Food Safety Awareness

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Basic Needs for Human Survival

- Food
- Water
- Shelter
TOPICS

- Lots of data are available about food safety
- Pay attention to these to enable prevention
  - If you don’t, illnesses happen…
- Need to adopt a risk reduction mindset
Foodborne Illness Estimates

United States
- 48 million cases
- 120,000 hospitalizations
- 3000 deaths

Global
- 1 billion cases
- 2+ million deaths

EU
- 45.5 million cases

China/Asia
- Surveillance beginning

Australia
- 5.4 million cases
- 120 deaths
Major Food Safety Outbreaks

- Incidents increasingly visible
- Improved detection & surveillance identifies broad issues
- Supplier control essential
## US FoodNet Estimates of Foodborne Illness
1996 to 2010

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>2010 Illness/ 100,000</th>
<th>Change since 1996-98</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella</td>
<td>17.6</td>
<td>NS</td>
</tr>
<tr>
<td>Campylobacter</td>
<td>13.6</td>
<td>27% ↓</td>
</tr>
<tr>
<td>Shigella</td>
<td>3.8</td>
<td>57% ↓</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>2.8</td>
<td>NS</td>
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<tr>
<td>E. coli O157</td>
<td>0.9</td>
<td>44% ↓</td>
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<tr>
<td>STEC non-O157</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>Vibrio</td>
<td>0.4</td>
<td>115% ↑</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>0.3</td>
<td>38% ↓</td>
</tr>
<tr>
<td>Yersinia</td>
<td>0.3</td>
<td>52% ↓</td>
</tr>
</tbody>
</table>

Age Makes A Difference!
2010 US FOODBORNE ESTIMATES


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Norovirus: Leading Cause of Foodborne Illness

TOP 5 US REPORTED OUTBREAKS (CONFIRMED AND SUSPECTED)

http://www.cdc.gov/outbreaknet/surveillance_data.html#historical
US Commodities Associated with Illness

Outbreaks

757 outbreaks

Mixed foods, Fin fish, Poultry, Beef, Leafy vegetables, Pork, Fruits-Nuts, Dairy, Grains-beans, Mollusks, Eggs, Vine-stalk vegetables, Root vegetables, Fungi, Crustaceans, Sprouts, Oils-sugar, Game

2006 Outbreaks, 2007 Outbreaks, 2008 Outbreaks

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Food Allergens

Food safety issue for sensitive population

- Peanuts
- Tree nuts
- Crustaceans
- Fish
- Eggs
- Milk
- Soy
- Wheat

Cleaning is essential!
FDA Food Recalls - 2010

Adapted from: FDA 2010 Recalls, Market Withdrawals and Safety Alerts

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Where Was Contaminated Food Consumed?

WHEN LOCATION IS KNOWN

- **Restaurant or deli**: 52%
- **Private home**: 15%
- **School**: 3%
- **Banquet facility**: 7%
- **Other***: 10%
  - Church, temple, etc: 2%
  - Wedding reception: 2%
  - Nursing home: 2%
- **Workplace, office, not cafeteria**: 7%

* < 1% of outbreaks

Source: CDC 2011 MMWR 60(35):1197-
CDC Risk Factors for Foodborne Illness
USA 1998-2002

- Improper holding, 27%
- Contaminated equipment/environment, 25%
- Other, 9%
- Unsafe source, 4%
- Inadequate cooking, 11%
- Poor personal hygiene, 24%

Adapted from CDC 2006 MMWR 55(SS10):1-34
Application of CDC Risk Factor Data
Improper Holding Temperatures

- Can allow pathogens to persist and in some cases, increase to harmful levels

- Proper hot and cold holding are crucial to food safety
  - Keep food out of the Temperature Danger Zone
    - Below 41°F (5°C) and above 135°F (57°C)
  - Monitor proper temperature control with a calibrated thermometer
  - Use equipment designed for keeping food at the proper temperature
**Clostridium perfringens**

- Frequent contaminant in meats
  - Not an issue unless it grows to high levels
- Cells grow in food with poor temperature control
  - Inadequate cooling
- Illness caused by ingestion large numbers of cells
  - Toxin produced in the intestine - “toxico-infection” causes symptoms
- Symptoms - relatively mild, but can include intense abdominal pain, diarrhea

**Outbreak in Corned Beef after St. Patrick’s Day**

[http://www.cdc.gov/mmwr/preview/mmwrhtml/00025191.htm](http://www.cdc.gov/mmwr/preview/mmwrhtml/00025191.htm)

- 156 cases all had eaten corned beef sandwiches from same deli
- Beef was held at 120° F, sliced & served through the day.
- Found high levels of cells in leftover beef
Contaminated Equipment

Cross-contamination from one food or surface to another is a major hazard in the flow of food. It is important to:

- Understand the flow of food through your establishment
- Understand where there is a possibility of cross-contamination
- Set up barriers and procedures to block pathogen transfer and growth
- Use proper sanitization procedures and chemicals, following the label instructions

Can transfer pathogens to foods
Campylobacter

- About 42,000 cases diagnosed annually
  - Many more cases go undiagnosed or unreported
  - Estimated to affect over 2.4 million persons every year

- Symptoms - diarrhea, cramping, abdominal pain & fever

- Illness occurs more frequently in the summer months than in the winter.

