Food Irradiation: *Moving from Complaining to Empowering*

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Harnessing E-Beam and X-ray technologies to improve human life

Discussion Points

- Food Industry Decision Making (in the current regulatory environment)
- Technology Options
- Empowering Decision Makers

Food Industry Decision Making

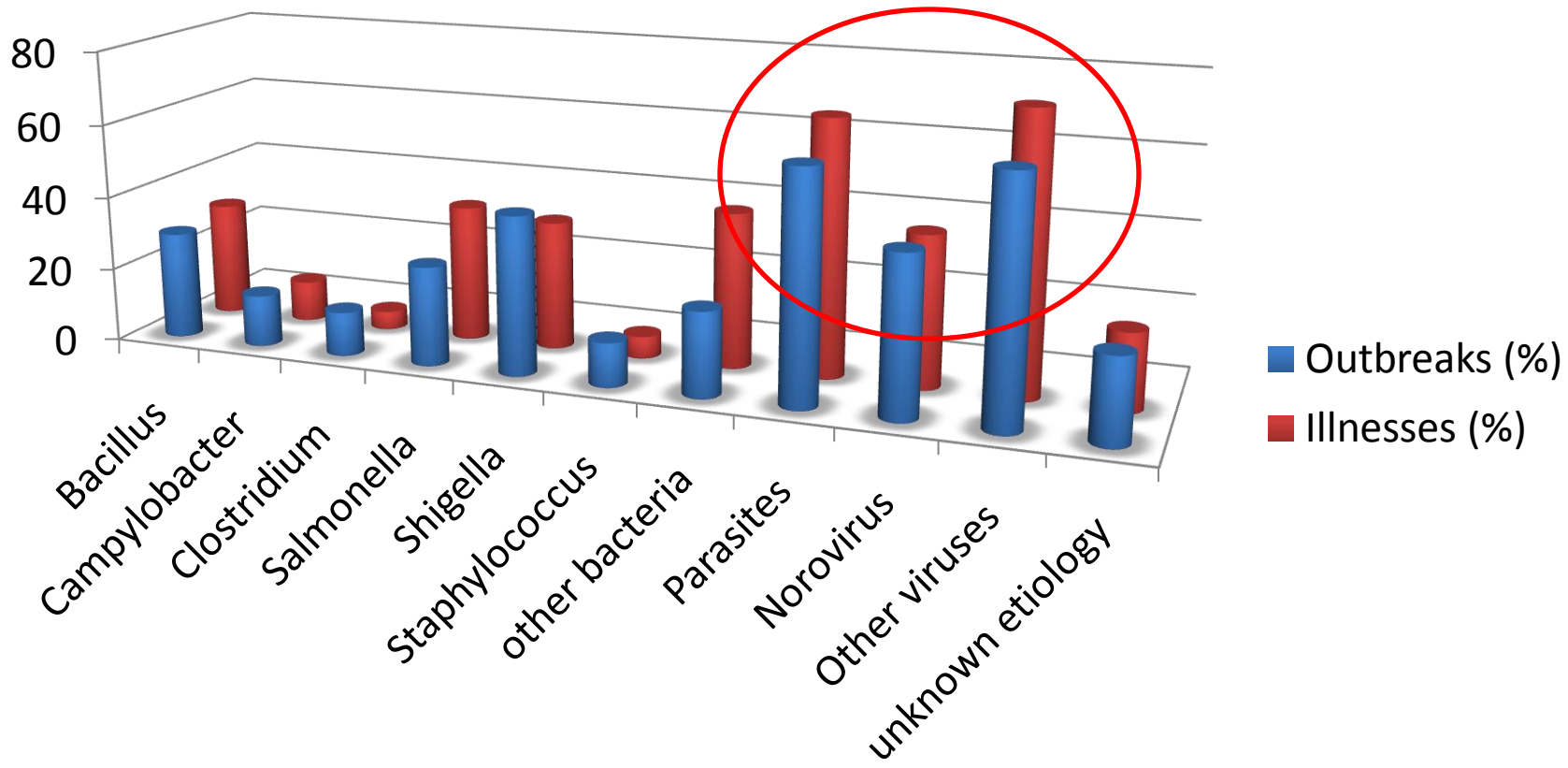
Current State of Food Safety

Increase in confirmed foodborne infections in the United States between 1996 and 2009 (*FoodNet, 2010*)

