INCIDENCE OF FOODBORNE DISEASES

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(help from
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Disease foodborne? Criteria:

"Food attribution" —

- Agent from patient(s) found in food ("fingerprinting")
- Food consumption matches among patients

Disease foodborne?

Other criteria:

- "Fingerprints" match among patients
- Frequently foodborne disease
- Gastrointestinal symptoms

How do we know a disease is foodborne?

- Outbreaks vs. sporadic cases — recognition of common-source outbreaks
- Acute vs. chronic illnesses — acute vs. chronic exposures

PulseNet

- A national network of public health laboratories that perform DNA "fingerprinting" on bacteria that may be foodborne

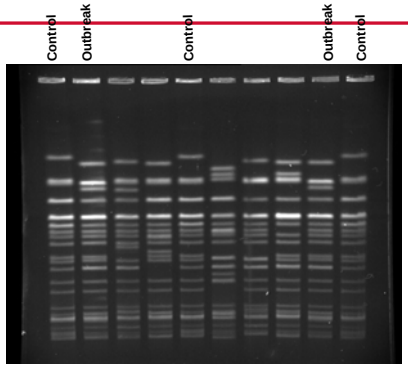
PulseNet (cont.)

- Permits rapid comparison of these "fingerprint" patterns through an electronic database at the CDC

PulseNet (cont.)

- Allows identification of concurrent outbreaks across wide geographical areas and aids identification of common source outbreaks

PFGE of *Xba*I-digested genomic DNA of *E. coli* O157:H7 "outbreak strain" — PulseNet



"At-risk" populations (~1990, CAST)

Category	People ($\times 10^6$)
Pregnant women	5.657
Neonates	4.002
Elderly (>65)	29.400

"At-risk" populations (~1990, CAST)

Category	People ($\times 10^6$)
In nursing homes	1.553
Cancer (nonhospitalized)	2.411
Organ transplant	0.110
AIDS patients	0.135

How are foodborne illnesses reported?

- Reporting channels
- Compilation
- Reporting

Reporting channels— from physician or ?

- Levels of government; priorities
- Paper vs electronic
- FoodNet — data from diagnostic laboratories
- Outbreak suspected, investigated?

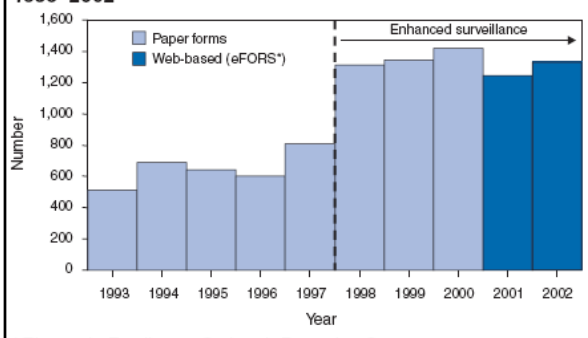
Compilation

- Structure of information gathering
- Structure of information recording

Reporting

- Choice of "medium“
- Timing

FIGURE 1. Number of reported foodborne-disease outbreaks, 1993–2002



*Electronic Foodborne Outbreak Reporting System.

U.S. statistics on foodborne disease

- Outbreaks only
- *Reported* incidence: outbreaks, cases, deaths
- "Causes": etiology, contributing factors

U.S. statistics on foodborne disease

- Seasonality, place food was eaten, vehicles (identity vs. "~~ethnicity~~")
- Undetermined etiology — **FoodNet**
- Estimates from CDC in *Emerging Infectious Diseases*

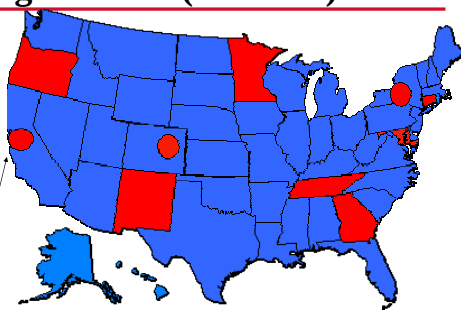
Foodborne diseases active surveillance network

