International Journal of Research Studies in Biosciences (IJRSB)
Volume 3, Issue 5, May 2015, PP 48-55
ISSN 2349-0357 (Print) & ISSN 2349-0365 (Online)
www.arcjournals.org

Bacteriological Quality and Safety of Raw Cow's Milk in and around Jigjiga City of Somali Region, Eastern Ethiopia

[1]Melese Abate, [2]Tesfaye Wolde

College of Natural and Computational sciences
Department of Biology, Jigjiga University, Jigjiga, Ethiopia
[1]melese1985@gmail.com, [2]tefalem2002@gmail.com

[3]Ayalew Niguse *(Corresponding author)*

College of Veterinary Medicine
Department of Veterinary Microbiology and Public Health
Jigjiga University, Jigjiga, Ethiopia
[3]jjuvetdean@gmail.com

Abstract: *A cross-sectional study was carried out in Somali Regional State of Ethiopia to investigate the hygienic milk handling practices, bacterial loads across different sampling points in the market chain from March 2013 to July 2014. The study employed questionnaire survey and bacteriological load analysis. One hundred and two (102) randomly selected milk producing households were interviewed for the survey-based study. A total of 120 [each 30 from udder, milking bucket, storage containers and market points] raw milk samples were also aseptically collected and tested for bacteriological load analysis. The overall mean plate count of aerobic mesophilic bacteria were 5.401log$_{10}$cfu/ ml from udder, 8.132log$_{10}$cfu/ ml from milking bucket, 9.976log$_{10}$cfu/ml from storage containers and 12.699log$_{10}$cfu/ml from market. There was an obviously steady increasing trend of plate counts throughout the value chain ($P<0.05$). The results of the current study indicated that the cow milk produced and distributed in the study area can generally be considered as substandard in quality and the consumption of unpasteurized milk carries an important public health risk.*

Keywords: *Bacteriological Quality, Raw Milk, Total Plate Count, Milk Hygiene.*

1. INTRODUCTION

Milk is a compensatory part of daily diet especially for the expectant mothers as well as growing children. It is virtually a sterile fluid when secreted into alveoli of udder. However, beyond this stage of production, microbial contamination might generally occur from three main sources: within the udder, exterior to the udder and from the surface of milk handling and storage equipments, but the surrounding air, feed, soil, faeces and grass are also possible sources of contamination [1].The demand of consumers for safe and high quality milk has placed a significant responsibility on dairy producers, retailers and manufacturers to produce and market safe milk and milk products [2, 3]. Milk and milk products have important role in feeding the rural and urban population owing to its high nutritional value. It is the most perfect single balanced food of high biological value in nature as it contains almost all ingredients of food in right proportion and in any easily digestible form. Wholesome milk and milk products have an important place in supplying potable, refreshing, nutritious, economical and convenient food for human being [4]. Milk is produced daily, sold for cash or readily processed. It is a cash crop in the milk shed areas that enables families to buy other food stuffs and significantly contributing to the household food security [5].

Raw or processed milk is a well-known good growth medium that supports the growth of several microorganisms because of its high water content, nearly neutral pH, and variety of available essential nutrients that renders it as one of the good media for microbial growth and multiplication [6, 7, 8].Microorganisms may contaminate milk at various stages of procurement, processing and distribution. The ill health of the cow and its environment, improperly cleaned and sanitized milk handling equipment, and unhygienic workers who milk the cow could serve as sources of contamination [9, 10].

Milking equipments, utensils, and storage tanks are the major source for psychrotropic contamination of raw milk. The safety of dairy products with respect to food-borne diseases is a great concern around the world. This is especially true in developing countries where production of milk and various milk products takes place under unsanitary conditions and poor milk production practices [11]. Good numbers of studies have been conducted in Ethiopia to evaluate the hygienic milking practices with variable results a few of which include studies by [5, 12, 13, 14, 15, 16, 17].

On the other hand, significant variation in bacterial plate counts at different milk collection points was observed as evidenced by some studies in different parts of the country [1, 5, 15, 16].

