Program Synopsis

This program guides pupils through the reasons why we need to process and preserve food, how it can be achieved when preparing food at home as well as in commerce and industry, and the considerations involved. The concept of 'from farm to fork' will be explored.

For more information please visit www.veavideo.com or contact customer service at vea@veavideo.com or on 1866 727 0840
Introduction

Most of the food purchased, especially in developed countries, has undergone some kind of preparation or processing. Some foods are minimally prepared and handled; even fruits and vegetables sold in a farm shop are sorted and displayed. Other foods undergo many processing operations employing many highly technical operations, for example, a canned soup will require carefully controlled pressure sterilisation to ensure it is safe and has a long shelf life.

Food processing enables us to convert raw materials and ingredients into a hugely diverse range of finished products. It also helps to provide controlled quality food products, in a convenient form with a shelf life that allows us to store it safely and minimise waste.

Although there is a huge number of different food process operations used in the food industry this program will introduce some that are key in the manufacturing of foods. It will help pupils to develop an awareness of how our food is processed and preserved (using preparatory or ‘primary operations’ and conversion or ‘secondary operations’), the techniques employed and the considerations and constraints that manufacturers need to consider (such as food systems and legislation).

Program Rationale

This program is aimed at years 9 to 11 and A Level or equivalent students studying Food Technology, Catering or Home Economics (Diet and Nutrition). It is designed to give an introductory overview of how popular food products are created using manufacturing techniques that prepare and convert ingredients and raw materials, how they are preserved using a range of established and modern methods plus process considerations. Students will gain an appreciation and understanding of the properties of different foods and the important factors that must be borne in mind when manufacturing food, such as quality control, processing systems, hygiene regulations and monitoring.

Program Timeline

00:00:00 Introduction
00:01:40 Chapter 1 - Why is food processed and preserved
00:03:43 Chapter 2 – How are foods processed
00:07:53 Chapter 3 – How are foods preserved
00:11:48 Chapter 4 part 1 – Meeting safe standards
00:16:52 Chapter 5 – How it all comes together: Case study – milk
00:21:21 Conclusion
00:21:53 Credits
00:23:12 End show

Internet Resources:

- www.design-technology.org
- www.nutrition.org.uk
- www.ifst.org

Related Programs

- Quality Control in Food Technology
- Batch and Continuous Processes - Food Manufacturing Case Studies
- The Design Process - From Concept to Customer
Program Worksheet

Before the Program

1. Discuss amongst class members how a range of popular food products (giving as many examples as you can think of) are preserved, how to store them and how long they keep for.

2. Find out about the main causes of food deterioration and how it affects different types of food – see if you can locate information on these causes: enzymic, microbial, and chemical.
During the Program

1. List four traditional methods of food preservation that may have been used to extend the shelf life of foods 100 years ago

2. List four reasons why food preservation is useful in modern society

3. Give two examples of how food processing can affect the nutritional content of food materials

4. What is the process called that is used to combine oil and vinegar so that it will not separate?

5. Name the most common process used to dehydrate liquid foods and convert them into a dry powder.

6. How does salt preserve meat?

7. What is the alternative term for ‘cold pasteurisation’?

8. List four important hygiene precautions that need to be taken when handling food in the kitchen.
9. What is the quick program of quality assurance adopted around the world to control food production and help to ensure its safety in a food factory called?

10. During each step involved in the manufacture of a food, it is important to check certain food quality aspects (known as parameters), what is this activity called?

11. What temperature is milk stored at when chilled?

12. What is the name of the process used to heat milk so that raw milk is safe to drink?
1. Chose a simple food product that contains at least four ingredients, research how that product is manufactured. Create a flow diagram that very simply shows the steps used to convert those ingredients into your chosen finished product.

2. List two suitable food preservation options available to food manufacturers appropriate for the following food products:
   - Orange juice
   - Yogurt
   - Chopped lettuce
   - Minced meat
   - Peaches

3. Give further examples of:
   - Size reducing food (e.g. grating)
   - Heating food (e.g. pasteurisation or baking)
   - Cooling food (e.g. chilling)
   - Chemicals used to preserve (e.g. salt)

4. Define the following terms used in the processing of food:
   - Irradiation
   - Sterilisation
   - Homogenisation
   - Modified Atmosphere Packaging
   - Spray Drying
   - Pasteurisation
   - Extraction
   - Freeze Drying
   - High Pressure Processing

5. During the processing of foods, from delivery of ingredients to use by the consumer, identifying the CCPs (Critical Control Points) helps a manufacturer to identify which hazards are serious risks. List the kind of CCPs present when preparing vegetables and chicken for a ready meal.
Suggested Student Responses - During the Program

1. Traditional methods of food preservation include:
   - Drying
   - Freezing
   - Salting (or brining)
   - Curing
   - Smoking
   - Fermentation

2. The benefits of food preservation to modern society include:
   - the creation of convenience foods
   - it allows for food to be transported and traded around the world
   - it increases the range of food choice and variety in our diet
   - it evens out seasonality, making most food materials available all year
   - it helps to reduce food waste from natural spoilage
   - it can remove food pathogens and toxins, improving food safety
   - it can help develop food flavour and consistency

3. Nutrients can be lost during the processing of food when:
   - it is heated, some nutritious components of a raw material are discarded food is exposed to air or trace metals and can leach out into cooking water or oil. Some nutrients are more vulnerable than others to processing conditions.
   - sometimes food processing methods such as blanching and packaging can protect vulnerable nutrients, some additive ingredients fortify foods with nutrients and some methods release nutrients within a food e.g. canning tomatoes increases the carotenoid content.

