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Review article

Developing awareness profiling force and activities linking safety and quality of foods of animal origin in Bangladesh

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ABSTRACT

Food safety is an important topic as large number of consumers has become victim of consuming adulterated foods. As the food safety laws, administration and inspection in Bangladesh do not include monitoring the chain of production and comply with the recommendation by Codex Alimentarius Commission (CAC), Sanitary and Phytosanitary (SPS) Agreement, and Hazard Analysis Critical Control Point (HACCP) System, the government is encouraging the private sector to put the food processing and marketing into the context of standard, cost effectiveness, public health issues and global trade. Recommendations came up for strengthening collaboration between Ministries and stakeholders. Since the public health service cannot combat alone the complex situation, the governmental agencies and academic institutions must work together to delineate many of the problems in food safety, consumers protection and zoonoses. In this paper the profiling force linking safety and quality of foods of animal origin in Bangladesh is highlighted.

1. Introduction

The current trend of improvement in human and animal health for safe animal products has resulted in encountering increased disease factors that fit into the full spectrum of health and hygiene *"healthy animals* (*ante-mortem examination*) ➢ *safe foods* (post-mortem examination) and➢ *healthy people* (*Good quality wholesome food consumption*)" In fact, of the 1,400 pathogens affecting humans, 800 originate in animals (Rahman, 2005). The epidemiologists group of the World health Organization (WHO) believed that 75% of the emerging infectious diseases in humans are of animal origin. A number of animal diseases that can be transmitted to humans (i.e., zoonoses), occur in developing world mostly affecting the poorest segment of the human population. Food-borne disease and zoonoses are now recognized as important public health problems and important causes of decreased economic productivity. Food animals are found reservoirs for important food-borne diseases, such as by *Escherichia coli* O157:H7, non-typhoidal *Salmonella* spp., *Campylobacter* spp. and *Yersinia* spp. Improper methods of food production, storage, handling and preparation have resulted in many outbreaks and each year millions of people are affected and thousands die, especially children in developing countries (Rahman, 2010a).

In recent years we experience complex changes in production, processing, storage, distribution, marketing and serving of foods. Many new problems have been created due to recent developments in handling, processing, packaging, distribution and storage. The public has started to question the quality of foods, as they are appearing in increasing numbers in supermarkets and retail grocery stores. In this view point to build awareness profiling force and activities linking to obtain wholesome foods we need to use skills, knowledge and resources which are embedded in a wide variety of professional areas and are profiled within the 'health triangle'. In the present discussion concern has been expressed about the public health profiling work force and activities needed to adequately address the scientific, technological, social, political and economic challenges facing global animal and public health.

2. Health professionals' profiling force and activities as related to food safety and promotion of health

It is now agreed that health problems are complex and delivery of appropriate health services depends upon the dynamic efforts of all health professionals. For promotion of human health and welfare the importance of 'Human - Animal bond' in modern food production systems as diagrammatically reflected below (Fig. 1) cannot be ignored.

To provide a framework for analyzing the significance of health professionals' activities as related to human health, the significant human health goals (Rahman, 2010a; FAO, 2010) identified are:

- *Food protection/safety* : To protect from food-borne illnesses by detection and appropriate control of foods of animals origin due to physical, chemical or biological agents
- *Zoonoses prevention*: To protect people from diseases transmitted between animals and people through prevention, control and eradication including profiling force of monitoring and surveillance in animals and humans.
- *Health education*: To protect and promote human health through awareness development, teaching health education and consultation to animal owners, industry groups, and interested individuals.

It is important to note that the goals mentioned above are stated in terms of protecting and promoting human health since these efforts are directed primarily towards preventing the occurrence of disease and dysfunction of people. Experts listed these activities destined to veterinary professionals and identify the profiles and scope of activities related to the delivery of health services and health hazard control systems. The list is organized into the following major group:

(1) Veterinary surgeon
(2) Public health veterinarian
(3) Veterinary epidemiologist
(4) Veterinary educationist
(5) Veterinary auditors
(6) Veterinary police
(7) Environmentalist

The significance of public health veterinary activities for human health dictates the necessity of a team approach. Interdependence and sharing responsibilities and activities in a team approach are characteristic of the human health services system. The exclusive involvement and participation of veterinarians as members of the health team could because of their unique professional qualifications contribute in certain services for the wellbeing of human health. The veterinarians are one of the few professionals regularly visit farms and have the credibility with rural family. It is therefore obvious that they are in an advantageous position to observe threats to human health and take appropriate action. In the foregoing discussion the food safety issues which have an enormous public health impact, as well as significant social and economic consequences will be highlighted.

3. Health professionals' goals / activities encompassing food safety

3.1. What does food safety mean?

Safety of foods has been defined by a joint FAO/WHO Expert Committee on Food Safety as *"All conditions and measures that are necessary during the production, processing, storage, distribution and preparation of food to ensure that it is safe, sound, wholesome, and fit for human consumption."*

Two terms, such as pre-harvest ('on-farm' production functions) and post-harvest ('in-plant' processing functions) are applied in food commerce. Food safety in basic term means any food must be prepared under conditions which assure that every reasonable precaution has been made to ensure that the food is safe and wholesome to eat and matches the description given to the product or the ingredient which is provided to the buyer or the ultimate consumer.

3.2. The importance of food safety

The Millennium Development Goals set out by the United Nations recognized improvement of human health through assuring safe and nutritious food. In many countries of the world food safety has been considered as yardsticks of wholesomeness and quality of foods and major public health issue. The world is approaching a liberalization of trade involving a minimization of trade barriers and all partners would agree with a uniform hygiene in pre-harvest and post-harvest food safety. It is therefore now the time for us in Bangladesh to realize our responsibility for the well being of people that fit into the full spectrum of "Healthy animal's $\rightarrow$ Safe foods $\rightarrow$ Healthy man."

The liberalization of the global trade and the fact that the consumers are more inclined to demanding food to be not only economical, but also healthy, tasty, safe and wholesome. This has dictated a growing influence of the consumer's demands implemented in vertically coordinated supply chains rather than on single farms. Progressive increases in food trade and shift from traditional method of processing to the present high-speed processing (e.g., ready-to-cook, precooked, ready-to-eat and take-away-home convenience foods etc.) has on the one hand stimulated the development of new items, but on the other hand dictated exposure of various agents. As a result bio-magnification ensues; health risk factors emerge and food mediated episodes appear. Emphasis is therefore given on the knowledge, skills, and resources, which should be properly utilized in the community and linked with health triad as double way traffic: Man $\Leftrightarrow$ Animal $\Leftrightarrow$ Environment. All these interactions are embedded in intervention activities of (a) early diagnosis of diseases (b) providing suitable management (c) determining health risk factors and zoonotic transfer and (d) assuring pre-harvest and post-harvest food safety.

3.3. Food safety lies within the 'Quality requirement triangle'

Scientists all over the world urge upon the importance of extrinsic and intrinsic parameters influencing food safety and consumers protection. They have bound these parameters within triangle-boundary of 'Quality requirement' (Fig. 2). During the last decades the link between food and disease has been increasingly replaced by sound evidence. The most critical area of health and hygiene is 'food *protection'* that means, what we eat has a major impact on health.

3.4. Food safety and food quality programs

Food safety (prevention of food-borne illness) and food quality (increased shelf-life and improved texture, flavor, and color of food) can be controlled by developing and implementing in-house food safety and quality

programs. The programs that are used most often to enhance food safety and quality fall into three categories: 1. Good Manufacturing Practices (GMPs), 2. Sanitation and 3.Hazard Analysis Critical Control Points (HACCP) programs.

3.5. Food safety and quality approach

To produce safe and sell high quality products *and* increase the efficiency of the production process have led to the development of quality assurance systems, such as quality control and quality assurance along production chains.

