DIVISION OF AGRICULTURE

RESEARCH & EXTENSION

University of Arkansas System

GOOD AGRICULTURAL PRACTICES GAP

What People Died From

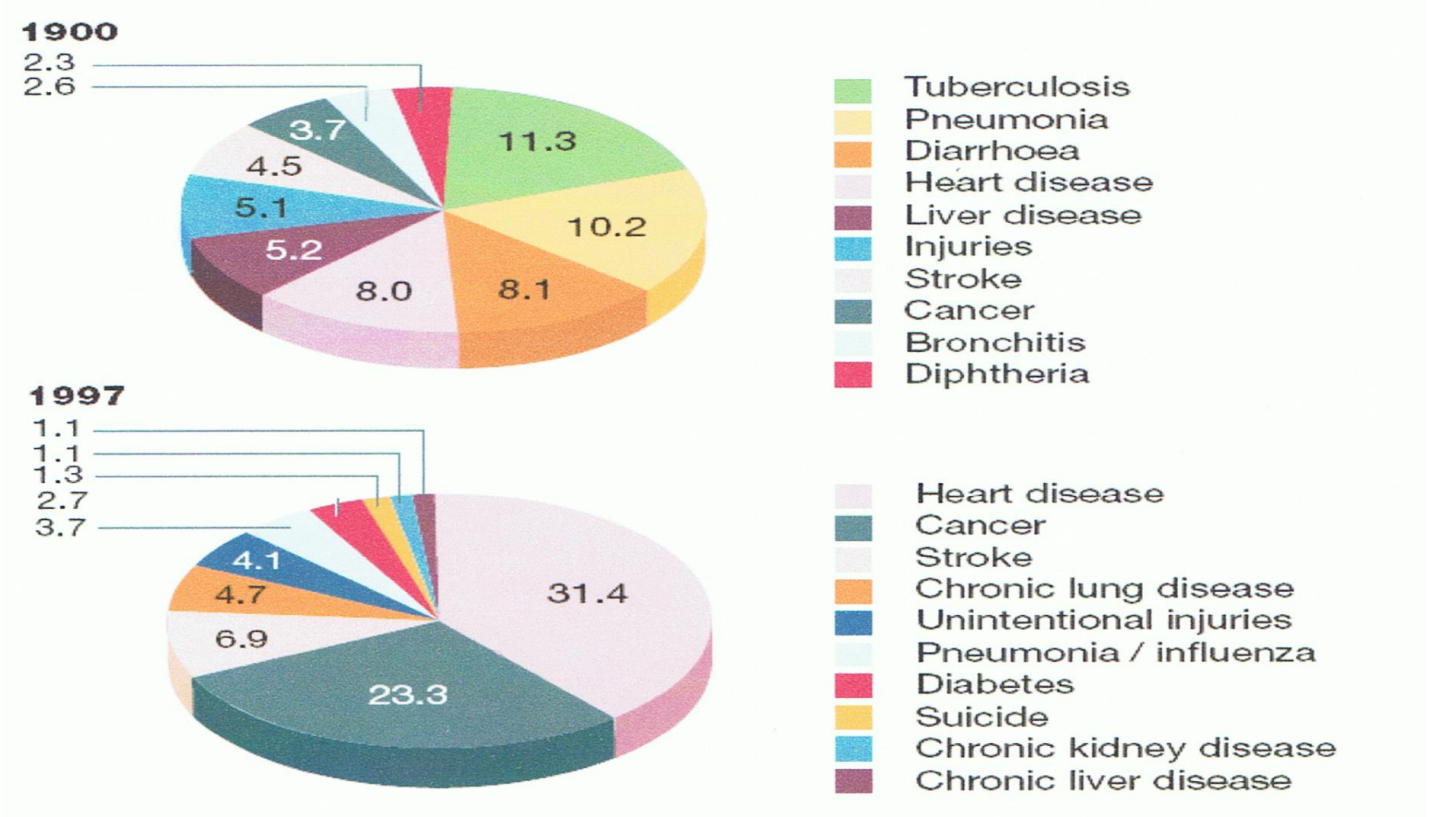


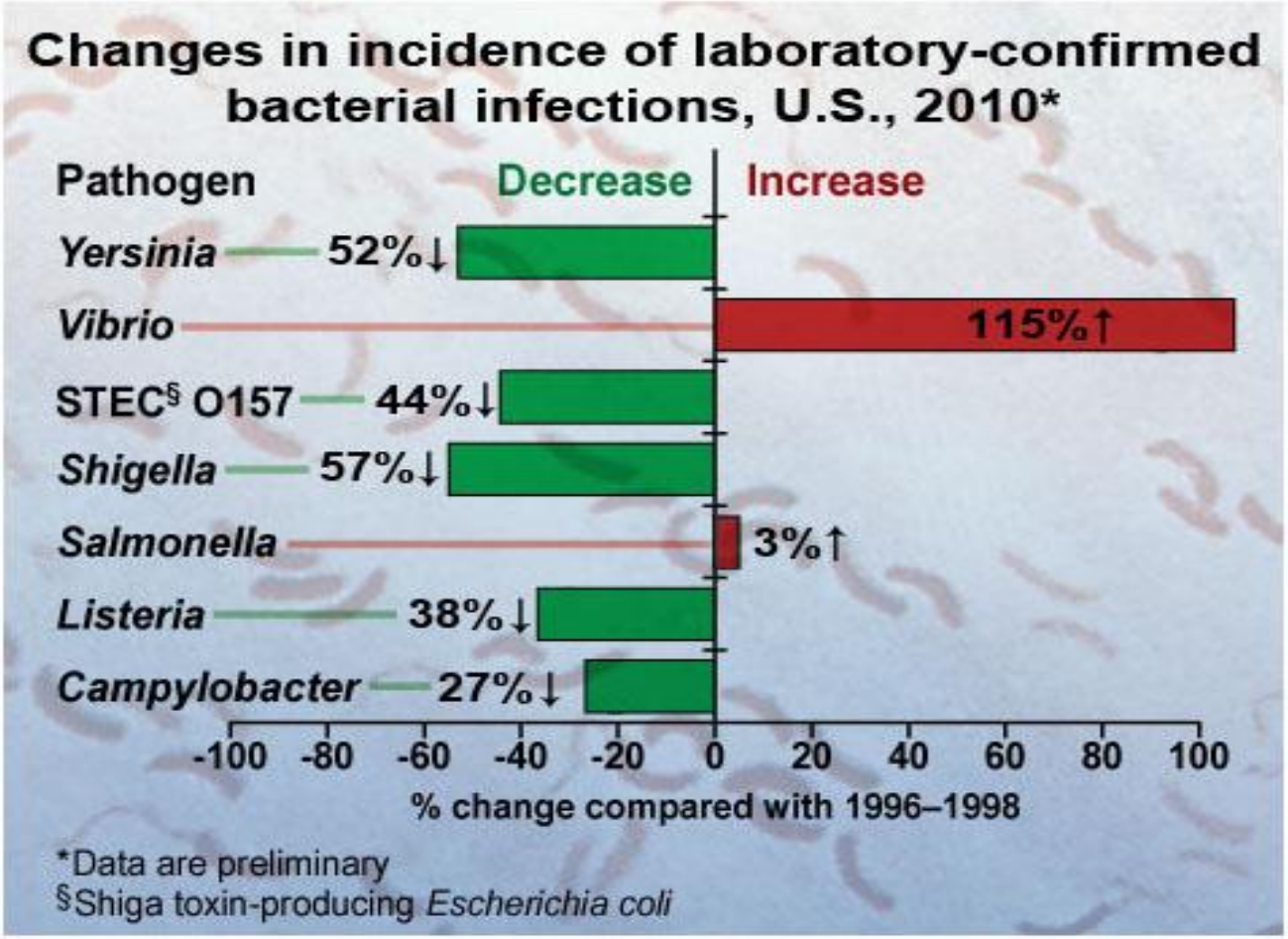
Figure 2 – The ten leading causes of death in the United States in 1900 and 1997. From "Changing Patterns of Infectious Disease", Mitchell L. Cohen, Nature, Volume 406, 17 August, 2002, pp 762-767.

Table 1; Mean Values for U.S. Concerns

(10= High concern; 1= Low Concern)

Issue	Mean
The U.S. Economy	8.44
Rising Energy Costs	8.29
Rising Cost of Food	8.23
Rising Health Care Costs	8.21
Personal Financial Situation	8.04
Food Safety	7.67
U.S. military involvement in Iraq and Afghanistan	7.22
Access to accurate information to make healthy food choices	6.60
Humane Treatment of Farm Animals	6.43
Obesity in America	6.37
Global Warming	6.05

Changes in incidence of laboratory-confirmed bacterial infections, United States, 2010 compared with 1996–1998



WHAT IS GAP?

- Defined; GAP stands for Good Agricultural Practices and they are those things we do in the field and during transport to the consumer that prevent contamination and if contamination does occur, how to prevent spreading.
- Think microbiological, chemical, physical hazards

The Big Idea

- Think only of foods eaten raw or without cooking
- Idea is prevent fecal bacteria from getting on produce and fruit that is eaten without cooking.

