

An Investigation into Foodborne Illness and Its Impacts

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CFI is a national, non-profit organization dedicated to improving public health through the prevention of foodborne illness by:

- **Encouraging independent research,**
- **Advocating for science-based solutions,**
- **Providing educational outreach.**

Defining the Impact of Foodborne Disease

The Public Health Impact

World Health Organization

- **2 billion cases** of diarrheal disease worldwide.
- **1.8 million deaths,** predominantly children.
- Leading cause of child mortality and morbidity.
- Mostly results from contaminated food/water sources.
- Affects **up to 30%** in industrialized countries.

World Health Organization, http://www.who.int/mediacentre/factsheets/fs330/en/

U.S. 2011 Burden of Disease Estimates

48 million are sickened (1 in 6 Americans)

128,000 are hospitalized

3,000 die each year from food-borne illnesses.

Scallan E, et al. Foodborne illness acquired in the United States—major pathogens. *Emerg Infect Dis,* Vol. 17, No. 1; 2011. Accessed *06/10/15* at: http://wwwnc.cdc.gov/eid/article/17/1/pdfs/p1-1101.pdf

Children and Foodborne Illness

Abby
Died, Age 7

Kevin
Died, Age 2

World-wide, 40% of diarrheal illness occurs in children <5.

Joseph
Died, Age 8

Kayla
Died, Age 14

Ryan
Salmonella

Ashley
E.coli O157:H7

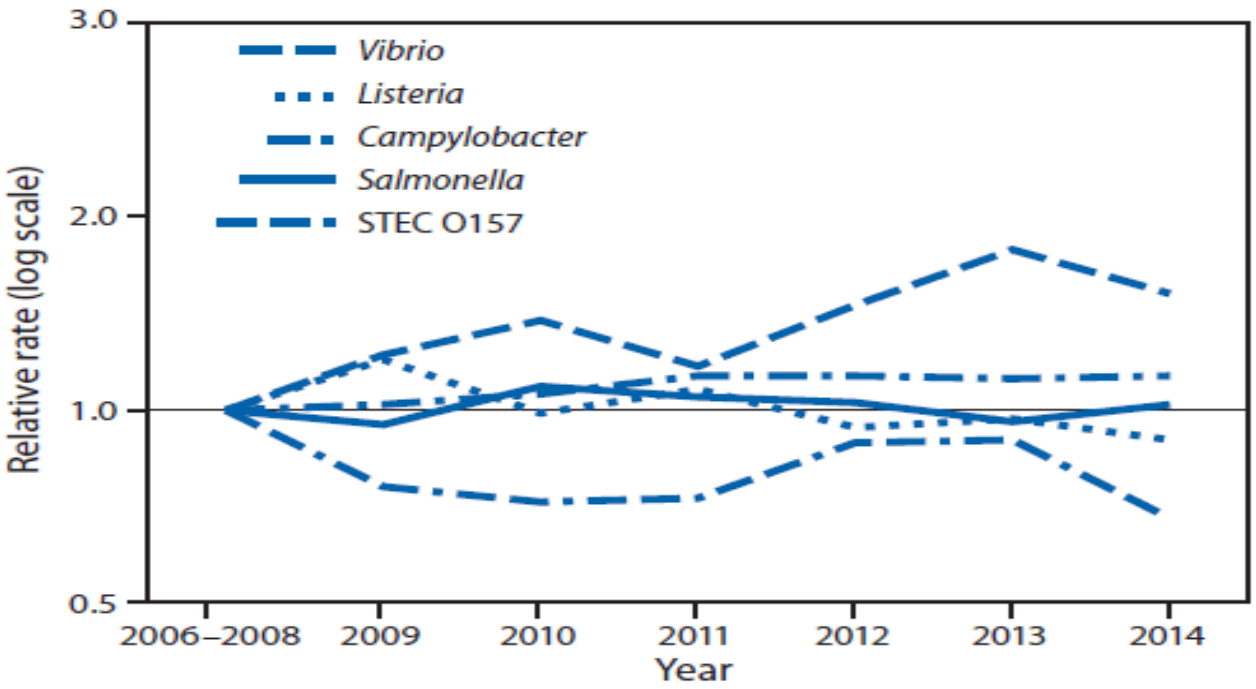
In U.S. almost half of the reported foodborne illness occurs in children >15.

