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Review on Food Safety, Quality Assurance and Control

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Abstract: Food safety means ensuring that the food does not pose any harm to the consumer while it is being prepared and/or consumed according to its intended use. Food safety and quality assurance are a growing alarm all over the world particularly when it comes to veterinary public health it includes food of animal origin such as meat, poultry, milk, egg, fish, game and their products. Therefore the objective of this seminar paper is to review the importance and principles of animal origin food safety, quality assurance and control system of particularly milk and milk products. Food becomes unsafe due to poor handling and storage conditions, naturally occurring toxins in food itself & contaminated water, pesticides & drug residues, and lack of adequate temperature treatment. Food contamination is generally defined as foods that are spoiled or tainted because they either contain microorganisms, such as bacteria or parasites, or toxic substances that make them unfit for consumption. Food quality refers to a blend of characteristics (chemical, physical, bacteriological and aesthetic) that boost up the acceptability of the milk product. For instance, pathogenic microorganism can contaminate milk at different stages of milk production, handling, processing and storage. So, milk should be kept safe while being milked processed and stored up by creating clean environment across areas where contamination could occur. Generally quality assurance & control of milk & milk products and certification schemes is tends to differentiate and guarantee products in relation to their biochemical composition; their origin and the origin of the raw material used to produce them; the production techniques used; residues of pesticides in products; the breeding and living conditions of animals and ethical aspects of production; quality assurance in processing, packaging, transportation, storage of animal products. In Ethiopia milk and milk products are channeled to consumers through both formal (2%) and informal (95%) marketing systems. The hygienic condition of milk and milk products channeled through these systems is poor due to limited knowledge of dairy product handling accompanied with the inadequacy of dairy infrastructure, such as cooling facilities and unavailability of clean water in the production areas. Milk is a safe and nutritious food that should be harvested, processed and handled properly. Therefore, identifying source of contaminants in food production and processing, as well as implementing good production practice, is very essential for ensuring consumers' health.

Keywords: Contaminants, Food Safety, Hazards, Milk, Quality Control, Public Health

INTRODUCTION

Food is any substance, whether processed, semi processed or raw, which is intended for human consumption including drink and other substances which has been used in its manufacturer, preparation or treatment. In terms of veterinary public health it includes food of animal origin such as meat, poultry, milk, egg, fish, game and their products.

Food safety and quality are a rising concern all over the world particularly when it comes to human health. In this regard, many countries have been running quality control programs for all food ingredients including animal source foods (El-Ziney and Al-Turki, 2007). Food safety is a scientific discipline dealing with handling, preparation, and storage of food in the manner that prevents food borne illness. This requires a number of routine activities that should be followed to prevent occurrence of potentially severe health hazards.

Milk quality refers to a combination of characteristics that enhance the acceptability of the milk product. Quality relates to chemical, physical, technological, bacteriological and aesthetic characteristics of milk and milk products. Quality assurance is all about critically planned and systematic activities implemented within all segment of the quality system, and concealed as needed, to provide satisfactory confidence that a certain food item will fulfill the quality requirements. Food Hygiene this comprises all conditions and measures necessary to ensure the safety, soundness and wholesomeness of food at all stages from its growth, production processing, storage and distribution up to its final consumption for the production (Buncic, 2006).

Hazard is a biological, chemical, or physical agent that is contributing likely to cause a great deal of illness or injury in the absence of its control. Wide range of food borne illness can be controlled by routine activities like keeping personal hygiene, proper processing of the food, heat treatment at higher temperature, adequate cooking before consumption and not subjecting the

food to temperature where bacteria can grow (Addis and Sisay, 2015).

Therefore, food control is emphasized to be a mandatory regular activity enforced by national or local authorities to grant consumers' protection and ensure that all foods during production, handling, storage, processing and distribution are safe, wholesome and fit for human consumption. Before a given food item is consumed, it should conform to safety and quality requirements, honestly and accurately labeled as prescribed by law (Cfsan, 2007).

