Heat Treatment of milk:

Milk is heat treated to kill many of m.o present in raw milk & this heat treatment makes the milk safe to drink & extends the potential shelf life.

Several different forms of heat treatment are used.

These are :--

1—Pasteurization:--

Purpose of pasteurization:

A—public Health aspect

To make milk &milk products safe for human consumption by destroy all bacteria that may be harmful to health .

B—Keeping Quality aspect

Pasteurization can destroy some undesirable enzymes & many spoilage bacteria , shelf life can be 7,10,14 or up to 16 days.

Pasteurized milk is milk that has been heat treated by one of the following minimum temperature &time

combinations to killed all pathogenic m.Os especially Mycobacterium tuberculosis & Coaxial burnetii .

1—By the (Holding Method)(Low Temp Long Time)(LTLT)

63C and not more than 65C/at least 30 minutes & than immediately & rapidly reduced to 4C or less & maintained at that temperature with protection from contamination until the milk is removed from the premises(building) for delivery .

2—By the (High Temp Short Time method (HTST))

73C/ at least 15 seconds& rapidly reduced to 4C or less & maintained at that temperature with protection from contamination until the milk is removed from the premises(building) for delivery .

3—By the High Temperature Method(Flash method)

85C & quick cooling to 4C or less & maintained at that temperature with protection from contamination until the milk is removed from the premises(building) for delivery .

The heat destroyed bacteria &rapid cooling prevents the remaining bacteria from multiplying .

2—UHT Milk:(Ultra High Temp or Ultra—Heat Temp)

(Ultra Pasteurization)(135C/2.5seconds)

3—Sterilization(In –bottle sterilization)(Long-life milks)

The term Sterilized is used to describe milk that has been subjected to temp in more of 100C & packed in airtight (محكمة السد)containers .

4—Boiling

Boiling of the milk in temp.morethan(100C)mean(100.7C) to kill all pathogenic m.o except spore forming bacteria especially those related to genus Bacillus.

Source of microorganisms in raw milk:

Initial number & types of m.o in fresh milk deepened on primary ones being:--

1—Udder & teat(interior & exterior condition).

2—Milking equipment & utensils.

3—Environment .

4—Milker & milk handles .

5—Water supplies .

6—Subsequent storage & transport condition .

Microbial number will increase if proper cooling (refrigeration) is not practical.

1—Internal contamination

Mean secretion of milk from udder containing pathogenic m.o & most important source are :

A—Udder B—Blood

2—External contamination

Mean secretion of milk from udder which is free from pathogenic m.o & contaminated during it is product or transported it or during most important source are:

A—Diseased animal B—Diseased milkier
C—Milking utensils D—farm water supplies
E-- Atmosphere contamination F—Insect,flies&rodents

G—Storage & transport

Sterilization:

Mean kill pathogenic & non pathogenic m.o which are contaminated different substance.

Disinfectant:

Mean killing only pathogenic m.o& their spores which are contaminated different substance of environment & human body & animal .

Cleaning:

Is remove organic & inorganic soils

Sanitizing:

Is destroy most of bacteria

Microbiological of dairy milk:

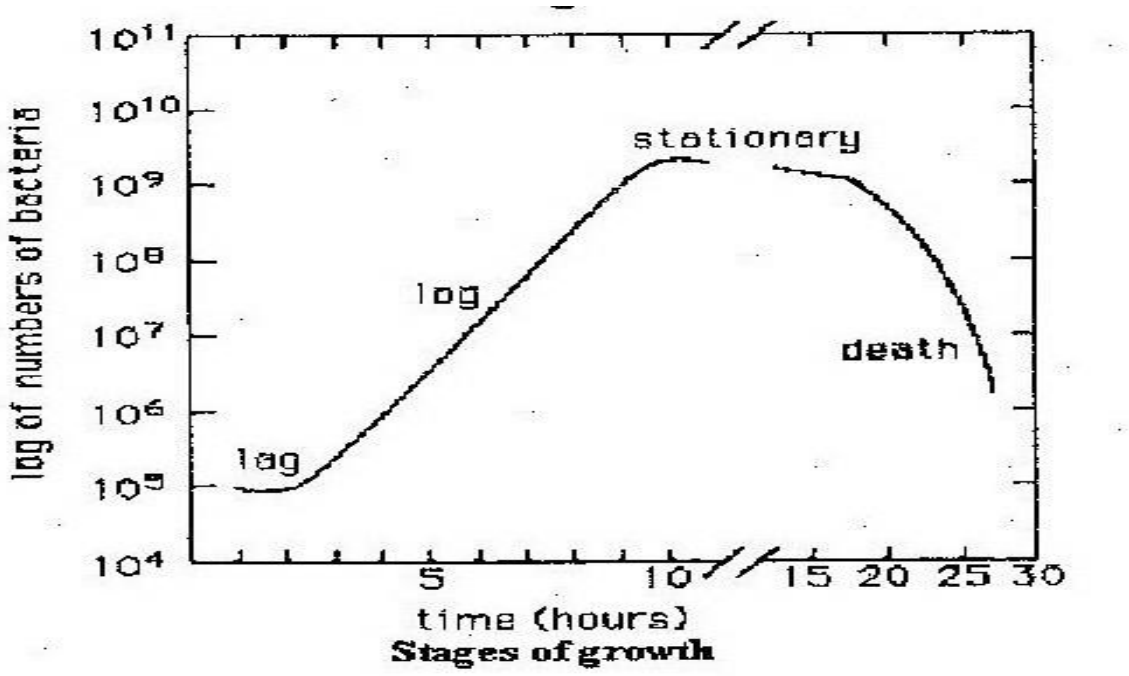
Stages of growth of bacteria:-

1—Lag phase طور التأقلم

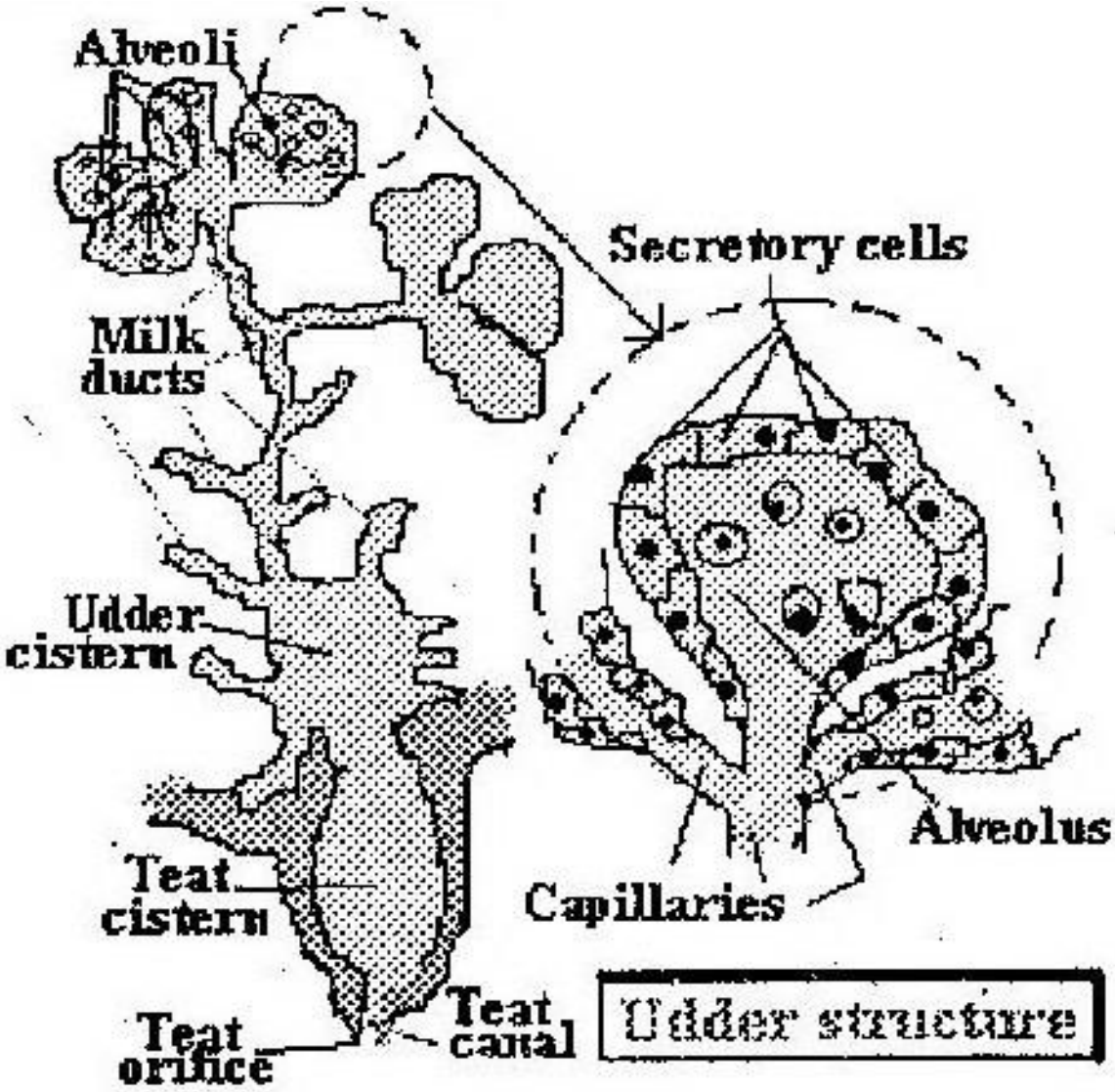
2—Log phase طور التكاثر

3—Stationary phase طور الثبات

4—Decline or Death phase طور الانحدار او الموت



Stages of growth



Udder structure

Important factors affecting growth bacteria:

1—Nutrients (Bact.lipolytic &protolytic enzyme)

2—Hydrogen ion(PH)

3—Temperature

Bacteria can be divided into:-

A—Thermophiles(Thermophilic) bacteria(Heat loving):

Bact.which survive & can grow in pasteurization at (55C—65C).Those organisms are usually (Bacillus , Clostridum) .

B—Thermoduric (Heat tolerance):

Bact. Survive pasteurization but cannot grow at pasteurization temperature(73c),often end spore (aerobic &anaerobic spore formers).

C—Mesophiles (mesophilic) are those bacteria in which optimum growth occure between(2oC & 45C)they usually can grow in or survive temp.between 10C & 50C . All animal pathogens are in this group .

D—Psychrophiles(Psychrophilic)(Cold loving):

Bacteria can grow at 15C(Pseudomonus,Flavobacterium ,Achromobacter & Alcaligenes) .

E—Psychrotrophs(Psychrotrophic)(Cold tolerant):

Bacteria can grow at low temp(OC—5C) but with optimum above (15C) .Psychrotrophic organisms are specifically important in spoilage of refrigerated dairy products & are very often(G—Ve)bacteria .

4—Water activity(aw):

Water is essential for the growth of microbial cells .It is not nutrient ,but it is needed to transport nutrients into & waste products out of the cell.

5—Oxygen requirements:-

a—Aerobic (+O2)

b—Anaerobic(--O2)

C—Facultative anaerobic (_+ O2)

d—Micro aerophilics (+<20% O2)

Effect of non –pathogenic organisms in milk:

Fermentation of milk:

Immediately after milking place or put an ordinary sample of milk in shallow dish(صحن مسطح) at room temp.(21C—27C)different changes usually will take place in this milk ,these changes some time called:

Normal fermentation of milk:--

It may be divided into four phases(stages or peroids) as follows:

1—Germicidal phase(Antimicrobial system in milk)

There is no growth of bacteria & microbial number does not increase & this phase take place (3hrs).There are different level of natural inhibitors substance which resistance normal development of normal bacteria & some time these substance are produced from infected m.o or compartment with disease resistant .
Such these natural inhibitors (Immunoglobulin ,complement ,Macrophage ,lactoferrin ,lysozyme , lacto peroxidase & vitamins –binding protein & fatty acid) .

2—Souring phase (growth of lactic acid bacteria(LAB)

In this phase lactic acid bacteria growth at faster rate &these over growth other microflora & curdle milk by lactic acid production.

Initially Streptococcus lactis produce 1% acidity(T.A) while Lactobacillus casei (more acid tolerant) rise acidity to 2%.

3—Neutralization phase(growth of yeasts&molds)

Due to dominant acidic condition, the bacterial population is either killed or inhibition ,however certain lactose fermenting yeast & mold like(Geotricum or Aspergellus or pencillium) will be grow on the surface of curdled milk & convert lactic acid into CO2& H2O so there be redorucing acidity & produce Alkaline with thick mud of mold often may be observed on surface of milk .This process may involve Several days.

4—putrefactive phase(Decomposing bacterial flora)

Lower of acidity due to fungal growth allow to multiplication of proteolytic m.o(spore-former) decomposed protein(casein) to produce off flavor & liquefied coagulate to seperate (water) from solid mass.

Effect of pathogenic organism in milk:

Abnormal change in milk:

1—Carbohydrate degradation.

2—Acid & gas fermentation.

3—Lipolysis. 4—Proteolysis. 5—Sweet curdling.

6—Ropiness(Ropy or slimy)milk. (Alkaligenus pysccolactes)

7—Alkalin production .

8—Alcohol fermentation . Decomposition of the Carbohydrate & produce alcohol .

9—Flavor changes (off—flavor)(malty or fruity flavor).

10—Colored changes.

Pseud.syncyanea(yellow) ,Bervibacteria erythrogenous(red).

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