8.1 FOOD AVAILABILITY AND SELECTION

8.1.2 Influences on Food Availability

HISTORICAL INFLUENCES ON FOOD AVAILABILITY

Staple Foods
- Foods that are commonly eaten as part of the daily diet
  - Readily available to most of the population
  - Major source of energy and protein in diet
  - More inexpensive/plentiful than other food sources
- Main plant staples
  - Potato
  - Corn/Maize
  - Wheat
    - Most common staples food
    - Grow better in cool, wet conditions and ripen in warm, dry conditions
  - Rice
    - Staple food of Asia
    - Needs warm climate and large quantities of water to grow
- Other examples = millet, sorghum, cassava and taro
- Cereals
  - Edible grains
  - Higher quantities of protein than root crops
- Root crops
  - Plant that develop below the ground’s surface
- Legumes
  - Seeds within the seed pods of specific plants
  - Best source of protein

Factors that affect food availability
- Location
- Income/funds available to spend on food
- Technology
- Government policies

Native Australian foods
- Well balanced, nutritious and varied
  - High in protein
  - Low in fat
  - Moderate amounts of carbohydrates
- Food availability = influenced by geographical and climatic conditions
- Food preparation = communal affair
- Animal sources
  - Marine life/shellfish (clams, eels)
  - Reptiles (lizards, snakes)
  - Birds (geese, emus)
- Plant sources
  - Roots (yams, bulrush)
  - Fruits and vegetables (figs, berries)
  - Seeds/nuts (chestnut, millet)
• BUSH FOOD = plants/animals eaten by the Aboriginal people when the colonists arrived
• Preparation – seeds were ground between stones, spears were made of wood to kill animals
  Cooking methods – open fires, steam oven, ground oven
• European settlement disrupted Aboriginal food supply = poor nutrition, inactivity and a new lifestyle

Migration

1830s
• Germans – wine making

1850s
• Chinese – stir-fry, vegetables
• Scandinavians – dairy farms, cheesecake, crisp-bread
• Greeks – fetta, filo pastry
• Americans – farming and cooking techniques

1880s
• Italians – sugar cane, fruit trade, cheese

1920s
• Americans – factories, companies (e.g. Kellogg's, Kraft, Heinz)

1940s
• British – crops, meat
• Americans – Coca-Cola, hamburgers, tinned/frozen/dried food
• Lebanese – milk bars, tabouli, falafel

1960s
• Americans – fast food (e.g. McDonalds, Pizza Hut)

1970s
• Asians (Cambodia, Thailand, Vietnam) – noodles

Reasons for migration
• Gold rush (1800s)
• WWII (post 1945)
• Economic failure in home country

TECHNOLOGICAL INFLUENCES ON FOOD AVAILABILITY

• Developed due to industrial revolution in the 1800s
• Increased speed of production
• The food industry uses large scale, technical machinery to mass produce food
• Distribution networks = essential for processed foods and their point of sale
• Has made it possible to:
  • Preserve food longer
  • Maintain a constant food supply
  • Eat foods that are out of season or from other parts of the world
  • Transform one raw food into numerous products
  • Have variety in our daily diet

Technology applies to:
• Processes – sterilisation of canned food
• Machines – microwave ovens
• Tools – whisk, sifter, peeler
• Systems – ordering, shipping, distribution
• Products – making of yoghurt
• Resources – coal to produce electricity
Refrigeration
- 1870s – ice carts deliver ice to homes and businesses
- 1940s – domestic fridge became common = less frequent shopping, longer storage time
- 1978 – deep freeze/freezer = store frozen convenience foods

Electricity
- 1930s – time saving devices (food mixers, ovens)
- A whole range of processed foods prepared with new equipment developed (e.g. sliced bread, microwave cakes)
- Allowed new appliances and equipment used in food preparation

Transport
- 1870s – rail transport = fast food transport over a long distance
- 1970s – freezer tailers (storage systems built to prevent spoilage)
- During the war, large amounts of food needed to be transported fast over long distances and maintain its quality

Storage
- Consumers have access to food products of good quality whenever and wherever they want
- E.g. apples are stored in moisture controlled storage in order to stop them ripening too early

Packaging
- Influenced by WWII
- 1800s – food was packed into cans
- 1950s – plastics (e.g. sauce bottles)
- 1980s – tamper evident seals (pop lids on jars)
- 1990s – retortable plastics (can be heated), vacuum sealing, modified atmosphere packaging

Value added = goods processed to increase their selling price (increased profit, less customer preparation)

ECONOMIC INFLENCES ON FOOD AVAILABILITY

Economy = the framework established and used by the government to regulate the production, distribution and consumption of goods and services

<table>
<thead>
<tr>
<th>STRONG ECONOMY</th>
<th>WEAK ECONOMY</th>
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<tbody>
<tr>
<td>Consumers have enough money to buy products</td>
<td>Little technology and poor medical services</td>
</tr>
<tr>
<td>Stable government</td>
<td>Few and unstable industries</td>
</tr>
<tr>
<td>Sufficient food produced</td>
<td>Poverty and high unemployment</td>
</tr>
<tr>
<td>Increased availability of food</td>
<td>Large population and large families</td>
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Subsistence agriculture = countries that rely on agriculture to supply their food needs. If yield is low = famine and malnutrition. Often there is no surplus (excess) of food and what is grown tends to be shared among the community.