Factors which give rise to potential hazards in foods include improper agricultural practices accompanied with traditional milk production; poor hygienic activities at all stages of the food chain; lack of preventive and controlling measures in food processing and preparation operations; misuse of chemicals; contaminated raw materials, ingredients and water and Inadequate or improper storage (Battu *et al*., 2004; Buncic, 2006). So, it requires controlling these hazards by implementing good quality assurance and control methods.

The HACCP approach which is a science based quality control system has been designed to be implemented in food and dairy sector of any nation in the world to make sure that safe food is produced regardless of the production system (Tamime, 2009). Hence, it is essential to understand the application and principles of quality assurance system to control and assure the quality and safety of milk and milk products at any production level.

1. LITERATURE REVIEW

2.1. Food safety and its importance

Food safety means ensuring that the food does not pose any harm to the consumer while it is being prepared and/or consumed according to its intended use (FAO, 1997). Safe food handling begins at production and continues through the preparation process. Food becomes unsafe due to poor handling and storage conditions, naturally occurring toxins in food itself & contaminated water, pesticides & drug residues, and lack of adequate temperature treatment.

Food contamination is generally defined as foods that are spoiled or tainted because they either contain microorganisms, such as bacteria or parasites, or toxic substances that make them unfit for consumption (Buncic, 2006).

Therefore, contaminated food would inevitably be hazardous agent for consumers' health and these health hazards to the consumer are often grouped into three subgroups: microbiological, physical and chemical (Walstra *et al*., 2006) so, the key issue to consider whether given milk is of quality and safe is to know the chemical, microbiological and physical standards in milk products (Mansel, 2010).

By conducting safe food handling, the extent of illnesses and fatalities to happen can be prevented. Safe food handling starts at production and continues all the way through the preparation process. If unsafe handling happens at any stage, there would be a potential danger. Food handling safety is critical at the consumer level because many consumers have contaminated food through a lack of awareness. By practicing hygiene before the food is handled and ensuring the cleanness of all utensils and surfaces, food contamination can be prevented. The best way to keep the food safe is to allow the food to be thawed in a refrigerator. Cross contamination is thought to have been a common cause of food contamination. Therefore, by using cleaned utensils and surfaces that have not touched other food items, the risk of cross contamination can be greatly reduced (WHO, 2002).

2.2. Food safety system

2.2.1. Traditional food safety systems

Traditionally food safety system has been described as unsafe. Food and enforcement tools have been prescribed for removing unsafe food from commerce and punishing parties responsible for it. Traditional food safety system is reactive approach with the main responsibility lying on the government, relies on end product inspection and testing, involves no structured risk analysis and the level of risk reduction is not always satisfactory (FAO, 1995). Due to the above and other reasons traditional food safety system remains inefficient and being unable to investigate and resolve many prevailing problems; and cannot effectively deal with the entire range of complex, persistent and revolving challenges that damage different parts of the food chain (Committee On Animal Nutrition, 2003).

2.2.2. Science risk-based food safety system

A science-based approach to food safety is associated with various activities such as good agricultural practices, good hygienic practices, good manufacturing practices and HACCP. The new concept it has adopted is the use of risk analysis as a framework to overview and reacts to food safety problems in a systematic, structured and scientific ways in order to upgrade the quality of decision-making throughout the food chain (FAO, 2003).

2.3. Food safety hazard

Chemical hazards can be described as contaminants of naturally occurring toxins, direct and indirect food additives, pesticide and veterinary drug residues and environment contaminants (for example, dioxins) (WHO, 2009).

Table 1: Chemical hazards and their impacts

Hazard	Main means of on farm control preventive Chemical controls	Main means of control in processing and food handling – secondary controls
Antibiotics	Good animal husbandry and veterinary practices (GVP	Pesticides and Insecticides
Pesticides and Insecticides	Use of authorized products, safe application and observance of withdrawal time	Compliance with regulatory controls and periodic testing at milk collection point
Food additives	Use of registered substances, good manufacturing practices (GMP)	Testing of milk and dairy products

A physical hazard can be defined as any physical material not normally found in a food which can cause illness or injury to the individuals who consume the product. It includes different types of materials often referred to as foreign materials or objects like dirt particles, hair, leaves, rubber and mettle which can get into the milk at the time of milking (Walstra *et al*., 2006