TYPES OF GAP

- Voluntary
- Commercial – SQF, GlobalGAP, Primus, Harmonized, USDA – All are voluntary.
- Food Safety Modernization Act (FSMA) – Required

Food Safety Modernization Act

- **GAP- Field Operations**
- **Preventive Measures (HACCP) Processing**
- Animal Feed
- Imported Food

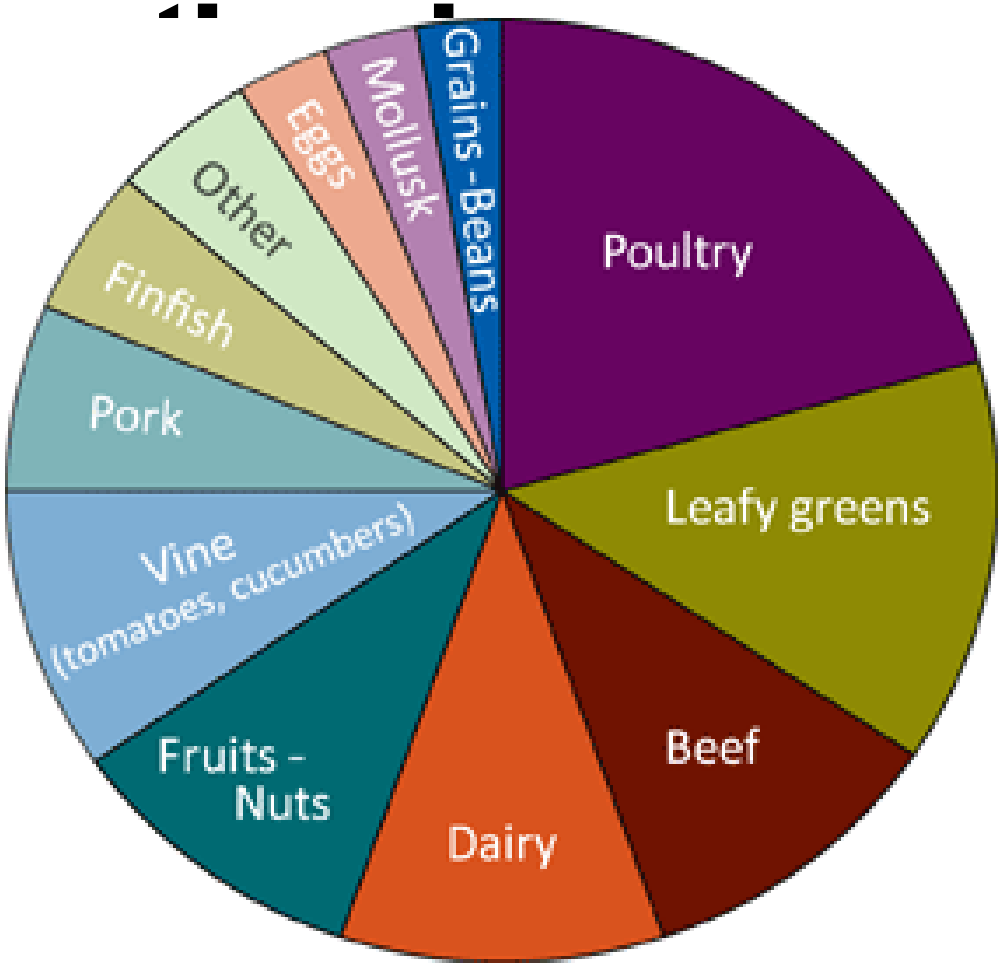
Why the interest in GAP?

- 47 million illnesses; 3,000 deaths
- 15% incidences from fruits and vegetables
- 37% of illnesses from fruits and vegetables
- Mostly fecal bacteria on foods eaten without cooking.
- Leafy greens, melons, berries,

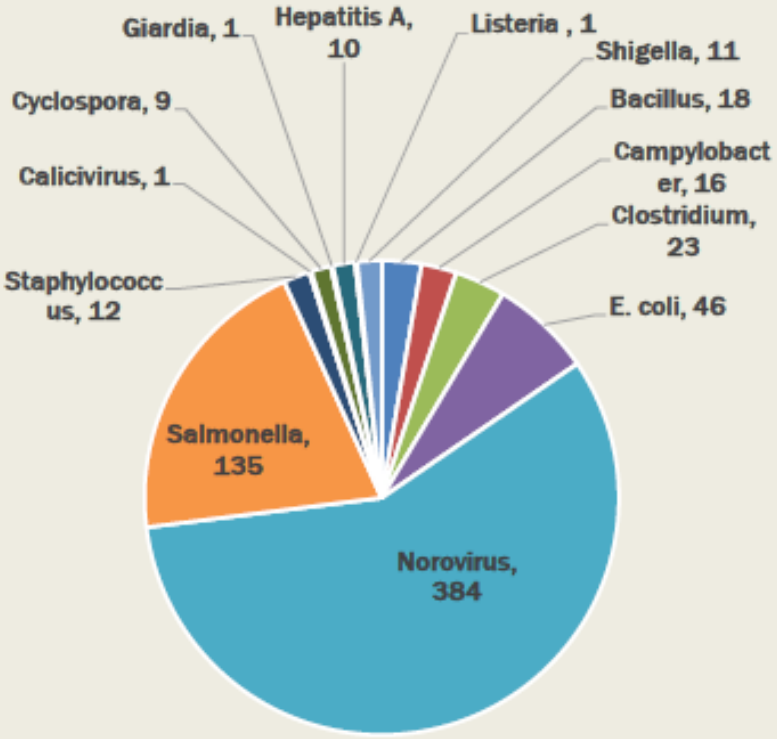
Number Outbreaks 2003 -2008

(1565 outbreaks)