Even when drawn under aseptic condition, milk always contains microorganisms which are derived from the milk ducts in the udder, in addition contaminants coming from milking utensils. A range of bacteria (*Bacillus subtilis, S. aureus, Salmonella spp, Lactobacillus sp and Streptococcus sp., coliforms, E. coli, Enterobacter sp., Klebsiella sp., Listeria sp., Corynebacterium sp., Lactobacillus sp., Pseudomonas sp., Acinetobacter sp., Flavibacterium sp.*) could be isolated from raw cow's milk [18,19,20].

Hygienic control of milk and milk products in Ethiopia is not usually conducted on routine bases. Apart from this, door-to-door raw milk delivery in the urban and peri-urban areas is commonly practiced with virtually no quality control at all levels [10]. In the study area, milk and milk products are important for family consumption and as a source of income through sale of milk products. Consequently, the products must be of high hygienic quality. Though in less developed areas especially in hot tropics, the production of milk products with safe and high quality is important; Poor hygiene, practiced by milk handlers and milk products, may lead to the introduction of pathogenic microorganisms into the products. Since they do not undergo further processing before consumption, these foods may pose risk of infections /intoxications to the consumers [5]. Therefore, provision of milk and milk products of good hygienic quality is desirable from consumer health point of view [21].

There is limited or no work undertaken so far to understand the hygienic practices during production and the microbiological quality of raw milk in Jigjiga City, which is essential to make improvement interventions.

2. METHODS AND MATERIALS

2.1. Study Area

The study was conducted in Jigjiga city and its surroundings from March 2013 to January 2014, which is located at 628Km east of Addis Ababa. Jigjiga is the capital city of Ethiopian Somali Regional State located at 9^o 20' north latitude and 42^o 47' east longitude. The altitude of the district ranges from 900-1600 meters above sea level and receives an annual rainfall of 300-500mm with the mean minimum and maximum annual temperatures of 20^oc and 28°C, respectively. The community in this region is pastoral and agro-pastoralist and there are large milk production from cows, camels and goats [22].

2.2. Questionnaire Survey

A Semi-structured questionnaire was used to assess the hygienic status of milk production, transportation and marketing. One hundred two (102) milking personnel and farm attendants located within10-21km around the city were interviewed. Consequently, the milk production, handling, hygienic practices employed, and others conditions thought to affect the hygienic quality of milk were assessed.

2.3. Study Design

A cross-sectional study design was formulated to determine the bacteriological quality and safety of raw cow's milk in dairy cows of the mentioned study area.

2.4. Study Population

The study populations were raw cow's milk from individual farmers' cows in and around Jigjiga city. Each individual farmer does have one or more lactating local and/or crossbred cows which were a source of milk.

2.5. Collection of Raw Milk Sample at Critical Control Points and Transportation

This study had two parts: questionnaire Survey and bacteriological load analysis. One hundred and two (102) households that own at least one local milking cow were randomly selected to assess

hygienic practices of the milker during milking, means of cleaning of the storage container, hygienic condition of transporting container to market. Following this assessment, a total of 120 samples (30 from each Critical Control Points i.e. from udder, milking bucket, storage container and at selling points) were collected in the morning for bacteriological load analysis (Table 3).

Samples of fresh raw milk (250ml) were collected aseptically following the standard procedure described by [23]. Accordingly, mixed and transferred into sterile screw-capped sampling bottles (250 ml capacities), which were then securely capped, labeled with permanent markers and kept in an ice box filled with ice packs and brought to Ethiopian Somali regional laboratory within 24 hours of sampling as described by [24], and it had kept in refrigerator at 4°C until the time of analysis and culturing was conducted within 24 hours as described by [25]. Milk Samples were taken from points considered to be associated with contamination or CCPs.

2.6. Standard Plate Count [SPC]

Ten ml from each sample of raw milk were transferred to 90ml sterile peptone water (0.1%) and thoroughly mixed to give 1:10 dilution 'first dilution. Serial dilutions were made by transferring 1ml of the previous dilution in 9ml of 0.1% peptone water. Aerobic Bacterial Count was made by incubating surface plated duplicate decimal dilutions of milk samples on Plate Count Agar (Oxid) plates. Colonies were counted after the culture media is incubated at 30^0C for 48-72hours. Total number of colonies on plates 30 to 300 per plates was selected and colonies were counted [16].

