# FOOD TECHNOLOGY

## UNIT V

## DAIRY PRODUCTS

## BUTTER

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# Butter Definition

## As per FSSAI (2011)

**Butter** means the **fatty product** derived exclusively from milk of **cow** and/or **buffalo** or its products principally in the form of **water-in-oil** type of an **emulsion.**

## Characteristics:

- Product may be with or without added **Preservative** (Common salt), starter cultures of harmless lactic acid and/or flavour producing bacteria and **Colouring matter** (Annato and Carotene).
- It should be **free from animal oil, wax, and mineral oil.**
- It shall have **pleasant taste, free from off flavour** and **rancidity.**
- It shall conform to the **microbiological requirements** of the regulation.

# FSSAI standards for butter

| Product | Moisture | Milk Fat | Milk solids not fat | Common salt |
|---|---|---|---|---|
| Table Butter | 16.0% (w/w, max.) | 80.0% (w/w, min.) | 1.5% (w/w, max.) | 3.0% (w/w, max.) |
| Desi butter | --- | 76.0% (w/w, min.) | --- | --- |

| Microbiological parameters | Count |
|---|---|
| Total plate count | 10,000/g |
| | 50,000/g |
| Coliform count | 10/g |
| | 50/g |
| E.coli | Absent/g |
| Salmonella | Absent/g |
| Staphylococcus aureus | 10/g |
| | 50/g |
| Yeast and mould count | 20/g |
| | 50/g |
| Listeria monocytogenes | Absent/g |

# Permitted food additives in butter as per FSSAI

| Additive | Quantity |
|---|---|
| **Colours (natural: singly or in combination)** | |
| Curcumin | 100 ppm max |
| Beta carotene | 100 ppm max |
| Carotene (natural extract) | 100 ppm max |
| Annatto extract on bixin/nor bixin basis (50:50) | 20 pm max |
| Beta apo-8 carotenal | 35 ppm max |
| Methyl ester of beta apo-8 carotenoic acid | 35 ppm max |
| **Acidity regulators** | |
| Sodium and calcium hydroxide | 2000 ppm max |

# Butter Definition

**As per CODEX**

**Butter** is a **fatty product** derived exclusively from **milk** and/or products obtained from milk, principally in the form of an **emulsion** of the type **water-in-oil.**

**Permitted ingredients:**

- **Sodium chloride** and food grade salt
- **Starter cultures** of harmless lactic acid and/or flavour producing bacteria
- **Potable water.**

