Dairy production

Level-II

Learning Guide 59

Unit of Competence:Assist in handling and processing of milk

Module Title: Assisting in handling and Processing of Milk

LG Code: AGR DRP2 M16 L01 LG59

TTLM Code: AGR DRP2 TTLM 1219v1

LO 1: Undertake milking operation and Preservation

Instruction Sheet	Learning Guide 59

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Preparing and using required materials, tools and equipment
- Conducting Milking procedure
- Milk composition and constituents
- Undertaking Milk quality test
- Preserving milk

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- Prepare and use required materials, tools and equipment
- Conduct Milking procedure
- Identify milk composition and constituents
- Undertake Milk quality test
- Preserve of milk

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheet (**1, 2,3,4 and 5**) in page **2,4,9,12 and 15** respectively
4. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
5. Accomplish the **“Self-check (1, 2, 3, 4 and 5)”** in page**, 3, 8, 10, 14 and 16** respectively.
6. If you earned a satisfactory evaluation proceed to “Operation Sheet 1 in page 17 and 2 in page 18 respectively.
7. Do the “LAP test” in page 19 (if you are ready). Request your teacher to evaluate your performance and outputs.

Information sheet-1	Preparing and using required materials, tools and equipment.

1.1. Definition of important terminologies

Milk: - is a nutrient rich white liquid food produced by the mammary glands of mammals. It is the primary source of nutrition for young mammals (including human who are breastfed) before they are able to digest other types of food.

Milking: is the act of removing milk from the mammary gland of mammals. (cow, sheep, goat, camel etc).

Milk preservation: Is the process of keeping milk safe as drinking food for a definite period of time free from spoilage.

1.2. Materials, tools and equipment

Milking materials and equipment:

Milking jar

, pail, milk can, weighing scale, towel, rope, strip cup, milk storage tank, sieve, apron, teat cup, milking machine

Milk cooling equipment: Cold water container, cooling shed and refrigerator, milk chiller

Milk boiling equipment: Boiler, boiling dish,

Milk processing equipment: cream separator churner, refrigerator, pasteurizer, homogenizer, , ladle, cooking dish, cooking jar, table, graduated jug.

Other equipment and materials: lacto meter, alcohol, spoon, salt, additive/ingredients, other miscellaneous materials.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define milking (5 points)
2. Mention at least five milking equipment (5 points)

Note: Satisfactory rating - 10points Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

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Information sheet-2	Conducting Milking procedure

2.1. Milking Methods

Methods of milking influence the quality and quantity of milk produced at the dairy farm. Proper method of milking results in the removal of entire milk present in the udder resulting in optimal milk production in a particular lactation besides avoiding injuries to the teat and udder and improving the udder health. Proper milking is enjoyable to the cow and profitable to the owner.

There are two types of milking methods, namely

1. Manual (hand milking)
2. Mechanical (machine milking)

2.1.1. Hand milking methods.

There are two techniques of hand milking methods.

1. Hand strip (using finger)

Stripping method is adopted in small cows with narrow teats. Few strips of milk from each teat are let on strip-cup to check for possible incidence of mastitis. Combination of initial full hand milking method followed by stripping at the end is a good method of milking. The first

2. Hand squeeze (full hand milking)

Full hand milking stimulates natural suckling of a calf. Cows with large teats and buffaloes are milked with full hand method. Full hand method removes milk quicker than stripping because of no loss of time in changing the position of the hand.

The recommended method is full hand followed by stripping.

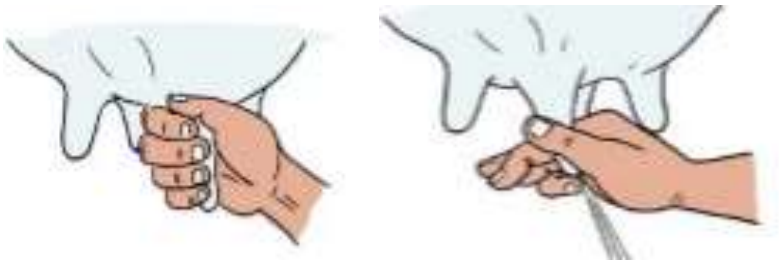


Fig. A Hand squeeze B. Hand strip

❖ Important points to be considered during milking

Milking time: milking can be done twice or three times a day. But this interval must be regular. A sudden change in the time of milking affects the total yield

Milking order: clean cow should be milked first. A suggested order

1. First calf heifers free of mastitis
2. Older cows free of mastitis
3. Cows with history of mastitis but not showing the symptoms
4. Cows with quarters producing abnormal milk

GOOD HAND MILKING PRACTICES

1. MILKING ENVIRONMENT

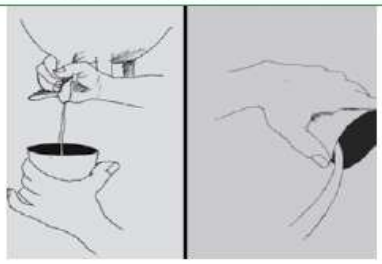
- Milking must be carried out in a shady or roofed milking place, which is clean and dry.
- The animal, the milker, the utensils and the surroundings must be clean.
- Milking must be carried out in a quiet and calm surrounding, undisturbed by anything what is unusual.
- Avoid smoking. Do not cough or sneeze above the milking pail.