2.7. Statistical Analysis

Data collected for questionnaire survey and bacteriological quality analysis were entered and analyzed. Counts expressed as colony forming units (CFU/mm^3) was transformed into log_{10} prior to statistical analysis using SPSS version 20. Both descriptive and analytical statistical methods were applied. Frequency and percentages were computed to describe the relevant variables. P-value of 0.05 was taken as cut-off for statistical significance.

2.8. Ethical Considerations

Ethical clearance was obtained from the Ethical Clearance Committee of Jigjiga University and Ethiopian Somali Regional Health Bureau. Data at the households were collected with full consent of head of the households. The study objectives were clearly explained to the households and each household was assured that the information provided would be kept confidential and used only for the purpose of the research.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Questionnaire Survey

In this study, a total of 102 households were selected to assess the hygienic conditions, utilization of milk and milk products. All the households included in the study had heads of cattle that ranged from 1 to 50. About 17.6% of respondents owned 10 head of cattle; 14% had 2 cattle, 12% of respondents had 8 cattle ranging from 2 to 50 cows. All respondents (100%) had milked their cows twice a day - early in the morning and at evening. Milk produced was mainly used for family consumption (59%), while 41% of the respondents sold to local consumers. About 60.8% of the respondents used plastic bags for milk transportation, while 37.3% used pot/jar. An overwhelming proportion (96.1%) of the respondents has habits of raw cow milk consumption (Table1).

In this study, about 92% of respondents had washed the udder before milking but only about 6% washed their hands between milking. Only 2% of respondents had washed the udder prior to the milking act and had never used warm water. The water sources used for cleaning purpose in 53% was tap water without detergent, while about 4% had used well water with detergents. All the interviewees did not use towel to dry udder after washing. About 74.5% of the respondents cleaned the barn once a day (Table 2).

3.1.2. Standard Plate Counts (SPC)

The mean ± standard error for standard plate counts [expressed in log $_{10}$cfu/ml] of raw milk sampled at four critical points are shown in Table 3. The overall mean count was 5.401, 8.132, 9.976 and

12.699log$_{10}$cfu/ml for milk samples collected directly from the udder, milking bucket, storage containers and market points, respectively. Accordingly, the count increased by 2.7log10cfu/ml (66.7%) from point of production to milk samples taken from storage container at the farm. Similarly, SPC increased by1.84 log$_{10}$cfu/ml (81.5%) from milking bucket to storage containers at the farm level. It also increased by 2.72log$_{10}$cfu/ml (78.6%) from point of storage containers to arrival in market. Results showed very significant differences in plate counts (P< 0.05) between each CCPs (Table3).

Table1. *General information on milking and milk use in Jigjiga City and its surroundings*

Attributes		**Frequency [N=102]**	**Percent [%]**
Milk used for	Family	60	58.8
	Processing plants	1	1.0
	Local consumers	35	34.3
Milking frequency per day	Twice a day	102	100.0
Storage container type for transport	Plastic bag	62	60.8
	Pot/jar	38	37.3
	Others	2	1.9
Performing milk quality test at collection centers	Yes	98	96.1
	No	4	3.9
Having habit of raw milk drinking	Yes	98	96.1
	No	4	3.9
Milking System	Hand	100	98.0
	Machine	2	2.0
No of cows milked by one man	1-3	64	62.8
	4-6	18	17.7
	7-9	0	0.0
	10-12	0	0.0
	13-15	2	2.0

Table2. *Hygienic, sanitary practices followed during milking by the individual farmers in Jigjiga city*

