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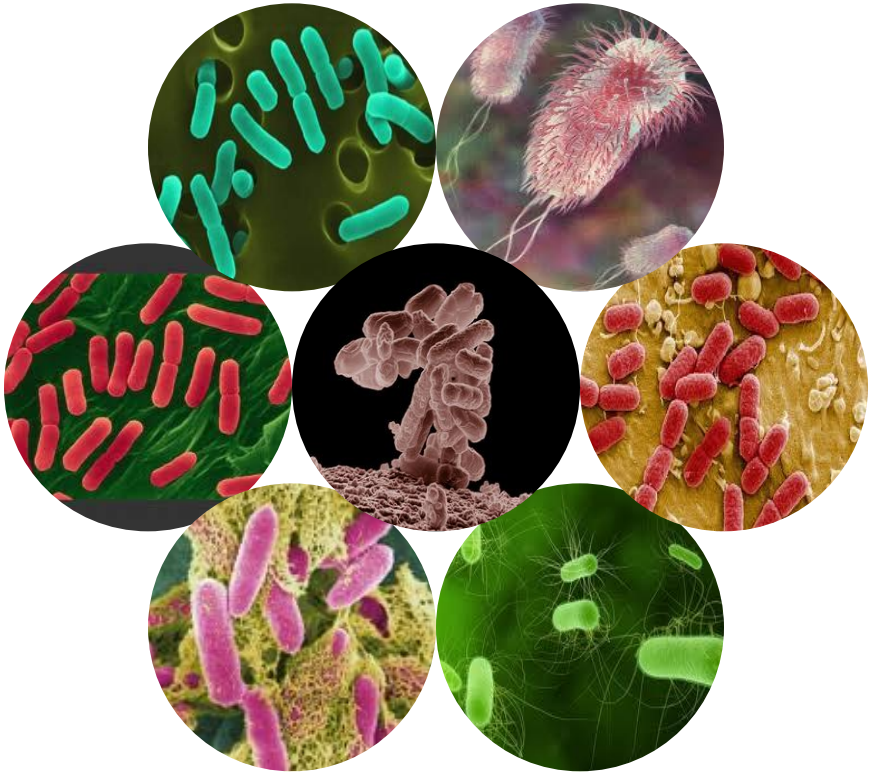
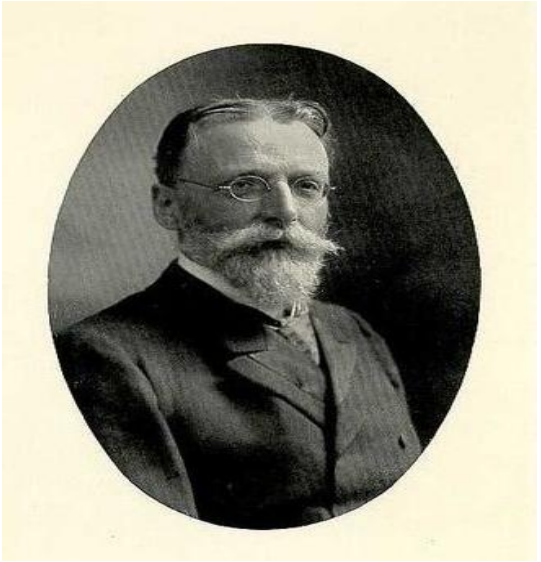
The Changing Faces of E.coli



E.Coli Background



- Discovered 1885 by Theodor Escherich
- Scientific name: ***Escherichia coli***
- Many strains of *E.coli*
- Most are normal inhabitants of the small intestine and colon
  - do not cause disease in the intestines
  - can cause disease if they spread outside of the intestines:
    - bladder or kidney infections if in the urinary tract
    - sepsis if in the blood stream

E.coli O157:H7

- First recognized in the U.S. in 1982
  - Only been isolated once before, from a sick patient in 1975
  - 1985 – associated with HUS
- Traced to contaminated hamburgers, dubbed "***hamburger disease***"
- Labelled as adulterant by USDA in 1994
  - illegal to sell raw meat contaminated with *E.coli* O157:H7

CDC Review Of Cases from 1982 – 2002:

- 350 outbreaks reported:
  - 8,598 cases
  - 354 HUS (hemolytic uremic syndrome) cases
  - 40 deaths
- Transmission routes:
  - 52% foodborne
  - 21% unknown
  - 14% person-to-person
  - 9% waterborne
  - 3% animal contact
  - 0.3% laboratory-related
- The food vehicle for foodborne outbreaks was:
  - 41% of cases due to ground beef
  - 21% of cases due to produce

More Than "Hamburger" Disease

- 1989-90 – drinking water, Missouri, US
  - water main break, contamination
- 1991 – apple cider, Massachusetts, US
  - cattle grazed in field near cider press
- 1992 – surface water, South Africa
  - men who were ill drank surface water
  - women & children were not ill, drank bore water
- 1994 – hamburgers, multi-state, US
  - 700 ill, 4 died, Jack in the Box outbreak

A Sprouting Issue …

- 1994 – swimming in a lake, Oregon, US
  - swimming, faecal contamination of water
- 1995 – leaf lettuce, Montana, US
  - suspect compost with cow manure
- 1996 – radish sprouts, Japan
  - 6000+ ill / 11 died
- 1996 – apple cider, multi-state, US
  - some “dropped” apples used, unpasteurized

Breath It In …

- 1997 – shallow beach, Finland
  - swimming, faecal contamination of water
- 1999 – romaine lettuce, multi-state, US
  - retirement facility & private home
- 2000 – drinking water, Walkerton, Canada
  - 2000+ ill, 7 died
- 2001 – airborne (?), Ohio, US
  - dance held in animal exhibition hall

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Marshmallow … Yum?

- 2002 – frozen burgers, multi-province, Canada
  - consumption of under-cooked burgers at home
- 2004 – petting zoo, BC
  - school and daycare field trips to a local farm
- 2004 – donair, Alberta
  - under-cooked donair meat
- 2005 – marshmallow milkshake, Alberta
  - infected food handler

Paddling Pool … You Say?

- 2006 – paddling pool , Manchester, UK
  - inadequate chlorination
- 2007 – beef products, Alberta
  - joint US/Canada investigation with DNA fingerprinting of the particular strain
  - producer was from Alberta
- 2008 – iceberg lettuce, US & Canada
  - bagged lettuce, several institutions and restaurants

Are You Nuts?

- 2011 – hazelnuts (US & Canada)
  - in-shell hazelnuts (filberts) were purchased from bulk bins , common producer
- 2011 – walnuts (Canada)
  - purchased from bulk bins

Late Breaking News (Sept 30th):

- Dec 2010 – Jul 2011 – leeks & potatoes (UK)
  - Soil on the vegetables is the likely source

Good News, Bad News …

- *E.coli* O157:H7 is becoming less of a threat!
- Why?
  - Most governments require mandatory reporting by food producers.

- However, a number of illnesses are caused by the Non-O157 Shiga-toxin *E.coli* strains

- Therefore, there is an ongoing need for **…**

  Continued Public Health Surveillance!!!

