

Food Irradiation: ***A Global Perspective & Future Prospects***



Ronald F. Eustice

Executive Director

Minnesota Beef Council



October 18, 2010



Council on Ionizing Radiation Measurements and Standards

What I will discuss today

- **Why irradiation is necessary**
- **Commercial introduction of irradiated foods**
- **Consumer acceptance**
- **Current status of irradiated foods in commercial market**
 - **USA**
 - **Global Market**
- **Future prospects**
 - **Challenges & Opportunities**

SWINGING MOSCOW
WOMEN'S B-BALL ON THE LINE

THE E. COLI THREAT— IT'S WORSE THAN YOU THINK

2

E. Coli O157:H7



Irradiation: A Food Safety Solution?



Could irradiation do for meat & poultry & produce what pasteurization did for milk?

- 1. Learn about the irradiation process**
 - 1. Was it effective?**
 - 2. Would irradiation affect taste, nutrition etc?**
- 2. Determine Consumer Acceptance**

Minnesota Department of Health



“I can find very, very few issues in the area of medicine and public health that have unanimous agreement and support of every major public health, medical, and scientific organization in the world.”

Michael T. Osterholm, Former State Epidemiologist

Could irradiation do for ground beef what pasteurization did for milk?



2 Million Samples

Food Irradiation

Minnesota

Steps Forward

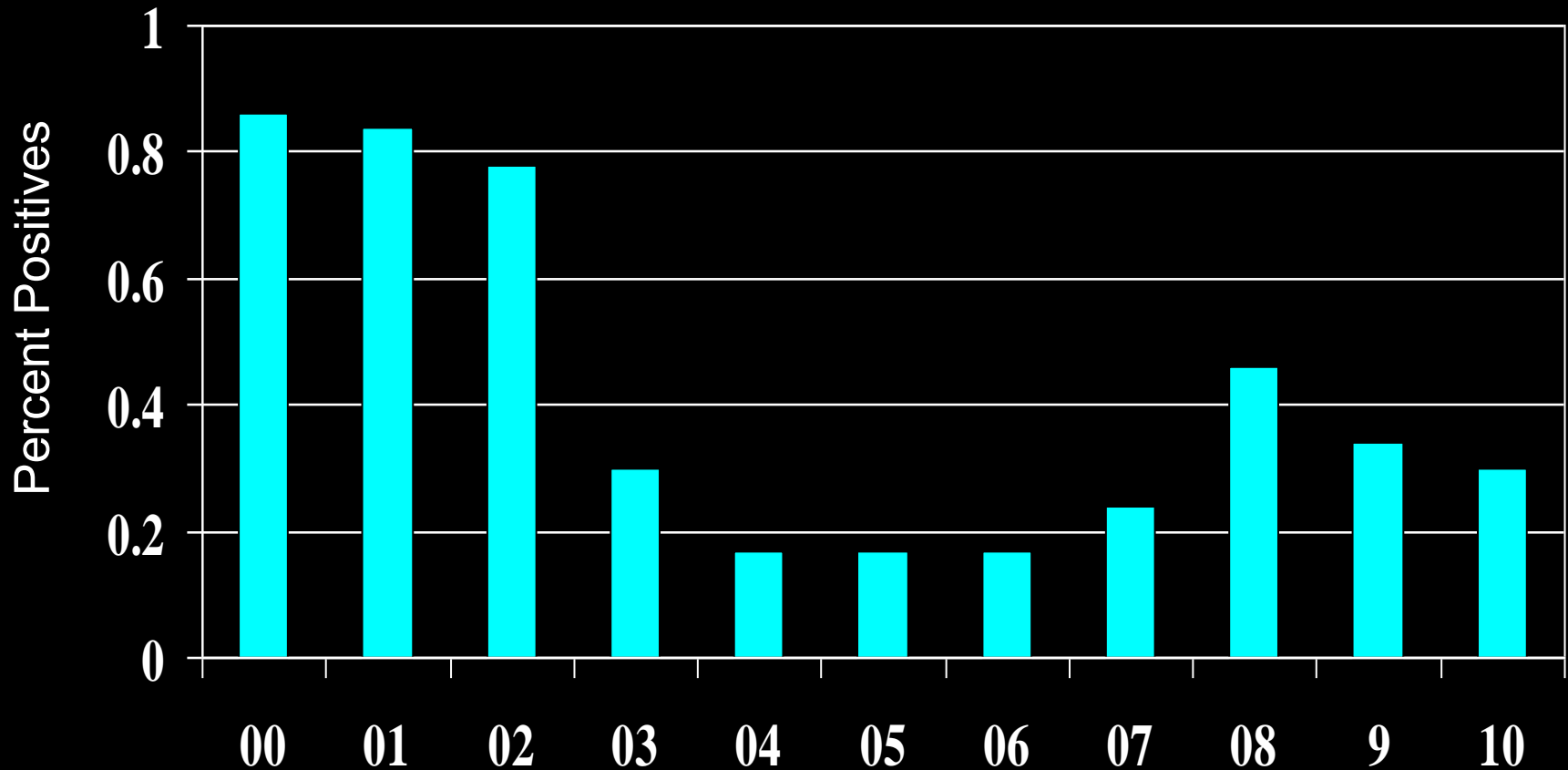
A Food Safety Conference sponsored by the Food Safety Center of the
Minnesota Department of Health in coordination with the Minnesota Department of Agriculture

Food Safety Conference
June 21-22, 1999

Northland Inn
Brooklyn Park, MN



Prevalence of *E. coli* O157:H7 in Ground Beef*



Results of raw ground beef products analyzed for *E. coli* O157:H7 in federal plants. 2010 Data (12/31/10).

E. coli O157 News

10-2011

Unpublicised E coli outbreak leaves 250 ill and one dead

theguardian

An eight-month E coli outbreak across the UK left 250 people ill and one dead but was not publicised at the time because its origins were unknown, health officials say. After six months of investigations the infection was ultimately linked to ... [\[CLICK TO READ\]](#)

California Firm Recalls Beef Products Due To Possible E. Coli O157:H7 Contamination

USDA Food Safety and Inspection Services

WASHINGTON, Sep 30, 2011 - Manning Beef, LLC, a Pico Rivera, Calif. establishment, is voluntarily recalling approximately 80,000 pounds of beef products that may be contaminated with E. coli O157:H7, the U.S. Department of Agriculture ... [\[CLICK TO READ\]](#)

Kansas Firm Recalls Ground Beef Products Due To Possible E. Coli O157:H7 Contamination

USDA Food Safety and Inspection Service

WASHINGTON, Sep 27, 2011 - Tyson Fresh Meats Inc., an Emporia, Kan. establishment, is recalling approximately 131,300 pounds of ground beef products that may be contaminated with E. coli O157:H7, the U.S. Department of Agriculture ... [\[CLICK TO READ\]](#)

Texas Firm Recalls Ground Beef Due To Possible E. Coli O157:H7 Contamination

USDA Food Safety and Inspection Service

WASHINGTON, Sep 23, 2011 - Palo Duro Meat, an Amarillo, Texas, establishment, is recalling 40,000 pounds of frozen fine ground beef products that may be contaminated with E. coli O157:H7, the U.S. Department of Agriculture ... [\[CLICK TO READ\]](#)

FoodNet Monitoring (2010)

	Illness	Hospitalization	Death
<i>E. Coli O157:H7</i>	442	184	2
<i>Non O157:H7 E. coli</i>	450	69	1
<i>Salmonella</i>	8250	2300	29

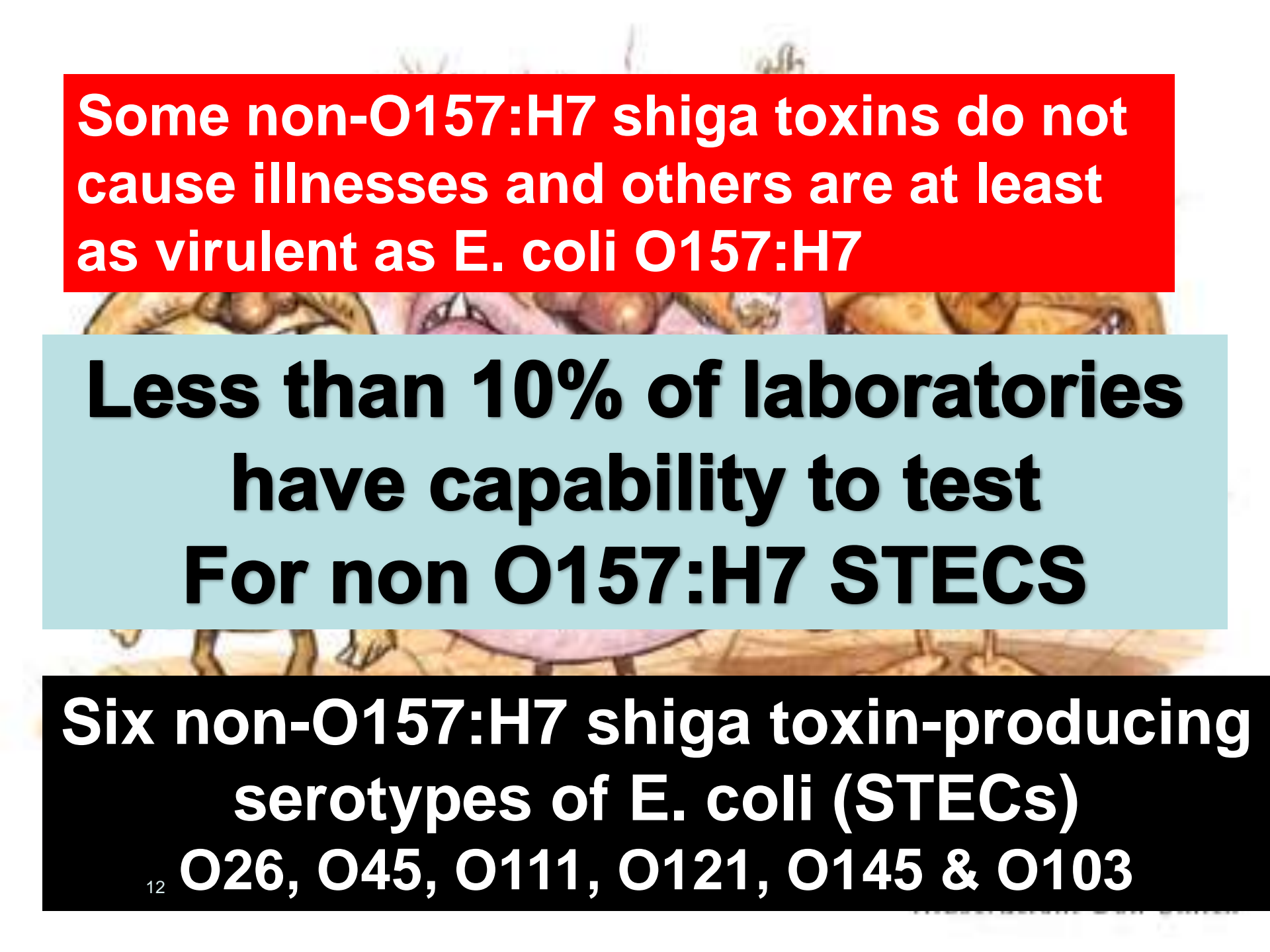
Remember:

This is data from 10 states representing 15% of US population.