1,565



TOP HAZARDS IN PRODUCE



Pathogens in Produce, 2001-2010, Outbreaks=667

Source: CSPI Outbreak Alert! Database

CENTER FOR Science IN THE Public Interest

HOW TO TARGET TESTING

Riskiest Produce 2001-2010

	Outbreaks	Illnesses	Pathogen #1	Pathogen #2
Greens-based salad	221	5,373	Norovirus	*E. coli*
Lettuce	117	3,455	Norovirus	*E. coli*
Fruit salad and mixed fruits	51	1,911	Norovirus	*E. Coli*
Tomatoes	41	4,859	*Salmonella*	Norovirus
Salsa	41	1,539	Norovirus	*Salmonella*
Melon	29	1,593	Salmonella	Norovirus
Sprouts	29	872	*Salmonella*	*E. coli*
Chili Peppers	7	1,662	*Salmonella*	*Clostridium*

Outbreaks N= 536 Illnesses N= 21,264

Source: CSPI Outbreak Alert! Database

CENTER FOR Science IN THE Public Interest

Why More Foodborne Illness?

- Better Detection Systems – DNA fingerprint/ PulseNet
- Aging population
- Eating more fresh produce
- More immuno-compromised people
- More imported produce – year around produce
- Loss of immunity
- Consumer preferences – ready to eat, bagged, no preservatives

Fresh Produce-Related Outbreaks

- *E. coli O157:H7*
- *L. monocytogenes*
- *Salmonella spp.*
- *Shigella spp.*
- *Vibrio cholerae*
- *Bacillus cereus*
- Hepatitis A
- *Cyclospora*
- *Cryptosporidium*

Bacteria and Outbreaks Associated with Produce

- ***E. coli* 0157:H7 -** Iceberg lettuce, radish sprouts, unpasteurized apple cider/juice, spinach

- ***Salmonella spp.-*** Tomatoes, bean sprouts, sliced watermelon, sliced cantaloupe, coleslaw, onions, alfalfa sprouts, root vegetables, dried seaweed, hot peppers

- ***L. monocytogenes -*** Cabbage, lettuce
- ***B. cereus -*** Sprouts

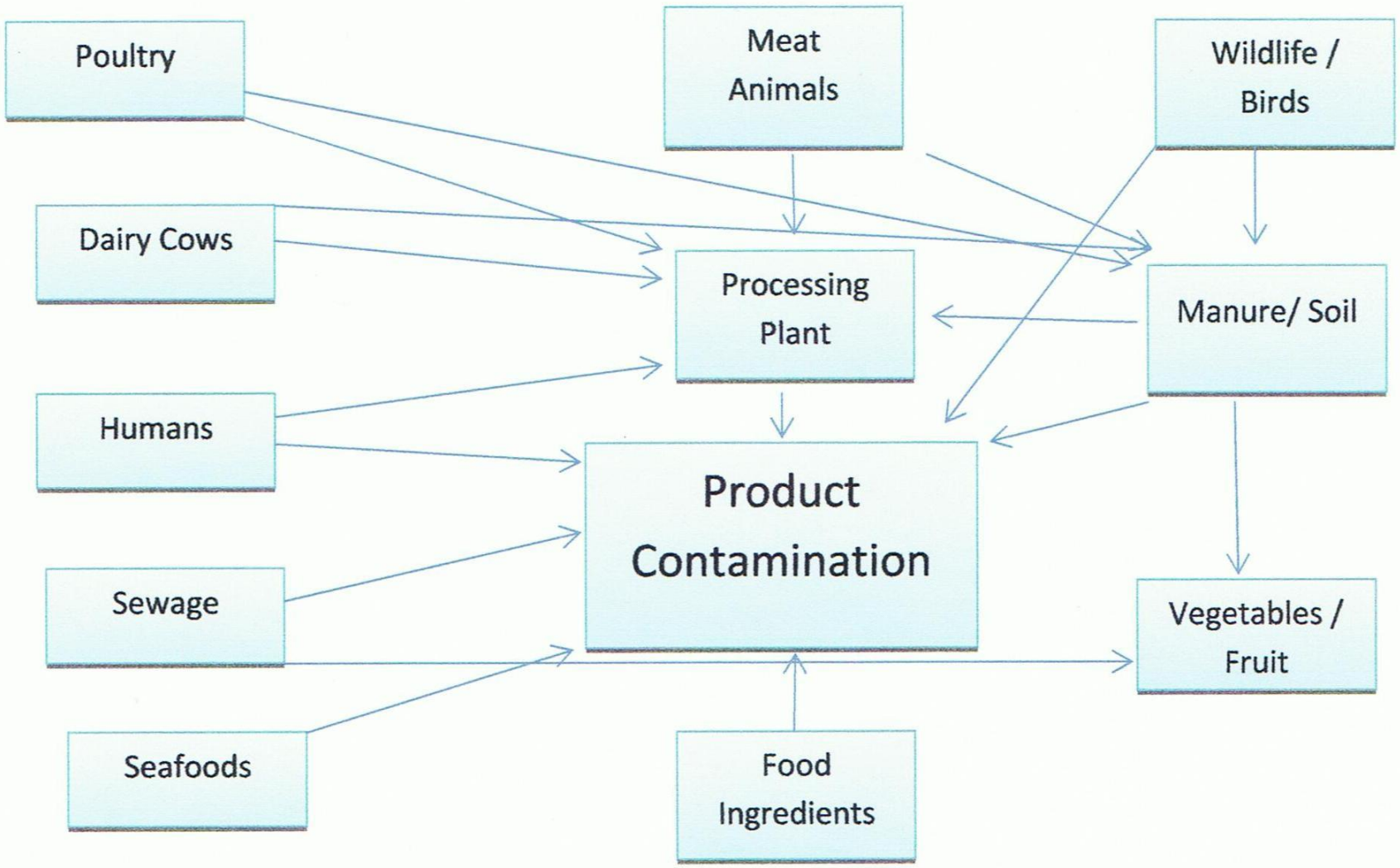
Where Do These Microbial Pathogens Normally Live?

