

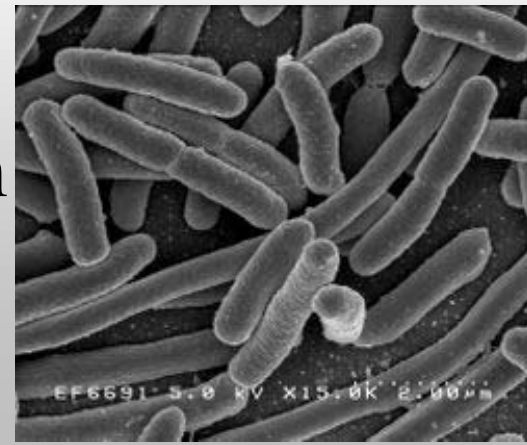
E. coli – The Good, The Bad, and The Ugly



“Keep your damn bacteria out of my river.”

What is E. coli?

- Full Name - Escherichia coli
- Coliform Bacteria Family, Facultative Anaerobic Fermenters
- Common, Single Cell, Highly Adaptable
- Digestive Tract Organism (10% of human fecal coliform)
- Can Grow Fimbriae to Attach to Cell or Surface Receptor



E. coli – The Good

- Vital to Mammals, Especially Ruminants
- Symbiotic
- Humans - Aids in Digestive Process in Large Intestine and Provides Vitamin K

*“I depend on my horse
and we both depend on
our E. coli.”*



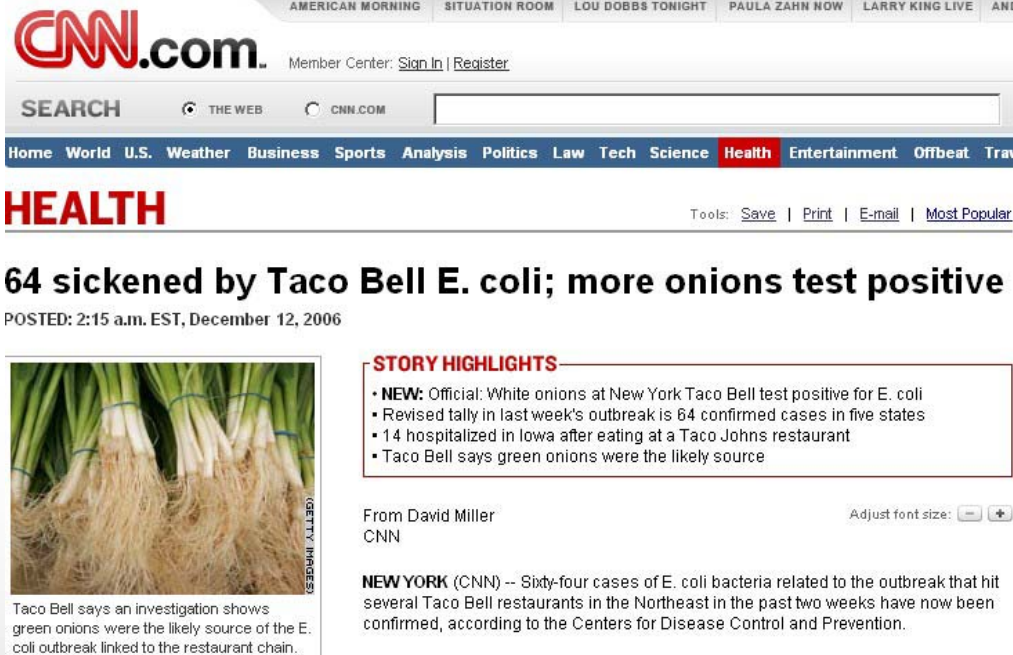
E. coli – The Bad

Bad Strains:

- Enterotoxigenic (ETEC), adhesin-type travelers diarrhea
- Enteroinvasive (EIEC), dysentery-like
- Enteropathogenic (EPEC), travelers diarrhea
- Enteroaggregative E. coli (EAaggEC), persistent children's diarrhea
- Enterohemorrhagic (EHEC)
 - O157:H7
 - Shigella-like toxin
 - Bloody diarrhea
 - Potential for kidney failure



