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Review article

Innovating veterinary public health challenges of Bangladesh to integrate the concept of 'one world, one health'

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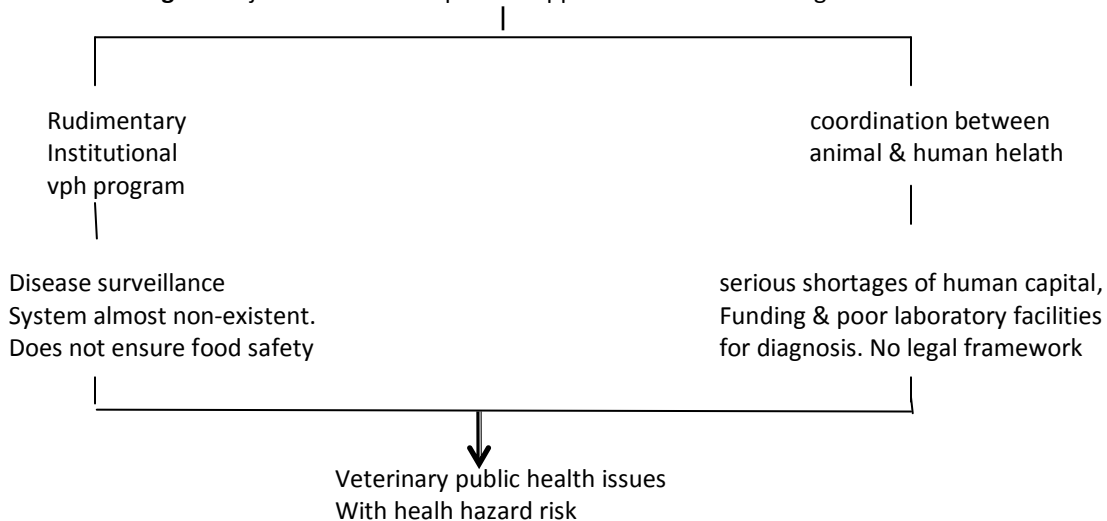
ABSTRACT

The present paper addresses relevant problems and constraints of VPH in Bangladesh in the light of global concept "One World, One Health" that need to be overcome and to ask for help, coordination and collaboration of international organization to promote and build the capacity for the spectrum of important VPH issues contributing to zoonoses, food-borne disease control, food safety and fostering better and living condition. In Bangladesh the loss of border controls within countries and the globalization of trade have led to an increasing trade in animals and products of animal origin. As a consequence there appears the demand and imperative need for new and elaborate surveillance strategies. The world is changing fast and new diseases are emerging and reemerging across the globe. Many of these new diseases can be linked to animals or changes occurring in environmental conditions. Bangladesh government has launched a collaborative effort and established increased participatory approach and joint venture activities with the World Organization for Animal Health (OIE) and the Codex Alimentarius Commission (CAC) in respect of capacity building for surveillance and control of zoonotic diseases, and food safety. The four recommendations mentioned below could provide valuable direction to the future VPH program and activities linked to global concept "One World, One Health" These are (1) Development and Strengthening of VPH (2) Formation of Veterinary Public Health

1. Introduction

In the 19th century Robert Virchow, the German physician and pathologist first felt that there exists no dividing line between animal and human medicine. Later on both medical and veterinary workers observed the impact of animal diseases and ecological change on public health. The great epidemiologist Schwabe in 1984 first noticed and pioneered the active integration of human and veterinary medicine (Schwabe, 1984). In recent years immense changes have occurred in animal farming system, production processes and agricultural structures. The loss of border controls within countries and the globalization of trade have led to an increasing trade in animals and products of animal origin (Taylor et al, 2001). In our global world, the free easy movement of people and animals has vastly increased, and along with it, there has been a corresponding exponential increase in the risk of exposure to zoonotic agents (WHO, 2002). In fact, of the 1,400 pathogens affecting humans, 800 originate in animals (Bravo et al, 2009). The epidemiologists group of the World health Organization (WHO) believed that in the last 30 years the prevalence of infectious disease has increased such that 75% of the emerging infectious diseases in humans are of animal origin. Keeping this fact in view veterinary public health is now considered although an international public good of paramount and increasing importance, but it does not fit on a single organization template because its responsibilities, functions, activities and resources are dispersed throughout a host of agencies and sectors, particularly health and environment. The FAO/WHO/OIE Experts and WHO study group strongly felt the necessity of liaison functions on undertaking operational responsibilities to provide technical cooperation to national and sub-national levels. In this view point Bangladesh Veterinary Service having very poor or rudimentary institutional VPH program and VPH infrastructure has amply realized the importance of VPH and has been thinking seriously to expand this field for establishing a sustainable VPH development policy. Coordination between animal and human health bodies is virtually non-existent (FAO, 2000 and National Livestock Development Policy, 2007). The figure 1 below outlines the major deficiencies in approaches to VPH in Bangladesh. The present paper addresses relevant problems and constraints of VPH in Bangladesh in the light of global concept “One World, One Health” that need to be overcome and to ask for help, coordination and collaboration of international organization to promote and build the capacity for the spectrum of important VPH issues contributing to zoonoses, food-borne disease control and food safety thus fostering better and living condition.

Fig. 1. Major deficiencies in present approaches to VPH in Bangladesh.



2. VPH horizon is widening: Bangladesh is in infancy

Veterinary Public Health has been recognized as the cardinal part of public health where the human health and human well-being are the central tasks. The new consensus definition of VPH (“The contributions to the physical, mental, and social well being of humans through an understanding and application of veterinary medical science”) in particular is pivoted round the comprehensive *application of professional veterinary skills, knowledge and resources and concerns not only the physical well-being of humans, but also includes the role of animals for the mental and social well-being of humans*. In the past this discipline at the beginning was evolved only to deal with three different issues:

First issue: to combat animal diseases

Second issue: to perform meat inspection and

Third issue: to take limited measures to control zoonoses

At the present time VPH encompasses a wide variety of professional areas linking the three elements within the ‘health triangle’ (Lipman and Knapen,2009) , such as

(1) Control of zoonoses

(2) Control of food-borne pathogens and chemical residues

(3) Environmental risks caused by companion animals of humans, animals and the environment, with all their interactions, with the goal of guaranteeing a safe and wholesome food supply, protecting human wellbeing and conserving the environment.

