Milk and Milk Products Inspection
(MICRO-404)

CLASS LECTURES

FOR

MID TERM Examination

(PART I)

Delivered by:

DR. SAJJAD UR REHMAN

Department of Veterinary Microbiology
Faculty of Veterinary Science
University of Agriculture
Faisalabad

Presented by:

MUHAMMAD SAJJAD HUSSAIN

Course No.: MICRO 404
Course Title:. Milk and Milk products Inspection
Credit Hours: 2(1-2)

Milk and Milk products Inspection

We can increase / improve shelf life of the milk and milk products by minimizing its spoilage and enhancing sanitary standards.

Milk Production in Pakistan

Pakistan possesses 3rd position all over the world in milk producing countries.

Distribution of Milk

The total milk production is fractionized into different categories according to their usage.

1) 12 % of the total milk production in Pak is used as Fresh Milk and Milk Products.
2) Distribution of remaining 88% of the total milk production and its usage in respective fields is as follows;
    a) *Paper Industry*: White color of the paper is due to the milk contribution.
    b) *Textile Industry*: The most precious and costly "Acrylic fiber" is derived from the milk – only royal families afford such cloth made up of acrylic fibers.
    c) *Cosmetic Industry*: Milk is used in lipsticks, shampoos, creams, lotions etc.
    d) *Medicines*: A range of medicines including anti-oxidants and drugs associated with age minimizing effects also have a considerable proportion of milk in their composition.
    e) *Paint Industry*: Usually paints are of two types; i) Oil paints and ii) Milk paints. So milk is used for making milk paints which are most expensive, but drier earlier and do not induce any allergic reaction.
    f) *Furniture Industry*: White glue, widely used, is made up of milk casein.
    g) *Usage for operation theater table washing*: as milk contains an important enzyme, lectoperoxidase, which is a good sterilizing agent and can kill a wide variety of bacteria and fungi.

Definition of Milk

Standard definition of milk is: " It is a lacteal secretion which is; i) practically free from the colostrum, ii) obtained from complete milking of one or more cow(s) and iii) it should contain not less than; 8.25 % - SNF (Solid Not Fat) and 3.25% - Fat.

Milk contains many diversified nature of substances which are usually not present in any other compound.

Basic Constituents of Milk

Some numerical figures for milk constituents are as follows: (i.e. Composition of Milk in relative terms – but not in absolute terms)

Milk Constituents	Minimum %	Maximum %
Water	82	90
Fat	2.5	8.0
Protein (casein & albumin)	2.3	4.0
Albumin	0.4	1.0
Lactose (milk sugar)	3.5	6.0
Ash contents	0.5	1.0

Terminology

TS (Total Solids)
It can be defined as: Milk fat + Milk proteins + Lactose + Ash contents
SNF (Sold-not-fat)
It can be defined as: Milk protein + Lactose + Ash contents
Milk plasma (or skimmed milk)
It consists of all the milk constituents except milk fat.
Milk serum (or milk whey)
It comprises of all the milk contents except milk fat and casein protein.
Milk price
Earlier, milk price was determined on the basis of fat percentage present in the milk but now a days both SNF and milk fat equally share for determination of milk price.

Effects on composition of milk

The milk composition depends on the various facts; it may vary:

a) from animal to animal
b) breed to breed of same specie / animal.
c) Season to season: Seasonal variation is very important. In winter, milk is usually high in nitrogenous contents and in summer season, it is high is chloride contents.
d) milking to milking and lactation to lactation
e) variation in availability of feed to the animal

Classification of Foods

There are three types of food stuffs on the basis of their texture and shelf life characteristics.

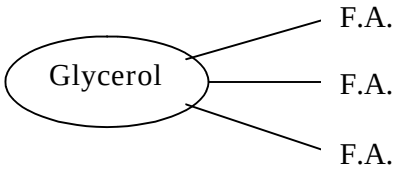
1) *Perishable*: Milk and fruits are highly perishable food itoms which can easily destroy within no time (just few hours shelf time)
2) *Semi-perishable*: e.g. Egg, unripened fruits and vegetables, shelf life is about 2-7 days.
3) *Stable food itoms*: e.g. Dry fruits – these food itoms can be preserved for many month

Comparative Composition of Milk

Milk composition varies from animal to animal and time to time greatly. For example;
Water contents
ASS milk ---- contains high water contents ----- about 91%
DOLPHIN milk ---- is low in water contents --- about 48%
Fat contents
ASS milk ---- is very much low in fat contents – about 1.15%
DOLPHIN milk ---- contains outstanding high fat contents ---- about 45.6%
Lactose contents (milk sugar)
Elephant's milk is the most sweetish in taste – means it is very much high in lactose – 8.8%
Protein contents
The highest protein % is found in the Rabbit's Milk which is about 15.5%.