- *Campylobacter*, *E. coli* O157, STEC non-O157, *Listeria*, *Salmonella*, *Shigella*, *Vibrio*, *Yersinia*, *Cryptosporidium*, *Cyclospora*, HUS
- **All clinical labs contacted at least monthly**

"FoodNet"

- Collaborative effort between state health departments, USDA, FDA, CDC
- Principal foodborne diseases component of CDC's Emerging Infections Program (EIP)
- Established in 1995 in four sites
- Currently 10 EIP sites with 41 million persons under surveillance

Emerging Infections Program sites (FoodNet)



CA EIP site includes San Francisco, Alameda, and Contra Costa counties

FOODBORNE DISEASE OUTBREAKS, U.S., 1998–2002

	Outbreaks		Cases		Deaths
	No.	%	No.	%	No.
Bacterial	1184	17.8	37887	29.5	70
Chemical	221	3.3	1140	0.9	0
Parasitic	23	0.3	630	0.5	0
Viral	709	10.7	28274	22.0	0
Multiple	30	0.5	1060	0.8	0
Confirmed	2167	32.6	68991	53.7	76

FOODBORNE DISEASE OUTBREAKS, U.S., 1998–2002

	Outbreaks		Cases		Deaths
	No.	%	No.	%	No.
Confirmed etiology	2167	32.6	68991	53.7	76
Undetermined etiology	4480	67.4	59389	46.2	12
Total (5 yr)	6647	100	128380	100	88

BACTERIAL FOODBORNE DISEASE, REPORTED VS EST.

Species	Reported, 1998–2002	Estimated, annual
Campylobacter	1,440	1,963,141
Clos. perfringens	6,724	248,520
Escherichia coli	4,864	173,107
L. monocytogenes	256	2,493
Salmonella	16,821	1,341,873

FoodNet data

Organism	1996–1998	2005
Campylobacter(/10^5)	21.7	12.7
E. coli O157 (/10^5)	2.3	1.1
Listeria (/10^6)	4.9	3.0
Salmonella (/10^5)	13.5	14.6
Shigella (/10^5)	7.7	4.7

ANNUAL (FOODBORNE?) CASES, U.S., BY SOURCE

Agent	Passive (1998–2002)	Estimated (Mead et al., 1999)	FoodNet (2005, 3×10^8)
Campylobacter	1,440	1,960,000	38,100
Salmonella	16,821	1,340,000	43,800

PARASITIC & VIRAL F-BN DISEASE, REPORTED VS EST.

Species	Reported, 1998–2002	Estimated, annual
Giardia	119	200,000
Toxoplasma	0	112,500
Trichinella	33	52
Hepatitis A	981	4,170
Noroviruses	27,171	9,200,000

FoodNet data (annual)

Organism (all /10^6 people)	1996–1998	2005
Cryptosporidium	26.8	29.5
Cyclospora	1.6	1.5
Vibrio	2.4	2.7
Yersinia	8.9	3.6

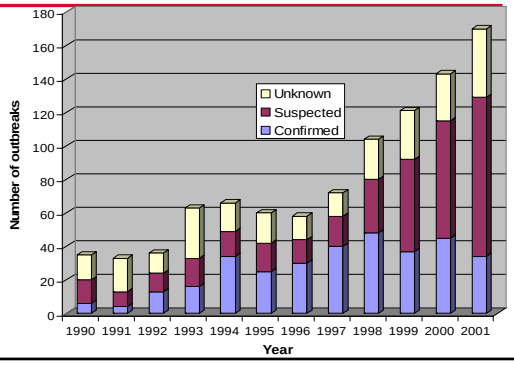
California Agriculture

- Leads US: ~88,000 farms & ranches; related economic activity = $100 billion
- Largest provider of milk & dairy products ($47.4 billion)
- Leads the nation in agricultural exports ($6.5 billion/yr)
- Large, diverse population