King (2009) finds the veterinary profession itself in the midst of a new world order which is today exquisitely inter-connected culturally, economically, socially, and professionally. As a consequence, societal needs and expectations of the profession are more demanding. Veterinarians all over the world should play important roles in **five intersecting domains of work** shown in the figure 2 below.

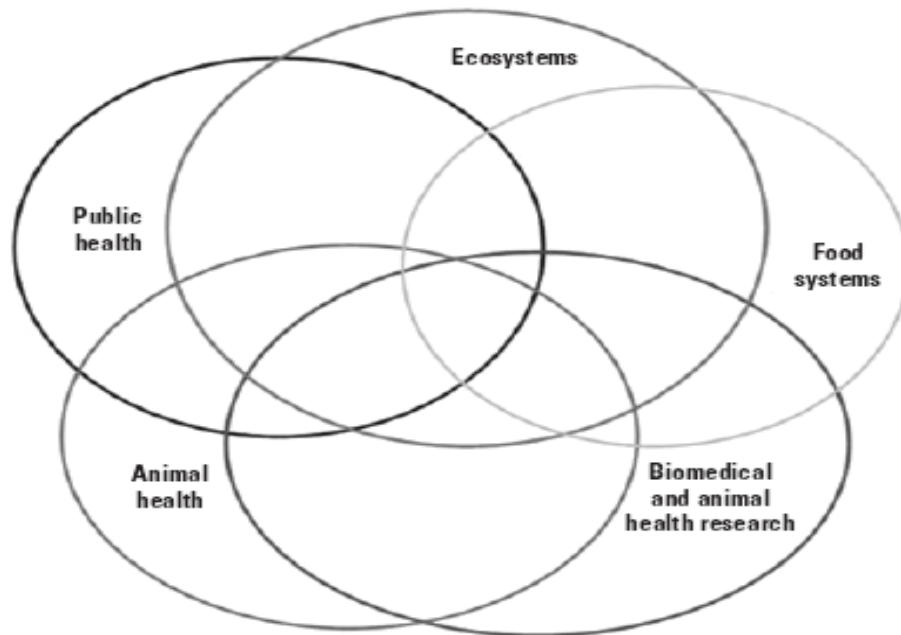


Fig. 2. Five intersecting domains of work of VPH.

3. VPH horizon in the current global health challenges and critical issues

The current global health challenges have prompted a call for more pivotal obligations, opportunities, and contributions of veterinarians to make in enhancing public health, recognizing and responding to zoonotic disease transmission, maintaining food and water quality, and promoting wildlife and ecosystem health. Realizing the

widening horizon of VPH, Osburn et al, (2009) indicated the emerging critical global issues of occurrences that received veterinary attention and rendered unique veterinary services. Veterinary profession is no more within the boundary of clinical practice and meat inspection, rather it has spread tremendously. Its responsibilities, functions, activities and resources are dispersed very widely throughout the horizon of health, environment and animal-agriculture. As observed keenly at the present day the widening horizon of veterinary profession has been made involved in the following critical issues:

- ☛ Food safety
- ☛ Food security
- ☛ Antimicrobial resistance
- ☛ Environmental degradation and sustainability
- ☛ The growing carbon footprint and huge energy demands of animal agriculture
- ☛ The vulnerability of animals due to intensified production systems
- ☛ Movements of exotic animals and their products
- ☛ Bio- and agro-terrorism
- ☛ The role of wildlife in disease transmission
- ☛ Food-borne, water-borne and vector-borne diseases
- ☛ The emergence and reemergence of new zoonoses
- ☛ The global trade of food and animals, including the unprecedented demand for proteins of animal origin,

which is projected to increase 50% by 2020

4. VPH horizon of wealthy and less wealthy societies

In all developed countries the need for awareness of the importance of VPH within the 'The One Health' initiative has been established to address many of the challenges described above. But 'the One Health' Initiative will only be successful if there is both interdisciplinary co-operation and a strong foundation of holistic activities across the spectrum of VPH issues (Gibbs and Anderson, 2009). Among all developing countries Bangladesh still is in infancy in this respect. The developed countries with a wealthy to rich society have highly organized agricultural production systems, and industrialized production of foods of animal origin, strong framework of legislation governing the areas of public health and animal disease control. In comparison Bangladesh being a developing country and belonging to less wealthy society has virtually no organized agricultural society and system nor any systematic government support for the improvement of livestock, food production of animal origin or organized campaigns against animal diseases. In wealthy societies VPH has developed into preventive population medicine which is population-oriented. The characteristic of wealthy society is 'food acceptance', i.e. acceptance by the public that a product is suitable for consumption (Lipman and Knapen, 2009). On the contrary in the less wealthy societies of developing countries like Bangladesh inspection of foods of animal origin (meat, milk, egg, fish etc), the destruction of carcasses unfit for human consumption and rendering, disposal of wastes are not well organized. Quality assurance systems based on Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Points (HACCP) or good veterinary practice do not yet exist. . Disease control and prevention programs if present, this is in the paper and superficial for few major zoonoses.