Table 2: Physical hazards origin and control measures

Hazard material	Origin/source	Control measure
Glass fragments	Bottle, jars, light fixtures and utensils	Examination of incoming materials
Insects or insect fragments and wood splinters	Fields, plant, pest-control process	Maintenance procedures designed to avoid contamination
Dirt, dust or hair	Unclean storage, environment and storm	Training in good personal hygiene practices

2.3.1. Food-safety hazards specific to poultry meat

The loss of the consumers trust and confidence in the quality and safety of poultry meat is a further challenge. Poultry meat can harbour different food borne pathogens. Salmonella and campylobacter species are the most common causes of human food borne bacterial diseases linked to poultry. Campylobacter is the leading cause of zoonotic enteric infections worldwide. Campylobacter load per chicken is increasing during transport, de-feathering and evisceration (Buncic, 2006).

Milk and dairy products can be damaged by a variety of micro-organisms, including many zoonotic bacteria and some viruses for example, retroviruses and cytomegalovirus (Kaufmann*et al*., 2002). Depending on their effect on milk, bacteria can be categorized as pathogenic and non-pathogenic. normally good. But, once the milk is secreted from the udder, it can be contaminated by pathogenic micro-organisms from many sources (Loessner and Golden, 2005)

Table 3: Most common bacteria which can be found in raw milk and their effects

Effect on milk	Bacteria
Spoilage	Genus pseudomonas (Pseudomonas fluorescens, Pseudomonas fragi), Genus Bacillus (Bacillus polymyxa, Bacillus cereus
Pathogenic	Brucella spp, Genus staphylococcus (Staphylococcus aureus), Genus streptococcus (Streptococcus agalactiae), Genus mycobacterium (Mycobacterium tuberculosis)
Spoilage & Pathogenic	Genus lacto-bacillus (L. lactis, L. bulgaricus , L. acido philus propioni bacterium species
Acid fermentation	Brucella spp, Genus staphylococcus (Staphylococcus aureus), Genus streptococcus (Streptococcus agalactiae), Genus mycobacterium (Mycobacterium tuberculosis)
Acid production	Genus lacto-bacillus (L. lactis, L. bulgaricus , L. acido philus propioni bacterium species
Flavor production	Lacto coccus lactis subspp ,lactococcus lactis diacetylactis

2.3.2. Food-safety hazards specific to milk and milk products

Pathogenic bacteria can contaminate milk at different stages of milk production, handling, processing and storage. Milk should be kept safe while being milked, processed and stored up by creating clean environment across areas where contamination could occur. Along with keeping the milk quality and safety, a great deal of milk safety and quality measures should be put in place at any segment of milk production,

handling, processing and storage to ensure the milk offered to the consumer is of high quality, safe and wholesome. Some bacteria namely, streptococcus thermophilus, lactococcus lactis sub spp. cremoris, and leuconostoclactis cause the fermentation of milk to products like yoghurt which is safe to be consumed. The bacterium lactococcus lactis sub species diacetylactis helps to provide good flavor to the milk. Microorganisms like brucella abortus, listeria mycobacterium, bovis monocytogenes, coxiella burnetii and s. aureus and mycotoxins for example, aflatoxin have been considered to be the main photogenic microorganisms posing a significant health hazard. It is therefore, mandatory to know the main source of infection for each photogenic microorganism and minimize pre disposing factors which could cause the deterioration of milk and milk products quality.

Herd health management like vaccination, serological screening, tuberculin testing, tick control, mastitis control, feed hygiene and control, screening tests on animal feed need to be conducted on regular basis. Moreover, the dairy farmers should undertake appropriate controlling measures (pasteurization and hygiene precautions for at-risk workers) while the milk is being processed and handled before provision to consumer. Generally, Milk and Milk Products Contaminants Are Often Classified Into Infectious and Non-Infectious (Mansel, 2010).

Infectious contaminants of milk and milk products

Generally, the main source of milk contamination includes commensal or pathogenic flora of the udder or teat canal, the animal's skin, fecal soiling of the udder, contaminated milking equipment and water used to clean the milking equipment and milk storage containers. Moreover, pathogenic organisms from humans, insects, rodents, birds, and other animals may get access to enter into the milk (Fsauk, 2016).

