Food Safety

Agricultural Issues in Society

B. LaShell

Overview of Food Safety

- What is causing an increase in food safety issues?
- What are the food safety issues?
  - Discussion of individual issues
- Solutions
  - Preventatives
  - Organic Farming
  - Local production and consumption

What is at the root of food safety issues?

- Are these new problems?

Source: Fort Lewis A&M High Altitude Crop Research

Let's review US Ag Facts

- Less than 2% of the population is involved in agriculture
  - Only 0.2% of U.S. population is producing most of its food.
  - The average age of U.S. farmers is currently fifty -six. (US Census Bureau)

Movement from Rural to Urban

- We suffer a net loss of 32,500 farms a year.
- 88% of average farm household income is derived from off-farm.

- Source: PrairieFire for Rural Action

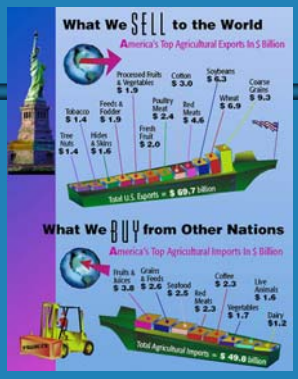
What % of your food .....

- Do you grow yourself?
- Do you know the grower?
- How many times a week do you eat out?

Do you eat seasonally?

- Fruit
- Meats
- Vegetables

Imports



Food Costs

What % of our income do we spend on food?

Global Comparison

- Mexico 25%
- Italy 18%
- India 51%

- United States 10%

Food Safety Issues

- Biotechnology
- Herbicides
- Pesticides

- BSE
- E. Coli 0157
- Salmonella
- Listeria
- Campylobacter
- Hepatitis A

American Consumer's Concerns

- 1989
- Pesticide/Herbicide
- Antibiotics/Hormones
- Nitrates
- Additives/Preserv
- Artificial food colors

- 2001
- Bacterial Contam
- Pesticide residues
- Chemical additives
- Hormones
- GMOs
- Antibiotics
- Irradiated foods

Cheeke, Peter. Contemporary Issues in Animal Agriculture, 3rd edition. Table 9-1, 9-3.

Factors influencing the perception of risk

- **Decreased Perception**
  - Risk assumed voluntary
  - Effect immediate
  - No alternatives avail
  - Risk known w/ certainty
  - Exposure is essential
  - Encountered occupationally
  - Common hazard
  - Affects ave people
  - Will be used as intended
  - Consequences reversible
- **Increased Perception**
  - Risk born involuntary
  - Effect delayed
  - Many alternatives avail
  - Risk not known
  - Exposure is a luxury
  - Encountered non-occup
  - "Dread" hazard
  - Affects esp sensitive people
  - Likely to be misused
  - Consequences irreversible

Cheeke, Peter. Contemporary Issues in Animal Agriculture, 3rd edition. Table 9-2.

Genetically engineered food

Biotechnology

Issues to Consider:

- Traditional plant breeding vs GE
  - What is your definition of GE?
  - Moving foreign genes into plants
  - Or all modification of pure plant breeding.
- How does the technology affect consumers and food safety?

Dec 00- Star Link Corn

- Only biotech crop that isn't approved for human consumption
- Contains a bacterium gene that makes the plant toxic to the European corn borer
- Taco shells that were tested were made in Mexico and distributed by Kraft Foods Inc

When introducing New Technology: Issues to Consider

- How does the technology affect the environment?

- How does the technology affect the farmer?

More Issues to Consider

- Government Regulations
- Patents and Control of Technology
- Long term affects on consumer
- Who decides on the products?

Consumer knowledge

- What percent had heard nothing or not much about GMOs?
  - 55%
- What % thought that less than half of the food in grocery stores contains GMOs?
  - 60%

2001 Survey by Mellman Group and Public Opinion Strategies

- What % of Americans felt they had eaten GMOs?
  - 19%
- What % of Americans said they had not eaten GM foods?
  - 62%

2001 Survey by Mellman Group and Public Opinion Strategies

- What % did not know whether GM foods were basically safe?
  - 46%
- What % felt they were basically unsafe?
  - 25%

2001 Survey by Mellman Group and Public Opinion Strategies

- What % of consumers oppose introduction of GM foods into U.S. food supply?
  - 66% of women
  - 50% of men

2001 Survey by Mellman Group and Public Opinion Strategies

- When informed that up to 70% of processed food sold in stores contain GM ingredients, what % of participants decided that GM foods are safe?
  - 48%
  - 20% changed their mind from unsafe

2001 Survey by Mellman Group and Public Opinion Strategies

Where do Genetic Modification and Biotechnology rank in consumer concern?

