




Industry Uses of Microbiological Criteria and Testing for Raw Food Products

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**This presentation is limited to food
safety, quality is not considered.**



Raw food products

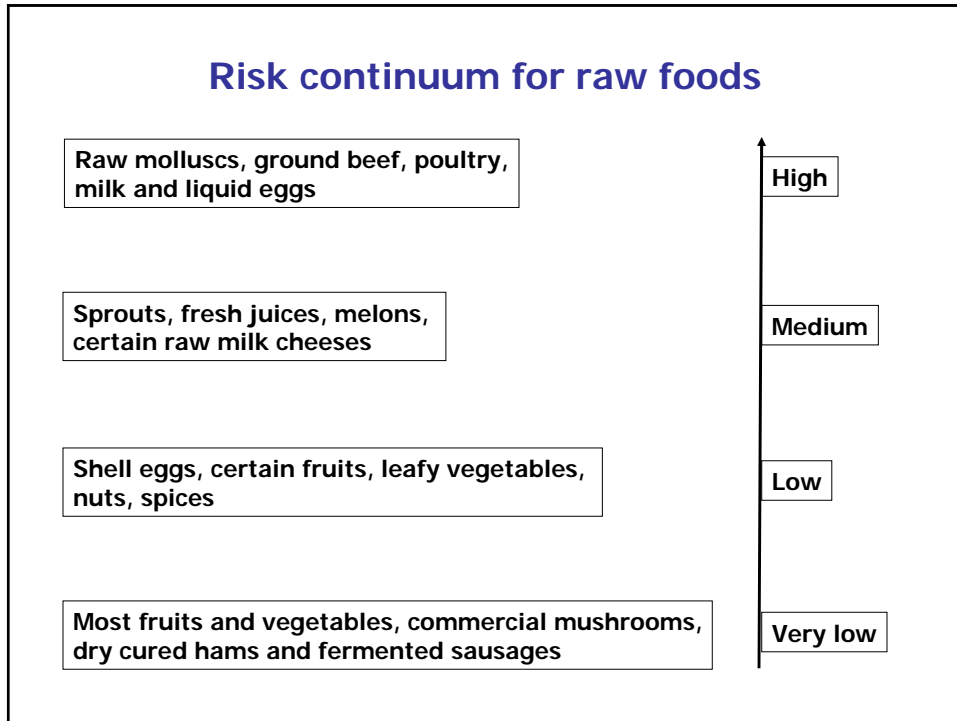
- **Examples: raw meat, poultry, seafood, eggs, fruits, vegetables**
- **They may have been subjected to one or more reduction steps (e.g., washing, sanitizing, steaming) that may be marginally effective**



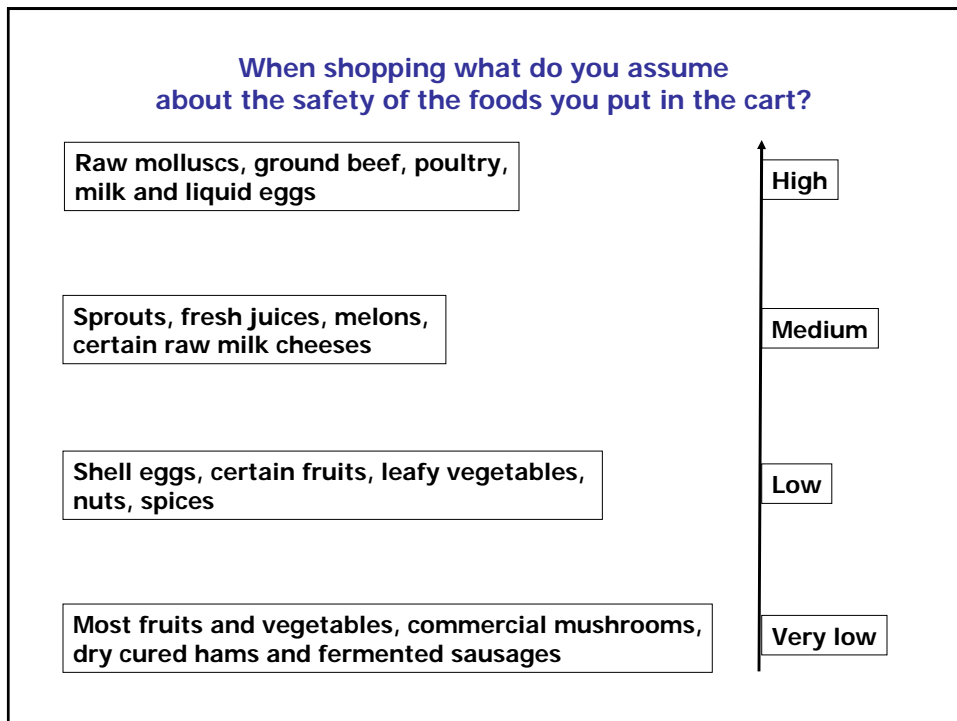
Significance of raw foods as a source of foodborne illness