Low yields can be caused by:
- Over-cropping of soils
- Low levels of technology
- Natural disaster
**Mixed economy** = receives its income from both agricultural and manufacturing industries  
**Agricultural economy** = relies on the production and export of agricultural products to maintain a standard of living  

**Market economy** = private businesses determine the goods and services available to consumers. Price is dictated through supply and demand  

**Quality of life** = the extent to which a person has their basic needs for food, clothing and shelter met  

ABSOLUTE poverty – individuals/communities are unable to supply any of their basic needs  
RELATIVE poverty – one or more of a person’s basic needs are not met due to lack of money. Having a standard of living below the rest of the community  

**Reasons for poverty cycle**  
- Poor government  
- Little resources  
- People are often born into poverty cycle and can’t “escape” it  

**Social justice**  
- Provision to all members of the community all that they require to sustain a mentally and physically healthy lifestyle  
- Stable society = meet basic human needs (e.g. clean water, food and shelter)  

**Over-consumption**  
- Economic impact on the community  
- Health problems for individuals  
- Need for expensive government initiatives to address the issue of unhealthy lifestyles  

**POLITICAL INFLENCES ON FOOD AVAILABILITY**  

**Politics** = system of public administration or government  

The government establishes and used a framework to regulate production, distribution and consumption of goods and services, in a way that is thought to best suit the population.
The government raises funds through:

- Overseas loans (e.g. foreign deficit)
  - If the country borrows too much, taxes will increase (so as to repay the loans)
  - Countries with stable economies can borrow money
- Taxes
- Selling assets (e.g. crown land – land owned by government)

The economy of developing countries usually has high inflation rates (the price of goods and services that are sold) because of the interest rate on foreign debts. With low incomes, the overall standard of living declines.

Foreign aid agencies and international assistance help with the relief of debt on borrowed money e.g. UN

Cash crops
- Crops grown for money, not because they need the food (e.g. sugar, coffee)
- Brings money into local economy and provides employment/income
- Can cause civil unrest and may be too heavily relied upon

GOVERNMENTAL INFLUENCES ON FOOD AVAILABILITY

**Policy of protection** = any action a country takes to give domestic producers an advantage over imported goods

<table>
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<tr>
<th>RESTRICTION</th>
<th>DESCRIPTION</th>
<th>EXAMPLE</th>
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<tbody>
<tr>
<td>Tariff</td>
<td>Tax on goods upon entering a country</td>
<td>5% tax on each L of NZ wine imported to Australia</td>
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<tr>
<td>Embargo</td>
<td>Ban/restriction on goods for health or political reasons</td>
<td>Imported fish that has high mercury levels</td>
</tr>
<tr>
<td>Subsidy</td>
<td>Government payment to help local producers charge the customers less and compete with cheaper imports</td>
<td>US gives a subsidy to its lamb producers</td>
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**Trade liberalisation** = decreased protection offered by the government in order to make companies more competitive on the world market. Loosening trade restriction = cheaper imports

**Free trade agreement** = countries can trade (import and export) goods without a tax

**TAXATION**
The government charge a 10% tax on many goods and services (GTS). Food that is GST includes most basic foods (e.g. fruit, eggs, meat, bread, tea, cereals, milk, tea)

**WAR**
During the war, the Government can take control of food production and distribution of food supplies and services and lead it towards the military effort = rationing
8.1.2 Factors affecting food selection

PHYSIOLOGICAL FACTORS - Affects the body’s need and desire for food

HUNGER
- Feeling of emptiness, weakness or pain caused by lack of food
- Controlled by hypothalamus (small gland in the base of brain)
  - Functions of hypothalamus:
    - Control body temperature
    - Regulate appetite, thirst and fluids
    - Induce sleep and wakefulness
    - Control release of growth and sex hormones

APPETITE
- Desire for food even when the body is not hungry - triggered by sight and aroma of food
- Hypothalamus registers these sensory cues and sends message to brain to make you think about food
- If not satisfied it will not go away (unlike hunger)

SATIETY
- Feeling of fullness that comes from eating adequate amounts of food
- Different foods remain in stomach for varied amounts of time, so slow moving foods = higher satiety value (e.g. dietary fibre)

Neuropeptide (NPY) = small molecules used by neurons to communicate with each other. It is an extremely potent simulator of feeding behaviour

Full
- Cholecystokinin
  - Secreted by cells that line the duodenum (small intestine) when they detect fat
- Oxyntomodulin
  - Delays gastric emptying and decreases gastric acid secretion
- Peptide YY
  - Increases the efficiency of digestion and nutrient absorption after the meal, by slowing down speed of digestion
  - NPY receptors turn off the hunger signal
- Leptin
  - Released by fat cells to signal that the body is fed
- Adiponectin
- Glucagon (like Peptide 1)

