Why Does Food Safety Continue to be Such a Challenge?
CHANGE! CHANGE! CHANGE!

Lynn M. McMullen

Department of Agricultural, Food and Nutritional Science

University of Alberta

Is the Canadian Food Supply Safe?

Estimated Annual Foodborne Illness in Canada

8 million cases

40,000 hospitalizations

500 deaths

AIC Formal Dinner

The Menu

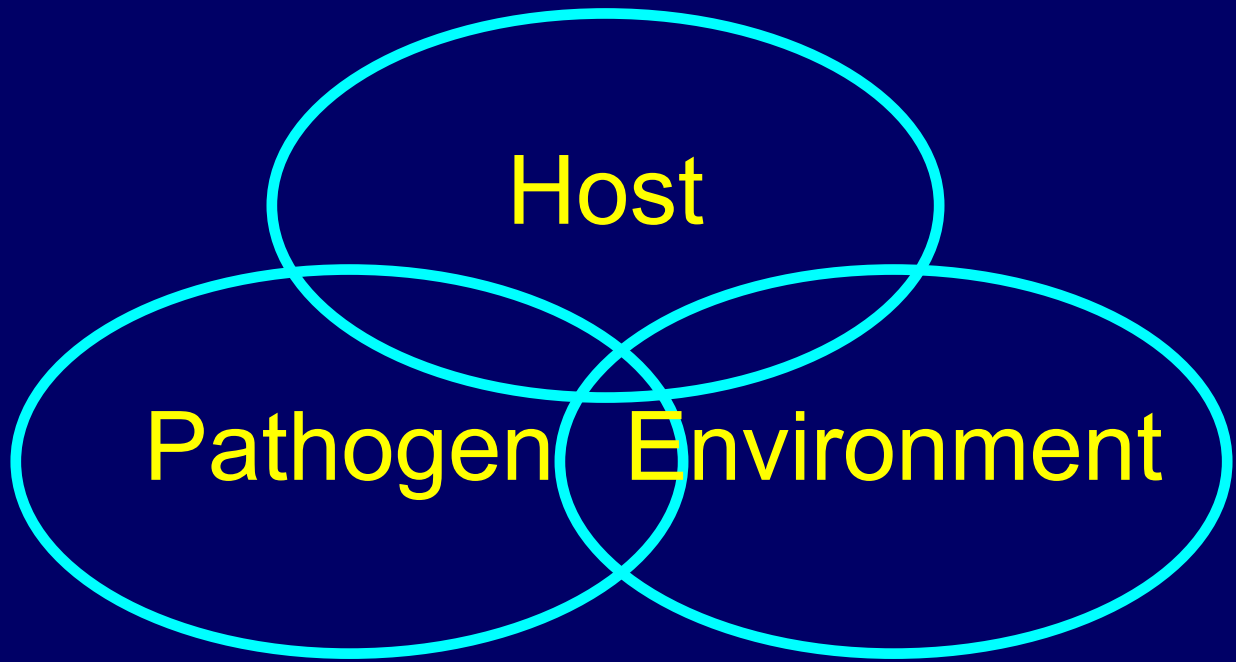
Seafood Chowder
Mesculun Lettuce
with Basil Dressing
Oysters Rockefeller
Chicken satay
with Rice Pilaf
Cream Puffs
Fresh Farm Milk

The Microbial Menu

Botulinum broth
E. coli salad with
Cyclospora Oocyte Dressing
Vibrios on the half shell
Salmonella surprise
with *B. cereus* rice
Staphylococcal delight
Listeria liqueur or
Campylobacter cocktail

Challenge to Food Safety

➔ Evolution and change



Challenges to Microbial Food Safety- Change is not always good!