Quality of Milk

Milk Fat
A fat molecule consists of 3 fatty acids attached with a 1 mole of glycerol.



More than 64 (>64) different kinds of fatty acids are discovered to be present in milk fat. Mostly these are essential fatty acids – so milk is declared as a complete food. Therefore, some special kinds of fatty acids are derived from the milk fat.
Each and every fatty acid plays important role in the determination of nature and texture of the milk fat.

Types of Milk fat

Milk fat is usually of two types;

1) Hard fat: which is rich in F.A. having high melting point; nearer to 40 C.
2) Soft fat: which is rich in F.A. having low melting point as low as 36.8 C – dissolve at body temperature – healthier for human health.

Types of Fatty acids

Broadly, fatty acids are of two types;
i) Saturated fatty acids ii) Unsaturated fatty acids
Unsaturated fatty acids: such as linoleic acid and oleic acid are very good for health and make soft fat.

Milk Products

There are five classes in which all the milk products are categorized;

1. Milk cream and its products:
   By definition, milk cream must contain more than 18% milk fat. Therefore, fat percentage in the milk cream products may vary from 18% to 40%.
   Examples of milk cream products:-
   i) *Light cream* / coffee cream / table cream: It must contains 18-30% milk fat.
   ii) *Heavy cream*: It contains not less than 36% milk fat.
   iii) *Whipped cream*: air and gas bubbles are injected into the cream in order to increase the texture of the cream – it must contain 30-36% milk fat.
   iv) Half and Half: It is prepared by mixing both milk cream and fresh milk in a definite proportion. It contains about 10.5% milk fat.
2. Concentrated milk products:-
   These are derived after complete or partial removing of water contents in the milk. In this way, these can be preserved for a longer period of time.
   Examples of such products are;
   i) Homogenized concentrated milk
   ii) Skimmed milk or fat-free milk
   ii) Vitamin D concentrated milk: As we know minerals and vitamins are lost during dehydration process – so vit. D is added according to the WHO and FDA recommendation; i.e. 400 USP [1 IU = 1.6 gm].
3. Flavored milk products:-
   Example of such products are;
   i) Egg nog: It is prepared with a combination of milk cream and egg yolk.
   6.0 % Butter fat + 1.0 % egg yolk and0.5% emulsifier also added. Egg yolk is added to enhance the flavor and mineral contents of the product. Likewise, various fruit flavors are also added such as banana flavor, orange flavor, strawberry flavor, chocolate flavor and vanilla flavor.
4. Cultured milk products
   Mostly these are acidified milk products. We add specific bacterial culture in the milk and obtained such product.

Example of such products are:

i) Yoghurt: It is prepared with a monoculture of *lactobacillus*, *streptococcus* and *micrococcus* bacteria. These bacteria ferment the milk lactose into lactic acid due to which curdling of the milk protein starts and we get it as yoghurt.

Typical properties of these monocultures of bacteria;

Lactobacillus: sour taste, increased acidity, easily separation of water

Streptococcus: sweetish taste, less acidic, water not easily separate.

Nestle yoghurt usually obtained by monoculture of streptococcus, and our home and street yoghurt usually obtained from a mix monoculture of lactobacillus and streptococcus – it may be sometimes contaminated with E.coli

4. Reconstituted / Recombined milk products:-

Reconstitution of milk is the mixing of different separated components / constituents of milk, and homogenizing it to make a complete milk.

- International Law prohibits manufacturing and preparation of such products because there are many chances of adulteration and contamination at each step.
- Such products are only prepared and used for research and study purposes.

Probiotics: These are useful microorganisms, used in cultured milk products in various combinations. *Advantages*: increase digestibility and restore the normal flora of GIT after excessive use of antibiotics.

[Next Upcoming Notes (MICRO 404) >>> 25 Oct 2010, Monday]