Food Safety, Scientific Perspective

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Food Safety, Scientific Perspective

- What is current about food safety?
  - Impact on Public Health
  - Costs of foodborne illness (FBI)
  - Impact on international trade
- A sound scientific approach to food safety
  - Knowing the problem
  - Evaluating possible solutions/remediation
  - Implementing technology

Impact on Public Health and Economy

Foodborne Illness in the U.S.

- **Annual No. cases of FBI**
  - 76 millions
- **Hospitalizations due to FBI**
  - 325,000 every year
- **Deaths attributed to FBI**
  - 5,000 every year

CDC, 1999

Societal costs of foodborne illness

- Costs to individual households
  - Medical expenses
  - Income loss
- Industry costs
  - Animal production
  - Pathogen control
  - Outbreaks and recalls
- Government costs
  - Surveillance
  - Research
  - Outbreaks

Cost (in millions of dollars per year) of foodborne disease caused by selected pathogens in the United States

Pathogen	Foodborne cases	Total cost (million dollars)
Salmonella	606,000-3,840,000	600-3,500
Staphylococcus aureus	1,513,000	1,200
Campylobacter	1,375,000-1,750,000	600-1,000
Escherichia coli O157:H7	8,000-16,000	200-600
Clostridium perfringens	10,000	100
Listeria monocytogenes	1,526-1,767	200-300
Total	3,603,526-7,130-767	2,900-6,700

ERS-USDA, 1996

No. cases of FBI in Argentina, 1997

- Reported cases
  - 569,583
- Hospitalized
  - 28,479

Costs for FBI in Argentina, 1997

Type of cost	Amount (US Dlls)
Medical attention	45,677,294
Hospitalization	19,336,101
Loss of family income	10,252,500
Total	75,265,895

Nader et al., 1999

Estimated costs of FBI. Argentina, 1997

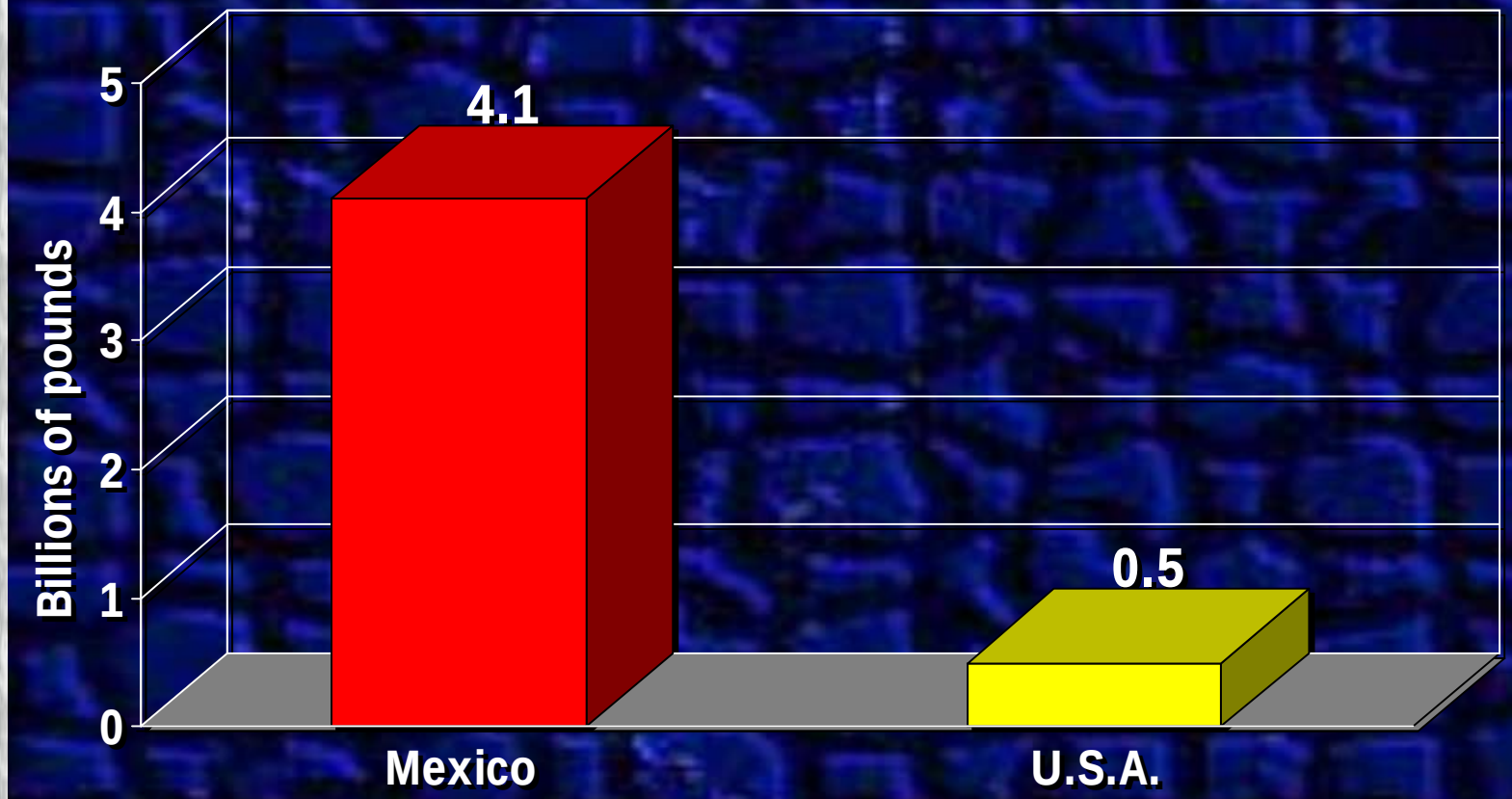
Calculated costs	US$75,265,895
Under-reporting	1% real incidence
Estimated costs	US$7,526,589,500