Quality control is the evaluation of a final product prior to its marketing, i.e. it is based on quality checks at the end of a production chain aiming at assigning the final product to quality categories such as "high quality", "regular quality", "low quality" and "non-marketable". It is the testing of carcasses for residues. As for example it is the testing of meat products for pathogens prior to their marketing and consumption and is the implementation of residue avoiding production procedures at farm level.

Quality assurance, in contrast to quality control, is the implementation of quality checks and procedures to immediately correct any failure and mistake that is able to reduce the quality of the interim products at every production step. It is the implementation of on- and off-farm pathogen-reducing measures as standard operating procedures. It needs to improve food safety and quality.

The liberalization of the global trade and the fact that the consumers are more and more inclined to demanding food to be not only economical, but also healthy, tasty, safe and wholesome. It is therefore agreed that the quantity-oriented food production, guaranteeing the nutrient supply for a population is no more so important than the competitiveness of food production linking to the reliability of the safety and the quality of the food and acceptability of the production. This has created a steady increase of the national and international standards for food safety. Experts believe that due to foreseeable changes and their implications on- and off-farm measures need to be developed and implemented in vertically coordinated supply chains rather than on single farms.

3.6. Food safety is an increasingly important public health issue

Food safety is a growing problem due to the occurrences of a wide range of food-borne diseases. The chief technical adviser of Food and Agriculture Organization (FAO) in Bangladesh Dhaka in a seminar on 'Food Safety Challenges in Bangladesh' stated that an estimated 45 million people in Bangladesh suffer from food poisoning or some kind of food-borne diseases round the year. Pathogenic organisms such as bacteria and virus as well as chemical contaminants like pesticides, residues, heavy metals and food additives lead to food-borne diseases and this situation is grave in Bangladesh due to poor awareness about food safety among producers and consumers. While most food-borne diseases are sporadic and often not reported, food-borne disease outbreaks may take on massive proportions. FAO Experts in Bangladesh scrutinized this problem in the following way (FAO, 2010).

- Rapid urbanization is adding to risks, as urban dwellers eat more prepared foods outside the home that may not be handled or prepared safely — including fresh foods and fish, meat and poultry.
- Unsafe food, whether arising from poor quality supplies or inadequate treatment and preparation, increases the risk of food-borne infections. These infections have a much higher impact on populations of poor nutritional status as in many people of Bangladesh, where diarrhea can easily lead to serious illness and death.
- Food contamination can occur at any stage from farm to table. Everyone on the food delivery chain must employ measures to keep food safe — farmer, processor, vendor and consumer.
- Safety at home is just as vital to prevent disease outbreaks. Women are primary targets for food safety education as they are responsible for household meals in many societies.
- Obstacles to building efficient food safety systems are ear marked as below:

(i) Lack of political awareness,
(ii) Rare acknowledgement by decision makers in many situations
(iii) Little priority by major donors.
(iv) Lack of data on the burden of food-borne diseases for evidence-based national and international food safety policies.

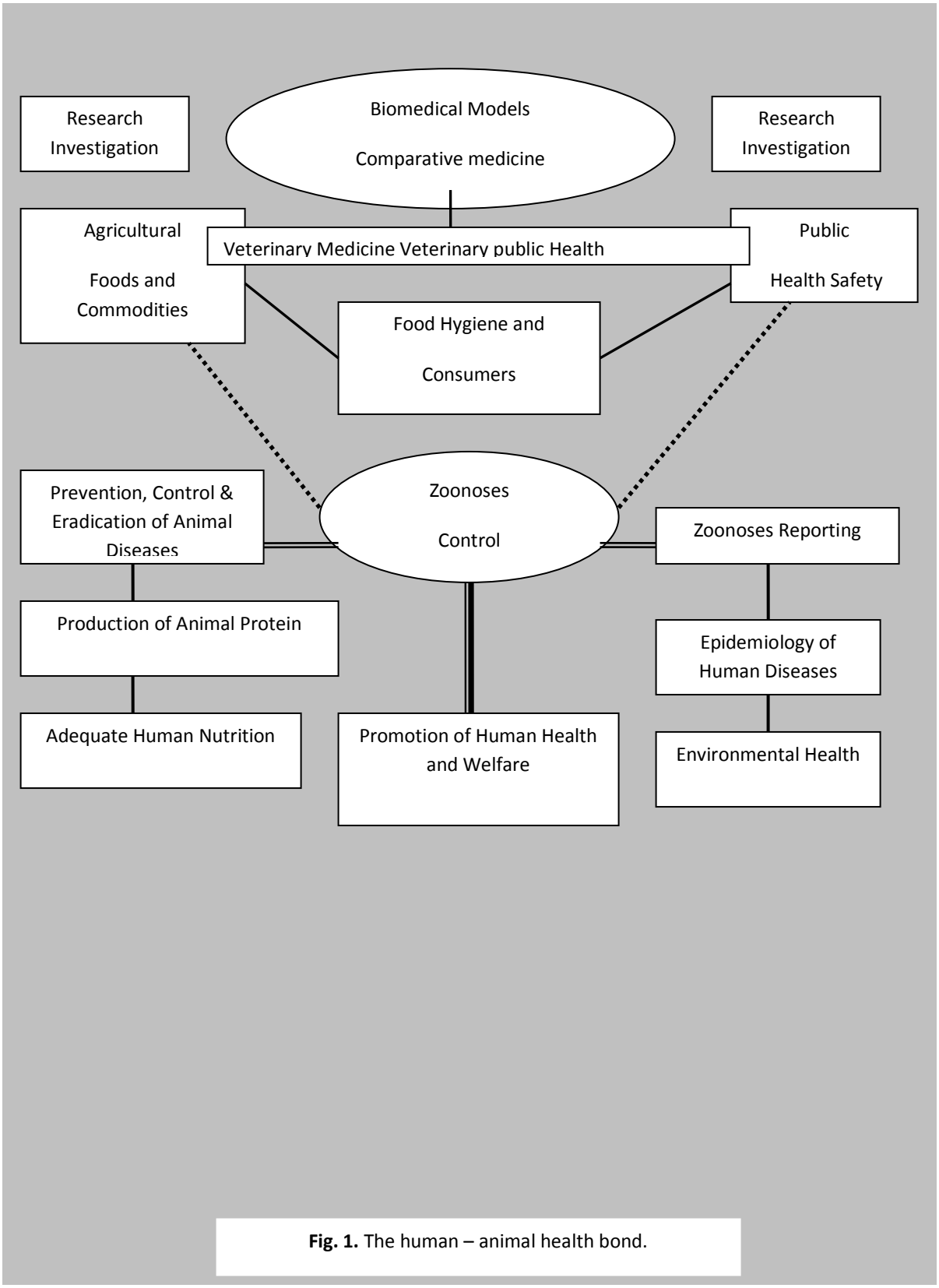

Fig. 1. The human – animal health bond.

(v) Lack of setting standards for the content and quality of food via the Codex Alimentarius Commission (together with the Food and Agriculture Organization of the United Nations);

(vi) Little knowledge on food safety and hygiene practices.

Governments all over the world are accelerating their efforts to improve food safety. These efforts are in response to an increasing number of food safety problems and rising consumer concerns. In our country also it has become an important topic as consumers in Bangladesh have become victims of serious hazards and adulteration incriminated in foods. In our counry the scenario of food safety system is quite rudimentary and primitive. Here the government has to provide all necessary supports to maintain the safety of foods. Our constitution also gives due importance to food safety. Article 15 of the Bangladesh Constitution states that it shall be a fundamental responsibility of the state to secure provision of the basic necessities of life including food. Article 18 of the Constitution states that the State shall raise the level of nutrition and improve public health as its primary duties. Both the Articles imply food safety requirements for consumers (Rahman, 2010b)**.**

3.7. Food safety has become an important topic of electronic and print media and internet

Food safety has become an important topic as large number of consumers in Bangladesh has become victim of consuming adulterated foods. Interesting reports are covered by the media. Some of the examples are presented below:

(1) Using of dead chicken meat by certain so called elegant restaurants
(2) Selling of sweets mixed with health hazardous substances,
(3) Soaking of mangoes in chemicals
(4) Using of chemicals to ripen bananas,
(5) Adding formalin to fish and milk,
(6) Offering of local beef at exorbitant price with false tag in the name of 'California Beef' or 'Texas Beef' and recently anthrax infected meats are eaten that definitely pose high risk health hazard.