- **Historically, raw foods have been a major source of foodborne disease**
- **Important factors:**
 - **Cross contamination to RTE foods (e.g., raw poultry)**
 - **Survival in marginally processed foods (e.g., raw milk cheese)**
 - **Growth (e.g., melons, sprouts)**

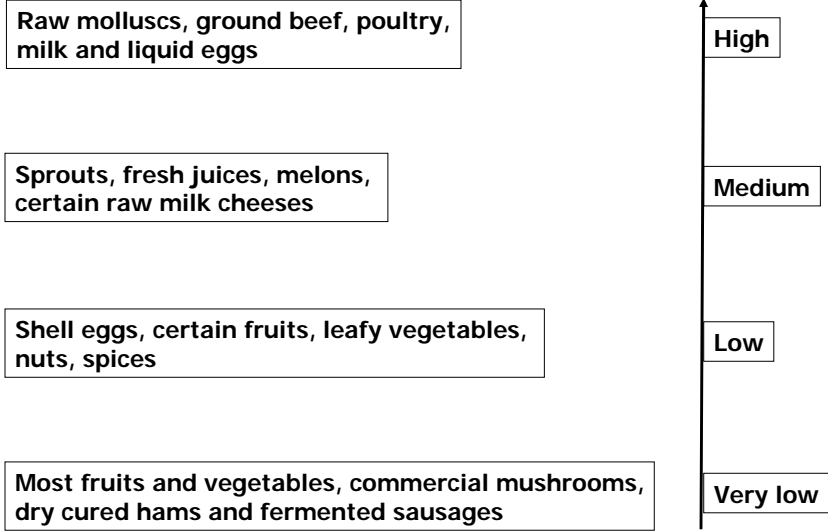
Risk continuum for raw foods



When shopping what do you assume about the safety of the foods you put in the cart?



Where on this continuum would testing the food be an effective control measure?



Risk-based sampling

- Influenced by:
 - Importance to food safety
 - Whether sampling is used as a control measure (e.g., CCP) to manage risk.
 - If yes, a more stringent sampling plan is needed
 - The expected prevalence rate of a microbial hazard (e.g., >5%; < 0.5%)

Risk based sampling – another continuum

Sampling is a control measure (i.e., CCP):
dry sausage blends - *E. coli* O157:H7
ground beef - *E. coli* O157:H7
sprouts – salmonellae, *E. coli* O157:H7

High:
ICMSF-type
of plan

Sampling is for process verification of each lot:
fresh juice – *E. coli*

Medium

Sampling to assess trends for process control
(e.g., moving window):
E. coli and salmonellae on carcasses

Low

Company policy requires a report-for-the-file

Very low

No. samples required for 95% confidence of detecting at least 1 defective unit

% defectives in lot	No. sample units
20	14
10	29
5	59
2	149
1	299
0.1	2995



Frequency of positive lots for salmonellae

Liquid whole eggs	48%
Ground chicken	36%
Ground beef	1.7%
Cantaloupe	0.3, 0.5, 2.4, 3.3% (4 surveys)
Leafy greens	0.0, 0.6% (2 surveys)



When does industry test raw foods?

- Three reasons:
 - Lot acceptance sampling
 - Process control
 - Investigational sampling



When does industry test raw foods?