# Butter Composition

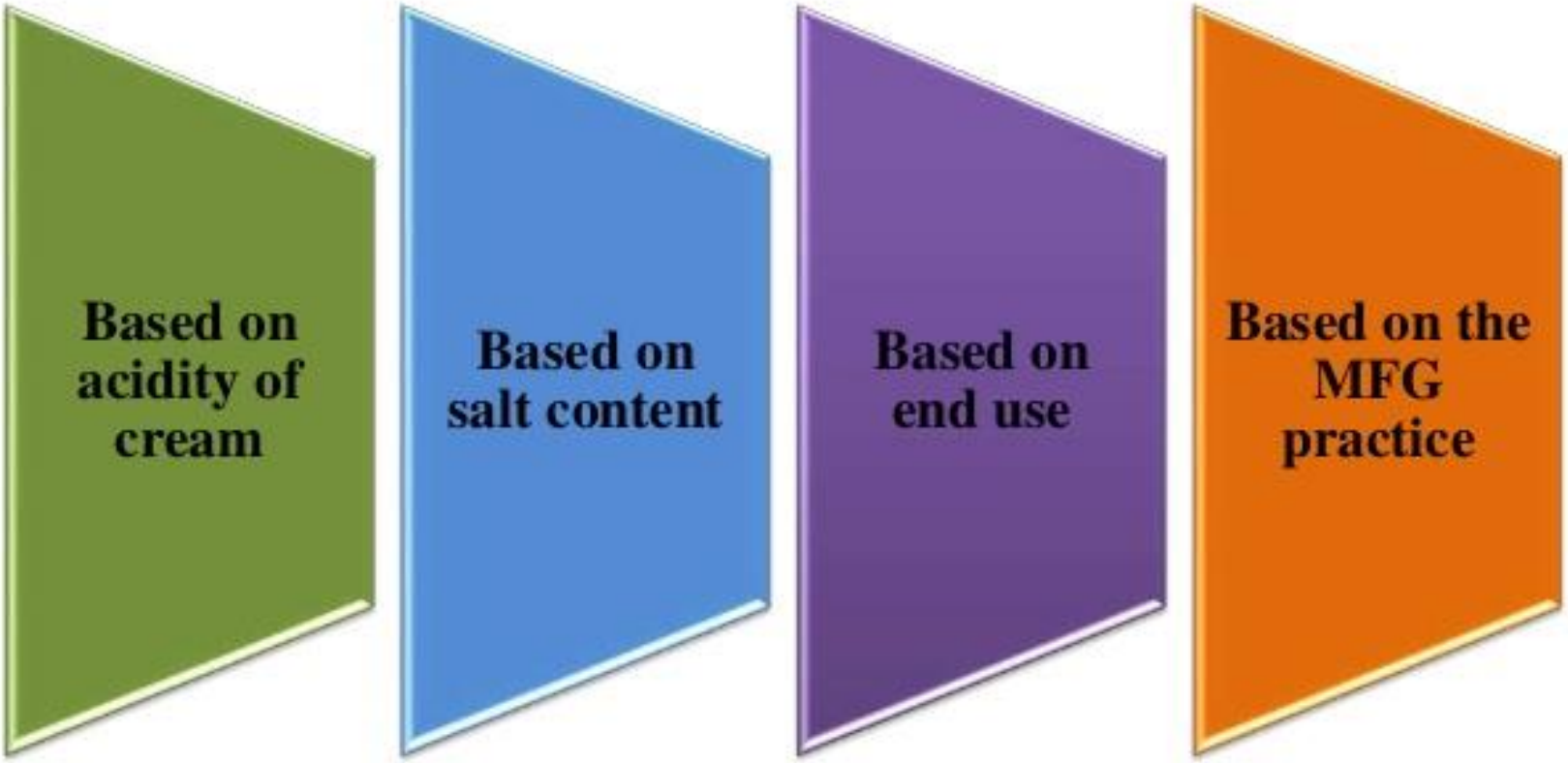
**As per CODEX**

Minimum milk **fat content 80%**

Maximum **water content 16%**

Maximum milk solids-not-fat **(SNF) content 2%**

# CLASSIFICATION OF BUTTER



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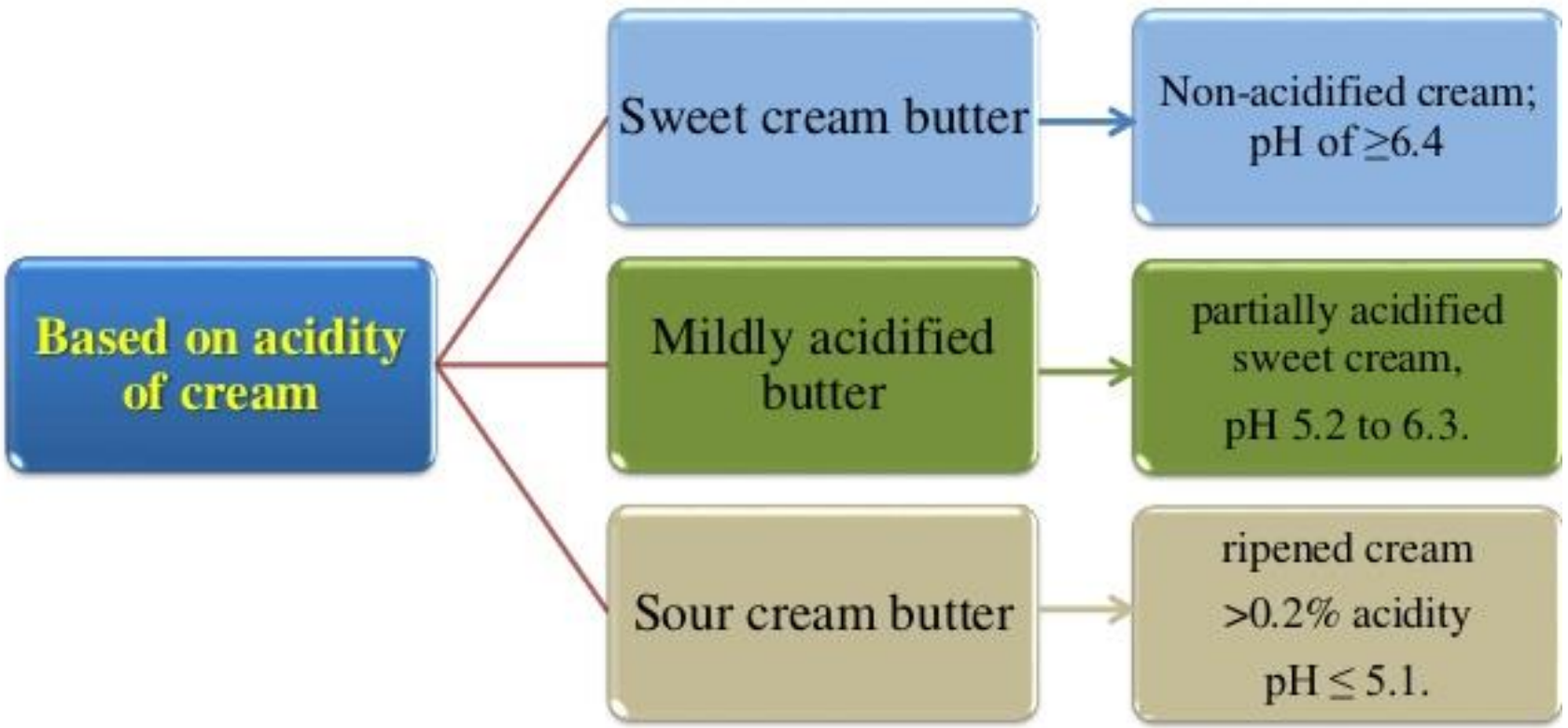