Food Safety:

A Global Problem With a Global Impact

Microbiological Hazards: Global Threat in the 1990s

Source of fresh fruits and vegetables consumed annually in Texas



Gulfcrest International, Inc., Houston, TX

Urgently Needed: Reducing FBI's

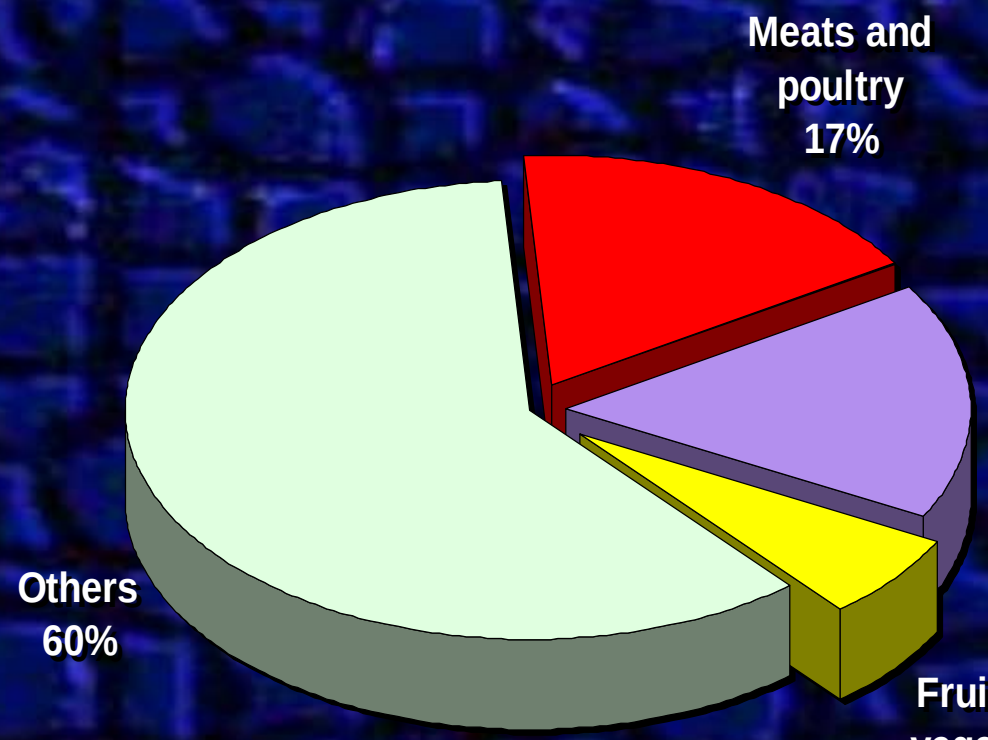
Too painful

Too costly

Scientific Approach