Lot acceptance sampling

- Sensitive ingredients that may be added to RTE foods
 - ingredients added to ice cream – salmonellae
- Pre-shipment tests required by purchaser
 - beef trimmings – *E. coli* O157:H7
- Regulatory requirement or guidance
 - irrigation water for sprouts – salmonellae, *E. coli* O157:H7



Lot acceptance sampling

- Determine acceptability of a suspect lot
 - When confidence in a process is in question
 - Buyer wants a report-for-the-file
- ### Process control
- Examples:
 - carcasses - *E. coli*
 - fresh citrus juice – *E. coli*



■ **Investigational sampling:**

- Validate CCPs ($H_0 - \Sigma R + \Sigma I \leq PO$ or FSO)
- Understand risk (e.g., prevalence and concentration of pathogens)
- Identify sources and routes of contamination to learn where and how control measures can reduce risk



■ **Investigational sampling:**

- Investigate process failures and deviations from normal
- Evaluate new suppliers and co-packers
- Evaluate new technologies to control pathogens



The tremendous value of compositing samples

- Compositing has made it possible to apply more stringent sampling plans and increase confidence in the decisions made by industry over the past 35 years



Examples of alternatives to testing

- Molluscs – sample the water (e.g., total coliforms, fecal coliforms)
- Fresh meat and poultry:
 - Specify date from kill and conditions for holding/shipping (e.g., temperature)
 - Can include method of chilling and added ingredients (e.g., CO₂ snow, salt, nitrite)

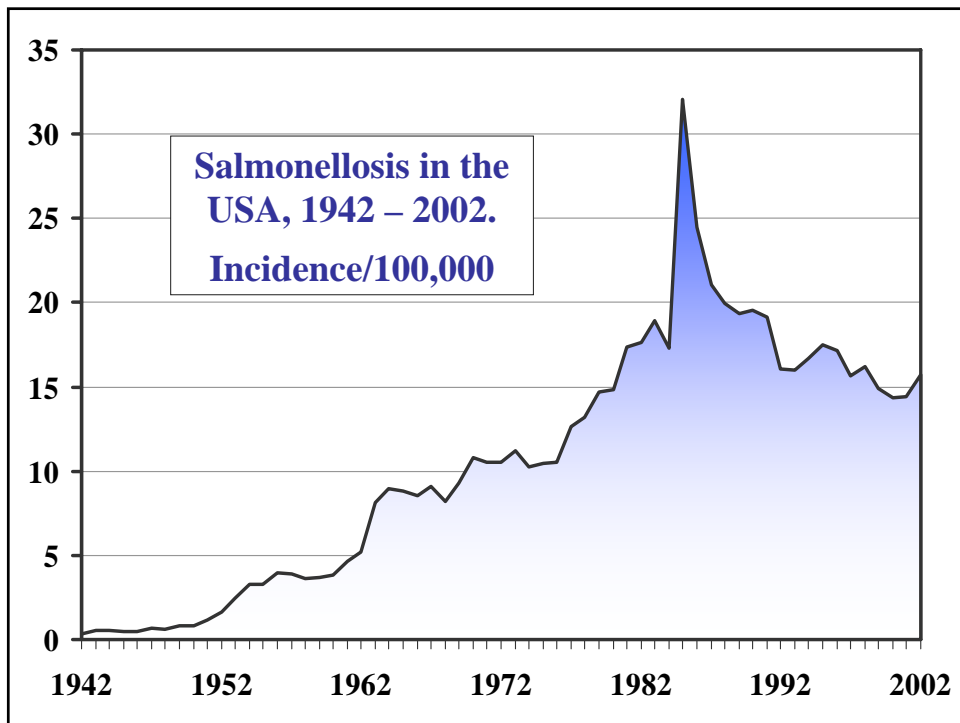
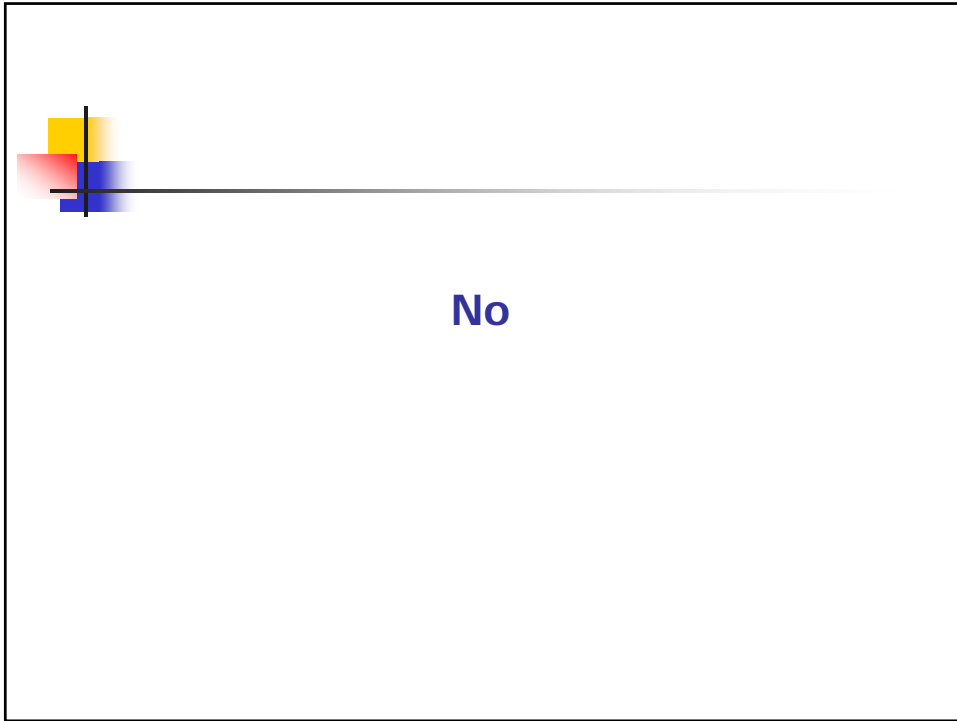