We cannot ignore the above coverage of the media as this is a matter of life and death. Since the media has a great impact on people's behavior, as well as on policy maker's awareness of the impact of food safety incidents in the country it is definitely a very important partner for improving food safety in Bangladesh and can be used as a vehicle for transferring information about food safety to the public and to inform about what FAO representatives and the government together are doing to improve the food safety situation in the country. FAO has very recently launched first food safety website for Bangladesh (bdnews24.com) to provide Bangladeshis with easy access to information on food safety and giving consumers and other interested parties rapid access to important news on food safety matters.

It is known from the website (http://www.bsti.gov.bd/about.html) of the Bangladesh Standards and Testing Institution that it is a body made corporate under the law entitled, "The BSTI Ordinance, No. XXXVII of 1985". The Ordinance has been amended as 'The Bangladesh Standards and Testing Institution (Amendment) Act, 2003'. Since its inception, it is the sole body to look after and to certify the quality of commodities, materials, whether for local consumption or for export and import the quality of the products in Bangladesh. BSTI has rules and regulations but not enough manpower to implement the job to protect consumers. According to the local press release consumers protection activities of BSTI include actions carried out periodically by qualified inspecting officers of the institution and random samples are being taken and tested at the BSTI Laboratory and products bearing the standard mark are collected by the surveillance team of the institution directly from the open market and tested in the BSTI Laboratory. Representatives from the Consumers Association of Bangladesh (CAB) and the respective chamber of commerce and industries help the surveillance team in performing its function. However it is very unfortunate that in practice it is questionable whether the information with the certification ascribes authenticity to food safety and quality (Yusuf et al., 2009). In real situation we are experiencing many a times a different undesirable story. The TV channel screened a number of documentaries and print media published reports on facts how bread was being made, fruits, fish, milk and meat foods being prepared, processed, adulterated masking the poor quality, distributed and sold in markets under very unhealthy environment and RAB (Rapid Action Battalion) identified the unscrupulous malpractice of factories selling foods.

4. Situation of safety of foods of animal origin in Bangladesh

Food safety situation in Bangladesh is very much precarious. Consumers in Bangladesh become victims of serious adulteration in food. Here food safety laws, regulations and administration are rather ineffective. Food safety administration and inspection does not include the monitoring of the entire chain of production and transaction. The country has although set some goals for domestic consumption and increasing export of fresh and processed foods, but adequate food safety control has not yet been achieved to gain access to the European and global markets. It is agreed that to ensure quality and safety of foods in this country *'from farm to table'* pre-harvest and post-harvest hygienic functions are very much neglected. The primary prevention 'on-farm' exposure to food-borne hazards due to pathogens and residue producing chemicals persisting in the food chain is not given due importance (Rahman, 2010b).

We know that "Open Dating" on a food product is a quality date stamped on the package of a product to help the store management determine how long to display the product for sale. In Departmental food shops in Bangladesh sometimes packaged perishable foods are found, but "Open Dating" is rarely found primarily on perishable foods such as meat, poultry, eggs, and dairy products. According to latest information from internet, more than 35 per cent of meat available in the local market in Bangladesh goes to domestic households as well restaurants. Some of the elite society's elegant restaurants in the capital are selling local beef in the name of 'California Beef' or 'Texas Beef', but Bangladesh Customs confirms the fact that, in past two years, no cow meat was ever imported by anyone in Bangladesh. So, it is understood that, those so-called imported beef is nothing but very much local one, which the shrewd restaurant owners are selling at exorbitant price to the customers with false tag.

In recent years we experience complex changes in production, processing, storage, distribution, marketing and serving of foods. High standards of hygiene at abattoir, improved dressing procedures and sophisticated quality control for holding meat foods under cold chain and refrigeration for extended period are established in many developed countries to assure food safety and consumers' protection. Prime cuts of meats are now packaged to specification to local needs and of overseas customers. These are transported and chilled in air-tight bags of multilayer polyethylene and plastic to prevent spoilage. In comparison to the above facilities the scenario of our home country is very primitive. Food control activities are implemented in a disorganized form. There is a lack of consumer/public awareness program. Both producers and consumers are lacking in knowledge regarding food safety laws, regulations and standards. Proper enforcement of laws, regulations and standards are absent. Food laws and regulations do not embody recent international developments. It is not up to date with recommendation by CAC (Codex Alimentarius Commission Act 1961), SPS (Sanitary and Phytosanitary) Agreement, TBT (Technical Barriers to Trade) Agreement and HACCP (Hazard Analysis Critical Control Point) System. The Government of Bangladesh is however encouraging the private sector to put the food processing and marketing into the context of industrial standard keeping in view the cost effectiveness and public health issues, so that we can enter the global trade. In recent years a modern abattoir namely Bengal Meat Ltd has been established to offer consumers wholesome meat. The situation of food safety needed in relation to hygiene and production of foods of animal origin in Bangladesh is briefly narrated below.

4.1. Meat from food animals

4.1.1. The food safety needed in the present status and public health implications

The situation of meat production and supply in terms of handling, slaughtering and dressing of food animals in Bangladesh takes place in a much disorganized way and in unsanitary conditions. There is generally no or poor pre-slaughter conditions, sanitation, removal of waste materials, and disposal of offal (Rahman, 2007). Ante- and post-mortem meat inspection programs are not primary responsibilities of National Veterinary Services in Bangladesh; as a consequence inspection procedures are not designed according to a risk-based approach and management systems that reflect international norms. In Bangladesh there are many self-made field abattoirs in rural and urban areas, small towns and even in cities slaughtering is still carried out by unauthorized butchers in fields, bushes, backyards or at some street corners, where killed animals are skinned, eviscerated and dressed. The dressed carcasses are made into various cuts and portions and sold to customers.

