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Analysis of contamination in bottles and nipples used for infants

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Abstract

The ultimate quality of bottle feeding is also influenced by the hygienic conditions of feeding bottles and nipples. Improperly cleaned and unsterilized feeding bottles and nipples have been found to be an important source of contamination of prepared feeds for babies. For analysis of the microbiological quality of feeding bottles and nipples, rinse samples were taken of 125 feeding bottles and 100 nipples obtained from Meerut district in the year 2009-10. To take the bottles rinsing 10ml. of ringer solution or normal saline was used. Appropriate dilution of rinsed sample will be used for analysis total bacterial counts, staphylococcal counts, B.cereus counts and coliform counts. The present study showed the unhygienic conditions of feeding bottles and nipples. About 4.00 and 8.00 percent of bottles and nipples rinse samples contained more than 10,000 organisms per ml. 9.00 and 12.00 percent of the samples of bottles and nipples were positive from faecal coliform and also contained staphylococci and B.cereus pathogenic. This accounts for the poor hygienic measures adopted at homes and relatively less awareness of mother for proper cleaning and sterilization procedure to achieve healthy feeding practices. Steaming for 5 minutes in a pressure cooker was an efficient in comparison to 10 minutes boiling. In order to bring down the contaminants to a negligible level, 10 minutes steaming was required. There is a need to awareness of mother for adaptation of sanitary practice in respect of bottles and nipple used for baby feeding is strongly advocated in the area.

Keywords: Bottles and nipples, feeding, microbiological quality, sterilization, pathogen

Introduction

Pathogenic bacteria in milk have been a major factor for public health concern since the early days of the daily industry. Many disease are transmissible via milk products; traditionally raw or unpasteurized milk has been a major vehicle for transmission of pathogens Another source of contamination by microorganisms is unclean teats.

Introduction

Feeding bottles and nipples play an important role in influencing the final quality of the prepared feed. The main draw-back of infant feeding through bottles in the abuse of the system due to ignorance about hygiene and sanitation. Improperly cleaned bottles and nipples may significantly influence the final quality of infant feeding. The general lack of awareness about hygienic practices may lead to mishandling of bottles and nipples which act as a major source of contamination of otherwise good quality prepared infant feed. Thus, feeding bottles and nipples needs to be sterilization because infant immunity level are very low.

So, it is goes without saying that sterilizing bottles and nipples in one of the most important part of the baby care which follow before the first use and after each use. Now, without sterilization feeding bottles and nipples it may contain bacteria, which will be harmful of infant health. Keeping in mind the above facts the present study is an effort in this direction and has been undertaken with following specific objectives:-

- To analysis microbial quality of rinse sample of feeding bottles and nipples.
- Effect of heat treatment on feeding bottles and nipples.

Material and methods

The study was conducted to asses the microbiological quality of feeding bottles and nipples. Rinse samples were taken of 125 feeding bottles and 100 nipples obtained from Meerut district in the year 2009-10. To take the bottles rinsing 10 ml. of ringer solution or normal saline was used. Appropriate dilution of rinsed samples will be used for analysis total

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bacterial counts, staphylococcal counts, *B.cereus* counts and coliform counts etc. While, the nipples were rinsed by immersing in 10ml of ringer solution in a wide mouth jar.

All the samples were analysed for total bacterial count using nutrient agar, by serial dilution the samples petri plates was incubated at 37°C ± 1°C for 24 hours and number of colonies was counted. The enumeration of coliform counts was done using on violet red bile agar [VRBA] plate. The incubation was carried out for 24 to 48 hours at 37°C. The samples were also plated in eosine methylene blue agar. The suspected colonies was carried through indole, methyl red ,voges proskauer and citrate utilization test. To differentiate between faecal and non faecal coliform. Elijkans test was employed by incubating at 44°C ± 1°C. To detected *Bacillus cereus* counts colonies were picked up at random from Mannitol egg yolk Polymoysin Agar [MYPA] and were examined microscopically, conformation of B.cereus was done by biochemical reactions sugar fermentation, gelatinase production and citrate utilization.

To analysis of staphylococcal counts was spread over prepared plate of Blood agar and also followed using Tryplic Soy Broth Himedia [1979]. Confirmation of staphylococcal isolated were also examined by gram's staining fermentation of sugar, catalase production, phosphatase production, gelatinase production, haemolysins salts tolerance and coagulose production etc.