Food-borne illnesses are usually pathogenic or toxic in nature and caused by bacteria, viruses, parasites, or chemical substances entering the body through contaminated food or water. Milk and milk products could carry organisms and/or their poisonous metabolites called toxins. Most often organisms shedding from human carriers, the environment, milk-producing or other animals, have been agents of milk borne diseas

Table 4: Common milk borne infections and their urces

Sources	Milk borne infections	Way of minimization/ elimination
Milk-producing animals (infected)	Bovine tuberculosis, brucellosis, anthrax, salmonellosis, listeriosis, leptospira infection, Q fever, foot and mouth disease, toxoplasmosis and hypersensitivity reactions	By improvements in animal husbandry, environmental cleanliness in dairies and processing plants, pasteurization.
human carriers	Septic sore throat and diphtheria, typhoid fever, paratyphoid fever, infectious hepatitis, polio infection, enteritis, amoebiasis and giardiasis	improvements in water supplies, public health and hygiene, and pasteurization
Environment	Botulism, coli infection, rat bite fever and Balentidiasis	Hygienic production practices, proper pasteurization, handling and storage

Non-infectious contaminants of milk and milk products

In developing countries like Ethiopia**,** milk production has been very low due to poor genetic and management factors accompanied with small scale farming system carried out in villages and unorganized barns. The non- infectious contaminants of milk and milk products may occur through the point of milk production all the way to processing. Some of these contaminants include chemicals/toxins/ drugs (drugs of abuse), milk additives, environmental (heavy metals) and naturally occurring substances.

Quality assurance & control of milk & milk products quality assurance and certification schemes is generally tends to differentiate and guarantee products in relation to their biochemical composition; their origin and the origin of the raw material used to produce them; the production techniques used; residues of pesticides in products; the breeding and living conditions of animals and ethical aspects of production; quality assurance in processing, packaging, transportation, storage of animal products.

Milk collection in most developing countries is both informal and formal. The informal channel is characterized by lack of established milk collection infrastructure with the farmers delivering milk in aluminum cans or plastic jerrycans to a "pick-up point" established by a trader, transporter or his agent. Quality

control during milk reception is very limited. Milk is put in 50 liter aluminum cans, which are transported on open pickup trucks over long distances (up to 400 km) to retail outlets in urban centers. The evening milk is often not collected. (it is either consumed by the producing household, used to make ghee or boiled, cooled, stored and added to the morning milk on the following day.) Most milk traders and private dairy processors use this system of milk collection and transportation and this allows minimal milk quality assurance.

The formal marketing channel utilizes well-established infrastructure for bulking and transportation of milk. Here, farmers transport warm milk in aluminum cans to the village milk collection centers where it is cooled down immediately (morning and evening). Standard quality tests are carried out before the milk is accepted. To allow quality assurance, the storage should be in position to maintain the milk at a low temperature to prevent any deterioration in quality prior to processing / product manufacture; facilitate bulking of raw milk supply (this will ensure uniform composition); to allow for uninterrupted operation during processing and packing; and to facilitate standardization of milk qual

2.4. Milk quality control

Milk quality refers to a blend of characteristics (chemical, physical, bacteriological and aesthetic) that boost up the acceptability of the milk product. Milk quality control is the utilization of internationally approved tests to ensure the application of approved practices, standards and regulations concerning the milk and its products (FAO, 2011). Milk safety and quality assurance has been becoming an area of priority and necessity for consumers, retailers, manufacturers and regulators. Globally, the occurrence of food borne diseases has been increasing and international food trade has been disrupted by frequently ongoing disputes over food safety and quality requirements (Lemma *et al*., 2008; FAO, 2010). So, to achieve the accepted quality standard, it is mandatory to monitor and control the quality of milk at the grass root level.

2.4.1. Quality at the farm

Quality control and assurance must start at the farm where the milk is produced (Mansel, 2010), by using approved practices of milk production and handling and observation of regulations concerning the use of veterinary drugs on lactating animals and regulations against adulterations of milk, etc. (Battu *et al*., 2004)

2.4.2. Quality at milk collection centers

All milk collected from different farmers having their own considerable management activities or milk which is bulked from various collecting centers must be checked for its wholesomeness, bacteriological and chemical quality (Felleke *et al*., 2010).