Mariah
E.coli O157:H7

Jake
Salmonella

2014 CDC FoodNET Incidence Data

Relative rates of culture-confirmed infections with *Campylobacter*, STEC* O157, *Listeria*, *Salmonella*, and *Vibrio* compared with 2006–2008 rates, by year — Foodborne Diseases Active Surveillance Network, United States, 2006–2014†



CDC MMWR 64(18);495-499, 2015. Figure 1. Accessed 6/09/15 at: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6418a4.htm

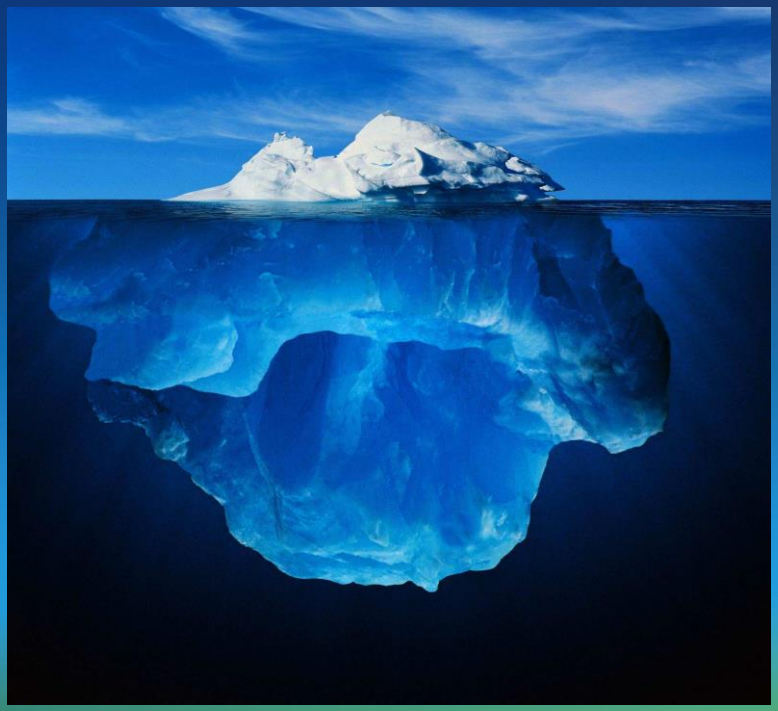
Pathogens Causing Most Deaths

Salmonella (nontyphoidal)	380
Toxoplasma gondii	330
Listeria monocytogenes	250
Norovirus	150
Campylobacter	76
Vibrio strains	48
Yersina	29
E. coli strains	21

CDC. Pathogens causing US foodborne illnesses, hospitalizations, and deaths, 2000–2008. Accessed 6/15/15 at: www.cdc.gov/foodborneburden/PDFs/pathogens-complete-list-01-12.pdf

Reporting Foodborne Illness

We only know about the Tip of Iceberg



PulseNET & New Testing Protocols

Tracking Microbes: Defining The Horizon For Molecular Surveillance Of Foodborne Disease

Kowalcyk, B. CFI White Paper. Accessed 06/15/15 at:
www.foodborneillness.org/cfi-library/CIDT-Report-052015-12pages-FINAL-MAY.pdf

Multi-Drug Resistance Zoonotic Diseases

Each year, 2 million are sickened with antibiotic resistant bacteria – about 23,000 die.

Resistant bacteria in food animals is one area of concern. Food animals can serve as a reservoir for resistant bacteria and can be transmitted to humans through the foods we eat. [1]

President Obama calls for a National Action Plan for Combating Antibiotic Resistant Bacteria (CARB)

[1] CDC. Antibiotic Use in Food-Producing Animals. Accessed 6/16/15 at: http://www.cdc.gov/narms/animals.html

