


HAMBURGER DISEASE

What are regulatory agencies doing about the incidence of *E. coli* 0157:H7 in our meat supply?



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Topics of Discussion

- A historical perspective of *E. coli* 0157:H7 in meat
- The organism and its pathogenesis
- The regulatory agencies' efforts to deal with the problem
- The most recent results of the effect of those strategies

A Historical Perspective of E. coli 0157:H7....

The First Major Outbreak

Demographics

- Occurred late 1992 and early 1993
- Cases reported in WA, ID, NV, CA
- One of the largest ever reported
- Vehicle: Undercooked hamburger patties
- Source: 95 individual restaurants in one restaurant chain

The First Major Outbreak

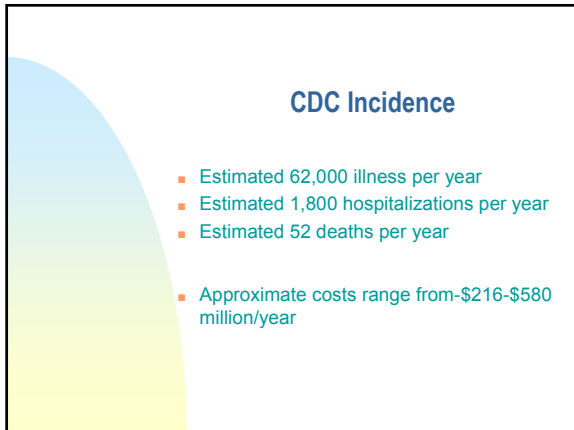
Those Affected

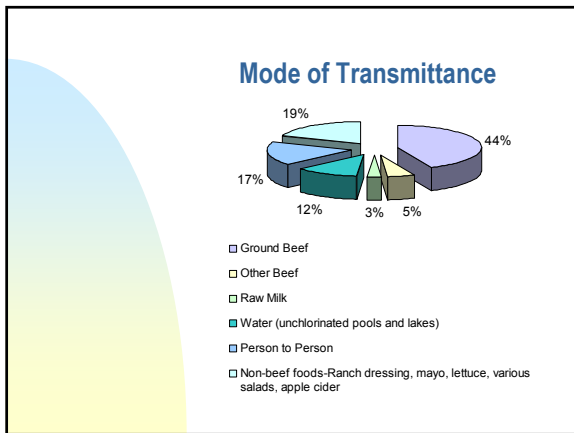
- Pulsefield Gel Electrophoresis linked strains from patients and product consumed
- Over 500 culture confirmed positive cases
- Many developed hemolytic uremic syndrome (HUS)
- Delayed recognition due to the lack of Sorbitol MacConkey Agar use

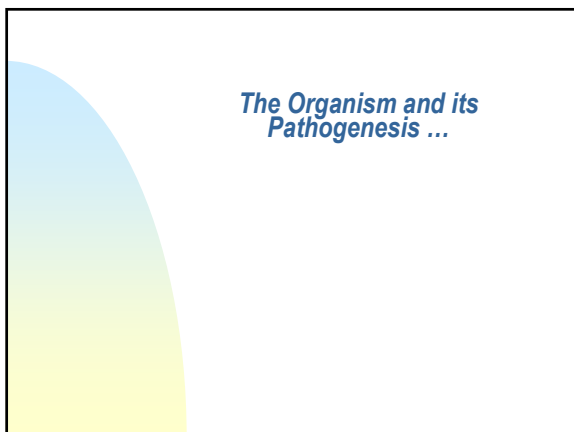
The First Major Outbreak

The Fallout

- More than 700 illnesses reported
- 4 children died
- Countless children permanently affected
- > 1/4 million hamburgers recalled







E. coli Strains


- Enterovasive Strains-surface attachment and invasion of mucosal cells
- Enterotoxigenic Strains-enterotoxin manufacturing
- Enterohemorrhagic Strains-produce verotoxins (Shiga) attaching-effacing lesions (O157:H7)

What's in a Name?

