



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



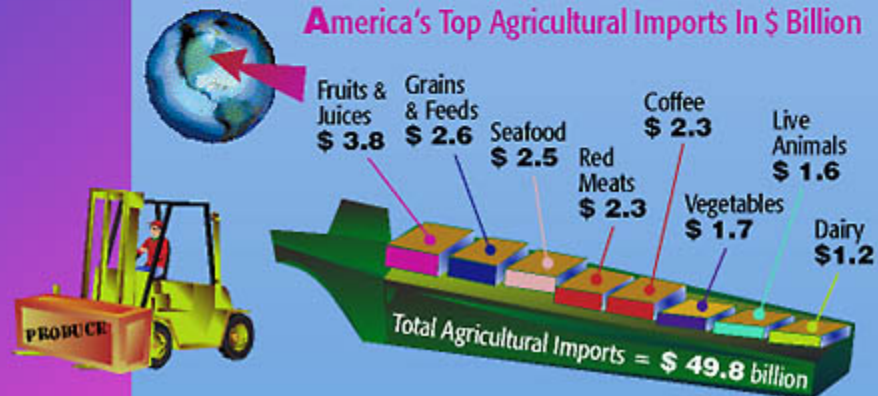
What We **SELL** to the World

America's Top Agricultural Exports In \$ Billion



What We **BUY** from Other Nations

America's Top Agricultural Imports In \$ Billion



Food Costs

What % of our income do we spend on food?





Global Comparison

Ω **Mexico** **25%**

Ω **Italy** **18%**

Ω **India** **51%**

Ω **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

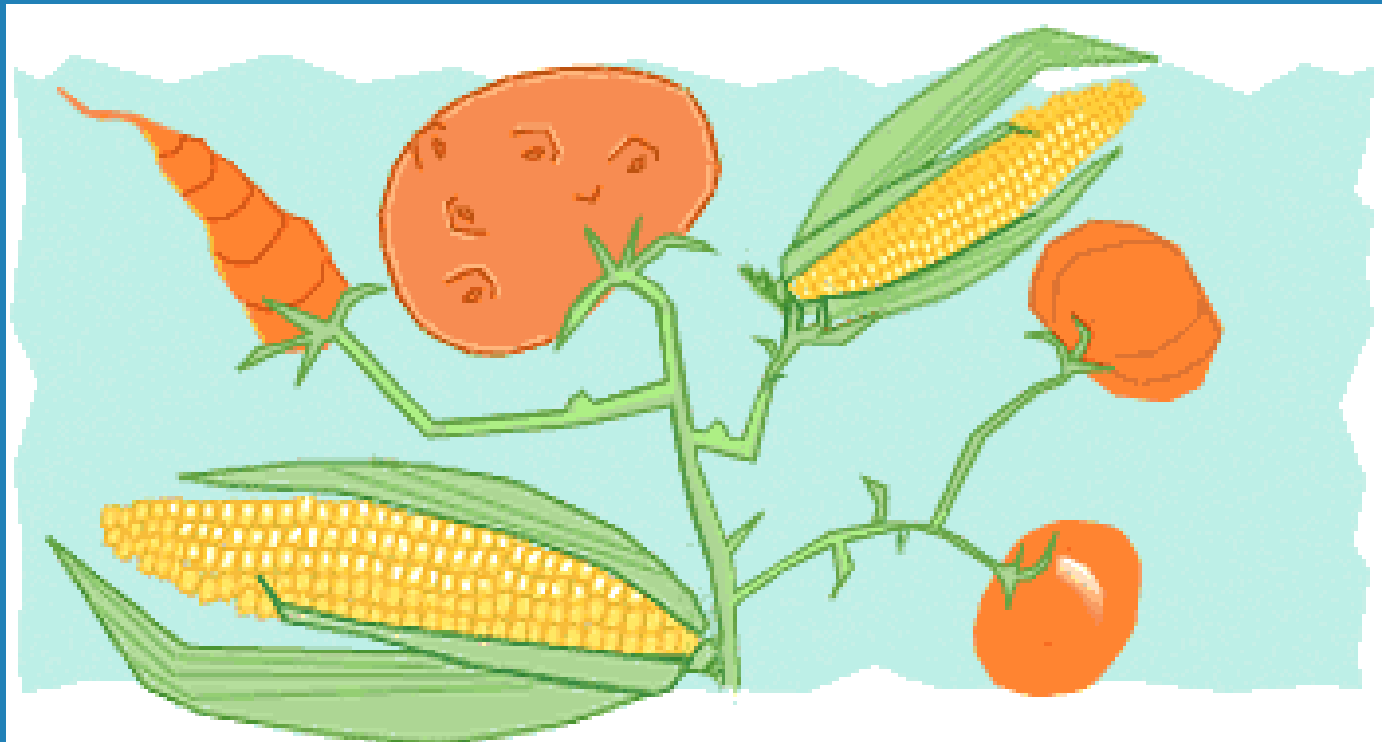
- Risk assumed voluntary
- Effect immediate
- No alternatives avail
- Risk known w/ certainty
- Exposure is essential
- Encountered occupationally
- Common hazard
- Affects ave people
- Will be used as intended
- Consequences reversible