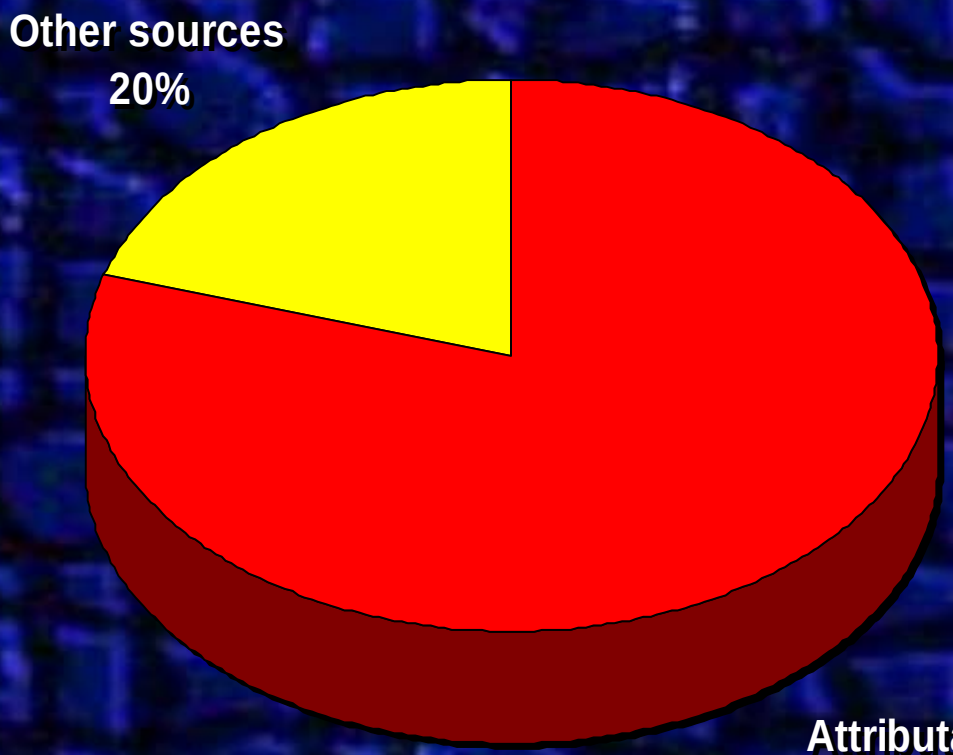
1. Knowing the problem

Vehicles associated with foodborne disease outbreaks in the United States



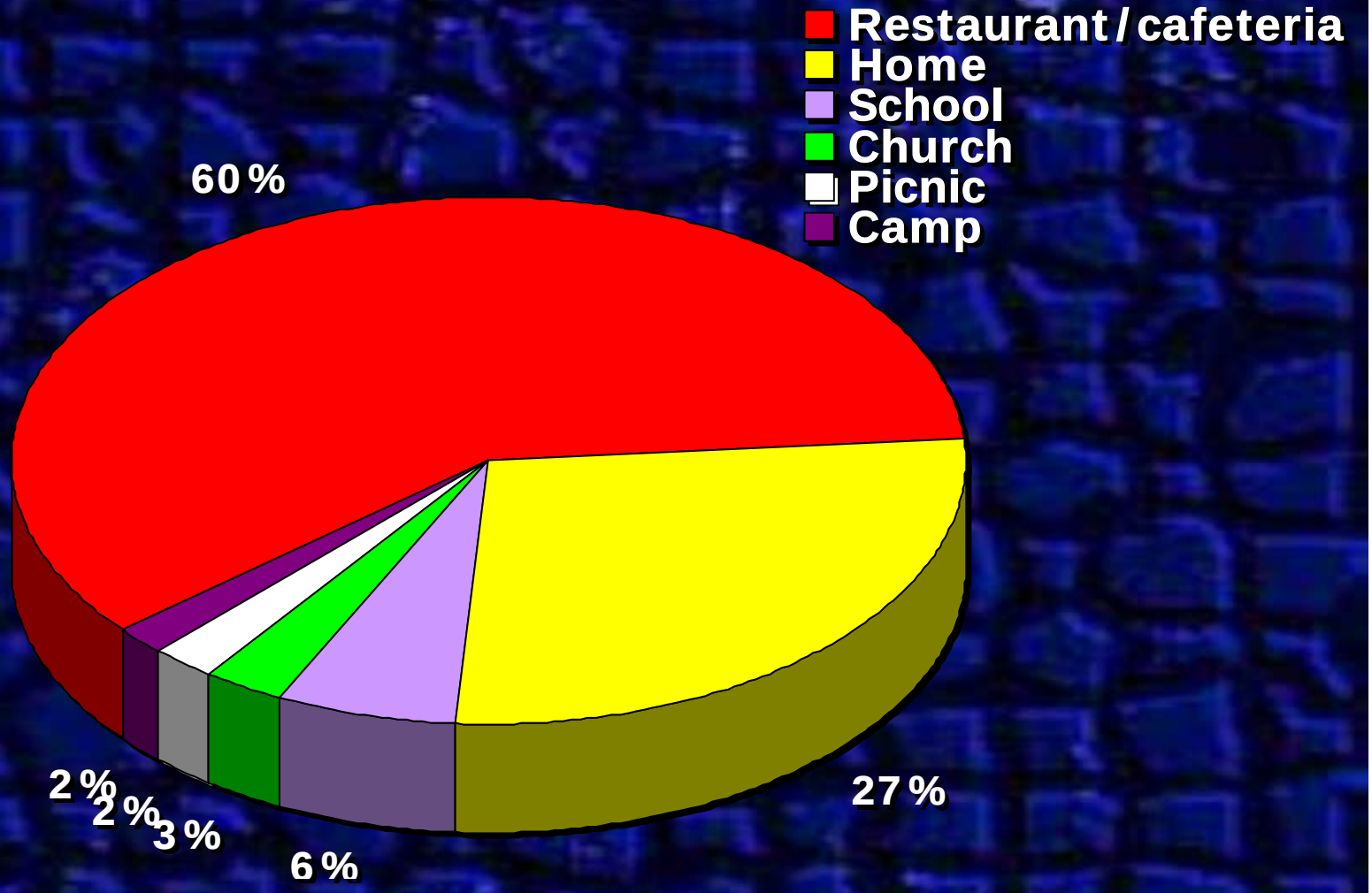
Bean et al., 1997

Overall costs of foodborne diseases associated with meat and poultry



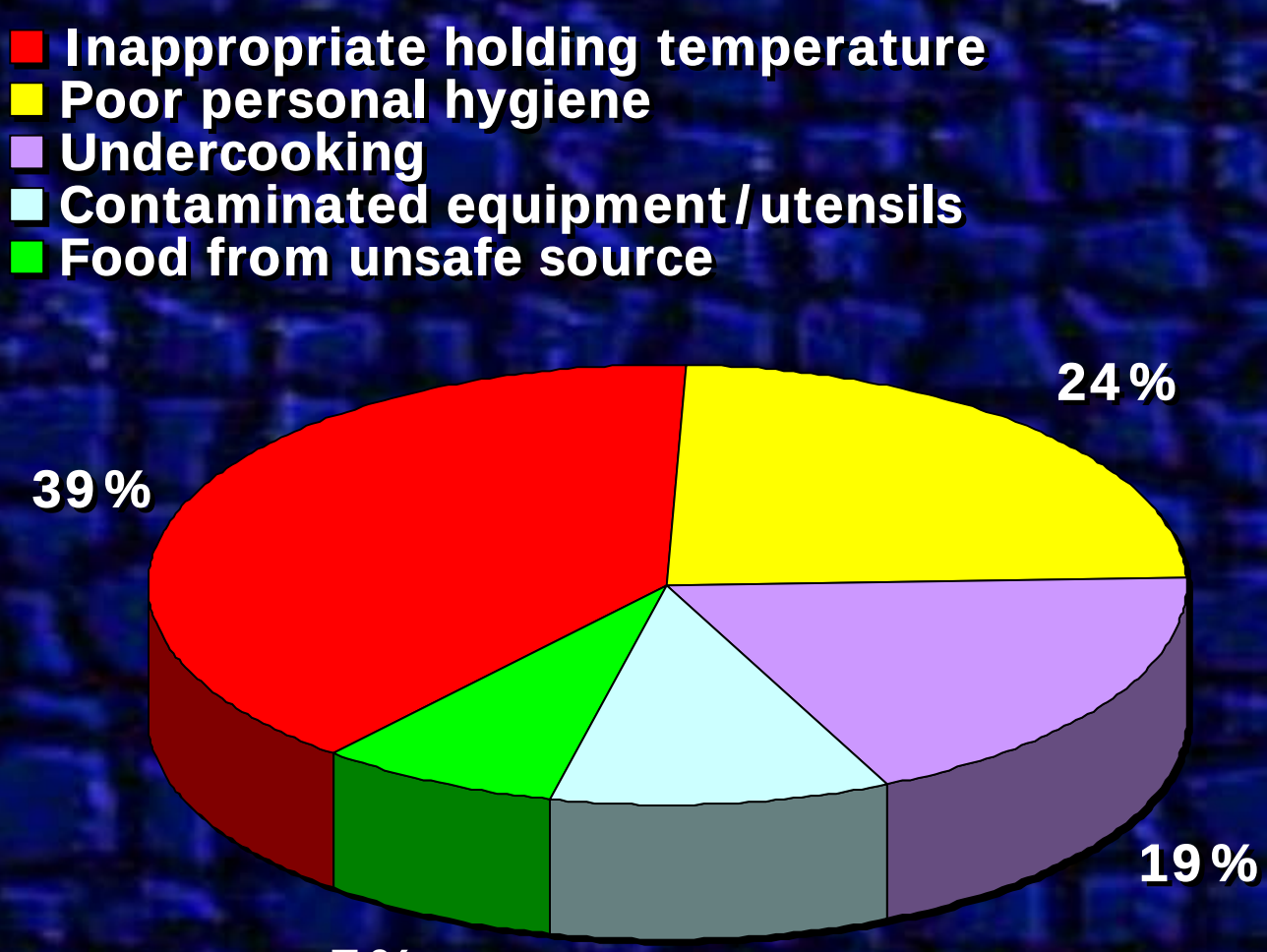
ERS-USDA, 1995

Where do people get ill?



CDC, 2000

Factors favoring FBI outbreaks



Risk Assessment

Process of identifying specific hazards and characterizing the risk of disease

NACMCF, 1998

Steps in conducting Microbiological Risk Assessment

- Hazard identification
- Exposure evaluation
- dose-response evaluation
- Risk characterization