Pathogen	Confirmed Foodborne Infections		% Increase
	Year 1996	Year 2009	
Salmonella	2064	7039	241%
Campylobacter	3367	6033	79%
Listeria	65	158	143%
Vibrio	21	164	680%

http://www.cdc.gov/foodnet/factsandfigures/2009/Table1a_all_numbers_96-09.pdf

Produce Associated Outbreaks and Illnesses



Scharff,2010

Pathogen-related recalls in October 2010

- Alfalfa sprouts (*Salmonella* spp)
- Smoked fish (*Listeria monocytogenes)*
- Ice-cream (*Salmonella* typhi)

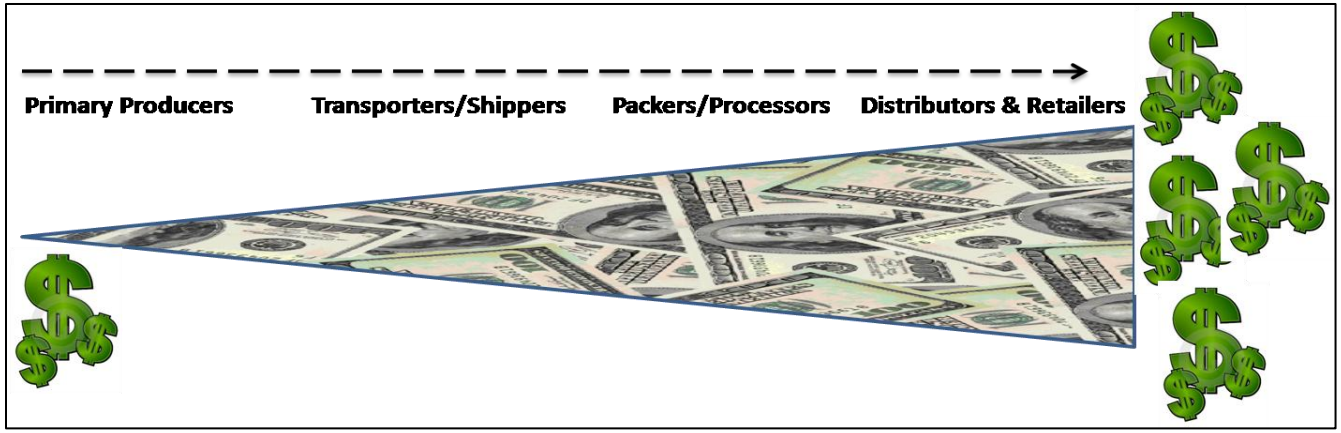
Do we really believe there is a silver bullet?

- FreshRinse™ -launched by Chiquita/Fresh Express (October 15, 2010)
  - *"Chlorine is the abacus and FreshRinse is the iPad"*

- Enhanced Microbial Testing?
  - Does end-product testing really improve safety?
  - Where are the pathogen kill steps?

- Who has the vested interest in adopting pathogen-kill technologies?

Who can afford to adopt this technology?



Acquisitions and mergers among grocery retailers

Consolidation also occurring among wholesalers

Consumers showing greater acceptance to new produce packaged items

Per capital consumption of fresh produce increased 12 % from 1987-1997

Globalization in the fresh produce industry

Supply chain management practices being adopted by produce items

Foods Currently Permitted to be Irradiated

Food	Purpose	Maximum Allowable Dose
Fresh, non-heated processed pork	Control of *Trichinella spiralis*	0.3 kGy min. to 1 kGy max.
Fresh foods	Growth and maturation inhibition	1 kGy max.
Foods	Arthropod disinfection	1 kGy max.
Dry or dehydrated Enzyme preparations	Microbial disinfection	10 kGy max.
Dry or dehydrated spices/seasonings	Microbial disinfection	30 kGy max.
Fresh or frozen, uncooked poultry products	Pathogen control	3 kGy max.
Refrigerated, uncooked meat products	Pathogen control	4.5 kGy max.
Frozen uncooked meat products	**Pathogen control**	**7 kGy max.**
Fresh shell eggs	Control of *Salmonella*	3.0 kGy max.
Seeds for sprouting	Control of microbial pathogens	8.0 kGy max.
Fresh or frozen molluscan shellfish	Control of *Vibrio* species and other foodborne pathogens	**5.5 kGy max.**
Fresh iceberg lettuce and fresh spinach	**Control of food-borne pathogens, and extension of shelf-life**	**4.0 kGy max.**