Outbreaks, Recalls & Imported Food

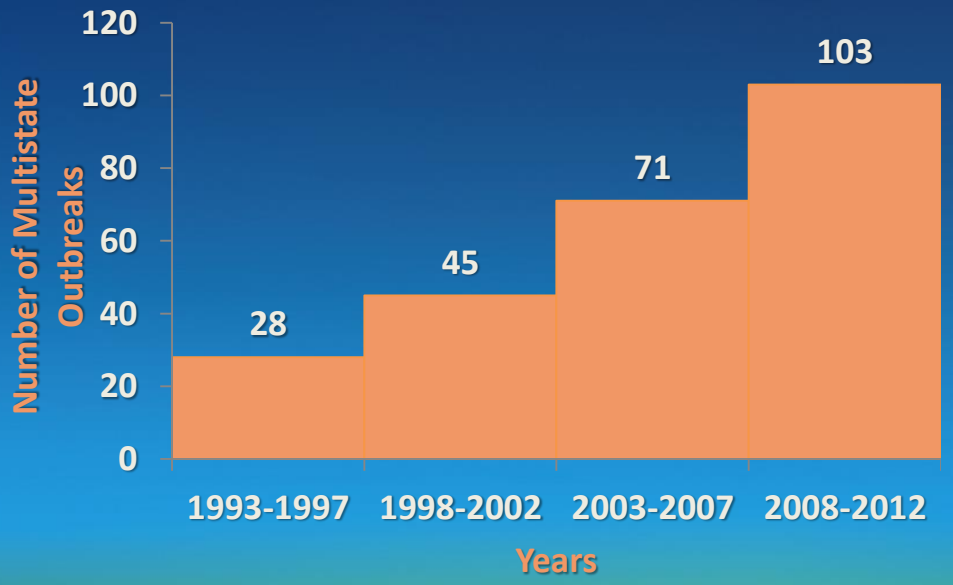
CDC Outbreak Reports

Each year, >150 multistate outbreaks and >1,000 state or local investigations

Since 2006, identified 22 new food vehicles that can transmit pathogens

60% of 2013 reported outbreaks were associated with food prepared in restaurants; 14% with catered food and 12% with home prepared food.

1993-2012 Outbreak Summary



Top Ten Food Combinations

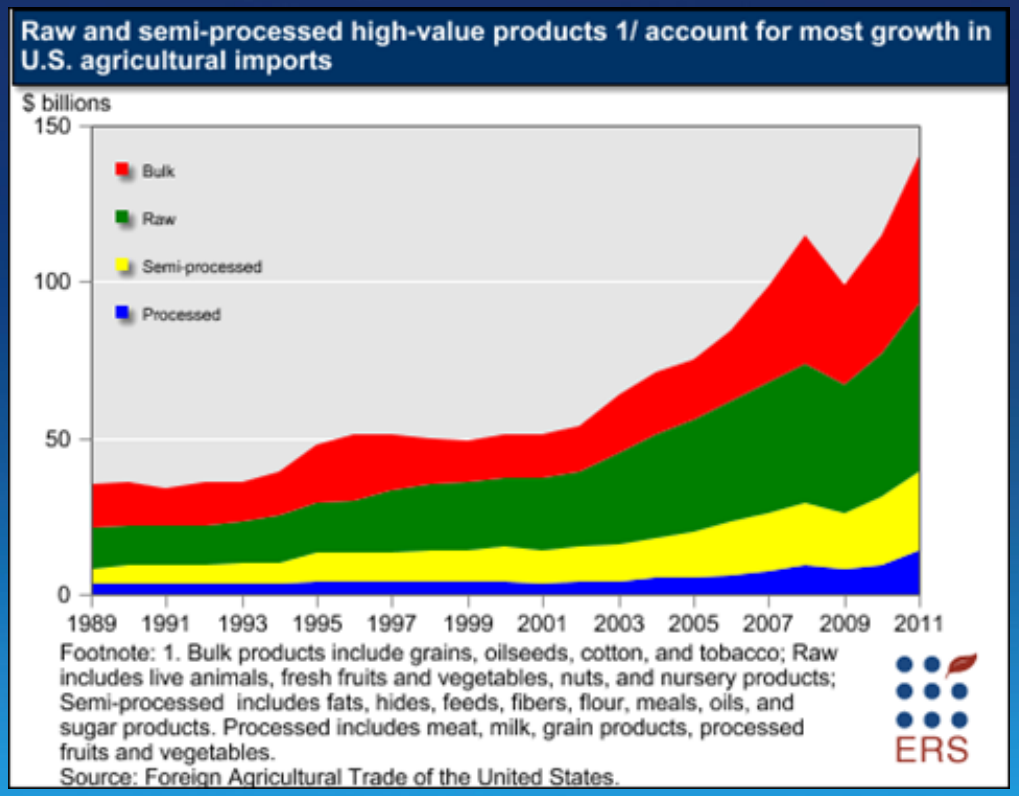
- *Campylobacter*/Poultry
- *Toxoplasma gondii*/Pork
- Listeria monocytogenes/Deli meat
- *Salmonella*/Poultry
- *Listeria monocytogenes*/Dairy
- *Salmonella*/Complex food
- *Norovirus*/Complex food
- *Salmonella*/Produce
- *Toxoplasma gondii*/Beef
- *Salmonella*/Eggs

Source: Batz M, Hoffman S, Morris JG. Ranking the risks: The 10 pathogen-food combinations with the greatest burden on public health. U. of FL, 2011, p. 9.