All samples was taken 10 g of samples + 90 ml of sterile saline water and then it is serially diluted to 10"4 from that 0.1 ml sample is taken in agar plates following spread plate technique and it incubated at 37°C. for 48 hour which colonies formed were counted and expressed as colony forming unit per gm. [cfu/g]

The CFU/g of the sample was calculated by using the following formula:

CFU/g =

$$\frac{\text{Number of colonies} \times \text{Dilution factor}}{\text{Dry weight of the sample}}$$

To sterilization of feeding bottles and nipples as many as 20 assembled feeding bottles with nipples were collected at randomly. These were grouped into four batches each and were exposed to four different heat treatments such as boiling in water for 5 and 10 minutes and steaming in a pressure cooker for 5 and 10 minutes, respectively. The rinse samples taken after these treatments were analysed for total bacterial counts. Analysis was done using simple statistical tools like average and percentage.

Results and Discussion

A wide variation of bacterial counts was found in the rinse samples of feeding bottles and nipples. The log counts of bottles ranged from 1.2 to 4.5 per ml. of the rinse with an average count of 4.1 log per ml. Rinse samples of nipples revealed total bacterial counts from 1.1 to 3.8 log per ml. The average counts, however, was 3.5 log per ml. (Table 1)

Table 1: Total bacterial counts in the rinse samples of feeding bottles and nipples used for infants.

Source of Rinse Samples	Number of Samples	Log Counts / ml. rinse Min.	Max.	Average
Feeding Bottles	125	1.2	4.5	4.1
Nipples	100	1.1	3.8	3.5

A wide variation existed in the distribution pattern of total bacterial counts both in bottles and nipples as high as 4.00 and 8.00 percent of the bottle and nipple samples, respectively contained more than 10,000 counts per ml. Majority of rinse samples from these sources had total bacterial counts in the range of 1001 to 5000 per ml. (Table 2).

Table 2: Distribution of total bacterial counts in the rinse samples of feeding bottles and nipples used for infants.

Range (Counts/ml.)	Bottles Positive Samples	Percent	Nipples Positive Samples	Percent
101-1000	29	23.20	18	18.00
1001-5000	76	60.80	63	63.00
5001-10000	15	12.00	11	11.00
More than 10000	5	4.00	8	8.00

It can be concluded from the table 2 that the average bacterial counts of feeding bottles were higher then the nipples. While, the distribution of total bacterial counts of bottles and nipples indicated higher percentage in the range of 1001-5000 counts/ml.

Incidence of coliform

The data regarding the occurrence of coliform in the rinse samples of bottles and nipples recorded in Table 3 and 4. The average log count of faecal coliform was 2.3 and 1.5 for bottles and nipples rinse solution. No faecal counts showed higher values of 3.0 and 1.7 per ml rinse in the above samples.

Table 3: Occurrence of coliform in the rinse samples of feeding bottles and nipples used for infants

Source of rinse Samples	Number of Samples	Log Counts / ml. Rinse			Faecal	Non-Faecal	
		Minimum	Maximum	Average	Minimum	Maximum	Average
Feeding Bottle	125	0.5	2.6	2.3	0.0	3.4	3.0
Nipples	100	0.0	1.8	1.5	0.0	2.0	1.7

Table 4: Distribution of coliform the rinse samples of feeding bottles and nipples used for infants.

Range (Counts/ml)	Bottles				Nipples			
	Faecal		Non Faecal		Faecal		Non Faecal	
	Positive	Percent	Positive	Percent	Positive	Percent	Positive	Percent
Less than 10	5	55.55	15	16.85	6	50.00	40	44.44
10-100	3	33.33	19	21.35	4	33.33	37	41.11
101-1000	1	11.11	33	37.09	2	16.67	10	11.11
1001-2000	0	-	22	24.72	0	-	3	3.33

The distribution pattern showed that 11.11 and 16.67 percent of rinse solution obtained from bottles and nipples demonstrated faecal coliform count between 101 to 1000 per ml. However, 37.09 and 11.11 percent samples contained non-faecal coliform in the range of 101-1000 per ml. (Table 4). While, 24.72 and 3.33 percent samples contained non-faecal coliform in the range of 1001-2000 per ml. The coliform were also characterization

It can be concluded from the table 4 that there was not more difference in the average of faecal and non faecal of feeding bottles and nipples.

Incidence of B.cereus

Table 5: Occurrence of B.cereus in the rinse samples of feeding bottles and nipples used for infants.

Source of Rinse Samples	Number of Samples	Log Counts / ml. Rinse		
		Minimum	Maximum	Average
Feeding Bottles	125	0.0	2.5	2.2
Nipples	100	0.0	2.8	2.5

Table 6: Distribution of B.cereus the rinse samples of bottles and nipples used for infants.