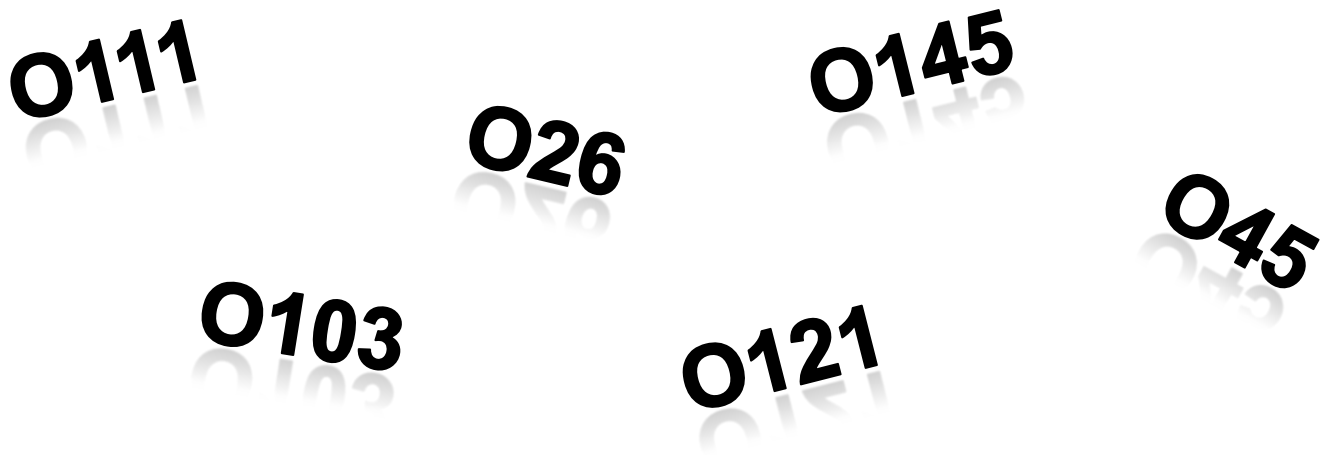
Non-O157 E.coli

- In 2010, for the first time, the rarer strains of *E.coli* were responsible for more infections in the U.S. than *E.coli* 0157
  - Non-O157 caused 451 infections, 69 hospitalizations, 1 death
  - *E.coli* 0157 caused 442 infections, 184 hospitalizations, 2 deaths.

- Sept 2011 - USDA banned 6 new *E.coli* strains from meat supply
  - "the big six" are classified as "adulterants" capable of causing infection and death

The Big Six!

- Known as Shiga toxin-producing *E.coli*
- Group includes the following strains:



…does not include O104:H4 (Germany Outbreak) …yet!

E.coli 026

Year	Country	Facility / Source
2000	Germany	5 institutions, served by 4 kitchens Source: Seemerrolle, cut of beef
2001	USA	Swimming at a beach
2006	USA	Strawberries or blueberries
2010	USA	Day care, no severe illness, Some household transmission
2011	USA	Kitchen workers at summer camp Source: unknown

E.coli 0111

Year	Country	Facility / Source
1999	USA	Cheerleading camp consuming ice from open buckets and eating from the cafeteria salad bar
2005	USA	Fresh pressed apple cider
2007	USA	Wedding reception in private home Source: ground beef
2008	USA	Day care Person-to-person spread
2011	Japan	Korean raw beef dish called yukhoe, similar to tartare

E.coli O103

Year	Country	Facility / Source
2006	Norway	Linked to fermented sausage Samples of sheep meat also contained isolated of identical or closely related strains of *E.coli* O103
2007	Japan	Nursery school Source unconfirmed Suspected secondary cases in school and affected families.

E.coli 0121

Year	Country	Facility / Source
1999	USA	Swimming in a lake
2006	USA	Day care Person-to-person
2006	USA	Catered teacher's conference Fast food salad

E.coli 045

Year	Country	Facility / Source
2005	USA	Correctional facility Source: Infected food handler
2006	USA	Farm Affected had handled goats
2007	USA	Petting zoo Source: Animal Contact

E.coli 0145

Year	Country	Facility / Source
1999	USA	Day care Suspect person-to-person
2007	Belgium	Pasteurized ice cream sold on a farm Suspect infected food handler
2010	USA	Colleges and universities (multi-state) Source: Romaine lettuce in
2010	USA	Linked to ready-to-eat, custom, smoked meat products that were made from game

E.coli 0104:H4

Year	Country	Facility / Source
2004	Korea	First case identified in a patient with HUS
2011	International	Start in Germany Fenugreek sprouts 3rd largest outbreak in recent history •3000+ cases, 908 with HUS, 50 deaths Deadliest outbreak to date
2011	France	Event at a Recreational centre Suspect sprouts, seeds from Egypt

Lessons Learned …

Preventing E.coli Infections

- WASH Your Hands
  - after using the bathroom or changing diapers and before preparing or eating food.
- WASH Your Hands
  - after contact with animals or their environments (at farms, petting zoos, fairs, even your own backyard).
- COOK Meats Thoroughly
  - Ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 70˚C/160˚F. It's best to use a thermometer, as color is not a very reliable indicator of "doneness."

Preventing E.coli Infections

- AVOID Raw Milk
  - as wells as, unpasteurized dairy products, and unpasteurized juices (like fresh apple cider).
- AVOID Swallowing Water
  - swimming or playing in lakes, ponds, streams, swimming pools, and backyard “kiddie” pools.
- PREVENT Cross Contamination
  - in food preparation areas by thoroughly washing hands with soap & water for required 20 seconds washing and sanitizing cutting boards, utensils, etc. after they touch raw meat.