Hungry
- Ghrelin
  - Main hunger hormone
  - Secreted by cells that line the stomach when empty
  - When released into circulation, it directly activates the NPY neurons to stimulate appetite
- Cortisol
  - Regulates metabolism and hunger
  - Determines whether you use stored fat or carbohydrates
- Insulin
  - Causes cells in liver, muscle fat and tissue to take up glucose when it is released into bloodstream. It can amplify the hunger sensation
- Glucagon
NUTRITIONAL REQUIREMENTS

- Body size/type and heredity
  - People with larger builds require more nutrients to maintain and operate their body processes
  - They require more carbohydrates and protein
- Age
  - 3-19 years = more calcium and protein for bone/tissue growth
  - 40+ years = less energy-rich foods
- Activity level
  - More active people require more energy-giving foods and more of all nutrients
  - Athletes believe they require more protein for muscle growth
- Gender
  - Men require more protein to build their muscle tissue
  - Women need a higher intake of iron and calcium
- Health status
  - People with high cholesterol need to reduce amount of animal fat in diet
  - People with anaemia require foods rich in iron
- Pregnancy/lactation
  - Pregnant women should eat a variety of nutritious foods (e.g. bread, cereal, fruit, milk)
  - Foods rich in folate (leafy greens, nuts), iron (lean beef, legumes) and calcium (cheese, tofu)

PSYCHOLOGICAL FACTORS

Values
- Deep personal feeling about what is important
- Can’t change
- Reflects family and culture
- Influence choices related to food origins and health
- E.g. vegetarianism

Beliefs
- Opinion which isn’t based on scientific truth
- Can change
- Includes religious customs
- E.g. Hindus don’t eat meat

Attitudes and experiences
- Way a person views something and behaves towards it, usually after evaluating its merit
- Based on culture, personal history experiences, status, war and origin of the food
- E.g. raw meat is part of Japanese culture; lobster has a high status

Habits
- Something we do regularly without thinking
- Difficult to break
- E.g. putting salt on food

Emotions
- People over or under consume food due to emotional stress
- Comfort foods = usually high in sugar and fat
- E.g. eating chocolate when sad

Self-concept
- How we feel about ourselves and the way we see our personal appearance
- Influenced by media, advertising and family/friends
- E.g. anorexia
SENSORY PERCEPTIONS

- Appearance
  - Shape
    - Carrot can be sliced, grated, julienned or diced to create interest
    - Smaller sized portions
  - Colour
    - Indicates its quality and nutritional value
    - Alterations in colour = food spoilage sign
  - Turgor
    - Pressure placed on cell walls by fluid in cell
    - Gives foods a full, fresh appearance, firm texture and a crisp feeling
    - Wilted vegetables (lost turgor) are not appealing

- Flavour
  - Based on taste and smell
  - Very salty or sour foods are not appealing
  - Taste buds on tongue and sense of smell affect taste
  - To be tasted, the flavouring substance must be dissolved in a liquid

- Aroma
  - How something smells
  - There are odour receptors in the nose that transmit signals to the hypothalamus
  - Specific aromas are associated with a particular cuisine e.g. Indian spices

*Umami* = sensation/feeling in mouth (e.g. mint, spicy food, soft drink)

SOCIAL FACTORS

- Culture and traditions
  - Many traditions/social occasions where a meal is the focus of the event (e.g. Easter)

- Lifestyle
  - Employment
    - Type of job and physical requirements
      - Active jobs require larger amounts of high-energy foods to be consumed
    - Number of people in the family employed
      - Dual career/2 incomes = greater income flexibility, limited shopping time, convenience factors cost more but save time
    - Social status of the job and education
      - Higher status jobs = larger amounts of money to make food choices
      - Better educated about nutritional needs
  - Household/family structure
    - Parents are usually responsible for the selection of food for children
    - Likes and dislikes can be overriding in food selection within household
  - Climate and geographical location
    - Dictates type of food that can be grown
    - Not as significant now due to improved preservation techniques
  - Travel and other interests
    - Advancements in technology = allow food to be purchased from distant places
    - Nations can make trade agreements to try different foods from many cultures

*Allergy* = physical reaction to specific ingredients or foods

*Intolerance* = less severe (may only make you FEEL ill)
SOCIAL INTERACTION

- Media
  - Advertising
  - Celebrities
  - Scientific experts
  - Restaurant reviewers
- Peer group
  - Family/cultural beliefs
  - Eating foods to “fit in”
  - Fad diets
- Hospitality
  - Celebrations with family/friends
  - Informal family entertainment
  - Takeaway food = more convenient

ECONOMIC FACTORS

The cost of food varies according to

- How much is bought a once (e.g. bulk sale – Costco)
- Whether the food is in season or locally produced
- How much processing the food has undergone
- Ripeness or use-by-date
- Place of purchase
- Store specials and purchase of generic/home brands