FoodNet



The 10 states involved in FoodNet calculations represent 15% of the US population. (Snapshot).



Some non-O157:H7 shiga toxins do not cause illnesses and others are at least as virulent as E. coli O157:H7

**Less than 10% of laboratories have capability to test
For non O157:H7 STECS**

**Six non-O157:H7 shiga toxin-producing serotypes of E. coli (STECs)
O26, O45, O111, O121, O145 & O103**

Foodborne Illness in the USA

Estimates for 2011:

- The US Centers for Disease Control (CDC) estimates that one of every six in the US (or 48 million persons) becomes ill from food each year;
- 128,000 hospitalizations;
- 3,000 deaths.



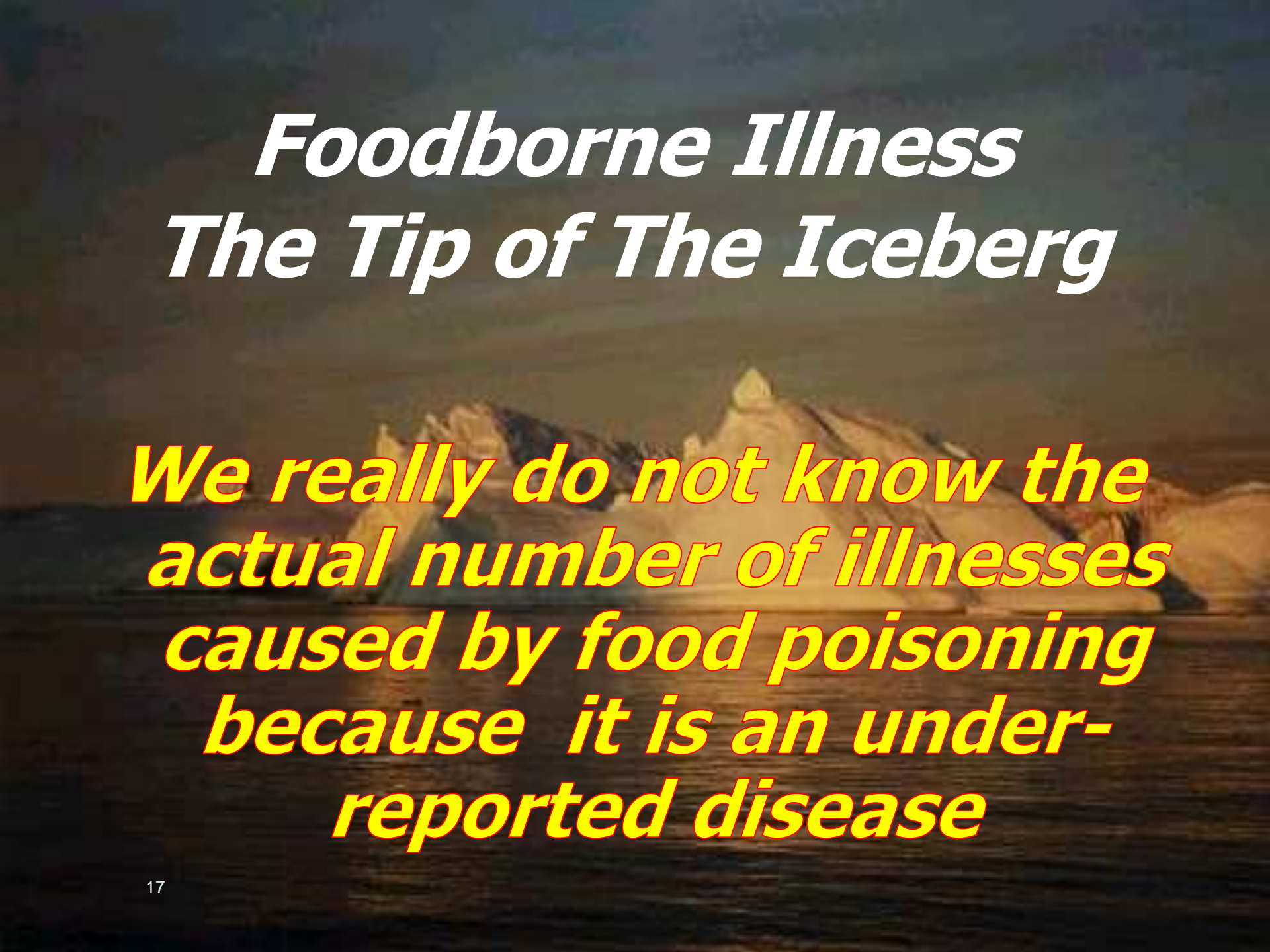
Top five pathogens causing domestically acquired foodborne illness resulting in hospitalization

Pathogen	Estimated annual hospitalizations	90% Credible Interval	%
<i>Salmonella, non-typhoidal</i>	19,336	8545-37,490	35
Norovirus	14,663	8,097-23,323	26
<i>Campylobacter spp.</i>	8,463	4,300-15,227	15
<i>Toxoplasma gondii</i>	4,428	3,060-7,146	8
<i>E. Coli (STEC) O157:H7</i>	2,138	549-4,614	4
Sub-Total			88

**Salmonella infections in the U.S.
have not declined in a decade,
and should be targeted in new
public health initiatives.**

US Centers for Disease Control (June 8, 2011)

(In 2010) FoodNet detected over 8,250 cases of salmonella poisoning with almost 2,300 hospitalizations and 29 deaths. That's up 10% from 2006-2008.

A photograph of an iceberg floating in the ocean. The tip of the iceberg is visible above the water, while the much larger submerged part is hidden below the surface, illustrating the concept of 'the tip of the iceberg'.

Foodborne Illness

The Tip of The Iceberg

We really do not know the actual number of illnesses caused by food poisoning because it is an under-reported disease

Pathogenic bacterium sicken & kill



Victims of foodborne illness



Let's do some research

- **What is food irradiation?**
- **What are others saying about irradiation and why?**
- **Does irradiation impact nutrition?**
- **Does the flavor or texture of food change?**
- **Is irradiation safe?**
- **“Cover-up” for poor sanitation?**

Food Irradiation

One Process:



Multiple Uses

**Sprout
Inhibition**

Onion, Potato,
Ginger, Garlic



**Quarantine
Fruits**



**Insect
Disinfestation**

Cereals, Pulses,
Dry Fruits



Shelf-life Extension

Chicken, Meat, Fish



**Pathogen
Reduction**

Spices, Meats & Poultry



Credit to Dr. Arun Sharma

Who Supports Irradiation?

- *American Medical Association*
- *World Health Organization*
- *Centers For Disease Control*
- *American Dietetic Association*
- *Institute of Food Technologists*
- *American Council on Science and Health*
- *Food and Drug Administration*
- *American Public Health Association*
- *Every scientific & medical organization*

Nutrition

**Nutritional comparison of irradiated
and non-irradiated cooked chicken
(Amounts are for 1 kg. (2.2 Lbs)).**

	Non-irradiated	Irradiated
Vitamin A	2200	2450
Vitamin E (International units)	3.3	2.15
Thiamine (milligrams)	0.58	0.42
Riboflavin (milligrams)	2.10	2.25
Niacin (milligrams)	58.0	55.5
Vitamin B6 (milligrams)	1.22	1.35
Vitamin B12 (milligrams)	21	28
Pantothenic acid (milligrams)	13	17

<i>Nutritional analysis of irradiated & non-irradiated ground beef Retail Frozen Product</i> Amounts are for 100 grams of frozen ground beef		
<i>Nutrient/Vitamin/Count</i>	<i>Non-irradiated Sample</i>	<i>Irradiated Sample</i>
<i>Protein (by Dumas)</i>	<i>16.6</i>	<i>16.7</i>
<i>Iron (milligrams)</i>	<i>2.19</i>	<i>2.31</i>
<i>Thiamin (milligrams)</i>	<i>.0400</i>	<i>.0400</i>
<i>Zinc (milligrams)</i>	<i>3.89</i>	<i>3.97</i>
<i>Niacin (milligrams)</i>	<i>4.68</i>	<i>4.82</i>
<i>Vitamin B⁶ (milligrams)</i>	<i>0.200</i>	<i>0.140</i>
<i>Vitamin B¹² (milligrams)</i>	<i>1.60</i>	<i>1.70</i>
<i>Phosphorus (milligrams)</i>	<i>135</i>	<i>135</i>
<i>Medallion Laboratories (2002)</i>		

Nutritional analysis of irradiated & non-irradiated ground beef Foodservice Fresh (Refrigerated) Product

<i>Nutrient/Vitamin/Count</i>	<i>Non-irradiated Sample</i>	<i>Irradiated Sample</i>
<i>Protein (by Dumas)</i>	<i>18.1</i>	<i>20.0</i>
<i>Iron (milligrams)</i>	<i>2.07</i>	<i>1.98</i>
<i>Thiamin (milligrams)</i>	<i>.0500</i>	<i>.0500</i>
<i>Zinc (milligrams)</i>	<i>4.09</i>	<i>3.96</i>
<i>Niacin (milligrams)</i>	<i>4.16</i>	<i>4.32</i>
<i>Vitamin B⁶ (milligrams)</i>	<i>.230</i>	<i>0.220</i>
<i>Vitamin B¹² (milligrams)</i>	<i>1.96</i>	<i>1.78</i>
<i>Phosphorus (milligrams)</i>	<i>150</i>	<i>142</i>
<i>Medallion Laboratories-</i>		

Are there “long term” studies on the safety of irradiated foods?

