

Review on Roles of Veterinary Services in Food Safety of Animal Origin in Ethiopia

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Abstract: Veterinary Service is a service which is provided by the veterinarians (governmental and private) under the World Organization for Animal Health, Terrestrial Animal Health Code with the aim of controlling and preventing animal disease including Zoonosis and keeping animal welfare. The production of safe animal products that will in turn protect the consumer requires the integration of all processes of production from the farm, through slaughtering, primary and secondary processing, storage, distribution, sale, cooking and serving of food in hygienic manners. The public health threats arising from animal products are presently international issues as a result of global trades. Therefore, Veterinarians have a various roles in the production of safe food of animal origin starting from the farm to fork in hygienic manner. However, the service is not well established in developing countries especially Ethiopia so that there is lack of documentation on this regard. This seminar is aimed to review the roles and responsibilities of veterinary service in production of safe food of animal origin. Thus, both the professionals and government should have to cooperate in order to improve animal and public health.

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1. Introduction

Foods of animal origin can serve as potential threats to human health if not properly handled. Contamination of these foods with pathogenic microbes and chemical residues can result from production at the farm level, transportation, storage, distribution and preparation for consumption. These contaminations may arise from diseased animals and unhygienic handling of animal products such as milk and meat. It is estimated that hundreds of millions of people are affected by food-borne diseases of animal origin annually especially in developing countries [1]. The traditional systems for food protection such as the examination of samples from the end products and the inspection of processing and catering establishments for hygienic practices as well as the removal of such contaminated foods from the market could not ensure food safety, because they were not preventive in nature [2]. The risk of food-borne diseases greatly reduced with the present approaches to food safety that targets prevention of contamination from the farm level through processing, stored distribution of foods of animal origin [3, 4, 5].

Food safety and quality are best assured by an integrated, multidisciplinary approach, considering the whole of the food chain. Eliminating or controlling food hazards at source (i.e. preventive approach) is more effective in reducing or eliminating the risk of unwanted health effects than relying on control of the final product, which is traditionally applied via a final

“quality check” approach. Approaches to food safety have evolved in recent decades, from traditional controls based on good practices (Good Agricultural Practices, Good Hygienic Practices, etc), via more targeted food safety systems based on hazard analysis and critical control points (HACCP) to risk-based approaches using food safety risk analysis [6].

Contaminated foods of animal origin in producing countries may cause food-borne disease outbreaks in importing countries. Thus globalization of trade has made food safety an international issue [7]. In a contemporary food safety environment, veterinarians play an essential role in the prevention and control of food borne zoonotic diseases and/or infections which are likely to be naturally transmitted from animals to human and other sources of food-borne disease such as food vehicles, meat and meat products, milk and milk products, eggs and egg products, fish and fish products, and honey and apiculture products. Risk analysis processes and methodologies are at the heart of modern approaches to food safety and Veterinary Services must adopt new approaches to decision-making and standard setting if they are to be successful risk managers [8]. Veterinary service is considered as a national and global public good and thus it becomes the responsibility of national governments and international communities. While at international level, OIE and Food and Agriculture Organization (FAO) of the United Nations are performing major functions of global veterinary

service reasonably well, in fact responsibilities of the respective national governments to establish and administer an efficient veterinary service in their respective countries [9].

This service operates predominantly at the national level in contributing to public health safety and food is significant part of the import and export trade profile of most countries. Thus there is an increasing need for involvement of Veterinary Services in risk-based standard setting at the international level. Where zoonoses are concerned, it is clear that there is a functional overlap between public and animal health activities. Veterinary competence can be shared in these circumstances even though public health and animal health objectives are separate and distinct. A number of countries are exploring such synergies in the reform of regulatory systems and structures. Research and the education emanating from studies in the Food Safety Consortium are strongly Hazard Analysis and Critical Control Point (HACCP) based and extends from producers farms to fork. The HACCP is a food borne hazard prevention approach focusing on physical, chemical and microbiological hazards [6, 10, 11, 12].