The Marketplace = where consumers purchase food (e.g. corner store, supermarket, shopping centre, online, specially store)

- Smaller selling venue = more expensive food (they need to cover the cost of buying from larger stores)
- Specially stores give customers a wider range of services and choices
- Larger supermarkets can’t sell every brand so they need to know what the people in the local area want (consumers can request certain products/brands). Many supermarkets include different sections (deli, bakery, fruit and vegetable) so majority of food is available. They use a variety of strategies to influence consumers:
  - Advertising
  - Sales and discounts
  - Store displays
  - Samples
  - Generic brands
  - Store layout
  - Product positioning

Resource

- Something we use to achieve goals (time, money, skill)
- Varied but limited (e.g. once you spend money, it is gone) and are interchangeable
  - Things we own (e.g. appliances, cars, recipe books)
  - Things we have (e.g. electricity, water, marketplace time, money)
  - Personal attributes (e.g. skills, knowledge, experience, interest)
8.2 FOOD QUALITY

8.2.1 Safe storage of food

**Shelf life** = the length of time an item remains fit for consumption and sale

**Perishable** = likely to go bad quickly (e.g. milk)

**Semi-perishable** = does not require refrigeration but still as limited shelf life (e.g. potatoes)

**Non-perishable** = not subject to rapid decay/won’t go bad quickly (e.g. dried pasta)

FOOD BORNE ILLNESSES

Main causes of contamination
- Growing (e.g. irrigation with contaminated water)
- Production (e.g. salmonella in cattle used for meat)
- Final handling (e.g. leaving chicken out too long)

Ways to reduce food borne illness
- Better sanitation
- Public health surveillance and research
- Food processing improvements (pasteurisation, freezing, refrigeration, canning)
- Development of vaccines

Factors that influence eating habits
- Produces and handles food
- Changes in dietary patterns
- International source of food
- Changes in susceptibility of population

Main CAUSES of food borne illness
- Norovirus
- Salmonella
- Clostridium perfringens

Main CAUSES of death
- Salmonella
- Toxoplasma Gondi
- Listeria Monocytogenes

Financial implications
- **Individual**
  - Loss of job and income
  - Medical costs
  - Physical disability
- **Industry**
  - Food recall
  - Reduced consumer demand
  - Lawsuits
  - Imposed fines
  - Improved safety process
  - Improved marketing efforts
**Food borne illness** = illness caused by consuming contaminated foods. Microbes and pathogens contaminate the food (food poisoning caused by micro-organisms)

**Food borne outbreak** = incident in which 2 or more people experience a similar illness after eating a common food

**Cause of food contamination**
- Chemical (e.g. cleaning chemicals/pesticide residue)
- Physical (e.g. foreign objects such as glass or stones)
- Biological (e.g. micro-organisms or toxins/poisons)

**USA Food and Drug Administration ranking of health hazards (most – least serious)**
1. Microbial contamination
2. Inappropriate eating habits
3. Environmental contamination
4. Natural toxic constituents
5. Pesticide residues
6. Food additives

**Natural toxins**
- Chemicals naturally produced by living organisms
- Not harmful to the organism but may be toxic to other creatures
- SOLANINE found in green potato skin
- TETRODOXIN causes respiratory paralysis and is carried by the puffer fish

**Factors affecting microbial growth**
- **PH level**
  - Acidity of a substance
  - Different micro-organisms have different optimal pH for growth (usually around a neutral pH of 7)
- **Adverse conditions – how the food is stored**
  - Under adverse conditions, some micro-organisms survive by producing spores with protective coating (enables them to survive in a dormant state for a long time)
  - Spores are heat resistant and can tolerate dry or frozen conditions
  - Spores can be prevented from germinating (become active again and grow/increase in number) by keeping food hot (above 60°C) or cold (below 5°C)
- **Temperature**
  - Hot food zone = 60°C - 100°C (bacteria is destroyed)
  - Danger zone = 5°C - 60°C
  - Cold food zone = 0°C - 5°C
  - Frozen food zone = -10°C - 0°C (bacteria won’t grow)
  - 4hr/2hr rule - if food has been left in danger zone for a total of:
    - 0-2 hrs. – use immediately or keep below 5°C/above 60°C
    - 2-4 hrs. – use immediately
    - 4+ hrs. – throw away
  - Micro-organisms that prefer:
    - Low temperature = psychrophiles
    - Medium temperature = mesophiles
    - High temperature are called = thermophiles
Gas atmosphere
- Aerobic = requires oxygen for growth (e.g. moulds – Bacillus Cereus)
- Anaerobe = prefers an oxygen free atmosphere (e.g. Clostridium)
- Facultative = can grow with or without oxygen (e.g. Salmonella)
- CO₂ and O₂ affect microbial activity

Availability to nutrients
- Moisture
  - Needs water to survive but some can tolerate dry conditions
  - Measured in terms of water activity (water not bound in food/water available for microbial growth – is NOT the same as the moisture content)