Imported Food

Imports are increasing.

Between 2004-2013, the average growth in imported food was 8.5% [1]



[1] USDA/ERS. Jerardo, A. U.S. food import value, by food group. Accessed on 6/15/15 at: www.ers.usda.gov/data-products/us-food-imports.aspx

More Than Just a Stomach Ache

According to the Food and Drug Administration, an estimated 2 to 3 percent of foodborne illness victims develop secondary long-term medical complications.

Over one million lingering health problems each year.

Frezen. Economic Research Service, USDA. The Economics of Food, Farming, National Resources and Rural America, www.ers.usda.gov

Vulnerable Populations

Food poisoning is always a miserable experience, but for the most vulnerable people, food safety can literally be a matter of life and death."

- Dr. Barbara Mahon, Deputy Chief, Enteric Diseases Epidemiology Branch, CDC

Serious Short-term Health Outcomes

There are many serious short-term health outcomes associated with foodborne disease:

Some of the acute illnesses caused by foodborne pathogens are:

Carditis, Colitis, Encephalitis, Liver abscesses, Meningitis, Hemolytic uremic syndrome, Pancreatitis, Pneumonia, Septicemia, Sepsis.

Serious Long-term Health Outcomes

There are also serious long-term outcomes associated with foodborne diseases

Some of the LTHOs include:

Guillain-Barré syndrome; reactive arthritis; irritable bowel syndrome; schizophrenia; neurological or kidney dysfunctions; hypertension; mental retardation; motor impairment; diabetes; chronic urinary tract infections, and vision or hearing loss.

LTHOs of Five Foodborne Pathogens

The long-term consequences of food-borne infection can be more significant than those of acute illness.

Salmonella

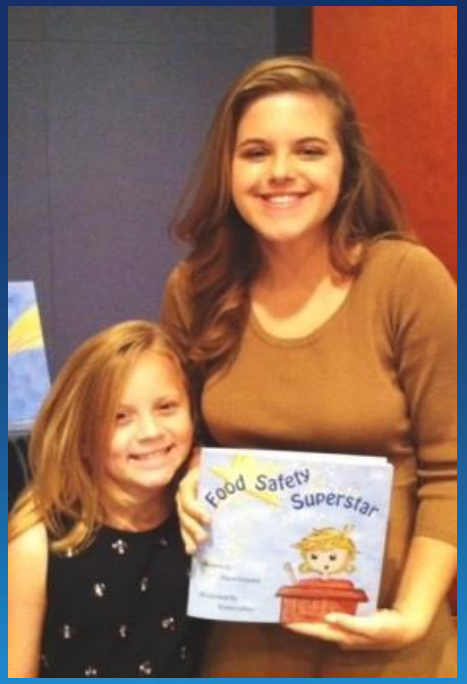
- An estimated 1.2 million illnesses and ~400 deaths/year
- Children < 1 year are 10 times more likely to be sickened [1]
- *Salmonella* accounts for 28% of all deaths and 35% of all hospitalizations caused by a known foodborne pathogen [2]

[1] Shea, Katherine, MD and the Committee on Environmental Health and Committee on Infectious Diseases. *Nontherapeutic Use of Antimicrobial Agents in Animal Agriculture, Am Acad of Peds*, 2004, p. 8 .

[2] Scallan, E. Estimates of Foodborne Illness Acquired in the United States. Power point presentation. FDA Pacific Region Retail Food Seminar and WAFDO Conference, August 9, 2011.

Salmonella & Reactive arthritis

- *Salmonella*, *Shigella*, *Yersinia* and *Campylobacter* infections are linked to reactive arthritis .
- ReA causes painful and swollen joints and can greatly affect quality of life.