- 1. Freshness
- 2. Poisoning
- 3. Salmonella
- 4. Chemicals/fertilizers
- 5. Genetic modification
- 6. Biotechnology

2001 Survey by Mellman Group and Public Opinion Strategies

Web Sites

- Pure Foods Campaign
  - http://www.purefood.org/
- Biotech Basics
  - http://www.biotechbasics.com/
- Ag Biotech Conference
  - http://www.nysaes.cornell.edu/comm/gmo/

Salmonella

Salmonella enteritidis

Strain found in eggs

What do Farmers think?

- American Corn Growers Association Survey (2003)
  - 34% of nations corn crop in GMO
  - Results…
- V/s National Corn Growers Association
  - http://www.acga.org/comparison/default.htm

Foods Associated with Salmonella

- Raw poultry products, eggs, raw milk
- Less commonly,
  - Raw fruits and vegetables
  - Cantaloupe, tomatoes and alfalfa sprouts

- In 1970's, pet turtles!
  - Sale banned in 1975

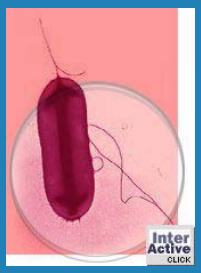
According to CDC:

- 40,000 cases a year in U.S.
- 1,000 people a year die
  - Children, elderly and immuno-compromised
- More people die from salmonella than all other food borne illnesses combined

Solutions

- Cook it
- Clean it
- Cool it
- Avoid Cross contamination

E. coli 0157:h7

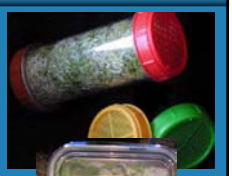


E. Coli 0157 Statistics (CDC)

- 73,000 cases in U.S.
- 61 deaths

- Lives in intestines of healthy cattle
- Produces powerful toxin
- First recognized in 1982
- Most lab tests don't look for 0157

E. coli 0157 Sources



ConAgra Recall of 2002

- 2nd largest recall in history
- Exposed cracks in USDA meat inspection program

Deadly Spinach

- September 2006
- Produce from 4 fields
  - 3 die; 200 infected
  - 26 states
  - Ban all sale of bagged spinach
- Spread by wild pigs
- Source?

Taco Bell

- December 06
- 65 infected in NE in 5 States
- What was it?
  - Shredded lettuce ???
  - Scallions ???
  - Still don't know
- http://www.cfsan.fda.gov/~dms/tacobga.html

Solutions

- Cook it –
  - 160 for meat and poultry
- Clean it
- Cool it
- Avoid Cross contamination

Other foodborn diseases

- Listeria
  - Resists nitrates, salt, acidity and freezing
- Cyclospora
  - On cell parasite
  - Imported raspberries for school lunch program
- Campylobacter
  - Often associated with unpasteurized milk because of outbreak in the early 40s
- Hepatitis A
  - Highly contagious virus associated with poor hygiene

BSE-Mad Cow Disease

Bovine Spongiform Encephalopathy

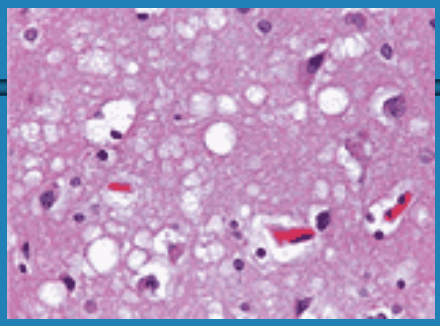
- Caused by prion protein
  - Only pathogen known to contain no DNA
  - Mutant form of proteins found in all neurons
  - Found in 1968; linked to TSEs in 1982
  - Stanley Prusiner received Noble Prize in 1992
- Transmitted across species via the brain, spinal cord and retinal tissue
  - Only way BSE spreads is through contaminated feed
  - UK cattle infected by scrapie-contaminated feed

Bovine Spongiform Encephalopathy

- No evidence of horizontal (nose to nose) spread
- BSE affects older cattle, typically more than 30 months of age
- Not killed by UV, microwave or cooking

Other Transmissible Spongiform Diseases

Scrapie in Sheep	Early 18th century U.S. - 1947
CWD in Elk/Deer	1967
Kuru in Humans	1957
CJD in humans	1920s
TME in Mink	
vCJD in Humans	



from a patient with Creutzfeldt-Jakob disease are a tell-tale sign of spongiform encephalopathy

BSE begins

- November 1986
  - Outbreak in United Kingdom
  - 178,000 cattle diagnosed with BSE
  - Since 1990, 159 cases of vCJD had been identified.
- By 1992
  - Spread to France, Germany and Switzerland

What has US done?