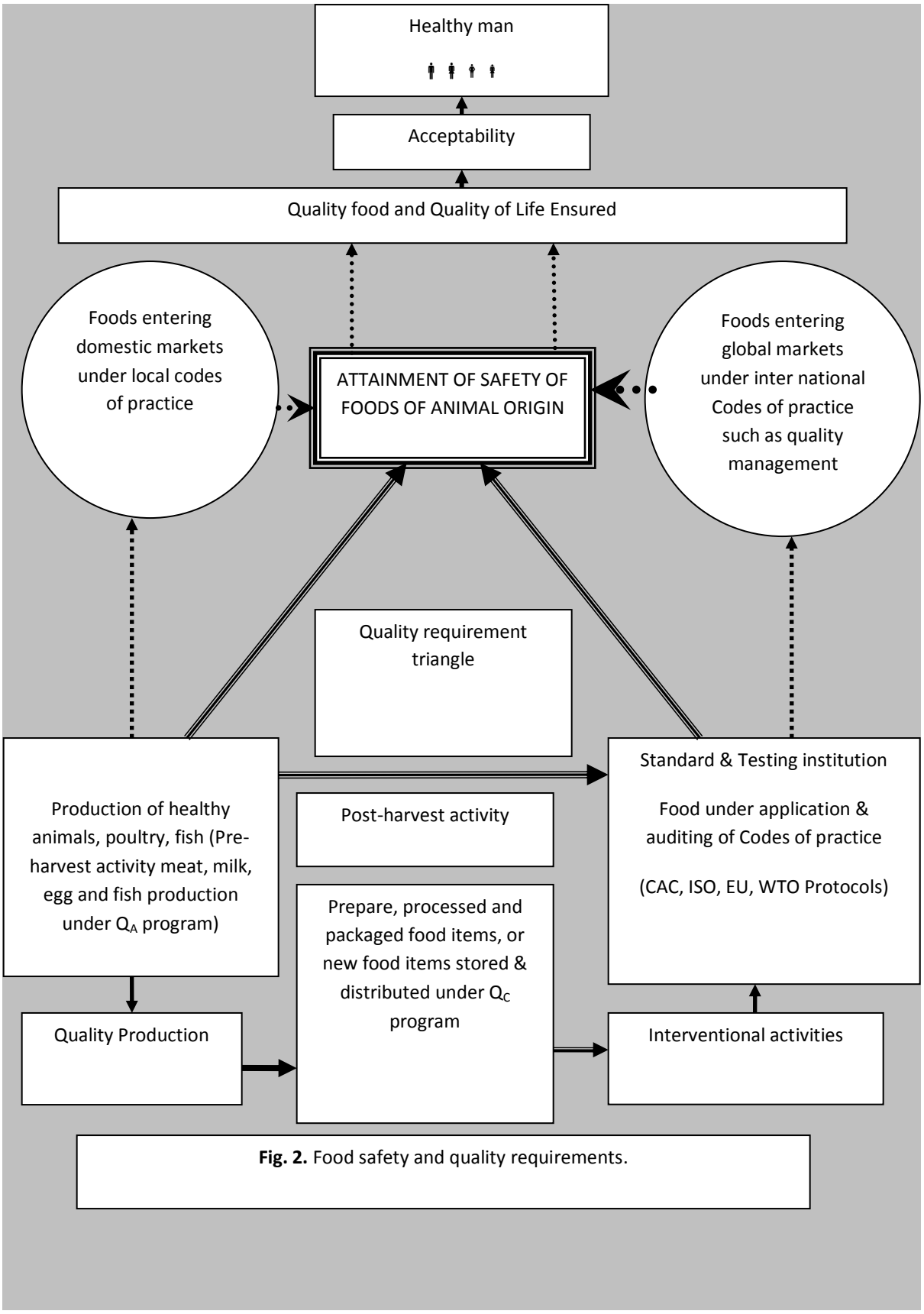

Fig. 2. Food safety and quality requirements.

There are an estimated 192 improvised slaughter houses at district level, 1215 at Upazila level and more than 3,000 slaughtering points in hats and bazaars as well as by road sides of cities and towns.

There is neither any pre-slaughter care nor ante-mortem examination nor any humane method of slaughter (post-harvest food safety). Post-mortem examinations are not at all practiced and these do not constitute integral parts for the hygienic production of meat. The finished products so prepared are transported to meat stall by rickshaw, cart or shoulder carriage, often lying on unclean surfaces and exposed to health hazardous agents. When blood, ruminal and intestinal contents are wasted, these are either left where the slaughter has taken place or washed down a drain to eventually end up in a pond or a watercourse (Rahman, 2010a).

The importance of careful handling of meat animals before slaughter cannot be exaggerated, for unsuitable conditions of transport lead to injury, bruises, lameness, fatigues, suffocation, transit fever, convulsions, diarrhea, and death. It is interesting to note that in Bangladesh the percentage of occurrence of diarrhea is remarkable in all species of animals when they are brought by driving on the hoof (cattle 38.44%; buffalo 15.16%) or transported by trucks (buffalo 30.80%; sheep 29.26% and goats 21.14%). The disease is more pronounced in goats when they are transported by boats. Most animals arrive at the slaughtering point are seen with exhaustion, fatigues and stress conditions. As a result meat obtained from these animals cannot be regarded as free from potential threat of health risk factors. Undoubtedly meat after slaughtering and dressing of food animals under Bangladesh conditions carries an extremely high initial contamination loading, which is exacerbated by poor transport and retailing conditions.

Improved hygienic conditions (post-harvest food safety) during slaughtering, evisceration and dressing will reduce initial microbial load and there will be minimization of contamination (Rahman, 2007).

In Bangladesh cattle are generally dressed on their backs on a flat ground surface, using removed hide a surface to separate meat portions from the concrete or dust. Evisceration of cattle is also performed in the prone position. Although it would be desirable to dress the carcass on a dressing cradle and hoist to an overhead rail for final hide removal, evisceration and final carcass preparation, but unfortunately this is not given attention. To get remedy from the present situation it is therefore evident that a proper way of improving slaughter hygiene and introduction of effective meat inspection programs are indispensable and urgently needed to prevent entry of diseased agents contaminating meat into the food chain. The country obviously needs slaughterhouses with meat processing plants. The project initiated by Government and Nongovernmental organizations Agro Industries Ltd., if implemented would certainly improve not only the dietary intake of people, but also supply safe and wholesome meat, strive to export processed meat products to Middle East, Southeast. Asian countries, Brunei and encourage more efficient utilization of organic meat by-products.

4.1.2. Need to improve food safety and quality assurance of meat from farm to table

Although mandatory meat inspection and food hygiene have been regarded as sufficient to guarantee safe meat over almost 100 years, new approaches to food safety measures and meat quality assurance and control have led to a remarkable decline of meat related food-borne diseases in man. There are five major reasons for this need:

(1) Despite the generally recognized achievements of mandatory meat inspection in making meat foods safer over the decades, there are still deaths due to food-borne diseases in man.

(2) Modern agriculture is contributing to the increase of drug-resistant pathogens in humans. According to WHO report: "Antimicrobials are used in meat production to increase growth, but not usually in sufficient amounts to kill microbes? Drug-resistant bacteria are then passed through the food chain to the consumer".

(3) Food safety issues have become non-tariff trade barriers. The statement ‘our fresh meat and meat products come from animals raised naturally without hormones and antibiotics’ create new consumer demands and increase the distrust in meat without any safety or high-quality "label".

(4) The consumer has the tendency to ask more and more for fresh and naturally raised (organic) products: The tendency "back to the farmers' markets" results in the increasing consumption of food that is not or less processed than branded products. The more fresh or organic the food is, the more is the consumer dependent on the absence of pathogens and contaminants in or on the raw material.

(5) The traditional mandatory meat inspection still is indispensable. Classical Zoonoses, such as tuberculosis and brucellosis caused both clinical diseases could be recognized at farm level and lesions could be recognized

during meat inspection at slaughter. On the other hand the emerging pathogens of today such as Salmonella, Toxoplasma, Trichinella, Campylobacter and Yersinia are only detectable through targeted monitoring systems, since they do neither cause clinical symptoms in affected animals nor lesions that could be helpful to recognize contaminated carcasses.

4.1.3. *Food safety in relation to consumers' demand and quality*

The Household consumption survey calculated that average per capita daily intake of beef in our country is about 5.2 g per day and mutton 0.9 g per day. When calculated across the population those figures indicate a consumption of some 49,000 tons of mutton and 226,000 tons of beef per annum. The Household survey did not include Eid festival slaughter. The impact of slaughter for Eid festival has been estimated to be 40% of the total annual slaughter. If this is included then the total annual consumption of beef and mutton could rise to 445,000 tons. Moreover the demand of supermarkets, hotel, restaurants and Defense department for quality meat has been surveyed. If we include the total demand of all sections and if we could double the daily intake of people then we need to supply annually 8, 00,000 tons. The establishment of project of the meat plant would be capable to meet the actual demand of the country and the gap could be filled up in due course.