NACMCF, 1998

Scientific Approach

2. Evaluating solutions:

- –Process modification
- –Decontamination

Decontamination

Beef carcass decontamination combined treatment

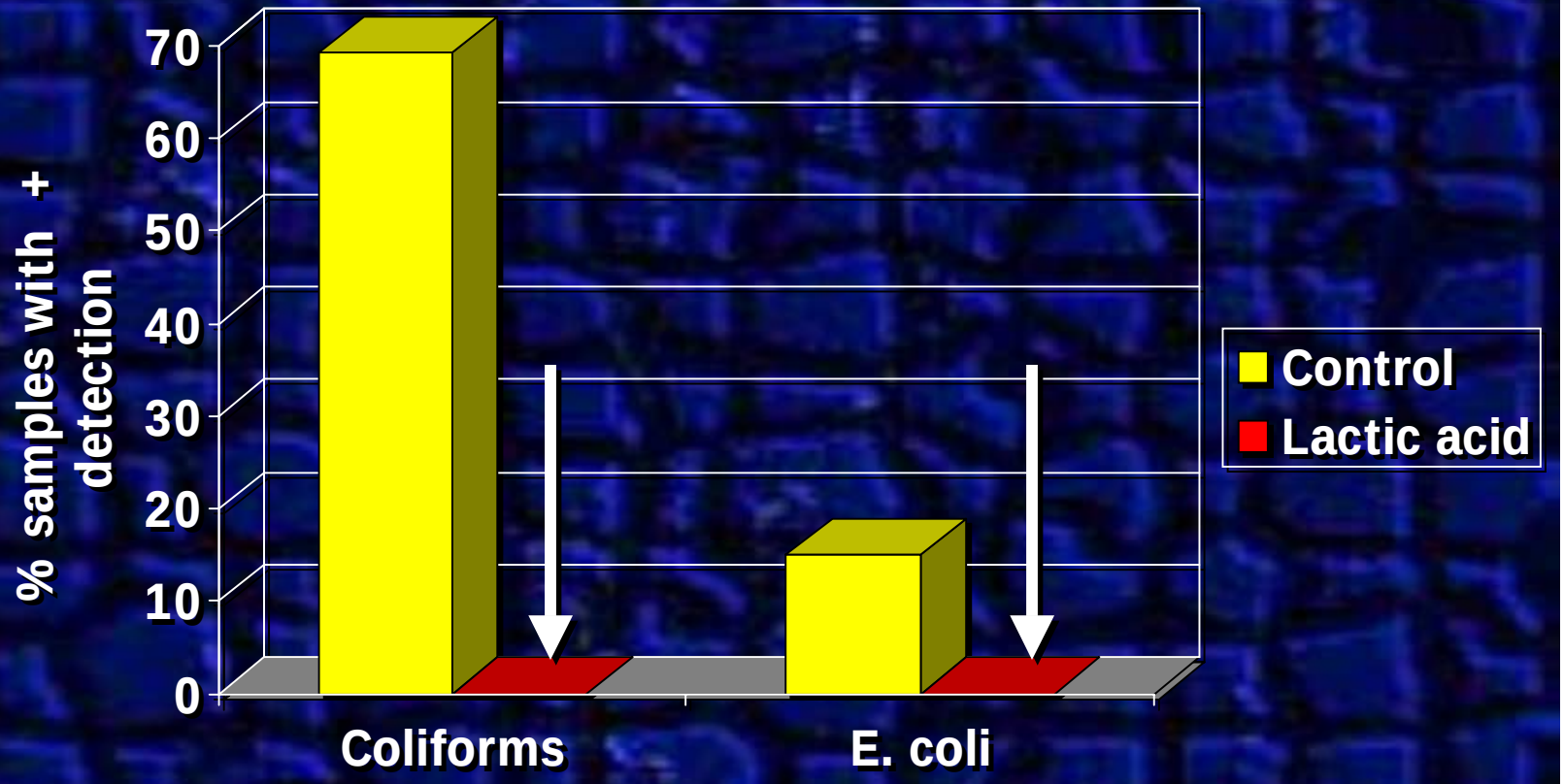
- **Automated water wash**
  - **2-log reduction of *E. coli* O157:H7 and *Salmonella* Typhimurium**
- **Hot water + lactic acid spray**
  - **>3-log reduction**

Partial Cost Matrix of Target Log Reductions ($/carcase)

Target log Reduction	Strategy	Domestic Plants S	M	L
1.0< x =<2.0	W	0.16	0.09	0.08
2.0< x =<3.0	W + HW	2.24	0.82	0.59
	W + LA + SP	4.62	1.69	1.20
3.0< x =<4.0	W + HW + LA	3.41	1.37	1.04
	W + LA + HW	3.41	1.37	1.04
	SV + HW	1.13	0.64	0.53
4.0< x =<5.0	W + LA	1.33	0.64	0.53
	T + HW	3.73	1.20	1.06
5.0< x =<6.0	T + LA	2.82	1.02	1.00

