Effect of serving factors of milk powder in sachet packaging on total microbial

[1]Dwi A. Ratih and [1.2]Nurliana

[1] Laboratory of Veterinary Public Health, Faculty of Veterinary Medicine, Syiah Kuala University, 23111, Indonesia; [2]Department of Veterinary Public Health, Post Graduate Program, Syiah Kuala Univesity, 23111, Indonesia.Coorresponding Author: nunayafiq@yahoo.com

Abstract. The aim of this research was to study the microbial quality of milk powder based on the serving factors during milk powder serving process. The method used in this research was Total Plate Count (TPC). Nine sachets (400 g/sachet) of milk powder was used as many as This experiments used Split Plot Design, comprised three factors, storage factor (P1, P2 and P3), time of serving factor (morning and evening), and shelf life factor (day of 1^{st}-7^{th}). Each treatment consisted of three sachets of milk powder. Storage factors comprised P1 (sachets packaging contained of milk powder were placed into the glass bottle container), P2 (sachets packaging contained of milk powder were placed into glass botlle with spoon inside, and P3 (sachets packaging contained of milk powder with spoon inside were not placed into the glass bottle container). The results of this research showed that storage factors and time of serving did not sifnificantly (P>0,05) affect on the microbial count of milk powder, but shelf life factor significanly (P<0,01) affected on microbial count of milk powder at day of 1^{th} and 7^{th}. Milk powder in sachet packs (400 grams) has been opened, with or without spoon in the sachet and more than five days of shelf life can increase the total number of microbes, which was exceed TPC decision at $5x10^4$ CFU/grams of milk powder.
Keywords: milk powder, serving factor, microbes contaminant.

Introduction

As one of foodstuffs, milk can be used in either pure or processed form. As we knew, that the often availability of milk in circulation commercially can be divided into two groups: whole milk packed in plastic bottle, and milk powder, canned-condensed milk, tetra pack, or sachet package. Ordinarily the availability form of powder is produced by dairy manufacturing and consumed for predetermined periode, and indicating expiration date. The milk powder allows the availability of milk agent into area in which the dairy species are not found, or economic condition is not condusive for many peoples to buy the whole milk product (Winarno, 2004). Milk powder is needed so much by peoples from various socioeconomic levels, thus there should be simple access in the market (Siswono ,2005).

The feasible milk powder to consume is the good and safe one by Total plate Count 5 x 10^{-4} CFU/gr of powder milk (SNI, 2000). It is considered to be safe because it has complied with the standard, either content of nutrition or safe from several biological, physical and chemical dangers. According to Astawan (2009), if package is not open yet counted since date of production, the canned milk powder can persist until two years. The milk powder in tetra pack can persist from six months to a year, and in sachet it can be until six months. If the the powder milk is unpacked, it should be consumed competely for one month. For the reason, the expiration date written on the pack should be complied with carefully. The determination of expiration date is closely related to composition contained in the milk powder. Milk powder contain very good protein and it can be recomposited simply/reconstructed to became liquid milk and to be another materials of another product elements (Herdiana, 2007). Therefore, milk powder can contain microba due to weak sanitation during processing and management or contamination after processing allowing the incidence of foodborne disease.

The main disadvantage of consuming the powder milk is in process of presentation or serving. Misserving can be baused by less understanding of consumers, or may be intentionally. The low care of Indonesian people about hygienity in presentation process allows the microbial contamination. In addition, there is underestimation for blockade of mite entrance (Mardiani, 2009). The destroyed milk powder can be caused by careless serving and treatment controversial to properties of the powder milk itself (Anonimous, 2010a). The destruction of milk powder can be prevented by appropriate preparation, processing, storage and serving of milk powder thus promoting the physical, spritual and environmental health (Anonimous, 2010b). For the reason, it will be very important to consider the methods of preventing destruction of milk powder due to mistake in presentation or serving process. The

result of research is hoped to give peoples with information that inappropriate process of serving can decrease the quality of milk powder.

Materials and Method

Preparation of Milk Powder according to Design Research

This experiments used Split Plot Design. The first factor was storage (P1, P2 and P3), second factor was time of serving (morning and evening), and third factor was shelf life of milk powder (observation day of 1^{st}-7^{th}). Each treatment (P1, P2 and P3) consists of 3 (three) replications. Treatment I (P1): milk powder in sachet packaging was entered into glass bottle container (as control). Treatment I was recommended serving procedure of milk powder (Andi, 2011). Treatment II (P2): milk powder in sachet packaging was entered into bottle container with spoon inside. Treatment III (P3): milk powder in sachet pack was folded and tied by using rubber with spoon inside (not in glass container).

