Pasteurization

❑ **Review:**

➢ It is a thermal process used to reduce microbial growth in food.

➢ The principle of pasteurization is heating a food, usually liquid to a specific temperature for a specified period of time, and then cooling it immediately.

➢ Used mainly for milk, fruit juices and beer.

➢ Unlike sterilization, pasteurization is not intended to kill all microorganisms in the food, instead pasteurization aims to <u>reduce</u> the number of viable pathogens so they are unlikely to cause diseases but it requires additional preservation method to extend shelf life (example: refrigeration).

➢ The process of pasteurization was named after Louis Pasteur who discovered that spoilage organisms could be inactivated in wine by applying heat at temperatures below its boiling point. The process was later applied to milk and remains the most important operation in the processing of milk.

➢ **Purpose of Pasteurization:**

There are two distinct purposes for the process of milk pasteurization:

<u>(A)</u> **Public Health Aspect**:

1. Reduces microorganisms in milk.
2. It makes the milk safe and healthy for consumers.
3. Minimize food borne diseases.

 (B) Keeping Quality Aspect:

1. Improves the quality of milk.
2. Pasteurization can destroy some undesirable enzymes and many spoilage bacteria.

3. Increase storage life of milk and milk products without being spoilt (extent shelf life).

➢ **Types of pasteurization**

1. Low temperature long time (LTLT):

• Heating at 63°C for at least 30 minutes.

• Is favorable because:

➢ It is less likely to change flavor and nutrient composition.

➢ It is more effective against resistance bacteria such as *Coxiella* and *Mycobacterium.*

2. High temperature short time (HTST) pasteurization:

• Heating at 72°C for at least 15 seconds.

➢ **Factors affecting pasteurisation:**
• Types of food.
• pH of the products.
• Particle size.
• Equipments used.
• Methods used.

➢ **Methods of Bacteriological Examination of milk**:

Different Methods Can be used to examination of microorganisms in milk as fallow:

1. Viable bacterial count / Standard plate count (**SPC**).

2. Laboratory Pasteurization count (**LPC**)

3. Counting coliform bacteria (Coliform Plate Count (**CPC**)

4. Direct microscopic count.

1. Viable bacterial count / Standard plate count (SPC):

- Determined by either pour plate or spread plate count method.

- Permissible number of bacterial flora in pasteurized milk is 5×10^4 cfu/ml.

- Permissible number of bacterial flora in long life milk is 10 cfu/ml.

❖ Using Raw Milk   (SPC_R).

❖ **Procedure:**

  1. Collect samples of raw milk aseptically in sterile bottle.

  2. Prepare serial dilution of sample.

  3. Using spread plate method inoculate plates with 0.1ml of the dilutions (the dilutions 10^{-2}, 10^{-3} are recommended).

  4. Incubate the plates at 37^oC for 24 hrs.

2. Laboratory Pasteurization count (LPC):

- Is performed in the laboratory to detect high level of thermoduric bacteria in raw milk.

Procedure:

  1. Place raw milk sample in water with a constant temperature at 63^oC for 30 minutes.

  2. Put the sample immediately on ice.

  3. Prepare serial dilution of sample.

  4. Using spread plate method inoculate plates

   with 0.1ml of the dilutions (the dilutions 10^{-2}, 10^{-3} are recommended).

  5. Incubate the plates at 37^oC for 24 hrs.
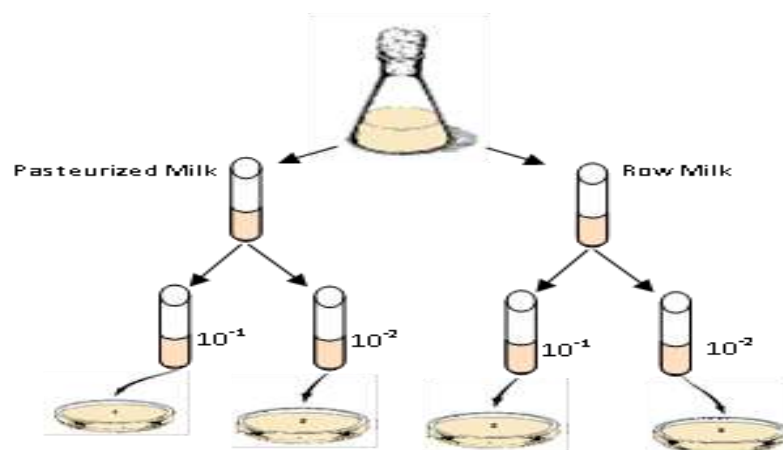
3. Counting coliform bacteria (Coliform Plate Count (CPC):

❖ **Procedure:**

1. Prepare Violet Red Bile Agar (V.R.B.A) medium.

2. Pour some of the medium and wait until it solidified.

3. Inoculate one of the samples then add the medium again to form anaerobic condition.

4. Incubate the plate at $37^{o}C$ for 24hrs.

5. Count the coliform bacteria.

➢ **Results:**

Number of bacteria/gram = number of colonies $\times$ 1/ dilution factor $\times$ 1/ weight (or volume) of sample

Product:	Bacterial Limit
❖ **Raw Milk**	SPC/1ml = 200,000-400,000 cfu/ml
	CPC/1ml = 50-150 cfu/ml
❖ **Pasteurized Milk**	SPC/1ml > 20,000 cfu/ml
	CPC/1ml = 5 cfu/ml

Results:

1. Compare between bacterial counts of raw milk with low pasteurized milk.

2. Calculate kill percentage of pasteurization efficiency by using the following formula:

$$\text{P-E} = \frac{SPC_R - LPC}{SPC} \text{ x } 100\%$$