

# HSC Biology

## Core 3 - Search for Better Health

### Focus 2

🚩 Over 3000 years ago the Chinese and Hebrews were advocating cleanliness in food, water and personal hygiene.

**Distinguish between infectious and non-infectious disease.**

- **Infectious disease:**
  - Caused by an organism.
  - Can be transferred from person-to-person.
    - May be;
      - Direct.
        - Disease causing organism (virus/bacteria):
          - Passed directly to person.
        - Carried by a vector (intermediary) (blood-sucking insect).

Viruses	Bacteria	Protozoans	Fungi
Influenza	Tonsillitis	Amoebic dysentery	Ringworm
Herpes	Tuberculosis	Giardia	Dandruff
Poliomyelitis	Gonorrhoea	Malaria	Tinea
AIDS	Tetanus	Sleeping sickness	Thrush

External Parasites (Ectoparasites)	Internal Parasites (Endoparasites)
Head louse	Tapeworm
Body louse	Flukes
Crab louse	Threadworm
	Pinworm
Bed bug	Hook worm
Flea	Filarial worm
Tick	Roundworm
Itch mite	Giardia parasite
	Malarial parasite

- **Non-infectious disease:**
  - Not caused by organisms.
  - Genetic diseases.
  - Nutritional deficiency.
  - Environ factors.

Category	Example
<b>Inherited</b>	Haemophilia Down syndrome Cystic fibrosis Phenylketunuria Huntington's disease
<b>Nutritional</b>	Scurvy Beri-beri Anorexia nervosa Kwashiorkor Tooth decay
<b>Environmental</b>	Skin cancer Lung cancer Heavy metal poisoning Asbestosis Hearing loss Stress Asthma

**Explain why cleanliness in food, water and personal hygiene practices assist in the control of disease.**

- Huge number of disease causing organisms.
  - Most microscopic.
  - Enter body through any opening.
- Intake of food, water:
  - Easy access for microscopic organisms to enter body.
  - Minimising organisms in food & water:
    - Reduces risk of infection.
- Personal hygiene ensures entry through openings kept low.
  - Clean broken skin etc.
- Cannot see micro-organisms:
  - Take precautions known to stop them.
  - Wash hands, clean wounds, boil water, separate waste & food.
- Control measures can stop spread of infectious disease.
  - Especially if we know how transmitted.
- Cleanliness:
  - Personal level.
    - Hand washing.
  - Gov. legislation.
    - Waste disposal.
- Hygiene practices:
  - Limit spread of organisms.
    - Containment.
    - Laws.
    - Disinfection/sterilization.
  - Minimise chance of infection.
    - Protective measures.
      - Gloves.
      - Face masks.
      - Safe food handling.
      - Disinfection techniques.

Identify the conditions under which an organism is described as a pathogen.

- Pathogen:
  - Organism that can produce disease.
  - Can be;
    - Microscopic viruses.
    - Tapeworms (macroscopic).
  - Require right conditions to multiply & transmit.
    - Cleanliness discourages growth & spread.
  
- Pathogens may live:
  - Outside the body:
    - Fungus causing ringworm.
  - Inside organs:
    - Parasitic worms (intestines)
  - In tissues.
  - In cells.
    - Viruses.
  
- Heating, pasteurization, freezing & irradiation used to kill microorganisms
  
- Chemicals:
  - Chlorine & detergent.
  - Antiseptics & disinfectants.
  - Discourage growth & spread.

**Identify Data Sources, Plan and Choose Equipment or Resources to Perform a first hand investigation to identify microbes in food or in water.**

**Aim:** To investigate the number & types of microbes living in water,

**Materials:** - 7x Petri dishes containing agar.

- Wand.
- Autoclave.
- Sticky tape.
- Sources of water.

**Method:** - Locate bodies of water within the school.

- Toilets.
- Bubblers.
- Tap.
- Bin.
- Drain.
- Sink.
- Swamp.
- Collect drop of water from each area & using a wand, spread on agar plate ensuring that no bacteria from the air can enter.
- Seal and label each Petri dish & place it in an autoclave for several days.
- Remove from autoclave and identify types of bacteria in each area, without opening dish.

**Gather, Process and Analyse information from secondary sources to describe ways in which drinking water can be treated and Use Available Evidence to explain how these methods reduce the risk of infection from pathogens.**

- Drinking water:
  - Screened, filtered to remove large & small particles.
  - Chlorine added to kill bacteria.
  
- Boiling:
  - One of the best ways to purify unsafe water.
    - Due to presence of protozoans.
  - Pathogens may be killed if boiled for long enough.
  - Drives out Volatile Organic Compounds (VOCs).
  
  - Should not be used when toxic metals/chemicals present.
  - May concentrate harmful contaminants not vaporised as pure water boils off.
  - Energy required to boil water.
  
- Distillation:
  - Water boiled in chamber.
    - Causes evaporation.
    - Pure steam leaves non-volatile components behind.
  - Steam condenses in different part of chamber.
  - Vapour trap/carbon filter used in conjunction.
    - Removes volatile organic compounds.
  - Removes:
    - Pathogens.
    - Chlorides.
    - Nitrates.
  - Water quality consistent.
  
  - Takes time (2-5hrs/gallon).
  - High electricity.

- Reverse osmosis:
  - Water pressure forces water molecules through membrane.
    - Has extremely tiny pores.
    - Leaves larger contaminants behind.
  - Purified water collected.
  - Reduces salt, organic material.
  - Removes most viruses.
  - Cheap to run.
    - Purify more water than distillers /day.
  - No electricity used.
  
  - pH, temp<sup>0</sup>C, water pressure effect efficiency.
  - Will not function without high water pressure.
  - Require high maintenance.
  - Damaged membranes not easily detected.
    - Allow substances to pass through.
  
- Dissolved Air Floatation Filtration (DAFF) System:
  - Water enters system from storage area (dam).
  - Lime (calcium carbonate) added to increase alkalinity (buffering capacity).
  - Alum (aluminum sulfate) added.
    - Attracts -<sup>ve</sup> dirt particles.
  - Poly (Lt20) added.
    - Floc forms clumps.
  - Saturated with compressed air & water added.
    - Aerates flocculant, floats to top.
    - Pushed off top.
  - Water exits through sand bed to remove small floc particles.
  - Lime added to increase alkalinity.
  - Disinfection:
    - Ammonia & Hypochlorous acid added.
      - Destroys all pathogens.
    - Ammonia stabilises, removes toxicity of hypo.
    - Cl<sup>-</sup> ions not added; need to last all the way to the tap.

- CO<sub>2</sub> added to reduce pH, make safe to drink.
- Pumped to reservoirs, towns, homes.
  - Boiled, filtered to ensure safety.
  
- Addition of NH<sub>3</sub> & hypo *disinfects* water; only destroys pathogens.
  - Remains in water all the way to the tap to continue destroying pathogens encountered on way.