2.4.3. Quality at the dairy factory and within the dairy factories

Once the dairy factory has accepted the milk brought from different farmers and numerous collection centers, it holds the responsibility of ensuring that the milk is handled hygienically and processed to various products.

2.4.4. Quality during marketing of processed products

The government of any country employs public health authorities in order to protect the health of the people and keep the interest of the milk consuming public (Felleke *et al*., 2010).

2.5. Milk quality indicators

Quality milk contains normal chemical composition, completely free from disease causing bacteria and harmful toxic substances, free from sediment and extraneous substances, have lower level of titratable acidity, has good flavor, sufficient in preserving quality and low in bacterial counts and completely free from harmful bacteria, toxic substances, extraneous substances and colostrums (FAO, 2010) and quality testing methods.

2.5.1. Physical quality measures of milk

Mostly physical quality of milk is determined by considering appearance (color) and flavor of milk, acidity of milk, freezing point & boiling point of milk and ph and density of milk. Testing milk for organoleptic characteristics is often called sensory testing and done using the normal senses of sight, smell and taste in order to know the overall quality.

Table 5: Physical quality measures of milk

Indicator of milk quality	Quality of cow fresh milk	Quality of ewe fresh milk	Quality of ewe fresh milk
Density	1.028-1.034 g/cm3	1.034-1.042 g/cm3	1.024-1.040 g/cm3
pH value	6.5-6.7	6.5-6.8	6.4-6.7
Freezing point	< - 0.517°C	< - 0.517°C	<- 0.54°C

2.5.2. Defining milk quality by density

The density of milk, among others, is usually used for quality test mainly to check for addition of water to milk or removal of cream. Addition of water to milk minimizes milk density, while removal of cream increases it (O'connor, 1994).

Table 6: Defining milk quality by density (Source: FAO (2011).

Dairy product	Its density (kg/m3	Dairy produc	Its density(kg/m3
Fresh whole milk	1030	Light cream 20% fat	1009
Skimmed milk	1035	1035	1066
Heated standardized milk	1030	Evaporated milk 32% solids	1085
Sweet condensed milk	1310	Heavy cream 40% fat	988
Sweet whey	1025	Buttermilk	1029

2.5.3. Milk quality test

Clot-on-boiling test

It is one of the oldest test to determine too acidic milk (PH<5.8) or colostrums, containing mastitis. It is known when the milk is changed to form a curd which means the milk must contain many acids, rennet producing microorganisms and colostrums shed from the cow as soon as the cow gives birth. Such milk cannot stand the heat treatment in milk processing and must be rejected (O'connor, 1994).

Alcohol test

It is conducted to check the instability of the proteins occurring when the levels of acid increased and acted upon by the alcohol. Also, elevated levels of albumen (Colostrums Milk) and salt concentrates (mastitis) result in a positive test by curd formation (O'connor, 1994).

Lactometer test

Farmers, milk traders, transporters and shops often add water and other substances to milk, to increase their profits. This is a common problem, but can be easily tested with a lactometer, which is an instrument used to measure the density of milk. Pure milk has a density (specific gravity) of 1.026 to 1.032 grams per ml. Addition of water or other substances changes the density. Addition of water reduces the density, while addition of solids increases the density considerably. If density is outside the normal range, it means the milk has been adulterated.

Titratable acidity test

Titratable acidity is defined as a measure of freshness and bacterial activity in milk. When the milk is left for a while, the bacteria will proliferate by utilizing lactose to convert it to lactic acid, thereby increasing the acidity and decreasing the ph value. This acidity is said to be developed or real titratable acidity (O'connor, 1994; Vishweshwar and Krishnaiah, 2005).

2.5.4. Compositional quality measure of milk

Milk is a highly nutritious substance which contains macro and micro-nutrients, additionally possessing quite a lot number of active compounds that play significant role in both nutrition and health protection (Boza and Sanz Sampelayo, 1997). All milks contain the same constituents but these vary in amounts thus making milks differ in their compositions with milk fats showing the greatest variation followed by proteins and lactose.

