Irradiation of meat products

Identification

Key words Irradiation, meat products, decontamination
Latest version 2012/07/17
Completed by DIL

How does it work?

Primary objective nonthermal microbial decontamination of meat and meat products.
Working principle The application of Ionising radiation (Irradiation and allergens) is based mainly on the fact that ionizing radiation effectively inhibits DNA synthesis and the final result is the death of the cell. Irradiation harms and kills the cells of insects, parasites, moulds and microbial pathogens that could be present in the product and on the surface of the product.
Unlike chemical or heat treatments, which can leave residues or alter the food structure, colour or flavour, irradiation achieves its effects without significantly raising the food temperature, leaving the food product closer to its unprocessed state. However by irradiation, free radical reactions are induced and the possibility of color change, lipid oxidation and odour generation in meat and meat products can affect the product quality.

Images

Additional effects Parasite disinfestation
Vitamin, flavour and colour retention, Effect on irradiation on allergenicity of different food products

Important process parameters Irradiation dose, absorbed dose

Important product parameters product temperature, packaging use

What can it be used for?

Products Liquid, semi-liquid and solid products in a final or processing package. Poultry, red meat, fish and seafood can be processed. In reality, the list of products depends on legislation. On European level the irradiation of herbs and spices is allowed in all member countries
Operations Raw products as well as packed products are placed in front of the irradiation source for a few minutes until the appropriate dose is reached
Solutions for short comings Irradiation has the advantage to be a non thermal decontamination which can be applied on fresh and packed products and in combination with other techniques for enhancing the safety of mainly processed, chilled meat products
What can it NOT be used for?

**Products**  
Restriction is related with the legislation and with the approval of national safety agency

**Operations**  
Restriction is related with the legislation and with the approval of national safety agency.
In Europe equipment are limited to 10 MeV for an e-beam equipment and 5 MeV for X-Ray. Irradiation technology requires a high investment and maintenance cost. Facilities have to be designed in order to ensure the control of the radiological hazard for the operating personal and the environment. Operation is restricted to limited facilities and they must be approved by national authorities to process food products. Approved facilities can be find under: http://ec.europa.eu/food/food/biosafety/irradiation/index_en.htm

**Other limitations**  
Product treated with irradiation must be labelled with different words and symbol depending on the country. Consumer resistance to irradiated products is still common

**Risks or hazards**  
The risks are associated with the ionising energy for the operators of the irradiated plant. The ionising radiation does not convert the atoms of food product in radio-nuclides

Implementation

**Maturity**  
The technology is mature and used in some European countries. In addition it is used in the US, India and other countries.
In the US irradiation is allowed for two uses in meat and poultry. Inactivating of Trichinella spiralis in fresh and previously frozen pork and for controlling pathogens in uncooked poultry. Only one company in the U.S. Food Technology Service of Plant City, Florida is selling irradiated poultry.

**Modularity/Implementation**  
A special facility has to been designed with specific conditions related with radioactive plant. Implementation will have a huge impact on the design and layout of the factory

**Consumer aspects**  
Most of the consumers have rejected the technology. Proper information about the safety and benefits could increase the level of acceptance of irradiated products. A survey from 1993 by the American Meat Institute Foundation found 54 % percent of the respondents were willing to buy irradiated meat

**Legal aspects**  

**Environmental aspects**  
Energy efficient. Ionized energy has to be confirmed in the ionized chambers treatment in order to avoid the presence of ionized energy in the environment. Special concrete walls and lead walls have to be set up in order to comply with this.

Facilities that might be interesting for you

<table>
<thead>
<tr>
<th>Title</th>
<th>Institute/company</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab scale oven for infrared and impingement heating - SP</td>
<td>SP</td>
</tr>
<tr>
<td>Pilot scale tunnel oven for infrared and impingement heating - SP</td>
<td>SP</td>
</tr>
<tr>
<td>Pulsed light labscale IRTA</td>
<td>IRTA</td>
</tr>
<tr>
<td>UV irradiation - FRIP</td>
<td>FRIP</td>
</tr>
</tbody>
</table>
Further Information

Institutes

Companies
Gamma-Service, BGS Beta-Gamma-Service, Isotron, Ionisos

References