Serotype designation O157:H7 refers to the number of somatic (O) and flagellar (H) antigens carried by that strain of E. coli

Pathogenesis


Ingestion
↓
3-4 days
↓
Severe abdominal cramps
Non-bloody diarrhea
Vomiting
↓
1-2 days
↓
Bloody diarrhea



Infective Dose

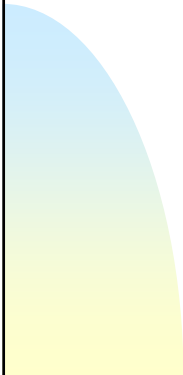
100 cells or less

- Non-bloody diarrhea (98%)
- Bloody diarrhea (91%)
- Severe abdominal cramps (91%)
- Little or no fever
- H.U.S.



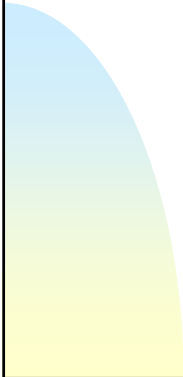
Illness Severity

- Hospitalization 22%
- Hemolytic Uremic Syndrome 5%
- Death 2%



Hemolytic Uremic Syndrome

- First described in Switzerland in 1955
- E. coli O157:H7 represents most common cause
- Affects 3 in 100,000 children 5 years of age or younger



Hemolytic Uremic Syndrome (continued)

- Results in anemia, low platelet count and kidney failure
- Major cause of kidney failure in North America
- Complications:
 - ◆ 3-5 % die
 - ◆ 14 % result in severe hospital complications, stroke, blindness, bowel resection
 - ◆ 39 % chronic kidney abnormalities



The Regulatory Agencies Efforts to Deal with the Problem...

Responses in 1993

- Immediate demand for zero tolerance of fecal contamination
- Fall 1993-safe handling and cooking instructions

Safe Handling Instructions

This product was prepared from inspected and passed meat and/or poultry. Some food products may contain bacteria that could cause illness if the product is mishandled or cooked improperly. For your protection, follow these safe handling instructions.


Keep refrigerated or frozen.
Thaw in refrigerator or microwave.

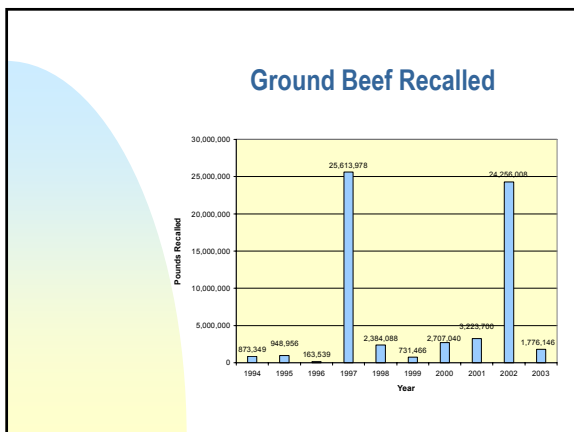
Keep raw meat and poultry separate from other foods.
Wash working surfaces (including cutting boards, utensils, and hands) after touching raw meat or poultry.

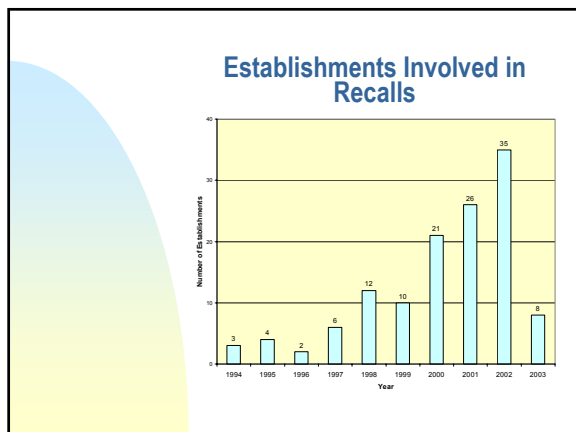
Cook Thoroughly.
Keep hot foods hot. Refrigerate leftovers immediately or discard.

