2. Low Temperatures

- inhibits microbial growth by slowing down microbial metabolism
- static effect, and depend on Tem. and microorganism

i) Refrigeration: Temperature is from 0 - 5°C .

- reduces metabolic rate of most microbes so they cannot reproduce or produce toxins, but does not halt its activity completely.
- only for shorter-term storage of food and other items.

ii) Freezing: Temperatures below 0°C (-10 to - 80° C).

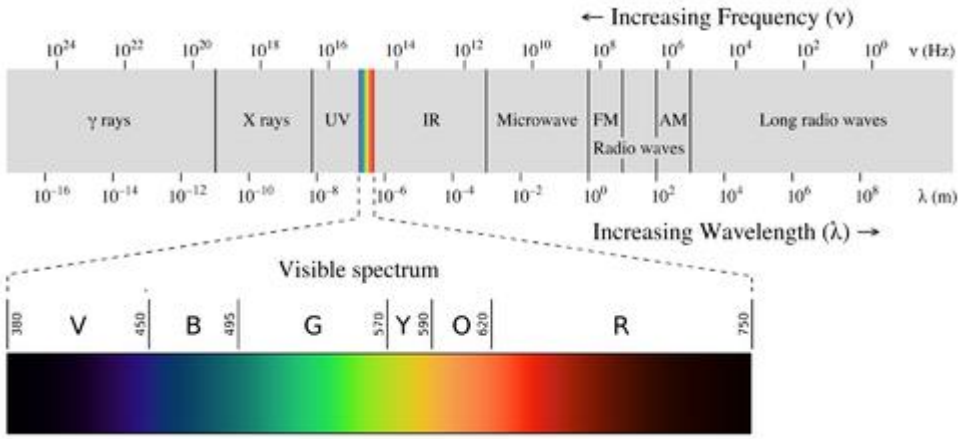
- stops microbial growth, but generally does not kill microorganisms
- keeps food fresh for several months.
- long-term storage of microbial samples

Flash Freezing: Does not kill most microbes.

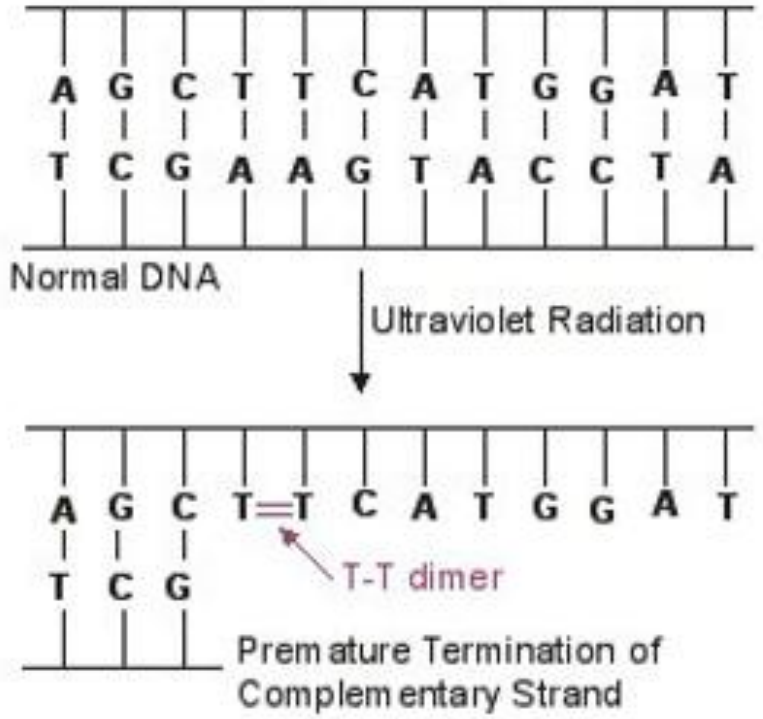
Slow Freezing: More harmful because ice crystals disrupt cell structure.

3. Radiation

Radiation is the emission or transmission of energy in the form of waves or particles through space or through a material medium



i) Ultraviolet Radiation : Radiations with wavelengths from 100 nm to 400 nm.
The microbicidal activity depends on the length of exposure and the wavelength of UV used.
The most cidal wavelength is 260 nm - 270 nm range



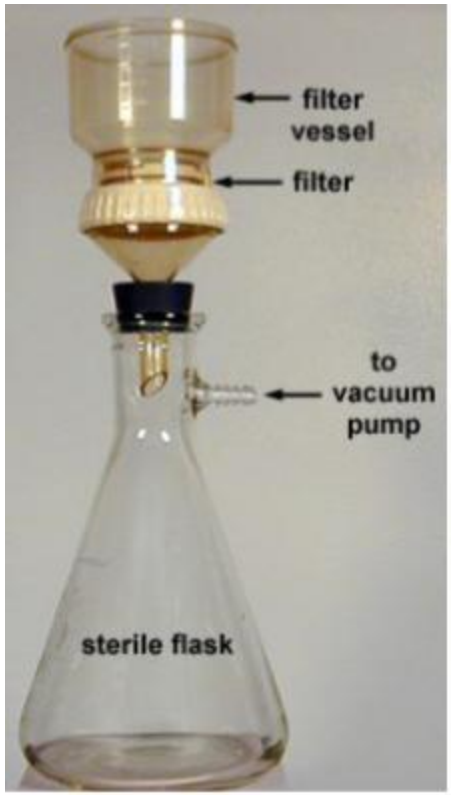
UV light causes forming thymine-thymine dimers.
- nucleotides do not complementary base pair with the thymine dimers and terminates replication
- causes mutation and faulty protein synthesis, blocking metabolism and the organism dies.
- Used to sterilize pharmaceuticals and disposable medical supplies. Food industry

ii) Ionizing radiation (X-rays and gamma rays**)**:
- much more energy and penetrating power than ultraviolet radiation.
- ionizes water and other molecules to form radicals
- disrupt DNA molecules and proteins.
- Used to disinfect operating rooms, nurseries, cafeterias

