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Lecture 4 : preservation of meat

Successful feeding in countries unable to rise all their own food which has been possible only by the improvements in methods of food preservation and transportation. as a result of the improved methods of preservation and transportation, our diet has become more varied and better balanced. perishable foods have been made available the year round instead of only seasonally , the preparation of meals has been made easier and food in general are being produced in a cleaner and more sanitary manner than previously .

The primary purpose of food preservation is to retard spoilage. it is customary to use the term preservation to include the retardation or prevention of changes in flavor , odor , texture , appearance and nutritive value of the food . whether food spoilage is mild to extreme , the primary cause is the action of microorganisms (bacteria , molds or yeast) that can survive and developed under particular environmental conditions . moreover , food spoilage can also occur due to autolytic changes including enzymatic , chemical and physical actions .

The main principles of all food preservation methods is to create unfavorable conditions (extreme heat or cold , deprivation of water and sometimes oxygen , excess of saltiness or increased acidity) to the growth or survival of spoilage organism or destruction of such organisms .

The methods of food preservation are classified into two main categories .

1- include methods for preservation of microbial decomposition **(bactericidal methods**) as canning and irradiation , as well as methods of hindering the growth

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and activity of microorganism (bacteriostatic methods) as chilling , freezing , drying , curing , smoking and use of chemicals .

2- it depends on the prevention or delay of **self-decomposition of food by destruction or inactivation of enzymes (blanching) ,** prevention or delay chemical relations (antioxidants) , and prevention of damage because of insects , animals and mechanical causes .

For successful preservation of meat , it is essential to manage all animals correctly on the farm during transportation and in the lairage to ensure the supply of clean healthy animals to the meat plant and that the operations in the meat processing plants are carried out in a good manner . the meat from animals properly handles and processed will have a low PH value which will aid in the preservation process .

With any method of preservation , it is essential to evaluate the effect on product quality , any health hazards involved for food handlers and consumers , the methods possible misuse , distribution of the methods commercial applications .

Growth curve of microbial culture .

Whenever microorganisms are added to a food and the conditions are favorable , the organisms will begin to multiply and pass through a succession of phases , **which include …**

1- the initial 'lag' phase (during which there is no growth) .2- logarithmic "exponential" phase (during which the rate of multiplication is rapid and constant) .

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3- stationary phase (during which the number of microorganisms decrease) .

Lengthening , as much as possible of the lag phase is of special importance in food preservation . this can be accomplished by reducing the contamination (the fewer organisms present , the longer will be the lag phase) . avoiding the addition of actively growing organisms from the logarithmic growth phase , applying one or more unfavorable environmental conditions (the greater the number of these conditions that are unfavorable . the longer will be the delay of the imitation of growth) . and actual damage to organisms by processing methods such as heating or irradiation .

The generation time of microorganisms vary with the environmental conditions e.g. type of food , ph. , temp. , oxidation-reduction potential , available moisture and presence of inhibitors .the generation time shorter as conditions become more favorable and lengthens as they become less favorable . any change in the environmental conditions that will extend the generation time will lengthen the keeping time of the food . if we start with a single cell , and if it divides every 10 minutes , there will be about a million cell in 3 hours , but only about 1000 cells if the generation time is 20 minutes , and only 32 cells if it is 40 minutes . this emphasizes the importance of avoiding contamination of food with microorganisms that are in the logarithmic phase of growth because their generation time is the shortest .

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Physical changes in stored meat .

Meat undergoes certain superficial changes as a result of storage , chief of which are shrinkage , sweating and loss of bloom .

Shrinkage :

Or loss of weight occurs as a result of evaporation of water from the meat surface carcass cut into quarters dissipate water vapor rapidly and continuously , and retail joints even more . a freshly killed carcass dissipates body weight slowly , losing 1.5-2% of water by evaporation during the first 24 hours of hanging .

Sweating :

This denotes the condensation of water vapor on meat brought from a cold store into ordinary room temperature . the condensation occurs because the cold refrigerated carcass lowers the temp. of air to below the dew point .

Loss of bloom :

Bloom is defined as the color and general appearance of a carcass surface when viewed through the semi transport layers of connective tissue , muscle and fat which from the carcass surface .

Chemical changes in stored meat .

The chemical changes that take place after slaughter are indicative of a slight degree of breakdown in protein , due either to endogenous enzymes or to those of microorganisms , the odor of meat becomes progressively more marked but never disagreeable . the storage life of meat is more dependent on the chemical changes that take

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place in fat rather than in muscle , for fat rancidity , even in slight degree , is objectionable .

Drying :

Drying as such plays only a minor role in preservation today , the whole vast process of refrigeration is largely based on the principles of drying , e.g. the removal of water available for microbial growth . aging , salting largely owes its preservatives action to the extraction of water by osmosis . drying is not a commercial preservation method but is chiefly used by those who require a protein diet of great durability and lightness .

Meat curing :

While curing may be applied to all kinds of meat . it is adapted to those with a high fat content e.g. pork or fine-fibred beef intermixed with fat . and it is for this reason that brisket and flank of beef make high-quality pickled meat . on the other hand , lean beef , veal or mutton become dry and unpalatable on pickling . salt is the principle preserving material used in curing on a commercial scale , though it appears to have a little directly harmful effect on bacteria .

Distinction must be made between salted meats (beef , pork) and cured meats (bacon , ham , corned beef) . in salted meats the dry salt first dissolves in the surface fluid and then passes slowly inward until it is evenly distributed throughout the meat substances .

Curing may be defined as the addition of salt (NaCl) and nitrate or nitrite or nitric oxide to the meat . which results in conversion of the meat pigments , predominantly myoglobin to the nitroso or cured form . myoglobin in

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freshly cut uncured meat is in the reduced form (purple) which in contact with air is rapidly oxygenated to oxymyoglobin , which is bright red and responsible for the bloom on meat .

Smoking :

The purpose of smoking bacon is to preserve color and flavor of meat . the bacon is dusted with pea meal prior of smoking , which enhance the smoked appearance , the smoke is produced in room so constructed as to emit a cool smoke .

Cold :

The cold method , the basis of the great industry of refrigeration , is the simplest for the preservation of food efficient refrigeration can preserve meat in a condition approaching its natural state for periods adequate for commercial requirements , its appearance , weight and flavor are little altered and no substances is added to the meat nor any extracted .

Abattoir's should have sufficiently large chilling or refrigerating rooms lay down that ….

1- meat must be chilled immediately after post-mortem inspection and kept at a constant temperature of not more than 7C° for carcass and cuts and 3C° for offal's .

2- cutting plants must have cooling equipment in the cutting rooms to keep meat at a constant internal temperature of not more than 7 C° .

3- cutting plants must have a thermometer in the cutting rooms .

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4- during cutting the temperature of building must not exceed 10C° . in recent years emphasis has been placed on shorter chilling cycles and lower temperature .

Quick chilling for the following reasons …..

1- both time and building space are saved and higher rates of product handling are achieved overhead in labor are reduced and capital investment in building minimized .

2- the meat is said to have a better keeping quality because lower air temperature usually below -3C° initially , retard the rate of bacterial growth on the surface of carcass where their concentration is most pronounced .

3- shrinkage of meat is reduced substantially an important factors .

4- the bloom is said to be enhanced by quick chilling .

Good Luck