∞ 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**

TACO  HELL



¡No
Quiero
g'Mo!

© 1999 Taco Bell

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

Q **What percent had heard nothing or not much about GMOs?**

- **55%**

Q **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



Q 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



Q 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**

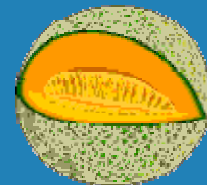
⌚ **Less commonly,**

- **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.**

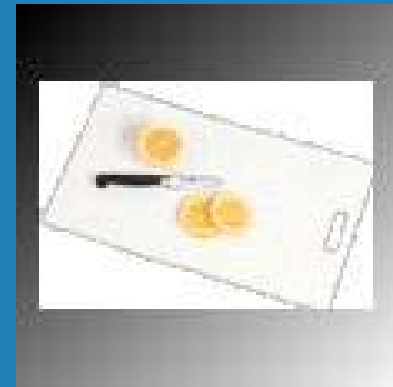
∞ **1,000 people a year die**

- **Children, elderly and immuno-compromised**

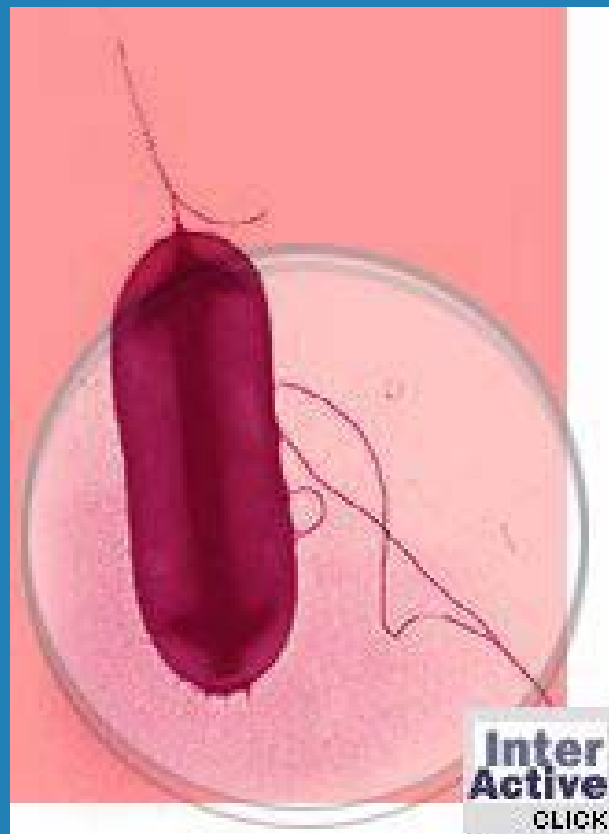
∞ **More people die from salmonella than all other food borne illnesses combined**