Responses in 1994

- October 1994-declared bacterium an adulterant in raw ground beef
- Cooking educational campaign started
- Initiated nationwide sampling of plants and retail stores





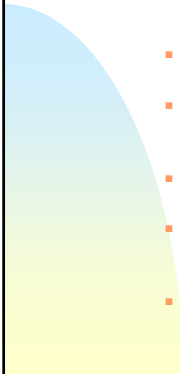


Responses in 1995

- July 1995- major overhaul of inspection announced
- Creation of veterinary field epidemiologist collateral duty position
- Established food safety liaison position at CDC

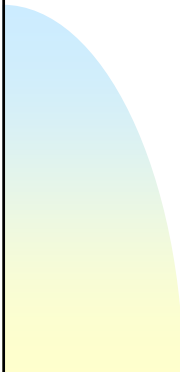
Responses in 1996-1997

- July 25, 1996- Final Rule HACCP
- Created Under Secretary for Food Safety
- Increased funding for food safety research
- Developed and improved public information and education materials
- October 1997-Increased testing sensitivity (25g. increased to 325g.)



Responses in 1999-2002

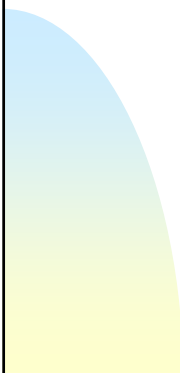
- January 1999-Developed position on non-intact cuts of beef
- September 1999-Increased testing sensitivity (improved methods of selection and detection)
- February 2000-Final Rule on Meat and Poultry Irradiation
- October 2002-Ohio Department of Agriculture began testing establishment's ground beef
- October 2002-Federal Register Notice issued: E. coli 0157:H7 Contamination of Beef Products



Federal Register Notice E. coli 0157:H7 Contamination of Beef Products

Risk Assessment Study

- Ag Research Service
 - 28 % animals infected
 - 43 % carcasses contaminated
- CDC increased estimates for illnesses in humans
- Conclusion: E. coli 0157:H7 more prevalent than thought



Federal Register Notice E. coli 0157:H7 Contamination of Beef Products


HACCP Reassessment Required

- E. coli 0157:H7 declared hazard reasonably likely to occur in raw beef products
- Establishments must determine if hazard for them
- If hazard, must establish CCP
- Grinders can require purchase specifications of suppliers
- Establishments to conduct ongoing verification
- Supporting documentation
- Implement in phases

Federal Register Notice E. coli 0157:H7 Contamination of Beef Products

What Establishments are Required to Reassess

- Beef slaughter establishments
- Ground beef manufacturing establishments
- Beef fabrication establishments

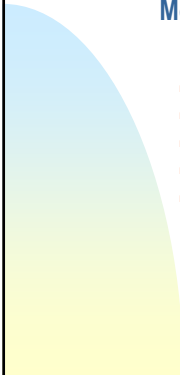


Examples of Slaughter Intervention Strategies

| <u>Strategy</u> | <u>Reduction (logs CFU/cm)</u> |
|---------------------------------------------------|--------------------------------|
| Carcass Trimming | 3.0-4.0 |
| Carcass Washing (95° F) | 2.0-3.5 |
| 2% Lactic Acid Rinse (at 130° F with 95° F water) | 3.0-4.9 |
| 2% Acetic Acid Rinse (at 130° F with 95° F water) | 2.4-3.7 |
| Hot Water Rinse (146-203° F) | 0.3-4.0 |
| Dry Aging (7 days at <41° F and RH <90%) | 3.3 |