- APHIS- Animal & Plant Health Inspection Service
- 1989
  - Cannot import live ruminants from UK
  - BSE surveillance program
    - Examine cattle brains from adult cattle displaying neurological signs
    - Tracing 496 head of cattle imported from UK from 81-89

What has US done?

- 1991
  - Voluntary ban on use of rendered products from adult sheep in animal feeds
  - Cannot import ruminant meat and edible products and most byproducts of ruminant origin from countries known to have BSE

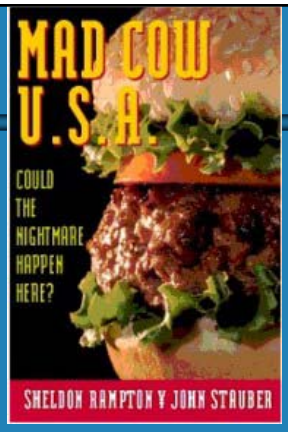
What are Ruminant Protein sources

- Blood meal, meat meal and bone meal
- High Protein/ Low Cost
  - Blood Meal 81% CP
  - Meat meal 93.5% CP
- V/S Plant Sources
  - Alfalfa Hay 22.5% CP
  - Soybean Meal 50.9% CP
- By-product of animal harvesting
  - Rendered (cooked) to kill viruses and bacteria
  - 250-300 degrees F

What has US done?

- 1997
  - FDA established regulations to prohibit feeding of most mammalian proteins to ruminants
  - Prohibited importation of live ruminants and most ruminant products from all of Europe
- 2000
  - Prohibited importation of all rendered animal protein products, regardless of species, from Europe.

Canada- May, 2003



U.S- December 23, 2003

What did U.S. do?

- May 2003
  - First Case in North America found in Canada
  - Closed Canadian border to live cattle and beef imports
- And then,
- December 2003
  - First case found in U.S.
  - Cow had been imported from Canada

What immediately happened?

- 10,410 pounds of beef from 20 cows recalled
- All beef exports stopped
  - 10% of total beef produced in U.S. was exported
    - Mexico, Japan and Korea are primary markets
  - Export market valued at 4-5 billion/year
- Futures and Cash markets dropped 20% in Jan
- 255 additional "related" animals tested
  - All negative for BSE

What did the U.S. do immediately after 12/23/03?

- FDA banned following from human food supply
  - "downer" cattle (cattle that die on the farm or before reaching the harvest facility)
  - Specified Risk Material (SRM) like the brain, skull, eyes and spinal cord of cattle 30 months or older, and a portion of the small intestine and tonsils from all cattle, regardless of age or health

What did the U.S. do immediately after 12/23/03?

- Monday Feb 2, 2004, FDA also bans use of :
  - Mammalian blood and blood products for use as a protein source to other ruminants,
  - Poultry litter as a feed ingredient for ruminant animals, and
  - "Plate waste" -- uneaten meat and other meat scraps currently collected from some large restaurant operations and rendered into meat and bone meal for animal feed -- as a feed ingredient for ruminants.

What has U.S. done?

- Tested for BSE as part of surveillance program
  - 2002, USDA tested around 7,000 animals
  - 2003, USDA tested 20,566 animals
  - 2004, USDA tested over 150,000 animals
  - 2005, USDA tested over 200,000 animals
  - 2006, USDA tested over 200,000 animals
  - 2007, USDA plans to reduce testing to 40,000
- Found 2 cases during testing
  - Texas in November 04 (dairy cow from Canada)
  - Alabama in Feb 06 (beef cow from unknown origin)

Canada in 2004

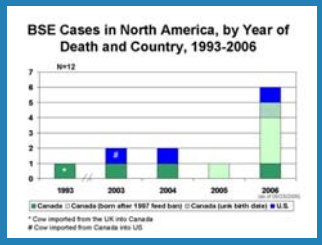
- USDA opens Canadian border to boxed beef imports of cattle under 30 mos
  - 2004 import figures surpass 2003 totals
- USDA publishes rule to open border to live cattle imports on March 7, 2005
- Canada tests 22,000 cattle in 2004

Canada in 2005

- BSE case confirmed on Jan 4, 2005
- Canadian newspaper breaks story on feedban violations
  - 40% of current feed contains ruminant proteins
- BSE case confirmed in beef cow on Jan 11, 2005
- USDA stands by rule to re-open border
  - R-Calf files injunction to stop it
  - Judge issues injunction

Canada in 2007

- 9 total cases reported



http://www.cdc.gov/ncidod/dvrd/bse/

Is USDA protecting us?