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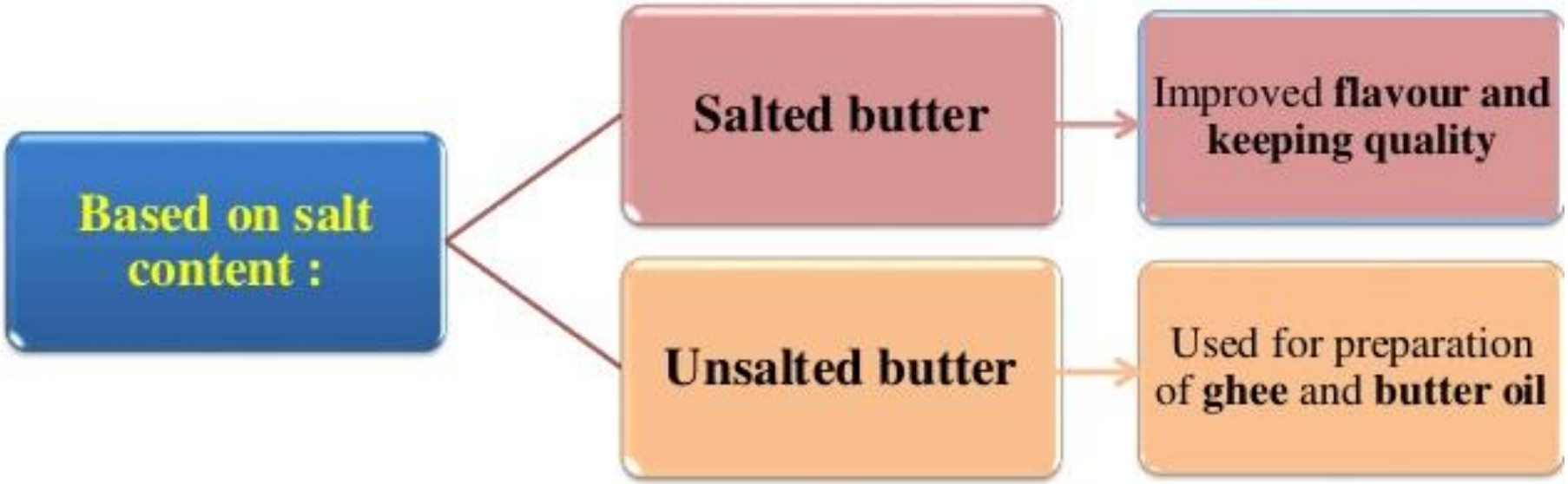