The process of irradiation has been more thoroughly studied than any other food preservation method.

There have been many hundreds of scientific papers published on the safety and effectiveness of irradiation during the past 50 years.



CIDRAP

Center For Infectious Disease Research & Policy
UNIVERSITY OF MINNESOTA



“Irradiation is the single most-studied food safety process in the history of humankind.”

Dr. Michael T. Osterholm

The RALTECH Study

The largest study ever undertaken to evaluate the safety and wholesomeness of irradiated food

RALTECH: Perspective on the Study

- **Magnitude of the effort**
 - 230,000 chilled eviscerated broilers used /
 - 300,000 kg of chicken meat
 - Involved many labs and researchers
- **Types of studies**
 - Nutritional adequacy
 - Genetic toxicity
 - Teratogenicity
 - Chronic toxicity, oncogenicity, and multi-generation general health and reproductive function

RALTECH: Treatments Compared

- **Five diets compared**
 - **Diet N** control diet (dog chow or rodent chow)
 - **FC** 35% frozen control chicken; 65% diet N
 - **T** 35% thermally processed chicken; 65% diet N
 - **E** 35% electron beamed chicken (~60 kGy); 65% diet N
 - **G** 35% gamma rayed chicken (~60 kGy); 65% diet N

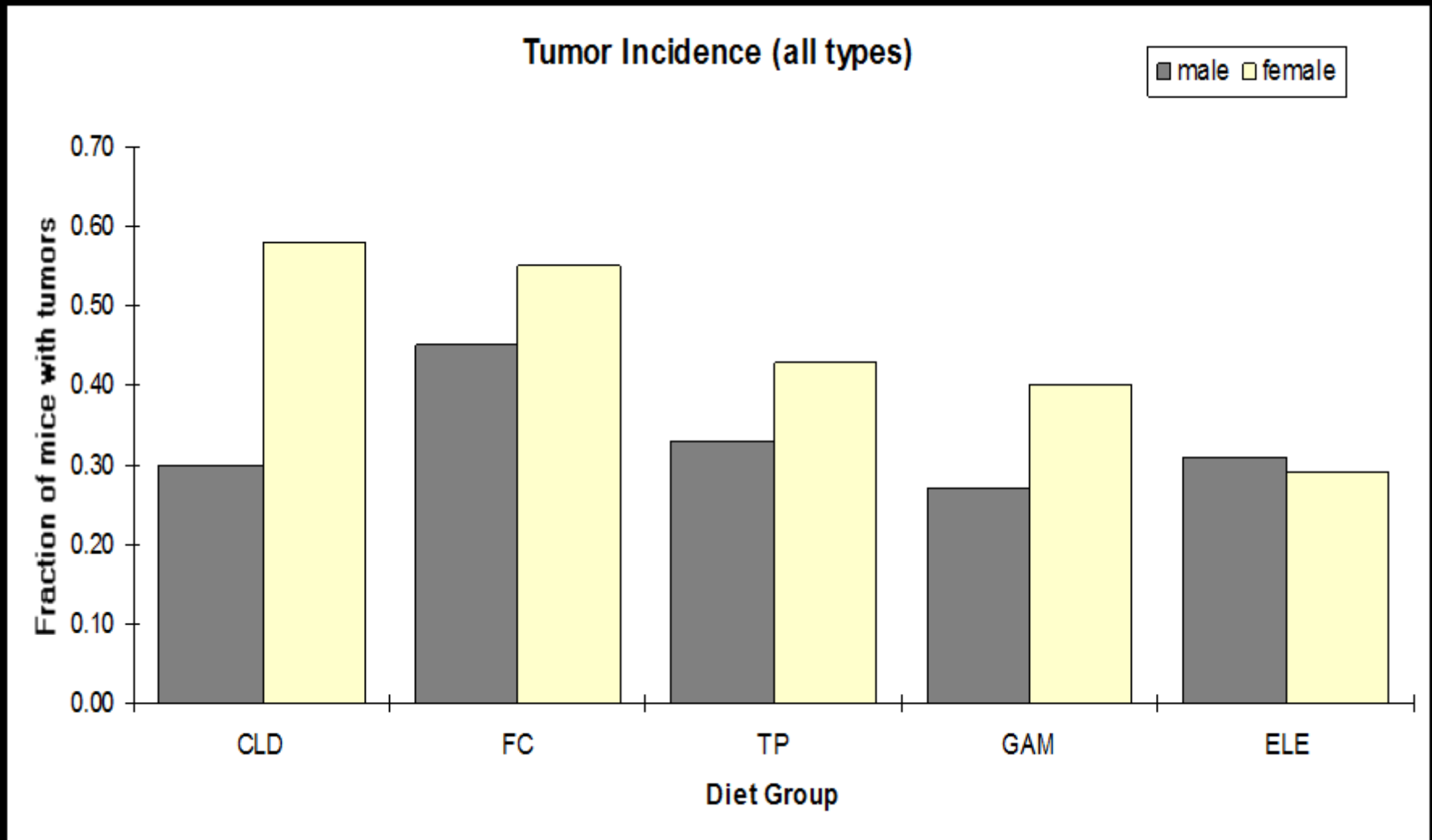
Genetic Toxicity Tests

- Four tests used:
 - Ames test (*Salmonella typhimurium*)
 - Sex-linked recessive lethal mutations (*Drosophila melanogaster*)
 - Heritable translocation mutations (mice)
 - Dominant lethal mutations (mice)

Conclusion:

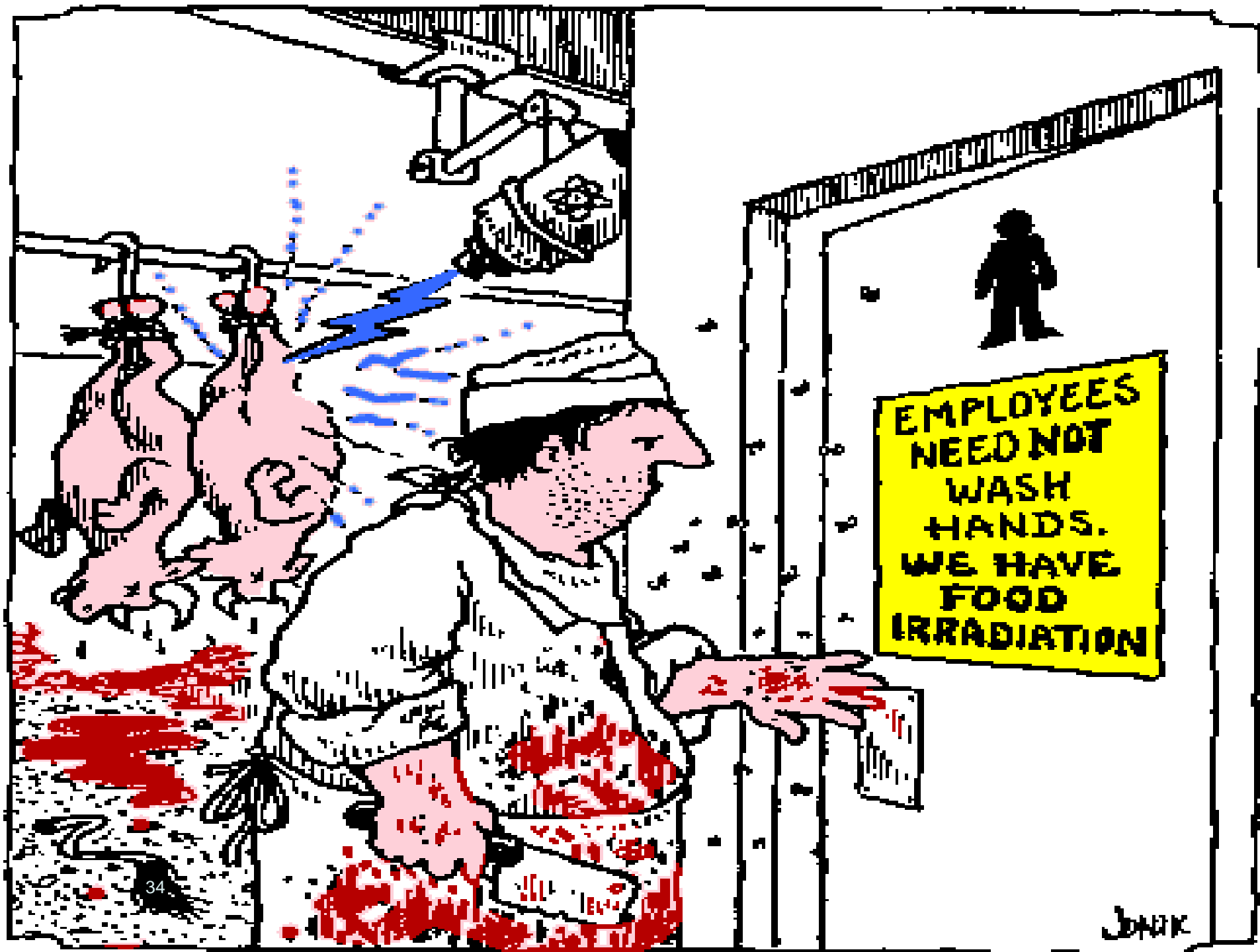
All four tests failed to reveal any mutagenic activity present in irradiated chicken meat
(Note that this is for doses approximately 20-fold greater than those used for meat and poultry pasteurization)

RALTECH: Cancer Incidence Data



Irradiation does not replace hygiene & sanitation

- ***Irradiation is an additional step.***
- ***Irradiation is NOT A REPLACEMENT
FOR OTHER TECHNOLOGIES
already in place.***



EMPLOYEES
NEED NOT
WASH
HANDS.
WE HAVE
FOOD
IRRADIATION

Arguments against...

This is little more than an excuse for the sale of contaminated (food).

(This process) will be used to mask low-quality foods. Better controls and inspection are what is needed.

(This process) decreases the nutritional value of (food).

It leads to formation of harmful products in (food). Possibly dangerous substances could be formed.

This (process) will increase the price of the product. It is not necessary. We have a direct and prompt food distribution system.

Arguments against pasteurization

This is little more than an excuse for the sale of contaminated milk.

Pasteurization will be used to mask low-quality foods. Better controls and inspection are what is needed.

Pasteurization decreases the nutritional value of milk.

It leads to formation of harmful products in milk.