Foodborne illness in California

- 9 million illnesses (viral>bacteria>parasitic)
- 39,000 hospitalizations (bacterial>viral>parasitic)
- 600 deaths (bacterial>parasitic>viral)

Foodborne outbreaks in California 1990–2001



Confirmed etiologic agents, CA

Etiology	1999 # (%)	2000 # (%)	2001 # (%)	2002 # (%)
Bacterial	35 (95)	27 (60)	21 (54)	20 (48)
Parasitic	1 (3)	1 (2)	3 (8)	0 (0)
Chemical	0 (0)	2 (4)	4 (10)	4 (10)
Viral	1 (3)	15 (33)	12 (31)	18 (43)
Total	37 (100)	45 (100)	39 (100)	43 (100)

Foodborne outbreaks, California

Year	Outbreaks (Cases)	Increase	Confirmed # (%)	Suspected # (%)
1999	121 (3325)	20%	37 (31)	55 (46)
2000	141 (3716)	17%	45 (32)	71 (50)
2001	177 (2806)	25%	39 (22)	103 (58)
2002	207 (3355)	17%	40 (20)	143 (69)

Specific agents in foodborne outbreaks, CA

Etiology	1999 # (%)	2000 # (%)	2001 # (%)	2002 # (%)
Norovirus	1 (3)	14 (31)	12 (31)	18 (45)
Salmonella (non SE)	9 (24)	13 (29)	5 (13)	8 (20)
Salmonella Enteritidis	14 (38)	6 (17)	1 (3)	1 (3)
E. coli O157	2 (5)	1 (3)	5 (13)	5 (13)
Shigella	5 (14)	3 (9)	7 (18)	2 (5)

Food vehicle by year of outbreak, CA

Vehicle	1991–1995	1996–2000
Produce	1 (2)	29 (30)
Meats	17 (30)	14 (15)
Dairy	3 (5)	2 (2)
Eggs	12 (21)	17 (18)
Seafood	4 (7)	7 (7)
Multiple	7 (13)	16 (17)
Other	12 (21)	11 (11)

Includes only outbreaks with a confirmed etiologic agent.

What about foodborne disease in other countries? (e.g., Europe)

- Some have no reporting mechanism
- *Salmonella* is almost everywhere—may be presumed foodborne
- *Campylobacter* often not sought

Other countries?

- Viruses rarely reported (EU) — hepatitis A presumed foodborne in Germany
- "Undetermined etiology" vs. "other-and-unknown" and "infectious enteritis"
- UK's special problem—vCJD

CJD in the UK

Year	Sporadic	vCJD	Other
2001	58	20	9
2002	72	17	5
2003	76	18	11
2004	51	9	6
2005	65	5	13
2006	57	5	10

Other countries?

- Some countries seem not to consider foodborne disease from food prepared and eaten at home, whereas others take this very seriously.
- Canada similar to U.S., except that foodborne virus disease is rare, and acute illness is sometimes attributed to yeasts and molds.

Other countries?

- European Union now has a program; Australia and New Zealand seem to be on the way
- Pan American Health Organization—Latin America & Caribbean

What might we aspire to?

- More timely reporting
- More complete reporting
- Measures of severity and economic impact
  - –Monetary costs
  - –"Human" costs
- **FoodNet**

Prognosis for foodborne disease reporting

- From physicians to national health services, incentives to report are lacking
- **FoodNet**
- Undetected problems don't require solutions (disincentives)
- Who speaks for the public?

Summary

- Information on incidence of foodborne disease = "educated" (?) guesses
- This ignorance has led to misapplication of limited resources for food safety

Summary

- Ignorance persists because of political expediency
- The "public" is unlikely to make things better
- FoodNet may make a difference