Dana & her sister, holding Dana's book on food safety

Salmonella sources: Undercooked poultry or meat; unwashed produce; raw milk; eggs or products with raw eggs (like cookie dough); reptile or baby chick/duck contact

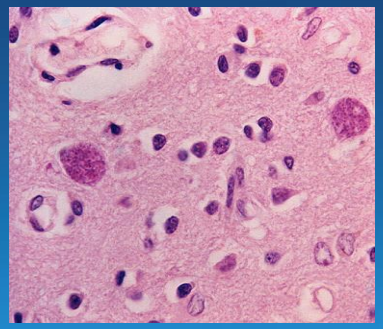
Toxoplasma gondii

***T. gondii* is a common foodborne pathogen.**

In the U.S. about 22% of people under 12 have been infected and the parasite can remain dormant in your system for years.

CDC has declared *T. gondii* to be a neglected parasite infection.[1]

Recent research studies show that families with cats are significantly more likely to have a child later diagnosed with schizophrenia or another serious mental illness. [1]



[1] CDC. Neglected Parasite Infections. Accessed 6/14/15 at: www.cdc.gov/parasites/resources/pdf/npi_toxoplasmosis.pdf

[2] Rorrey, E F; W Simmons and R. Yolken. Is childhood cat ownership a risk factor for schizophrenia later in life? Published Online: April 18, 2015 at: www.schresjournal.com/article/S0920-9964(15)00176-0/pdf

Toxoplasma gondii & Pregnancy

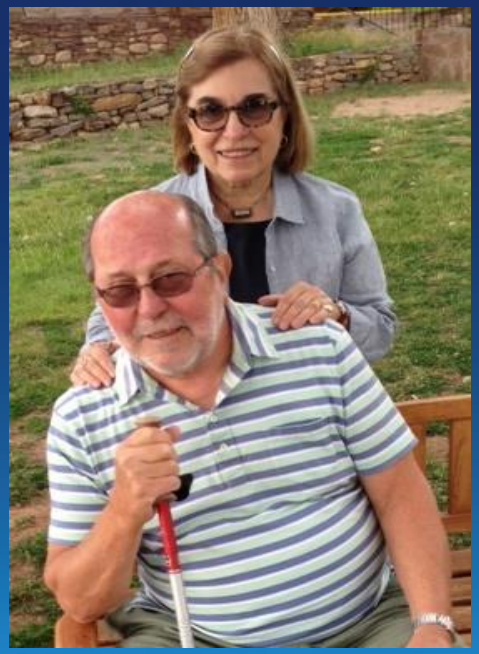
- Pregnant women are 10-13 times more likely to develop active cases of disease.
- Pregnant women experience flu-like symptoms, but the unborn child can be severely impacted.
- 80% of infected newborns are impaired by 17th year [2]
  - 50% severe-moderate retardation
  - 8% total blindness
  - 53% moderate visual impairment

[1] Scallan, E. et al. Foodborne Illness Acquired in U.S. *Emerg Infect Dis,* 2011;17(1):7-15. Accessed 06/12/15 at: www.medscape.com/viewarticle/743676

[2] Roberts, T. et al. Long-term Health Outcomes of Selected Foodborne Pathogens. 2009. Accessed on 06/14/14 at: www.foodborneillness.org/cfilibrary/CFI_LTHO_PSP_report_Nov2009_050812.pdf

Listeria monocytogens

- An estimated 1,600 illnesses and 260 deaths/year
- Adults over 65: 4 times more likely to be sickened
- *Listeria* in dairy products has been associated with soft ripened cheeses made from unpasteurized milk
- 40% of surviving adults and 20% of infected newborns will suffer life-long disabilities. [1]



John with wife Pat
Recovering from Lm

Roberts, T. et al. The Long-Term Health Outcomes of Selected Foodborne Illnesses. CFI White paper, 2009. Accessed 6/16/15 at http://www.foodborneillness.org/cfi-library/CFI_LTHO_PSP_report_Nov2009_050812.pdf

Listeria & Pregnancy

Listeriosis can cause:

- **Miscarriage**
- **Premature delivery**
- **Stillbirth**
- **Serious health problems for the newborn**

Pregnant women should avoid these foods:

Deli meat; hot dogs; soft cheeses; refrigerated pâté, meat spreads & smoked seafood; unwashed produce

Campylobacter

- A common causes of diarrheal illness in U.S. – about 2.4 million illnesses with 124 deaths/year
- Incidence is increasing – up 13% from 2006-2008
- 19% of reported *Campylobacter* cases are associated with international travel
- National Antimicrobial Resistance Monitoring System 2011 study found *Campylobacter* on 47% of raw chicken samples bought in American grocery stores.