It is considered a scientific and systematic system for assuring food safety [13] which can be applied throughout the whole food chain [14]. It is management system in which food safety is addressed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling to manufacturing, distribution and consumption of the finished product. Physical hazards may enter the food chain anywhere from farm to fork. Those that enter at the farm, including broken injection needles, shotgun pellets, breaks in bones, and splinters of wood, metal, or glass can be prevented only at production level. Chemical hazards enter our foods almost exclusively during production. The most important focus is on preventing animal drug, including antibiotic residues, agricultural chemical residues, and pest poisons in meat and meat products must be controlled during production. Microbiological hazards enter the food chain along its entire length. Major microbiological hazards in meats and meat products include food borne parasites, mycotic and bacterial toxins, pathogenic bacteria from infected/carrier animals, environmental bacteria, and human source bacteria [15]. Even though veterinary service in food safety plays a key role in prevention and control of food poisoning, there is a shortage of reviewed data in Ethiopia. Therefore, the objective of this review paper was to give brief review on the role and responsibilities of veterinary service in food safety of animal origin in Ethiopia.

2. Roles of Veterinary Service

2.1 Definition

Veterinary Services means the Governmental and Non-governmental organizations that implement animal health and welfare measures and other standards and guidelines in the Terrestrial Code and Aquatic Animal Health Code (Aquatic Code) in a country. Veterinarian means a person registered or licensed by the relevant veterinary statutory body to practice veterinary medicine/science in that country [16]. Veterinary Authority means the Governmental authority of a Member Country, comprising veterinarians, other professionals and paraprofessionals, having the responsibility and competence for ensuring or supervising the implementation of animal health and welfare measures, international veterinary certification and other standards and guidelines in the OIE Terrestrial Code in the whole country. Veterinary Statutory Body is an autonomous authority regulating veterinarians and veterinary paraprofessionals [17].

2.2 Control of livestock diseases at the farm level

In recent years, issues of food safety focus on the production of safe food unlike the traditional methods of checking for the safety of foods that are already marketed for human consumption [6]. Veterinarians should ensure that animals are handled in hygienic manners on the farm. Animals on farm should be routinely monitored for endemic food-borne zoonoses to ensure that products from diseased animals are not forwarded for human consumption. They should also ensure that to produce an abundant safe supply of high quality milk, dairy cows must be healthy [18].

Dairy farmers make sure each animal receives safe, comfortable housing by providing specialized bedding and personal resting spaces. Dairy cows are fed high-quality diets containing protein, vitamins, and minerals several times a day. Also, dairy cows are vaccinated to ensure good herd health and prevent disease [4]. Through their presence on farms and appropriate collaboration with farmers, the Veterinary Services play a key role in ensuring that animals are kept under hygienic conditions and in the early detection, surveillance and treatment of animal diseases, including conditions of public health significance. The Veterinary Services may also provide livestock producers with information, advice and training on how to avoid, eliminate or control food safety hazards (e.g. drug and pesticide residues, mycotoxins and environmental contaminants) in primary production, including through animal feed. For example, the veterinary will also have interest in the food the animals consume, this is because, if the animal feed is incorrect or toxic, it will affect the health of animals, and in some cases, the toxin in the animal feed can be absorbed by the animal and then

passed on to the consumer in the milk, meat or eggs produced [19].

Dioxins, heavy metals such as lead and mercury, Polychlorinated biphenyls (PCBs), dichloro biphenyl trichloro ethane (DDT), radionuclides (radioactivity), salmonella and the prions causing BSE are well known examples of contamination in animal feed. In these cases, if there is a problem, the vet will try to find and remove the source of toxin. Checks will be made for a period on the animals, their milk, meat, eggs etc, to make sure that the level of the toxin present is below international safety standards [20]. Producers, organizations, particularly those with veterinary advisers are well placed to understand their priorities. Technical support from the Veterinary Services is important and both private veterinarians and employees of the Veterinary Authority can assist. The Veterinary Services play a central role in ensuring the responsible and prudent use of biological products and veterinary drugs, including antimicrobials, in animal husbandry. This helps to minimize the risk of developing antimicrobial resistance and unsafe levels of veterinary drug residues in foods of animal origin [4].