The FAO/WHO/OIE emphasizes the need of both the wealthy and less wealthy societies to improve biosecurity measures to control the emergence and spread of infectious diseases. Wealthy societies of developed countries must take this VPH issue into consideration and surveillance and response strategies for infectious diseases must be directed against all potential emerging infections, both natural and deliberate (Westergaard, 2003). To prevent and respond to the recent avian influenza epizootic it has been shown that many countries as well as Bangladesh were unprepared to deal with this type of disaster. In many cases, countries could not afford to sufficiently invest in their Veterinary or Public Health Services. Both the OIE and FAO prefer the new concept of 'One World, One Health', rather than 'One Medicine, One Health'. Nevertheless, veterinary medicine is increasingly working at the interface between human and animal health and is of course deeply involved in the prevention and control of zoonoses (the majority of emerging infectious diseases of humans are of zoonotic origin). The human and the veterinary medical professions of both developed and developing countries not only have to collaborate, but also have to understand each other's cultures and practices so as to be able to plan and execute joint programs and policies.

5. Common platform for professional linking to achieve improvement of VPH spectrum

Veterinarians all over the world must be on the front line of the surveillance and control of diseases at their animal source. Animal diseases not transmissible to humans can have a serious impact on the production of foods of animal origin and undermine food security. As food security is also a public health concern, the concept 'One World, One Health' encompasses many non-zoonotic diseases. The One Health Initiative has been established to address many of the challenges described above. But the One Health Initiative will only be successful if there are both interdisciplinary co-operations (Westergaard 2003).

Due to the fact that the horizon of VPH is widening, as part of its mandate to improve VPH worldwide, the OIE has following six primary objectives:

1. Surveillance and control of animal diseases
2. Transparency of animal health information
3. Safeguarding trade and consumers
4. Animal welfare and well-being
5. Continuing education of veterinarians to maintain and improve the competence

6. Veterinary statutory bodies to strengthen the animal health policies and activities of their national Veterinary Services and help foster recognition of the importance of veterinary activities for society as a whole at global level.

Table 1

Horizon of VPH of New World and Bangladesh at a Glance

New World	Bangladesh
Awareness of the importance of VPH within the 'The One Health' initiative has been established to address many of the challenges	Bangladesh still is in infancy in this respect.
Highly organized agricultural production systems and industrialized production of foods of animal origin	Virtually no organized agricultural society and system and no systematic government support for the improvement of livestock, food production of animal origin
Strong framework of legislation governing the areas of public health and animal disease control	Weak framework of legislation governing the areas of public health and animal disease control.
VPH has developed into preventive population medicine which is population-oriented	VPH is poorly developed
Epidemiological tools are used and risk analysis is reliably assessed and, whenever possible, policy decisions may be based on calculations drawn from mathematical models.	Epidemiological tools are not built and risk analysis is not reliable and accurate
Quality assurance systems based on good manufacturing practices, hazard analysis critical control points (HACCP) or Good Veterinary Practice or Good Manufacturing Practice are strongly implemented	These systems do not yet exist.
The Diagnostic Veterinary Skills (microbiology, pathology, laboratory analysis and diagnosis and clinical experience) are highly developed and form the basis of the veterinary public health system.	The Diagnostic Veterinary Skills (microbiology, pathology, laboratory analysis and diagnosis and clinical experience) are lacking or very poor and do not form the basis of the veterinary public health system. Disease

There is both interdisciplinary co-operation and a strong foundation of holistic activities across the spectrum of VPH issues with greater emphasis on preventing human diseases and eradicating animal diseases.

control and prevention programs if present, this is in the paper and superficial for few major zoonoses. There is little emphasis on preventing human diseases and eradicating animal diseases.

6. Scope of VPH in Bangladesh

6.1. Increasing importance

In Bangladesh the loss of border controls within countries and the globalization of trade have led to an increasing trade in animals and products of animal origin. As a consequence there appears the demand and imperative need for new and elaborate surveillance strategies. Veterinary Public Health like in many other developing countries is also getting increasing importance in Bangladesh and this is because of the development of health awareness among the government, politicians, professionals, academicians, environmentalists, industrialists, and health conscious public. The active surveillance of trans-boundary animal diseases and their distribution routes in Bangladesh is at the present time one of the major tasks of veterinary public health. It includes the analysis of the health risks and provides measures for the protection of human and animal health that is prevention and control of zoonoses and food safety.

6.2. Essential coverage

In Bangladesh the rapidly increasing trade in foods, at both the local and international level, particularly exports of shrimps to European countries and fish, vegetables in the Middle East countries is resulting in increased attention to bio-security and the potential transmission of diseases of animal health importance via the food and feed chain. In shrimp production Bangladesh has already entered into global markets, which prompted the shrimp producers to develop programs for economic viability and sustainable level of shrimp culture and here the water environment friendly management plays a vital role in obtaining biosecurity. In Bangladesh inspection of slaughtering animals can provide a valuable contribution to surveillance for specified diseases of animal health importance particularly exotic diseases. Due to the flourishing establishment of modern poultry farms many entrepreneurs are encouraged to set up poultry processing plants. They understand the economic viability, hygienic status and utility of dressing operations, increasing consumers' demands, and acceptance of production of wholesome good quality dressed and packaged poultry meat. As a consequence poultry meat packing plants are on-coming in the country. Recently some farms in a limited way started functioning in producing dressed birds in plants. Among these Aftab enterprises, Biman poultry unit, few native agro-sectors, and domestically developed small scale farms have already introduced dressing of birds in their own processing units. These dressed and packaged birds are now appearing in different departmental and grocery stores of marketing channels of Dhaka and elsewhere in the country.

It is unfortunate that in Bangladesh there exists no veterinary service and regulation governing meat inspection and post-mortem judgment of slaughtered poultry, particularly dressed or processed birds. Routine ante-mortem and post-mortem examinations are not practiced in food animals - large or small and this is similarly applied to poultry. From public health point of view public health veterinarians as meat inspectors are not employed for the purpose that could detect diseases and give suggestive guideline of post-mortem judgments.

