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CONCLUSION and RECOMMENDATION

Milk and dairy products are unique and ideal foods for human. However, they are highly nutritious media in whom microorganisms will thrive and so are susceptible to deterioration and spoilage. Presence of *B. cereus* and related species in milk and dairy products is not surprising in view of fact, that it is widely spread in nature and contaminate the milk during milking, storage in the farm and processing in the dairy factories.

The information given by the achieved results in this study, demonstrated to what extent a considerable number of samples from all examined products, except UHT milk, found to be massively contaminated with such objectionable *Bacillus spp.*

Briefly, *Bacillus spp.* may contaminate other food, if milk or milk products is one of their ingredients, and if conditions are right, multiply rapidly and produce sufficient toxin to induce symptoms of food poisoning. Its presence in heat treated milk and milk products could be explained in terms of regular contamination of raw milk during milking followed by survival during heat treatment (even if only at low levels) and subsequent out growth at ambient temperatures.

The quality of the finished products would of course, be not encourages and this must be reflected upon its keeping quality, which would sooner or later, be affected by certain types of off-flavors. These flavors including gelation, putrid flavors reaching in the worst cases to the complete spoilage of the product.

From the results of the present study it was established that the high incidence of *Bacillus spp.* were recorded in the examined pasteurized milk samples and constitutes from the epidemiological point of view a

dangerous source of infection to human beings. It is clear that pasteurized milk is not a sterile product. In the contrary the lowest isolation rate was carried out in UHT milk samples which subjected to ultra high temperature reach 140°C for seconds in conjunction with a septic filling that require no refrigeration. These processes are designed to result in commercially sterile products.

It is worth while to state contamination of infant food and milk powder with *Bacillus spp.* especially *B. cereus* even in low number (10^3 – 10^5) constitute a major public health concern for children, economic losses and incriminated in many outbreaks of gastroenteritis as well as food poisoning. The high prevalence of organisms in the examined samples of condensed milk and processed cheese may be attributed to lack of cleanness in manufacture, handling and distribution; and ignorance of sanitary measures storage.

In addition our data disclose comparison between MYP and PEMBA media for selectively and effectiveness in *Bacillus spp.* isolation and identification. It was evident that using of MYP agar is more sensitive for these purposes. Through this work likewise one can easily recommended that MPN technique is suitable for examining foods containing low populations of *Bacillus spp.*, while, the direct plating technique is preferable for higher populations.

Improving microbial safety and extending the shelf life of heat-treated milk and related products have always been important concern to the dairy industry. A major factor limiting realization of these goals is microorganisms surviving the pasteurization process and / or contributing to post pasteurization contamination. The fact that aerobic

sporeformers naturally exist in numerous foods owing to their wide spread distribution in environment that prevent the establishment of specifications that preclude their presence in food.

Therefore, the hygienic production of milk and milk products is necessary to provide the public with a safe, wholesome and high quality products, through the followings:

1. Educational programs should be imposed for producers and handlers to improve the quality of the produced milk and to ensure a maximum safety to consumers.
2. Scrupulous hygienic measures must be maintained from milking including Water that should be properly treated (chlorinated), manufacturing, storage and distribution of finished products.
3. Proper heat treatment of milk and milk products should be imposed in all factories, avoid fluctuated temperatures at their storage and prevent post-heat treatment contamination.
4. Application of new quality assurance programs such as " HACCP" system, which must be, adapted in both milk productions units, milk products processing plants and transportation and displaying the final products.
5. High quality ingredients and properly balanced of low microbial content governed by standard specifications should be used.
6. The performance of various detergent in destroying *Bacillus spp.* should be applied, 1% nitric acid at 60°C were reported to be sporicidal against *B. cereus*.

SUMMARY

A total of two hundred random samples of heat treated milk and some milk products including: pasteurized milk (35), UHT milk (35), sweetened condensed milk (25), milk powder (35), processed cheese (35) and baby foods representing five brands (35) of different manufacture dates were purchased from different dairy shops, pharmacies and supermarkets. These samples were examined for isolation and enumeration of *Bacillus cereus* and related species. Where the isolated strains were biochemically identified.