Attributes		**Frequency [N=102]**	**Percent [%]**
Hand Washing	Before milking	94	92.2%
	Between milking	6	5.9%
	Using detergent	7	6.9%
Hand Washing by:	Tap water	54	52.9%
	Well water	4	3.9%
	With Detergent	14	13.7%
	Combination	28	27.5%
Teat Cleaning By	Detergent	2	2%
Barn Cleaning	Once	76	74.5%
	Twice	16	15.7%
	Not every day	2	2.0%
	Four times a day	2	2.0%
	Not at all	2	2.0%
Teat Dipping		2	2.0%
Use of Bactericidal Chemical		20	19.6%
Use of Traditional Favorants on Transport Equipment		90	88.2%
Smoking of Milk Handling Containers [%]		102	100%

Table3. *Different variables of standard plate counts of milk samples collected from the four CCPs*

CCPs of Sampling	N	Min	Max	Mean [± S.E] log $_{10}$ cfu/ ml	% increment / decrement	*df*	***95% CI for Mean***		P-value
							Lower Bound	Upper Bound	
Udder	30	4.70	6.16	5.40 [0.09]		3	5.2114	5.5907	0.000
Collection Bucket	30	6.70	8.79	8.13 [0.113]	66.7%		7.9004	8.3654	
Storage	30	9.00	10.81	9.98 [0.114]	81.5%		9.7420	10.2093	
Market	30	11.60	14.49	12.70 [0.12]	78.6%		12.4593	12.9381	

3.2. Discussions

Milk is virtually a sterile fluid when secreted into alveoli of udder. However, beyond this stage of production, microbial contamination might generally occur from three main sources; within the udder, exterior to the udder and from the surface of milk handling and storage equipments.

Cows in the study area are usually milked twice a day (100%). Comparable figures (95%) were reported by [5] from households in Southern Ethiopia. About 75% of the respondents clean the barn once per day, while 16% clean two times a day. Comparable to this study [21] in Addis Ababa reported that about 87% of the respondents cleaned their barn on daily basis, while few (9%) of them cleaned only once or twice a week. Contrary to this work, study by [5] reported very low proportion (47%) of the respondents cleaned the barn three times a week, while 39% cleaned two times and only 11.7% of them reported to clean daily.

Cleaning the udder of cows before milking is important since it could have direct contact with the ground, urine, dung and feed refusals while resting. However, 92% of respondents did not use udder washing before milking and only about 2% of respondents had washed the udder prior to the milking act and had never used warm water in this study. This is in agreement with other reports [5; 12, 13, 14]. Contrary to our finding, the works by [15] in Debre Zeit, [16] in Hawasa reported the households are practicing pre milking udder washing. [26] reported that cleaning of the udder before milking is important to remove both visible dirt and bacteria from the outer surface of the udder and to minimize contamination and produce good quality milk. Unless properly handled, milk can be contaminated by microorganisms at any point from production to consumption. The water sources used for cleaning purpose in 53% was well water without detergent, while about 4% had used well water with detergents. All the interviewees did not use towel to dry udder after washing. Plus, most of the dairy cow owners cleaned milk equipments with cold water without detergent after each usage, which may lead to insufficient cleaning and hence could serve as a major cause of milk contamination. It was reported by [17] that pre-milking udder preparations play an important part in the contamination of milk during milking.

Equipment used for milking, processing and storage determine the quality of milk and milk products. Over 60% of the interviewed households in the study area used plastic jars as milking utensil and remaining 40% used pots. The use of plastic and traditional containers can be a potential source for the contamination of milk by bacteria, because this allows the multiplication of bacteria on milk contact surfaces during the interval between milking. There may be difficulty of removing all milk residues from traditional containers that are porous by nature with the common cleaning systems. Producers need, therefore, to pay particular attention for the type as well as cleanliness of milk equipment. Milking equipment should be easy to clean. Aluminum and stainless steel equipment are mostly preferred. Similar concern was addressed by [5].