Residents of human and animal intestinal tracts

- *Salmonella*
- *E. coli* O157:H7
- *Shigella*
- *Campylobacter*
- Viruses

Courtesy of Cornell University

Sources of Fecal Contamination of Food

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USA TODAY TUESDAY, AUGUST 9, 2011

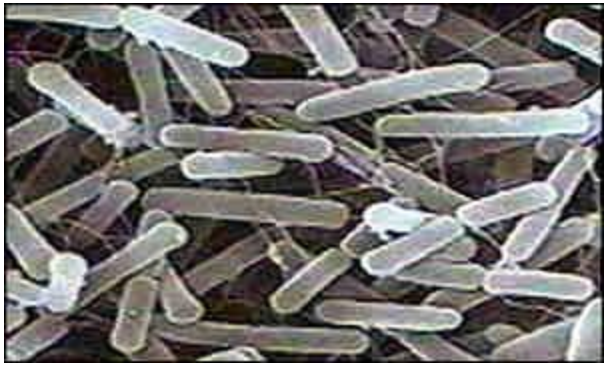
One dies of E. coli in strawberries

Oregon health officials said one person has died and at least nine others were made sick from an E. coli outbreak traced to fresh strawberries picked at a farm in northwestern Oregon.

Paul Cieslak of the Oregon Public Health Authority identified the source of the outbreak as the Jaquith Strawberry Farm in Newberg, about 25 miles southwest of Portland. He said the bacteria are likely from fecal material from a deer, and the farm does not appear to have done anything wrong. Officials said strawberries are safe if they were sold in stores after Aug. 1.

Example: *E. coli* O157:H7 Outbreaks

- July 1993: Salad / WA
- Aug. 1993: Salad / WA
- Sept. 1994: Salad / TX
- July 1995: Lettuce / MT
- Sept. 1995: Lettuce / ME
- Oct. 1995: Lettuce/ OH
- May 1996: Lettuce / unclear state
- June 1996: Lettuce / NY
- May 1998: Salad / unclear state
- Feb. 1999: Lettuce / NE
- June 1999: Salad / TX



More *E. coli* O157:H7 Outbreaks

- Sept. 1999: Lettuce / WA
- Oct. 1999: Lettuce / PA
- Oct. 1999: Lettuce / OH
- Oct. 1999: Caesar salad / OR
- Oct. 2000: Salad / IN
- Nov. 2001: Lettuce / TX
- July 2002: Lettuce / WA
- Nov. 2002: Lettuce / IL
- Dec. 2002: Lettuce / MN
- Sept. 2003: Lettuce / CA
- Nov. 2003: Spinach / CA
- Nov. 2004: Lettuce / NJ
- Sept. 2005: Lettuce / not stated
- Sept. 2006: Spinach / 19 states
- Nov. 2006: Lettuce / 5 states

Source: www.foodsafetynetwork.ca

Liability and Insurance

- You are legally liable for the safety of your product.
- If someone suffers, you are responsible
- Could lose your farm.
- As a minimum, you need FLIP insurance.