FOOD BORNE ILLNESSES

Protozoa
- Giardia and C. parvum are protozoans (single cell microscopic or near microscopic organisms) that attach firmly to the intestinal wall and cause diarrhoea (can last for many weeks)
- Water supplies have been reported to be contaminated with Giardia lamblia and Cryptosporidium parvum
- Outbreaks have also been reported in day-care centres

Fungi and moulds – transferred directly from source
- Secrete toxins (mycotoxins) that are harmful to man
- The mould Aspergillus flavus produces aflatoxin (toxin) which was linked with contaminated peanuts, wheat, corn and rice and resulted in illness
- Produce mycotoxins that are harmful to man
- Mycotoxins in food = public health problem
- 60 countries control the levels of mycotoxins in animal feed

Viruses – require a host cell
- Do not grow in or on food because they need a living host cell in which they can reproduce
- Eating food contaminated with viruses enables micro-organisms to enter the person’s body
- A virus takes over the cell it enters and reproduces until there are so many viruses within the cell that the cell membrane breaks. The viruses then escape to invade other cells.
- Hepatitis A and Norwalk virus = cause food-borne illness because they can be transmitted by an infected food handler to food

Bacteria
- Bacteria (tiny one-celled organisms) can cause two types of food poisoning:
  - Infective food poisoning = result of eating live bacteria that is in the food
    - To prevent poisoning = prevent the growth of the microorganisms
    - E.g. salmonella, Listeria, Escherichia coli
  - Toxic food poisoning = result of toxins produced by some bacteria. Toxins can NOT be removed/inactivated by cooking (e.g. Staphylococcus aureus, Clostridium perfringens)

FOOD-BORNE DISEASES
- Majority of bacterial outbreaks = due to Salmonella and Clostridium perfringens
- Main cause of death = infection with Salmonella and Listeria monocytogenes
- Main foods associated with outbreaks = meat (esp. chicken), fish, seafood, salad, sandwiches and eggs
PATHOGENS

- Most susceptible = the sick, children, elderly and pregnant women
- Campylobacter jejuni
  - Source = consumption of raw/unpasteurised milk, raw/undercooked poultry, cross-contamination
  - Growing conditions = over 35°C
  - Symptoms = abdominal pain, fever, nausea and diarrhoea (2-10 day onset)
  - Case = 2013 ANU lunch – 53 students fell ill from chicken liver pate
  - Prevention = pasteurise milk, cook foods properly
- Salmonella
  - Symptoms = fever, headache, nausea, vomiting, abdominal pain, diarrhoea (6-48 hr. onset)
  - Source = Eggs, meat (esp. chicken), raw milk and chocolate.
  - Growing conditions = 7°C – 48°C, require water
  - Case = 1996 Aus. - involved peanut butter processed from contaminated roasted peanuts
  - Prevention = separate raw foods from cooked foods, refrigerate foods or keep hot
- Escherichia coli
  - Source = Faeces of infected people, contaminated food and water, animals
  - Case = Pizza Ranch (USA) – many people contracted E. Coli
  - Symptoms = diarrhoea, blood in the stools, haemolytic uraemic syndrome (3-4 day onset)
  - Prevention = don’t consume untreated water, thoroughly cook food
- Listeria monocytogenes
  - Source = soil, water and vegetation (linked to contaminated milk, soft cheeses undercooked chicken, raw seafood, packaged ready-to-eat salads, pre-cooked salads)
  - Growing conditions = 0 °C to 45 °C (can survive freezing for long periods of time)
  - Symptoms = fever/chills, headache, muscle aches/pain, nausea, diarrhoea (2-30 day onset)
  - Case = 2009 QLD – Chicken wrap on Virgin Blue flight
  - Prevention = avoid unpasteurised food

SAFE STORAGE OF FOOD

- As food ages, it losses colour, flavour, texture, nutritional value and smell
- Factors that affect prediction date of food
  - Growth of micro-organisms
  - Changes in moisture
  - Chemical or biochemical changes

Food spoilage = deteriorated food caused by non-microbial factors (e.g. enzymes) or microbial contamination which may promote the growth of micro-organisms

Shelf life = length of time an item remains fit for consumption/expected time a food will retain quality

Perishable = likely to go bad quickly as it has a short shelf life (e.g. milk)

Semi-perishable = does not require refrigeration but still as limited shelf life (e.g. potatoes)

Non-perishable = not subject to rapid decay/won’t go bad quickly (e.g. dried pasta) as it has a long shelf life

Use-by date = after this date, food should not be consumed (e.g. packaged vegetables, cream)

Best-before date = the food is at its highest quality before this date (e.g. milk eggs, cereal)
COMMERICAL STORAGE