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/tacobqa.html>**

Solutions

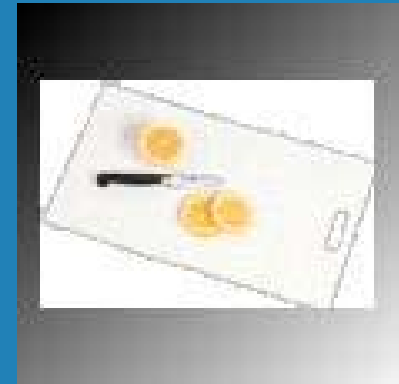
∩ Cook it –

- 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**

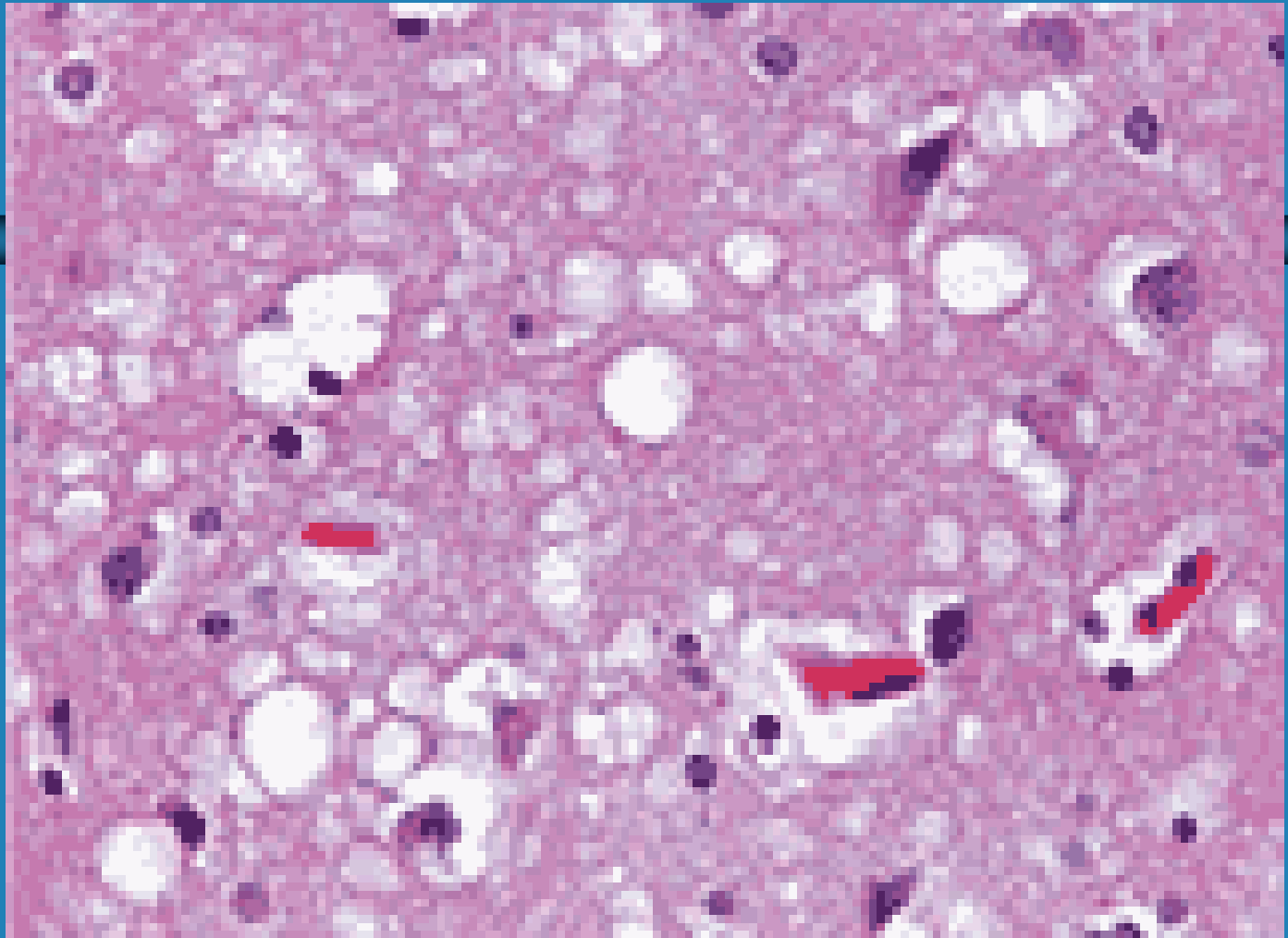
1957

⌘ **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

Ω November 1986

- **Outbreak in United Kingdom**
- **178,000 cattle diagnosed with BSE**
- **Since 1990, 159 cases of vCJD had been identified.**