Regulatory Environment

United States Government Accountability Office
Washington, DC 20548

February 16, 2010

Congressional Committees

Subject: *Food Irradiation: FDA Could Improve Its Documentation and Communication of Key Decisions on Food Irradiation Petitions*

Regulatory Inaction (*GAO, 2010*)

Table 2: The Six Food Irradiation Petitions Pending Review With FDA

Petitioner	*Federal Register* date	Years in FDA review	Purpose for petition
United States Department of Agriculture's (USDA)–Food Safety and Inspection Service (FSIS)	December 21, 1999	10.0	Use of Ionizing Radiation on Unrefrigerated, Refrigerated, and Frozen Poultry Products (FAP 9M4696)
USDA–FSIS	December 22, 1999	10.0	Use of Ionizing Radiation on Unrefrigerated Meat Food Products (FAP 9M4695)
Grocery Manufacturers Association (formerly National Food Producers Association)	January 5, 2000	10.0	Use of Ionizing Radiation on Certain Refrigerated, Frozen or Dried Meat, Poultry, Fruit or Vegetable Products (FAP 9M4697)
National Fisheries Institute	February 6, 2001	8.9	Use of Approved Sources of Ionizing Radiation as a Physical Process to Reduce the Food Safety Risk in Consuming Crustaceans (FAP 1M4727)
STERIS Corporation	May 9, 2003	6.6	Use of Gamma Rays to Reduce Micro-organisms on Dietary Supplements (FAP 2M4741)
Sterigenics	November 30, 2004	5.0	Request Approval for Shelf Stable Foods Processed with Irradiation in Combination with Other Methods (FAP 3M4744)

Source: GAO analysis of Food and Drug Administration information.

Technology options for Mexican commodities that can be currently imported

Commodity	Irradiation	Cold Treatment	Methyl Bromide	High Temp. Forced Air	Vapor Heat	Hot Water Dip
Apple		X				
Carambola	150Gy					
Cherry		X				
Grapefruit	150Gy	X	X	X	X	
Guava	400Gy					
Mango	150Gy			X	X	X
Nectarine		X				
Sweet Lime	150Gy					
Sweet orange	150Gy	X	X	X	X	
Peach		X				
Manzano Pepper	150Gy					
Plum		X				
Tangerine/Clementine/Mandarin	150Gy	X		X		
Yam			X			

Consumer Acceptance

- Study after study shows that consumers (if provided accurate information) will pay a premium for irradiated foods because of food safety concerns
- If irradiated products are available, consumers will purchase them
- No product has ever been removed from stores because of consumer complaints
- Consumers will never purchase irradiated foods if they are NOT available!

Food Industry Decision Making

- However ‘consumer acceptance” has become the *de facto* red herring
- Anecdotal references have become decision-making tools
- How to frame technology adoption to the consumer?

Commercial Food Irradiation –U.S.

- Approximately 15-18,000,000 pounds (8,000 MT) of ground beef irradiated annually in USA
- Approximately 8,000,000 pounds (4,000 MT) of produce irradiated annually
  - *primarily for insect disinfestation*
- Approximately 175,000,000 pounds (70-80,000 MT) of spices irradiated annually

If FDA approved all pending petitions?

- Is there enough installed capacity to irradiate the products?
- Medical sterilization needs will trump food irradiation needs
  - Profit margins, cold chain, warehousing needs
- Current installed capacity for food (produce and meat) irradiation
  - 2 E-Beam facilities (Sadex and Texas A&M)
  - 1 cobalt-60 facility (Florida)
  - X-ray (Hawaii Pride)

If FDA approved all pending petitions?