4. Homogenisation breaks down oil and vinegar into minute particles so small they remain mixed together forming an emulsion. This process is also used for sauces, milk and ice-cream mixes and prevents the lighter fatty portion from separating out and rising.

5. A spray drier dehydrates liquid foods such as evaporated milk or liquid egg into a fine powder by atomising into a fine spray in a vessel full of hot air which dries it very quickly as a powder.

6. Salt preserves meat by drawing water from the meat tissues using osmosis. This reduces the amount of water available for spoilage, particularly inhibiting the growth of bacteria. This process is known as ‘Water Activity Reduction’.

7. Cold pasteurisation is otherwise known as IRRADIATION.

8. Four of the hygiene precautions listed are:
   - carefully and thoroughly wash hand before preparing food
   - wash fruit and vegetables before preparing them
   - clean all utensils and work surfaces well
   - don’t prepare food while you are sick
   - other precautionary considerations include the prevention of cross contamination, storing and cooking food correctly etc.

9. HACCP (Hazard Analysis Critical Control Point) is a risk assessment system used by the food industry that helps to ensure the quality and safe production of food.
10. When the different food parameters during processing are checked, this is referred to as MONITORING, an important aspect of quality control. It is used to check that the food is at the correct temperature, pH, viscosity etc.

11. When milk is stored it must be kept cool, to reduce the growth of micro-organisms. The temperature used for this is usually around 4 degrees Celsius.

12. Pasteurisation is the thermal processing method that heats milk so that all pathogens contained are destroyed. It usually employs the use of heat exchangers and must heat the milk to 72°C for 15 seconds before cooling.

- NB Pasteurisation is only a mild form of heat processing, it does not destroy all micro-organisms, and sterilisation is needed to achieve the destruction necessary for sterility and to achieve a ‘shelf-stable’ product that does not require refrigerated storage.
After the Program

1. Example: Chicken Curry

Ingredients may include:

- Chicken
- Vegetable oil
- Chopped onion
- Spices e.g. cardamom,
- Garam masala, chilli etc
- Stock
- Seasonings
- Rice

Sequence the order of the activities and try to consider how each of these are achieved in a food factory (using ‘continuous production methods) where machines are more likely to be used than manual handling.

Chicken Curry

Gather ingredients from stores→ weigh out → chicken is baked, cooled and diced → sauce is prepared in a 'jacket pan', chicken is added and boiled → rice is boiled in a separate 'jacket pan' with inbuilt colander → rice cooled → rice and sauce are assembled (deposited) into ‘tray’ packs → heat sealed with film, sleeved, coded → blast chilled → tested → stored and dispatched

2. Orange juice – canned, pasteurised and cartooned or sterilised

- Yogurt – chilled, sterilised, dried, frozen
- Chopped lettuce – chilled, MAP (modified atmosphere packed and chilled)
- Minced beef – chilled, frozen, canned, MAP
- Peaches – pickled as chutney, jam or in brandy, dried

3. Size Reduction examples include - grinding, slicing, dicing, pureeing, mincing and even homogenisation

Heating - baking, broiling, grilling, frying, pasteurisation, sterilisation, thermal concentration using evaporators, blanching, sun drying and spray drying etc

Cooling – refrigeration, blast chilling, freezing, blast chilling, immersion freezing (cryogenics)

Chemicals – sugar, salt, vinegar and other mild acids, smoking, preservative additives, alcohol

4. Irradiation – treats foods with ionising radiation to preserve foods or packaging, inhibit ripening and inhibit sprouting, even destroy insects. Its use is very much restricted and controlled and irradiated food must be clearly labelled.

Sterilisation – a severe form of heat processing that will destroy all micro-organisms in a food. UHT (ultra-high treatment) is a popular way of sterilising foods, it using very high temperatures for a very short time that helps to minimise damage of the product

Homogenisation – allows food that do not normally mix because of their difference in density to form a stable emulsion. An homogeniser reduces the size of fat droplets so that they are minute.

Modified Atmosphere Packaging – seals a food in a package in a gas mixture that is not the usual atmospheric mix gas we normally have around us. This gas mixture will be specially blended to extend the shelf life of the food contained. For example, a salad will be held in a reduced oxygen mix to delay respiration and red meat a raised oxygen blend to enhance its red colour.

Spray Drying – dries a liquid food sprayed into a current of hot into a fine powder.
Processing and Preserving Foods

Pasteurisation – heat treats a food using mild conditions that destroy any pathogens present making it safe to eat.

Extraction – separates a desirable food component from a raw material e.g. juice from oranges or grapes or flour from wheat.

Freeze Drying – removes water and dehydrates water from a food without losing volatile flavours. The food is frozen under a vacuum which causes the water to be drawn from the food using SUBLIMATION (the ice is vaporised without forming a liquid).

High Pressure Processing – is a modern way of preserving liquid foods without heating them, they retain their fresh flavour. Hydrostatic pressure is applied to packaged drinks or sauces which destroys micro-organisms.