- Foodborne pathogens
- Consumers
- Food supply

Change - Microorganisms

- Adapt to new environments

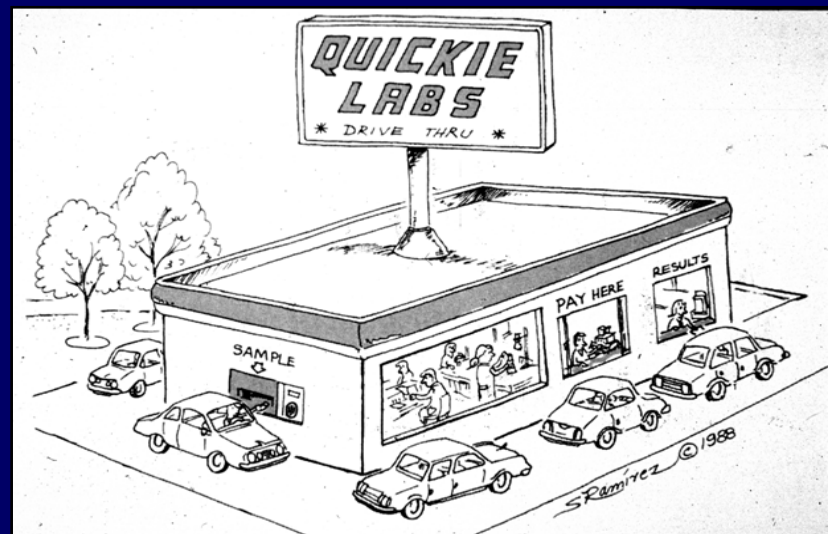
Adapt to New Environments- Acid Tolerance

1995 *Salmonella* in orange juice
29 cases

1996 *E. coli* 0157:H7 in apple juice
1 death, >66 cases

Change - Microorganisms

- Adapt to new environments
- Find in new environments



Find in New Environments:

Hepatitis A in green onions

2003 >550 cases

Salmonella in almonds

2001 168 cases in Canada
2004 29 cases

CALVIN & HOBBES

Salmonella in cookie dough

Change - Microorganisms

- adapt to new environments
- find in new environments
  - 2004
    - 50 *Vibro parahaemolyticus* infections linked to consumption of oysters from Alaska
    - A direct result of an increase in water temperature

Change - Microorganisms

- adapt to new environments
- Find in new environments
- acquire new genes

Change - Microorganisms

- adapt to new environments
- find in new environments
- acquire new genes
  - toxin genes
    - Enterohemorrhagic *Escherichia coli*
    - Evolved over past 50 years
    - Acquired toxin genes

Change - Microorganisms

- adapt to new environments
- acquire new genes
  - toxin genes
  - Antimicrobial resistance genes

Salmonella Typhimurium DT104
Salmonella Heidelberg

- multiple drug resistant (MDR)

Percentage of multiple drug resistant *E. coli* and *Salmonella* isolated from different abattoir sources in Canada

Organism	Year	Source		
		Chicken	Swine	Cattle
E. coli	2002	80	79	31
	2005	77	85	27
Salmonella	2002	48	45	-
	2005	40	47	-

Canadian Integrated Program for Antimicrobial Resistance Surveillance

Change - Microorganisms

- adapt to new environments
- find in new environments
- acquire new genes
- sequalae

Chronic Sequelae

• Septic arthritis	*Salmonella* spp.
• Rheumatoid arthritis	*Yersinia, Shigella, Salmonella, Campylobacter, Escherichia* spp.
• Graves Disease	*Yersinia enterocolitica*
• Crohn's disease	*Mycobacterium paratuberculosis*, *E. coli, Streptococcus* spp.
• Renal disease	*E. coli* O157:H7 and others
• Guillain Barre syndrome	*Campylobacter jejuni*

Change - Consumers

- Eat more meals away from home
  - Risk factor for foodborne disease

Change - Consumers

- Eat more meals away from home
- Low level of knowledge about practices that impact food safety
  - handwashing

ASM – Sept 2007

- 92% of adult Americans self-report *always* washing their hands after using a public restroom
- Actual observations –
  - 66% of men wash their hands in public
  - 88% of women wash their hands in public


