Food Microbiology

*Microbiology is the study of microorganism. A microorganism is a microscopic form of life which like any living creature uses nutrients, eliminate waste products, grows, and reproduce. We cannot see them with unaided eye but they are responsible for food spoilage and food borne illness. Thry can be see under a microscope after they are magnified. Microorganism are ubiquitous (present every where). They are found in the air, soil, water, all surfaces, food and in all living being.

There are five groups of microorganism that are important in food microbiology these are:-

1. Virus

2. Bacteria

3. Fungi

4. Parasite

5. Algae

Virus

It is the smallest form of microorganism can only grow and reproduce inside the living cell. I.e they are strictly parasitic. They feed on living cell of plants and animals and are pathogenic. They are very minute in size, approximately one tenth to one hunderdth size of bacteria and can only see under electron microscope. They vary size from 0.015-0.2 micrometer.

Some common food borne infections caused by virus are hepatitis, poliomyelitis, influenza, common cold, mumps, mieasels and chicken pox.

Bacteria

Bacteria are microscopic unicellular organism of different shapes, sizes, and activity. Their sizes vary from 0.2um to 10ums and is one micometer on an average. They are identified on the basis of their morphology i.e shape, size, cell arrangement and special structure. Four shapes are observed : rod shaped, spherical shaped, spiral shaped, and comma shaped.

1. Rod shaped bacteria such as flagella, coliform bacteria may cause typhoid, decentry etc.

2. Spherical shape or round bacteria are called cocci. They exhibit the following arrangement :-

a) pairs of cocci called diplococcic

b) Chains of cocci called staphylococci. e.g bacteria causing sore throat.

C) Irregular cluster of cocci called staphylococci. e.g bacteria causimg staph food poisoning.

D) tetrads or cubes of four to eight cocci causing spoilage of food.

3. Spiral shaped bacteria also called spirilla cause disease such as syphilis.

4.Comma shaped bacteria also called vibrios, cause disease such as cholera.

Fungi

This group include the lower plants which laks chlorophyll and are mainly saprophytic. They are usally multi cellular but the plant body is not differentiated into root, stem, leave. They vary in size from small microscopic yeast to mushroom. Fungi include both yeast and molds.

Yeast

Yeast are single celled organism which require food, particularly carbohydrate, moisture for growth. They are found naturally in soil and dust. They are much larger in size than bacteria cells approximately 5-10micrometers and are oval, lemon shaped, elongated.

Molds

Molds are multicellular microorganism which are often seen fuzzy, velvety or powdery patches on the surface of food with low moisture content. Thry are 2-10 micrometer in diameter and severalilimeter in length. They can exist at almost any storage tempetatureunder almost any condition. Foods most suspect able to mold growth are bread, meat, fruit, jam, cheese etc.

Parasite

Parasite are microorganism which are dependent on living hostfor growth and reproduction. Parasite can be in the form of single celled animals in the case of prtozoa Entamoeba bistolytica which cause amoebic dysentery in humans or multi vellef animals such as intenstinal worm. e.g Taenia solium or pork tapeworm. They vary in shape and size from 2 micrometer to many feet.

Algae

Algae are both unicellular and multicellular organism found naturally in water. They contain chlorophyll and photosynthetic. They vary in shape and size from one micrometer to many feet. They are generally non pathogens although some may have unpleasant odour and alimy texture. Unicellular algae are of importance in water purification and sewage treatment plant. They are also important as primary producer of food for aquatic environment.

Factors affecting growth of microbes:

1. Food

Microorganism use our food supply as a source of nutrients for growth. Since bacteria, yeast and mold are saprophytic they need a source of carbon and nitrogen as well as growth factor and trace elements to grow and multiply. When the food supply gets exhausted or conditions get unfavorable the bacteria form spores or die.

2. Warmth

Microorganism grow and multiply best in the temperature range between 5°c to 63°c. This temperature range is called danger zone. Microorganism are destroyed if exposed to temperatures above 63°c and below 5°c for several minutes. On the basis of temperature required for growth they are classified as:

a) Psychrophilies: Microorganism having an optimum temperature below 20°c. eg Pseudomonoas which grows at refrigeration temperature.

b) Mesophiles: Microorganism having an optium temperature between 20°c to 45°c. e.g human pathogens which grow best at human body temperature and cause disease such as typhoid, bacillary dysentery and most latic acid fermenting bacterialike lactobacilli are mesophiles.

c) Thermophilies: Microorganisms having an optimum temperature above 45°c eg spore forming Microorganism such as bacillus and clostridum can cause food poisoning and food spoilage.

Mosture

All microbesneed water in the air to grow. Water acvounts for a large percentage of the weight of the microbial cell. Salt and sugar when present in water bind the water making it unavailable for microbes to grow. In general bacteria need more moisture than fungi and growth of moisture does not depend on total moisture but it depend on availablr moisture on food.

Time

Microorganism need time to grow to numbers, large enough to harm us. When the environment is favorably in terms of temperatures, moisture and food they multiply rapidly and in short span of time they are in large enough to cause spoilage or illness. Food which is consumef as soon as it is cooked has lesser chance of Foodborne illness.

pH level

Most Microorganism prefer aneutral pH value to grow and multiply. Molds and yeast grow better in an acidic medium of pH 4 to 4.5 as compared to bacteria. In general foods with an acidic pH have a better shell life as compared to foods with a near neutral pH. Acids such as acetic and citric are added to preserve food.

Osmotic pressure

The osmotic pressure of food depend on the kind and amount of solute. eg salt and sugar dissolve in it. Bacteria cannot grow in higher concentration of sugar or salt where as yeast and mold can grow at high pressure. This is the reason for yeast and mold spoilage seen in preserves such as jam and pickles.

Oxygen

On the badis of oxygen requirement Microorganism are classified as aerobic, anaerobic and faculative organism. Oxygen is needed for all aerobic Microorganism. Anaerobic Microorganism do not need oxygen. Facultative Microorganism can respire aerobically or anaerobically.