Campylobacter – LTHOs

- *Campylobacter jejuni* causes about 40% of U.S. cases of Guillain-Barré Syndrome, a serious auto-immune disorder that affects the nervous system.
- Campylobacterosis is also a predictor for Reactive Arthritis and chronic Irritable Bowel Syndrome
- Incidence is increasing for multi-drug resistant strains

Shiga Toxin-producing *E. coli*

- An estimated 265,000 illness/year
- About 10-15% develop Hemolytic Uremic Syndrome
- HUS is leading cause of acute kidney failure in children under 5 years of age in U.S.
- About 30% develop LTHOs
- 3% - 5% of HUS victims die

E. coli O157:H7 & HUS LTHOs

Ashley

Mariah

Conclusions About LTHOs

- Most foodborne pathogens have both acute & long-term outcomes, but we only have evidence for a few of the LTHOs.
- Foodborne illness is costly, but several economists feel that the LTHOs far outweigh the costs associated with acute illness.
- Need more studies focused on the LTHOs and emerging zoonotic diseases.
- Need better prevention strategies and technologies to identify, manage and contain foodborne diseases.

Food Safety . . .

Looking for solutions!

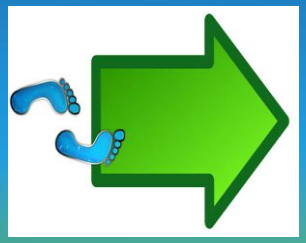
Steps forward . . .

2011 was an important food safety year!

Passage of FDA Food Safety Modernization Act

and

USDA declares six additional STECs as adulterants in raw non-intact beef



Other Steps Forward . . .

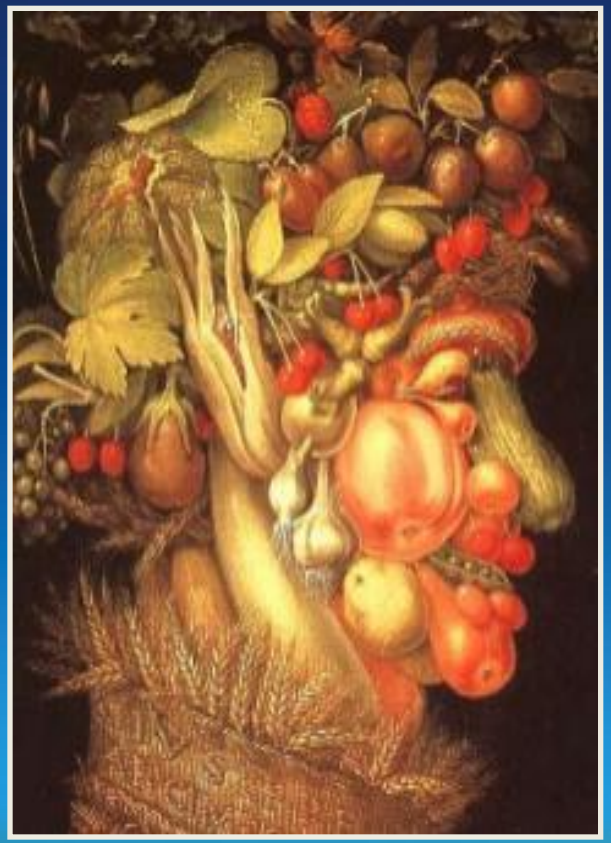
- FDA develops seven proposals to implement FSMA
- USDA sets new standards and improves labeling
- CDC's two new programs – Vital Signs and Business Pulse – help us better understand the impact of foodborne disease
- Industry is working to remove antibiotics from preharvest production, especially on poultry farms
- Congress has introduced several bills to address on-going food safety concerns

And continuing challenges . . .

- Must adopt food safety practices into all food operations.
- Must improve funding for foodborne illness surveillance.
- Must improve funding for food safety education.
- Must declare important antibiotic resistant strains as adulterants in high risk food products.
- Must increase the number of people entering food science and public health fields.

Working together, we can affect change!

Questions?



- Guiseppe Arcimboldo

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