THE FAR SIDE
By GARY LARSON
DIDN'T WASH HANDS
MEN
© 1992 Universal Press Syndicate
2-17

Change - Consumers

- Eat more meals away from home
- Low level of knowledge about practices that impact food safety
- Increase in diseases that cause immunosuppression

Change - Consumers

- Eat more meals away from home
- Low level of knowledge about practices that impact food safety
- Increase in diseases that cause immunosuppression
- Increase use of immunosuppressive agents
  - chemotherapy
  - transplant patients

Change - Consumers

- Eat more meals away from home
- Low level of knowledge about practices that impact food safety
- Increase in diseases that cause immunosuppression
- Increase use of immunosuppressive agents
- Aging population

Change - Consumers

- Eat more meals away from home
- Low level of knowledge about practices that impact food safety
- Increase in diseases that cause immunosuppression
- Increase use of immunosuppressive agents
- MaInutrition

Change – the food supply

- Longer storage life
  - Modified atmosphere packaging

  →Longer time for pathogen growth at refrigeration temperatures
    - i.e. *Listeria monocytogenes*
- Fresh, preservative free foods

Change – the food supply

- Longer storage life
- Fresh, preservative free foods
- More perishable foods consumed
  - increased consumption of fruits and vegetables

Traditional Sources of Foodborne Pathogens

- Meat and poultry
- Milk
- Fish and seafood
- Fruits, vegetables, cereals
- Ready-to-eat foods

Percentage of Cases of Foodborne Disease from Different Sources

Year	Source Implicated		
	Animal	Plant	Fish and Seafood
1973 to1987	39	5	5
1988 to 1992	17	12	3
1990 to 1998	20	41	8

Public Health Agency of Canada; FSIS, USDA

Change – the food supply

- Longer storage life
- Fresh, preservative free foods
- More perishable foods consumed
- Global food supply

Cyclospora cayentanensis on Guatemalan Raspberries

Year	Location	# of Cases
•	Canada/USA	1,465
•	Canada/USA	1012
•	Canada	221

Change – the food supply

- Longer storage life
- Fresh, preservative free foods
- More perishable foods consumed
- Global food supply
- Changes in agricultural practices

Change – the food supply

- Changes in agricultural practices
  - Application of manure as a fertilizer
  - Intensive livestock practices

Change – the food supply

- Longer storage life
- Fresh, preservative free foods
- More perishable foods consumed
- Global food supply
- Changes in agricultural practices
- Economic impact of foodborne disease

SETTLEMENT CLOSES CHAPTER IN '93 HAMBURGER DEATHS

Feb. 26/98

Reuters

Bob Burgdorfer

CHICAGO -- A $58.5 million payment to Foodmaker Inc. by nine beef suppliers this week clears up nearly all claims stemming from four deaths and many illnesses in 1993 from *E.coli* tainted hamburgers.

ODWALLA pleads guilty over deadly outbreak

July 23/98
AP/Reuters

SACRAMENTO, Calif. -- Juice manufacturer Odwalla Inc. pleaded guilty and agreed to pay a record $1.5 million fine today over a 1996 *E. coli* outbreak that killed a Colorado girl and sickened at least 66 other people.

Economic impact of *E. coli* O157:H7

- 1994 Zero tolerance policy for *E. coli* O157:H7 in USA
- 1997 25 million lbs of ground beef recalled Hudson Foods closes
- 2007 21.7 million lbs of ground beef recalled Topps Meats closes
- 2007 All products from Canadian Est 630 recalled
- 2007 Cargill (US) recalls over 1 million lbs of ground beef

Challenges to Microbial Food Safety- Change is not always good!

- Foodborne pathogens
- Consumers
- Food supply

Food Safety – Who is responsible?

- Regulators
- Industry
  - Farm
  - Processors
  - Foodservice
  - Retail
- Consumers

Consumer Education

A toll-free telephone service ready to answer consumer questions and concerns about home food safety

1-800-892-8333