E. coli – The Ugly



The screenshot shows the top of a CNN.com page with navigation links for 'AMERICAN MORNING', 'SITUATION ROOM', 'LOU DOBBS TONIGHT', 'PAULA ZAHN NOW', and 'LARRY KING LIVE'. Below the search bar, the 'HEALTH' section is highlighted. The main headline reads '64 sickened by Taco Bell E. coli; more onions test positive', posted at 2:15 a.m. EST on December 12, 2006. A 'STORY HIGHLIGHTS' box contains the following points:

- **NEW:** Official: White onions at New York Taco Bell test positive for E. coli
- Revised tally in last week's outbreak is 64 confirmed cases in five states
- 14 hospitalized in Iowa after eating at a Taco Johns restaurant
- Taco Bell says green onions were the likely source

The article is attributed to David Miller of CNN. A small image of green onions is visible on the left side of the article.



“You contaminated my apples, didn’t you?”

F.D.A. Warns Against Eating Bag Spinach

WASHINGTON, Sept. 14 — Consumers should avoid eating fresh bagged spinach after an outbreak of E. coli in eight states killed one person and sickened at least 49, federal health officials announced Thursday night...

Coliform Bacteria as Indicators

- Often used to indicate the general level of bacterial populations and/or fecal bacteria
- Municipal Wastewater
 - secondary: 23 MPN/100 mL Total Coliform
- Swimming and Recreation Waters
 - 240, 400, 1000, or 2400 MPN/100 mL Total Coliform
- Recycled Water Limits
 - tertiary recycled: 2.2 MPN/100 mL, 2 NTU

Sources of O157:H7

- Cattle, 70% of Herds, 2% Within Each Herd
- Grain versus Hay Fed Cattle?
- Wild Animals
 - wild pigs, deer
- Person-to-person (fecal-oral)
- Unpasteurized Milk or Juice

Transmission Pathways

- Manure Application
- Runoff
- Irrigation
- Slugs???
- Vegetable Handling
- Cross-contamination During Processing

Killing/Removing O157:H7

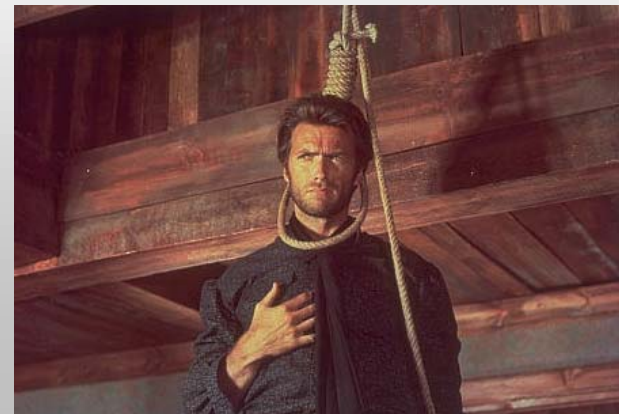
- Similar to General Coliform Disinfection
- Washing (only partially effective)
- Chlorine (4 logs in 1 min. @ 1.1 mg/L)
- UV
- Heat (160 degrees F)
- Drying
- Composting (manure)



Water Quality Regulation

- Process/Rinse Water (parameter?)
- Groundwater Testing
 - sample contamination, soil coliform
- In-Plant Recycled Water (jurisdiction?)
- Irrigation of Fresh Market Crops with Process/Rinse Water

“I was only trying to beneficially reuse my process/rinse water.”



Bacteroides as an Indicator Species

- New tool in Bacterial Source Tracking (BST)
- Used in recent East San Joaquin Study
- Digestive bacteria, but not *E. coli*
- Easier/cheaper tests to differentiate source animal groups, especially ruminants
- Dogs, cats, humans (& raccoons?) hard to differentiate

Conclusions

- E. coli is often only an indicator of fecal bacterial populations, not necessarily pathogenic.
- Some strains, particularly O157:H7, are dangerous.
- Cattle manure is less safe than many believe.
- Standard disinfection techniques also generally apply to O157:H7.
- Recycled wash water streams which contact fresh market vegetables should probably be disinfected.