Elements of GAP

- Water Quality
- Soil Amendments (Manure)
- Livestock, Pets and Wildlife
- Worker Health and Sanitation
- Equipment, Tools & Buildings

Water Quality

Soil Amendments (Manure)

Livestock, Pets and Wildlife

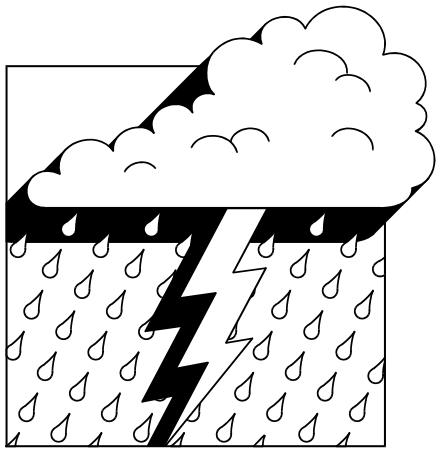
Worker Health and Sanitation

Equipment, Tools & Buildings

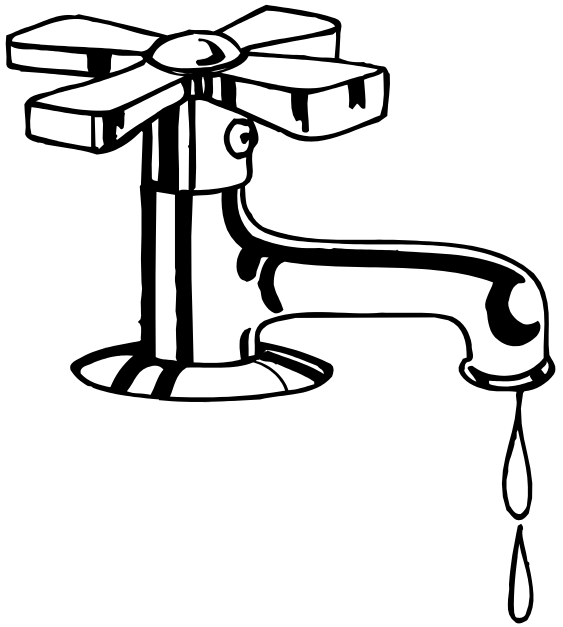
FDA Guidance

Whenever water comes in contact with produce, its quality dictates the potential for contamination. Minimize the potential of microbial contamination from water used with fresh fruits and vegetables.

It is the #1 source of contamination



Water Uses



- Irrigation
- Washing produce
- Washing hands
- Washing contact surfaces
- Used in sprays such as herbicides and pesticides
- Cooling water

Irrigation Practices

- Surface water may contain pathogens and parasites of humans.
- Well (ground) water is less likely to harbor pathogens, depending on depth, but may contain pesticide residues or heavy metals.
- Water sources should be tested for generic *E. coli* and chemicals.

Irrigation Practices

- Overhead irrigation is more likely to spread contamination to above-ground plant parts than root-zone irrigation (furrow or drip).
- Consider proximity of water source to livestock (water runoff).
  - Maintain separation in distance and topography.

Pathogens in Water

Water can be a source of and vehicle for biological hazards such as:

- *Escherichia coli*
- *Salmonella spp*.
- *Vibrio cholerae*
- *Shigella spp*.
- *Cryptosporidium parvum*
- *Giardia lamblia*
- *Cyclospora cayetanensis*
- *Toxoplasma gondii*
- Norwalk virus
- Hepatitis A.

Water Testing

- Fecal coliform is only partially useful as an indicator. Testing for generic *E. coli* is recommended.
- Remember that very low bacterial counts of *E. coli* O157:H7 will cause disease.

Water Source Will Determine the Possible Frequency of Testing

Source	Possible Water Testing Frequency
Municipal/District water system	Test annually and keep records from the municipality/district water system (monthly, quarterly or annual report).
Closed system, under the ground or covered tank	One annual test at the beginning of season
Uncovered well, open canal, water reservoir, collection pond	Every month during the production season

Chlorination Unit

Water Quality

Soil Amendments (Manure)