Ω 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

MAD COW U.S.A.

COULD
THE
NIGHTMARE
HAPPEN
HERE?

SHELDON RAMPTON Y JOHN STAUBER

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

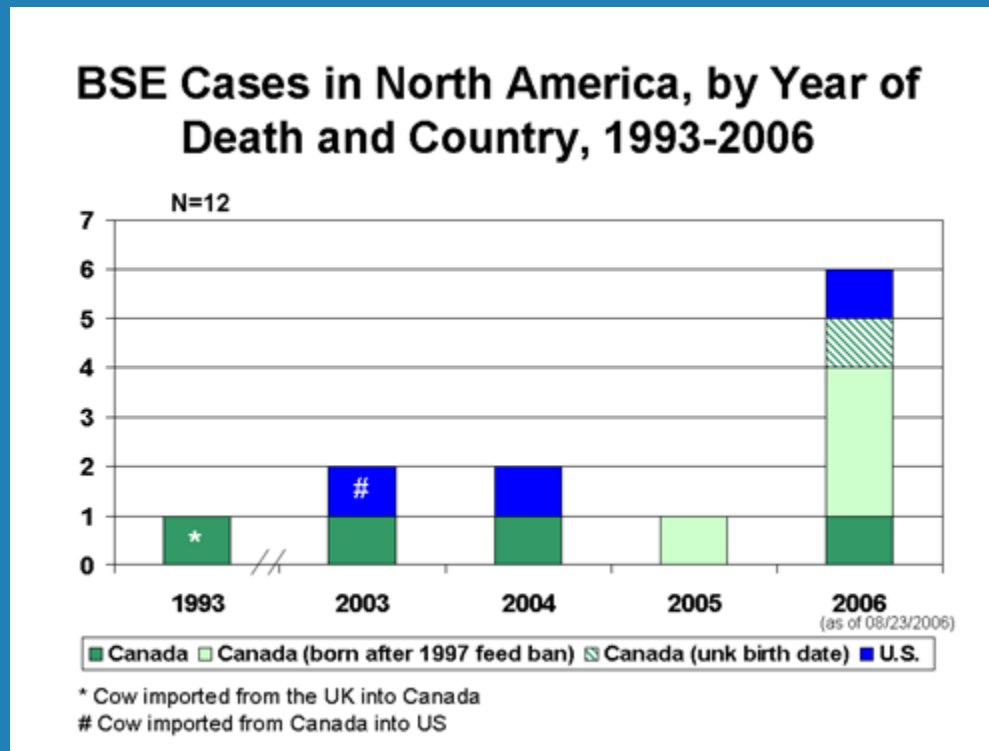
- ⌚ **USDA opens Canadian border to boxed beef imports of cattle under 30 mos**
 - **2004 import figures surpass 2003 totals**
- ⌚ **USDA publishes rule to open border to live cattle imports on March 7, 2005**
- ⌚ **Canada tests 22,000 cattle in 2004**