2. RESTRAINING THE COW

- Put concentrates in the feed trough before bringing the cow into the milking place.
- Gently restrain the hind legs and tail of the cow with a soft rope.
- Do not beat the cow nor shout at her. Avoid exciting her.

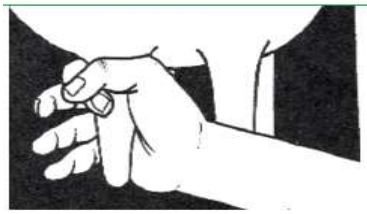
3. UDDER PREPARATION

- Wipe the udder and the teats of the cow with a clean damp towel.
- Dry the udder and do massage it with a clean, dry towel or tissue paper.
- Clip the hair of the udder and trim the tail twice per year to facilitate cleaning.



4. CHECK FOR MASTITIS

- Milk the first drops from each teat into a strip cup or on any black surface to observe milk clots.
- Always discard these first drops, Do not add it to the other milk.
- In case you observe clots from a teat, milk that quarter last and keep that milk separate.



5. PROPER MILKING TECHNIQUE

- Always sit on the same, normally the right, side of the cow on a wooden stool.
- Take hold of the base of the teat and squeeze with thumb and forefinger.
- Close the other 3 fingers and squeeze them in turn. This will push the milk downwards and expel it.
- Repeat this in a rhythmic way. Start with the 2 front quarters. After finishing these move to the back quarters.
- Never do "strip milking" by pulling the teat between your thumb and your forefinger.
- Strip milking can cause injury to the teat.
- Establish a calm regular milking routine. Try to milk at a 12 hour interval at the same times of the day.
- Milk regular but quickly and make sure you empty the udder at each milking within 7 – 12 minutes.

6. TEAT DIPPING

- After milking rinse each teat in an antiseptic teat dip, udder wash or 2% lugol's iodine.
- This helps to prevent mastitis.

7. MILK HANDLING

- Weigh or measure the milk of each cow.
- Filter the milk through a clean cloth when you empty the milking pail into a milk can.
- Keep the milk can closed and keep it in a cool place before you take it to a Milk Collection Centre.
- Never add the milk of a cow, which you are treating for mastitis. Also never add colostrum to the milk delivered.

8. CLEANING EQUIPMENT

- Use stainless steel equipment with a smooth surface.
- The surface of plastic material easily gets scratches and then cannot be cleaned properly anymore.
- All utensils must be washed immediately after milking. Use a brush and hot water with a detergent, like teepol.
- Then rinse the utensils, using cold water with a disinfectant, like chlorofoam.
- Place the utensils upside down on a rack above the ground and let them dry in the sun.

This message is being provided by GART as its public good activity and knowledge transfer to smallholder dairy farmers.

Machine milking

Milking is done by using machine and generally adopted for herds with large number of cows and with high yielders. Most milking in the developed world is done using milking machine. Teat cups are attached to the cow's teat and then the cups alternate between vacuum and normal air pressure to extract the milk. The milk flow is continuous in this method.

Advantages

1. Clean milk/with less contaminants
2. Fast milking/time saving
3. Less man power
4. Complete milking
5. Important for large scale farm
6. More manageable
7. less injury to teats
8. hygienic method of milk production

Disadvantages

1. Machines are expensive
2. Require skilled man power
3. Require facilities(electricity, road)etc
4. Requires maintenance cost.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

3. Mention the two types milking methods (4 points)
4. Advantage of machine milking (6 points)

Note: Satisfactory rating - 10points Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

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Information sheet-3	Milk composition and constituents

3.1. Milk composition of different dairy animals

Milk composition varies among species, breeds within the same species, and even among individual animals within the same breed.

Table: 1. Percentage composition of milk of different Animals

Source of milk species	Water	Fat	lactose	protein	minerals
Cow	87.35	3.75	4.75	3.40	0.75
Sheep	80.25	6.97	4.96	6.72	0.90
Goat	81.04	4.63	4.22	4.35	0.76
Camel	87.10	2.91	5.39	3.90	0.70

3.2. Factors that affect the milk composition and constituents are:

- The species of dairy animal
- Breed
- Age
- Diet
- Stage of lactation,
- Parity (number of parturitions)
- Farming system,
- Physical environment
- Season influence

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the composition and constituents of milk? (6 pts)
2. Mention factors that affect the milk composition and constituents (7pts.)

Note: Satisfactory rating – 13 points Unsatisfactory - below 13 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

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Information sheet-4	Undertaking Milk quality test

Milk testing and quality control is an essential component of any milk processing industry whether small, medium or large scale. Milk being made up of 87% water is prone to adulteration by unscrupulous middlemen and unfaithful farm workers.

There are various ways and methods of monitoring milk quality, with the key ones described briefly below. Many of the methods are relatively inexpensive, with little needed in the way of equipment. Other methods may require more expensive equipment, but are more accurate and quicker.