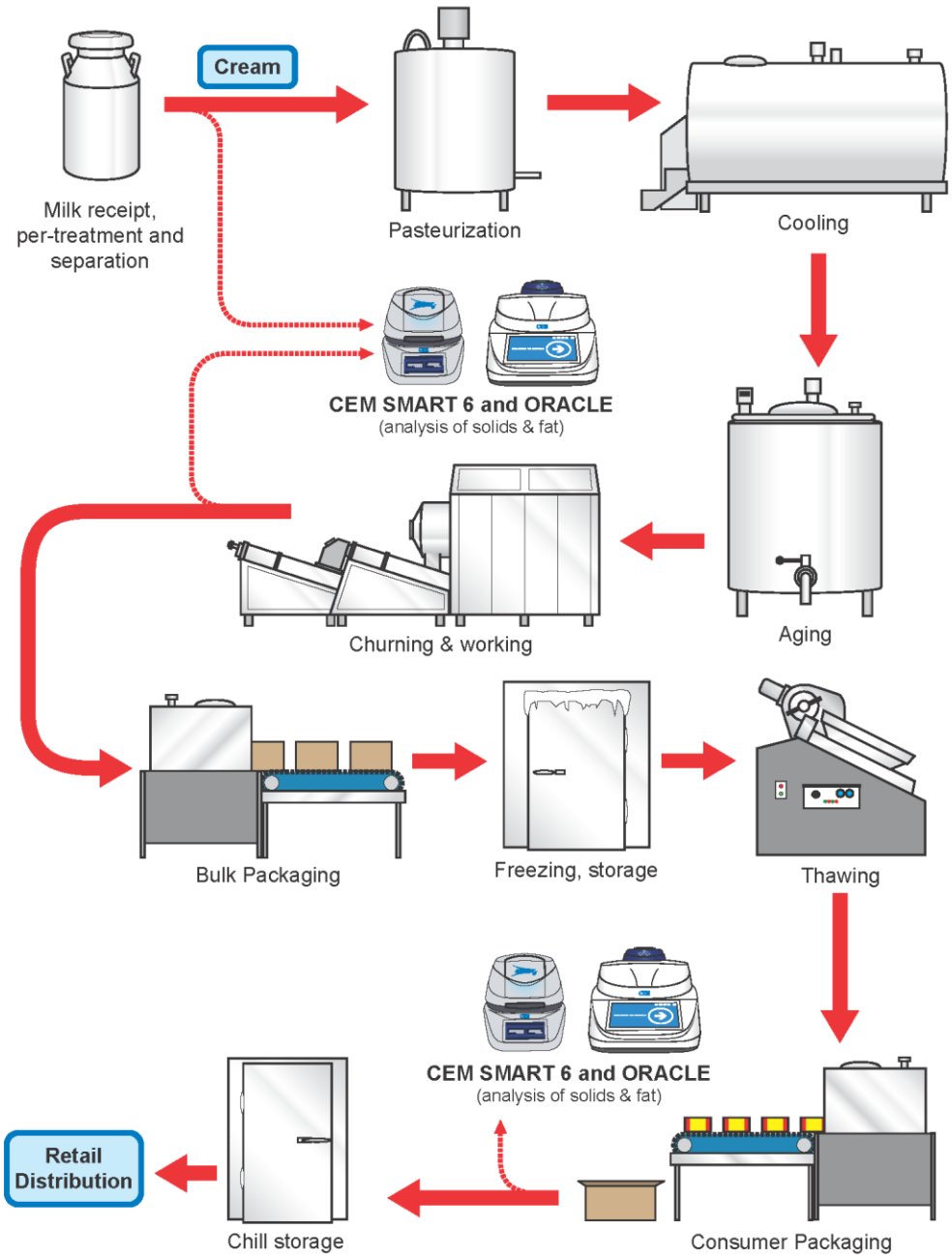
# Butter Manufacturing Process

- Receiving of milk
- Grading, Weighing, Sampling
- Preheating **(35-40˚C)**
- Seperation
- Neutralization
- Standardization **(35-40% fat)**
- Pasteuriuzation **(82-88˚C)**