A recent survey of retail market of meat revealed a strong trend toward more branded, value-added products being offered to consumers. Most of the meat produced and available in our country is sold by retail butcher shops to general consumers as fresh meat (unchilled). This meat is cooked in the household in different ways according to tastes and preferences. The production of processed meat is almost negligible. However recently the dynamics of consumers' attitude are rapidly changing in favor of processed meat products especially in metropolis and big cities. Several traditional meat products like meat kabab, samosa, kopta, tikka etc. have been able to create an impact on the urban consumers. In big cities there is an ever increasing demand for 'ready to cook'; 'ready to eat', 'heat and serve' and 'take away home' convenience or fast foods. The present demand of supermarkets, household consumers, hotels, restaurants, army, navy and other defense departments for catering requirements of meat and meat products focus attention to tailor the food items in plants under Quality, Standard and Acceptability (QSA) concept. In addition to our native demand, we could strive to export meat products rather than fresh meat. Western type meat products like Sausages, Frankfurters, Salami, Hot dog, Meat patties, Burgers, Luncheon meat, Liver paste etc are popular items which can be prepared here for our domestic consumption in big cities and these could be export items as well. If we can produce quality product and enter global marketing as per Code of Practice of importing countries we would be able to earn more foreign exchange and the industry's efficiency will be of more viable nature.

4.1.4. The food safety impacts on the feasibility of establishment of abattoir in Bangladesh

The feasibility of establishment of abattoir In Bangladesh entails three emergent food safety impacts

(1) Economic impact

- The fragmentation of traditional meat production results in the poor recovery of by-product.
- Due to low slaughter numbers at any single location blood and intestinal contents are in general not being collected and utilized. The opportunity to recover these products as a feed source or fertilizer is being lost.
- Hide trimmings, horns, hooves, hair and bone are not collected in any manner. Some areas around the tanneries collect hide trimmings, fleshing materials, bones, bristles and hairs occasionally and these are utilized in a very small scale in a cottage industry environment.
- Some 40,000 tons of raw blood equivalents to 5000 tons of dried blood with an average 80% protein content are being wasted.
- It is estimated that 40% of this material (16,000 tons of raw blood and 2,000 tons of dried blood) are produced on the 3 days of Eid festival.
- It is known that blood contains a valuable lysine source – a protein supplement for poultry production. To get this in feed the collected blood is boiled ⇨ coagulated ⇨ drained ⇨ dried ⇨ and mixed with rice or wheat bran.

- There could be up to 100,000 tons of wet rumen contents produced resulting in some 12, 000 tons of dried material (8-20% protein). This material could be utilized for pig ration as well as in preparing compost and fuel gas in biogas system
- Lack of policy making or indifferent in setting to minimize controllable damage of hides and skin due to poor flaying and poor preservation and transportation.

(2) Public health impact

- Ante-mortem and Post-mortem meat inspections do not exist
- Improved hygienic condition during slaughtering, dressing distribution and retailing operations are not practiced
- Methodology of detection of diseases and control of hygienic quality are least developed
- Cold chain system – (chilling, refrigerated transport, frozen storage etc), hygienic processing and packaging are ignored
- Appropriate Legislation or Act of 'Meat Inspection and Hygienic production' need to be developed and implemented

(3) Environmental impact

- Slaughtering wastes are discharged into the environment, drains and watercourses
- Rendering plants to utilize by-products is not present; as a result the BOD load and other hazardous materials cause environmental pollution
- Tannery wastes causing pollution

4.1.5. Food safety in future prospect development

For a long time meat industry has remained confined to a very small section of people in our country and the traditional form of meat production rests on the hands of butcher workers. These people have very little knowledge about wholesome meat production and effective utilization of valued slaughterhouse by-products. During the past few years the establishment of modern abattoir complexes has been proposed. Since there is an export potential of 'Halal meat' in Islamic countries, Bangladesh could emerge as a prospective country. Therefore there is an urgent need to establish modern and hygienic abattoir with cold chain facilities solely for export purposes and rendering plants for utilization of by-products. It is hoped that these developmental activities will improve the present hygienic crisis of meat sector and promote effort to enter the global marketing so that we could occupy the significant share in world meat export (Rahman, 2007).

4.1.6. The targets for intervention measure to decrease the meat-borne health risks in foods of animal origin

The role of the livestock producer is now changing from just raising animals to food production chain that supplies a wholesome, safe and high quality food product. The food animal practitioner's formerly focusing at treating diseased animals, and herd health and productivity is now supporting the livestock producer to provide slaughter animals with quality properties that meet the demands of slaughter-houses and meat processors, wholesalers, retailers and finally the consumer. To reliably decrease the food-borne health risks and to improve the consumer's confidence in food of animal origin, pre-harvest and post-harvest food safety programs should consist of six elements:

(1) Implementation of GMP and HACCP programs

(2) Implementation of monitoring & surveillance at slaughter to determine the introduction of food-borne health risks into the food chain identifying the farms of origin

(3) Developing incentives benefit mechanisms for the farming community to reduce risks

(4) Implementation of a certification involving accredited veterinarians and quality consultants

(5) Prioritizing targets for intervention measures in the food chain

(6) Implementation of internationally recognized HACCP system to assure safe food production.

4.2. Milk and milk products

4.2.1. Milk transportation and public health

The milk production in Bangladesh takes place still not under organized condition and the importance of hygienic milk is not felt by the general public. Supply of milk from widely scattered sources, non-availability of cooling before and during transportation, careless handling, and distribution under improper hygienic condition and willful adulteration with pond or river water are all unsanitary activities under which milk is being sold. Gowallas and milkmen, who ultimately collect milk in big vessels and transport to towns and cities on shoulder carriage or bicycle or by road transports and rail, during transportation innumerable opportunities are provided for contamination. The milkmen to prevent its splashing from the container place banana and date leaves in milk. They do not give attention that the leaves could be abode of pathogens (post-harvest food safety).

4.2.2. Effort for quality milk production

In all developed countries 'Milk inspection Act' proposes the complete exclusion of milk from cows suffering from infectious diseases. It enforces that only milk from registered animal must be sold and the stocks are registered only when the byres meet certain satisfying requirements and the cows are certified to be healthy by veterinary inspection. Bangladesh is still backward in this respect. It is really surprising that incompetent personnel who have little or no knowledge about food safety are generally employed by the health authorities to work as sanitary inspector and assess the quality of foods. The veterinarians in spite of their adequate knowledge about hygiene of foods of animal origin and food safety functions are not usually employed for these purposes. The limited developments of some dairy enterprises like, Milk Vita, Pran, Arong, Star ship, Danish etc have contributed in the upliftment of quality milk production and processing, but without any effort to adapt them to cultural, socio-economic, climatic and sanitary condition of the country. Some milk processing plants are producing packaged milk products and they get certificates about quality from the BSTI (Bangladesh Standard and Testing Institution) which do not meet standard prescribed by ISO or CAC (Rahman, 2005, 2007, 2010a).

4.3. Poultry meat

Two marketing systems or mechanisms dominate the poultry meat sector in Bangladesh: (1) marketing rural scavenging poultry and (2) marketing broilers. In recent years there has been a rapid expansion in commercial processing of eviscerated ready-to-cook poultry. In cities live broilers are sold to customers based on live weight. The birds are then slaughtered, scalded and mechanically plucked (using a multi bird drum plucker), eviscerated and packaged while the customer waits. Undoubtedly the poultry slaughtered and dressed under Bangladesh conditions carry extremely high initial contamination from the point of slaughtering process to the point at which the customers are offered the product. Improved hygienic measures will minimize the initial microbial load and the proper sanitary applications to the distribution and retailing framework and the arrangement for the inherent cold chain through all the steps up to the customers (pre-harvest and post-harvest food safety) could in fact meet the challenge to deliver a safe good quality product (Rahman, 2007).

4.4. Eggs

The poultry population in Bangladesh is still dominated by native chickens, which are used by the production of both eggs and meats. In Bangladesh eggs are sold not on the basis of quality cleanliness, size, and weight but sometimes on the basis of production origin that is native or deshi eggs and farm eggs. Considering the growing importance of poultry farming, farmers are encouraged to produce good quality eggs in order to improve their economic condition. In Bangladesh, many people suffer from gastrointestinal disturbances by taking egg products contaminated with health hazardous organisms. Hens' eggs are comparatively free from salmonella organisms than those of ducks. Salmonella organisms have been found to be frequently present in dirty and cracked duck eggs. The higher incidence of salmonella in duck eggs calls forth the public health significance (Rahman, 2005, 2007).