4.1. Factors affecting Milk quality

There are many factors that affect quality of milk .some them are listed below

- Adulteration
- Milk Hygiene
- Temperature
- Disease problem (commonly Mastitis)

4.2. Common milk quality testing methods

There are four simple milk quality tests that may be carried out routinely both at the farm and milk collection centre:

- Sight-and-smell (organoleptic) test
- Clot-on-boiling test
- Alcohol test
- Lactometer test

These tests ensure that only milk of acceptable quality is received and require only a small amount (sample) of milk from each container. If the sample of milk doesn't pass the test, the milk from that container will be rejected and in most cases, the farmer bears the loss. Thus, it is important that milk is handled in accordance with good hygienic practice particularly at the farm.

1. **Organoleptic (sense) tests**

The organoleptic test permits rapid segregation of poor quality milk at the milk receiving platform. No equipment is required, but the milk grader must have good sense of sight, smell and taste. The result of the test is obtained instantly, and the cost of the test is low. Milk which cannot be adequately judged organoleptically must be subjected to other more sensitive and objective tests.

Abnormal appearance and smell that may cause milk to be rejected could be due to:

- Type of feed or atmospheric taint (e.g. feeding silage or brewer's waste too close to milking time)
- Cows in late lactation or in some cows when on heat or soon after conception (due to hormonal changes)
- Bacterial taints (from cows with mastitis)
- Chemical taints or discolouring (may be due to equipment not rinsed properly)
- Advanced acidification or souring (milk that is fermenting)
- Marked separation of fat may be caused by:
- Milk previously chilled and subjected to excessive shaking during transportation
- Adulteration with other solids (may also show as sediments or particles)
- Boiling, if milk fat is hardened

2. **Clot on Boiling (C.O.B) Test**

The test is quick and simple. It is one of the old tests for too acid milk (pH<5.8) or abnormal milk (e.g. mastitis milk). If a milk sample fails in the test, the milk must contain many acid or rennet producing microorganisms or the milk has an abnormal high percentage of proteins like colostrums milk. Such milk cannot stand the heat treatment in milk processing and must therefore be rejected.

3. **The Alcohol Test**

The test is quick and simple. It is based on instability of the proteins when the levels of acid and/or rennet are increased and acted upon by the alcohol. Also increased levels of albumen (colostrums milk) and salt concentrates (mastitis) results in a positive test.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down common milk quality testing methods (4pts)
2. What are the factors that affect milk quality? (4pts)
3. Write method of milk quality test which ***doesn't not*** require equipment (2pts)

Note: Satisfactory rating – 10 points Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Information sheet-5	Preservation of milk

Milk can be preserved using the following simple methods:

- Cooling
- Boiling
- Pasteurization and
- Sterilization

4.1. Cooling milk

Since milk is an ideal medium for the multiplication of most disease producing organisms, the milk should be kept at 50^0F or below starting immediately after milking. This is very important especially if milk is going to be delivered raw to consumers. This temperature range is essentially needed to arrest the growth of micro-organisms specially brucella organisms.

Cooling methods

- keep the milk in the shade not in the sun
- keep the milk in a well-ventilated place
- use cold water to cool the milk (for example put the milk in a water bath, or in a stream)
- use ice to cool the milk

4.2. Boiling

This is the easiest and most practicable method of making milk safe in every home. As soon as raw milk is produced or delivered it should be boiled. Boiling is raising the temperature of the milk to boiling point and maintaining the milk at this temperature for a few minutes. Then the milk should be immediately cooled. Boiling of milk destroys all microorganisms except the spore formers but it changes the nutritive value of milk, its flavors and palatability appearance and difficult to process on a large scale and is commercially uneconomical.

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write 4 limitations of milk pasteurization in developing countries like Ethiopia (4pts)

2. List down at least 3 milk preservation methods. (2pts)

Note: Satisfactory rating – 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Operation sheet-1	perfume hand milking

1. prepare all necessary materials
2. Wear PPE
3. Create silent environment
4. Clean properly of milking pen.
5. Provide concentrate feed to the cow for good milk letdown
6. Restrain the cow in number 8 position
7. Washing hands
8. Clean teats with warm water
9. Dry teat by towel
10. Check for mastitis using strip cup
11. Milk using both hands; squeeze properly the teats with full hand.
12. Filter/sieve/ milk
13. Record the amount of milk from each cow
14. Cool the milk to store in time

Operation sheet-2	Under take milk quality test

A. Organoleptic (sense) tests

Procedure:

1. Open a can of milk.
2. Immediately smell the milk.
3. Observe the appearance of the milk.
4. If still unable to make a clear judgment, taste the milk, but do not swallow it.
5. Spit the milk sample into a bucket provided for that purpose or into a drain basin, flush with water.
6. Look at the can lid and the milk can to check cleanliness.
7. Judgment: Abnormal smell and taste may be caused

B. Clot –on – boiling test

Apparatus

One boiling water bath (a 600 ml beaker on a gas or electric heater is adequate)

Test tubes

Timer (a watch or clock is adequate).

Procedure

1. Place about 5 ml of milk in a test tube (the exact amount is not critical)
2. Place the test tube in boiling water for 5 minutes.
3. Carefully remove the test tube and examine for precipitate.
4. The milk is rejected if any curd forms.

LAP test	Practical demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 3 hours.

Task 1. Perform hand milking

Task 2. Organoleptic (sense) tests

Task 3. Clot –on – boiling test

References

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Marshall, R.T. (1992) Standard Methods for the determination of Dairy Products. 16th ed. Publ. American Public Health Association.