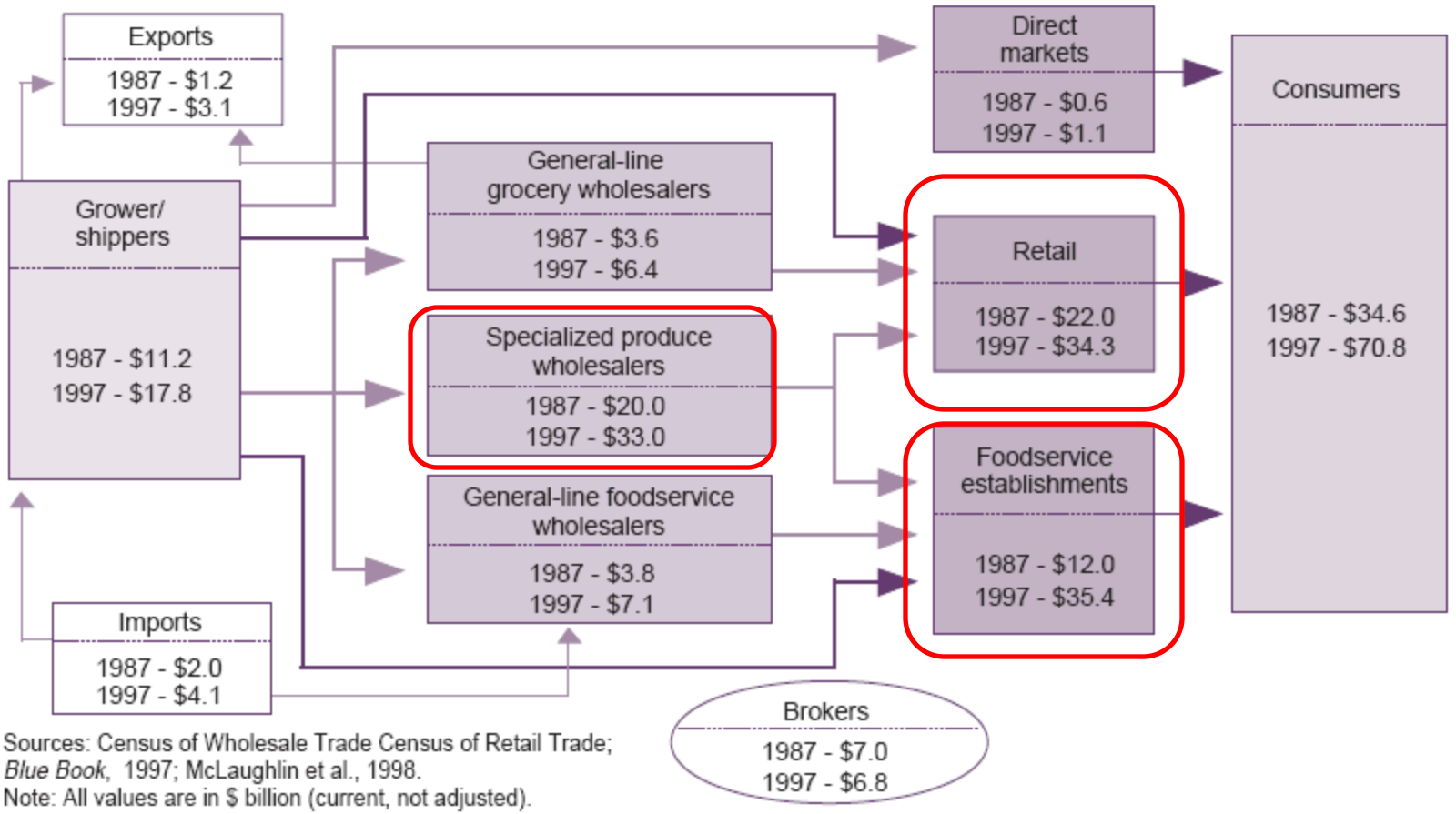
- There are no robust business models for food irradiation in the US
  - Produce industry
  - Meat and poultry industries
  - RTE /minimally processed foods industries

If FDA approved all pending petitions?

- There is absolutely no capacity to meet
  - Equipment needs
  - Personnel needs
    - Technicians
    - QA/QC personnel
    - Facility managers
- Current fresh produce packaging not approved for irradiation
  - Limited irradiation packaging design R&D support

If FDA approved all pending petitions?