This study reveal that the overall mean count of total aerobic bacteria were 5.401, 8.132, 9.976 and 12.699$\log_{10}$cfu/ml for milk samples collected directly from the udder, milking bucket, storage containers and at market, respectively. In agreement with our finding, reports by [16] in Hawasa showed that average counts of aerobic mesophilic bacteria from the udder, storage containers at farm gate, and selling points upon arrival, were 4.57, 7.28, and 10.28$\log_{10}$cfu/ml respectively. A comparable result reported by [15] in Addis Ababa that the mean total aerobic plate counts of raw milk samples from udder, collection bucket, storage container, and upon arrival at processing plant were 5.322$\log_{10}$cfu/ml, 7.199 $\log_{10}$cfu/ml, 8.176 $\log_{10}$cfu/ml, and 9.754 $\log_{10}$cfu/ml respectively. In our finding, there was an increasing trend of total aerobic plate counts as the milk passed through udder, milking bucket, collection centers and upon arrival at the market ($P<0.05$).

Accordingly, in our finding the SPC increased by 2.7329 $\log_{10}$cfu/ml (66.7%) from udder to milk samples taken from storage container. Similarly, SPC increased by 1.84 $\log_{10}$cfu/ml (81.5%) from milking bucket to storage containers; it also increased by 2.72$\log_{10}$cfu/ml (78.6%) from point of storage containers to arrival in market. Results showed very significant differences in plate counts between each CCPs ($P<0.05$). This is in agreement with report by [16] in Hawassa that Average counts of aerobic mesophilic bacteria increased by 2.71 $\log_{10}$cfu/ml from udder to milk sample taken from storage container, and it also increased by 3$\log_{10}$cfu/ml from storage containers to arrival in market ($P<0.001$). A similar increasing trend was observed from the work by [15] in Addis Ababa

increased by 2.854 $\log_{10}$cfu/ml from udder to milk samples taken from storage container; it also increased by 1.578 $\log_{10}$cfu/ml from storage containers to arrival at market. As reported by [1], there was significant difference ($P<0.05$) between counts of bacteria in raw milk collected from milk containers and milking buckets. In agreement with our result, [5] in Gurage zone revealed that the average aerobic mesophilic count of milk samples from storage container were 9.82$\log_{10}$ cfu/ml.

The overall mean SPC observed in the current study was higher than the maximum acceptable limits given for raw milk intended for processing (1.0×10^5cfu/ml or 5log10cfu/ml) and direct human consumption (5.0×10^4cfu/ml or 4.69897$\log_{10}$cfu/ml) [5]. This high level of contamination of milk might be due to initial contamination originating from the udder surface, quality of cleaning water, milking utensils and materials used for filtering the milk, poor hygienic practices during milking. Milk residues on equipment surfaces provide nutrients for growth and multiplication of bacteria that contaminate milk of subsequent milking. Cows with mastitis and failure to cool milk rapidly to <4.4°C and extremely hot and humid weather can also contribute to high SPC in raw milk [15].

4. CONCLUSION

Very poor dairy farm hygiene is observed in the study area. The habit of boiling milk before consumption in the study area is almost non-existent. The quality of milk sold and distributed in the study area indicates unacceptable levels of contamination with microorganisms that profoundly increase across CCPs. In conclusion, dairy cow owners should be educated on farm hygienic practices and consumption of boiled/pasteurized milks. Further studies that could incorporate isolation of milk contaminating bacteria to the species level should be done to evaluate the imminent danger posed by microbes from milks.

ACKNOWLEDGMENTS

We are grateful to Jigjiga University for funding this research project, Ethiopian Somali Regional Health Bureau, Regional Public Health and Research Laboratory for laboratory facilities.

REFERENCES

[1]. Solomon M., Mulisa M., Yibeltal M., Desalegn G., Simenew. Bacteriological quality of bovine raw milk at selected dairy farms in Debre Zeit town, Ethiopia, *Comprehensive Journal of Food Sciences and Technology Research. 1(1), 1-8* (2013).

[2]. Adesiyun A., Webb L., Rahman S., Microbiological quality of raw cow's milk at collection centers in Trinidad, *J. Food Protection* 58,139-46 (1995).

[3]. Mennane Z., Ouhssine M., Khedid K., and Elyachioui M., hygienic quality of raw cow's milk feeding from domestic. *Int. J. Agri. Biol*. 9(1), 1560–8530, (2007).