- **If a raw food will be subjected to a validated reduction step (e.g., 5D) that operates within a HACCP system, there is no need to test the food.**

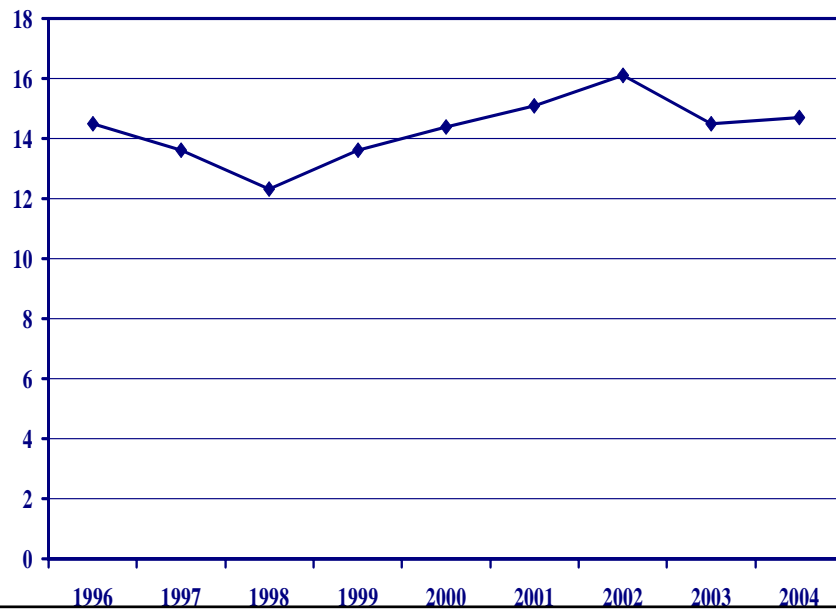


Issues

- **Hold and test programs for highly perishable raw foods require very close management to ensure safety, avoid a recall and retain shelf life**
- **Where can future improvements in control best be attained: at the plant vs. at the farm**
- **Have industry efforts since 1996 to control salmonellae on carcasses led to a reduction in human salmonellosis?**