- Cold Storage
  o Foods stored at 0°C - 5°C (slows microbial and enzyme activity and quality is maintained)
  o Fruit
    ▪ Low temperatures slow enzymes responsible for ripening
    ▪ During ripening, ethylene gas is produced which speeds the ripening of nearby fruits
    ▪ Cold storage is combined with controlled atmosphere storage (when gas levels rise, the air is removed and replaced with low oxygen air)
    ▪ Humidity = controlled (otherwise the fruit will dry out)
  o Vegetables
    ▪ Stored above 0°C to maintain sweetness (e.g. corn)
    ▪ Controlled atmosphere and water vapour (prevent wilting)
    ▪ When produce is needed, the temperature and level of gas is increased to allow natural ripening to occur (the produce was picked BEFORE it was fully ripe)
  o Flesh Foods (meats, poultry, seafood)
    ▪ Contains enzymes which cause foods to age
    ▪ Have high water content – optimum microbial growth conditions
    ▪ Cold storage slows bacteria growth

Domestic food storage tips

- Meat should NOT be kept wrapped up – keeps the meat longer (may dry out)
- Foods with strong odours should be wrapped
- Cooked foods should be covered
- Raw foods should be placed below other foods – prevents drips falling

- Dry Storage
  o All foods contain traces of moisture but foods kept in dry stores and need controlled levels of humidity and water vapour (e.g. rolled oats, flour and dried beans)
  o $A_w = \text{moisture content (within food) that is needed for bacteria growth}$
    ▪ Foods with a low $A_w$ = stored in an environment that has circulating air and controlled humidity/water vapor (dry storage)
    ▪ If extra moisture is present, a low-$A_w$ food will absorb it and so micro-organisms will multiply (food’s quality decreases)
    ▪ Increased moisture = activate enzymes (causes ripening/browning)
    ▪ Foods that require dry storage to maintain their quality:
      - Freeze dried foods (e.g. coffee, herbs)
      - Frozen foods and some fresh vegetables (onions, potatoes)
      - Very low $A_w$ foods that need to be reconstituted (have water/liquid added)
        ▪ Dried soup, cake mix
      - Moderately low $A_w$ with crisp texture (lost if in contact with moisture)
        ▪ Crackers, biscuits

- Freezer Storage
  o Food quality is maintained for long periods of time (3-12 months) between -18°C and -30°C
  o Low temperatures cause micro-organisms to be less active and slow enzyme activity
  o Blast freezing – ice crystals = small and round, so don’t damage food cell structure in thawing
  o Wrapping food in the freezer protects it from cold, dry air – freezer burn (drying of the surface resulting in discoloration and spongy texture)
8.2.2 Safe preparation and presentation of food

Keys to safer food
1. Keep clean
2. Separate raw and cooked
3. Cook thoroughly
4. Keep food at safe temperatures
5. Use safe water and raw materials

SAFE FOOD HANDLING
• Temperature control
  o Keep hot foods hot (above 60°C) and cold foods cold (below 5°C)
  o Temperature control is important during transportation e.g. ice-cream
• Prevention of cross-contamination
  o Cross contamination = transfer of micro-organisms from one food item to another - occurs when foods touch each other during storage or preparation e.g. buffet serving spoon
  o Cross-contamination can take place during
    ▪ Transport
    ▪ Storage
    ▪ Preparation
    ▪ Service/display
• Clean work environment
  o Wash dishes with hot, soapy water and air dry them (to prevent cross-contamination)
  o Make sure all doors/windows are insect-proof
• Personal Hygiene
  o Hygiene = the idea/practice of cleanliness and preservation of health
  o Staphylococcus bacteria – human nasal passages, boils, cuts, skin, pimples and hands
  o Salmonella can survive on fingertips, preparation surfaces and equipment for at 10 mins
  o Rules for personal hygiene
    ▪ Cover wounds
    ▪ Toilets must be separate from food prep and storage areas
    ▪ Use utensils and gloves (not hands)
    ▪ Wash hands after handling food

COMMERCIAL FOOD PREPARATION
• Food storage rooms
  o Should be well ventilated, easy to clean and well lit
  o Good ventilation reduces condensation (reduces number of air-borne micro-organisms)
  o Cold rooms open to a small entry, creating an airlock (keeps room cold)
• Work flow in the kitchen
  o Describes the path food takes as it travels through food preparation and serving
  o Main areas
    ▪ Basic preparation area
      ▪ Wet kitchen (fruit, vegies, flesh food) - sinks, peelers, slicers
      ▪ Dry kitchen (pastry, ready-to-eat foods)
    ▪ Cooking area (ovens, stove)
    ▪ Service area (Bain-Maries, plates)
    ▪ Cleaning and washing up area
      ▪ Near service area (cutlery, plates)
      ▪ Near wet and dry areas (pots, pans)
Walls, ceiling, floor and bench surfaces
- Easy to clean
- Undamaged by fats or water
- Resistant to bumps from trolleys
- Walls – aluminium sheeting
- Floors – non-slip, smooth (heavy duty vinyl)
- Ceilings – heat resistant, slightly absorbent (to reduce condensations), able to dry out quickly

Equipment
- Smooth surfaces, no sharp corners or gaps/cracks, easily disassembled for cleaning
- Prep equipment = reliable, good condition, appropriate size, suitable for type of food
- Materials = non-absorbent, unable to react with food (e.g. plastic, stainless steel)
- Large equipment = self-emptying, easy draining and out of the way