[4]. Kashifa K., Ashfaque M., Iftikhar H., and Masood A., Bacteriological studies on raw milk supplied to Faisalabad city during summer months: university of agriculture. *Pakistan Vet. J.*, 21(2), (2001).

[5]. Abebe B., Zelalem Y., and Ajebu N., Hygienic and microbial quality of raw whole cow's milk produced in *Ezha* district of the Gurage zone, Southern Ethiopia. *Wudpecker Journal of Agricultural Research, 1(11), 459-465, (*2012).

[6]. Ashenafi M., and Beyene F., Microbial load, microflora, and keeping quality of raw and pasteurized milk from a dairy farm. *Bull. Anim. Hlth. Prod. Afr*, 42, 55-59, (1994).

[7]. Soomro A., Arain M., Khaskheli M., and Bhuto B., Isolation of *E. coli* from raw milk and milk products in relation to public health sold under market conditions at Tandonjam. *Pakistan. J. Nut, 1(3), 151-152,* (1996).

[8]. Teka G., *Food Hygiene Principles and Food Borne Disease Control with Special Reference to Ethiopia.* 1st ed, Faculty of Medicine, Department of Community Health, Addis Ababa University, Addis Ababa, Ethiopia, 1997, *pp.* 73-86,

[9]. Gilmour D. Milking. *In*: Falvey, L., Chantalakhana, C. [Eds.] Smallholder Dairy in the Tropics, ILRI, Nairobi, Kenya. 289-298, (1999).

[10]. Godefay B., and Molla B., Bacteriological quality of raw milk from four dairy farms and milk collection center in and around Addis Ababa. *Berl. Munch. Tierarztl. Wschr., 113, 1-3,* (2000).

[11]. Mogessie A., Microbiological Quality of *Ayib*: A traditional Ethiopian cottage cheese. *Int. J.Food Microbiol., 10,* 263-268, (1990).

[12]. Lemma F., Fekadu B., Hogde P., Rural smallholder milk and dairy products production, utilization and marketing systems in east Showa zone of Oromia. *In:* Participatory Innovation and Research: Lesson for Livestock Development, Conference Proceeding, Proceeding of the 12thAnnual Conference of the Ethiopian Society of Animal Production Held in Addis Ababa, Ethiopia, August 12-14, Pp 17-28, (2004).

[13]. Fayo D., Assessment of milk production, marketing, feeds and feeding system of dairy cows in and around Dire Dawa town, M.Sc.Thesis, Harmaya University, Ethiopia, (2006).

[14]. Derese T., Present situation of urban and peri-urban milk production and quality of raw milk produced in West Shewa zone, Oromia Region, M.Sc. Thesis, Haramaya University, Ethiopia, (2008).

[15]. Alehegne W., Bacteriological quality of bovine milk in small holder dairy farms in Debre Zeit, Ethiopia, M.Sc Thesis, Addis Ababa University, Ethiopia, (2004).

[16]. Haile W., Zelalem Y., Yosef T., Hygienic practices and microbiological quality of raw milk produced under different farm size in Hawassa, southern Ethiopia. *Wudpecker Research Journals; Agricultural Research and Reviews, (4), 132-142,* (2012).

[17]. Galton, D., Petersson, L., and Merril W., Effects of pre-milking udder preparation practices on bacterial counts in milk and on teats. *J. Dairy Sci., 69, 260-266,* (1989).

[18]. Fadaei A., Bacteriological Quality of Raw Cow Milk in Shahrekord, Iran. *Veterinary World,* 7 (4): 240-243, (2014).

[19]. Olatunji, E., Ahmed I., and Ijah, U., Evaluation of microbial qualities of skimmed milk [nono] in Nasarawa State, Nigeria, Conference Proceeding, Proceeding of the 14th Annual Conf. of Ani. Sc. Asso. of Nigeria. [ASAN] LAUTECH Ogbomoso, Sept. 14th-17th (2009).

