks**

Presentation Outline



Definitions of key terms used in Food Processing

Antimicrobials: Chemical Compounds Present in or Added to FOODS, FOOD PACKAGING, FOOD CONTACT SURFACES, or FOOD PROCESSING ENVIRONMENTS that Inhibit the Growth of, or Inactivate, PATHOGENIC or SPOILAGE Microorganisms

Processing Aid: a substance used in the manufacture of food products but is not present in the finished food product

Food Additive: any chemical substance added to food at any stages of processing/storage that becomes part of the food or affects its characteristics while serving a particular technical function (CFIA)

Effect of cetylpyridinium chloride (CPC) on E.coli O157:H7 on beef under different treatment conditions.

Beef Surface	Treatment Conditions	Log Reduction of E.coli O157:H57/g or cm²	Reference
Beef cubes	Beef cubes sprayed with 10 ml 0.5% CPC and wrapped in packaging materials containing an absorbent pad sprayed with 20 ml CPC and then stored for 14 days at 4°C	2.8	K.Lim and A.Mustapha, J.Food Prot. 67:310 (2004)
Roast beef, sliced	Beef slices sprayed with 2.5 ml 0.5% CPC and then air dried for 5 minutes prior to packaging with an adsorbent pad containing 5 ml CPC package then stored for 10 days at 4°C	6.2	K.Lim and A.Mustapha, Food Microbiol. 24:89 (2007)
Beef carcasses	Beef carcass surfaces sprayed with 0.5% CPC solution for 30 s every 30 minutes during 10-h chilling	>5.0	J.D.Stopforth et al. J. Food Prot. 67:2099 (2004)

Adapted from M. Doyle

Selective antimicrobial agent – acidified sodium chlorite on E.coli O157:H7 on beef under different treatment conditions – SANOVA.

Beef Surface	Treatment Conditions	Log Reduction of E.coli 0157:H57/g or cm²	Reference
Beef briskets	ACS (1,000 ppm, pH 2.5) sprayed on beef briskets for 10-60 s at a pressure of 419 kPa	~1.5	M.N.Hajmeer et al. Meat Sci. 68:277 (2004)
Beef carcasses	Beef carcass surfaces sprayed with 0.12% ACS for 30 s every 30 minutes during a 10-h chilling	1.7-2.2	J.D.Stopforth et al. J.Food Prot. 67:2099 (2004)
Ground beef	Beef trim sprayed on one side with a 1,200-ppm ACS and then ground	1.2	K.Harris et al. J.Food Prot. 69:1802 (2006)
Beef cubes	Beef cubes sprayed with 10 ml of 0.12% ACS, wrapped in packaging materials containing an absorbent pad sprayed with 20 ml ACS, and then stored for 14 days at 4°C	4.6	K.Lim et al. J.Food Prot. 67:310 (2004)

Adapted from M. Doyle

A case for the organic acids- e.g. Lactic acid

- It is a natural product
- It is physiological and not toxic
- Produced fortuitously in meat products via fermentation
- Discoloration that may occur is in the subcutaneous fat cover (trimmed off)
- Colorado State University
- Ohio State university (Ockerman et al.)
- Texas Tech University
- Kansas State University
- University of Arkansas

Don't expect a silver bullet; best practice approach along with multiple hurdles with continuous Improvement will help to keep the pathogens under control