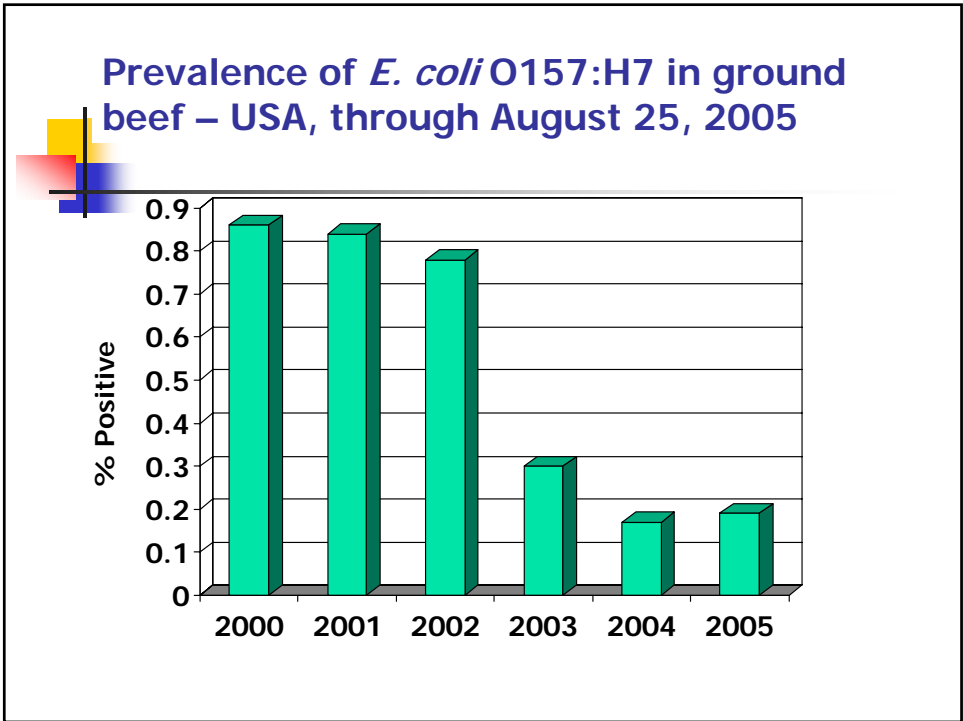
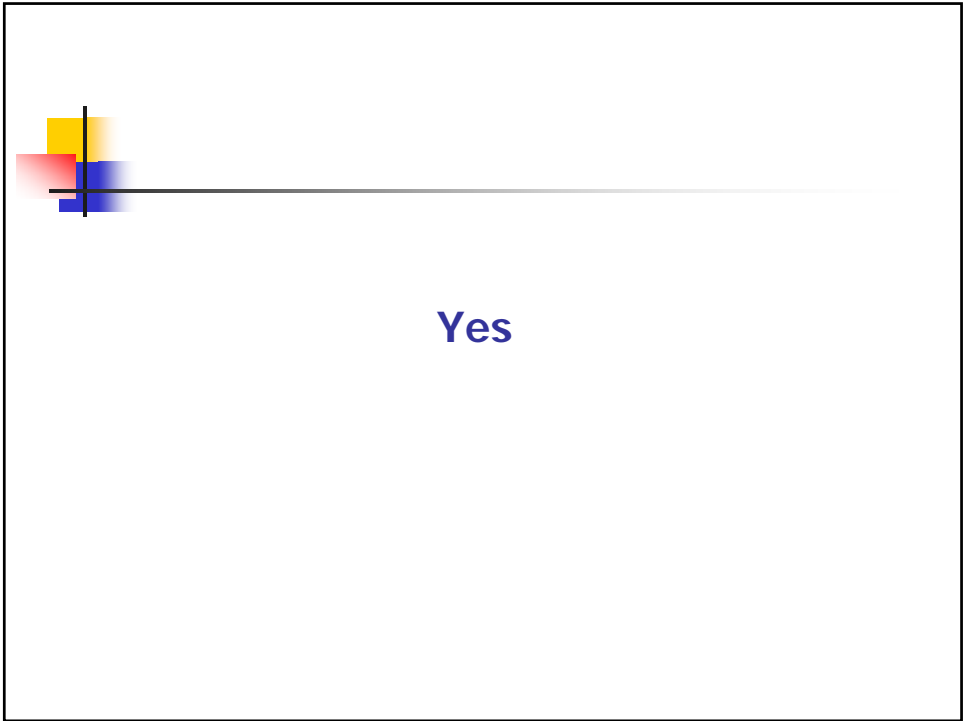