4.5. Fish

Fish production in Bangladesh has been increasing as a result of the expansion in freshwater aquaculture activities. Due to the country's great freshwater potential, fish cannot be regarded only as an excellent source of

food, but also as a source of exportation revenue. With the rising costs of meat and cheese protein foods, consumers have become increasingly interested in fish as source of dietary protein. The fresh fish trade in Bangladesh has grown from practically nothing to a frozen shrimp industry and fresh water fish production for domestic consumption only a few years back. Raw fish, if rotten and sold, will not usually be accepted, rather rejected by general customers. Several outbreaks of food poisoning caused by consumption of fish and fish products reflect attention to microbiological safety of the food (Department of Fisheries, 2008). Unfortunately in Bangladesh there exists no Public Health Regulatory Mechanism with regard to microbiological safety of raw fish. Emergence or re-emergence of serious diseases such as typhoid, bacillary dysentery, cholera, undulant fever, tuberculosis, listeriosis and hepatitis is a growing concern in this country both in humans and food-animals in the predisposed populations. Fishes from the departmental shop contained more bacteria than fishes from open market. The possible reason for this variation might be due to the fact that unsold fishes were kept for longer times in the departmental shops.

Requirements as per recommendation of ISO, CAC and EU standards have not been drawn up for fish and fish products and processing premises. In Bangladesh the frozen fish industry has grown in recent years and shrimp and Hilsa now represent the important export item of food. There is therefore need for Government Regulatory Control for the 'Establishment of International Code of Practice' for specifications of quality standard and safety for this product under controlled processing and strict sanitary conditions.

4.6. New food items

The extensive development of modern food technology has made possible to offer many kinds of processed foods to consumers in accordance with their needs. Due to constant changes in technological revolution various processing methods are introduced and new convenient and ready-to-cook types of foods are replacing simple foods (Rahman, 2005, 2010b). In Bangladesh the following are some of the examples of commonly marketed popular food items of animal origin:

- Barbecue, Beef patties, Samosa, Patties and Tikka, Seek and Shami kabab Chicken nugget, Corned beef, Meat loaf, Tandoori chicken, Meat or fish pies, Precooked meat rolls, Meat soups, Salami, Vacuum packed meats
- Malaysian Parata
- Frozen or cooked peeled shrimp, Canned Hilsa Ring
- Dry soup cube
- Chocolate milk, Yoghurt, Butter milk
- Trade salad

As new food items with various ingredients are developing the food hygienists are becoming more and more concerned in the endeavor to maintain food safe and wholesome. Surveillance as an important tool for intervention activities has now become more and more necessary with the progressive increase in international trade in foods and hazards which could stem from the introduction of new technique transfer for mass production, rapid and wide spread distribution into commerce.

5. A challenge to food safety: adulteration of foods of animal origin in Bangladesh

5.1. Mischievous skills

Adulteration of foods is a common age-long problem of Bangladesh. Unscrupulous traders willfully and consciously practice this abominable work to debase by mixing inferior spurious ingredients, which is no doubt a social evil. To undertake the practice of adulteration the major mischievous skills put into habitual action are:

- Mixing with nonfood ingredients
- Substituting with under quality food substances or fabrication
- Texturing to mask the poor quality or under-processing
- Adding decomposed foods to fresh foods and putting up for sale
- Misleading labels of foods
- Misrepresentation of foods

- Using health hazardous agents in foods as preservatives
- Attracting consumers by introducing coloring and flavoring chemical adulterants

The table 1 below shows the type of common adulteration and malpractices openly seen in Bangladesh. The Prevention of Food Adulteration Act in Bangladesh is a very old one. There exists no monitoring and surveillance of programs for prevention of food adulteration. Occasionally the Magistrate vested with power and the Food inspectors suddenly raid on food shops and food preparation yards, food workshops, manufacturing plants to catch red-handed the unscrupulous food traders with adulterated foods. Anybody found to do this malpractice is given moderate punishment by the mobile court. It is obvious that the present system of prevention of food adulteration cannot curb the evil activities of unscrupulous food traders and wipe out the growing concern of food safety (Rahman, 2005, 2010ab).

5.2. Impacts of food safety on the use of antimicrobials in food animals of Bangladesh

5.2.1. Anti-microbial usage

The use of veterinary antimicrobial substances has been consistently considered as a key issue in animal and human health (OIE, 2011; Wegener, 2004) Bangladesh has experienced to realize that every time when a new antimicrobial is placed in the market by pharmaceuticals there is development of the occurrence that the bacteria quickly respond by becoming resistant. It has been found that the rate of resistance emergence is proportional to the indiscriminate use or overuse or misuse of drugs. The reports of clinicians of this country indicated that the rate of resistance of microorganisms is consistently emerging which commensurates with the extent of usage in man and animals. Recently the use of antimicrobials in food animals has attracted renewed attention, because it has been shown that pathogenic bacteria resistant to antimicrobials are critical for the treatment of infections in human can transmit from animals to humans, and furthermore, that resistances emerge because of indiscriminate antimicrobial use in food animals (Bruschke, 2005).The use of antibiotics in feeds is thought to be common and a cause of public health concern**.** The intention is to make animals grow slightly faster and reduce the need of feed marginally. In Bangladesh no registration is required for feed additives such as toxins binder, antibiotics, and vitamin-mineral premixes, animal protein, many of which are potentially detrimental to human health (Fanning, 2009).

5.2.2. Focus on risk

The chief aim of the use of antimicrobials is to protect both animal and human health, but in Bangladesh there is no policy recommendation for animal and public health for prudent use of antimicrobials to protect human health ensuring the safety of foods of animal origin. Most of the drugs traders and shop keepers in Bangladesh have no formal training on drug handling, transportation, storing and dispensing, and they readily sell drugs such as antibiotics, hormones, and sedatives across the counter without prescription. This mismanagement and misuse have led to the potential growing of threat arising from antimicrobial resistance in animals intended for food. The potential of antimicrobial chemotherapy in food animals increase the occurrence of resistant populations of bacteria, which may subsequently be transferred to humans through the food chain, or other means, has been recognized.

6. Food safety challenges that face Bangladesh

Food safety not only ensures a dependable food security system for all people of the country at all times, but also provides adequate and stable supply of safe and nutritious food. It is a matter of grave concern for every national government. To highlight this matter a national level seminar was organized by FAO under the project Improving Food Safety, Quality and Food Control in Bangladesh [3]**.** The principal thrust of the recommendations that came up was reflected on the need for strengthening collaboration between Ministries and national stakeholders involved in food safety and stressed upon emphasizing the inter-disciplinary nature of food safety issues along the entire food chain from farm-to-table. Some of the challenges that Bangladesh is facing are presented below.

6.1. Challenge 1: Absence of planned food safety program in Bangladesh leads to food-borne disease

Food safety is no doubt a scientific discipline describing handling, preparation, and storage of food in ways that prevent foodborne illness and includes routines that should be followed to avoid potentially severe health hazards. Absence of planned food safety program in Bangladesh leads to food-borne disease that has an enormous public health impact, as well as significant social and economic consequences. According to FAO advisor in Bangladesh high level of gastroenteritis were due to ignorance and unawareness of people and wives and mothers, main cooks of families, who have little knowledge on food safety and hygienic practices.

In Bangladesh, multiple Ministries are involved in food control activities and their roles and responsibilities are not always clearly defined, as a result gaps and overlaps exist. Recently National Food Safety Advisory Council (NFSAC) is constituted under the Bangladesh Pure Food (Amendment) Act, 2005 and the government has taken steps to improve food safety working with other SAARC member countries on harmonization of food standards. NFSAC has outlined these activities proposed for each of the following four key output areas:

Key 1 Development of national food safety and quality policies and strategies, supported by risk- based food control programs,

Key 2 Introduction of preventative approaches to food safety and quality management,

Key 3 Strengthening of risk-based food inspection and enforcement services

Key 4 Enhancement of food analysis capability and capacity.