- Creekstone Farms
  - USDA won't allow them to test everything
- Sec'y of Agriculture
  - Refers to "North American" Beef Industry
  - Allow Canadian cattle into U.S. for processing
- NAIS – National Animal Identification System
  - Identify premises
  - Identify all animals (not just cattle)
  - Record all animal movements
  - Still voluntary

Genetic Resistance to TSEs

- Sheep
  - Single codon 171 with 3 Genotypes
  - RR- Resistant
  - QR: Appears Resistant
  - QQ- Susceptible
- Elk
  - Single codon with 3 Genotypes
  - LL, LM and MM
  - Only LL has not gotten CWD
  - Research project at "old fort"
  - www.cervid.com

Genetic Resistance to TSEs

- Cattle?
- Humans?

Recent BSE Research

- January 05
  - Prions found in kidney, liver and pancreas
  - How much tainted tissue causes infection?
- January 07
  - Cows can be genetically modified to be resistant to BSE
  - http://www.technologyreview.com/read_article.aspx?id=17962&ch=biotech

To find out more:

- Foreign Agriculture Service
  - www.fas.usda.gov/dlp/BSE/bse.html
- Dr. Stanley Prusiner
  - http://www.ucsf.edu/neurosc/faculty/neuro_prusiner.html
- Center for Global Food Issues
  - http://www.mad-cow-facts.com/index.html
- BSE Info (NCBA)
  - http://www.bseinfo.org/

Food Safety Solutions

- Fight BAC
- Irradiation
- COOL
  - Labeling of imports
- Organic farming
- Local and sustainable production

Fight BAC Campaign

Http://www.fightbac.org

Who is Fight BAC?

The Partnership for Food Safety Education is an ambitious public-private partnership created to reduce the incidence of foodborne illness by educating Americans about safe food handling practices

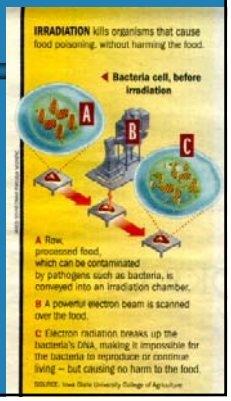
Fight Bac campaign

Fight Bac Public Service Announcements

Food Irradiation

Irradiation- What is it?

- Form of "cold sterilization"
  - USDA uses this term in literature
- Radiation disrupts cell components and kills germs



More on Irradiation.....

- Food is exposed to gamma rays, electron beams or x-rays
- Kills salmonella, listeria, campylobacter and e.coli
- Costs $.13 to .20 per pound

More on Irradiation.....

- Delays or stops normal ripening and decay processes so that foods can be stored for longer
  - Does not "fix" spoiled food
- Minor changes in flavor and texture like those caused by canning or freezing
- Can be handled or consumed immediately

Historical perspective

- 1963
  - FDA approved the use of irradiation to kill pests in wheat and flour.
- 1964
  - FDA approved use of irradiation to prevent sprouting of white potatoes
- 1986
  - FDA approved pork irradiation to control parasites that cause trichinosis.

Historical perspective con't

- 1986
  - FDA approved the use of irradiation to delay maturation, inhibit growth and disinfect certain foods,including vegetables and spices
- 1992
  - USDA approved irradiation of raw poultry to kill salmonella and other bacteria.

Historical perspective con't

- 1997
  - FDA approved irradiation of red meats
- 1999
  - Approved for sale in grocery stores
- 2003
  - Approved for USDA school lunch program

How do we feel about irradiated foods in the school lunch program?

Irradiation labeling

- Radura symbol
- "Irradiated to destroy harmful microbes".
  - It is not required to label a food if a minor ingredient of the food, such as a spice, has been irradiated
  - Major ingredients must be identified
    - Irradiated Pork
- Cold sterilization
  - Means the same as irradiated

Use of irradiated foods

- NASA astronauts eat foods that have been irradiated to the point of sterilization
- Irradiation of foods has been endorsed by :
  - World Health Organization (WHO)
  - Centers for Disease Control (CDC)
  - Assistant Secretary of Health
  - U.S. Department of Agriculture (USDA)
  - Food and Drug Administration (FDA).