E.coli Outbreaks

- Underscore the critical importance of all aspects of public health, including:
  - continuous public health surveillance
  - rapid epidemiological investigation
  - laboratories that can examine and identify uncommon organisms
  - ***food safety authorities that take appropriate measures to***
    - ***control the source of the infection, and***
    - ***prevent similar events from happening in the future.***

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FDA Food Safety Modernization Act (FSMA)

Signed by President Obama on Jan 4, 2011

- The law gives more power to FDA in the following areas:
  - Prevention
  - Inspection and Compliance
  - Regulatory Response
  - Imports
  - Enhanced Partnerships

Is CFIA working on a Canadian version of the FSMA???

Surprising Facts …

The Fact: The FDA allows you to sell bugs and rodent hair for consumption.

They allow an average of 30 or more insect fragments, and one or more rodent hairs, per 100 grams of peanut

Shiga -Toxin Producing E.coli

- Some strains of E.coli produce toxin called ***Shiga toxin***
- Shiga toxin is one of the most potent toxins known to man
  - damages the lining of the intestines
  - Shiga-toxin producing E.coli can survive at
    - low temperatures
    - acidic conditions
  - infectious dose is relatively low

CDC lists it as a ***potential bioterrorist agent!***

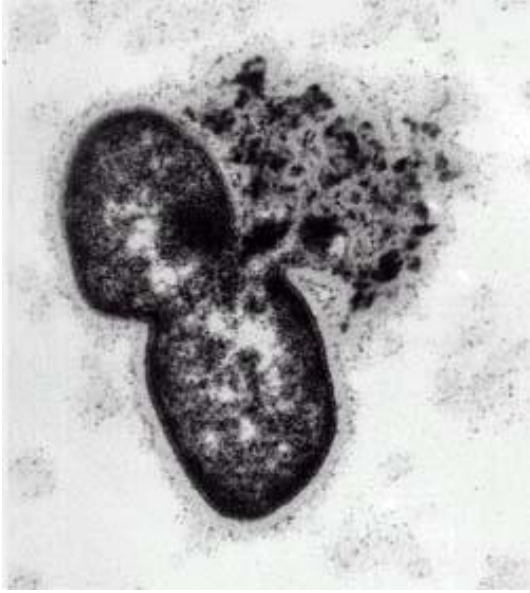
E.Coli 0104: H4's Resistance

- It is resistant to at least 14 antibiotics.
- Exact reason unknown

- Theory:
  - These bacteria OR other bacteria with which they exchanged genetic material must have developed in an environment with these antibiotics present … possibly a hospital or a farm!

Did we create this "superbug"???

Do Antibiotics Work?



- Antibiotics:
  - can worsen an *E.coli* infection
  - can kill the Shiga-toxin E.coli bacteria **by releasing the toxin in massive amounts which can kill the patient**
- Carbapenems antibiotic don't seem to trigger toxin release
  - only prescribed in special circumstances
  - common drug names: Doribax or Merrem
- Reason why travelers are advised not to take their prescribed antibiotic if they have bloody diarrhoea!

Kevin's Law

- Introduction of the law in 2005 to US Congress Committee
  - 2008 documentary "Food Inc."
- It would have given the US Dept. Of Agriculture the **power to close down plants that produce contaminated meat**
- It never became Law but versions of it are still being presented to US Congress Committee … as evident by the new Food Safety Modernization Act!

**Nicknamed in memory of 3yr old Kevin Kowalcyk of Colorado, died in 2001 with HUS complications. Source was hamburger*

So, what can we do?

- E.coli and other pathogens are not going away!!!
- Therefore, there is an ongoing need for …
  - "farm to fork" preventive measures and monitoring programs by
    - Operators / Owners
    - Regulatory Agencies

What can YOU do?

- In order to be the leading edge company that is **never non-compliant**, you should have adequate preventative strategies in place for achieving and maintaining:
  - minimal legislated standards in food safety.
  - minimal standards in outbreak management.
  - compliance to all related legislations and “best practices”.

Good Luck!

Questions?

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Thank You!

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