Dairy Products
Processing
Factors affecting Quality of Milk Products

A) **Milk Quality**
   - Protein
   - Fat
   - Inhibitors

B) **Milk Processing**
   - Standardization
   - Homogenization
   - Heat Treatment
   - Dearation
Dehydrated Products

- Skimmed Milk Powder
- Whole Milk Powder
- Dairy Whitener
- Coffee Whitener
- Nutritional Supplements
  - Protein Supplements
  - Specialized Dairy Based Food Products
  - Infant Milk Substitutes
  - Convenience Foods – Dairy Based
Fractionation of Milk Solids & Drying

MILK

CREAM

SKIMMED MILK

PREcipitation

CASEIN

WHEY

REVERSE OSMOSIS

WHEY PROTEINS

LACTOSE
Fermented Dairy Products

- Dahi/Curd
- Yoghurt & Flavoured Dahi
- Lassi – Sweet or Salted
- Butter Milk/Chhach Plain – Plain or Spiced
- Drinking Yoghurt
- Probiotic Drink
Factors affecting Quality of Fermented Milk

A) Milk Quality
   • Protein, Fat, Inhibitors

B) Milk Processing
   • Standardization, Homogenization, Heat Treatment, Dearation

C) Fermentation Process
   • Fermentation Temp, End pH, Cooling & post Treatment

D) Type of Culture
Lactic Cultures

Types of Culture:

1. Mesophillic Culture: Optimum growth temperatures of < 30°C
2. Thermophillic Culture: Growth optima at > 37 °C

Primary Function: Acid Production

Other Functions:
- Flavour, Aroma, Alcohol etc (eg Diacetyl……..)
- Inhibition of undesirable organisms
- Texture Development: Exopolysachharides (EPS),
Factors in Culture Selection

• Type of Product: - Yoghurt, Lassi, Butter Milk……..

• Product Characteristics: - Flavour, Texture etc

• Regulatory Requirements

• Manufacturing Constrains: - Time, Packaging, Incubation

• Form: - Frozen or Freeze Dried or Propogation

• Phage Resistance/ Rotation
Important Parameters

- **Heat Treatment:**
  - 85 – 95°C for 5 - 10 Min

- **Filling:**
  - Inoculation & Filling Temp of 43 deg C
  - Immediate transfer to incubators

- **Incubation:**
  - Temp 42-43 degC
  - Time 4-6 hrs

- **Cooling:**
  - Reach 35 deg C is 30 min
  - Reach 18-20 in next 45 min
  - Further cooling to 5 deg C slowly
Process Flow Chart – Cultured Dairy Products

1. **Milk Standardization**
2. **Vacreation**
   - Odour Removal
3. **Homogenization**
   - Uniform body and texture
4. **Inoculation**
   - DVS or propagated Culture
5. **Preheating to 42°C**
   - 92°C for 5 – 10 minutes
6. **Pasteurization**
7. **Filling**
8. **Incubation**
9. **Breaking of Curd**
10. **Addition of Water**
11. **Cold Storage**
12. **DAHI**
13. **Plain Butter Milk**
14. **LASSI SWEET**
15. **Spiced Butter Milk**

Flowchart details:
- DAHI: Incubation → Breaking of Curd → Addition of Water → Filling → Cold Storage
- Plain Butter Milk: Incubation → Breaking of Curd → Addition of Water & Sugar → Filling → Cold Storage
- LASSI SWEET: Incubation → Breaking of Curd → Addition of Water & Spices → Filling → Cold Storage
- Spiced Butter Milk: Incubation → Breaking of Curd → Addition of Water & Spices → Filling → Cold Storage
## Difference between Dahi & Yoghurt

<table>
<thead>
<tr>
<th>Dahi</th>
<th>Yoghurt Plain</th>
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<tbody>
<tr>
<td>1. Obtained by Fermentation of Milk using harmless Lactic acid bacteria</td>
<td>1. Obtained by Fermentation of Milk using <em>L. Bulgaricus</em> &amp; <em>S. Thermophilus</em> species</td>
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<tr>
<td>2. May contain other harmless bacteria</td>
<td>2. May contain other harmless bacteria</td>
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<td>3. May contain permitted Additives</td>
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Sweetend Dahi is also allowed

### Flavoured Dahi & Yoghurt Requirements

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<tr>
<td>1. May add cane sugar, corn syrup, glucose</td>
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<td>2. May add Fruits/Fruit preparations</td>
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<tr>
<td>3. Veg Oil can not be added</td>
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<td>4. May contain permitted Additives i.e. Colours, Flavours, Stabilizer, Thickner etc</td>
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# Coagulated Products: Paneer & Cheese Process Comparison

