Food Irradiation is Safe: Half a Century of Studies.

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About this Presentation

• General Introduction
• International scientific consensus of the safety of irradiated foods

Some opinions on –
• Reasons for the limited use of irradiation
• How acceptance and use may be increased.
BENEFICIAL EFFECTS

- Increased food safety (lower pathogen numbers)
- Increased food security (reduced post-harvest loss)
- Improved biosecurity (quarantine measure) for trade
Irradiation Advantages

- versatile and effective
  - part of the solution to safety, security and trade problems
- cold process
  - food looks, tastes natural; fruits can be fully ripened
- penetrating
  - treatment in final package, deals with bacteria/insects throughout package, product distribution in package relatively unimportant
- solid, raw foods can be processed
Irradiation Advantages

- no chemical residues
- broad spectrum effectiveness for bacteria and insects
- immediate distribution to trade
- process is easy to control
  - depends only on conveyer speed and ‘power’ of the source; temperature, humidity, pressure are unimportant
But - Is Food Irradiation Safe?

YES

(it’s the answer provided by science and confirmed in reviews by expert international and national committees)
International Organizations

- Codex Alimentarius (1983)
- WHO (1992)
- WHO/FAO (1999)
- European Food Safety Authority (EFSA 2001)
- Codex Alimentarius (2003)
- EFSA (2011)
National Organizations

• Approximately 60 food safety agencies world-wide have approved at least one use of irradiation
  – US Food and Drug Administration (many reviews 1986 to present)
  – Health Canada (2008)
Professional Organizations

- Int. Committee on Food Microbiology and Hygiene (Int. Union Microbiological Societies)
- American Dietetic Association
- American Medical Association
Safety issues

• Radioactive safety
• Toxicological safety
• Microbiological safety
• Nutritional safety
Irradiated Food Is Safe to Eat

• The evidence is overwhelmingly that irradiated food is toxicologically safe, and presents no special nutritional or microbiological problems (JECFI 1981).

• This includes evidence for the safety of long-term consumption of irradiated foods
  – *In vitro* and *in vivo* studies, animal feeding trials
  – Multi-generational animal studies
  – Decades of routine use of irradiated diets for laboratory animals
  – Use in the US space programme
Irradiated Food Is Safe to Eat

  - Any food irradiated up to an overall average dose of 10 kGy is safe and wholesome (1983)
  - Dose should not exceed 10kGy except for a legitimate technological purpose (2003).
Despite the Science -

Some critics persist in questioning safety

- requesting 50 years of tests in humans
- quoting old data selectively that has been considered by the scientific committees
- pointing to new data on radiolytic products, the compounds formed when radiation causes chemical reactions.
There is always new data

- The 1981 JECFI concluded “irradiation of any food commodity up to an overall average dose of 10 kGy presents no toxicological hazard; hence, toxicological testing of foods so treated is no longer required”

- However, since 1981 analytical methods have improved, and will continue to improve.
  - compounds can be identified at the ppb level
- Radiolytic products that were not known in 1981 are occasionally identified. Are these a hazard?
Cyclobutanones

- Radiation exposure results in many chemical reaction products (‘radiolytic products’)

- Individually each product is present in very low, even trivial concentrations. They can generally be found naturally in foods or in foods treated by other processing methods.

- A class of compounds, cyclobutanones, have been found in irradiated foods containing fats. They were suggested to be unique to radiation processing.
  - However, they have been reported in some non-irradiated nuts and nutmeg.
• Some preliminary and simple *in vitro* tests for toxicity suggested more detailed work was required
  – Some opponents of irradiation suggested the evidence showed irradiated foods were unsafe
  – The authors of the studies disagreed

• After expanded toxicity testing and review, it was concluded that cyclobutanones in irradiated foods posed no threat to human health

• This conclusion has been endorsed by international and national committees (e.g., WHO, EFSA, USFDA)
Other “New’ Radiolytic Products

Other chemical products that have received scrutiny in recent years include -

• Furans
• Certain hydrocarbons
• Cholesterol oxide

• Although they may not have been specifically identified at the time, these ‘new’ products were inevitably present during earlier testing, including the extensive animal feeding trials.
Nutritional Adequacy

- Irradiation of fresh produce is usually conducted below 1 kGy because loss of quality may occur at higher doses.
- Loss of total vitamin content below 1 kGy is negligible.
- Loss of any specific, sensitive vitamin is < 10%, probably much less. The losses are less than:
  - losses associated with storage
  - differences in content found between different varieties and harvesting conditions.
What should the Consumer believe?

• Critics of irradiation continue to question safety
• Proving something is “absolutely” safe is impossible in science
  – New data must always be examined
  – Public debate is healthy
• Ultimately, food authorities responsible for consumer safety must go with hard science, not general opinion
Irradiated Food Is Safe to Eat

- Scientific committees charged with monitoring the safety of foods remain confident in the safety of irradiated foods
So-

• Food irradiation helps solve major food problems
• Food irradiation has many technical advantages
• Food irradiation is safe

Therefore –

• It is being widely used and growing rapidly – right?
• WRONG!!
Global Use is limited

- Global volume of food treated with ionizing radiation is approximately 0.5 million tonnes per year (Kume & Todoriki, 2013)
  - Expanding fairly rapidly in China, Vietnam, Mexico
  - Expanding very slowly in the US, Australia/New Zealand, other parts of Asia
  - Declining in the EU
Why is Use Limited? Some Mis-conceptions**