6.3. The way forward

The world is changing fast and new diseases are emerging and reemerging across the globe. Many of these new diseases can be linked to animals or changes occurring in environmental conditions. Bangladesh government has launched a collaborative effort and established increased approach and joint venture activities with the World Organization for Animal Health (OIE) and the Codex Alimentarius Commission (CAC) in respect of capacity building for surveillance and control of zoonotic diseases, and food safety. Bangladesh has agreed upon the decision of International fora, who emphasized the need to prevent and control of Transboundary Animal Diseases (TADs).

Table 2

Cardinal scope of VPH in Bangladesh.

Increasing importance	Essential coverage	The way forward
<p>There is a great demand of new and elaborate surveillance strategies due to the loss of border controls within the SAARC countries. The active surveillance of trans-boundary animal diseases and their distribution routes in Bangladesh is at the present time one of the major tasks of veterinary public health. It includes the analysis of the health risks for humans and animals and provides measures for the protection of human and animal health that is prevention and control of zoonoses and food safety.</p>	<p>In Bangladesh inspection of slaughter animals can provide a valuable contribution to surveillance for specified diseases of animal health importance particularly exotic diseases.</p>	<p>Bangladesh government has launched a collaborative effort and established increased approach and joint venture activities with the World Organization for Animal Health (OIE) and the Codex Alimentarius Commission (CAC) in respect of capacity building for surveillance and control of zoonotic diseases, and food safety.</p>
<p>In Bangladesh the rapidly increasing trade in foods, at both the local and international level, particularly exports of shrimps to European countries and fish, vegetables in the Middle East countries is resulting in increased attention to bio-security and the potential transmission of diseases of animal health importance via the food and feed chain.</p>	<p>In Bangladesh there exists no veterinary service and regulation governing meat inspection and post-mortem judgment of slaughtered Food animals, including dressed or processed birds. Public health veterinarians as meat inspectors are not employed for the purpose but they could detect diseases and give suggestive guideline of post-mortem judgments.</p>	<p>Bangladesh Government is willing to contribute to the strengthening of confidence between its neighbors, particularly SAARC country members through transparency, implementation of consensual and harmonized methodologies and common work with respect to VPH activities, zoonoses prevention and control and food safety.</p>

7. Major obstacles of VPH delivery services in Bangladesh

The implementation of VPH in developing country like Bangladesh faces a number of difficulties. The major of these as observed and identified are related to the following matters:

7.1. Prerequisites to be met

1. Lack of a clearly defined VPH mandate and associated legislation
2. No government agency has specific responsibility for VPH
3. Lack of priority-setting and resources including trained professionals and auxiliary staff and lack of reliable data
4. VPH services are unable to meet the needs and demands of the public and the livestock industry
5. Decentralization of a number of VPH responsibilities to municipalities
6. The disease surveillance system is almost non-existent.

7. The Veterinary Public Health Unit in the DLS has the mandate in the paper to perform diagnosis, surveillance and control of zoonotic diseases, ensure food safety of animal origin, and liaison with the Health Department.
8. The VPH unit is however, suffering from serious shortages of human capital, funding and laboratory facilities. It has no legal framework to implement its mandate. Coordination between animal and human health bodies is virtually non-existent.
9. The quality and quantity of vaccines produced and delivered by the DLS are inadequate.
10. There is no independent authority to check the quality of domestically produced or imported vaccines. Vaccination is done in a haphazard manner without any strategic plan for controlling the targeted diseases. There are no provisions for movement control and quarantine during disease outbreak or epidemics.

7.2. Lacking need to overcome

1. Shortage of qualified personnel:
2. Non-availability of Funds:
3. Inadequate diagnostic facilities:
4. Improper Data reporting and analysis.
5. VPH programs rudimentary:
6. Legislation and regulation underdeveloped

7.3. Innovations and vigilance to build

1. Guidelines, legislation and strengthening
2. Central authority in charge of VPH programs
3. Improvement in existing and new VPH programs
4. VPH activities focusing
5. Meat Inspection Commission
6. VPH link to medical profession
7. Building Collaboration between Ministries
8. Profiling VPH systems and activities
9. Formulating Coordinated programs
10. Initiating Collaborative VPH programs for SAARC

8. Situation of VPH, Animal Diseases, their prevention, control and eradication measures in Bangladesh

8.1. Disease aspect

The List A diseases comprise 15 infectious diseases and the diseases which in particular are of importance in Bangladesh for ruminants and poultry include: Foot and mouth disease (FMD), Rinderpest, PPR, Sheep pox and Goat pox, Newcastle disease (ND) and highly pathogenic Avian influenza (Westergaard, 2003). List B diseases are transmissible diseases which are considered to be of socio-economic and / or public health importance within countries and which are significant in the international trade in animals and animal products. List B diseases refer diseases within the different animal species and consist of 68 diseases.

The commercial poultry sector which is primarily depending on imported chickens has in recent years experienced outbreaks of several infectious diseases presently as causing problems in Bangladesh. These diseases recorded include:

- Chicken anemia virus infection , Egg drop syndrome and Avian infectious laryngotracheitis

In Bangladesh the scenario of preventing or control of disease is not well organized and do not meet the required global standard. When a disease occurs in domestic holding mostly in rural areas or in small holding in urban regions, at formal and informal farms the typical picture is handled in two ways:

Way no. 1 If the owner is capable to prevent or control the introduction of a disease he takes intervention of treatment or biosecurity measures as per suggestion of the locally available veterinarian

Way no. 2 On the other hand if the owner is incapable he lets the diseased animals 'live with the disease'

The main objectives of disease control in Bangladesh are two fold and are still centered

- (i) to minimize the prevalence of existing disease and
- (ii) to reduce the morbidity and mortality rate from clinical disease.