2.3 Roles at the abattoir

Ante-mortem inspection identifies animals not fit for human consumption. Here animals that are down, disabled, diseased, or dead are removed from the food chain and labelled "condemned." Other animals showing signs of being sick are labelled "suspect" and are segregated from healthy animals for more thorough inspection during processing procedures. Post-mortem inspection of the head, viscera, and carcasses helps to identify whole carcasses, individual parts, or organs that are not wholesome or unsafe for human consumption [21].

Animals or birds are often transported directly from the farm to slaughterhouse. In this process, veterinarians have many different roles. Initially they are involved in checking the health and welfare of the animals at some of the stages of transport to the slaughter house and once there, in the ante-mortem inspection prior to slaughter. In most developed countries ante- and post-mortem meat inspection at the slaughterhouse is carried out (or audited) by them as they are regarded as the most, if not only, competent and qualified persons to do such inspections. A general high level of hygiene in a slaughter house is vital. For example, important to make sure that there is no contamination (particularly of bacterial origin) and between 'unclean' parts of a carcass such as stomach contents and the meat, which people will actually eat. In Bovine Spongiform Encephalopathy (BSE) endemic countries there are additional hygiene requirements, i.e. the separation of

Specified Risk Materials (SRM) from the rest of the carcass in the prevention of the spread of BSE [22].

The following portions of animals are designated as SRM and are excluded from the human food, the skull, brain, eyes, tonsils, and spinal cord of cattle over 12 months and the intestine from the duodenum to the rectum of bovine animals of all ages, the skull, brain, eyes, tonsil and spinal cord of sheep and goats that are over 12 months of age or that have one permanent incisor erupted through the gum and the spleen of sheep and goats of all ages. These materials are isolated on slaughter of the animals, permanently stained and removed directly to especially dedicated rendering plant, where they are rendered and the resultant meat and bone meal and tallow stored pending destruction by incineration [23].

The Department of Agriculture and Food of Eire (Ireland) states that "Veterinary Inspection staff carries out continuous detailed inspections to ensure that no SRM gets in to the food chain" [24]. Slaughter house inspection of live animals (ante-mortem) and their carcasses (post-mortem) plays a key role in both the surveillance network for animal diseases and zoonoses and ensuring the safety and suitability of meat and by-products for their intended uses. Control and/or reduction of biological hazards of animal and public health importance by ante- and post-mortem meat inspection is a core responsibility of the Veterinary Services and they should have primary responsibility for the development of relevant inspection programmes [25]. Wherever practicable, inspection procedures should be risk-based. Management systems should reflect international standards and address the significant hazards to both human and animal health in the livestock being slaughtered. The Codex Alimentarius Code of Hygienic Practice for Meat (CHPM) constitutes the primary international standard for meat hygiene and incorporates a risk-based approach to application of sanitary measures throughout the meat production chain [9].

2.4 Certification of animal products for international trade

Another important role of the Veterinarian is to provide health certification to international trading partners at testing that exported products meet both animal health and food safety standards. Certification in relation to animal diseases, including zoonoses, and meat hygiene should be the responsibility of the veterinarians and the department of veterinary services. In addition, veterinarians should also ensure that importers of live animals, animal products and veterinary biological present certificates of health before such animals and products are allowed into the country as it is required by law [26, 27, 28].

The regulatory framework to control food safety and health issues can generally be divided into the main elements of requirements, conformity assessment and enforcement. Export certificates refer to both product and process standards, including management and monitoring systems along the entire food supply chain that are increasingly implemented and aim at reducing the probability that the production and consumption of products results in hazard for humans, animal and plant health. The requirements stated in export certificates can be those of the importing country, the exporting country or a mixture of both. Most importantly, export certificates stipulate that the exporting country must be free of certain infectious animal diseases, such as FMD, CBPP, LSD, Anthrax, Blackleg, Bovine Tuberculosis, brucellosis, PPR, or BSE in order to maintain the disease-free status in the importing country, or to accommodate other animal health and food safety objectives. Many countries in the Middle East, Near East and African sub-region have, in recent years, shown growing interest for animal and animal products from Ethiopia, and the Government of FDRE is striving relentlessly to satisfy the demands and requirements of these countries by improving the performance and status of its veterinary services to win bilateral and international recognition as a reliable and credible body for bearing the task entrusted in it. As regards external trade of livestock and livestock products, the direction, or the line of action of the Government of FDRE is that of commodity and/or compartment-based trade with internationally recognizable bio-security plan and implementation in the short term, while preparing, simultaneously, for geophysical-based or spatial disease management that will allow greater freedom of international movement from zones or regions liberated from trade restricting veterinary and/or zoonotic diseases [29].

