**Growth phrase of bacteria**

The growth of bacteria can be define as an increase in mass of bacteria per unit volume of medium.

The bacteria divide by binary fission, that is, a division of 1cell to 2 cells.

In other way in suitable condition, bacteria reproduced by dividing themselves into two new cells .Within 20 to 30 minutes it divided into many this is known as binary fission.

Under various conditions of moisture, pH, nutrition & temperature, the growth of bacteria takes place.

Growth of bacteria is generally expressed by a curve in which there are 4 principal stages.

FIG --- Given in class

1. Lag phase – cell are prepared for division but **no cell division takes place.**
2. Log phase – In this phase the cell division takes place. It is also known as growth phase. Cell division is known as binary fission.
3. Resting phase – After rapid growth the cell multiplication get stagnant, due to the less nutrients & also the waste products.
4. Death phase – In this phase the cell death occurs due to toxic waste produced. If the medium is not change the bacteria will die.

**Factors effecting the growth of bacteria –**

**Intrinsic – Nutrition, pH, Osmotic pressure, Moisture**

**Extrinsic – Oxygen, temperature, light.**

**Each factors mentioned above affect the growth of bacteria individually. But the growth mainly depends on the combined effects of these factors.**

Nutrition –

 Food is food to human &microbes, be it carbohydrates, protein or fat. The nutritional requirements differ from species to species. (One microorganism to another.) The nutrition is required not only for the sources of energy but also for manufacturing the cellular components. Except carbohydrate, protein, fat some minerals are required such as – nitrogen,sulpher, iron etc.

Oxygen –

Presence of oxygen is another important factors.They are classified into 2 groups

* Aerobic - presence of oxygen
* Anaerobic – absence of oxygen.

 Mould yeast is aerobic & bacteria are both aerobic & anaerobic

Temperature –

 This is another factors.Process of growth of bacteria depends on the temperature. The temp. At which maximum growth occurs is known as optimul temperature. Biased on the temp at which maximum growth occurs are divided into three main categories –

* Thermopiles – the bacteria which grow rapidly between 45 to 65 degree.
* Mesophilies - the bacteria which grow rapidly between 20 to 45 degree
* Phychrophiles - the bacteria which grow rapidly at 0 degree & even below.

 Lactobasilus – thermophiles

 Streptoccous – Mesophiles

 Mould & yeast do not grow well above 35-37 degree centigrade.

pH (hydrogen ions concentration )

 This is an important factor. As every organism has a minimum, maximum,& optimal pH. PH scale extended from 0-14. The pH of water is neutral that is 7. The substance known as acidic whose pH is below 7 & Alkaline whose is above 7.

 Most of the bacteria prefer the pH near 7.Where as some bacteria is acidic or alkaline in nature. Yeast & mould are more acidic then bacteria.

Moisture – (water activity, a/w)

 water is important for living organisms. Organism contain 75-80% of water in cells . Organism needs the moist environment to grow. The water requirement is described in terms of water activities a/w . The a/w of pure water is 1.00.Most food borne pathogens required a/w to be greater than 0.9 for the growth & multiplication.

Osmotic pressure –

 Osmosis & its pressure is another important factors. Organisms are made up by cell membrane which allows water to pass in & out from cells. The tendency of cell membrane to allow water to passes through is to maintain the equilibrium or balance between the cellcontaint & its fluids surroundings.

Light –

 Visible light are some time good for photosynthetic bacteria. UV are some time harmful for bacteria even causes death.