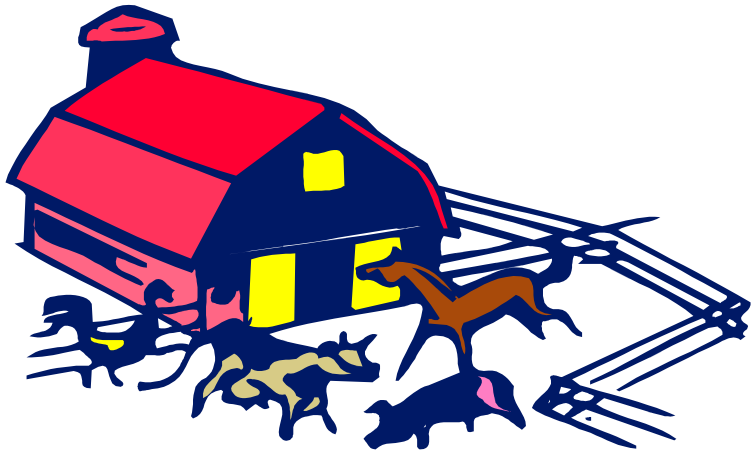
Livestock, Pets and Wildlife

Worker Health and Sanitation

Equipment, Tools & Buildings

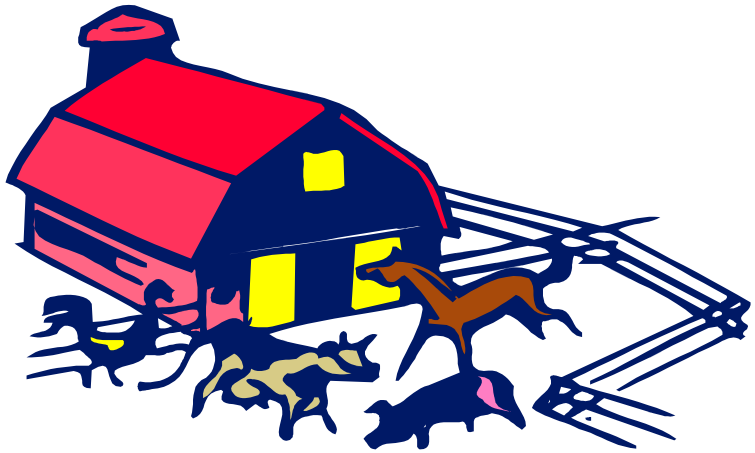
FDA Guidance

Practices using animal manure or chicken litter should be managed closely to minimize the potential for microbial contamination of fresh produce.



FDA Guidance

Practices using animal manure or municipal biosolid wastes should be managed closely to minimize the potential for microbial contamination of fresh produce.



Fertilization Practices

- Inorganic fertilizers originate from synthetic chemicals, so pathogenic bacteria are not likely to be present.
- Incompletely composted manure may contain pathogenic bacteria.
  - Use only well-composted manure.

Composted Manure

Composting guidelines often based on federal biosolids law (40CFR503):

- At or above 131 F for at least three (within-vessel or static aerated pile) or 15 (windrow) days
- Turned at least five times (windrow only)

Pathogens Most Often Associated with Manure

- *E. coli* 0157:H7
- *Salmonella*

Survival of Human Pathogens in Raw Manure

- Pathogens have been reported to survive in raw manure for one year or longer.
- No one knows precisely how long manure-borne pathogens survive after application to fields.
- Where it is not possible to maximize the time between application and harvest, raw manure should not be used.

Production Practices to Reduce Risks Related to Use of Raw Manure

- Proper storage of manure
- Incorporate into soil early in year
- Target time of application (9 months before harvest)
- Target crop – do not use on RTE products
- Proper and thorough composting of manure

Water Quality

Soil Amendments (Manure)

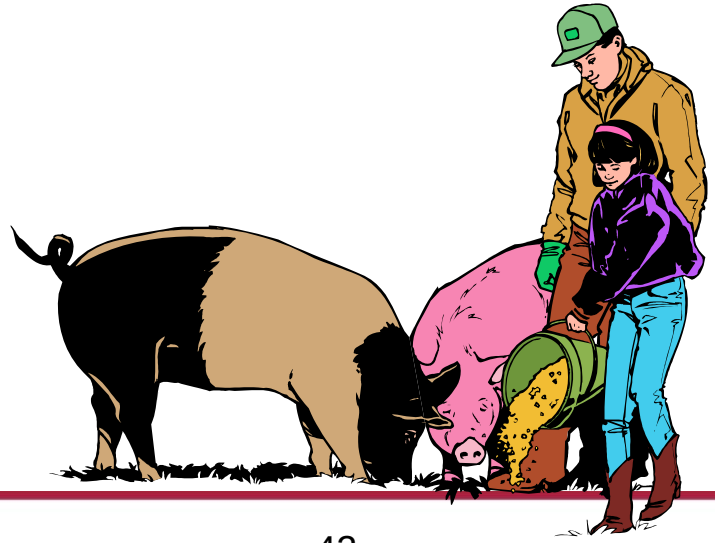
Livestock, Pets and Wildlife

Worker Health and Sanitation

Equipment, Tools & Buildings

FDA Guidance

A major source of microbial contamination with fresh produce is human or animal feces. Keep pets, domestic animals, chickens and children out of produce fields.



Animal Hazards

- Animal feces are a main source for pathogenic organisms.
- Since animals are in contact with soil, manure and water, they can easily pick up contaminants from these sources.

Proximity of Animals

Wild Animals

- Watch out for evidence of large populations of wild animals.
- Fencing, scare tactics, depredation and/or modification of the surrounding environment are potential management measures.

Control Sources of Rodent and Bird Contamination

Cleaning Considerations for Surrounding Areas

- Keep grass and weeds short to avoid the presence of rats, reptiles and other pests.
- Keep all areas free of garbage.
- Remove all unnecessary equipment—old and broken equipment can provide protection for rats and insects.