This makes export certificates specific to pairs of trading partners, and exporters may have to qualify for several different export certificates according to their export destinations. While negotiated by the respective authorities of importing and exporting country, the contents and format of certificates is mainly determined by the importing country, and thus reflect the domestic requirements of the importing country. According to the World Trade Organization (WTO) trade rules, import requirements are not to exceed domestic requirements. However, importing countries can impose further reaching and different food safety and health standards under the sanitary and phytosanitary agreement, and include them in the respective export of complex trade issues, the Official Veterinarian is in a unique and quite special position to facilitate trade between international partners [9, 30].

Through OIE, the Official Veterinarian has direct access to the professional network of colleagues worldwide when trade problems or misunderstandings occur and may facilitate trade as an economic driver to the national interest. In addition, through OIE, the Official Veterinarian has access to those veterinarians directly involved in the setting of the animal health and welfare standards through which trade in foods of animal origin is regulated by the WTO. Certification in relation to animal diseases, including zoonoses, and meat hygiene should be the responsibility of the Veterinary Authority. Certification may also be provided by other professions (a sanitary certificate) in connection with food processing and hygiene (for example, pasteurization of dairy products) and conformance with product quality standards [31].

2.5 Risk based management system

A generic risk management framework (RMF) provides a systematic process whereby food safety standards and other measures are chosen and implemented on the basis of knowledge of risk and evaluation of other factors relevant to protecting human health and the promotion of non-discriminatory and least trade-restrictive practices [6]. Veterinary Services have essential roles in the application of the RMF process. Some activities draw almost exclusively on Veterinary Services, whereas others require multidisciplinary inputs. Preliminary risk management activities Once a food safety issue has been identified, the initial process is the establishment of a risk profile to place the issue within a particular context and provide as much information as possible to guide further action. Risk profiling may also be used for ranking or prioritizing different food safety issues. Although a detailed risk assessment is not necessary in many cases, the risk manager may commission one as an independent scientific process to inform decision-making [31].

The development of risk-based systems has been heavily influenced by the WTO Agreement on the Application of Sanitary and Phytosanitary Measures ("SPS Agreement"). This agreement stipulates that signatories shall ensure that their sanitary and phytosanitary measures are based on an assessment of the risks to human, animal or plant life or health, taking into account risk assessment techniques developed by relevant international organizations. Risk assessment, the scientific component of risk analysis, should be functionally separated from risk management to avoid interference from economic, political or other interests [32]. The SPS Agreement specifically recognizes as an international benchmark standards developed by the OIE for animal health and zoonoses and by the Codex Alimentarius Commission for food safety. Also in recent decades there has been a trend towards redefinition of responsibilities. The

traditional approach, whereby food operators were primarily held responsible for food quality while regulatory agencies were charged with assuring food safety, has been replaced by more sophisticated systems that give food operators primary responsibility for both the quality and the safety of the foods they place on the market [16].

The role of the supervisory authorities is to analyze scientific information as a basis to develop appropriate food safety standards (both processing and end product standards) and verification inspections to ensure that the control systems used by food operators are appropriate, validated, effective and operated in a way that the standards are met. Even in non-compliance, regulatory agencies are responsible to ensure that appropriate corrective actions are taken and sanctions are applied [4]. The Veterinary Services play an essential role in the application of the risk analysis process and the implementation of risk-based recommendations for regulatory systems, including the extent and nature of veterinary involvement in food safety activities throughout the food chain, as outlined above. Each country should establish its health protection objectives, for animal health and public health, through consultation with stakeholders (especially livestock producers, processors and consumers) in accordance with the social, economic, cultural, religious and political contexts of the country. These objectives should be put into effect through national legislation and policies and steps taken to raise awareness of them both within the country and to trading partners [6].