There are poorly developed surveillance monitored program to adopt the principles of disease control. The Government has some targeted vaccination programs for enhancing immunity to few infectious diseases.. There exists poorly defined epidemiological knowledge. In addition there is lack of suitably trained individuals at all levels and lack of VPH infrastructures to establish and implement comprehensive animal disease and zoonoses control and eradication program. Adequate resources are not available and this has been recognized as the major issue for not to be able to effectively and efficiently address the needed surveillance, monitoring, prevention, control and eradication of animal and zoonotic diseases and set up the diagnostic laboratories meeting the levels of international standards prescribed by OIE and CODEX. Extension Delivery Services for the livestock services provided by NGOs are available, but these are inadequate and not related to VPH.

8.2. Legal framework

The role of Veterinary Service particularly Official veterinary service has been changing and it is tilting towards regulatory affairs related to animal health, animal welfare, human health and food safety and conservation and protection of nature. Bangladesh is yet to develop a unified Food Safety Administration System and to formulate a Food Safety Policy (Westergaard, 2003). The Ministry of Fisheries and Livestock and Directorate Livestock services in very recent years have shown keen interest in the preparation of new legislation within the circle of animal production, animal health, veterinary public health and animal welfare.

There is neither any law nor any provision of Codes of Practice implemented to determine the quality of foods and provide consumers protection. However Bangladesh Standards and Testing Institution (BSTI) is trying to adopt specifications for the foods of animal origin. These are:

- Bangladesh Standard for Handling, Processing, Quality Evaluation and Storage of Poultry
- Bangladesh Standard Specification for Mutton and Goat Meat (Chevon) – fresh, chilled and frozen
- Bangladesh Standard for Methods for Detection of Bacteria responsible for Food Poisoning
- Bangladesh Standard Specification for Dressed Chickens
- Bangladesh Standard Specification for Beef and Buffalo Meat – fresh, chilled and frozen
- Bangladesh Standard Specification for Milk and Milk Products including Infant milk

9. VPH issues related to food safety is a growing concernment in Bangladesh

Bangladesh being a significant agricultural nation has recently set goals for domestic consumption and increasing export of fresh and processed foods, but adequate food safety control has not been achieved to enter the European and global markets. The present scenario of check and quality management of food product of this country is unfortunately still not under the impact of World Trade Organization (WTO) negotiations and agreement. It is now agreed that to ensure quality and safety of foods in this country 'from farm to table' pre-harvest and post-harvest hygienic functions are important. 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.

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

The public has started to question the quality of foods in a wider sense, as foods are appearing in increasing numbers in supermarkets and retail grocery stores. Veterinary medicine is now no more basic activities of treatment. In our home country the government is encouraging the private sector to put the meat 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 hygiene and production of foods of animal origin in Bangladesh is briefly presented below.

9.2. Meat from food animals

Present status and public health implications

Most meat in Bangladesh is handled under unsatisfactory sanitary conditions in both rural and urban areas. Enforcement of legislation relating to slaughtering or meat inspection is weak. There is generally poor pre-slaughter conditions, sanitation, removal of waste materials, and disposal of offal. 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. 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. 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. FAO is promoting activities to establish ideal slaughter slabs or slaughterhouses. It is recommended that the concerned authority should introduce and enforce 'Hygienic codes of practices' and follow Hazard Analysis Critical Control Point (HACCP) principles; otherwise the wholesomeness and quality of the final meat products will be questioned and cannot be aimed at ensuring food safety.

The public health aspect of meat focuses attention to the fact that 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. However this improvement resulting from intervention activities is likely to be undermined if hygienic practice is not maintained throughout the distribution and retailing chains and inherent low temperature storage (Rahman, 2005).. 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.

9.3. Consumers demand and quality

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 according to demand. 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.

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.

10. Milk and milk products

10.1. 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, Milk after production is kept in buckets or earthenware pails and sold to 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, as in many cases the vessels in which the milk is delivered usually have no coverings, the utensils are not properly washed and cleaned and made free from possible bacterial 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).

10.2. Effort for quality milk production

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.

10.3. Poultry meat

Two marketing systems or mechanisms dominate the poultry meat sector in Bangladesh — (1) marketing rural scavenging poultry and (2) marketing broilers. In the former farmers bring birds to a village market where they are either purchased directly by consumers or by middlemen. The middlemen then transport birds to urban areas and sell either in wholesale markets or direct to retailers. Scalding, plucking and evisceration are done at the household level. During these pre-harvest and post -harvest activities hygienic conditions are not maintained. In the second system the producers of broilers are usually located close to urban centers. If fresh killed birds are required the farmer manually slaughters, plucks and eviscerates near the farm or market premises. The processed birds are packed in polythene bags and places in ice for delivery to customers. The retailer using a chest type freezer unit often then freezes these birds down.

In recent years there has been a rapid expansion in commercial processing of eviscerated ready-to-cook poultry. As with any food product, the sanitation under which these birds are produced is of major concern. 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. This system allows the customers to select the live birds but avoid the messy process of slaughtering and trouble of preparing the carcass. 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. There occurs bio-magnification at all levels of handling, poor transport and retailing conditions. 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 and Anower, 2008)

10.4. 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. However the preservation of egg quality and its public health importance are not given due attention. In Bangladesh, many people suffer from gastrointestinal disturbances by taking egg products contaminated 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.

10.5. Fish

Fish production in Bangladesh has been increasing as a result of the expansion in freshwater aquaculture activities. In recent years increased export demand (12 %) for Hilsa fish (Hilsa hilsa) together with high economic returns (75 billion taka) has received attention for improved intervention measures in order to reduce the involvement of risks of pathogenic activities of microorganisms associated with fish (Department of Fisheries, BD, 2008).

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. Several outbreaks of food poisoning caused by consumption of fish and fish products reflect attention to microbiological safety of the food. Bacterial contamination of raw processed fish and fish products continue to be of great concern to consumers and Regulatory and Health Officials. 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. In Bangladesh the frozen fish industry has grown in recent years and shrimp and Hilsa now represent the important export item of food. In Bangladesh there is no 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.