Richardson, G.H. (1985) Standard Methods for the examination Dairy Products 15th edition, American Public Health Association, Washington

Dairy production

Level -II

Learning Guide 60

Unit of Competence:Assist in handling and Processing of Milk

Module Title: Assisting in handling and Processing of Milk

LG Code: AGR DRP2 M16 L02 LG60

TTLM Code: AGR DRP2 TTLM 1219v1

LO2. Process milk into different products

Instruction Sheet	Learning Guide 60

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Determining types of milk products
- Preparing milk processing equipment and materials
- Preparing whole milk and other ingredients
- Processing milk into different types of products
- Identifying any OHS hazards and taking appropriate action
- Using PPE
- Observing sanitary procedure

This guide will also assist you to attain the learning outcome stated in the cover page. Specifically, upon completion of this Learning Guide, you will be able to –

- Determine types of milk products
- Prepare the processing equipment and materials
- Prepare whole milk and other ingredients
- Process milk into different types of products
- Identifying any OHS hazards and taking appropriate action
- Using PPE
- Observing sanitary procedure

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheet (**1, 2,3,4,5,6 and 7**) in page **3,6,8,10, 16, 19 and 21** respectively
4. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
5. Accomplish the **“Self-check (1,2,3,4,5 and 7** in page **(5, 7, 9 ,15,18, 20 and 23**)respectively.

6. If you earned a satisfactory evaluation proceed to “Operation Sheet 1-2 in page 24 and 3 in page 25 respectively.

7. Do the “LAP test” in page 19 (if you are ready). Request your teacher to evaluate your performance and outputs.

Information sheet-1	Determining types of Milk products

Some of the common milk products that are made locally or commercially from whole milk are

- **Cream:** A portion of milk containing not less than 18% milk fat. Cream may be taken from milk by “skimming “or “separating” Skimming is the process of removing manually the cream, which rises to the surface, after milk stands in a container. The remaining part of the milk is called skimmed milk. Separating is the process of removing cream mechanically. The remaining part is called separated milk.
- **Curd/yoghurt:** The coagulated part of milk if milk is stands in a container for sometime at room temperature, it forms clots called curds which are contained in a clear liquid called whey.
- **Whey**: This is the watery part of milk after separation of the curd from the whole milk. It contains protein, lactose, minerals and salts.
- **Cheese**: This is the clotting casein of milk. Cheese is made from separated milk or whole milk. The milk curd, after being removed from the whey, is pressed into solids and through other processes and forms cheese. Genuine cheese must contain no fat other than that obtained from milk.

Fig.1.cheese

- **Butter**: This is the solidified milk fat or cream prepared by churning. The cream produced from milk is violently churned up and shaken so that the fat globules are broken up and closed together into pieces of mass called butter.

Fig.2. fresh butter

- **Ghee:** This is butter which has been heated and clarified. Butter is boiled over heat until the water is evaporated. It is then strained and ghee is produced.

Fig.3. Ghee

- **Ice cream:** This is cream made by mixing milk products with other ingredients and them freezing them into a semi solid state. The principal ingredient of the cream is usually milk or cream flavoring and coloring materials, etc.

Fig.4.ice cream

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down common milk products that are made locally or commercially produced (6pts)

Note: Satisfactory rating – 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Information sheet-2	preparing milk processing equipment and materials

After collecting whole milk from different sources, the milk should pass through different steps for processing. In each step different materials and equipment are required. The materials and equipments must be cleaned and disinfected properly. The following are materials and equipment used for the processing of milk.

1. Bucket
2. Ladle /Spoon
3. Sieve/filter
4. Milk jars
5. Milking can
6. Lactometer
7. Cream separator
8. churner
9. Refrigerator
10. Weighing scale
11. Cooking dish
12. Homogenizer
13. Pasteurizer and the others should be prepared accordingly

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the five materials, tools and equipment used in milk processing (5pts)

Note: Satisfactory rating – 5 points Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

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Name: _____ Date _____

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Information sheet-3	Preparing whole milk and other ingredients for processing

3.1. Conditions for clean milk production

Here are some important points to observe in order to produce clean milk:

- Milking should be carried out in a well-ventilated barn with adequate lighting.
- The floor of the milk barn must be durable and easy to clean, preferably made of concrete.
- After use, milking vessels and equipment must be cleaned with potable water, sanitized and dried in the sun on a drying rack.
- Milkers must be healthy and not suffering from contagious diseases or ulcers.
- Only healthy cows should be milked. Cows suffering from mastitis should be milked last and their milk discarded.
- Milk handlers need to pay particular attention for the type of milking and handling equipment.
- Plastic equipment is also unsuitable for milk handling as they are sensitive to heat and prolonged exposure to cleaning agents.
- Where possible, raw milk should be cooled using simple methods such as immersing milk cans in a trough of running cool water or evaporative cooling

3.2. Addition of milk ingredients

Most of the time milk ingredients are added to the whole milk to keep the flavor/ odor and aroma of milk. The most common milk ingredients are:

Salt, garlic, flavoring spices like “Beso bila” etc

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

2. List down the common milk ingredients (6pts)

Note: Satisfactory rating – 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

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Name: _____ Date _____

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Information sheet 4.	Processing milk into different type of product

Milk is processed in a number of milk products in the form of concentrated, cultured and dried products, to be reconstituted in to milk as required or mixed with other ingredients to provide mixes such as solid cheeses of various flavors and types, and in condensed or evaporated forms for convenient transportation and longer shelf life.