Fresh fruit and vegetable marketing channels 1987 and 1997

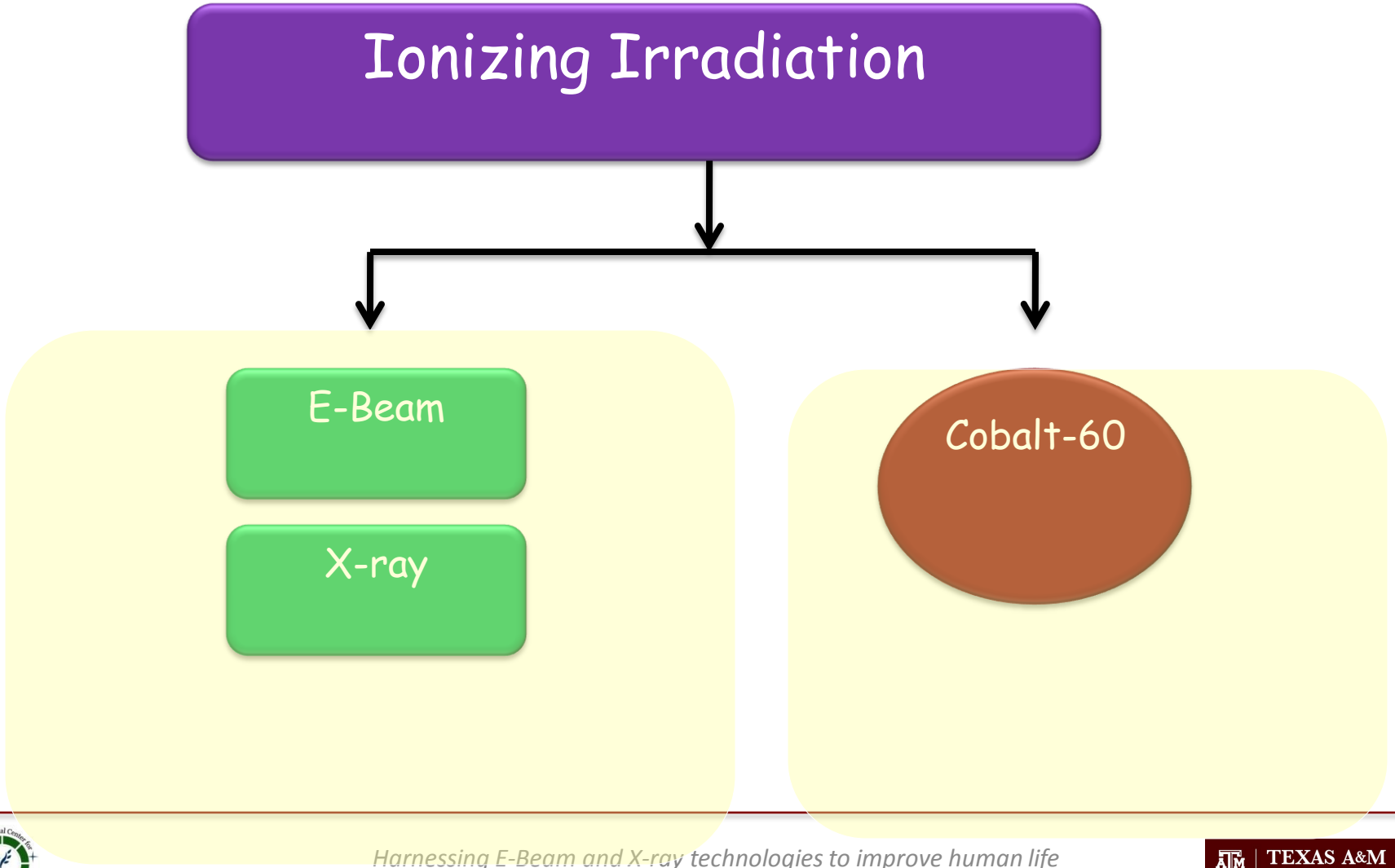


Sources: Census of Wholesale Trade Census of Retail Trade; *Blue Book*, 1997; McLaughlin et al., 1998.
Note: All values are in $ billion (current, not adjusted).

If FDA approved all pending petitions?

- Serious limitations in academic irradiation research infrastructure
  - Only Texas A&M University has irradiation equipment
  - Iowa State University scrapped its food irradiation research program

Technology Options for the Food Industry?