Adulteration of foods of animal origin in Bangladesh

11.1. Mischievous skills

Adulteration of foods is a common age-long problem of Bangladesh. Unscrupulous traders of the country willfully and consciously practice this abominable work to debase by mixing inferior spurious ingredients, which is no doubt a social evil. The general public, food traders and food inspectors are all responsible for perpetuating this evil practice. 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

It is evident that the Prevention of Food Adulteration Act in Bangladesh is a very old one. The Rules and Regulations are not framed and revised time to time to conform to the present status of ensuring food safety so that the consumers' could get their right to get protection from fraudulent / deceptive food trade practices. There exists no monitoring and surveillance of programs for prevention of food adulteration. Occasionally the Health authority, the Magistrate vested with power and the Food inspectors suddenly raid on food shops and their 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 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.

11.2. Zoonoses information in Bangladesh

Zoonotic diseases represent not only one of the leading causes of illness and death from infectious disease. Worldwide but also that these diseases have a negative impact on commerce, travel and economies. The information available on the majority priority zoonotic diseases in Bangladesh is not only meager but also very inaccurate and not reliable. Few zoonotic diseases are reported by Directorate Livestock Services (DLS), National

Institute of Preventive and Social medicine (NIPSOM), Rashid et al and a number of research workers and reports (Blaser et al, 1985; Neogi and Shahid, 1987; Samad et al 1998; Samad and Ahmed, 2003; Hsu et al, 2004; Ali, 2006; Rashid et al, 2007; Rahman, 2008; Health Protection Report, 2009; Jaffry et al, 2009; Kaku, 2009; Seppa, 2009; Muhammad, 2010). The major diseases recorded are Rabies, Brucellosis, Japanese B. encephalitis (JE), and Bovine tuberculosis, Anthrax, Psittacosis, Yellow fever.

Emerging zoonoses: (that is newly recognized or newly evolved or previously occurred diseases showing an increase in incidence have potentially serious human health and economic impacts). Examples are Avian influenza, Bovine Spongiform Encephalitis (BSE) and the Nipah virus.

Bacterial zoonoses: Anthrax, Bovine tuberculosis, Campylobacteriosis, Brucellosis, E. coli infection, Salmonellosis, Shigellosis, Leptospirosis, Plague

Viral Zoonoses: Rabies, Avian influenza, and the Nipah virus.

Parasitic Zoonoses: Cysticercosis /Taeniasis and Echinococcosis /Hydatidosis

Unconventional Zoonoses:

Bovine Spongiform Encephalopathy

Protozoan zoonoses:

Toxoplasmosis

Impacts of use of antimicrobials in food animals in Bangladesh

12.1. Anti-microbial Usage

The use of veterinary antimicrobial substances has been consistently considered as a key issue in animal and human health (OIE, 2003; Brusckhe, (2005). The occurrence of this emerging problem is thought to be due to the presence of antimicrobial resistance bacteria that do not respond or show less response to the antimicrobial therapy Wegener, 2004). It is evidenced from the reports of clinicians of this country that the rate of resistance emergence is usually proportional to the extent of usage in man and animals.

There are three modes of antimicrobial usage in veterinary practices animals:

- therapeutic use
- prophylactic use
- growth promotion use – antibiotics as feed additives

In Bangladesh the antimicrobials are used mostly for the treatment of diseases. Prophylactic use of antibiotics is not practiced. However the use of antimicrobials as feed additives for growth promotions by some farms and feed suppliers has been reported. 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 (National Livestock Development Policy, 2007).

12.2. Focus on risk

The Bangladesh Government as well as Veterinary and human health department has no policy recommendation for animal and public health and information 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.

The guidelines of WHO and OIE and recommendation concerning antimicrobial resistances has not yet been adopted in Bangladesh. From available clinicians report it is evident that the high percentage of Salmonella, Enterococci, Staphylococci and E. coli organisms have become resistant and in many cases can no longer be used for empiric treatment. Several countries have set up antimicrobial resistance monitoring systems. The European Union banned the use of growth promoters in animals which were related to antimicrobial agents.. This ban was subsequently extended to all antimicrobial growth promoters. Ultimately, the ban on antimicrobial agents as growth promoters in these countries led to a reduction in the prevalence of antimicrobial-resistant bacteria in animals, food products and humans, thus justifying the strategy. Such ban is not practiced in Bangladesh. In this country the

clinicians are experiencing delay in treatment with an effective antimicrobial agent, thereby increasing the risk of failure and /or leading to the need to prescribe more toxic or more expensive therapeutic agents.

13. Situation of VPH activities in government organization in Bangladesh

- In Bangladesh deficiency at all levels of infrastructures, general VPH services and surveillance systems and control programs are found. In addition there exists poorly defined epidemiological knowledge of VPH problems and lacking of laboratory-based organized surveillance program
- Unfortunately Bangladesh Livestock Directorate is still lagging behind to develop, cultivate and access skills required for disease management, control of animal diseases based on national priorities and organization and management of VPH programs relating to zoonoses, food and water-borne infections and other environmental problems. There is however poorly managed and implemented Quarantine Act and enacted Legislation on slaughtering of meat animals and some poorly developed VPH programs.
- In Bangladesh Veterinary health service as well as in VPH delivery the Planning and Development of Livestock and Poultry do not depend on appropriate holistic data as well as proactive and reactive population services (i.e., animal health and production service, official veterinary service, VPH service, Q_A and Q_C services (i.e., Quality Assurance and Quality Control Services).