Standard operating procedures
- Hazard Analysis Critical Control Points (HACCP) = preventative food safety system
  1. Assess the hazards
  2. Determine the critical control points (CPPs)
  3. Establish the limits at each critical point
  4. Monitor the CCPs
  5. Establish corrective actions
  6. Verify that measures have been taken and the plan is operating well (through inspection)
  7. Establish documentation and record-keeping systems of monitoring
- Examples of HACCP guidelines – employees to wash hands with warm, soapy water before starting work, raw produce shall be thoroughly washed with potable water before use

DOMESTIC FOOD PREPARATION
- Temperature control
  - Allow cooked foods to stand for a short time at room temp before putting in fridge
  - Heat leftovers to 60°C before eating
  - Avoid frequently heating and cooling food
  - Cook food to at least 75°C
  - Subdivide large batches food into smaller containers in fridge
  - Thaw frozen food in the fridge
  - To prevent cross-contamination
    - Clean benches, utensils, cutlery after preparing raw food (esp. chicken)
    - Use separate equipment
    - Wrap foods for storage and place raw foods below other food in fridge
- Cleanliness
  - Spray insect repellents away from food and equipment
  - Leave adequate time for the poison to destroy the bugs/insects
  - Clean the surface/equipment with warm, soapy water to remove residue
  - Domestic animals should not be allowed in the kitchen (e.g. cats may lick equipment)
  - Food handling tips
    - If in doubt, throw it out
    - Cooked food should be handled as little as possible
    - Use disposable gloves and serving tongs
    - Clean food spillages and clean work surfaces
  - Make sure all equipment is safe/clean
    - Wooden/plastic chopping boards with deep cuts = micro-organisms can grow
    - Glass measuring jug = break/chip if dropped/heated
    - Damp washing up cloth/tea towel = contain food particles = encourages pests
    - Oven/stove are difficult to clean = food spills attract micro-organisms
BASIC PRINCIPLES OF COOKING

Methods of transferring heat

• Conduction – food/food container comes into direct contact with a hot surface (e.g. BBQ)
• Convention – food is heated by the hot air around the food (e.g. boiling pasta in a pot, oven)
• Radiation – food cooked by heat waves that bounce off sides and top of device (e.g. toaster)

Method depends on

• Type of food (e.g. tougher cuts of meat require long, slow cooking)
• Style of food (e.g. foods that are to be served with a crisp outer layer need to be baked)
• Quantity of food (e.g. large amounts of food require larger equipment)

COOKING METHODS

• Dry heat methods – tender cuts of meat, foods that require a crisp surface, cakes/breads/pastries
  o Grilling – quick methods of cooking by radiant heat under/over grill plates
  o Baking – heating air by hot air or an oven
  o Roasting
  o Frying – quick method that uses hot oil/fat to seal the food

• Moist heat methods – longer cooking times and blending of delicate flavours
  o Braising – combines frying and stewing
  o Boiling – food may be almost covered with liquid (usually boiled initially then simmered)
  o Stewing – long and slow method using a small amount of liquid in a covered container
  o Poaching – food is simmered in a shallow container of water/stock
  o Steaming – foods cook in steam from small amount of boiling water in a pan
  o Microwave cooking

PRODUCING HIGH-QUALITY FOOD

• Types of food service operations - cafeterias, canteens, milk bars, takeaway outlets, restaurants
• Steps to ensure high quality of food
  o Choose the best quality ingredients
  o Carefully clean food
  o Avoid over handling food
  o Season food with care
  o Use the cooking technique that best suits the particular food
  o Use proper equipment for the task
  o Measure ingredients properly
  o Experiment with textures/tastes a little at a time
  o Serve food attractively
  o Serve hot food hot/cold food cold
  o Consider tastes/needs of eaters

PLATING MEALS FOR SERVICE

Arranging food on the plate for the customer (usually done in the kitchen)

• Semi-silver service - the main item is arranged on the plate while other food is served by waiter
• Silver service - a clean plate is put before the customer and the waiter serves the entire meal
• Gueridon service - a chef prepares the entire meal and serves it in front of the customer (teppanyaki)

Size of a portion depends on

• Customer’s expectations
• Number of courses
• Overall presentation of the meal
• Size of plate and crockery
• Type of plating for service
8.2.1 Sensory characteristics of food

SELECTION OF FOOD

Food preferences are influenced by:
- Experiences with food
- Medical advice (e.g. teenage girl - red meat)
- Allergies and intolerances
- Desire for a healthy body
- SENSES (sight, touch, smell, taste, sound)