Technology Options

- Accurately define user requirements
  - Business
  - Logistical
  - Technological
- Explicitly define validation requirements
- Clients need to be provided with all possible technology options

Technology Options

- Objective and credible information for industry
  - Permitting requirements
  - Environmental assessments
  - Source availability and related issues
  - Facility design and construction costs
  - Energy requirements
  - Preventive maintenance requirements

Empowering Decision Makers

Corporate Responsibilities

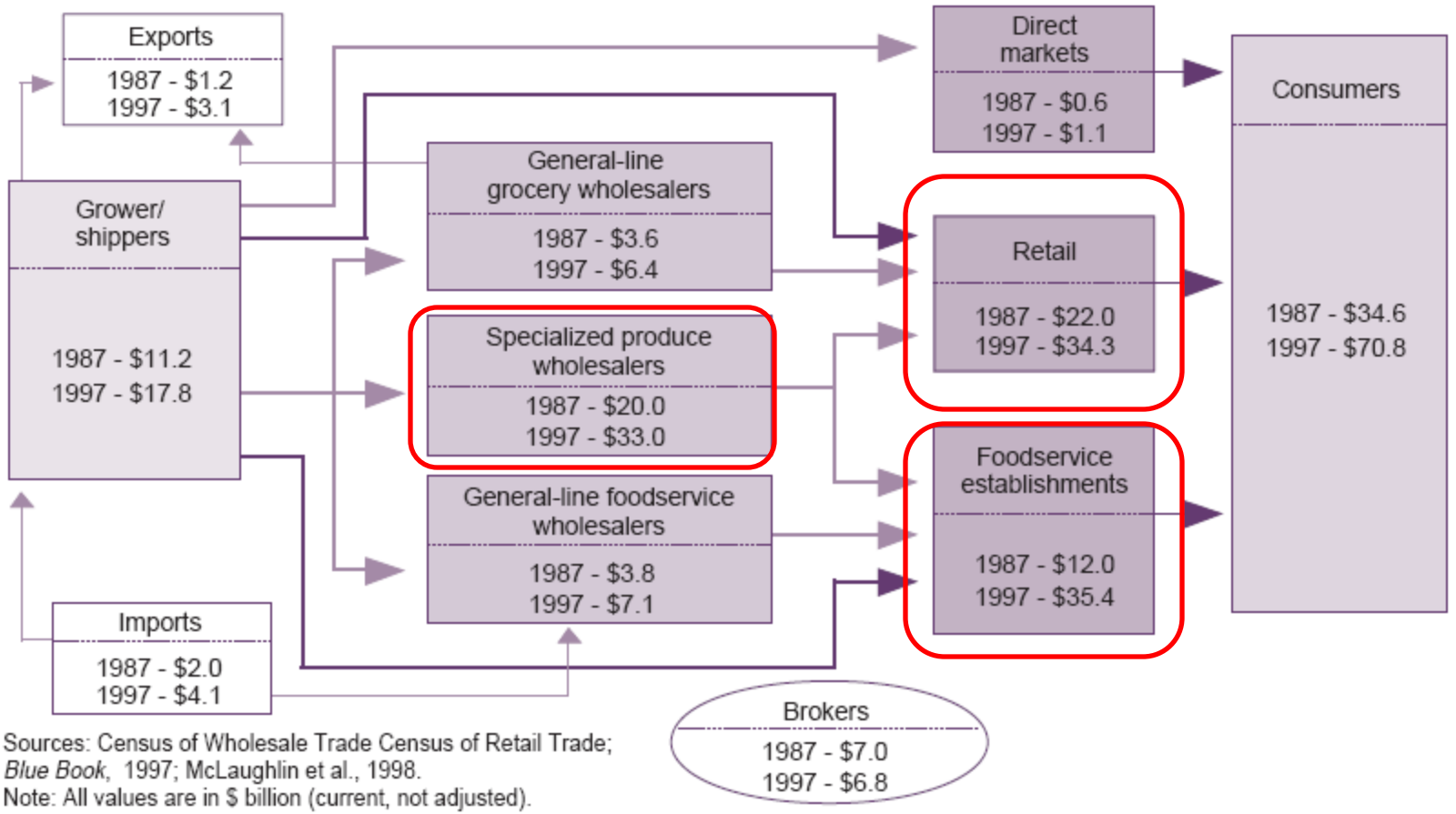
- Food irradiation SHOULD NEVER be used as a clean-up technology

