7. Using Preservatives:

What are food preservatives?

Is synthetic or natural chemical that when added to a food product extends its usable life .In modern food preservation, serve as antimicrobials which prevent or slow down the growth of moulds, yeasts and bacteria. Preservatives function in two ways:

1- Is by delaying the spoilage of the food, this method includes the use of sugar, vinegar for pickling meats and vegetables, salt (one of the oldest preservatives), and alcohol. Good wine will keep almost indefinitely, and fruit placed in a 15% to 20% alcohol solution (brandying) is well preserved.

2- While the other is by ensuring that the food retains, as nearly as possible, its original quality, this method includes the use of ascorbic acid (which prevents color deterioration in canned fruits), benzoic acid, sulfur dioxide, and a variety of neutralizers, firming agents, and bleaching agents.

Ideal preservative characterized by:

1. Can inhibit the growth of a wide range of microorganisms
2. Should be non-toxic to humans
3. Should not be expensive
4. Should not affect the flavor, taste or aroma of the food product
5. Should not be inactivated by the food itself
6. Should not promote the development of resistant microorganisms
7. Should kill rather than inhibit the microorganism.

8. Treatment by Radiations:

A food preservation process in which foods are treated with low doses of gamma rays, x-rays and high-energy electron. Irradiation has been declared safe by the Food and Drug Administration and World Health Organization.

Thus, despite opposition from those who fear that health hazards from its use will be discovered later, this method is gradually gaining acceptance.

Specific terms are:

- Radurization:

It refers to the enhancement of the keeping quality of a food by causing substantial reduction in the numbers of viable specific spoilage microbes by radiation foods. Typical levels to chives this processes (~**1 kGy**) for fresh meats, poultry, seafood, fruits, vegetables , and cereal grains.

- Radicidation:

Is equivalent to pasteurization of milk, for example, it refers to the reduction of the number of viable specific nonspore-forming pathogens; other than viruses, so that none is detectable by any standard method. Typical levels to achieve this process are **2.5-10 kGy.**

- Radappertization

Is equivalent to radiation sterilization or "commercial sterility", as it is understood in the canning industry. Typical levels of irradiation are **30-40 kGy**.
The effect of this treatment on endospore & exotoxin of *Cl. Botulinum*

Radiation dose

Is the amount of radiation used to expose food, is measured in units called kilograys (kGy).The dose permitted for use in food varies according to the type of food and the desired action.

- Low" doses, (< 1 kGy)

Control insects in grains and fruits .Delay the ripening of some fruits/vegetables

- Medium" doses, (1-10 kGy)

Control *Salmonella, Shigella, Campylobacter, Yersinia, Listeria and E. coli* in meat, poultry, and fish

- High" doses, (> than 10 kGy)

Kill microorganisms and insects in spices .Commercially sterilize foods, destroying all microorganisms

How irradiation is used???

- Sterilization of medical equipment (instruments, surgical gloves, alcohol wipes, sutures, etc.)

- Sterilization of consumer products (adhesive bandages, contact lens cleaning solutions, cosmetics, etc.)

- Foods for immune-compromised hospital patients (e.g., AIDS, cancer, or transplant patients)

- Some foods for astronauts, who cannot risk food-borne illness

- Spices and seasonings used in products such as sausage and certain baked goods

Influence factors

- Nature of process:

Among the several methods available (x-rays, β-rays, and γ-rays), γ -rays have a higher potential for effective and economical use in food preservation. ^{6O}Co is predominantly used in food irradiation because it is more readily and economically available.

- Nature of foods*:*

γ-Rays have a penetration capability of 40 cm and can penetrate through paper, plastic, and cans. Thus, foods can be exposed to γ-radiation in packages, cans, baskets, and bags. Frozen, dry, or anaerobically packaged foods need higher doses of treatment to obtain the desirable antimicrobial effect.

- Nature of M.O*:*

Microorganisms vary greatly in their sensitivity to ionizing (and UV) radiation. Because of size differences, molds are more sensitive than yeasts, which are more sensitive than bacterial cells; bacterial cells are more sensitive than viruses (including phages). Among bacteria, Gram-negative cells are more sensitive than Gram-positive bacteria, and rods are more sensitive than cocci . Spores are quite resistant to irradiation, probably because their water content is very low. spores of *Cl.botulinum* Type A and *Bacillus pumilus* are probably the most resistant to irradiation. Generally, *Bacillus* spores (aerobes) are less resistant than *Clostridium* spores (anaerobes).

Food irradiation - Benefit or Risk?

Why Allow Irradiation Of Food?????

- Decrease in the loss of food due to insect infestation, food borne pathogens, and spoilage.

- Decrease in consumer concern over food borne illness.

- The nutritional value is essentially unchanged

-No harmful chemical changes

- The food does not become radioactive

-The appearance of the food is unchanged.

Limitations:

-It can be used only on a limited range of foods . Not all fresh product is suitable for irradiation.
-Some treated foods may taste slightly different.
-Some chemical changes occur
-Radiation doses at the levels recommended will not kill all microorganisms

Conclusion

Foods cannot become radioactive at energies used in irradiation. Below 10 kGy there are no known toxicological, microbiological, or nutritional problems.