SENSORY CHARACTERISTICS

- Flavour
  - Our perception of a food’s flavour is an assessment of taste and smell
  - Best flavour evaluation temperature = 20-30°C
  - Flavour = the sensory message resulting from the combination of taste and aroma
- Taste
  - A taste sensation occurs when chemicals in the food stimulate taste receptors
  - Main sensations of taste = salty, sweet, sour and bitter
  - Umami = detected by tastebuds to enhance qualities of flavours (e.g. mint = cold feeling)
  - Astringency = sensation caused by umami
- Texture
  - How the food feels in the mouth or hand (tactile texture)
  - Visual texture – the texture seen by looking at the food item
  - Viscosity = thickness (e.g. thick cheese sauce has a HIGH viscosity)
- Aroma
  - Hot food has more aroma than cold food because steam rising off the food has volatile aromatic substances
  - The more the food is heated, the stronger the aroma
  - Cold foods e.g. strawberries, mangoes have a distinct aroma
  - Electronic sensing can detect and analyse volatile chemicals at low levels
- Sound
  - Can be positive or negative (e.g. biting into an apple that does not crunch)
- Visual Appeal
  - Colour – consumers expect certain colours to have certain flavours
  - Appearance can affect acceptability

SENSORY TESTS

- A subjective evaluation of how people perceive a product by using their senses
- Sensory analysis = analysis of a food’s aroma, taste, overall appearance and texture. It is done to test the development of a new product or as a way to improve an existing one
- Can measure consumer preference, acceptance, rejection of certain foods/flavours.
- Can measure the difference between processing/storing procedures
- The info helps manufacturers improve food being produced/developed and thus increase sales

Guidelines for sensory tests

- Each test should only evaluate one food characteristic
- Max 5 different samples at one time
- Provide a sensory evaluation sheet
- Label the samples to prevent panellist ranking them in a suggested order (e.g. 402, 586 and 972)
- Record each sample number to avoid confusion
- Check ingredient list to identify differences
- Tasters should not have a cold – it will dull their senses
- Testing should not occur when the panellist is hungry or just finished a meal
- Panellists should take 2-3 bites of food and rinse mouth with ROOM TEMP water after each sample
- No discussion between panellists, separate with dividers
- Make sure food is at proper/correct temperature

Types of sensory tests
- Hedonic Scale
  - Used to rate product acceptability with faces (good for children)
  - Can also use words or numbers (e.g. poor, fair, good)
- Descriptive tests
  - A list of words is presented and the panellist chooses best description
- Ranking
  - Several foods of the same kind are assessed together and placed in order of preference
- Profiling Food
  - Ranking of descriptive words to create a food profile, presented on a star diagram
  - The star diagram can compare similar products or results of several panellists
- Difference sensory testing
  - Used to test the perceived difference between products
  - At least 20 panellists are needed
  - Paired comparison test – samples are presented in pairs
    - E.g. the panellist will taste:
      - Sample A and Sample A
      - Sample A and Sample B
      - Sample B and Sample B
  - Triangular comparison test – 2 different samples are tested but are presented in sets of 3
    - E.g. the panellist will taste:
      - Sample A, Sample B and Sample A
      - A, B and B
      - A, A and B
      - A, B and A etc....
  - 2 out of 5 comparison test – panellist taste 5 samples, of which 2 are the same and are asked to identify these 2 samples

Consumer Sensory Assessment
- Consumers consider:
  - Unwanted extras
  - Overall physical appearance
  - Smell/aroma
  - Anticipated taste
  - Texture/anticipated texture
- Meat
  - Not stringy or fatty
  - Bright red, moist flesh
  - No broken bones (chicken)
  - Plump w/ fresh, clean smell and appearance
  - Clear eyes (fish)
- Fruit/vegetables
  - Uniformity of size and colour
Firm touch, no bruises or visible mould

- Packaged foods
  - No cuts or tears in packaging
  - Reasonable use-by date
  - No build up of frost on package (frozen foods)

Layout of food for visual appeal

**Food presentation = how the food is arranged, decorated and garnished on plates, platters etc.**

**Plate presentation**
- Good quality plates (no chips/cracks)
- Plate food neatly to coordinate colours, textures and flavours
- Don’t overcrowd plate or stack too high
- Use an appropriate portion size and garnish

**Garnishes** – edible trimmings applied to a dish to improve its appearance and add colour, texture, focus of interest and highlight ingredients used in the dish

**Food stylist** = creates pictures/moods with foods that are on display for a function (buffet) or photography
- Choose a theme are collect appropriate table cloths, plates etc.
- Decorate the food
- Arrange the food on the dish and add garnishes

**Food Photography**
- **Control colour of food**
  - Bright colour = fresh
  - Colours should contrast (e.g. light and dark, patterns and plain)
  - Cooked food looks darker so only partly cook the food
- **Make hot food look ‘hot’ or cold food look ‘cold’**
  - Microwave cooked food to produce steam
  - To make a food appear golden brown, brush surface with brown food colouring or oil
  - To make food look chilled, spray cold water on surface.
- **Make the food look life sized**
  - Cameras tend to flatten food and reduce its overall size
  - Create height by arranging food in uneven layers
  - Make decorations taller than the food
  - Cut/make food pieces larger than normal
- **Tips and tricks**
  - Use potato instead of ice-cream and PVA glue instead of milk
  - Use plastic ice-cubes in drinks
  - Spray cake with hairspray so it doesn’t look dry
  - Use a blow-torch to cook perfectly