

Research Paper—Dairy Science



SEPT—2009

**STUDIES ON PHYSICO-CHEMICAL
PROPERTIES IN BREAST MILK IN
LACTATING MOTHER**



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ABSTRACT

Milk is the almost nature's perfect food for infants. In the present investigation entitled, "STUDIES ON PHYSICO-CHEMICAL PROPERTIES IN BREAST MILK IN LACTATING MOTHER", the tests were carried out by adopting standard methods. The average values in three lactations observed are Titrable acidity = 0.0225 per cent, pH = 7.432, Specific gravity = 1.0282, Viscosity = 1.6114 Centi poise, Refractive index = 1.45806 and Electrical conductivity = 3.01 m Mhos.

Key Words : Breast milk, Titrable Acidity, pH, Specific Gravity, Viscosity, Refractive Index, Electrical Conductivity.

INTRODUCTION

Milk happens to the nature's more blessed food bestowed with almost every nutrient needed for our survival and growth and that too, in almost perfectly balanced quantities. Besides fat, carbohydrates and proteins, milk contains almost all essential amino acids, vitamins and minerals required for growth and disease resistance.

Milk is a maternal lactating secretion, the first and the sole food for infants for a certain period of time. From countless generations breast feeding required the sole source of infant nourishment. It is true that breast feeding is

the best for infants as it brings about interaction and interrelationship between mother and child.

Milk whether it is human or bovine exceptionally complex. It includes more than 200 recognized compounds (Nayak – 2001). The composition of milk of various mammal species differs considerably in quality and quantity.

Excellent reviews on composition and physico-chemical properties of cow and buffalo milk are available, but human milk does not appear to have received such as systematic and comprehensive attention. Keeping in view the urgent need to exploit human for its importance and to understand the nutritive value

of human milk with special emphasis on its physico-chemical properties, the present work has been undertaken.

MATERIALS AND METHODS-In the investigation 90 milk human milk samples, 30 from each Ist lactation, IInd lactation and IIIrd lactation were collected daily from lactating women for the period of 8 days, early in the morning hours. For the collection of samples sterile plain glass bottles and breast pumps were used. The milk samples were tested within 2 hours after collection for following parameters regarding physico-chemical properties.

- Titration acidity (%)
- pH
- Specific gravity
- Viscosity
- Refractive index and
- Electrical conductivity
- Titration acidity was determined by adopting

the procedure recommended in IS:147 (part-I) 1960. pH of milk by “digital pH meter” using glass electrode together with KCl solution, specific gravity by using a specific gravity bottle, viscosity by using capillary flow type Ostwald U-Tube viscometer, refractive index by using Abbe’s Refractometer and electrical conductivity by using the conductivity meter (model no. EQ 664). All were measured according to the method recommended by A.O.A.C. (1950). The data at Ist lactation, IInd lactation and IIIrd lactation was statistically analysed.

RESULTS AND DISCUSSION-The studies on physico-chemical properties of breast milk was carried out by selecting the patients from Latur town in respect of the parameters, Titration Acidity, pH, Specific Gravity, Viscosity, Refractive Index and Electrical Conductivity. The results obtained are presented as under –

1. Per cent Titration acidity in breast milk:

Table No : 1 Summary of results in respect of Titration acidity in breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	0.018	0.027	0.0225	0.00284	0.00090	15.05
II nd lactation breast milk	0.018	0.027	0.0225	0.00402	0.00127	18.61
III rd lactation breast milk	0.018	0.027	0.0225	0.00284	0.00090	15.05

The results obtained on per cent titration acidity values of milk obtained from Ist, IInd and IIIrd lactations are presented in Table No.1. It could be seen from this table that the average titration acidity of the breast milk obtained from Ist lactation is 0.0225, IInd lactation is 0.0225

and IIIrd lactation is 0.0225. There is non significant variation in the milk samples obtained from Ist lactation, IInd lactation and IIIrd lactation. Ref.....These observations are in agreement with

2. Hydrogen ion concentration of breast milk:

Table No : 2 Summary of results in respect of pH of breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	7.25	7.50	7.375	0.0820	0.025937	1.1126
II nd lactation breast milk	7.30	7.55	7.425	0.0789	0.02495	1.0604
III rd lactation breast milk	7.40	7.58	7.496	0.05949	0.01878	1.7930

The pH values shows in Table No:2 indicates that the values ranges between 7.25 to 7.50 with mean value 7.375 in case of Ist lactation, 7.30 to 7.55 with mean value 7.425 in IInd lactation and 7.40 to 7.58 with mean value 7.496 in IIIrd lactation. The mean values shows

negligible differences which clearly reveals that the pH value in breast milk is 7.432. The values are in collaboration with Cunningham et.al. (1997) and Szili (1917) who also observed alkaline pH.