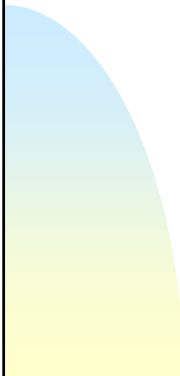
Examples of Beef Fabricators and Grinders Actions

- Supplier purchase specifications
- Temperature controls
- Antimicrobial treatments
- Certificate of analysis
- Audit/contact with supplier about process



Monitoring (Critical Control Points) Interventions

- Zero tolerance
- Concentration of solutions
- Temperature
- Pressure
- Application time and volume

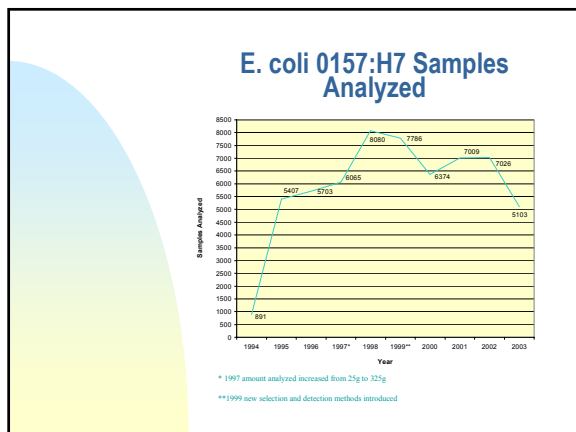


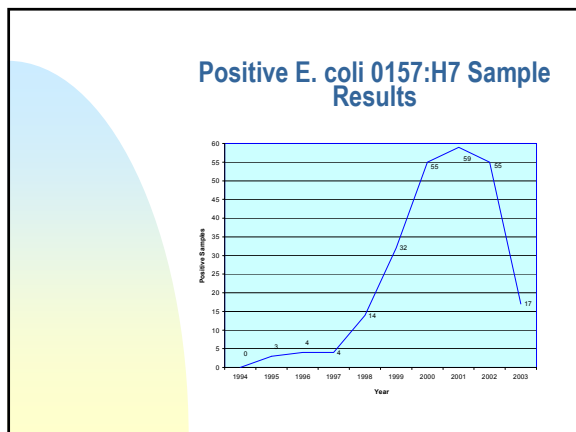
Validation and Verification Procedures

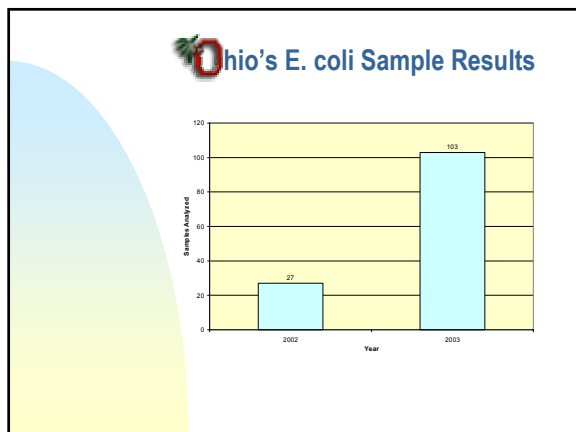
- Multiple microbial tests
- Establishment must verify at a justifiable rate (microbial tests)

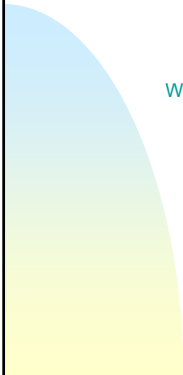


Recent Results of the effect of the Regulatory Strategies...









Conclusion

Washington, September 17, 2003 FSIS
Administrator, Dr. Garry L. McKee –

“ The Agency’s sampling data suggests that
initiatives begun in the past year are
beginning to pay dividends”

| | |
|------|---------------|
| 2001 | .84% positive |
| 2002 | .86% positive |
| 2003 | .33% positive |