2.6 Drug and chemical residue checks

Traditional meat inspection procedures have now had modern additional checks added in order to safeguard the public. These checks are to look for substances such as growth promoters, hormones, antibiotics or chemicals used legally or illegally in the production of the meat; with the aim of significantly reducing the risk of the public from consuming meat with harmful chemicals [33]. An illegal substance, such as clenbuterol or salbutamol is called a “beta-2-agonist” and when fed to livestock it assists growth and increases the proportion of lean meat produced. People may suffer nervousness, fast heart rate, muscle tremors and other symptoms after eating meat containing these illegal chemicals [1, 34]. Checking for residues is not a static matter. There are constant changes; evolving problems and new matters have to be addressed. No matter what is the source of food is. In the last few years, there have been many different problems with residues in food. Melamine in milk, malachite green in fish, caponizing hormones in birds, growth hormone in feed lot cattle are examples [23]. However, in Ethiopia screening this condition is very difficult.

2.7 Food safety in food processing

Veterinary involvement in food processing is seen mainly in the inspection of food factories, meat, milk, cheese and yoghurt. One example of this was the importing country's requirement for veterinary inspection to ensure that meat was deboned and cooked to avoid Foot and Mouth Disease virus from surviving the manufacturing process and being imported (the virus survives for a long time in bone marrow. Another example was the requirement for veterinary inspection to ensure moon cakes were cooked to a certain temperature and specified time in order to reduce the risk of Newcastle disease virus, Salmonella, and other serious pathogens passing through the manufacturing process. In addition, Veterinarians have also inspected food-processing facilities in which export livestock and food of animal origin for Middle East Countries [28].

2.8 Food safety in the storage and transport of food

Traditionally, food inspectors are involved in the inspection of the retail side of the food process. However, vets do have a great interest in how food of animal origin is stored prior to going to retailers [35]. This is an area where if one is not careful, mistakes can occur. In this respect, it is important that batches of food are kept separate from each other and are clearly marked and identified with their movements recorded [17]. Certain countries use veterinary supervised inspections of the storage and transport of food. In Singapore, for example, the Agri-Food and Veterinary Authority (AVA) has established certain requirements for the handling and processing of meat and fish, through their Wholesome Meat and Fish Act and Sale of Food Acts. In addition, if food is to move across international borders, it often requires some form of veterinary health certification. This can only be completed by a veterinary part of the certification will be to ensure not only that the food is correctly handled at the correct temperature, but also it has good hygienic quality and safe to eat [36].

2.9 Food safety through trace back

If a food poisoning problem does occur in the retail or domestic cooking area, vets will want to be informed by their public health colleagues about the identity of the suspected food. This is because worldwide opinion is important to check the whole food producing system, as the problem may not be just in the restaurant or at home. In particular, they will want to know the batch number, name of the food manufacturer, name of the food and other details to help with identification and trace back. They will then start the “trace back” exercise processes and systems were originally developed in the USA and Europe [37]. The aim of the trace back exercise is to find out where in the chain the problem has occurred. Did the problem occur at the point of sale for example a

restaurant? If not then did the problem occur at a food storage point? If so, which one and what other foods were stored at that time and place? Alternatively, did the problem occur at a processing and if so, which one? This is highly relevant for example with ground beef and E.coli O157 food poisoning [18]. If not these ones, did the problem occur at a food factory? Which one and on what day? What other batches of food from that factory may be affected? If not the food factory, what about the Abattoir? If not the abattoir, the livestock transport Lorries to the abattoir or finally the farm itself or the feed going into the farm. In this whole trace back process, many professions will be involved not only vets, but if the source looks likely increase to be from the farm itself, there is a much greater veterinary involvement as compared to other professions [37].

3. Conclusions

Generally, Veterinary Service in food safety in low income countries including Ethiopia is limited. But, veterinarians have a key role to insure the provision of safe food which is recognized as a public good. Moreover, they are primarily importance in the provision of such a public good associated with the protection of public health, animal health and animal welfare. To guarantee a high level protection of consumers from food-borne diseases, there is an urgent need to integrate the modern animal production system. This concept of integrating all stages of the food production can be easily adapted to food of animal origin. Thus, the government and Professionals at different levels should have to ensure Veterinary Service in food safety and awareness creation of the community about food borne pathogen of food animal origin and its effective prevention and control methods.

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