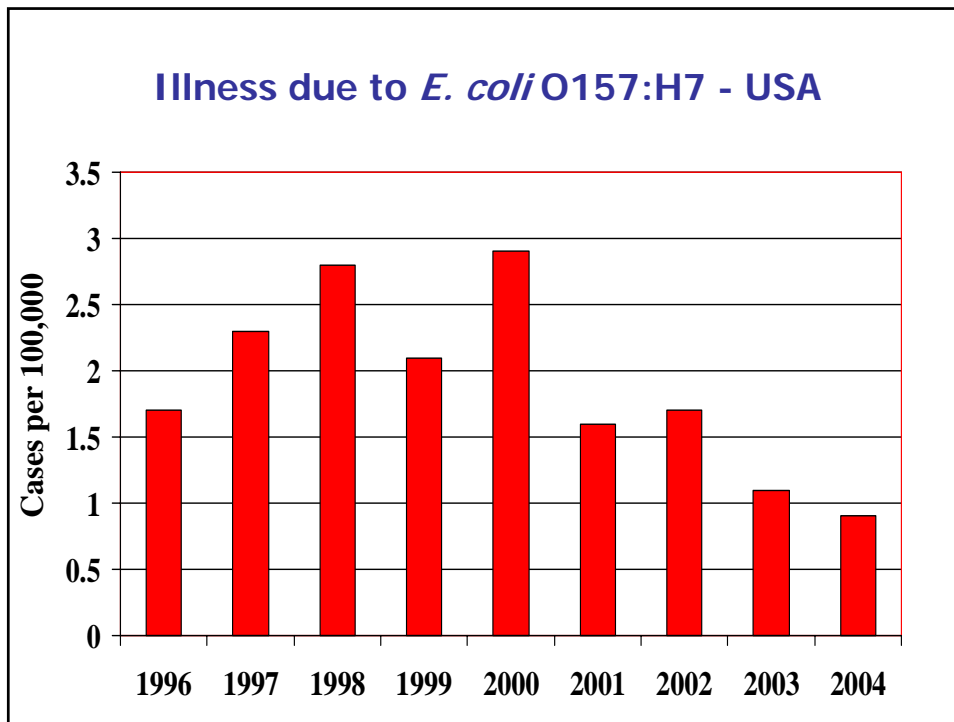
FoodNet data for salmonellosis, 1996 - 2004



Beef trimmings and ground beef – a unique situation

- Testing beef trimmings and ground beef is being used as a risk management strategy for *E. coli* O157:H7
- Has testing been an effective control measure?





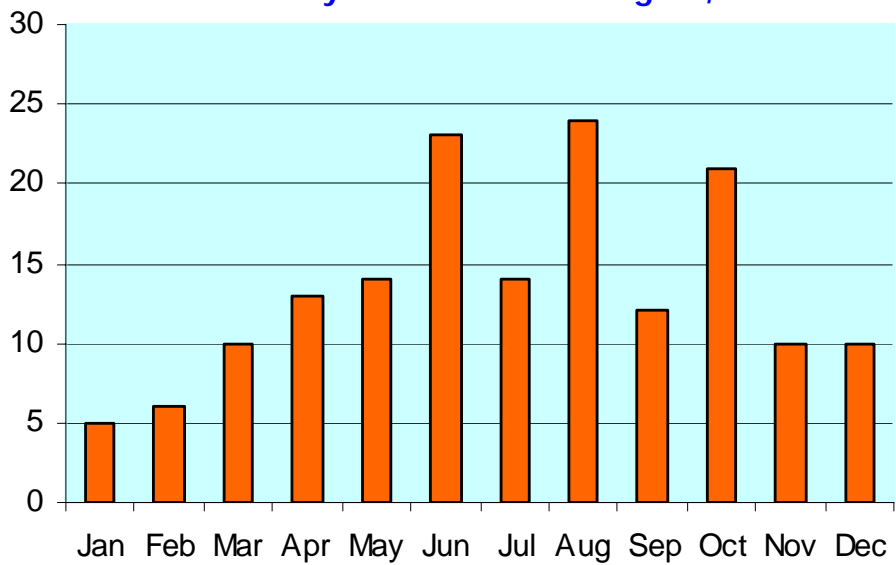
Seasonality is a significant factor in many raw foods