Range (Counts/ml.)	Bottles		Nipples	
	Positive Samples	Percent	Positive Samples	Percent
10-100	8	22.22	21	44.68
101-1000	17	47.22	17	36.17
1001-5000	11	30.55	9	19.15

The occurrence and distribution of *B.cereus* in rinse samples of feeding bottles and nipples are presented in Table 5 and 6. The average log count was 2.2 and 2.5 per ml. of the rinse solution, respectively. Approximately 47.22 and 36.17 percent of positive samples had *B.cereus* count of 101 to 1000 per ml. of the rinse samples of bottles and nipples and 30.55 and 19.15 percent of positive samples had *B.cereus* count of 1001 to 5000 per ml. While, 22.22 and 44.68 percent had counts of *B.cereus* count of 10 to 100 per ml. of the rinse samples of bottles and nipples, respectively. The biochemical characterization of *B.cereus* isolates .

It can be concluded that in table 5 to 6 *B.cereus* counts was higher in feeding bottles than the nipples.

Incidence of staphylococci

The average log count of staphylococci in the rinse samples of feeding bottles and nipples are tabulated in table 7. The maximum log count obtained in rinse samples of bottle was 2.0 per ml. Samples from nipples however, exhibited significant number of staphylococci (3.4 log/ml.).

Table 7: Occurrence of Staphylococci in the rinse samples of feeding bottles and nipples used for infants.

Source of Rinse Samples	Number of Samples	Log Counts/ml. Rinse		
		Min.	Max.	Average
Feeding Bottles	125	0.0	2.0	1.7
Nipples	100	0.0	3.4	3.0

About 12.50 percent of bottle rinse samples contained staphylococci in the range of 1001 to 5000 per ml. (Table 8). Tests for identification of staphylococci were done as stated earlier in case of baby food.

Table 8: Distribution of Staphylococci in the rinse samples of feeding bottles and nipples used for infants.

Range (Counts/ml.)	Bottles		Nipples	
	Positive Samples	Percent	Positive Samples	Percent
10-100	26	81.25	25	73.53
101-1000	2	6.25	9	26.47
1001-5000	4	12.50	0	-

It can be concluded from the table 8 that log counts/ml. of rinse samples of nipples was higher than feeding bottles. It can also further be concluded in above tables that use of such feeding bottles and nipples containing high load of organisms may vitiate the attributes of otherwise good quality infant foods.

Sterilization of feeding bottles and nipples

Table 9: Effect of heat treatments on feeding bottles and nipples used for infants.

Heat Treatment	Total Counts/ml.	
	Minimum	Maximum
Steaming		
5 minutes	0.0	2×10^1
10 minutes	0.0	1×10^1
Boiling		
5 minutes	0.0	1×10^1
10 minutes	0.0	0.0

Sterilization of feeding bottles and nipples prior to use is necessary to avoid contamination. The two common systems practiced are steaming and boiling. Investigations were carried out to as certain the efficacy of these processes. The data presented in table 9 indicated that assembled feeding bottles when subjected to steaming or boiling resulted in significant reduction of contaminants.

It can be concluded from the table 9 that boiling treatment on feeding bottles and nipples is better than steaming to reducing the microbial load. Based upon discussion of the result obtain in the present study, that there is an urgent need for users to adopt proper cleaning and sterilization techniques for bottles and nipples to keep bottle feed baby healthy and vigorous.

References

Altug, G. and Bayrak, Y. (2003). Microbial analysis of caviar from Russia and Iran. Food Microbiol; 20 : 83-86.

Aneja, K.R. (2003). Experiments in microbiology plant pathology and Biotechnology. 4th edu; PP : 355-370.

Bonfoh, B. A., Wasen, A.N., Traore, A.F. and Spillmann, H. (2003). Microbiological quality of cow's milk taken at different intervals from the udder to be selling point in Bamako (mali). Food control; 14 : 495-500

Cushing, A.H. and Anderson L. (1982). Diarrhea in breast-fed and non breast-fed infants. Pediatirics. 70 : 921-5.

Fouzia, B., Ahmad, N., Hussain,T. and Manan, F. (1995) Effect on infant feeding practices on birth interval and morbidity among children in north west frontier province of Pakistan. Journal of Islamic Academy of Sciences 8:2, 69-72.

Harrigan, W.F. and McCance, M.E. (eds.) (1976). Laberatory Methods in Food and Dairy Microbiology. New York; Academic Press.

Mossel, D.A.A., Koopman, M.J. and Jongerius, E. (1967). Enumeration of *Bacillus cereus* in foods. Appl. Microbiol., 15 : 650-653.

Speck, M.L. (1976). Compendium of methods for the microbiological examination of food. APHA, NW, Washington; D.C.