Measuring of total number of milk powder Microbial by Total Plate Count Method

The preparation of microbial cultur medium was conducted by dissolving 5.6 gram of Plate Count Agar (PCA) with 240 ml of sterilized aquadest in Erlenmeyer, and then homogenized and heated while stirring until boiling. Measuring of total microbial number of milk powder was conducted by using Total Plate Count method (TPC) (Swanson *et al*., 1992). The number of growing colony in petri dish was counted between 25-250 (SNI, 1992). Total number of microbia was multiplied with magnitude of dilution as Total Plate Count. The parameter observed in this research was number of microbia (CFU/g of milk powder) based on SNI No. 01-6366-2000 (BSN, 2000). Data was analyzed statistically by using Varian Analysis (ANAVA), if it is of significant difference, it would be continued with Duncan-Test (Steel and Torrie, 1995).

Results and Discussion

The total number of microbe in milk powder presented in Table 1. The result of statistical analysis showed that storage and time of serving (morning and night time) not significantly effect ($P > 0.05$) on total number of microbe of milk powder, but shelf life of milk powder storage in 1 to 7 days very significantly effect ($P<0.01$) on the total number of microbe (table 1). Total number of microbe in all three treatments either in morning or night investigation were tended to increase from days 1 to 7. Microbial mean x 10^4 (CFU/gr) of milk powder in serving of morning from first to seventh days increased from 1.10 ± 0.10 to 8.33 ± 1.33 in treatment I, 1.20 ± 0.17 to 9.30 ± 3.91 in treatment II and 1.40 ± 0.20 to 14.06 ± 7.36 in treatment III.

The milk powder serving in night coud also increase the number of microbia, from 1.26 ± 0.15 to 9.30 ± 0.88 in treatment I, 1.46 ± 0.57 to 10.76 ± 1.96 in treatment II, while treatment III increased from 2.96 ± 2.71 to 13.60 ± 4.80. Generally in all three treatments, there was an increase in total number of microbe since sixth day until seventh day.

The number of microbe in treatment I (milk powder sachet entered into glass bottle container) was lower than in treatment II (milk powder excluded from sachet entered into glass container and spoon inside) and treatment III (milk powder in sachet pack tied with rubber and spoon inside not entered into glass bottle container. The milk powder serving in treatment I was a recommended serving suggestion of milk powder. The high number of microbia in treatments II and III could be caused by serving factor. Milk in both treatments did not comply with recommended procedure of milk serving. the consumption of milk powder has main disadvantage, in standard of serving (presentatioin). Misserving could be caused by less understanding of consumers, or may be intentionally (Mardiani, 2009).

The milk powder serving in morning and night time could also increase the number of microbia. The factors effecting microbial growth in foodstuff was moisturation, among others. A Factor of microbial growth was moisturation (Saksono and Saksono, 1986). Generaly, the moisturation in night time was higher than morning. Microbial, especially bacteria could growh well in high moisturatioin of medium, over 85%. This moisturation could increase the number of microbia. The microbia as determined by National Standard of Indonesia (SNI) was not over of Total Plate Count 5 x 10^4 colony per gram of milk powder. The increased number of microbia was due to milk powder was more often making direct contact to air surrounding.

However based on standard operational of milk powder serving in house after pack was open, the milk shoud be storaged in tighly-closed glass container. With more exposure to air, it would result in oxidative process to decrease the nutrition content of the milk powder (Megarani, 2010).

Table 1. Mean ± SD of microbial total number x 10^4 (CFU/gram) in milk powder for 7 days. Mean TPC of milk powder in the same row and column followed by a different superscript indicate significant differences (P<0.01).

Time of Serving (W)	Storage (P)	Shelf Life (days) H1	H2	H3	H4	H5	H6	H7
Morning	P1	1.10 ± 0.10^a	1,36 ± 0,11^a	1,50 ± 0,17^a	2,20 ± 0,40^a	3,10 ± 1,46^a	4,33 ± 2,04^a	8,33 ± 1,33^b
	P2	1,20 ± 0,17^a	1,13 ± 0,11^a	1,96 ± 0,40^a	1,93 ± 0,21^a	2,76 ± 1,08^a	7,30 ± 2,52^b	9,30 ± 3,91^b
	P3	1,40 ± 0,20^a	1,50 ± 0,26^a	1,56 ± 0,32^a	3,00 ± 1,41^a	6,03 ± 4,66^a	12,03 ±7,33^b	14,06 ± 7,36^b
	Mean	1,23 ± 0,16^a	1,33 ± 0,16^a	1,67 ± 0,29^a	2,37 ± 0,67^a	3,96 ± 2,40^a	7,89 ± 3,96^b	10,56 ± 4,22^b
Night	P1	1,26 ± 0,15^a	1,46 ± 0,21^a	1,66 ± 0,40^a	1,83 ± 1,63^a	5,56 ± 3,21^a	5,50 ± 2,78^a	9,30 ± 0,88^b
	P2	1,46 ± 0,57^a	1,70 ± 0,56^a	2,23 ± 1,47^a	3,03 ± 1,89^a	4,33 ± 1,04^a	7,53 ± 1,74^b	10,76 ± 1,96^b
	P3	2,96 ± 2,71^a	3,60 ± 3,38^a	5,63 ± 2,45^a	8,56 ± 5,17^a	8,86 ± 2,32^b	9,93 ± 6,16^b	13,60± 4,80^b
	Mean	1,89 ± 1,14^a	2,25 ± 1,38^a	3,17 ± 1,44^a	4,47 ± 2,89^a	6,25 ± 2,19^b	7,65 ± 3,56^b	11,22 ± 2,55^b