- Often associated with consumption of raw or undercooked poultry (primarily), meat and unpasteurized milk.
  - Cross-contamination of raw to cooked items significant contributing factor to illness
Lettuce contaminated with raw chicken

(http://www.cdc.gov/mmwr/preview/mmwrhtml/00051427.htm)

- 14 patrons of a restaurant became ill

- Symptoms – diarrhea, fever, cramps, nausea, vomiting & visible blood in stools. Two hospitalizations.
  - *Camplybacter jejuni* isolated from all patients

- Investigation revealed multiple sources of contamination
  - Countertop too small to separate raw poultry and other foods during preparation.
  - Cook cut up raw chicken for dinner before preparing salads.
  - Lettuce for salads was shredded with a knife.
  - Cook wore a towel around her waist, frequently used to dry hands.
  - Uncertain whether the cook had cleaned the countertop after cutting up the chicken.
Poor Personal Hygiene

- Food handlers can contaminate food and cause the consumers to become ill. They should:
  - Avoid unsanitary habits
  - Maintain and monitor their personal health
  - Report illness and wounds
  - Follow hygienic hand practices: good handwashing and proper glove use

- Not following these basic requirements can result in food safety concerns
Norovirus

- Spreads rapidly in large populations
  - Originates in feces or vomit of infected person & spreads
  - Transmitted person to person, through unwashed hands, via contaminated food or water or contact with contaminated surfaces

- Resilient under a wide range of conditions

- Symptoms – Nausea, vomiting & diarrhea, cramps

- Infectious dose is < 100 viral particles
  - One projectile vomiting incident may aerosolize up to 100 billion viral particles
Norovirus Outbreak

**Subs – Michigan, 2005**  
MMWR 55(14):395-7

- Guests at different events received sandwiches from common source
- > 100 people estimated to be affected
- Illness associated with sandwiches containing lettuce
- Employee with norovirus symptoms returned to work the same day his symptoms ended
  - Was still excreting Norovirus in his stool
- Food prep sink used to wash lettuce also used for hand washing

After this… Michigan issued guidelines that food service workers with suspected norovirus not return to work until they are asymptomatic for 48-72 hours
Staphylococcus aureus

- Carried by ~30% of humans in nose and in some cuts on hands
  - Need to wash hands well

- Food poisoning results from consuming toxin
  - If *Staph* grows to >100,000 cells per gram of food, a toxin may be produced
  - Consumption of the toxin causes illness
  - Toxin is not inactivated with cooking

- Symptoms - Nausea, vomiting, retching, abdominal cramping, and bloating
**Staph. aureus** in Cream based desserts

- **December 2010** – Tiramisu, cream cake, frosting implicated
- **4 outbreaks involving dessert items from 1 bakery**
  - 100 illnesses reported
  - 70 reported from a single event in Wisconsin
- **Cream cake contaminated with high levels of** *Staphylococcus aureus*
- **Fillings and frosting were occasionally prepared using bare hand contact.**
- **Bakery recalled all desserts made after Nov. 1, 2010**

http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm238103.htm
Inadequate Cooking

- Cooking to proper final cooking temperatures for a specified time reduces microorganisms.
- Final cooking temperatures for various products depend on the type of microorganisms associated with that food type.
- Since not all pathogens and toxins are destroyed by heat, proper handling before and after cooking are crucial.
- Surviving pathogens can cause illness.
E. coli O157:H7

- E. coli is part of the normal flora of the gut of most animals
- Food poisoning is caused by a few strains that produce toxins
  - O157:H7 of great concern today
- Symptoms
  - Severe abdominal pain
  - Diarrhea – watery to bloody
  - Typically 2-7% of cases proceed to hemolytic uremic syndrome (HUS) – kidney failure
E. coli O157:H7 Outbreaks

Hamburger – 1993 - 1st major outbreak

- Hamburger restaurants implicated
- >500 people ill; 45 HUS; 3 deaths
- Attributed to under cooked contaminated hamburger patties
- Other eventual outcomes of the outbreak:
  - Increased temperature to 155°F minimum for restaurant cooked hamburgers
  - Safe-food-handling labels on meat
  - *E. coli* O157:H7 declared an adulterant in raw ground beef
  - Irradiation of hamburger patties gained favor

http://jama.ama-assn.org/content/272/17/1349.full.pdf
Unapproved Source

What is an Approved Source?
- Has been inspected
- Is in compliance with local, state and federal law
- Known source or point of origin
- Good reputation

What can cause issues?
- Contingency plans/Need to use a back up vendor
- Spot purchase/local vendors
- Not being specific enough in required criteria – e.g., Growing conditions for produce and seafood, Production conditions for meat & seafood
Do you know where your seafood comes from?