Some of the comments of International and national Consultants on the constraints of Bangladesh Veterinary Services (Roeder,2002; Huda, 2003; Hansen 2003a; Hansen 2003b,, Rahman, 2003a ; Rahman, 2003b; Fanning et al, 2009;) are presented below:

1. There is shortage of skilled manpower in all aspects of Bangladesh livestock sector responsible for quality service delivery, planning and implementation of development programs.
2. Improper and inappropriate technical knowledge reflects the inability to technology transfer in a comprehensive and integrated manner.
3. The Veterinary Services in Bangladesh are rudimentary and unable on a sustainable basis to supply more than a very 'basic clinical service'.
4. The technical qualifications of personnel are not always matched with the required skills for the right positions. DLS personnel are designated as jack of all trades and master of none
5. Very few / none of the DLS senior staff has skills in strategic planning and management, HRD (Human resource development) and preparation of programs and projects
6. The employing of veterinarians is oriented almost totally towards clinical services to the animal owners
7. There seems to be little appreciation of the requirement of capable of meeting WTO standards
8. Livestock service is not well documented and there is no livestock database
9. There is lack of comprehensive, integrated approach in extension services
10. There are poor health protection and management services
11. There is lack of quality assurance and quality control services
12. The weak planning process acts as a constraint for VPH development strategy and the associate plan off action.

The above essential features of activities are consistently poor and there is a lack of, or insufficient, inter-country and inter-sectoral collaboration and cooperation among national authorities responsible for VPH programs and activities at all levels. Moreover there is usually lack of public health awareness and education, as well as community involvement in the prevention and control zoonotic and food-borne diseases and pre-harvest and post-harvest food safety. The Director of Livestock Services has not been able to frame any Inspection Program or Service for foods of animal origin like 'Food safety and Quality' service that assures consumers that food products sold in Bangladesh markets or intend to ship abroad are safe to eat and truthfully labeled.

14. Scenario of VPH education in veterinary schools of Bangladesh

In Bangladesh just after obtaining DVM degree when a young veterinarian is posted at grassroots level, he shoulders the responsibility of giving treatment against the livestock diseases and look after morbidity and mortality of animal resources of the area under his jurisdiction. Thus his activities are precise to keep vigilance on economics that threaten animal health and animal resources. His pivotal duties are devoted to extension work to create public awareness about measures of prevention and control of diseases of animals and their relation to human health. The knowledge he acquired in Microbiology, Pathology and Parasitology, Population medicine

including Epidemiology, and Veterinary public health including Food hygiene are one and almost the same with that of medical profession. His training and academic fitness in Medicine, Surgery and Gynecology will not only give relief to his patient but also give relief to his client from anxiety and economic loss. This veterinarian remains responsible for preventing and controlling of zoonotic diseases by his study of Veterinary Public Health like that of medical profession.

In Bangladesh Veterinary Public Health courses are integrated in veterinary curriculum. Universities and Veterinary Colleges of this country are producing qualified Veterinary Food Hygienists to deal with matters of health and demands consumers' food protection. It is therefore the veterinarians to realize that their responsibility for the well being of man and to form an overall view of their profession. It is unfortunate that Bangladesh is still in infancy in this area. 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, but it is sad to say that the recognition of these experts in this field is very limited. Our experience advocates that zoonotic and food-borne diseases can be prevented through changes in behavior and practices in communities. The knowledge acquired by veterinarians from attitudes existing in the community towards these diseases could be the basis for designing and implementing adequate prevention and control strategies.

15. VPH activities in Bangladesh are rudimentary: wanting in strengthening

15.1. The Need for Professional Development in VPH:

The following recommendations could provide valuable direction to the future VPH program and activities which may be of value for VPH issues, zoonoses and food-borne disease control and food safety thus fostering better health and living conditions.

Establishment of veterinary public health forum

The important function of the forum would be:

- (i) to suggest development of ways and means of public health veterinarians and community participation in VPH activities relating to the prevention of and control of zoonoses, consumers protection,
- (ii) to give suggestions for upgrading the capabilities of Public Health veterinarians in surveillance and information systems of emerging and reemerging of diseases of public health importance and
- (iii) to instruct development of national strategies in preparing and adapting legislation framework concerning VPH, Zoonoses and Food Safety.

Development and Strengthening of VPH for Assisting Inter-country and Region Members of TAD_s Countries such as SAARC Countries to Organize and Develop their Animal Health and VPH programs, Activities and Services

The main objectives are

- (i) to foster national and interregional programs for the prevention, surveillance and control of zoonoses and food-borne diseases as an integral part of national health programs,
- (ii) to strengthen cooperation between national animal health and public health services,
- (iii) to improve prevention, surveillance and control of these diseases, and
- (iv) to strengthen and execution of joint venture targeted plans and collaboration between SAARC Country members, collaborating partners and national participating institutions.

The major VPH activities need to be implemented or planned should be as follows:

- Firstly the VPH plan should be well targeted and standardized by the member countries
- Secondly with respect to Surveillance, information, prevention and control of animal disease, zoonoses and food-borne pathogens VPH priorities should be defined
- Thirdly to ensure community participation for the involvement of all stakeholders and the coordination of VPH activities
- Fourthly for the success of VPH programs continuous professional development and extension works

- Finally establishment and maintenance of a database bank on all activities related to disease occurrence and study of epidemiological surveillance, prevention and control of diseases should be established and maintained.