Basically milk is processed to increase deliciousness of milk products and their shelf life. It is processed in different ways in to different products; traditional or industrially. The types of products to be processed are determined based on the enterprise requirements. Raw milk can be processed in to the following products include: Cream, yoghurt, butter, cheese, Whey and other special products.

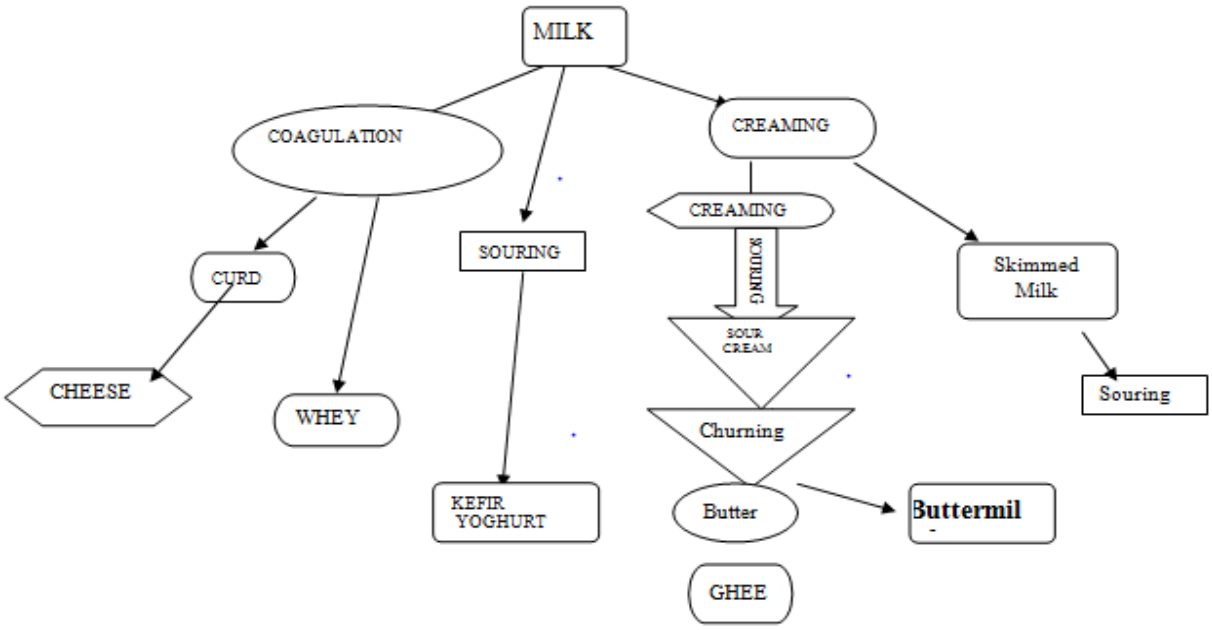

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Diagram. 1. Different products of milk

3.1.Cream separation

3.1.1.cream separation method

1. **Gravitational separation**: When milk is allowed to stand for some time, there is a tendency for the fat to rise. Gravity separation is slow and inefficient Cream can be separated from milk by allowing the milk to stand in a setting pan in a cool place. This can be done in either of two ways

➢ **Shallow pan method-** Milk, preferably fresh from the cow, is poured into a shallow pan 40 to 60 cm in diameter and about 10 cm deep. The pan should be in a cool place. After 36 hours practically all of the fat capable of rising by this method will have come to the surface, and the cream is skimmed off with a spoon or ladle. The skim milk usually contains about 0.5 to 0.6% butter fat.

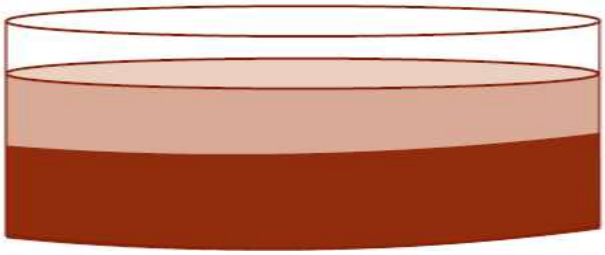

Fig.5 Shallow pan

➢ **Deep setting methods –** Milk preferably fresh from the cow, is poured into a deep can of small diameter. The can is placed in cold water and kept as cool as possible. After 24 hours the separation is usually as complete as it is possible to secure by this method. The skim milk is removed through a tap at the bottom of the can.

Fig.6. Deep setting pan

2. Centrifugal separation – Centrifugal separation is quicker and more efficient leaving less than 0.1% fat in the separated milk compared with 0.5--0.6% after gravity separation. It also allowed removal of cream and recovery of the skim milk in a fresh state.