[20]. Mulugeta K., and Million T., The Bacteriological Safety and Antimicrobial Susceptibility of Bacteria Isolated from Street-Vended White Lupin (*Lupinus Albus*) in Bahir Dar, Ethiopia. *Ethiop J Health Sci.,* 23(1), (2013).

[21]. Zelalem Y., Microbial Properties of Ethiopian Marketed Milk and Milk Products and Associated Critical Points of Contamination: An Epidemiological Perspective, Epidemiology Insights, Dr. Maria De Lourdes Ribeiro De Souza Da Cunha (Ed.), ISBN: 978-953-51-0565-7, (2012).

[22]. Somali Regional State, Ethiopia: Livelihood Zone. Field Surveys conducted by SCUK/DPPB. Food Security Monitoring and Early Warning Programme. [2004]

[23]. Richardson G H., Standard Method for the Examination of Dairy Products, 15th ed., American Public Health Association, Washington D.C., 1985.

[24]. American Public Health Association (APHA), Standard Method for the Examination of Dairy Products., 16th ed., Washington,1992.

[25]. Quinn P J., Carter M E., Markey B., and Carter G R., Clinical Veterinary Microbiology: London, Wild life Publisher, 2004, pp. 95-101.

[26]. FSA [Food Standards Agency] (2006). Milk Hygiene on the Dairy Farm. Practical Guides for Milk Producers, England.

AUTHORS' BIOGRAPHY

Melese Abate Reta, Having received his B.Sc.in Applied Biology at Faculty of Applied Science from Arba Minch University, Ethiopia, in 2008 G.C., Mr. Melese went for M.Sc.in Medical Microbiology at School of Medicine, Addis Ababa University, Ethiopia, and graduated in 2011. He is a Senior Lecturer and Researcher at Jigjiga University, College of Natural and Computational Science from 2008 to date. During his tenure, Mr. Melese has taught Microbiology, Immunology, Virology, Molecular Biology, Mycology, Applied Microbiology and Research Methods to Biology students. He also delivered General Microbiology and Food Microbiology to Food and Nutrition Science undergraduate students. He is currently serving as Supervisor of B.Sc. students, College Laboratory Committee Chairman and College Educational Quality Assurance Committee Secretary. He is currently principal investigator for three research project funded by Jigjiga University. His research interests include Microbiology, Epidemiology, Immunology and Molecular Biology. He has submitted four ongoing research works for publication. He is a Life Member of Ethiopian Public Health Association (EPHA), Ethiopian Society for Microbiology (ESM), The Biological Society of Ethiopia (BSE), and Ethiopian Red-Cross Association (ERCA).

Tesfaye Wolde Bereda, Graduated from Arba Minch University in Applied Biology (BSc) in 2007, he had served as an Officer of malaria and other vector borne disease prevention and control expert for two years in Gurage Zone, South Ethiopia. In 2009, he then joined Jimma University to pursue MSc in Applied Microbiology and following completion, he has been working in Jigjiga University as an instructor to date during which he taught General Microbiology, Virology, Molecular Biology, Applied Microbiology, Biochemistry, Mycology and Research Methods and Reporting in Science. Moreover, he is research coordinator of college of natural and computational sciences. His research interests include Food Microbiology, Medical Microbiology, Agricultural Microbiology, And Applied Microbiology of Ethiopian traditional fermented food. He has three researches which are submitted for publication and there are three ongoing researches.

Ayalew Niguse Alemu, Dr. Ayalew is also an Ethiopian academic. He received his DVM in 2006 and then MSc in Medical Microbiology both from Addis Ababa University. He has been working at Jigjiga University, Ethiopia since 2007. He has taught numerous courses at the College of Veterinary Medicine of same university and mentored over 20 DVM graduates. He has participated in more than fifteen research works and has to date published eight (8) of them in various scientific peer-reviewed journals. He worked as head of Department of Vet Parasitology and Pathology from 2011- late 2012. He is currently the Dean of College of Veterinary Medicine of Jigjiga University for over two and half years. His research interests are Epidemiology, Virology, Bacteriology and Molecular Biology.