The obtained results achieved that *Bacillus spp.* could be detected in 32 (91.4%), 13 (37.1%), 19 (76%), 27 (77.1%), 26 (74.3%) and 28 (80%) of the examined pasteurized milk, UHT milk, condensed milk, milk powder, processed cheese and baby food samples using direct plating technique on MYP agar with mean values of $1.94 \times 10^8 \pm 1.11 \times 10^8$, $2.02 \times 10^3 \pm 7.01 \times 10^2$, $2.92 \times 10^4 \pm 1.57 \times 10^4$, $4.90 \times 10^4 \pm 2.37 \times 10^4$, $1.21 \times 10^5 \pm 8.82 \times 10^4$ and $4.13 \times 10^5 \pm 1.31 \times 10^5$ cfu /ml or g, respectively. However, their incidences on PEMBA were 32 (91.4%), 6 (17.1%), 18 (72%), 23 (65.7%), 22 (62.9%) and 25 (71.4%) with mean counts of $6.57 \times 10^7 \pm 1.75 \times 10^7$, $6.16 \times 10^2 \pm 3.09 \times 10^2$, $1.07 \times 10^4 \pm 4.09 \times 10^4$, $3.06 \times 10^4 \pm 1.51 \times 10^3$, $1.72 \times 10^4 \pm 3.77 \times 10^4$ and $2.20 \times 10^5 \pm 6.53 \times 10^4$ cfu /ml or g, respectively. On the other hand MPN technique showed that 35 (100%), 18 (51.4%), 20 (80%), 29 (82.9%) and 30 (85.7%) of the corresponding samples were contained *Bacillus spp.*, respectively.

B. cereus could be isolated in percentages of (42.9, 17.1, 56, 48.6, 40& 71.4 %) from the examined pasteurized milk, UHT milk, condensed milk, milk powder, processed cheese and baby food, respectively on MYP agar and in percentages of (31.4, 8.6, 52, 42.9, 31.4& 54.3 %) from the aforementioned products, respectively on PEMBA. While by MPN technique (45.7, 20, 72, 54.3, 48.6& 85.7 %) from pasteurized milk, UHT milk, condensed milk, milk powder, processed cheese and baby food, respectively.

B. subtilis could be detected in percentages of (17.1, 22.9& 25.7 %) from pasteurized milk, (14.3, 8.6& 22.9 %) from UHT milk, (8, 8& 16 %) from condensed milk, (14.3, 8.6& 17.1 %) from milk powder, (20, 11.4& 14.3 %) from processed cheese and (14.3, 8.6& 17.1 %) from baby food samples on MYP, PEMBA and MPN technique, respectively.

The percentages of *B. licheniformis* was (34.3, 25.7& 37.1 %), (8.6, 5.7& 11.4 %), (20, 25.7& 20 %), (11.4, 17.1& 22.9 %) and (8.6, 14.3& 14.3 %) from the same products, on the MYP, PEMBA & MPN technique, respectively except in condensed milk samples, *B. licheniformis* could not be detected.

About *B. mycoides* by using MYP, PEMBA & MPN was found in (20, 14.3& 20 %) for pasteurized milk, (11.4, 5.7& 5.7 %) for UHT milk, (36, 20& 40 %) for condensed milk, (8.6, 2.9& 11.4 %) for milk powder, (17.1, 20& 31.4 %) in processed cheese and (11.4& 8.6 %) in baby food samples, respectively.

B. polymyxa could be detected in levels of (17.1, 20& 22.9 %) , (2.9, 2.9& 8.6 %) and (2.9, 8.6& 8.6 %) from pasteurized, UHT milk and milk powder samples only on MYP, PEMBA& MPN, respectively.

B. pumilus elsewhere isolated from the previous products in addition to processed cheese in percentages of (11.4 %) on both MYP& PEMBA and (8.6 %) on MPN technique in pasteurized milk. Also of (5.7, 2.9& 11.4 %) and (5.7, 2.9& 5.7 %) on MYP, PEMBA& MPN technique in UHT milk and milk powder, respectively. But, in processed cheese it could be isolated in (2.9 %) using MPN technique only.

However, *B. macerans* could be isolated in a percentage of (5.7 %) on PEMBA and MYP from pasteurized milk, milk powder and processed cheese, respectively.

B. megaterium could be detected in (4 %) using MPN from condensed milk samples only.

These results declared the presence of *B. cereus* and related *species* in the examined heat-treated milk and milk products. This may be belongs to its resistant to heat treatment processes and neglected sanitary control measures during handling, manufacturing, distribution and storage of the different products.

On the other side, UHT milk samples recorded lowest contamination rate as a result of its subjective to ultra high temperatures reach 140°C for seconds in conjunction with aseptic filling.

Also, it was evident that using MYP agar for enumeration *Bacillus spp.* was better especially for *B. cereus*.

Direct plating technique was satisfactory for enumerating large population of *Bacillus spp.* in foods, while MPN technique was more reliable for count small numbers of these organisms.

Recommendations were suggested to control the presence of such microorganisms in heat treated milk and milk products, to avoid their undesirable changes that resulted economical losses, besides the possibility of their public health hazard.