Fig.7.cream separator

Factors affecting efficiency of cream separation:

- Mechanical condition of machine
- Temperature of the milk
- Los speed of bowl
- High rate of inflow
- Clogging of bowl Acidity of the milk

3.2. Butter making

Churning: is the process of shaking up whole milk or cream to make butter. Butter production (changing whole milk to butter) is a process of transforming a fat-in-water emulsion (milk) to a water-in-fat emulsion (butter).The process can be summarized in 3 steps:

- Churning physically agitates the cream until it ruptures the fragile membranes surrounding the milk fat. Once broken, the fat droplets can join with each other and form clumps of fat, or butter grains.
- As churning continues, larger clusters of fat collect until they begin to forma network with the air bubbles that are generated by the churning; this traps the liquid and produces foam.
- The cream separates in to butter and buttermilk. The buttermilk is drained off, and the remaining butter is needed to form a network of fat crystals that becomes the continues phase, or dispersion medium, of a water-in-fat emulsion.

Fig.8. Traditional butter churning in a gourd (left), clay pot (right)

Fig.9.Simple hand driven butter churns Modern electric churner

Factors affecting butter churning

- Milk acidity
- Churning temperature
- Degree of agitation, and
- Extent of filling the churn

3.3. Yoghurt

It may be produced from different types of milk, including skimmed or partially skimmed milk from cows, goats, sheep or water buffaloes.

3.4. Cheese

Cheese is one of the most highly concentrated and nutritious dairy products. Cheese is obtained principally through coagulation of casein by milk-coagulating enzymes, acid precipitation, or a combination of the two.

Cheese may be classified based on the moisture content of the fat-free solids, the fat content of the dry matter or type of ripening.

Classification based on moisture content of the fat-free solids:

- Soft (69 per cent or more)
- Semi-hard (57–69 per cent)
- Hard (49–56 per cent)
- Extra hard (less than 49 per cent).

Classification based on fat content of the dry matter:

- High fat (60 per cent or more)
- Full fat (45–59 per cent)
- Medium fat (25–44 per cent)
- Partially skimmed (10–24 per cent)
- Skimmed (less than 10 per cent)

Fig.10: Some traditional milk fermentation vessels from Ethiopia

Self-Check - 4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Define churning? (3 points)
2. What are the factors that affect churning? (7 points)

Note: Satisfactory rating – 10 points Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Information sheet-5	Identifying any OHS hazards and taking appropriate action

According to the International Labor Organization (ILO) OHS Hazard can be categorized into physical, chemical or biological nature. Proper management is needed to avoid accidents and to keep the staff motivated.

Types of OHS hazards

Physical

- Exposure to high levels of noise.
- Injuries of teats, udder
- Long-time exposure to heat and cold.
- Skeletal problems resulting from lifting and moving of animals, feed bins (bags)

Chemical

- Respiratory problems resulting from exposure to dust, which is composed of feathers, dander, micro-organisms, etc.
- Respiratory, skin, and eye diseases due to exposure to gaseous chemicals.(e.g. NH3, H2S, CO2, CO, and CH4.
- Exposure to disinfectants, detergents, formaldehyde and pesticides.

Biological

- Zoonotic infections. These diseases are transmitted between animals and humans & they also are transmitted from animals to humans and include bacterial, viral, fungal, and parasitic diseases. tuberculosis,

OHS requirements

Work task is provided according to Occupational Health and Safety (OHS) requirements. This may include:

- Using of relevant protective clothing and equipment,
- Use of tooling and equipment,
- Creating conducive working environment and safety handling of material,
- Using First aid kit to provide aid services
- Hazard control and hazardous materials and substances.etc,
- Following Occupational health and safety procedure designated for the task
- Checking and fulfilling required safety devices before starting operation

Self-Check -5	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the three types of hazards (3pts)
2. Write the Occupational Health and Safety (OHS) requirements in work place. (7pts)

Note: Satisfactory rating – 10 points Unsatisfactory - below 10 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Information sheet-6	Using personal protective equipment (PPE)

Select suitable personal protective equipment.

There are different types of materials, tools and equipments and supplies to perform different activities in milk handling. Therefore, identifying, selecting, using and preparing facilities, supplies according to the working activity are very important aspect in work.

Personal protective equipment include

- Overalls
- Gloves
- plastic boots/shoes
- Respiratory musk
- Aprons,
- Hair cover

Protective clothing should be selected to prevent skin contact with contaminated materials or environments. Consideration should be given to the type of work being performed by the worker when selecting personal protective clothing.

Self-Check -6	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down PPE used in processing of milk (6pts)

Note: Satisfactory rating – 6 points Unsatisfactory - below 6 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

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Information sheet-7	Observing Sanitary procedure

In order to reduce/eliminate contamination by spoilage and pathogenic organisms from the farm to the dairy plant, the cow's teats and surrounding udder area, and all utensils and equipment used during milking and processing should be properly cleaned.

When all cows have been milked, the shed and all milking equipment must be thoroughly cleaned. There are many dairy detergents and chemical sterilizes available, but misuse could lead to ineffective cleaning and sterilizing, or residues appearing in milk.

Good cleaning practice includes:

- Dry clean and remove all loose dirt and debris from the shade and yards
- Rinse or wet the surface, using cold or warm (not hot) water
- Hot wash using a detergent solution that holds contaminants (or soils) in suspension for a short time
- Rinse with cold water and drain
- Apply sanitizer to contact surfaces and allow to dry.

7.1. Milking barn or cowshed

Everything within the milking barn, stable or cowshed should be kept clean and tidy. These rooms should be free of dirt and animal droppings. They should be kept free of dust and the floor should be dry, clean and fly and rodent proof. The interior and the surroundings of the barn, stable or cowshed should be kept clean and tidy. The walls, ceilings, windows and equipment should be free of filth, litter and vermin. Animal droppings and manure should be collected and disposed of properly.