4. Filtration:

- A physical process
- remove microbes through a screen like material or filter with small pores.
- to sterilize heat sensitive materials like vaccines, enzymes, antibiotics, and some culture media.
- 0.22 and 0.45µm pores for most bacteria
- 0.01 µm pores for all viruses and some large proteins

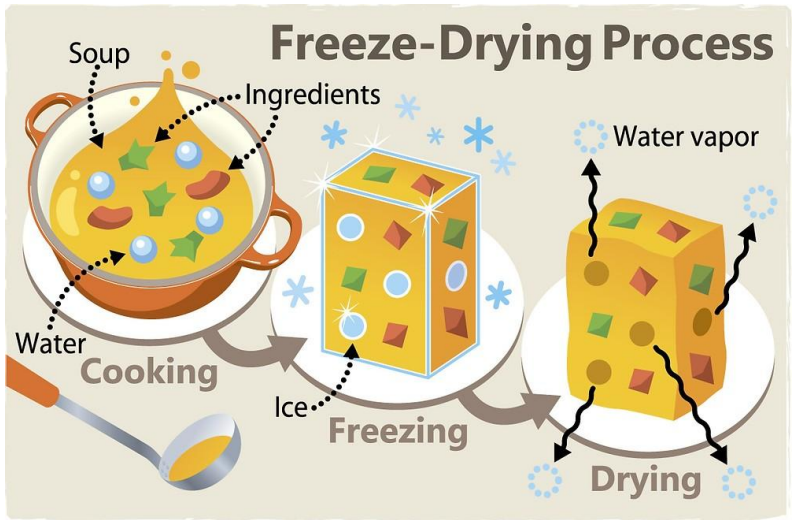
Membrane filter



High-efficiency particulate air (HEPA) filter

5. Desiccation or Drying

- Water removal
- static effect
- Susceptibility varies
- survives from about one hour (Neisseria gonnorrhea) to several months (Mycobacterium tuberculosis) to decades (Clostridium spp.)
- Viruses fairly resistant

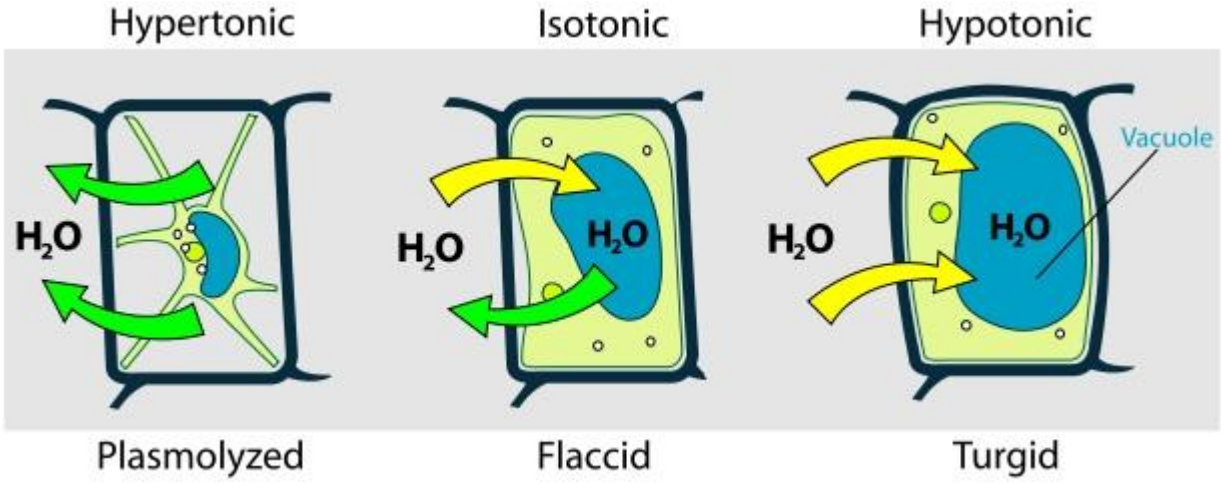


Endospore

6. Osmotic pressure

minimum pressure applied to a solution to prevent the inward flow of solvent across a semipermeable membrane.

- salts and sugars
- hypertonic environment
- plasma membrane shrinks or plasmolysis
- stops growing
- Yeasts and molds are resistant to high osmotic pressures



7. High Pressure

- used to kill bacteria, yeast, molds, parasites, and viruses
- 100 - 800 MPa sufficient to kill vegetative cells by protein denaturation,
- but endospores may survive these pressures.
- In food industry to maintain quality and shelf-life