Possibly dangerous substances could be formed.

This process will increase the price of the product.

It is not necessary. We have a direct and prompt food distribution system.

Sources:

- Milk Pasteurization, Hall & Trout (1968)***
- Technology Review (December 1997)***

Food Irradiation Update is published by the Minnesota Beef Council

Quotable Quotes:

According to the USDA, combining chlorination and irradiation can be an effective way to kill E. coli and Salmonella on alfalfa sprouts. In 1999, USDA Agricultural Research Service found that a treatment of irradiation and chlorine solution not only killed both organisms, but extended the shelf life of sprouts from about five days to more than a week.

In the tests, they used the same dose of irradiation as approved for irradiating meat. They also subjected the alfalfa seeds to various levels of chlorinated water. According to the research results, the best way to eliminate pathogens would be a combination of irradiation and sanitation treatments. That's because sprouts can be contaminated internally, which would prevent a surface disinfectant from working effectively.

USDA Agricultural Research Service scientists Donald W. Thayer, Kathleen T. Rajkowski and William F. Fett

"Dr. Mansour Samadpour of IEH Laboratories and Consulting Group in Seattle reported at the "7th International Symposium on Shiga Toxin Producing E. coli" that his lab tested approximately 5,000 samples of ground beef purchased at retail stores and found non-O157 STECs in 1.9 percent of the samples. One positive out of every 50 packages sampled suggests a high rate of contamination. It is more proof that the pathogens exist in our food supply and make people sick. We urge the President, his appointees and the industry to join us in supporting FSIS's efforts to get non-O157 STECs out of our ground beef."

Dr. Richard Raymond & Carol Tucker-Foreman

"In the wake of Europe's recent E. coli outbreak, in which sprouts contaminated with a particularly vicious strain killed 36 people and sickened thousands, food safety officials are asking once again what more can be done to curb the spread of food-borne illnesses. Some experts say part of the solution lies with food irradiation — an effective, underused method of prevention that's been around for more than 100 years."

Los Angeles Times

"It is practically impossible to prevent at least some bugs getting into food in the field, no matter how stringent the hygiene rules. And washing fresh produce removes little more than surface dirt. The only answer is irradiation. That means treating food with high-energy bursts of electrons or photons to attack the micro-organisms' DNA, preventing them from spitting out dangerous toxins and proliferating.

The Economist

"If even 50% of meat and poultry consumed in the United States were irradiated, the potential impact of food borne disease would be a reduction [of] 900,000 cases and 300 deaths."

Michael Osterholm, director of the Center for Infectious Disease Research and Policy at the University of Minnesota.



**People buy foods,
not technologies**



**Dr. Christine M. Bruhn,
Department of Food Science & Technology,
University of California at Davis**

Don't confuse consumer response with activist's statements;

- Consumers are currently buying significant volumes of irradiated meat and produce;**
- Education and promotion will increase the number who select /prefer irradiated food.**

Consumer Reaction

- **Generally positive or neutral;**
- **Many are undecided & want to know more;**
- **A small minority are opposed;**
 - **(Many of these folks are opposed to other technologies, not just irradiation...**

Acceptance Increases

- When people hear about the safety testing;
- When people hear who endorses safety;
- When people see the product;
- After a foodborne illness outbreak that irradiation could have prevented.

– Dr. Christine Bruhn, University of California, Davis

Consumer Focus Group Results

Recently a major food company conducted focus group research to determine consumer attitudes toward food irradiation.

“The results came back very positive and some of our executives were skeptical. So we repeated the research and the results were even more positive.”

***Education is
the key to
consumer
acceptance.***



ARGENTINA BRAZIL CANADA INDIA
KOREA PERU SPAIN THAILAND
URUGUAY USA





Food Irradiation 101

Ronald F. Eustice

Executive Director, Minnesota Beef Council

Consultant, Food Irradiation Processing Alliance (FIPA)



<http://www.mnbeef.org/index.htm>

Name _____

Master

Date FN-222

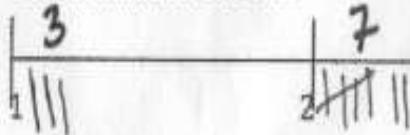
IRRADIATION

Ron Eustice - Executive Director, Minnesota Beef Council & Amy Halvorson, RD - Minnesota Beef Council

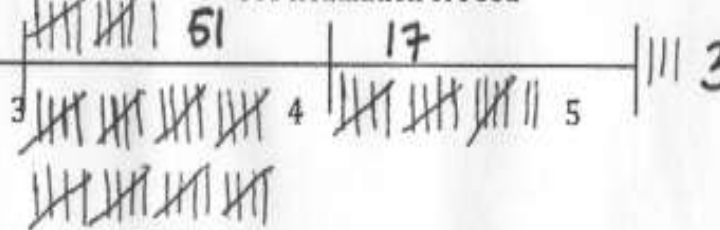
- Before the Presentation:

Circle a Number

Con Irradiation of Food



Pro Irradiation of Food



- After the Presentation:

<http://www.mnbeef.org/index.htm>

Name _____

Master

Date FX-222

IRRADIATION

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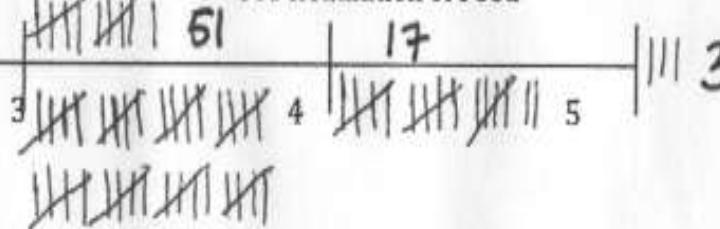
- Before the Presentation:

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Con Irradiation of Food



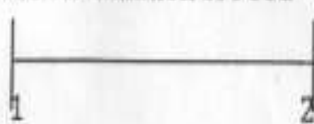
Pro Irradiation of Food



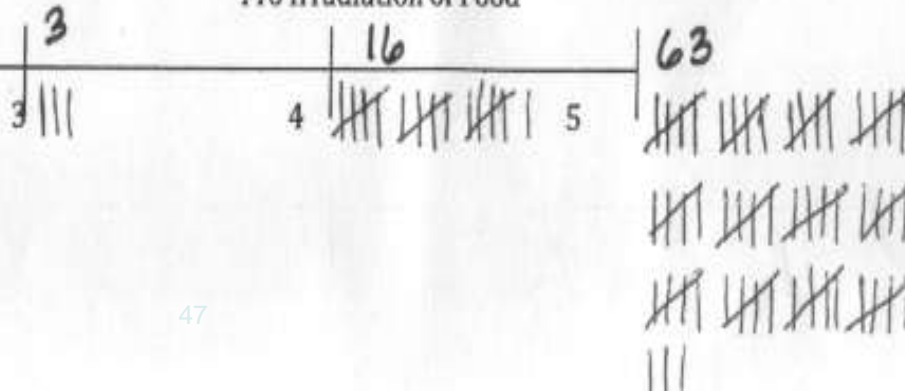
- After the Presentation:

Circle a Number

Con Irradiation of Food




Pro Irradiation of Food



Comments:

<http://www.mnbeef.org/index.htm>

Foods Approved for Irradiation in the USA				
Year	Food	Dose	Purpose	
1963	Wheat Flour	0.2-0.5 KGY	Control of Mold	
1964	White Potatoes	0.05-0.15 kGy	Inhibit Sprouting	
1986	Pork	0.3-1.0 kGy	Kill Trichina Parasite	
1986	Fruits & Vegetables	< 1.0 kGy	Insect Control/ Extend Shelf Life	
1986	Herbs & Spices <i>(Flavoring Materials)</i>	< 30 kGy	Sanitization	
1986	Dried Enzymes	10 kGy	Bacterial Reduction	
1990	Poultry	< 3 kGy	Pathogenic Bacteria Reduction	
1995	NASA/Meat	> 44 kGy	Sterilization	
1997	Fresh Meat	< 4.5 kGy	Pathogenic Bacteria Reduction	
2000	Frozen Meat	< 7 kGy	Pathogenic Bacteria Reduction	
2000	Sprouts		Pathogenic Bacteria Reduction	
2000	Shell Eggs	3 kGy	Pathogenic Bacteria Reduction	
2001	Pet Treats/Animal Feed	< 50 kGy	Pathogenic Bacteria Reduction	
2006	Molluscan Shellfish	< 5.5 kGy	Pathogenic Bacteria Reduction	
2008	Fresh Spinach & Iceberg Lettuce	< 4.0 kGy	Pathogenic Bacteria Reduction	

FDA Approval of Ingredients

(Partial List)

Approved

- Seeds & seed products
- Grains & grain products
- Spices/herbs
- Dry vegetables
- Fruits & fruit products
- Enzymes & rennet

To be determined

- Yeast & extract
- Dried egg products
- Dried meat products
- Gums/thickeners
- Coconuts
- Dairy ingredients
- Soy
- Gelatin
- Chocolate & products
- Nuts & nut products

Labeling Requirements in the U.S.A

Labeling

***At Retail:
Radura, symbol and “Irradiated for Safety”***

***Additional Terminology: Reduced,
Eliminated, or Free of (OK, if it can be proven
or justified).***

***If an irradiated product is used as an
ingredient it must be identified on the
ingredient label.***

Restaurants

***Radura symbol and word irradiated must
be on the outside package or carton.***

Notification of customer is not required.



Symbol can be any color



Labeling



Schwan's Burgers always cook up tender, juicy, and full of big, beefy flavor! At Schwan's, we're very proud of our dedication to bringing you quality, great taste and convenience. In keeping with this tradition, we utilize USDA/FDA-approved irradiation, the latest in food safety technology. This innovative process continues our commitment to superior quality and safety by ensuring that all our beef burgers are the best they can possibly be. Stack a couple of these Quarter-Pound Burgers with crisp slices of our hickory-smoked Thick Sliced Bacon (440) and tangy triangles of our American Processed Cheese (661) for a truly memorable burger!

PREMIUM HEARTLAND QUALITY

OMAHA STEAKS

SINCE 1917

OMAHA
STEAKS

Beef

1136



TREATED BY IRRADIATION

Ground Beef (Omaha Steaks Premium)

4 - 1 LB. Packages

NET WT.: 64 OZS. (4.00 LBS.)