Steam Pasteurization

Organism

Brisket @

***E. coli* O157:H7**

Water Wash

0.75

Steam Pasteurization

3.53

Coliforms

Steam Pasteurization

1.25

@ Log CFU/cm² Reductions

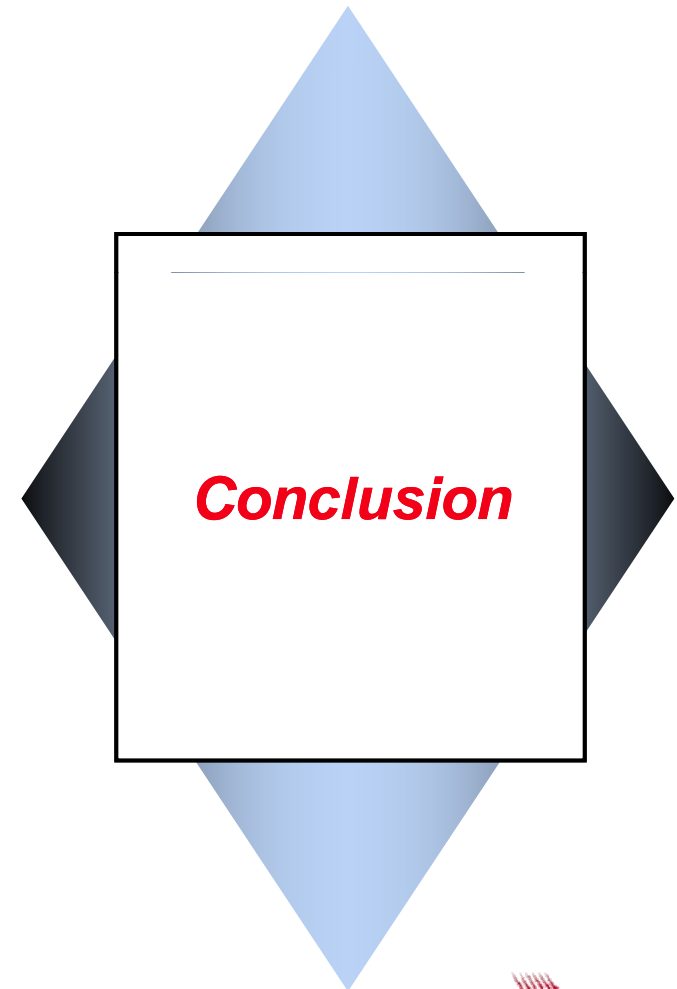
Nutsch et al. 1998

Presentation Outline

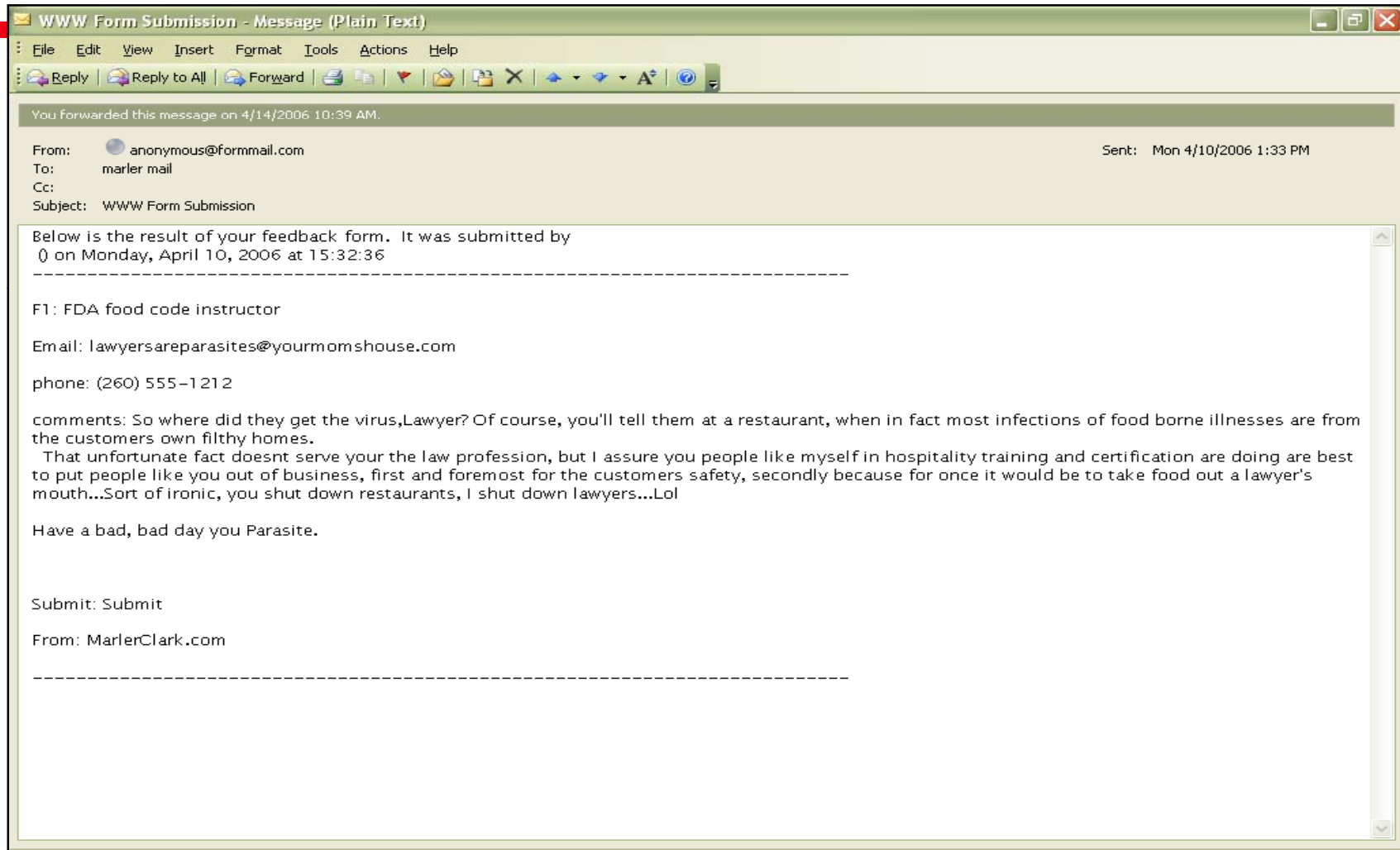
**Historical
Perspective**

**Challenges
and
Industry
Approach**

**Selected
Antimicrobial
Research Data**



Lawyer's E-Mail



Adapted from W.D. Marler's FSIS presentation

We must not take the Organic from Organic Acids

- **Organic acids as processing aid-**
 - **Fresh color of meat is not preserved**
 - **No extension in shelf life by design, normal microbial spoilage activity continues**
 - **Nutrient composition not affected (protein not denatured; vitamins not enhanced)**
 - **Sensory characteristics not affected (color & odor)**
 - **No detectable residues of organic acid in meat**

Application of New technology in the fight against pathogens

Continuous vs. hand-held



Conveyorized spray system



verifEye

From CHAD

Looking ahead into the future

– keeping meat and meat products safe.

- **Strong cooperation among all the stakeholders**
- **Research to pursue new areas and opportunities**
- **Government funding and liberalization of policy**
- **Industry to remain transparent in its approach**
- **Bridging the trust gap between consumers and the industry**