Hooker et al., 2001

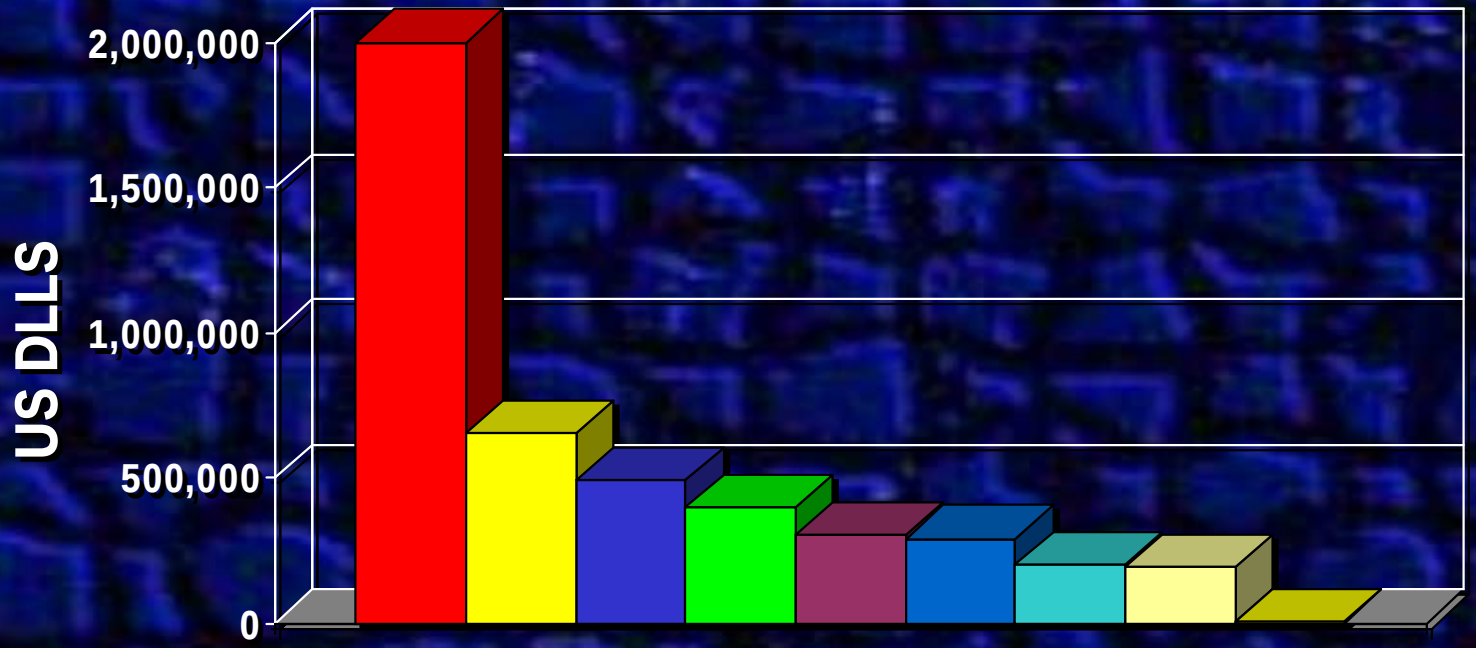
Percent detection* of coliforms or *E. coli* on chilled beef carcasses with or without hot lactic acid treatment



* Detection by FSIS-required sampling method

Produce Safety Is Important As Well

Agricultural exports from Mexico to the U.S.A.



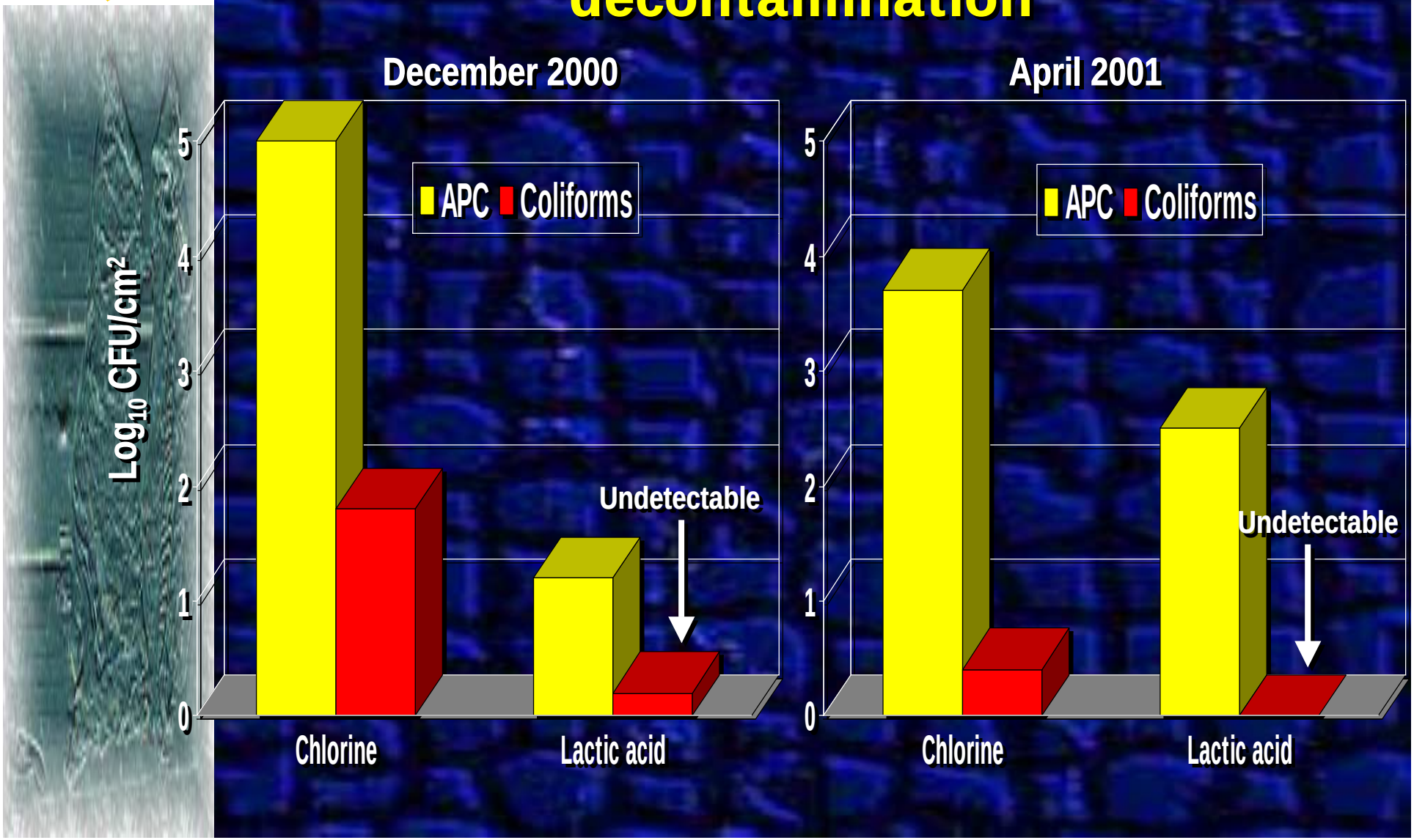
- Fruits and Vegetables
- Live Plants
- Tobacco
- Various RTE
- Candies
- Chocolate and Cocoa Bean
- Peppers and Spices
- Pasta and Cereals
- Peanuts