3. Specific gravity of breast milk:

Table No : 3 Summary of results in respect of Specific gravity of breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	1.0281	1.0311	1.0296	0.00097	0.00030	0.0946
II nd lactation breast milk	1.0282	1.0315	1.0298	0.00011	0.00036	0.1132
III rd lactation breast milk	1.0286	1.0315	1.0300	0.00098	0.00031	0.0960

The summary of results in respect of specific gravity of breast milk (Table No.3) reveals that its range in Ist lactation milk sample is 1.0281 to 1.0311 with the value 1.0296. In IInd lactation milk sample is 1.0282 to 1.0315 with mean value 1.0298 and in IIIrd lactation milk sample is 1.0286 to 1.0315 with mean value 1.0300. The variation is due to the fluctuating constituents of milk like water, fat, solids-not-fat.

The negligible deviation between mean values shows that the specific gravity of breast milk is 1.0282. Our observations are in accordance with those of Carter and Richmand (1998) reported the range of specific gravity from 1.0240 to 1.0426 in breast milk sample and average specific gravity as 1.0313. Wardlaw et.al. (1915) reported the specific gravity as 1.096 in human milk between 1st and 9th month after delivery.

Table No : 4 Summary of results in respect of Viscosity of breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	1.6047	1.6082	1.6064	0.00103	0.00032	0.0646
II nd lactation breast milk	1.6234	1.6270	1.6252	0.00129	0.00040	0.0797
III rd lactation breast milk	1.6012	1.6043	1.6026	0.00114	0.00114	0.0714

The results of viscosity of milk samples from three different lactational stages and statistical analysis of the data obtained in this study are presented in Table No: 4 .The values of viscosity in Ist lactation milk sample are between the range of 1.6047 to 1.6082 with mean value 1.6064 Centi poise. In case of IInd

lactation milk sample is between range of 1.6234 to 1.6270 with mean value 1.6252 C.poise and in case of IIIrd lactation milk sample is between 1.6012 to 1.6043 with mean values 1.6026 Centi poise .There is non significant variation in the milk samples obtained from Ist, IInd and IIIrd lactation.

Table No : 5 Summary of results in respect of Refractive index of breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	1.4572	1.4590	1.4581	0.00063	0.00020	0.0433
II nd lactation breast milk	1.4571	1.4590	1.4580	0.00055	0.00017	0.0381
III rd lactation breast milk	1.4573	1.4590	1.4581	0.00062	0.00019	0.0428

The figures in Table No.:5 indicates that the value of refractive index in breast milk sample identified in the range of 1.4572 to 1.4590 with mean value 1.4581 in Ist lactation in milk samples, 1.4571 to 1.4590 with mean value 1.4580 in IInd lactation milk samples and 1.4573 to 1.4590 with mean values 1.4581 in

IIIrd lactation milk samples. The mean value difference is negligible. The value of Refractive index observed are more or less similar to the value observed by Arnold (1912) reported refractive index at 40 °C ranges from 1.4576 to 1.4585 in human milk samples.

Table No : 6 Summary of results in respect of Electrical conductivity of breast milk.

Kind of sample	Range		Mean	SD	SE	CV %
	Min.	Max.				
I st lactation breast milk	2.90	3.10	3.00	0.6804	0.02121	2.2702
II nd lactation breast milk	2.89	3.12	3.00	0.07252	0.02293	2.4288
III rd lactation breast milk	2.95	3.12	3.05	0.06049	0.01913	1.9861

The summary of results in (Table No.6) in respect of electrical conductivity of breast milk indicates the range of 2.90 to 3.10 with mean value 3.00 m Mhos in Ist lactation milk sample .The corresponding figures for milk sample in IInd lactation and IIIrd lactation are 3.00 and 3.05 m Mhos respectively .

The mean values shows negligible difference which clearly indicates that the electrical conductivity of breast milk is 3.01 m Mhos.

SUMMARY AND CONCLUSION

The present investigation entitled, “**Studies on physico -chemical proerties in breast milk in Lactating mother** “. Was carried out for knowing the physico-chemical properties like Titrable acidity ,pH, Specific gravity ,viscosity, Refractive index and Electrical

conductivity in breast milk . The results indicates the average values for **pre cent Titrable acidity 0.0225 per cent ,pH - 7.432,Specific gravity -1.0282,Viscosity- 1.6114 C poise , Refractive index -1.4580 and Electrical conductivity -3.01 m Mhos** in breast milk .

Lot of work is done on composition of breast milk but physico-chemical properties are rarely studied in case of human milk. It is most common in animal milk to detect the infection of udder for mastitis disease. Thus the present work on physico-chemical properties in breast milk helps to know the abnormal conditions of breast milk regarding to infection of breast which affects on health of lactating women and infants.

R E F E R E N C E

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