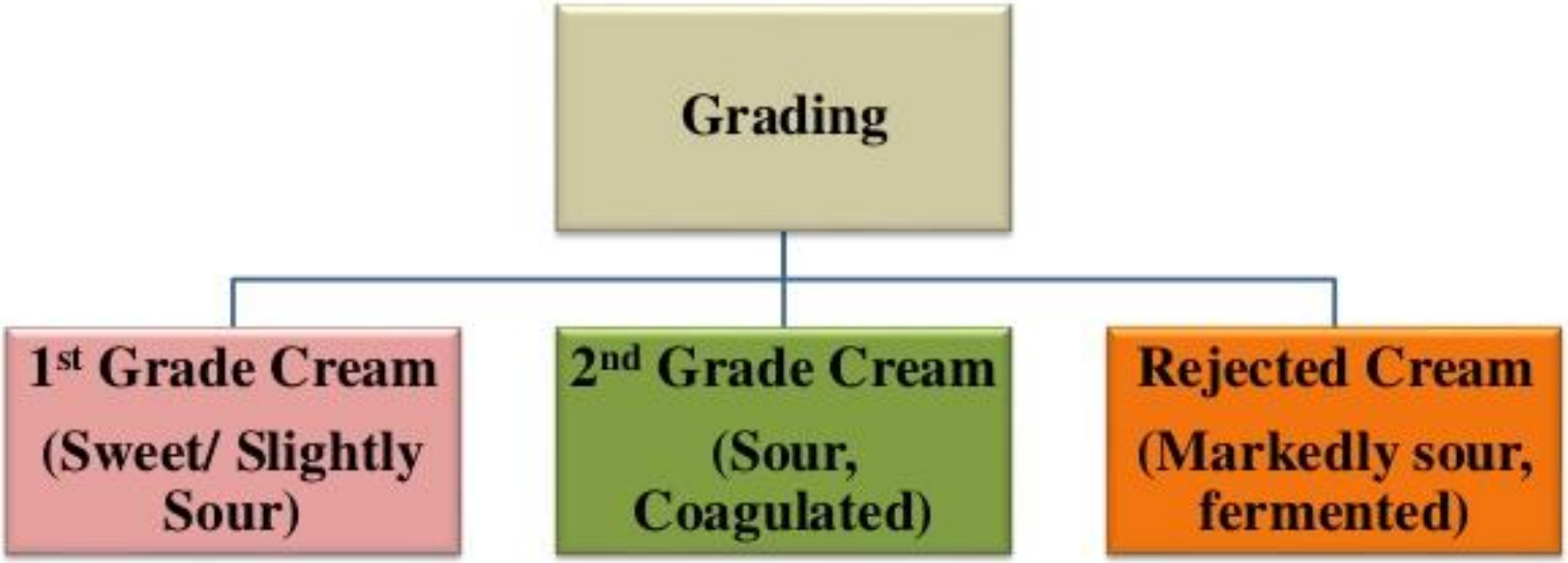
**Contd....**

- Ripening **(20-22˚C)**
- Cooling and Ageing **(5-10˚C)**
- Churning
- Salting
- **Packaging**
- **Storage (-23 to -29˚C)**

# Butter


Cream
Milk receipt, per-treatment and separation
Pasteurization
Cooling
CEM SMART 6 and ORACLE
(analysis of solids & fat)
Aging
Churning & working
Bulk Packaging
Freezing, storage
Thawing
CEM SMART 6 and ORACLE
(analysis of solids & fat)
Consumer Packaging
Chill storage
Retail Distribution

# Grading of Cream



# Objectives of neutralization

1. To reduce the acidity in cream to a point (0.14 -0.16%) which permits pasteurization without risk of curdling,
2. To produce butter which can be kept well in cold storage
3. To avoid excess loss of fat which result from the churning cream i.e. excessively sour.
4. To **prevent undesirable flavors** which may result when a cream of high acid which is subjected for pasteurization at higher temperatures.
5. To improve the keeping quality of butter from high acid cream. Salted-acid-butter develops a fish flavor during commercial storage at -23 to -29°C.

# Factors affecting neutralization

- **Accurate neutralization of sour cream is important to get a desired quality product.**

a. Accuracy in sampling.
b. Accuracy in testing.
c. Accuracy in estimation of amounts of cream and neutralizer.
d. Careful weighing the quantity of neutralizer.
e. Thorough mixing of neutralizer in cream prior to pasteurization.