7.2. Utensils and Equipment

General guide lines used to clean milk utensils and equipment should include:

- Be cleaned after each usage
- Be washed thoroughly after each usage
- Be sanitized before each usage
- Be protected from contamination and mishandling prior its usage

- Be stored free from flies and other vermin when not in use.

7.3. Milk handlers

- Keeping the milk handler level of personal hygiene high
- Washing of hands with detergents before handling milk
- The milk handler should always wear clean garments (PPE) while milking, transporting, storing and processing milk.

Self-Check -7	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down the general guide used in cleaning of milk equipment (5pts)

Note: **Satisfactory rating – 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

i. _____

ii. _____

iii. _____

iv. _____

0pration sheet -1	**Cream separation**

Procedure

1. prepare all necessary materials and equipment
2. Set bow, fit the skim milk spout and the cream spout.
3. Fit the regulating chamber on top of the bowl.
4. Put the float in the regulating chamber.
5. Put the supply can in position, making sure that the tap is directly above and at the centre of the float.
6. Pour warm (body temperature) water into the supply can.
7. Turn the crank handle, increasing speed slowly until the operating speed is reached.
8. Open the tap and allow warm water to flow into the bowl.
9. Pour warm milk (37--40°C) into the supply can. Repeat steps 6 and 7 above and collect the skim milk and cream separately.
10. When all the milk is used up and the flow of cream stops, pour about again the separated milk in to the supply can to recover residual cream trapped between the discs.
11. Continue turning the crank handle and flush the separator with warm water.

Opration sheet -2	Butter making

Procedure

1. Clarify or filtrates the milk as soon as it is milked & cool it.
2. Wash & dry the churner.
3. Sour the cream 2-3 days or add sweet cream to the churn after measuring the volume of cream to churn. The ideal volume of cream to be churned should not exceed one half the volumetric capacity of the churn.
4. Churn the cream in cool temperature (morning or evening).
5. When the butter grains appear, it may be necessary to add water ($2c^0$ below the churning temperature) to maintain butter grain butter grain of required size.
6. Churning should cease when the butter grains & are the size of small wheat grains.
7. Drain off the buttermilk or collect the butter grains & wash the butter with water several times. Adding only as much water as is needed to float butter in the container or churn does each washing.
8. Add dry & evenly ground & of best quality salt available at a rate of 16 salts per kg of butter or according to the test & wash it.
9. Roll out the 8 to 10 times or ridge with spatulas to remove excessive moisture.
10. Take weight & pack it in container.

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions**:** Given necessary templates, tools and materials you are required to perform the following tasks within 5 hours.

Task 1. Cream separation

Task 2. Butter making

Task 3. Cheese making

References

Marshall, R.T. (1992) Standard Methods for the determination of Dairy Products. 16th ed. Publ. American Public Health Association.

Richardson, G.H. (1985) Standard Methods for the examination Dairy Products 15th edition, American Public Health Association, Washington

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Dairy production

Level –II

Learning Guide 61

Unit of Competence: Assist in Handling and Processing of Milk

Module Title: Assisting in Handling and Processing of Milk

LG Code: AGR DRP2 M16 L03 LG61
TTLM Code: AGR DRP 2 TTLM 1219v1

LO3. Clean up on completion of milk

Instruction Sheet	Learning Guide 61

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Storing the processed milk and milk by products properly
- Returning materials to the store
- Cleaning, maintaining and storing tools and equipment
- Reporting work outcomes

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- Store the processed milk and milk by products properly
- Return materials
- Clean, maintain and store tools and equipment
- Report Work outcomes

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 1 to 7.
3. Read the information written in the “Information Sheet (**1, 2,3, and 4**) in page **2,4,6 and 9** respectively
4. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
5. Accomplish the **“Self-check 1, Self-check 2, Self-check 3” and Self-check 4** in page**, 3, 5, 8 and 9** respectively.
6. If you earned a satisfactory evaluation proceed to “Operation Sheet 1 in page 11.
7. Do the “LAP test” in page 12 (if you are ready). Request your teacher to evaluate your performance and outputs. Your teacher will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work.

Information sheet-1	Storing the processed milk and milk by products

The processed milk and milk by products are properly stored until transporting. All dairy products have a shelf life that varies according to how an item is processed, packaged, stored, how long a product has been allowed to stand unrefrigerated on a counter or the type of container used can alter the freshness period. Most milk, yogurt, sour cream and similar products are sold in date-coded cartons that indicate a product's peak freshness.

Important points to be considered in storing of milk and processed milk product:

- Avoid heat shock; do not leave milk out of refrigeration for a prolonged period of time.
- Try to keep the refrigerator door closed as much as possible,
- Keep the temperature steady.
- It is recommended that milk or dairy products be placed on refrigerator shelves and not on the door.
- Check the temperature of your refrigerator often.

Milk and milk products should be stored in clean conditions at appropriate temperature and humidity to prevent deterioration or permit maturation.