(c) Need to Develop Veterinary Professional Skill in Bangladesh in Relation to VPH, Zoonoses and Safety of Foods of Animal Origin

16. Conclusion and recommendations

In context of lacking identified the VPH activities in Bangladesh should adopt the following measures (Rahman, 2012):

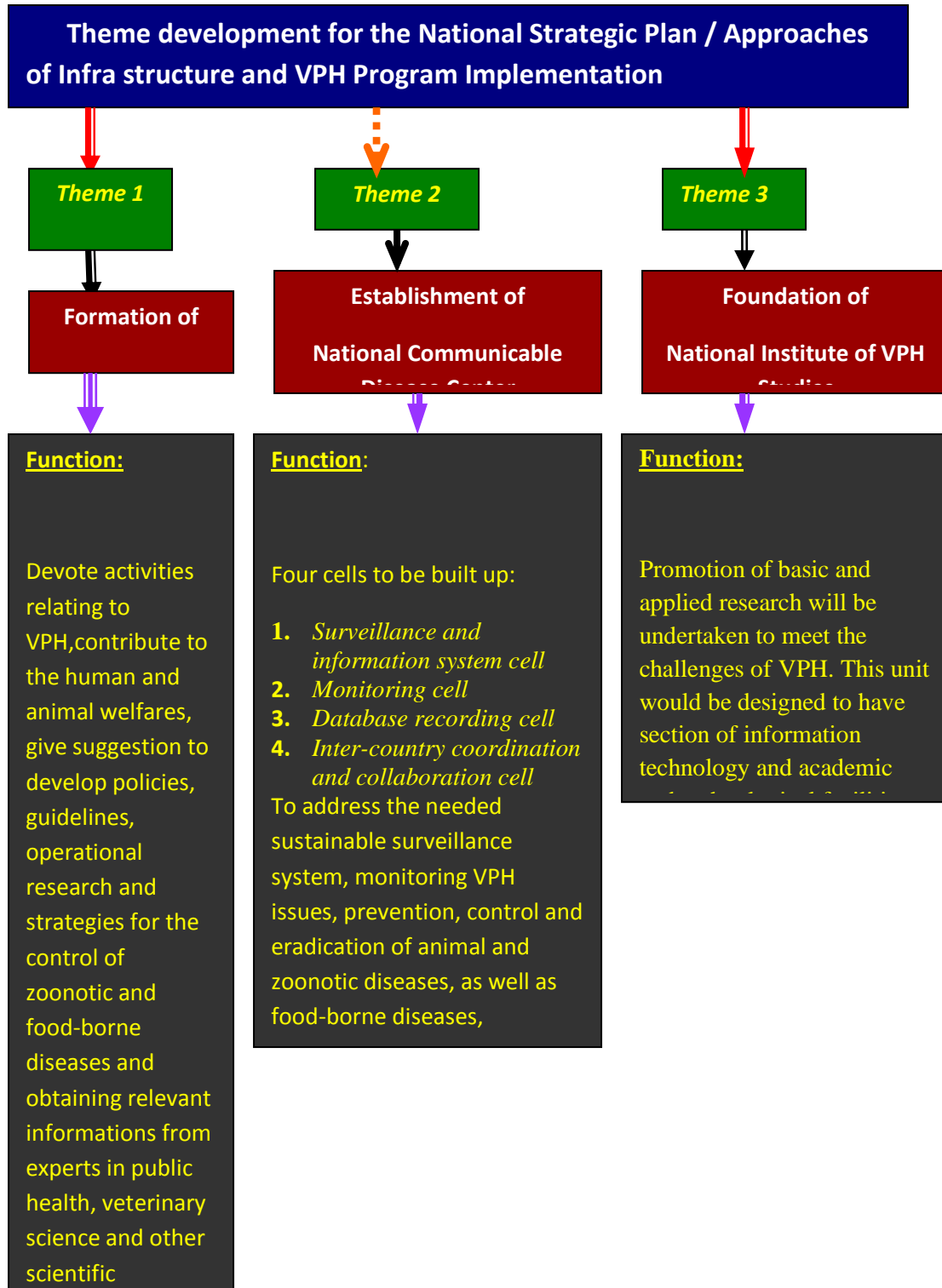
- (i) A national surveillance system and monitoring program for safety of foods of animal origin (meat, milk, egg and fish etc) and promotion of animal welfare;
- (ii) Development of an appropriate risk assessment methodology, for the potential impact on public health and antimicrobial resistance bacteria of animal origin threatening health and hygiene;
- (iii) The harmonization of technical guidelines provided by International Organizations would of value for the improvement of the legal framework and development of required resources of Veterinary services
- (iv) Technical assistances from international agencies may be sought in the establishment of laboratories to achieve the highest quality isolation, identification, sero-typing of etiological agents and antibacterial susceptibility testing results
- (v) Training courses on surveillance, outbreak detection and epidemiological study and response are essential for the success of national VPH programs for the prevention, surveillance and control of zoonoses and food-borne diseases and food safety.
- (vi) The following Theme development for the National Strategic Plan / Approaches of Infra structure and VPH Program Implementation would be of value.

Theme 1: *Formation of Veterinary Public Health Forum*

Theme 2: *Establishment of National Communicable Disease Center*

Theme 3: *Foundation of National Institute of VPH Studies*

- Theme 1: Veterinary Public Health Forum This is to be created as a nonpolitical society run by the public health veterinarians which would devote activities relating to veterinary public health, contribute to the human and animal welfares, give suggestion to develop policies, guidelines, operational research and strategies for the control of zoonotic and food-borne diseases and disseminating relevant information obtained from experts in public health, veterinary science and other scientific disciplines, to food industrialists, consumer groups and the public.
- Theme 2: National Communicable Disease Center This is to be developed constituting four different cells. These cells would be able to address the needed sustainable surveillance system, monitoring VPH issues, prevention, control and eradication of animal and zoonotic diseases, as well as food-borne diseases, assessment of risks and socio-economic impacts of communicable diseases, food safety and food security. Other functions of the cell would be database risk assessment, disease awareness, cost-benefit analysis of control strategies and improving to build technical capacity, development of standards, policies and plans and management of inter-country VPH programs in close collaboration with SAARC partner countries. The four cells to be built up may comprise:
 - a. Surveillance and information system cell
 - b. Monitoring cell
 - c. Database cell
 - d. Inter-country coordination and collaboration cell
- Theme 3: National Institute of VPH Studies This is to be founded where promotion of basic and applied research will be undertaken to meet the challenges of VPH. This unit would be designed to have section of information technology and academic and technological facilities for VPH professional development.



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