SAGAR, 1999

Salmonella and Cantaloupe

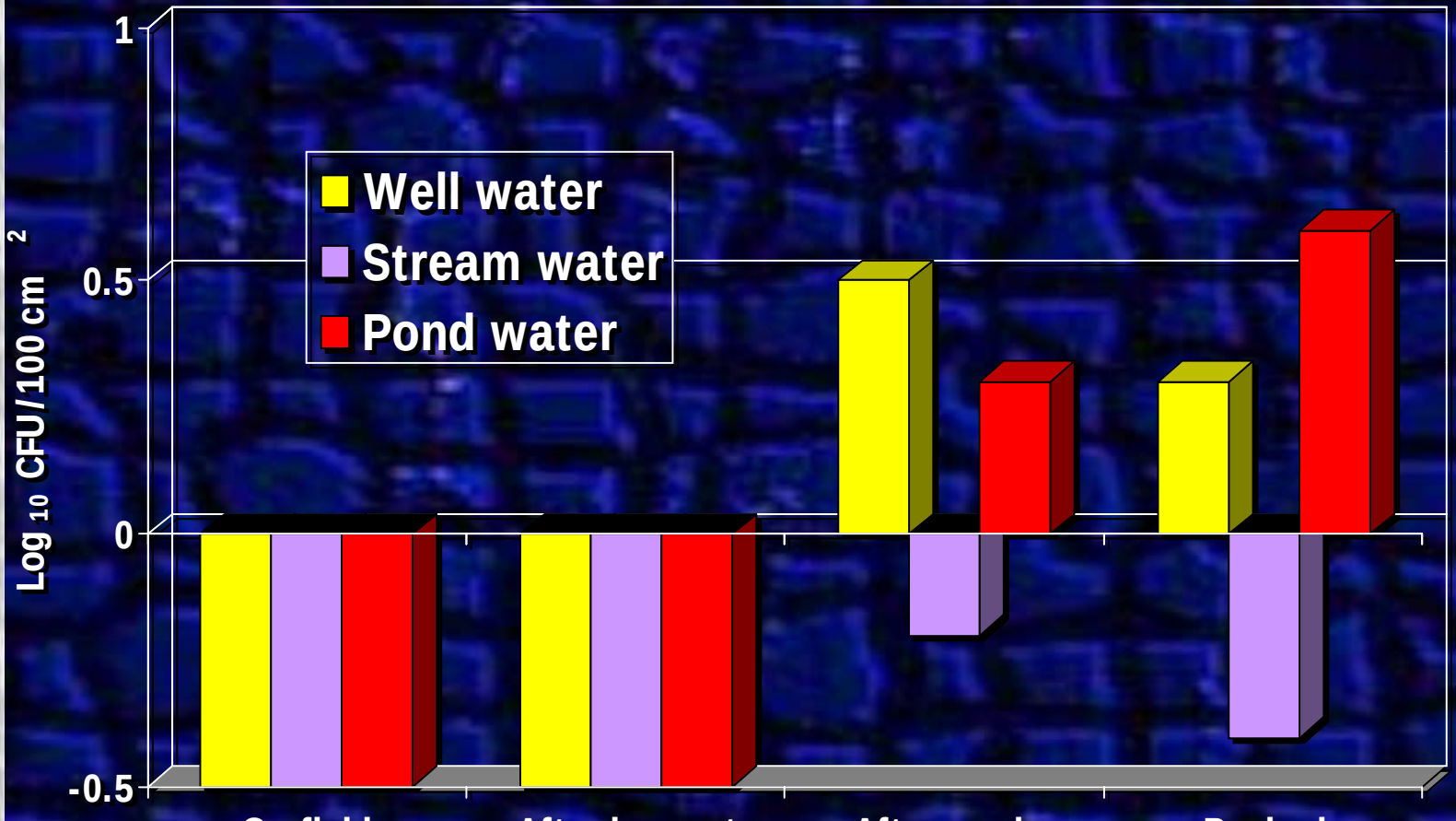
- 1990. *Salmonella* Chester
  - 295 cases, multistate
- 1991. *Salmonella* Poona
  - 143 cases, multistate
- 1997. *Salmonella* Saphra
  - 24 cases, California, Mexican melons
- 2000. *Salmonella* Poona
  - California, Mexican melons
- 2001. *Salmonella* Poona
  - Mexican melons, multistate, 2 deaths