Water Quality

Soil Amendments (Manure)

Livestock, Pets and Wildlife

Worker Health and Sanitation

Equipment, Tools & Buildings

What Is Proper Health and Sanitation?

- Physical health signs (illness and open wounds)
- Proper hand washing for everyone who touches food.
- Proper glove use
- Proper produce handling procedures

Personal Health and Hygiene

- The major source of human pathogens are worker's hands, so the single most effective public health measure to prevent disease is *proper hand washing.*

Employee Sanitary Facilities

- Number, condition and positioning of field toilets
- Should not be cleaned in field
- Hand-washing stations readily available

Proper Hand-washing Is the Best Method of Reducing Contamination

Probably the #1 source of food-borne illness is unsanitary worker conditions.

How to Wash Hands Properly

- Remove rings/watches/bracelets.
- Use running water.
- Use soap.
- Lather hands, wrists, fingers.
- Don’t forget to scrub your thumbs, under your nails and in between your fingers.
- Wash your hands for 20 seconds.
- Fully dry out your hands with disposable paper towel.

When Hands Should Be Washed

- Before beginning work
- After each restroom visit
- Before and after eating/smoking/other breaks
- After other activities not including produce handling
- Anytime hands become dirty

Good Manufacturing Practices (GMPs)

- Handwashing
- Employee Illness Policy
- Employee Hygiene
- Hair & Beardnet Policy
- Jewelry Policy
- Glove Policy
- Food in Workplace
- Personal Items

What's Wrong?

Mmmm – Tastes Good!

Water Quality

Soil Amendments (Manure)

Livestock, Pets and Wildlife

Worker Health and Sanitation

Equipment, Tools & Buildings

Field Work

- Most things are to prevent spread on contamination.
- Wash, rinse and sanitize tools, equipment, bins, etc
- Use one tablespoon bleach per gallon water.
- Use only approved pesticides and herbicides and observe withdrawal times.

Proper Cleaning

- All tools, tractors tires, bins, knives etc need to be washed and sanitized at least daily if not more often.
- Remember; WASH – RINSE- SANITIZE
- Produce to be washed should be washed in one container and then rinsed in real clean running water. Sanitize if appropriate.

Field Harvesting

Harvest Sanitation

- Avoid contact between fruits, vegetables, bins, etc. and soil – do not stack container EVER
- Avoid bruises or cuts to fruits or vegetables that may allow internal contamination.
- Don’t use open-water sources for field washing. Use running, well or city water.
- Clean and sanitize bins and harvest equipment after each use.
- Cover containers after washing to transport
- Remove unused/ decomposed veggies from garden

Chlorination of Wash Water

Crop	Chlorine Strength (available chlorine),ppm	Process
Bell Peppers	300-400/150-200	Dump Tank/Sprayer belt
Melons	100-150	Dump Tank/Sprayer
Lettuce, cabbage, leafy greens	100-150	Sprayer belt / Hydrocooler
Potatoes	200-300/100-200	Flume/Sprayer belt
Tomatoes		

Source: Post-harvest Chlorination , Trevor Suslow UC Davis

GOOD AGRICULTURAL PRACTICES FOR FRESH PRODUCE

Division of Agriculture - Cooperative Extension Service

Home

This website adddresses the area of Good Agricultural Practices (GAP) specifically fresh fruits and vegetables. If you just want to learn about types of audits and how to prepare for them, go to the end of this HOME page in the section labeled **How to do a GAP Audit**.

Overview

The news is filled with stories of food recalls due to contamination of food with bacteria that cause food-borne illness. The Center for Disease Control estimates that 46 million Americans will get food poisoning this year. They further estimate that 3,000 people die each year as a result of food poisoning. Traditionally most food borne illnesses were the result of contaminated meat and dairy products, however, as Americans began eating more fruits and vegetables as suggested by dietary guidelines, the number of food-borne illnesses due to fruits and vegetables increased. It is now estimated that over half of food-borne illnesses are the result of eating contaminated fruit and vegetables. Most of these cases of food-borne illness are from eating fresh fruits and vegetables that are not subjected to a heat treatment.

Good Agricultural Practices (GAP) are a series of production, harvesting, processing and transportation practices that if conducted properly should drastically reduce the incidences of food borne illness. Many pathogenic bacteria are of fecal origin so preventing fecal contamination resulting from flooding, wild and domestic animals in the produce areas, properly processing manure are important to growers. Many of the other GAP procedures are aimed are reducing the spread of these bacteria once the produce is contaminated.

http://www.uark.edu/ua/gap/

Current Status

- FSMA May 16, Sept 16, November 15
- Reopen comment period.
- FDA to issue regulations on GAP in October 2014.
- The five elements will be in it.
- The main changes are the exemptions.
- Training will be offered via PSA.

THE END