Vibrio parahaemolyticus on cruise, 2004
- 29% = attack rate among people who consumed raw oysters
- Warmer than normal water temperatures reported; Vibrio isolated from oysters

Vibrio in cooked garlic crab, 2003 – Florida
- Purchased from local market and consumed within 1 hour
- Investigation revealed cross contamination of cooked crab with raw seafood and poor temperature control in market.

Need to be wary of Red Tides
- Warning issued April 2009 in Maine
- Due to detection of large amounts of algae 40% higher than historical levels
  - Algae may produce toxins
- Eating seafood that have consumed algal toxins can cause illness

Source: [http://content.nejm.org/cgi/content/short/353/14/1463](http://content.nejm.org/cgi/content/short/353/14/1463) and [http://www.doh.state.fl.us/Disease_ctrl/epi/Epi_Updates/Epi_Weekly/08-08-03.htm](http://www.doh.state.fl.us/Disease_ctrl/epi/Epi_Updates/Epi_Weekly/08-08-03.htm#Vibrio%20Outbreak%20Discovered%20in%20Duval%20County) and [http://www.sciencedaily.com/releases/2009/04/090422085146.htm](http://www.sciencedaily.com/releases/2009/04/090422085146.htm)
2010 - *Salmonella* Egg Outbreak - Facts

- *Salmonella enteritidis* “routinely” occurs
  - Thousands of reported illnesses were “above the norm”

- Investigations suggested shell eggs as infection source

- >500 million eggs affected
  - Outbreak strain found in samples from affected farms
  - Several restaurant or event illness clusters identified

- Outbreak illustrates many potential contributing factors…

Source: [http://www.cdc.gov/salmonella/enteritidis/](http://www.cdc.gov/salmonella/enteritidis/)
Response to Egg Outbreak

How to protect public health? [http://www.fda.gov/Food/NewsEvents/WhatsNewinFood/ucm222684.htm]

- Don’t eat recalled eggs or products containing recalled eggs.
- Discard cracked or dirty eggs.
- Keep shell eggs refrigerated at ≤ 45º F (≤ 7º C) at all times.
- Do not keep eggs warm or at room temperature for more than 2 hours.
- Refrigerate unused or leftover egg-containing foods promptly.
- Wash hands, cooking utensils & food preparation surfaces with soap and water after contact with raw eggs.
- Cook eggs until the white and the yolk are firm & eat promptly after cooking. Avoid eating raw or undercooked eggs.

FDA Egg Safety Rule – went into effect July 9, 2010

- Flock-based control programs
- Include routine microbiological testing
Top 10 Factors Contributing to US Foodborne Illness 1998-2002

CONTAMINATION DOMINATED!

1. Food at room temp for several hours – 29%
2. Bare-hand contact by food handler – 25%
3. Inadequate cleaning of equipment – 22%
4. Handling by infected person or carrier – 20%
5. Inadequate cold-holding temperature – 19%
6. Cross contamination from raw animal products – 12%
7. Insufficient cooking – 12%
8. Raw ingr. contaminated by animal or environment – 11%
9. Slow cooling – 11%
10. Inadequate hot-holding time/temperature – 10%

Source: CDC 2006 MMWR 55(SS10):1-34
Consider… what can **you** do to help prevent another outbreak from being attributed to one of these factors?
Risk Reduction Mindset
How to think with a Risk Reduction Mindset?

Process
- Identify all relevant hazards
- Focus on prevention to address all identified hazards

Preventive controls must be effective, addressing the hazards of concern
- Do they work?
- Do they achieve the intended control?
Example: Risk Reduction Plan for Norovirus

- Hands should be washed frequently with soap and water
- Do not permit infected workers to prepare food:
  - For at least 3 days after recovery
- Review current cleaning and hygiene plan
- Discard food that may have been contaminated by an ill person.
Have a Spill Kit Available

- Procedures

- Registered disinfectant
  - Within shelf life

- Personal protective equipment
  - Gloves, mask, apron, shoe covers, etc.

- Absorbent beads

- Wipes

- Scoop

- Bag
Risk Reduction – Constant Attention

 Procedures with three levels of action:

- **LEVEL GREEN**
  - Standard procedures – maintaining hygiene when norovirus poses no direct threat

- **LEVEL YELLOW**
  - Risk reduction – a heightened defensive response to an outbreak in your area/industry

- **LEVEL RED**
  - Remediation – a focused response to an outbreak in your facility, designed to break the chain of infection or illness

- **INCIDENT CLEAN-UP**
  - How to clean an incident of vomitus or stool contamination
Food Safety Solutions
CONSIDER INTERVENTIONS AT MULTIPLE SITES

Agricultural Production

Processing

Food Service

Retail

Home
YOUR THOUGHTS & QUESTIONS