EUSE 2

0 21613 01136



PREMIUM HEARTLAND QUALITY

OMAHA STEAKS

SINCE 1917

OS SalesCo, Inc.

Labeling



Mango Packaging



Radura

Treated with gamma radiation
To control insect infestation

Frieda's

MANGOSTEEN 

Treated with irradiation

Product of Thailand

3042

Labeling

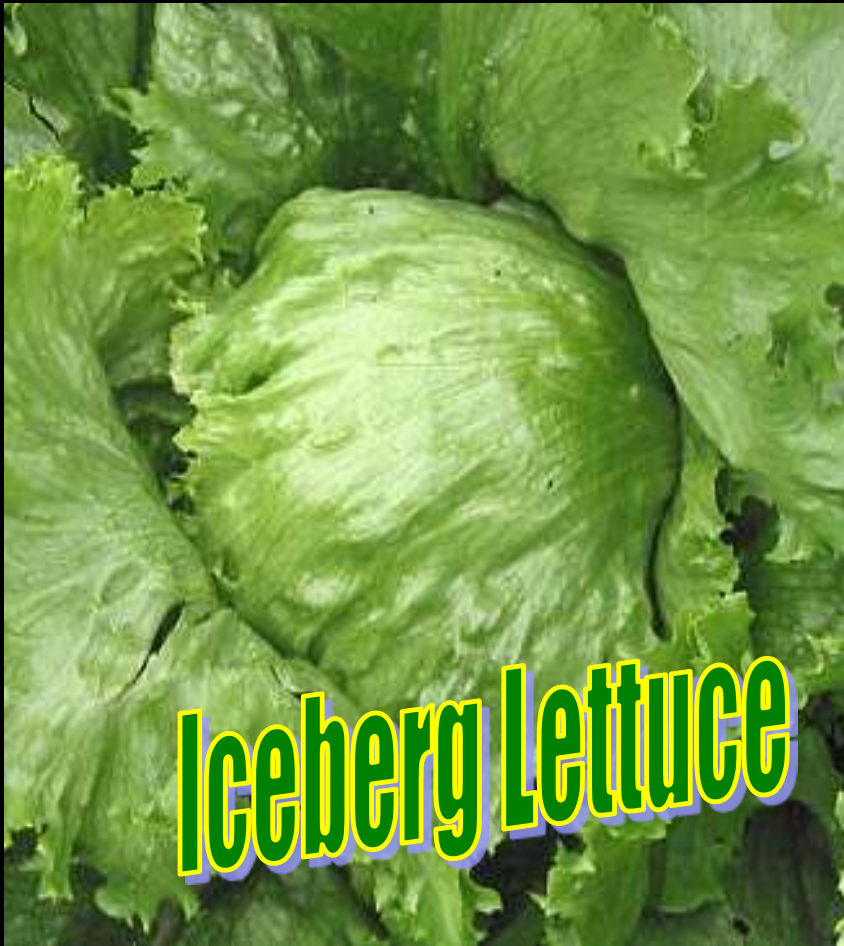
- “Treated by Irradiation to Improve Microbiological (or Food) Safety”

“Treated by Irradiation for Disinfestation”
- “Treated by Irradiation to Prevent Sprouting”

Labeling

- “Treated by Irradiation to Protect American Agriculture from Harmful Foreign Insects”
- “Treated by Irradiated to Increase Shelf Life”

Recent Approvals: Food Safety



Approved on August 26, 2008

Oyster Irradiation



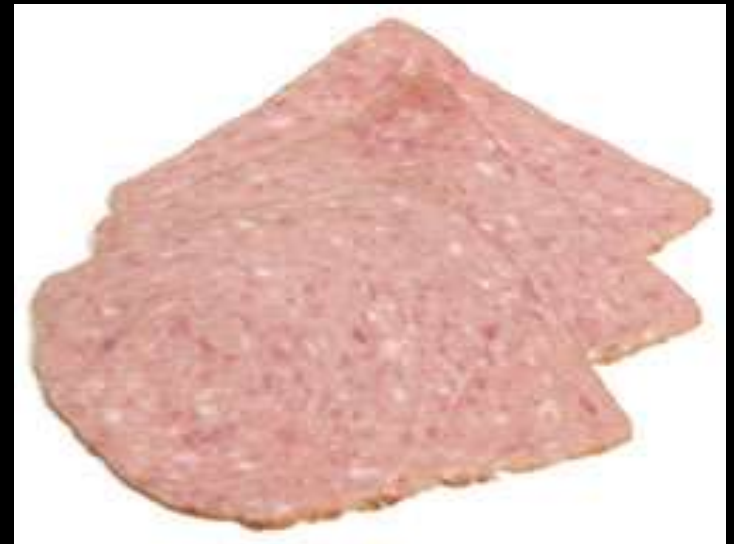
On 12 June 2009 Food Technology Service Inc., (FTSI) Florida became the first licensed facility to make raw oysters safer by irradiating them.



FTSI applies a proprietary dose to eliminate *Vibrio vulnificus*, which is a naturally occurring marine bacterium that can make some people very sick or can kill them.

Ready-to-Eat (RTE) Foods

- ***Grocery Manufacturer's Association (GMA) has petitioned FDA to allow irradiation of certain prepared foods including hot dogs, luncheon meats, bologna etc.***



Irradiated Spices

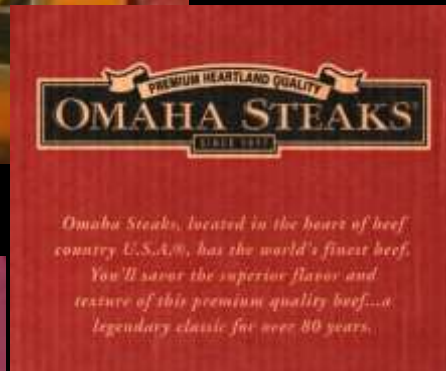


- It is estimated that approximately 80,000 metric tons (175,000,000 pounds) of commercial spices of spices are irradiated annually in the USA.

- One-third of total US production.*



Current Meat Applications of Irradiation in the USA





value price

Ground Beef

Specially designed to be moist and juicy with 85% lean beef making it a versatile ingredient, perfect for recipes. Irradiated for your safety.

4-8 oz. packs, 2 lbs.

WAS \$7.99 **#413 | NOW \$7.89**

99¢ per Serving, Serves 8

TREATED WITH IRRADIATION



New!

Breakfast Steaks

Steak and eggs define the hearty breakfast. These just-right portions of beef let you create a sizzling breakfast right at home. Just add your favorite eggs.

8-2 oz steaks
cal 90 fat 4.5g sodium 105mg carbs 0g

#454 | \$9.99

\$1.25 per Serving, Serves 8

TREATED WITH IRRADIATION

LIVESMART

schwan's



Black Angus Steak Burger

Fans of Black Angus beef will love this juicy, one-third pound burger. Irradiated for your safety.

8-5.3 oz. burgers, 2.65 lbs.

#458 | \$15.29

\$1.91 per Serving, Serves 8

TREATED WITH IRRADIATION



Quarter Pound Beef Patties

Our classic quarter pound burger, full of big, beefy flavor. 90% lean, irradiated for your safety.

8-4 oz. patties, 2 lbs.

#421 | \$9.99

\$1.25 per Serving, Serves 8

TREATED WITH IRRADIATION



- Mail order nationwide
- 81 retail stores in 29 states
- Expanding by 4 to 5 stores per year



OS SalesCo, Inc.

Wegmans
makes great meals easy

CargillTM



Irradiated Ground Beef

Wegmans Markets, Rochester, New York





8
Quarter
Pound
Patties
Keep Frozen

NET WT. 32 oz.
(2 LBS.) .91 kg.

100% Pure
Ground Beef
Patties

Publix®

U.S.
INSPECTED
AND PASSED BY
DEPARTMENT OF
AGRICULTURE
EST. 7353



Colorado Boxed Beef

Irradiated Meat in the US Space Program (NASA)



Irradiated pet treats & toys



18,000-20,000 MT
In USA

18,000-20,000 MT

In USA

(40 million pounds)



Animal Feedstuffs

- Colostrum
- Whey
- Whey Protein



sadex

Irradiated Fruits & Vegetables in USA

**15,000 MT (35,000,000 Lbs.)
Annually**



Boniatos



Boniato de Okinawa



Lychee



Rambután

Hawaii Pride



Hawaii Pride



Hawaii Pride



Irradiated Fruit



APHIS proposes adding irradiation facilities

- A proposal by the Animal and Plant Health Inspection Service to allow food irradiation facilities to operate in 15 states in the South could be very good news for importers and consumers who have a taste for fresh produce year-round.



- The agency of the U.S. Department of Agriculture published the proposed rule in the *Federal Register* on Sept. 29, 2011.

APHIS proposes adding irradiation facilities

APHIS has received a petition for permission to open an irradiation facility in McAllen, Texas, to treat foods coming into the U.S. and those being moved from state to state.



- There is a growing market in the U.S. for fresh guavas from Mexico and that any move by APHIS to expand technological applications to remove marketplace restrictions would be good news.

USDA Framework Equivalency Work Plans (FEWP)

- India
- Mexico
- Thailand
- Philippines
- Viet Nam
- Laos
- Malaysia
- Pakistan
- South Africa.



India



China



**200,000 MT of food
irradiated annually
(2009)**



China



Fermented spicy chicken feet and wings, a typically Chinese delicacy is now irradiated in very large volumes.

Irradiation provides a solution that increases the shelf life and the microbiological safety while fully preserving the sensory qualities. The products are sold throughout China with the mention of irradiation on the package.