The various factors that affect the composition of milk include:

Species: Each species of animal yields milk of different compositions.

Breeds: High yielding animals produce milk with lower fat percentage e.g. Friesian vs. Jersey cows. Individual variation: there is variation between individual animals.

Season: Variations are evident during the course of the year (especially fats being highest during dry seasons).

Age: The fat percentage increases up to 3rd lactation and afterwards decreases.

Milking interval: With longer intervals between milking, the yield is greater with acorresponding decrease in fat content and vice versa.

Completeness of milking: First milk contains less fat and last milk contains high fat. If the milking is not complete, the milk tests for less fat. Irregularity in milking: Frequent changes in the milking timings and frequent change in milking interval result in less fat.

2.5.5. Overview of milk quality standards and regulation

In most dairy industrialized countries, milk quality is defined by the level of somatic cells count (SCC) and the microbial load of milk in the pre-pasteurized bulk tank. These are the key components of international regulation put in place for milk quality, udder health and the prevalence of clinical and subclinical mastitis in dairy herds (Fatine *et al*., 2012). High levels of scc and microbial load indicate poor milk quality due to the fact that it contains reduced curd firmness and increased fat and casein loss in whey. Moreover, reduction of milk shelf life, poor farm hygiene, antibiotic residues and the presence of pathogenic organisms and toxins increase the microbial load of the milk.

Quality regulation

Regulation in the area of food quality and safety protection has been one the features of regulatory mechanisms established for problems that are difficult to be identified by consumers using their sense of sight, smell, taste or touch when selecting or consuming foods (Cac, 2007). Governments, all over the world, have put in place various mechanisms for protecting their citizens from food borne illnesses to ensure the socio-

economic development of their country. Milk quality standards have been regulated by the respective food and drug administration in the countries. The responsibility of food regulation in Ethiopia has been shared among ministry of health, ministry of agriculture and rural development, ministry of trade and industry, and quality and standards authority of Ethiopia. However, there has been poor coordination and cooperation among these government regulatory agencies towards implementing quality regulations laid down by the government.

Milk quality grading

In the United States, grade A milk (fluid grade milk), top quality milk, refers to milk produced in the farms where sufficiently sanitary conditions have been fulfilled to qualify for fluid (beverage) consumption. Grade B milk is referred to as manufacturing grade milk that does not meet the fluid grade standards and can only be used in cheese, butter and non fat dry milk. Grade C milk is the last grade milk which violates any of the requirements for grade B milk but is not subjected to adulteration (U.S. department of health and human services, 2011).

2.5.6. Milk Preservation

Milk is highly perishable item. The keeping quality of fresh milk is only 5-6 hours, unless proper steps are taken to preserve the quality. The major cause for spoilage of milk is due to the action of microorganisms on lactose yielding lactic and other acids, causing increased acidity milk. The principle behind milk preservation is only to destroy the micro-organisms or obstructing the microbial growth, so that acidity development is stopped or slowed down.

The methods of preservation may include: by cooling the milk (at refrigeration temperature mesophillic micro-organisms don't grow), by heating or pasteurization (this kills micro-organisms as majority of them are destroyed at different temperatures) and by addition of chemicals (preservatives in small concentrations will inhibit microbial multiplication e.g. Sodium carbonate/bicarbonate, formalin/formaldehyde, boric/benzoic acids, etc.

In most developing countries, the need to preserve milk normally arises after the evening milking when the farmer may not be able to deliver the milk to the milk collection centers or other buyer. Farmers have very few options for preventing spoilage of milk at farm level. Cold storage equipment would be necessary for storing milk for long hours before marketing. Small-scale farms may need equipment such as deep freezers while large farms may need coolers. In the south western milk-shed, milk preservation at farm level is still a big problem. About three quarters of the farms do not have any means for milk preservation while the other one quarter relies on heat treatment to prevent spoilage of the milk.