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



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

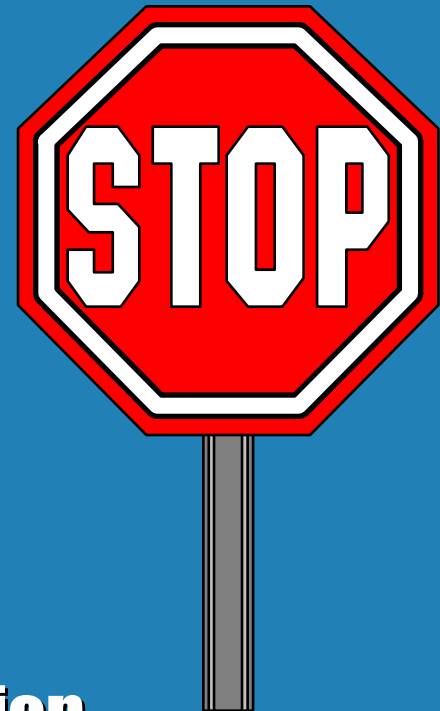
- <http://www.mad-cow-facts.com/index.html>

∞ 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](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!



Keep Food Safe From Bacteria™

Fight Bac Public Service Announcements



JANUARY 23-25, 1998

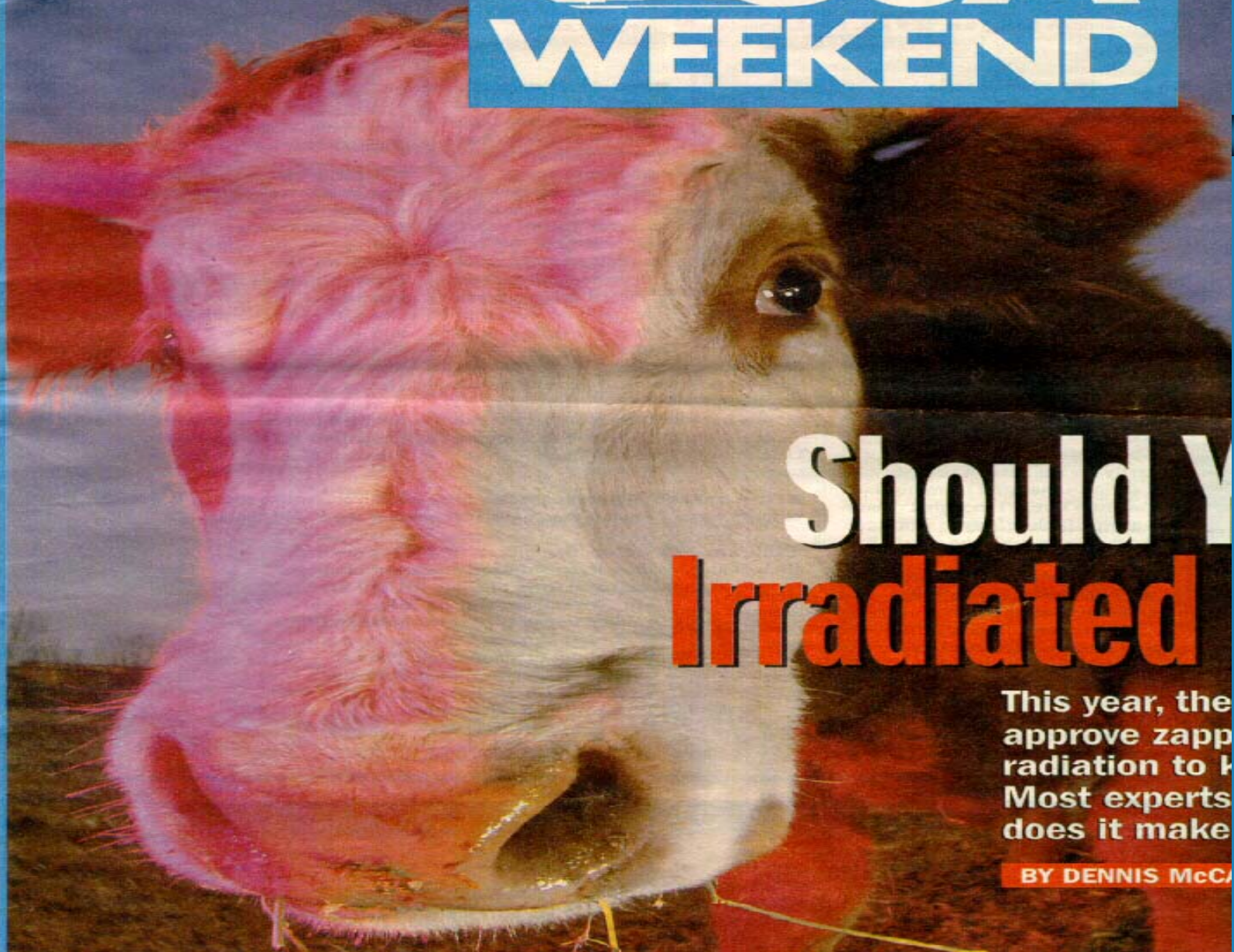
Food Irradiation

 **USA
WEEKEND**

Should You Irradiated

This year, the
approve zapp
radiation to k
Most experts
does it make

BY DENNIS McC



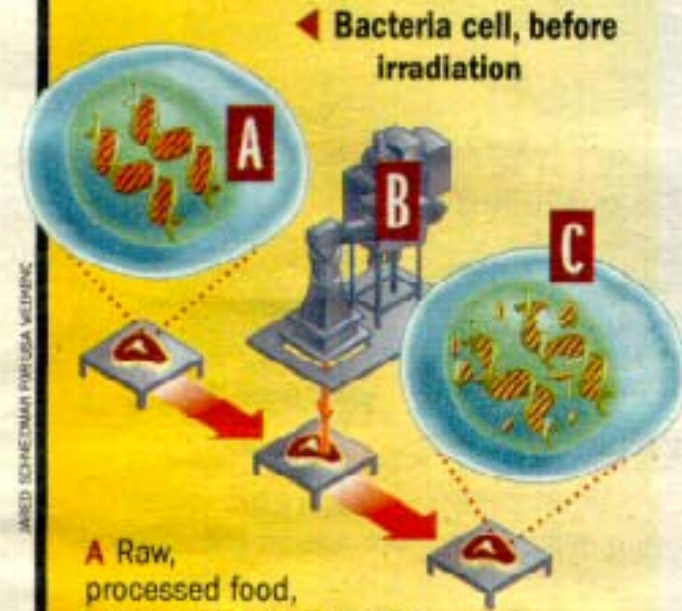
Irradiation- What is it?

Ω Form of “cold sterilization”

- USDA uses this term in literature

Ω Radiation disrupts cell components and kills germs

IRRADIATION kills organisms that cause food poisoning, without harming the food.



A Raw, processed food, which can be contaminated by pathogens such as bacteria, is conveyed into an irradiation chamber.

B A powerful electron beam is scanned over the food.

C Electron radiation breaks up the bacteria's DNA, making it impossible for the bacteria to reproduce or continue living — but causing no harm to the food.

SOURCE: Iowa State University College of Agriculture

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?

the safety factor

BY ROBIN L. FLANIGAN



School cafeterias have an excellent record of preventing food-borne illness but one outbreak is one too many

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

Q NCBA studies levels needed

- National Cattlemen's 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





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

Ω Voluntary until September 30, 2008

- Will become Mandatory**
- Jan 2007: Legislation being introduced to move that up to September 2007**



Other Solution Alternatives

Ω **Organic Production**

Ω **Local Production**

Ω **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**

