Food Irradiation and Public Health

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Multidisciplinary review team and references available at z.umn.edu/PolicyBriefs

Summary of Findings:

- The US Centers for Disease Control and the World Health Organization recognize the potential of food irradiation to prevent many infectious diseases that are transmitted by meat, poultry, fresh produce and other foods.
- Irradiation has been approved by the US Food and Drug Administration to kill harmful and spoilage bacteria and pests on fruits, vegetables, spices, raw poultry and red meats, and wheat flour.
- Use of irradiation would improve food security by reducing foodborne illness and reducing food waste by spoilage. Approved levels of irradiation do not sterilize food and are not a substitute for proper food handling.
- Food irradiation currently is underutilized, most likely due to limited processing capacity, demand uncertainty, consumer perceptions and the feelings of some organizations that more research is needed.

Background

Food irradiation is one of the most thoroughly researched food processing techniques. Public Health Agencies including the US Centers for Disease Control and the World Health Organization recognize the potential of food irradiation to prevent many infectious diseases that are transmitted by meat, poultry, fresh produce and other foods. Food irradiation is a process in which approved foods are treated with ionizing energy - gamma rays, electron beams, or x-rays – to kill harmful or spoilage bacteria or insect pests. The U.S. Food and Drug Administration has approved irradiation for use on fruits, vegetables, spices, raw poultry, red meats, and wheat flour. Food irradiation is used in more than 50 countries including the EU and many irradiated food products are available in the US (Table 1). Irradiation is not a substitute for proper food handling because irradiation at approved levels does not sterilize foods. The USDA advises that irradiated foods be handled and cooked in the same way as non-irradiated foods.

Table 1. Irradiated food products on the market

<table>
<thead>
<tr>
<th>Product</th>
<th>Producer</th>
<th>Market</th>
<th>Annual sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground beef products</td>
<td>Schwans</td>
<td>National</td>
<td>~18 million pounds (&lt;1% market share)</td>
</tr>
<tr>
<td></td>
<td>Omaha Steaks</td>
<td>National Northeast US</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wegmans Supermarkets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tropical fruits</td>
<td>Mangoes (from India, Mexico)</td>
<td>National</td>
<td>~35 million pounds (&lt;1% market share)</td>
</tr>
<tr>
<td></td>
<td>Guava (from Mexico)</td>
<td>National</td>
<td></td>
</tr>
<tr>
<td>Spices and seasonings</td>
<td></td>
<td>National</td>
<td>Estimates suggest that about ⅓ of the total volume of commercial spices in the U.S. food industry is irradiated.</td>
</tr>
</tbody>
</table>
Irradiation and food safety

- The Centers for Disease Control estimate that up to 3,000 people die each year in the U.S. from foodborne illness. Thousands more become ill and are hospitalized. Consumption of meat, poultry and fresh produce accounts for a large number of those illnesses.
- Food irradiation is an effective means of controlling pathogenic bacteria such as *Salmonella*, *E. coli*, and *Campylobacter* that can occur in raw meat or fresh produce. Treatment with irradiation is similar to pasteurization – pathogenic bacteria are eliminated or greatly reduced.\(^8\)
- Irradiation of poultry, ground beef, pork and processed meats would reduce foodborne infections, hospitalizations and death. Estimates by CDC suggest that hundreds of deaths, thousands of hospitalizations and more than 500,000 cases of foodborne illness would be prevented with irradiation of 50% of poultry, ground beef, pork and processed meats.\(^9\)

Irradiation and food processing

- Irradiation is an effective treatment for insect pests in grain and fruits. It is tolerated by most fresh commodities (some fruits including rambutan and mangosteen do not tolerate any other treatments), does not leave any residues, and can treat product in final packaging.\(^10\)
- Irradiation extends shelf life for fruits and vegetables such as strawberries, bananas, and mushrooms, and results in fewer food losses due to spoilage.\(^11\)
- Food irradiation also has the potential to reduce dependence on chemical pesticides such as methyl bromide.\(^12\)
- Irradiation effects on food characteristics including taste and nutritional quality are minimal, similar to those caused by cooking and freezing.\(^13\) The FDA will not approve irradiation if it results in significant nutritional loss.\(^8\)

Why don't we see more irradiated foods?

Despite broad agreement among scientists and regulators about its benefits and safety, food irradiation remains an underutilized tool in the battle against foodborne disease. A number of factors may affect use:

1. **Availability**
   - The most significant obstacle to more widespread adoption of food irradiation may be lack of availability – of both irradiation facilities in convenient locations for processors, and of foods in the marketplace. A 2004 survey of retail and foodservice beef purchasers found that over forty percent were interested in offering irradiated ground beef to their customers and cited lack of availability as the main reason for not doing so.\(^14\) New irradiation facilities in Mississippi and Hawaii will increase the availability of irradiated tropical fruits in the U.S. market.\(^15\)

2. **Consumer preferences**
   - Some believe that consumers would reject irradiated foods, but market studies indicate that when provided with basic information about the process, a majority would choose irradiated foods if they provide a safety benefit.\(^16\)
   In one trial, when irradiated and non-irradiated chicken breasts were equally priced, the irradiated product garnered a 43% market share.\(^17\)

3. **Consumer perceptions**
   - A common finding is that while many consumers have heard about food irradiation, they know little about it.\(^18\)
   While unfavorable descriptions of the process will cause consumers to avoid irradiated products, brief, science-based educational messages appear to address many of their concerns.\(^19\)

4. **FDA approvals**
   - FDA has yet to act on industry petitions to approve ready-to-eat meats and other foods. Spinach and iceberg lettuce were approved for irradiation in 2008 following a 2006 *E. coli* outbreak that killed three people. However,
as yet there is little or no irradiated spinach or lettuce on the market, in part because appropriate packaging materials have not yet been approved for irradiation. In 2011, USDA turned down a petition from the American Meat Institute to approve electron beam irradiation as a processing aid for the surface of beef carcasses. Approval as a processing aid would have exempted meat from labeling requirements.

5. Food safety and quality concerns
   • While scientific research has not shown a link between consuming irradiated food and cancer, some organizations want more research.20,21 Others voice concern that irradiation would replace sanitary practices and result in dirty food, and that it affects food quality by depleting vitamin levels.

6. Industry reluctance
   • Some industry executives are hesitant to adopt the technology – in part because of genuine concern about consumer reaction, but also because the process adds costs that will affect the processor's margin. Current costs for e-beam irradiation of ground beef are in the range of 10 to 20 cents/lb., in addition to added transport costs because of the scarcity of food irradiation facilities. Irradiation costs are expected to fall when irradiation is more widely used and economies are scale are realized.10

7. Labeling requirement
   • For regulatory purposes, irradiation is considered an “additive” and is subject to labeling requirements that do not apply to chemical fumigation. All irradiated foods must bear the radura – the international symbol for irradiation - and the words “Treated by irradiation” or “Treated with radiation.”2 Some consumers may view the mandatory label as a product warning instead of a quality label. In 2007, in response to a provision in the 2002 Farm Bill, FDA proposed changes in the labeling requirement that would require irradiated food to be labeled only when the treatment resulted in a material change such as changes in taste, texture, smell or shelf life.22 The proposed labeling change has not yet been implemented.

References