Queen of Fruits: The Mangosteen

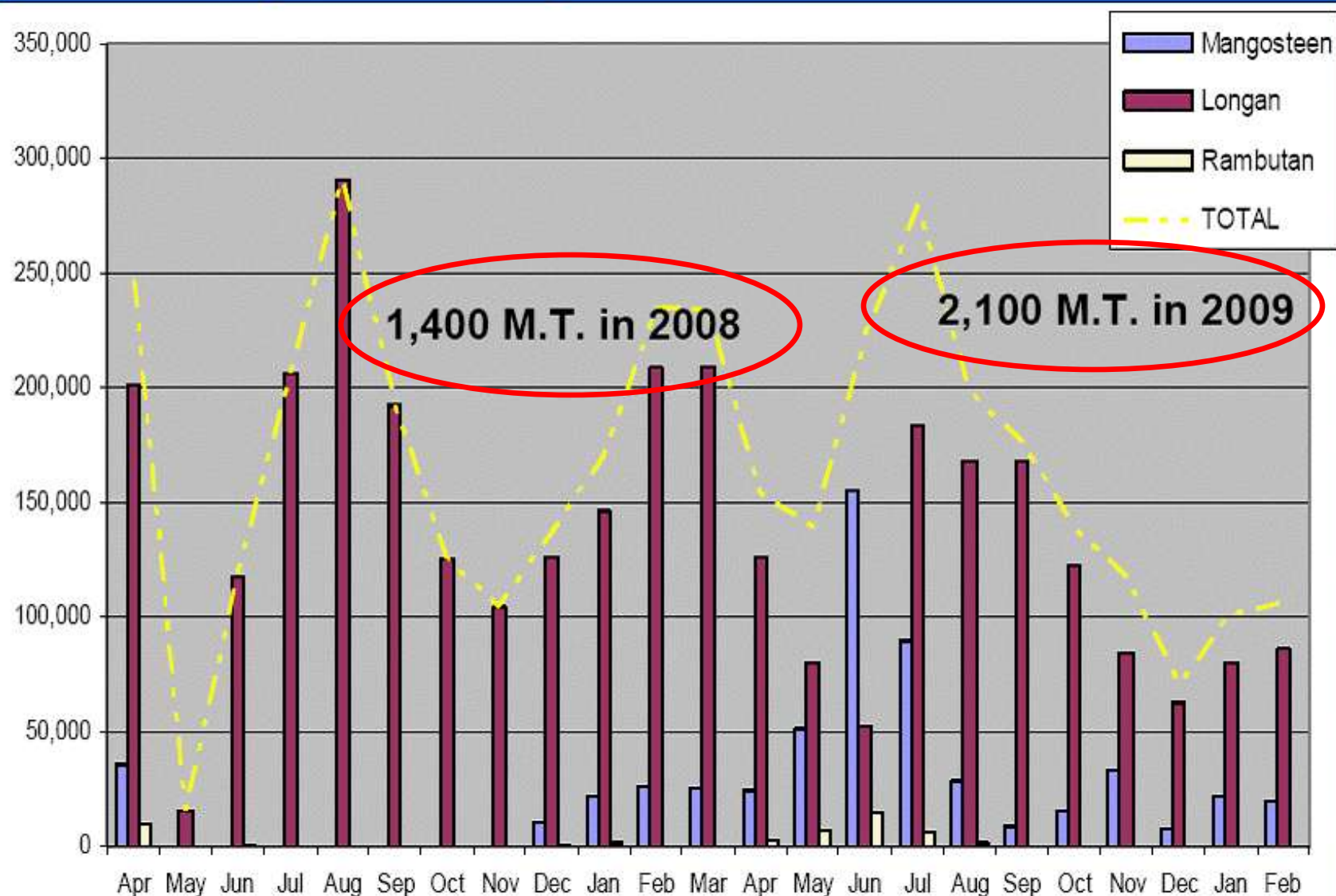
Thailand



Available From:



Isotron (Thailand) Ltd & Fruits Irradiation



Viet Nam



5,300 METRIC TONS



DRAGON
FRUIT



Mexico



Guavas & Mangoes from Mexico

- In 2010 more than 7,500 metric tons (16.7 million pounds) of irradiated guavas and mangoes entered the US from México. All was sold at retail.



Exportation of Irradiated Mexican Fruit to the USA:

Product	Total 2010 Pounds (Tons)	Total 2011 (estimate) Pounds (Tons)
Guava	16,000,000 (7,260)	17,500,000 (7,950)
Mangos	350,000 (160)	400,000 (182)
Peppers	350,000 (160)	400,000 (182)
Grapefruit	0	100,000 (45)
Total	16,700,000 (7575)	18,400,000 (8,347)



Production is expected to
reach 25 – 40,000 Metric
Tons in 2011
(and double that amount
in 2012- 2013)

 Sterigenics.



Benebión®

un servicio de PHYTOSAN, S.A. de C.V.

Brazil

- Animal Feed
- De-hydrated (dried) products
- Pet Food & pet toys
- Spices

25,000 MT



Irradiated Fruit Exportation Australia to New Zealand



Mangos are irradiated every day during the 90-120 harvest.

1,205 Metric Ton Irradiated in 2010



Exportation of Irradiated Australian Fruit to New Zealand (2004-2010) *Metric Tons*

	2004-06	2007	2008	2009	2010
Mango	256	228	261	585	1095
Papaya	0	13	1	0	0
Litchi	0	10	21	57	110
Total	256	251	283	642	1205

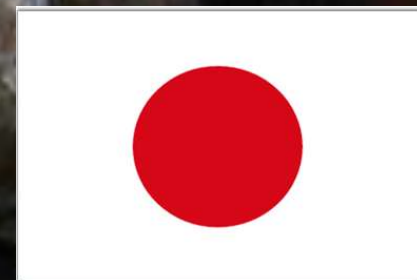
Turkey

- **Irradiated Food Volume (2010):**

– Gamma Pak	3.625 Tons
– TAEK(Government)	1.200 Tons

Total	4.825 Tons
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JAPAN



Quantity of Foods Irradiated Commercially in some Asian & North & South American Countries

Country	Metric Tons*	Main Commodities
* approximate values for 2009 or the latest year available; Dr. Arun Sharma and others		
Australia	1,200	Mango, papaya, litchi
Bangladesh	N/A	Spices, potatoes
China	200,000	Garlic, spices, dried vegetables, cooked meats
India	10,000	Spices, spice mixes, dried vegetable seasonings, mango
Indonesia	2,265	Spices, dried vegetables, dehydrated products, frozen products (shrimp, fish, frogs legs)
Malaysia	826	Spices, herbs, vegetable seasonings, cocoa
Pakistan	(i) 147 tons (ii) 560,000 packets	(i) Dehydrated foods (ii) Ready-to-eat meals
Philippines	345	Spices, dehydrated vegetables and fruits
Korea (Rep)	2,500	Dried vegetables, spices
Thailand	2,100	Nham, spices, herbs, vegetable seasonings, sweet tamarind, mango, mangosteen and longan
Vietnam	5,300	Spices, frozen foods and dragon fruit
Mexico	7,500	Guavas, mangoes
Brazil	25,000	Animal feed, dehydrated products, pet food, Pet treats, spices
USA	120,000	Spices, meats, produce, animal feed, pet treats

Irradiation in the USA Today

- Approximately 8,000 MT (15-18,000,000 pounds) of ground beef irradiated annually in USA.***
- Approximately 14,000 MT (30,000,000 pounds) of produce irradiated annually.***
- Approximately 70-80,000 MT (175,000,000 pounds) of spices irradiated annually.***
- Approximately 18,000 to 20,000 MT (40 million pounds) of irradiated pet treats.***

Asparagus

Comparison of asparagus tips by treatment group at day 0



Control



**X-ray
400Gy**



**X-ray
1,000 Gy**

Shelf Life Extension



Control
36 days at 34F



Irradiated at 400Gy
36 days at 34F

**SWINGING MOSCOW
WOMEN'S B-BALL ON THE LINE**







Can This Meat Kill You?

**THE E. COLI THREAT—
IT'S WORSE
THAN YOU THINK**

BEEF CHUCK GROUND
(FAMILY PACK)

SAFE HANDLING INSTRUCTIONS

THIS PRODUCT WAS PREPARED FROM INSPECTED AND PASSED MEAT AND/OR POULTRY. SOME FOOD PRODUCTS MAY CONTAIN BACTERIA THAT COULD CAUSE ILLNESS IF THE PRODUCT IS MISHANDLED OR COOKED IMPROPERLY. FOR YOUR PROTECTION FOLLOW THESE SAFE HANDLING INSTRUCTIONS.

	KEEP REFRIGERATORS ON FRIGID.		COOK THOROUGHLY.
	THAW IN REFRIGERATOR OR MICROWAVE.		KEEP HOT FOODS HOT.
	KEEP RAW MEAT AND POULTRY SEPARATE FROM OTHER FOODS WASH WORKING SURFACES INCLUDING CUTTING BOARDS, UTENSILS AND HANDS AFTER TOUCHING RAW MEAT OR POULTRY.		KEEP HOT FOODS HOT REFRIGERATE LEFTOVERS IMMEDIATELY OR DISCARD.

PACKED ON

SEE BY

AUG 26

0 200059 403283

NET WEIGHT 1.65 PRICE PER 1.99 \$3.28

#BXBDG###CAR-RT-SORT C0002

#000892247810017NDE97 1987-2M

SAUNDIE PUB LIB

PLAZA W SHOPPING CTR

1341 W HIGHWAY 13

55378-1479

Product:

02953407

Can This Meat Still Kill You?

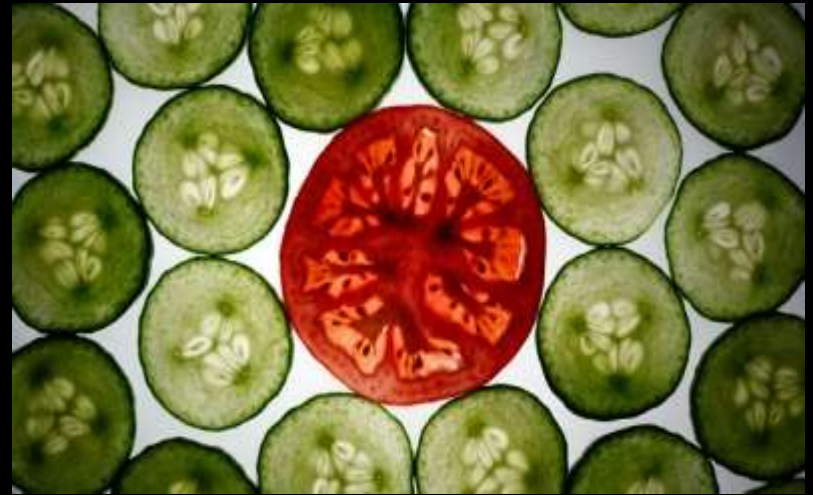
***Yes, This
Meat Can
Still Kill
You!***

Yes, Meat Can Still Kill You!!

