

Meat Spoilage

Meat spoilage is the deterioration of meat caused by microorganisms or other factors, so that it becomes unfit for human consumption.

Mainly, there are two types of meat spoilage:

1. Spoilage by microorganism
2. Spoilage by improper handling

Spoilage by improper handling

- **Oxidative rancidity:** caused by oxidation of meat fat due to improper storage conditions.
- **Brown or grey discoloration:** caused by protein denaturation due to heat, salt, UV light, low pH, surface dehydration.
- **Dehydration and discoloration:** caused by freeze burn and drip loss during freezing of meat.
- **Absorption of off flavor:** occurred due to storage of meat next to fruits and vegetables.

Spoilage by microorganisms

When large numbers of undesirable microorganism are present in meat, there will be chemical and biochemical changes in the food and the food becomes unappealing to human senses and not suitable for consumption.

Some examples of microbial spoilage are:

- **Production of ammonia and sulphur like smell:** caused by degradation of proteins, lipids, carbohydrates etc. by the action of bacteria and enzymes naturally present in meat.
- **Slime formation, bad odor, rancid flavor and color change:** caused by bacterial growth and yeast.
- **Sticky meat surface:** caused by mold growth.
- **Whiskers** (growth of filaments): formed by mold spoilage.
- **Surface discoloration:** due to colonies of molds.
- **Putrefaction:** due to growth of anaerobic bacteria.

Food Poisoning

Food poisoning is the ingestion of contaminated food containing either live microbes that produce toxins in the gastrointestinal tracts of susceptible person or chemical formed toxins, causing the individual to become ill.

Two types of food poisoning:

Food-Borne Infection: Food-borne infection takes place when microorganisms are ingested from food, and then continue to grow in the gastrointestinal tract, causing susceptible persons to become ill.

Food-Borne Intoxication: Toxic compounds in food may come from chemical contamination or be preformed by toxigenic microorganism. When these toxins are consumed, susceptible persons will become ill.

Food-Borne Outbreak: Food borne outbreak is the consumption of contaminated food from one source by two or many people who later become ill.

Food-Borne Disease Cases: A food borne disease case is the consumption of contaminated food by one susceptible person who later become ill.

Endemic: An endemic occurs when a particular illness affects an entire community.

Epidemic: An epidemic is an unusually large number of cases of a particular illness from a single source in a community.

Pandemic: A disease is said to be pandemic when it affects the entire world.

Epidemiology: Epidemiology is the study of diseases in a population using statistical methods.

Etiologic Agent: An etiologic agent is the agent that caused by specific disease.

Some examples of food poisoning are:

- Clostridium botulinum -----Canned meat
- Staphylococcus aureus-----Cooked meat
- Clotridium perfringens-----Cooked meat which allow to cool slowly
- Slamonella-----Cooked meat that come to contact with raw meat

Factors affecting the growth of meat spoilage microorganism

Following are some important factors that affect the growth of meat spoilage microorganism:

1. Temperature
2. Moisture and osmotic pressure
3. pH
4. Oxidation-reduction potential

Temperature

- Temperature is the single most important factor with affect the growth of meat spoilage microorganism. Broadly, higher the temperature, higher will be the growth of microorganism.
- On the basis of temperature, microorganisms can be divided into three types:
 - Psychrophiles
 - Mesophiles
 - Thermophiles
- In case of meat, at low temperature, under aerobic conditions, prominent microorganism causing meat spoilage are pseudomonades, while under anaerobic conditions spoilage is caused by lactobacilli.
- The effect of temperature also varies depending upon the nature of nutrients. Lactobacilli need phenylalanine, tyrosine and aspartic acid amino acids to grow at 39°C; while at 37°C requires phenylalanine and tyrosine and in the absence of these amino acids, it grows at 26°C.
- Meat from animals grown in tropical areas has small percentage of microorganisms as compared to the grown in temperate zones.
- Thawed meat would pick more microorganism or growth of microorganisms will be more in thawed meat as compared to fresh meat.

Moisture and Osmotic Pressure

- Water activity of meat is 0.99. Optimum water activity for microbial growth is 0.995, so meat is liable to spoilage by growth of a wide range of microorganisms.
- Optimum water activity for bacteria is 0.75 and for yeast and mold is 0.67.
- The availability of moisture is complementary to that of osmotic pressure which is the function of concentration of solute in aqueous medium.
- High concentration of solute tends to inhibit the bacterial growth.
- In general, mold and yeast can tolerate higher osmotic pressure than bacteria.

pH

- pH of meat depends on the amount of lactic acid produced from glycogen.
- In fresh meat, bacterial can grow at high pH especially in the deeper areas which are slow to cool causes bone taint.

Oxidation-reduction potential

- The greatest rage of change in oxidation-reduction potential occurs immediately after death and is due to removal of last traces of oxygen
- The effect of this on microbial growth is to prolong the initial lag phase.
- According to oxygen demand, there are four types of bacterial.
 - Obligate aerobic
 - Facultative aerobic
 - Obligate anerobic
 - Facultative anerobic