6.2. Challenge 2: Adulteration of foodstuffs in Bangladesh pose health hazard

The dynamic food safety challenge posing health hazards is associated with food adulteration and these have been identified as:

(i) Reemerging pathogenic *bacteria, viruses etc gaining access to foods*

(ii) Chemical contaminants *–pesticide residues, heavy metals, mycotoxins, food additives etc*

(iii) Recently emerging problems associated with indiscriminate use of *Chloropropanols, polycyclic aromatic hydrocarbons (PAH_s), acrylamide bisphenol A (BPA).*

In Bangladesh the wholesalers and retailers use artificial, toxic colorants, ripening agents and preservatives, and the food handlers at large do not have adequate knowledge nor attitude on hygienic and sanitary aspects of food handling, preparation and service. Ultimately the helpless consumers who are at the receiving end face risks of consuming heavily contaminated food. Unaware of the rampant use of toxic substances, the consumers continue to buy and eat foods.

6.3. Challenge 3: Indiscriminate use of food additives and agricultural chemicals

Indiscriminate use of food additives and agricultural chemicals, as well as contamination by environmental pollutants is a concern for health officials in Bangladesh. Up to 50% of the urban population living in major cities in the region lives in conditions of extreme poverty, filth, overcrowding and poor sanitation. In urban areas, towns and cities much food is purchased and consumed outside the home. Accordingly, street food vendors and food service premises are an essential and increasingly important part of the food supply system of the region.

Food growers, particularly fruits and vegetable growers resort to unscrupulous use of pesticides and insecticides, the wholesalers and retailers use artificial, toxic colorants, ripening agents and preservatives, and the food handlers at large do not have adequate knowledge nor attitude on hygienic and sanitary aspects of food handling, preparation and service. Recently mixture of sodium cyclamate with different articles of food, such as sugar, biscuits and eatables made of sugar and formalin in fish and milk have become a cause of common concern. Sodium cyclamate and formalin are poisonous chemical substances which cause serious injury to human body particularly to the children. Due to the absence of any effective control system in this country, the food twisters take the opportunity and become so rampant that sometimes it seems that it would be impossible to find a single food item in the market which is not contaminated or adulterated.

Table 1
Adulteration of Foods of Animal Origin in Bangladesh

Food items	Unscrupulous malpractice and adulteration with
Meat	
• Fresh raw meat from slaughtered animal	Left over meat, frozen, thawed, hanged and offered for retail sale Buffalo meat
• Beef	Sheep meat or mutton
• Goat meat	Inflation of carcass
• Emaciated lean carcass	Dog meat, fox meat, rabbit meat etc
• Meat from small food animal	Dead carcass meat not regularly slaughtered
• Regularly slaughtered meat animals	
• Slaughtered and dressed poultry meat	Dead poultry meat dressed
• Retail meat cuts from dressed carcass	
• Fresh meat cut in display cabinet	Retail meat cuts from dressed carcasses soaked or immersed in unhygienic unclean water
• Freshly cut raw meat with bones or boneless	Fresh meat cut in display cabinet with red lighting to impart red color to meat
Milk/ Milk product	Meats mixed with color fixatives
• Freshly drawn raw milk	
• Collected raw milk	
• Raw milk ready for distribution	Adding water to increase volume, water of old ditches or ponds having high pH value and bacteriophages to prolong shelf life
• Raw milk before reaching consumer	Adding treacle to increase attractive color
• Market raw milk	Adding salt, starch and sugar etc to increase density
• Butter/Cream	Extraction or withdrawal of fat
• Ghee	
• Curd (Dahi)	Adding heated milk to increase the keeping quality and shelf life Adding starch, animal fat, Vanaspati, blended rotten banana, coloring matters flavoring agents to mask undesirable odor
	Vanaspati, animal fat, flavoring substance, coloring matters
• Ice cream	Adding coloring and flavoring ingredients to mask poor quality and adding blended superfine tissue paper in place cream particles to mislead the consumers about enrichment of the product
• Sweetmeats	Adding in the mix cellulose, starch , harmful coloring and flavoring agents
Eggs	Adding Flour, suji, non-permitted coloring and flavoring agents
• Fresh shell eggs	
• Fresh shell eggs	
• Hen's eggs Duck's eggs	Rotten shell eggs Color used in brown shelled eggs
Fish	Duck's eggs
• Raw native	
• Fresh fish	
• Fresh fish	Imported fish with preservatives sold as locally produced fish
• Raw fish	Mixing of rotten fish to deceive the customers
• Dry fish	Left over fish frozen, thawed and sold to cheat consumers Use of coloring agent in the gill to show evidence of freshness
Salted fish	Adding fungicides, DDT, formalin etc to increase shelf life and check spoilage Use of excessive amount of salt and mycostatic agents to prolong the shelf life and prevent spoilage

6.4. Challenge 4: Controlling different kinds of adulteration of foodstuffs by Government

Alarming increase of adulteration of foodstuffs created a strong public opinion for combating the ferocity of the offence. Mobile courts are now vigilant around the capital and the districts to discover different kinds of food houses, hotels and restaurants which are found to be selling noxious foodstuffs. Electronic media has been giving a wide coverage of various forms of adulteration of foodstuffs consumed by the people at large.

At the present time the government has realized the importance of hygienically produced safe foods whether domestically produced and consumed, imported or exported. The demand of safe and hygienic foods of animal origin (beef, mutton, chicken, ducks, eggs, milk and milk products) is increasing. In Bangladesh the slow progress and the prevailing poor development of national food safety policies and infrastructures have made the establishment for implementing food safety activities to remain in darkness As a result food standards and codes of hygienic practice; inspection services and laboratory analysis; and promotion of Hazard Analysis Critical Control Point (HACCP) system as a tool for food safety management are not at all practiced.

6.5. Challenge 5: Absence of effective legislation to protect consumers

Adulteration of foodstuffs in Bangladesh is an act of dishonest tradesmen who intend to make maximum profit from minimum investment. Random manufacture of adulterated foodstuffs unsuitable for human consumption led to resolve for combating this trend in order to maintain a standard of purity, food safety and preservation of public health. The existing laws are old and not updated. Food regulations and standards are likewise deficient, and these do not address contemporary practices such as packaging, date labeling, use of additives, etc.

In recent years, widespread evil practice of food adulteration has begun to threaten public health. Adulteration of food articles has been marked as an offence under the Pure Food Ordinance, 1959 providing minor penalties of different kinds. Taking advantage of such minor penalties the unscrupulous traders has started masking the poor quality and begun activities of mixing injurious materials with almost every food articles like fruits, vegetables, fish, meat, flour etc. As a result an amendment of the Pure Food Ordinance, 1959 has become necessary to be replaced by the Bangladesh Pure Food (Amendment) Act, 2005, giving a widening definition of adulteration and the scope of the law and also enhancing the punishment of the offences.

Since a host number of Ministries, Departments and Agencies are involved in food safety activities, the enforcement of the existing legislation thus becomes complicated to implement. Moreover the joint collaboration of the Director Generals of the Directorate of Food, Directorate Agriculture and the Directorate of Livestock and Fisheries of plant and animal origins, have not been recognized and they are not made members of the National Food Safety Advisory Council as constituted under section 4A of the said Ordinance.

Food legislation before, was a general one. Now, after the emerging worldwide food safety issues, we have realized to incorporate the principles of HACCP. The government has a very important role to play in promoting the HACCP system. In Bangladesh food inspection is not an integral part of a food control system. Here the inspection units are under-staffed and lack necessary equipment. Monitoring of food safety requires laboratory facilities and testing ensures compliance with standards, and enables judgments on the level of food safety and hygiene, but here the laboratories are typically under-resourced and there is a lack of trained personnel.

