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University of Basra
College of Veterinary Medicine
Dept. of Public Health/ Milk Hygiene
Division Milk Hygiene Course/ Fifth Year
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Practical Lecture:
Group (A, B, C)

2nd Semester

Determination of Fat in Milk

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Definition

Measuring fat in milk refers to the process of determining the amount of milk fat present in a given quantity of milk, usually expressed as a percentage by weight or volume. This is done using analytical methods such as the Gerber test, Babcock test, or infrared spectroscopy, to ensure quality control, nutritional labeling, pricing, and detection of adulteration in milk and dairy products.

Gerber Test for Fat

Principle

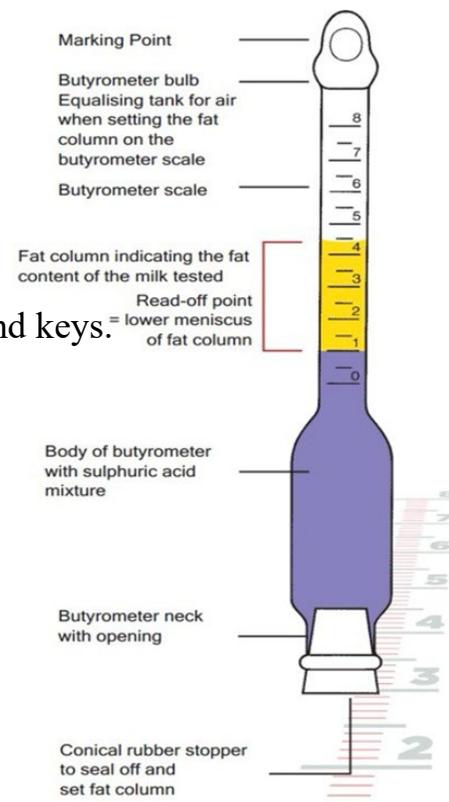
The principle of the Gerber method is based on the mixing of milk with concentrated sulfuric acid, which creates an exothermic reaction. This reaction generates the necessary heat to break down the emulsion structure of milk and digest the non-fat components. The sulfuric acid also dissolves the proteins that form membranes around the fat globules, releasing the fat.

When combined with isoamyl alcohol, the reaction enhances the separation of fat from the remaining solids. The free fat is then separated from the milk by centrifugal force and collected in the graduated neck of the Gerber butyrometer. This section is calibrated to show the fat content as a percentage by mass.

The method is suitable for use with both raw and pasteurized milk.

Equipment And Materials:

1. Sulfuric Acid:
 - Specific gravity: 1.820–1.825 g/mL at 21°C
 - Colourless, concentrated
2. Isoamyl Alcohol – For fat separation.
3. Gerber Butyrometers – 6%, 8%, or 10% scales, with lock stoppers and keys.
4. Stoppers & Shaker Stands – Rubber or plastic.
5. Pipettes –
 - a. 10 mL for acid
 - b. 1 mL for alcohol
 - c. 11 mL for milk
6. Bottle Rack – Vertical support, preferably stainless steel.
7. Centrifuge – $1,100 \pm 100$ rpm.
8. Water Bath – Maintains $65 \pm 2^\circ\text{C}$.



Procedure:

1. Add Sulfuric Acid

Measure 10 mL of sulfuric acid (15–21°C) and pour it into the Gerber butyrometer.

2. Add Milk Sample

Fill an 11 mL pipette with a well-mixed milk sample (not exceeding 24°C). Slowly add the milk to the butyrometer to prevent a violent reaction, then allow the pipette to empty normally. Blow out the last drop.

3. Add Isoamyl Alcohol & Mix

Using a 1 mL pipette, add 1 mL of isoamyl alcohol. Insert the lock stopper securely. With the stoppered end facing upward, hold the butyrometer at the graduated column and shake until the curd is fully digested (no visible white particles). Holding the hot butyrometer by the stopper and neck, invert it at least four times to mix any acid remaining in the bulb.

4. First Water Bath

Place the butyrometer in a water bath at 60–63°C for 5 minutes.

5. Centrifugation

Remove and dry the butyrometer. Place it in the centrifuge, positioning two butyrometers opposite each other for balance. Close and lock the lid. Once the desired speed is reached, centrifuge for 4 minutes.

6. Second Water Bath

Transfer the butyrometers (with stoppers facing down) into the water bath at 60–63°C for 5–10 minutes.

7. Reading Fat Content

Gently adjust the fat column so the bottom aligns with a main graduation mark. Read the top of the fat column at the bottom of the meniscus, to the nearest 0.05%. Subtract the lower reading from the upper and record the fat percentage.

Significance of the Test

The legal minimum fat percentage for milk varies by animal: 5.5% for buffalo, 4% for sheep, 3% for cow, and 2.5% for goat. Fat percentages lower than these standards may indicate adulteration, either through partial skimming or the addition of water. In some cases, a low-fat percentage may result from incomplete milking rather than adulteration.