- Seafood toxins
- Vibrios - seafood
- Salmonellae, *Campylobacter* - raw poultry
- *E. coli* O157:H7 – beef



The seasonal effect in raw foods is reflected in the incidence of human disease

E. coli O157:H7 in ground beef, USA.
Positive lots by month: 2001 - August, 2005



E. coli O157:H7 cases by month, USA - 2000

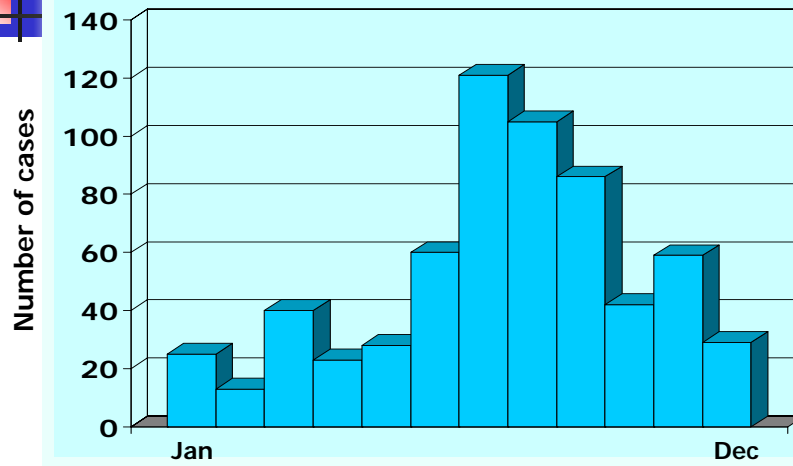
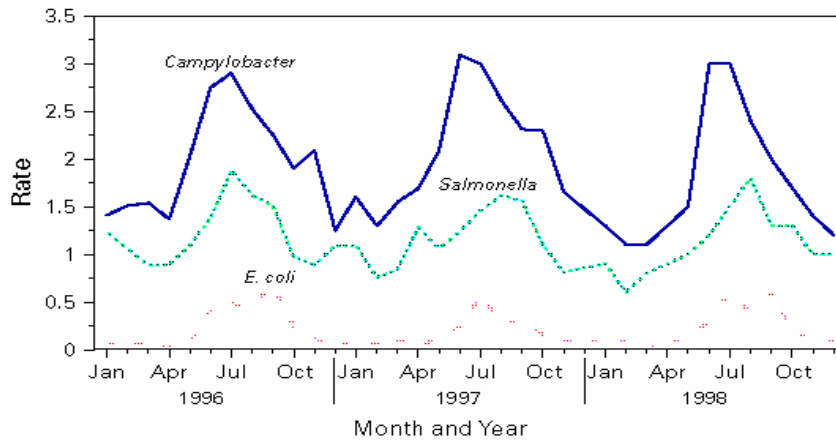


FIGURE 1. Rate* of laboratory-confirmed infections with selected pathogens detected by the Foodborne Diseases Active Surveillance Network (FoodNet)[†] — United States, 1996–1998



*Per 100,000 population.

[†]In 1996, active surveillance was initiated for culture-confirmed cases of *Campylobacter*, *Salmonella*, *Shigella*, and Shiga toxin-producing *Escherichia coli* O157 infections in Minnesota and Oregon and selected counties in California, Connecticut, and Georgia. Data presented in this figure are from the original FoodNet sites only.

Anon. 1999. MMWR 48:189-194



Microbiological criteria for pathogens in raw foods

- Specifications
- Guidelines
- Standards



Specifications – microbiological criteria

- Very common for quality (e.g., SPC)
- Not common for pathogens
 - Example: ingredients added to RTE foods that receive no subsequent pathogen kill step



Guidelines and standards

- Spent irrigation water for sprouts – salmonellae, *E. coli* O157:H7
- Raw meat and poultry carcasses – *E. coli*, salmonellae
- Beef trimmings, ground beef – *E. coli* O157:H7