<table>
<thead>
<tr>
<th>Paneer</th>
<th>Cheese</th>
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<tbody>
<tr>
<td><strong>Coagulation</strong></td>
<td><strong>Coagulation</strong> is carried out by addition of Enzyme Rennet and Starter Culture</td>
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<tr>
<td>No Ripening</td>
<td><strong>Ripened for few months up to years to achieve desirable taste</strong></td>
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<td>- Lactose fermentation</td>
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<td>- Production of Carbon Dioxide</td>
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<td>- Decomposition of protein</td>
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Process Flow Chart – Paneer

1. **Standardized Milk** → **Heat Treatment**
   - 90°C 15 MIN

2. **Pressing**
   - 2 Kg / cm² for 15 minutes. 5 - 6 batch per hoop

3. **Hoops Filling** → **Paneer Coagulation**
   - At 75°C

4. **Pasteurized Citric Acid Solution (1 %)**

5. **Cooling**
   - At 75°C

6. **Block chilling**
   - At 75°C

7. **Cutting into Slices** → **Vacuum Packing and Sealing**
   - At 5 – 7 °C for 30 minutes

8. **Cold Storage (2 – 4 °C)**
Process Flow Chart – Cheddar Cheese

Cow milk
Standardization (casein/fat ratio or only fat content)
Pasteurization
Cooling to 37°C
Addition of starter culture
(S. thermophilus+L. bulgaricus, 1:1@ 2.0% w/v)
Renneting
(1.5 g/100 kg milk)
40 min
Cutting of curd
Cooking of cheese curd
(37°C to 42°C in 40 min)
Draining of whey
Cheddaring of curd
Desired acidity at which curd will stretch in hot water
Plasticizing
(80-85°C/2-3 min)
Moulding into shapes
Immersion in chilled (8-10°C) brine (~20% strength)
Packaging and storage
Process Flow Chart – Mozzarella Cheese
Process Flow Chart – Table Butter

1. **Cream Separation**
   - 35 – 40% Fat

2. **Pasteurization and Chilling**
   - Heating to 92°C & cooling to < 8°C

3. **Storage & Ageing**
   - At 8-10°C

4. **Butter Milk Removal**

5. **Cream Breaking**
   - Peanut Size Fat Granule

6. **Addition of Annatto Colour**

7. **Churn Loading**

8. **Washing of Butter**

9. **Pre working**

10. **Addition of Salt**

11. **Butter Unloading**

12. **Store in Deep Freeze**
   - At -18°C

13. **Butter Packaging**

14. **Intermediate Storage**
   - At 5°C

15. **Dispatch**

To adjust the water content.
Process Flow Chart – Ghee

1. **Milk Reception** → **Separation of Cream** → **Churning of Cream to get white butter**
2. **Clarification** → **Prestratification** → **Ghee Cooking**
   - **Clarification**: At 65 ± 2°C for removal of solid residues
   - **Prestratification**: Melted butter is allowed to stand for 1 – 2 hours in settling tank. Butter milk serum is drained
   - **Ghee Cooking**: At 105 to 108°C
3. **Transfer to settling storage tank** → **Ghee Storage Tank**
   - **Transfer to settling storage tank**: At 70°C for 3 – 4 hours
4. **Ghee Storage Tank** → **Filling** → **Granulation** → **Storage** → **Despatch**
   - **Filling**: Seeding is carried out at 0.5% for 2 hours
   - **Granulation**: Proper stacking norms are followed to achieve proper granulation
   - **Storage**: At 5°C
Process Flow Chart – Ice Creams

1. Mixing of Ingredients → Pre Heating → Ferrous Detection & Removal
2. Heat Treatment at 85°C
3. Homogenization
4. Duplex Filtration
5. Ageing at < 7°C for 4 hours → Continuous Freezing
   - Air (passed through pre-filter, carbon filter & 0.3 micron filter)
   - At temperature < -5°C
7. Filling / Extrusion / Mould
8. Filling / Extrusion (Cups, Cones, Bulks) → Continuous Hardening
9. Stick Bar Freezing
10. Cold Storage ( < -25°C)
Process Flow Chart – Flavoured Milk

Milk Reception → Pasteurization → Standardization

- Aseptic Homogenization
  1st Stage 200 Bar
- Bottle Filling
- Crowning
- Heat Treatment (Retorting)
  120 – 121°C for 20 min
- Slow Cooling to Ambient Temp

- Addition of Colour, Flavour, Sugar, SMP etc.

- Ultra Heat Treatment
  144 ± 2°C for 3 – 4 sec

  - PM treatment
    (30% H2O2 @ 45 – 50°C for 15 sec)

- Aseptic Homogenization
  1st Stage 200 Bar
- Aseptic Packing
- Secondary Packing
- Despatch