Disadvantages of Irradiation

- Expensive
- Ineffective against viruses
- If 90% of micro organisms are destroyed
  - 10 % can still reproduce
- Destroys 25% of Vit E and 5-10% of Vit C
- Long term effects?

How much irradiation needed?

Chest X-ray	.001 kilo Gray
Kill salmonella (poultry)	4.5 kilo Gray
Frozen Ground Beef	1.35 kilo Gray
Kill 90% e.coli	.3 kilo Gray
Kill 99% e.coli	.6 kilo Gray
Parasites/insects	.1 kilo Gray

Recent Studies and Industry Publicity

- NCBA studies levels needed
  - National Cattlemens Beef Association

Consumer's Reaction

- Consumers are interested in a process that reduces the risk of foodborne disease
- In test marketing of specific irradiated foods:
  - Consumers are willing to buy them
  - At least half will buy the irradiated food, if given a choice between irradiated product and the same product non-irradiated
  - If consumers are first educated about what irradiation is and why it is done:
    - Approximately 80% will buy the product

Who else does it?

- France
- Netherlands
- Portugal
- Israel
- Thailand
- Russia
- China
- South Africa

Is it commercially available?

- Hospitals serve irradiated foods to cancer and immuno-compromised patients
- Groceries began selling ground beef in 2000
  - SuperValue, Cub Foods, FarmFresh
  - Rainbow Foods
  - Giant, Lowes,
  - Winn Dixie, Kroger
- Chains and outlets
  - Schwans, Omaha Steaks
  - Dairy Queen, Chammps

Is it commercially available?

- SureBeam
  - Largest US food-irradiation company

Alternative methods of prevention for e.coli

- Steam pasteurization
- Feeding hay or fresh grass 5 days before slaughter
- In home test
- Germ that kills e.coli
- High pressure
- Vaccine – January 2007 in Canada

Steam pasteurization

- For fresh beef
- Developed by subsidiary of Excel
- Exposes carcass surface to blanket of steam, killing the bacteria.

Steam pasteurization con't

- No chemicals are used and color remains unaffected
- Still must be sure meat isn't contaminated after pasteurization

COOL - Country of Origin Labeling

Made in the USA™
Foundation

COOL Guidelines

- 2002 Farm Bill
  - Voluntary program required for certain commodities
  - Fresh & frozen cuts of beef, veal, lamb, pork, fish, fresh and frozen fruits & vegetables and peanuts may be labeled at retail

COOL Guidelines

- Beef, Lamb and Pork
  - Animals born, raised and processed in U.S.
- Farm fish and shellfish
  - Hatched, harvested and processed in U.S.
- Wild fish
  - Harvested in U.S. waters or by U.S. flagged ship
- Fruits, Vegetables and Peanuts
  - Grown, packed and processed in U.S.

COOL Update

- 2004 Implementation was postponed
  - Funding removed by appropriations
  - USDA and President against mandatory COOL
- Conflicting financial analysis
- Several attempts to kill Bill in committee
  - All have failed
- Opponents want National ID system before implementation

COOL Update

- Voluntary until September 30, 2008
  - Will become Mandatory
  - Jan 2007: Legislation being introduced to move that up to September 2007

Other Solution Alternatives

- Organic Production
- Local Production
- Sustainable Production

Organic Production

- National Organic Standards Board in April, 1995:
- "Organic is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony."

Local Foods

- Farmer's Markets
- Community Supported Agriculture (CSA)
  - Purchase share of farm
  - Fruits, vegetables, meat, milk, flowers
- Farm to School
- Farm to College

Sustainable Production

- What does organic mean to you?
- Do you need to have the USDA certification?

Norwalk Virus

- "It must be something I ate."
- Unclassified, small, round-structured viruses
- Have been named after places where outbreaks occurred
  - Norwalk, Montgomery, Hawaii, Snow Mt

Norwalk Virus family

- Only the common cold is reported more frequently
- Spread by traditional fecal-oral route
- Most common sources of outbreaks
  - Water and ice
  - Shellfish
  - Salad ingredients

Good news about Norwalk

- Unlike many bacteria, this virus doesn't multiply in foods
- Virus is destroyed by thorough cooking