Table : 1 Recommended dairy product storage guidelines

Product	Shelf life	
	After opening T^o/Time	Un opened T^o/Time
Milk	35^o 1 week	35^o 10-14 days
Cream	35^o 1 week	35^o 2 weeks
Butter	35^o 2weeks	35^o 4 weeks
Processed cheese	35^o 5 weeks	35^o 24 weeks
Yogurt	35^o 3 weeks	35^o 4 weeks

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List down Important points to be considered in storing of milk and processed milk product (5pts)

Note: **Satisfactory rating – 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

1. _____
2. _____
3. _____
4. _____
5. _____

Information sheet-2	Returning/Disposing of materials

2.1. Waste materials produced during work

There are different waste materials or product which will be produced in work place but the common waste material which produced during handling and processing of milk are the following:-

- Animal dung and urine
- Plant debris
- Plastic,
- Metal and paper-based
- Dusty feeds or bedding materials
- Contaminated milk/Adulterated milk
- Milk-house wastes or washes, hair, hoof and horns etc.

2.2. Importance of waste management

- ❖ Eliminate threats of waste
- ❖ Convert waste into useful things
- ❖ Up scaling
- ❖ Modify the wastes
- ❖ Stops offensive odour from waste
- ❖ Prevention
- ❖ Destruction and disposal of waste

2.3. Handling of waste materials

Disposable materials properly buried in deep enough trench and should be covered with quicklime and then with soil or use Burning. But Burning is the most difficult because the Fumes and smoke may be a problem to the surrounding environment. Mud holes should be frequently filled or exclude the animals away from it quickly.

- ❖ **N.B. Never dispose waste materials everywhere.**

The farm should have to continuously reduce, reuse and recycle the quantity of waste and by-products of the harvest and processing that it generates.

Self-Check -2	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the waste materials produced during handling and processing of milk.(5pts)
2. list down importance of waste management(5points)

Note: **Satisfactory rating – 10 points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

1. _____
2. _____
3. _____
4. _____
5. _____

Information sheet-3	Cleaning, maintaining and storing tools and equipment

3.1. Cleaning materials, tools and equipment

Cleaning: Is removal of gross contamination, organic material, and debris from the premises or respective structures, via mechanical means like sweeping (dry cleaning) and/or the use of water and soap or detergent (wet cleaning). After each step during handling and processing of milk and by products the materials should be thoroughly washed and cleaned. This eases cleaning and minimizes the risk of contamination. If not thoroughly washed they becomes a source of microbial contamination and shorten the life span of the materials.

3.2. Maintaining material, tools and equipment

Maintenance: is the upkeep of equipment and machinery in proper working condition at all times

The main objective of maintenance is to:

- Increase the efficiency and improve the performance of all processing and service equipment
- Increase the overall productivity of the entire plant by achieving coordinated and continuous operation of all plant equipment
- Increase the certainty of meeting daily production schedules
- Reduce unscheduled down time
- Extend the useful life of all plant equipment
- Minimize property and personnel hazards.

Self-Check -3	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the advantages of cleaning and maintaining materials, tools and equipment. (4pts)
2. Mention the objectives of maintaining materials, tools and equipment.(4pts)

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

1. _____
2. _____
3. _____

Information sheet-4	Reporting Work outcomes

There are many work outcomes in dairy farm while handling and processing of milk and milk products. The work out comes should be reported to the supervisor.

Some of them are:

- The amount and quality of product to be produced.
- Disease out breaks/ disease transmission
- Human labor attendance
- Mastitis
- Insufficiency of working facilities e.g. electricity, ventilation
- Contaminations (feed, water and feeding and watering trough)
- Malfunctions of machines and equipment like cream separator, churner, milking machine etc
- Suspected and dead animals and the others should be properly reported.

Self-Check -4	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Mention 4 points that are reported to the supervisor (4pts)

Note: **Satisfactory rating – 4 points** **Unsatisfactory - below 4 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date _____

1. _____
2. _____
3. _____
4. _____

Operation sheet-1	Cleaning milk handling and processing equipment

Procedure

- wear appropriate PPE
- manually removing dust by brush
- Pre-rinsing with water to remove loose dirt
- Cleaning with appropriate detergent
- Rinsing with clean water
- Disinfection by heating or with chemical agents (optional); if this step is included, the cycle ends with a final rinse, if the water quality is good.
- Allow to dry upside down in a dust-free surrounding;

LAP Test	**Practical Demonstration**

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 1 hour.

Task 1. Cleaning milk handling and processing equipment

References

Dairy Practices Council. 1995. DPC #4 Guidelines for installation, cleaning, and sanitizing of large parlor milking systems, Keyport, NJ.

Missouri Department of Agriculture. (2008). Cleaning and Disinfection: Standard Operating Guide No. 004. In Missouri Department of Agricultural Emergency Response Actions: Livestock Disease Emergency. Retrieved from http://agriculture.mo.gov/animals/pdf/animalag_guide4.pdf.

Slaghuis, B.A., G.M.V.H Wolters, H.J. Soede and J.A.M. Boerekamp, 1994. Effect of different rinsing steps on cleaning of milking equipment. Proc. Fouling and cleaning in Food Processing, Cambridge, March 1994

Wolters G.M.V.H. and J.A.M. Boerekamp, 1996. Comparison of different cleaning systems for milking equipment. Proc. IDF-symp. Bacteriological Quality of raw milk, Wolfpassing, Austria.

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