2.6. Overview of milk safety and standards in Ethiopia

In Ethiopia, indigenous dairy products are produced by using traditional materials and methods, thus becoming potential hosts for many microorganisms (Alganesh and Fekadu, 2012; Abebe *et al*., 2013). Milk and milk products in Ethiopia are channeled to consumers through both formal (2%) and informal (95%) marketing systems (Netherlands development organization, 2008). The hygienic condition of milk and milk products channeled through these systems is poor due to limited knowledge of dairy product handling accompanied with the inadequacy of dairy infrastructure, such as cooling facilities and unavailability of clean water in the production areas.

2.6.1. Challenges, Constraints and Recommendations Concerning Ethiopian Dairy Policy Issues

HACCP is a systematic procedure or approach employed to identify, evaluates, and controls the source of microbiological or non-microbiological hazards, which are significant for food safety, be it raw or processed. Hazard is a biological, chemical, or physical agent in food or condition in food with the potential to induce adverse health effects. It is an *unacceptable* contamination of food with microorganisms, their toxins or metabolites or residues. With increasing demand for dairy products worldwide, it is necessary for every dairy industry to adopt HACCP in order to give quality assurance to consumers (Dpc, 2001). In Ethiopia where consumption of raw milk and milk products is common, provision of milk and milk products with superior hygienic quality is required to safeguard the consumers (Zelalem, 2003).

Hazard identification is the identification of biological, chemical or physical agents causing adverse health effects. Critical control point (ccp) is a location, step, point, a place, practice in a process or procedure at which control can be applied. Traditionally these practices were used to reduce manufacturing defects in dairy products and ensure compliance with specifications and regulations. There are seven principles of HACCP:

Principle 1: Identification of the hazard:- Which hazard is the main problem (microbial, residue, etc.)? How serious is the problem (quantify the problem)?

Principle 2: Determination of CCP (s) to control the identified hazard.

Principle 3: Establishing critical limits that must be met. (E.g. Critical limit is a T^o range that effectively controls microbiological or parasitological hazard.)

Principle 4: Establish procedure to monitor CCP (s):- this consists of scheduled or programmed testing and monitoring of the effectiveness of CCP.

Principle 5: Establish corrective action to be taken. Corrective actions are taken, when deviation occurs in CCP monitoring. The new measure introduced must be able to eliminate the hazard that was created by deviation from the plan.

Principle 6: Establishing procedure for verification that HACCP (the corrective actions made) are working correctly. Verification of methods, procedure and tests that they are in compliance with plan. This includes review of HACCP plan, CCP records deviations.

Principle 7: Establish effective record keeping system. Develop forms for recording findings. The form should provide data or information on all ingredients, processing steps, packages, storage and distribution (Cfsan, 2007; Cac, 2007).

2.6.2. Economic benefits of food safety system and quality assurance

Food safety plays a significant role in the national economy and health by; Safe- guarding the health of the nation through improved nutrition, Enhancing national and international trade and Preventing avoidable losses at pre/post-harvest, reducing public health costs by decreasing food borne illness and reducing export and trade barriers, resulting in countries becoming competitive in the global trade (WHO, 2005).

CONCLUSION AND RECOMMENDATIONS

Food safety is a scientific discipline dealing with handling, preparation, and storage of food in the manner that prevents food borne illness. In terms of veterinary public health food safety and quality includes food of animal origin such as meat, poultry, milk, egg, fish, game and their products. Food safety and quality are a rising concern all over the world particularly when it comes to human health. Incidentally, many countries have been running quality control programs for all food ingredients including animal source foods. This requires a number of routine activities that should be followed to prevent occurrence of potentially severe health hazards. Milk is a safe and nutritious food that should be harvested, processed and handled properly. Identifying source of contaminants in food production and processing, as well as implementing good production practice, is very important for ensuring consumers' health. As milk leaves the cow, it is dominated by lactic acid bacteria. However, during storage pathogenic bacteria introduced from the environment can cause spoilage of raw milk.

Depending on the above conclusion the following recommendations are forwarded:

- Apply and incorporate the principles of food safety specially milk quality and safety systems in a real application;
- Plan and investigate food quality and safety;
- Apply the principles of quality assurance system to control and assure the quality and safe of milk and poultry products;

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