Description : P1: milk powder in sachet pack entered into glass bottle container (as control). P2: milk powder in sachet pack entered into glass bottle container with spoon inside. P3: milk powder in sachet pack tied with rubber, spoon inside (not entered into glass bottle container). H1, H2, H3, H4, H5, H6, and H7 (1st ,2nd ,3rd ,4th ,5th ,6th ,7th day observation).

Conclusions

From the result of research, it could be concluded that the serving factors of sachet milk powder (400 gr) with spoon inside was kept into glass bottle container and sachet milk powder tied and with spoon inside was not kept in glass bottle container for more than five days could increase the total number of microbe (Total plate count) exceeded TPC specified provisions by SNI 5 x 10^4 CFU/gr of milk powder. Milk powder in sachet (400 gr) should be consumed completely in less than five days after being unpacked. For safe consumption, the milk powder sachet should be placed in tightly closed glass bottle container and in each picking it should use new or clean spoon.

References

Andi, M.A. 2011. Kiat memilih, membeli, dan menyimpan susu formula. *Ayahbunda. http://ayahbunda.co.id.* 08 Mei 2011.

Anonimus. 2010(a). bahaya biologis pada bahan pangan. *http://www.suaramedia.com.* 10 mei 2011.

Anonimus. 2010(b). Teknologi Pangan dan Gizi. Fakultas Teknologi Pertanian. IPB. Bogor. *http://www.femenina-online.com.* 10 mei 2011.

Astawan, M. 2009. Upaya Penyelamatan Gizi pada Susu. Waspada Online*. http://ningnangninggung-ningnangninggung.blogspot.com.* 27 mei 2011.

Badan Standarisasi Nasional (BSN). 2000. SNI 01-6366-2000. Batas Maksimum Cemaran Mikroba dan Batas Maksimum Residu Dalam Bahan Makanan Asal Hewan. Jakarta.

Herdiana, U.R. 2007. Tingkat Keamanan Susu Bubuk Skim Impor Ditinjau dari Kualitas Mikrobiologi. *Tesis*. Sekolah Pascasarjana, Institut Pertanian Bogor. Bogor.

Mardiani, I. 2009. Kerusakan Bahan pada Produk Hasil Peternakan, Kerusakan Nutrien pada Susu Bubuk. Jurusan Peternakan Fakultas Pertanian, Universitas Sebelas Maret. Surakarta.

Megarani, A.M. 2010. Susu Mana yang Lebih Baik. *Koran Tempo.* 15 Desember 2010. Halaman: 1.

Purnomo, S.H. 2008. Memilih Bahan Baku Untuk Susu Bubuk. *http://www.foodreview.biz.* 08 Mei 2011.

Saksono I dan Saksono L. 1986. Pengantar Sanitasi Makanan. Bandung: Penerbit Alami.

Siswono. 2005. Agar Susu Segar Aman Dikonsumsi. *http://www.gizi.net.* 15 Juni 2011.

Standar Nasional Indonesia (SNI). 1992. No. 01-2897-1992. Cara Uji Cemaran Mikroba. Badan Standarisasi Nasional. Jakarta.

Steel, R.G.D. and J.H., Torrie. 1995. Prinsip dan Prosedur Statistika: suatu pendekatan biometrik. Gramedia. Jakarta.

Swanson, K.M.J., F.F. Busta, E.H. Peterson, dan M.G. Johnson. 1992. *Colony Count Methods* (editor: Vanderzant C, Splittstoesser DF) *Compendum of Methods for the Microbiological Examination of Foods, Third Edition*. American Public Health Association. USA. Hlm 75-96.

Widodo. 2003. Teknologi Proses Susu Bubuk. Lacticia Press. Depok, Yogyakarta.

Winarno, F.G. 2004. Sterilisasi Komersial Produk Pangan. PT Gramedia Pustaka Utama. Jakarta.