- **So can;**
 - **Spinach**
 - **Lettuce**
 - **Peppers**
 - **Peanut Paste**
 - **Bean Sprouts**
 - **Alfalfa, Bean & Radish Sprouts**
 - **Pistacios**
 - **Etcetera, etcetera, etcetera**

Germany

May/June 2011



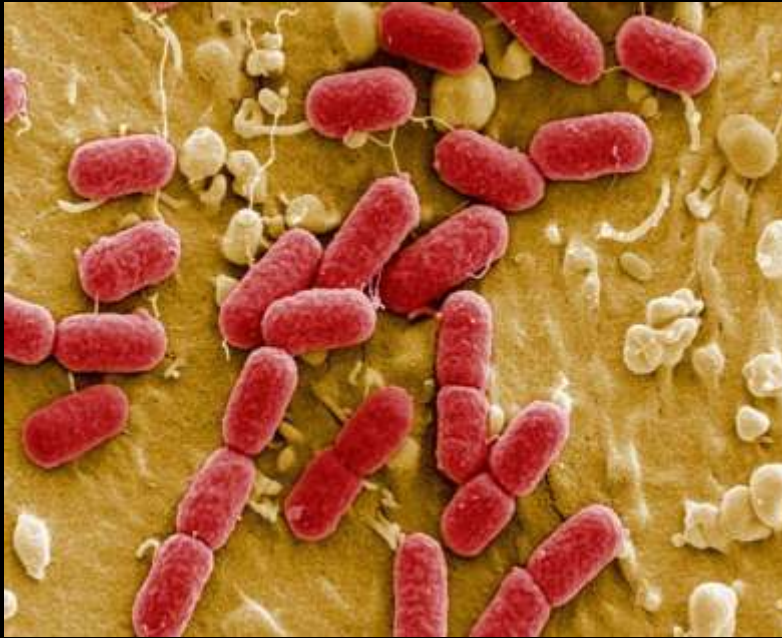
Yes, and so can.....



“There has not been such an outbreak before that we know of in the history of public health.”

**Dr. Robert Tauxe,
US Centers for Disease Control
(CDC)**

European E. Coli Outbreak



E. coli 104

Latest Statistics

(August 15, 2011)

Sick: $\pm 4,200$

Hemolytic Uremic

Syndrome: ± 900

Dead: 53

***Deadliest E. coli
outbreak in history***

WALL STREET JOURNAL

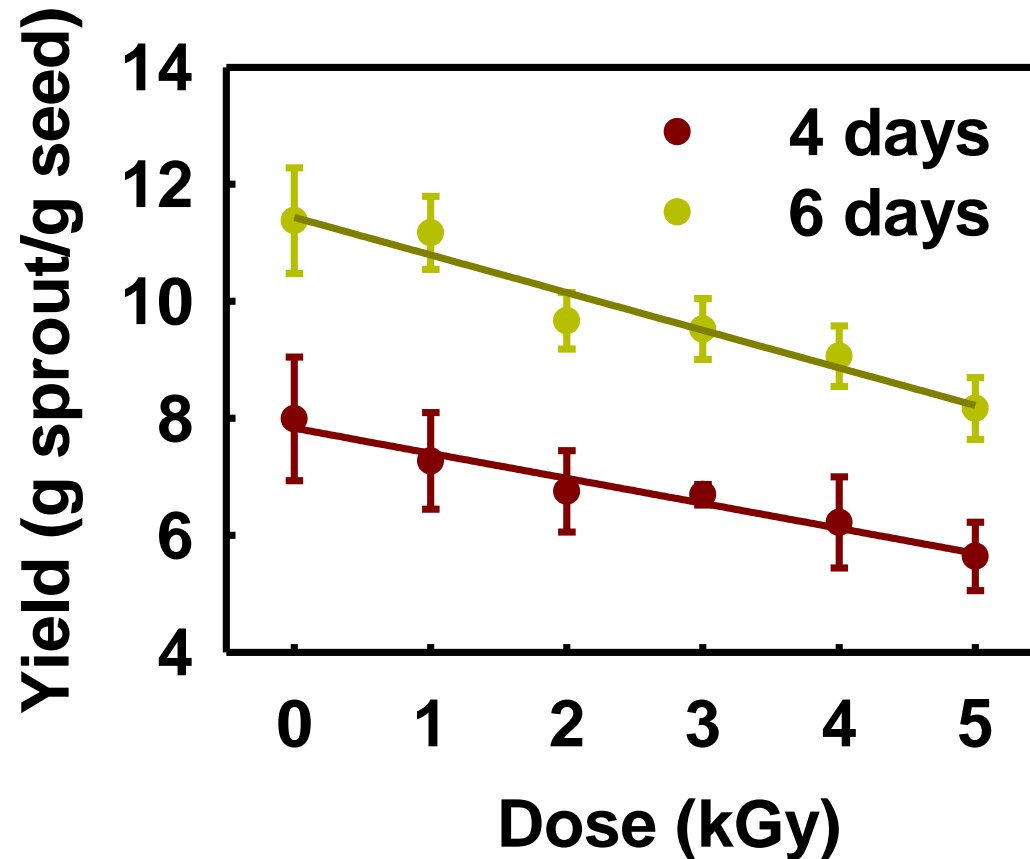
June 13, 2011

So here we go again: agitation for more money and regulation, though agricultural authorities still where the German farm erred. Sprouts require warm and humid farm environments, which make particularly hospitable to bacteria. But both harmful and harmless *E. coli* strains are present in the most animals, as well as human beings. No amount of standardizations or certifications will guarantee eradication from food.

The best practice for doing so would be, well, irradiation, which involves sending gamma rays or γ into meat, poultry and produce. The process can deactivate up to 99.999% of *E. coli*, and was declared the U.S. Food and Drug Administration almost 50 years ago. Even so, less than 10% of the global irradiated.

The problem is largely that the term "irradiation" sounds like what might have happened to Blink three-eyed fish that Bart Simpson caught downstream from the Springfield Nuclear Power Plant in

Yield of Irradiated Alfalfa Seeds



Fan et al., 2003
Rajkowski et al., 2003

Sprouts from Irradiated Seeds (6 days)



“Spices — this is, I think, this is the emerging issue.”

Michael P. Doyle, Ph.D., regents professor of food microbiology and director of the Center for Food Safety at the University of Georgia





Spices in many countries are dried on the ground and exposed to many food safety risks.



**These nasty critters
won't go away easy**

Cargill recalls ground turkey over salmonella fears 36 million pounds



Recall of 36 million pounds of ground turkey over a salmonella outbreak that sickened 76 people, killing one.

"It is regrettable that people may have become ill from eating one of our ground turkey products; And for anyone who did, we are truly sorry."

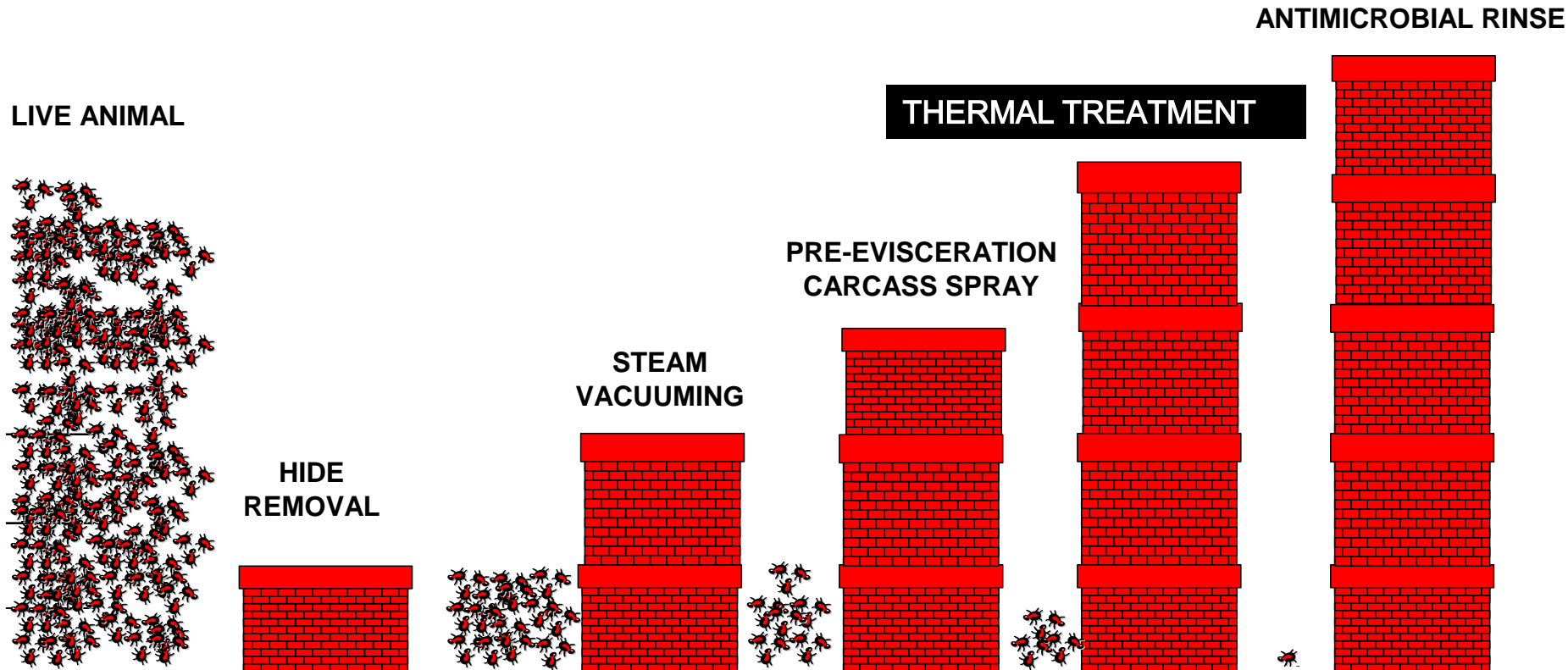
Steve Willardsen, president of Cargill's turkey processing business