- **Effective and comprehensive educational campaign to reach constituencies on food safety and individual responsibilities**

Selected antimicrobial agents – for applications in meat and meat products- US & Canada.

Substance	Meat system Usage	Approval in US	Approval-Canada
A blend of salt of Na- acetate, lemon extract	Ground beef, cooked and cured comminuted sausages	Not to exceed 0.5%	Not approved
Acidified sodium chlorite	Poultry carcasses and parts; meat carcasses, parts, and organs; processed comminuted, or formed meat products	500 – 1200 ppm in combination with GRAS acid – pH of 2.3 to 2.9	On red meat carcasses with potable water rinse; poultry before chiller
LAB mixture: L-acidophilus; L-lactis; P-acidilactici (Trade: NP3, NP35)	Non standardized comminuted meat products- beef patties, ground beef, raw whole muscle beef cuts	10 ⁶ to 10 ⁸ cfu of Lactobacilli per g of products (Pediococcus)	Not approved
Peroxyacetic acid- octanoic acid, acetic acid- -- etc	Meat and poultry carcasses, parts, trim and organs	220 ppm max for PAA meat carcasses, parts and organs	? Accepted by Sr. management committee; pending Gazette publication



**Our industry's future
is as good as our collective imagination,
and collaboration,
along with the application of science and technology.**

**The ever-growing world
needs REAL proteins of animal source
to sustain itself, despite the challenges associated with it.**

Thank you!