7. Role of universities and academic institutions in ensuring food safety

The reflection that seems to be unique that universities and academic institutions have clearly defined their roles in ensuring food safety and improving public health. Our graduate and post-graduate students of veterinary public health and food hygiene take a proper selection of courses to fit them for a career in aspects of food protection, zoonoses, and environmental hygiene and research experience. University personnel can devote time, facilities, and talents to multidisciplinary problems that may not have immediate importance in practical terms, but could be of great value to generate information for food producers, food processors, and food technologists, food microbiologists and consumers. The use and efficiency tests and standards for quality and problems related to public health must be worked out from academic, regulatory and industrial standpoints. The public health service cannot combat alone the complex situation now we are faced, but that the governmental agencies and academic

institutions of our country must work together to delineate many of the problems in food safety, hygiene, consumer protection and public health.

8. Need for professional development in safety of food of animal origin

Food safety is a major public health issue in many countries and has been a concern for all government and public health authorities. The world is approaching a liberalization of trade involving minimization of trade barriers, so that import control will no longer be present and all partners would agree with a uniform hygienic level in pre-harvest and post-harvest food safety. World Association of Food Hygienists (WAVHs) is playing the key role in this process and the veterinary public authorities advocate for QSA (Quality, Safety, and Acceptability) concept. It is the conviction of WAVFHs that the veterinarians are well prepared with various duties and tasks destined for food protection programs. The veterinary faculty of Bangladesh Agricultural University is although offering advanced courses in veterinary public health and food hygiene to obtain MS degree and thus producing experts to deal with matters of health and demands consumers' food protection, but it is sad to say that the recognition of these experts in this field is very limited.

9. National and International images in food safety

The Bangladesh Veterinary Association (BVA), Bangladesh Veterinary Council (BVC), Director of Livestock Services (DLS) and other related bodies could play professional roles of public health veterinarians. Time has come for taking immediate coordinated program at the national and international level. Standards for ensuring food safety, wholesomeness of foods, and other health risk factors need to be realized. Otherwise our country may lose prospect for food trade in food and agricultural commodities.

The hygienic codes of practice of HACCP, GMP, ISO, and CAC should be made mandatory for meat, poultry, egg and fish and their products. In most of the developed countries, particularly in Australia public health veterinarians are given opportunity to face the situation of food safety. We now find a division of veterinary public health under WHO. Collaborating Centers of FAO/WHO are established in Germany to deal with matters related to food hygiene and zoonoses. Many Asian academic institutions, Chiangmai University in Thailand, few Universities of Malaysia and India have made liaison activities with institutions for the mutual benefit in the delivery of veterinary public health education. In European countries veterinarians act as third party auditor in food safety and HACCP analysis. The government of Bangladesh is working with SAARC for harmonization of standards on food products. SAARC Food Security Reserve Board (SFSRB), at its 9th Meeting held in Islamabad, Pakistan in December 2002, urged the member states to consider harmonizing food laws, regulations, standards, quality control system, and control mechanism to facilitate maintenance of food safety for enhancing food trade. SAARC also organized a workshop in Nepal which adopted some recommendations to establish a Regional epidemiological network among the SAARC countries to combat FB-disease outbreaks.

The 3rd meeting of the National Food Safety Advisory Council (NFSAC) held on 22nd August 2010 at the Ministry of Local Government, Rural Development and Cooperatives (LGRDC), Dhaka made decisions on the formation of a NFSAC Standing Technical Committee (STC) at the national level and Technical Sub Committees (TSC) at different Ministry levels. The FAO Food Safety project will assist in preparing the scope and Terms of Reference of the committees. The names of the members of the committees will be communicated by the Secretary, LGRDC to the NFSAC members for their endorsement. In this respect we sincerely hope that in the near future Bangladesh will come forward with veterinary public health responsibilities incorporated in NFSAC planning and program. The concerned authorities in collaboration with international public health authority like WHO should establish a center for food safety, food quality control, and zoonoses.

10. Conclusion

- Qualified veterinary food hygienists and public health veterinarians can play leading as well as professional role in vitalizing and strengthening QC and QA programs of food safety and food hazards, in

controlling zoonoses, in incorporating plans for the social and economic development of the country and undertaking collaborative activities with multi-disciplinary national and international agencies.

- The National Food Safety and Control System should be strengthened to integrate and coordinate efforts and implement the following activities at the government, public and private spheres (both at farm or firm and home)

(1) help in policy making and in creation of capacity for actual compliance with standards

(2) monitor relevant activities nationally and internationally

(3) make information available for education of the general public and consumers as well as stakeholders in food production and marketing

(4) generate resources for requisite investment in infrastructure and research and

(5) directly intervene in the food system

- The concerned authority in collaboration with international health authority like WHO should not be slow to establish a national center for food safety, food hygiene and quality and zoonotic disease transfer.
- Community participation and consumer education should be built up in which customers should be known of their rights, privileges and responsibilities under the food law.

11. Recommendation for improving Bangladesh food safety system

Food-borne diseases pose a considerable threat to health and burden on the economy of individuals, families and nations. The principal Key areas recommended with a view to reducing the burden of food-borne diseases and thereby strengthening as well as vitalizing national food safety and consumers' protection systems are given below:

Key area 1: Food safety policy

- A National Food Control and comprehensive Food Safety Policy should be formulated
- The Food Ordinance/Rules and Regulations and other relevant Acts should be updated
- Consumer Protection Act, Feed Act, Antibiotic usage Act, Meat, Milk, Eggs Safety Act, HACCP at the abattoir level, etc. should be implemented as early as possible.
- Guidelines should be issued on GAP_s and GMPs for all foods including meat and meat products, milk and milk products, eggs and egg products, cereals and cereal products, bakery goods, sweetmeats, fruits and vegetables.
- Food Standards set by BSTI should have similarities in respect of parameter definition/limits/testing methods / institutional changes- complement HACCP, ISO management System etc. and review of standards and certification systems in purview of international requirements
- A comprehensive labelling law with appropriate labelling provisions for local and imported packaged food inconformity with CODEX should be formulated and properly implemented.

Key area 2: Food safety law, regulations and standards enforcement

- The laws in place should be implemented with full force and hurdles in implementing the existing laws against adulteration to be eliminated and ensure adequate and stable supply of safe and nutritious food.
- Establishment of bodies for accreditation, regulation and certification task of Food Quality and Safety Programs

Key area 3: Food safety technical assistance (TA) and training

- Training for the national food safety regulation agencies concerning the preparation of technical regulations (TBT principles); for implementing certification, accreditation and reinforcement; evaluating the impact of the standards/procedures/guidelines
- Training should be targeted for i) food inspectors, ii) food scientists and analysts, iii) policy makers, iv) microbiologists, v) public health physicians, vi) food technologists, vii) serial librarians and documentation officials, viii) food law experts etc.

- Education of consumers is important and implementation of grassroots advocacy on food safety is considered important for raising consumers' awareness.
- A central well-equipped and internationally accredited laboratory should be developed and that support to existing laboratories should be provided.

Key area 4: Food safety assessment

- Developing risk analysis infrastructure and making risk limits for adulterants/contaminants
- Providing guidance on the containment of the antimicrobial resistance and establish/review safe limits for food additives and contaminants, study data on these mycotoxins, level of risk and recommendation of Codex.
- Standardized transparent sampling procedure and adequate testing facilities including microbiological and safety parameters analysis should be developed to assist the compliance of HACCP, quality certification system and for continual improvement of a produce. An electronic certification (E-cert) system may be developed.

Key area 5: Food safety database

- Adequate data should be generated for pesticide residues, toxic metals, antibiotic residues and chemical adulterants food crops including food of animal origin for ensuring consumer's protection
- Growing a networking system on nationwide food borne diseases and its risk assessments.
- Share information/data for mutual usage & wider utilization (particularly to reduce risks) and provide support for publishing regional food safety bulletin containing news and views on food safety data/ events etc.
- Establish a regional epidemiological network among the SAARC countries on all possible ways to combat FB-disease outbreaks.

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