- Food irradiation SHOULD ONLY be used as an integral step of comprehensive GAP, GMP, HACCP plans
  - Not a replacement for current practices

- *Consider food irradiation as the "finishing touch" of a portrait!*
  - *Value-adding technology*

Empowering Decision Makers

Fresh fruit and vegetable marketing channels 1987 and 1997



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Empowering Decision Makers

- Perform simulations on business models for the different food industries
- Prototyping consumer survey instruments
- Education and outreach materials
  - Growers
  - Brokers
  - Distributors
  - Retailers

Empowering Decision Makers

- Who has the vested interest for the food industry to adopt this technology?
  - Federal agencies to meet food safety goals?
  - Consumers?
  - Equipment providers?
  - Academic researchers?

Empowering Decision Making

- Strategy should be education and marketing, not "selling"
- Continuing industry decision-maker education
- Continuing consumer education
- Continuing print media and electronic media outlets
- Train the next generation of technical personnel
- Train the next generation of decision makers

2011 Annual Hands-On Workshop in E-Beam and X-ray Irradiation Technologies

April 3-8, 2011 | Texas A&M University, College Station, TX

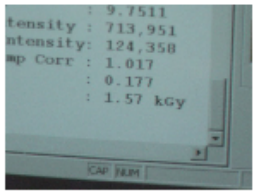
TEXAS AGRILIFE RESEARCH — TEXAS A&M UNIVERSITY SYSTEM

AgriLIFE RESEARCH

The National Center for Electron Beam Research (NCEBR) at Texas A&M University in College Station, Texas serves as an un-biased venue for academic, government, and industry scientists to carry out strategic electron beam pasteurization and sterilization research and commercial projects using E-Beam and X-rays. To address the needs of the food, phytosanitary, agribusiness, and pharmaceutical industries, the NCEBR is organizing a week-long hands-on workshop in E-Beam and X-ray technologies in April 2011. This will be the second E-Beam workshop, after the first successful workshop in April 2010.

The *objectives* of the hands-on workshop are:

- To provide attendees with an understanding of the basic principles of ionizing irradiation, focusing on E-Beam and X-ray technologies for food pasteurization, phytosanitary applications, environmental applications, and pharmaceutical sterilization
- To provide hands-on training in alanine dosimetry, radiochromic film dosimetry, dose-mapping, and dose validation with single and dual beam E-beam configuration and X-ray
- To provide attendees with an understanding of the relationships existing between material density, penetration, and dose distribution
- To provide attendees with an understanding of how E-Beam and X-ray irradiation inactivate microbial organisms and insects
- To provide attendees with an understanding of the irradiation equipment and other infrastructure needed to design, build, and operate an E-Beam/X-ray facility
- To explore how E-Beam and X-ray technologies can be exploited for food safety, as well as pharmaceutical, phytosanitary, biomedical, aerospace, and environmental applications



The National Center for Electron Beam Research

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Texas A&M University
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College Station, TX 77[illegible]45
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LOCATION

College Station is about a 2 hour drive from Houston/Austin and about 4 hours from Dallas. There are direct flights into College Station (CLL) by Continental Airlines and American Airlines.

REGISTRATION

Early registration fee is US $2000 until Feb 15th, 2011. Late registration is US $ 2145 after Feb 16th, 2011. Registration covers 5 nights hotel accommodation, welcome reception, an eBook Manual, hard-copy manual, lunches, dinners, refreshments, workshop materials, course completion certificates, and daily transportation from local hotels.

Payment via credit card, wire-transfer, or check can be made at *http://agrilifevents.tamu.edu; Keyword: E-Beam*

ACCOMODATIONS

Hotel reservations will be made at the Hyatt™ Place in College Station. Check-in will be Sunday, April 3rd with a check-out on Friday, April 8th, 2011. Additional details will be sent to the registrants.

Please send emails requesting workshop information to Prof. Suresh D. Pillai (s-pillai@tamu.edu) or Ms. Katherine McElhany (kmcelhany@gmail.com)

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