# Methods of neutralization of cream

- **There are five essential steps to follow for cream neutralization. These are:**

1. Adoption of definite standard of churning acidity
2. Correct estimation of acidity
3. Calculating the amount of neutralizer to be added
4. Adding neutralizer in the correct manner
5. Checking results by re-testing acidity

# Types of Neutralizers

- The neutralizers used for reducing acidity in cream.
- **Lime Neutralizers**
- **Soda Neutralizers**

# Types of Neutralizers

## Lime Neutralizers

- The neutralizers used for reducing acidity in cream.
- **Types:**

1. **Low magnesium limes** (<5% Lime)
2. **Medium magnesium limes** (30-35%)
3. **High magnesium limes** (45 to 55% )

## Soda Neutralizers

- Bicarbonate of soda or baking soda are used.

# Standardization of Cream

- **Adjustment of fat to desired level.**
- **Pearson square method is used.**
- Done by adding calculated quantity of skim milk or butter milk.
- Desired level of **fat** in cream for butter making is **33 to 40%**
- **Standardization** to both higher and lower level **leads to higher fat loss in butter milk.**

# Pasteurization of Cream

- Adjustment every particle of cream to a temperature not less that **71°C** and holding it at that temperature for at least **20 min** or any suitable temperature-time combination using properly operated equipment.
- A number of equipment can be employed for this purpose.
- More severe heat treatment of cream should be avoided
- Pasteurization of cream for making ripened cream butter is commonly carried out at higher temperature than for sweet cream butter e.g. **90-95°C for 15 or 105-110°C with no holding.**

# Ripening of Cream

- Main object of cream ripening is to produce butter with higher di-acetyl content.
- Starter culture consisting of a mixture of:

1. **Acid producing:** (*Streptococcus lactis, S.cremories*)
2. **Flavour producing:** (*S.diacetylactis, L.citrovorum* and *L.dextranicum*)

- Amount of starter added usually ranges between **0.5-2.0%** of the weight of the cream
- After thoroughly mixed, the **cream** is **incubated** at about **21°C** till **desired** an **acidity** is reached.

# Contd.....

- Cream is subsequently cooled to 5-10°C to arrest further acid development.
- Biosynthesis of **diacetyl** is not sufficient above pH 5.2.
- Stopping fermentation of cream by cooling at **pH 5.1-5.3,** results in a **milder flavour;** whereas continuing fermentation up to **pH 4.5-4.7** results in **higher levels** of both **diacetyl** and **lactic acid**, giving more pronounced flavour

# Cooling and Ageing

- When cream leaves the pasteurizer, the fat in the globule is in liquid form.
- When cream is cooled, fat crystallization starts, cream will not churn unless the butter fat is at least partially crystallized.
- If solidification of fat is not sufficient, the fat losses in butter are high.
- The temperature to which cream is cooled is chosen is such a way that the butter produced is of optimum consistency and cream churns to butter in a responsible time of about 35-45 minutes.
- Churning at too high temperature may give butter with 'greasy' body which may work up too quickly and become sticky.
- Generally cooling temperature in summer should be 7-9°C and that of in winter 10-13°C.

# CHURNING OF CREAM

- **Churning** is initiated by **agitation** of cream causing **incorporation of** numerous **air bubbles** into the cream.
- With incorporation of air there is **increase in the volume of cream** and air plasma interface.
- Surface active (such as frictional, impact, concussion etc.) causes partial disruption of fat globule membrane
- The fat film, thus formed, serve as a foam depressant causing the air bubble to burst.
- The liquid fat also serves as cementing material causing fat globules to clump together and eventually butter grains are formed which floats in plasma i.e. butter milk.

# Initial Working

- Working of butter is essentially a kneading process in which butter granules are formed into a compact mass.
- During this operation, any excess moisture or buttermilk is removed.
- However, the emulsion (w/o) at this stage is not fully stable.

# Salting of Butter

- In conventional process, butter may be salted by adding salt to butter churn after initial working of butter.
- Salt sets up osmotic gradient which draws water from the butter grains. This can lead butter to be leaky.
- Salt may be added either in dry form or as saturated brine solution.

# Packaging and Storage

- Stored at -23 to -29°C.
- Moisture proof or grease proof wrappers are used for packaging.
- **Overrun in butter:**
- The weight of butter obtained from a given lot of cream exceeds the amount of fat in the cream. That amount of butter which exceeds the fat present in cream is called as overrun.


Thank
you