It is **NOT** because of cost -

- Operational costs are low
- Capital cost (US$5-10M per facility) is much less than the annual costs of food borne disease, food losses or trade opportunities)

** The remainder of this presentation is based on experience in countries such as the Australia, New Zealand, USA and the UK.
Why is Use Limited? Some Mis-conceptions

It is NOT because of -

• Association with radiation, radioactivity or nuclear technology
  – It is often an issue initially with the general public
  – But regulators understand the issues properly
  – It is countered successfully by pointing to public acceptance of medical product sterilization, radiopharmaceuticals, nuclear diagnostics and therapy
  – It will be further assisted by the increasing availability of EB and X-ray facilities for food
Why is Use Limited? Some Mis-conceptions

It is NOT because of –

• Consumer rejection
  – Irradiated ground beef sales and Hawaiian fresh produce in the US remain steady; there is an increasing market for imported fruits
  – Fermented sausages in Thailand, frozen froglegs in France, spicy fermented chicken feet in China have been sold for years
Increasing volumes of irradiated mangoes and litchis have been sold at major supermarkets in New Zealand for 8 years. Irradiated tomatoes and capsicums were put on sale August 2013.

All these products are sold with information for the consumer that they are “irradiated”
Purchase Behaviour vs Opinion Surveys

- Purchase behaviour – will consumers buy when irradiated food is on retail shelves?
- Opinion surveys – what do consumers say if they haven’t seen irradiated food, especially when the survey provides no or little information on the process
- The response in these two situations is different
Purchase Behaviour vs Opinion Surveys

• Opinion surveys would lead you to expect considerable opposition to buying irradiated foods.
  – If good information is provided, opposition decreases
  – Surveys also indicate that irradiation is preferred over chemical treatments

• The response at retail outlets indicates most consumers will purchase irradiated food
  – There has never been a market failure simply because a food has been irradiated
Why is Use Limited?

- It is because food producers and, particularly, retailers have not been convinced there is a net benefit to them.
- They also assume that selling irradiated food may compromise their business because consumer resistance will be strong
  - Assumption is based on campaigns by relatively small numbers of consumer rights activists
  - Campaigns are based on repeating disproved ‘issues’ relating to safety, finding new issues to raise and quoting opinion surveys
- Experience at retail suggests this assumption is incorrect
How to Decrease Industry Resistance?

• Stress the superior nature of the product, not the process
  – safer; better for consumers and an insurance against costly food recalls
  – reduced chemical residues; this is increasingly what consumers want
  – higher quality; greater availability
How to Decrease Industry Resistance?

• Longer shelf-life is a positive for industry throughout the whole food chain
  – But consumers don’t always regard it as a positive – they want fresh! And they think shelf-life is about less wastage in the store and increasing profits
Decreasing Industry Resistance

Use labelling requirements positively –

- Always include a benefit on the label
  - Only mentioning irradiation looks like a warning
- Labelling allows consumer choice
  - The minority of consumers who strongly wish to avoid irradiated foods can do so
  - But consumers who wish to take advantage of the benefits of irradiation also have a right to choose –to- purchase
- Promote the international logo as a mark of quality food
Decreasing Industry Resistance

- Encourage regulators to ensure labelling provides the consumer with balanced information and in a context that is genuinely helpful.

- Labelling requirements are NOT for safety reasons
  - But this is not immediately obvious and could mislead consumers
  - It is solely to inform and allow consumer choice

- Permit inclusion of the purpose/benefit of treatment

- Do not require labelling if only a very minor ingredient has been irradiated

- Do not require labelling within the catering trade
FRESH AUSTRALIAN MANGOES TREATED WITH IRRADIATION - A CHEMICAL-FREE PROCESS

Australians now have an alternative to fruit treated with chemical insecticides like Dimethoate and Methyl Bromide.

These fresh Australian mangoes have been treated with irradiation to eliminate insects and satisfy biosecurity requirements to prevent the spread of insect pests, like fruit fly and mango seed weevil.

The process of irradiating these mangoes is safe and chemical-free. It involves treating the mangoes with ionising energy to eliminate insect pests while maintaining the quality of the mangoes.

This treatment option is used around the world including the United States and for all Australian mangoes sold in New Zealand. It is approved by the World Health Organisation and the Australian Government.

For more information, visit the Food Standards Australia New Zealand website (www.foodstandards.gov.au) or the Better Health Channel (www.betterhealth.vic.gov.au)
Point of Sale

(Australian Irradiated) SPECIAL Tomato $6.98
Legal – but inadequate??

IRRADIATION FOR LIFE: Safe, Green and Growing
Decreasing Food Industry Resistance

• Work with the food industry to resolve some of the genuine barriers to greater use of irradiation
  – Irradiation facilities are usually operated by an industry unrelated to the food industry
    • The process feels unfamiliar and not within producers’ control
  – Centralized facilities may be remote from production areas
  – Seasonality, maintaining correct temperature
  – Having a mix of irradiated and non-irradiated product causes marketing and cost issues
Decreasing Industry Resistance

- Most especially, emphasize the problems within the food industry that irradiation can help to solve
- It’s one of the “Tools-in-the-Toolbox” that is well worth considering
- And, yes, it is SAFE.
THANK YOU