Cargill announces second ground turkey recall over salmonella fears

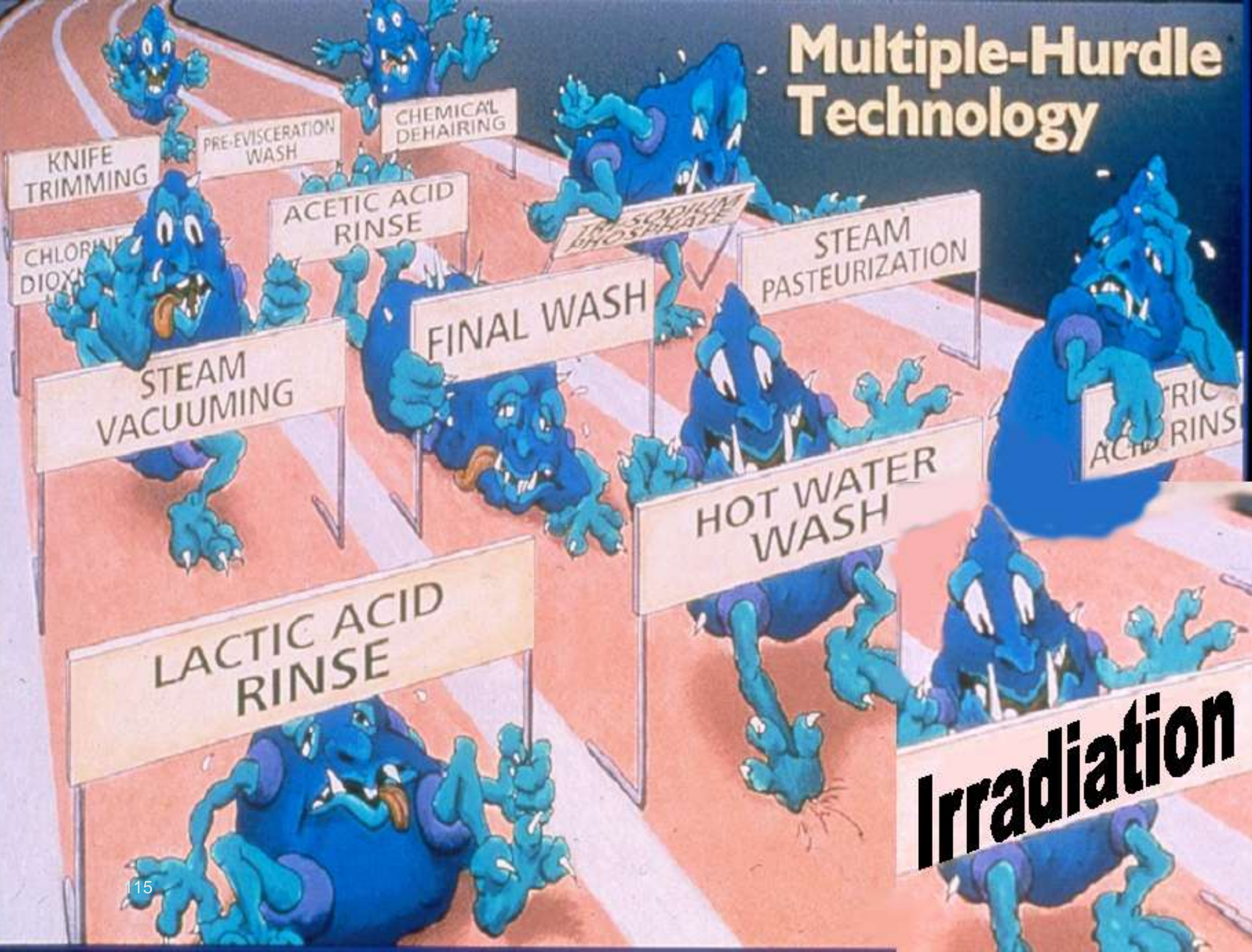


Multiple Hurdle Intervention

‘Firewalls for Microbial Control’



Multiple-Hurdle Technology



How effective is Irradiation?

- **At the doses commonly used to irradiate ground beef we can expect the following reduction in bacteria counts:**
 - ***E. coli O157:H7*** **99.99% to 99.99999%**
 - ***Salmonella*** **99% to 99.9%**
 - ***Listeria*** **99.9% to 99.99%**

Cantaloupe outbreak is deadliest in a decade

- As on October 12, 2011, a total of 116 persons infected with any of the four outbreak-associated strains of *Listeria monocytogenes* have been reported to CDC from 20 states. At least twenty three have died.



Cantaloupe Recalls are not new!!



The FDA has announced a Dole cantaloupe recall due to possible contamination with Salmonella Litchfield. Dole Fresh Fruit Company, a subsidiary of Dole Food Company, Inc., has voluntarily recalled all Honduran Cantaloupes. Fifty persons sickened.

March 31, 2008

Prevention & Elimination *versus* Reduction & Infection

**How close to zero can we get?
Which tools can help us get there?**

Canning eliminates bacteria



Irradiation of Poultry

Three biggest points:

- **Equality between ground beef and other meats;**
- **Packaging materials**
- **Packaging atmospheres**

From the Centers for Disease Control

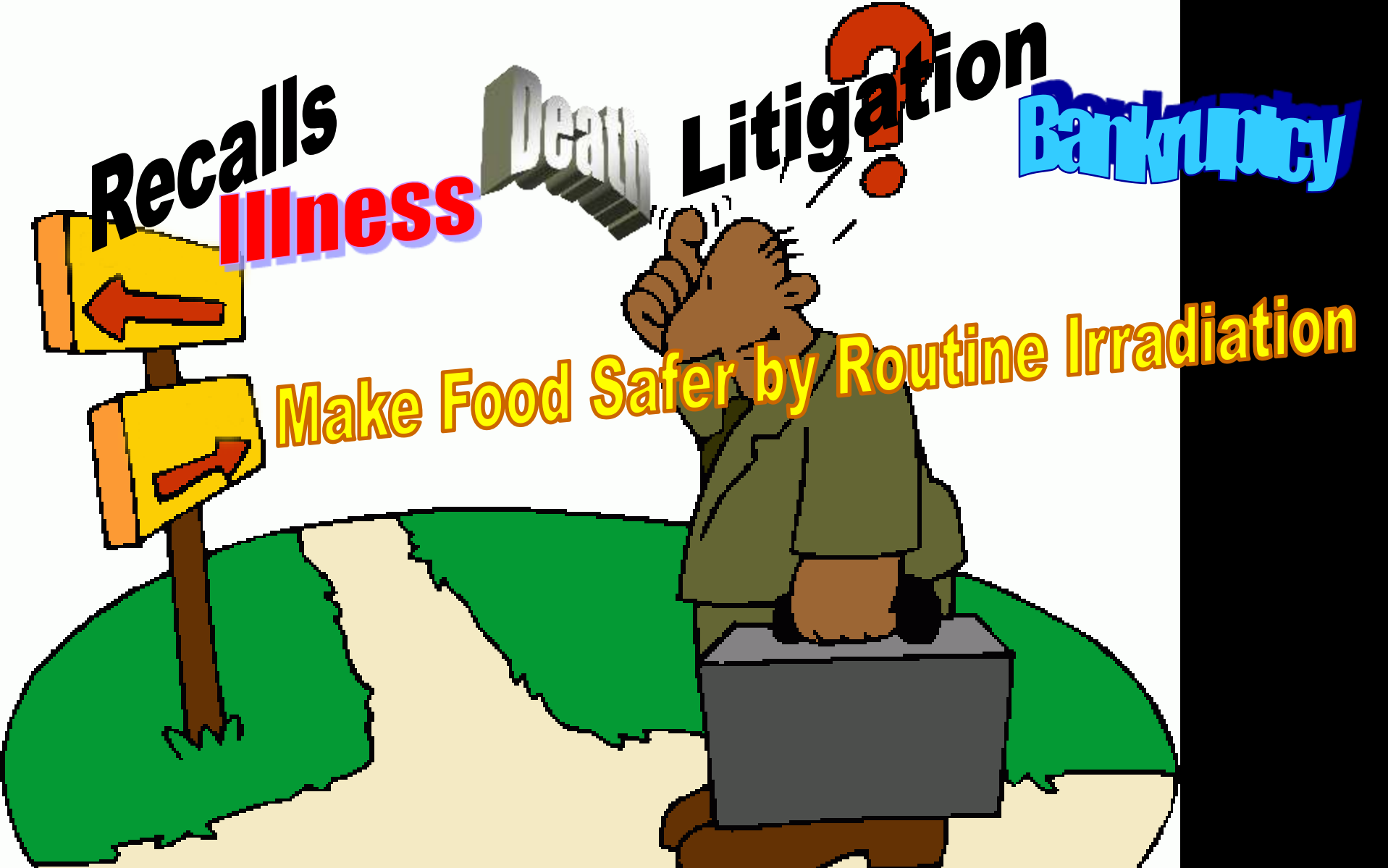
- If 50% of poultry, ground beef, pork, and processed meats in the U.S. were irradiated, the potential benefit would be a 25% reduction in the morbidity and mortality rate caused by these infections.**

Dr. Robert Tauxe, US Centers for Disease Control

From the US Centers for Disease Control

- **Irradiation could prevent nearly 900,000 cases of infection, 8,500 hospitalizations, more than 6,000 catastrophic illnesses, and 350 deaths each year.**

Dr. Robert Tauxe, CDC



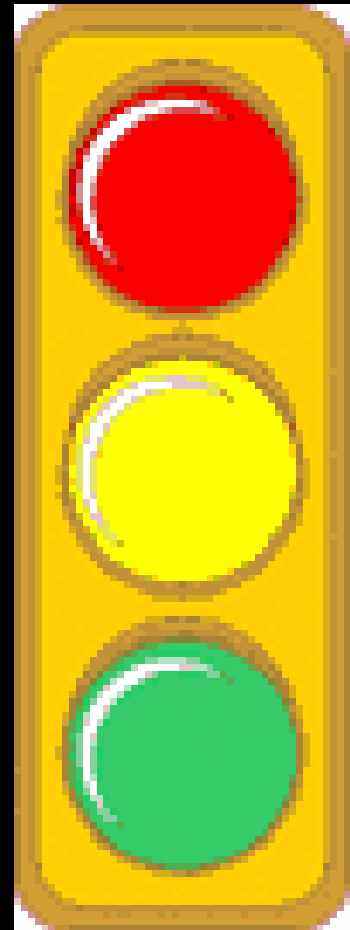
We are at a Crossroads

**It's time to seriously consider
using the silver bullet!**



“Why do we need to wait until the train hits us before we put up a stop light at the railroad tracks?”

**Dr. Michael Osterholm, Director, University of Minnesota
Center for Infectious Disease Research & Policy**



THANK YOU

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(952) 854-6980



Council on Ionizing Radiation Measurements and Standards