In-plant comparison of lactic acid and chlorine treatments for cantaloupe decontamination

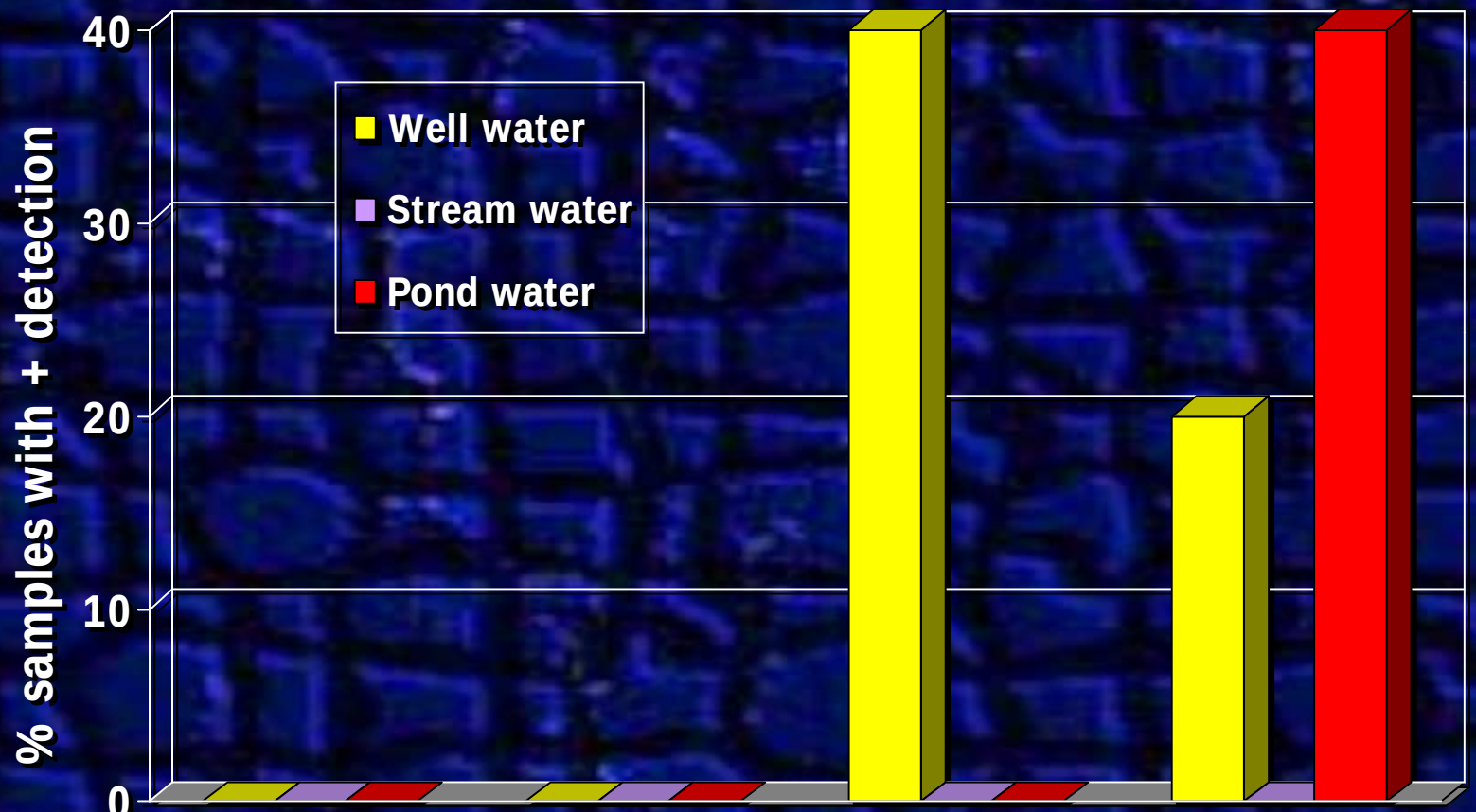


No Silver Bullets, Please

Average *E. coli* counts on cantaloupes at different processing stages



Percent detection of *E. coli* in environmental samples at melon-packing facilities



Conclusions

1. Scientific knowledge can provide sound basis for regulations and process modifications
2. Food safety systems such as HACCP can benefit from research on food decontamination

Conclusions (cont.)

3. Food safety means:
   - People can eat without risks (reasonably)
4. No silver bullets but integrated, science based systems will permit to achieve food safety
   - At every link of the food chain

Eat Safe = Live Happy