One Health Program: Its Future Implications, Challenges and Opportunities: Review

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Abstract: One Health (OH) plans to work locally, nationally, and globally to attain optimal human, animals and environment's health. The aim of the program is to bring desirable change in the public health that resulted due to globalization, growth of human population, ecological changes and technological advancements. The concept of one health embodies the integration of different disciplines to prevent and control zoonotic diseases. Humanity faces many challenges that require global solutions and one of these challenges is the spread of emerging and re-emerging infectious diseases that interfaces between animals, humans and the ecosystems. The future implication of the program will be improvements of animal, public as well as environmental health. Moreover; the commonalities of Public, Veterinary Medicine and the financial constraints that many governments presently facing are arguments in favour of one health one medicine approach. The marketing of animal and animal by-products between developing and developed countries are also strengthening. Thus; multidiscipline the professionals should be cooperated to implement the objectives of one health program via improving the status of thinking, education system, administrative structures and legislation.

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1. Introduction

One Health program is the concept that the health of animal, human and the viability of ecosystems are inextricably linked. The importance of the program is increasing as the expansion of human and animal populations, ecological changes due to human impact and climate variations, and technological advancements facilitating global human, animal, and product movements have resulted in an increased risk of disease transmission between animals and people. It embraces the idea that a disease problem impacting the health of humans, animals, and the environment can only be solved through improved communication, cooperation, and collaboration across disciplines and institutions (USDA, 2015).

The physiological, path-physiological, and genomic similarities among species anchor the comparative approach, and within the context of biomedical research, they support the One Medicine pathway to discovery (National Academic Research Council, 2005). The scope of One Health is impressive, broad, and growing (American Veterinary Medical Association, 2008). Multidisciplinary groups of professionals have to cooperate to improve public health (Ayele *et al*., 2014). A German scholar from the mid 1800's, Rudolf Virchow, who came from a farming family, was an early proponent of OH. He said, "Between animal and human medicine there is no dividing line nor should there be. The object is different but, the experience obtained constitutes the basis of all medicine" (USDA, 2015). Aim of One Health is to improve health and well-being through the prevention of risks and the mitigation of effects of crises that originates at the interface between humans, animals and their various environments (One Health Global Network, 2015).

Over 70 % human pathogens originate from animals for instances*:* Anthrax ,Influenza, BSE, Brucellosis, Campylobacteriosis, Lyme Borreliosis, Rabies, Toxoplasmosis, Ebola, Tuberculosis, Salmonellosis, Leishmaniasis and Echinococcosis (FVE, 2007). Moreover, cause of treatment failure in animals and humans attributable to antimicrobial resistance arising from the use of antimicrobial agents in food-producing animals or companion animals is a serious concern for public health (Australian Commission on Safety and Quality in Health Care, 2013).

The challenge to be better prepared for natural and man-made disasters is a huge concern for all, but veterinarians are in a unique position to appreciate the implication of disasters on both human and animal communities (Jones, 2009). While the demand for animal-based protein is expected to increase by 50% by 2020, animal populations are under heightened pressure to survive, and further loss of biodiversity is highly probable (Delgado *et al.,* 1999). Over 60% of existing and emerging pathogens affecting humans originate from animals; of those, 75% came from wildlife (FAO, 2011). On the top of

these, division of labor among public institutions makes for a segmented or vertical organization of work, in which institutions operate independently of one another and from the perspective of their discipline or sector (Agriculture and Rural Development Health Program, 2010).

The commonalities of human and veterinary medicine and the financial constraints that many governments presently facing are arguments in favor of One Health One Medicine approach, while status of thinking, education system, administrative structures and legislation hinder its implementations (Marsha and Tewodros, 2012). It was launched in Ethiopia on March, 2013 in collaboration of Jimma University with OHCEA Secretariat manager and various delegates from local and international organizations (OHCEA, 2014). Its initiative draws national recognition and the team includes researchers, clinicians and students from the Ohio State colleges of Nursing, Public Health, Medicine, and Veterinary Medicine. It focuses on health threats such as cervical cancer, rabies, neonatology, food and environmental quality in East Africa (Gebreyes, 2015). There is lack of well documented information regarding one health program in our country. Therefore; the objectives of this seminar paper are to review one health program, its future implication, opportunities and challenges.

2. One Health Concepts

2.1 One Health

The collaborative effort of multiple health science professions together with their related disciplines and institutions working locally, nationally, and globally to attain optimal health for people, domestic animals, wild life, plants and our environments (One Health Commission, 2015). It's is a concept that becomes an approach and then a movement. It is more of an approach then a new concept and rapidly becoming an international movement based on inter-disciplinary collaborations. Even though many definitions of One Health are used, the common theme is 'collaboration across sectors' (One Heath Global Network, 2015).

2.2 One Medicine (OH)

The term "One Medicine" is credited to Calvin (1927–2006), a veterinary epidemiologist and Parasitologist in his textbook "Veterinary Medicine and Human Health"(Calvin, 1984). It is integrated approach of veterinary and human medicine to prevent and control diseases of animal origin (FVE, 2007). It embodies the view that human and Veterinary Medicine is dependent on an overlapping collection of biological characteristics, technologies and research discoveries. Scientific advances have demonstrated striking commonalities among the genomes of humans, chimpanzees, dogs, cattle, chickens, and rodents and the importance of emerging zoonoses, public health and food safety, bio-defence, wildlife disease, and conservation. The interrelationships between human and animal health is at the core of the discipline of Comparative Medicine and is the basis of the "One Medicine" concepts (National Academic Research Council, 2005).

2.3 The Scope of One Health

The scope of One Health is impressive, broad, and growing. Some of the dimensions defining the scope of the concept are: agro-and bio-terrorism, antimicrobial resistance; basic, translational and biomedical research, clinical, comparative and conservative medicine, diagnosis; surveillance, control and response to chemicals, toxicants and radioactive substances. Further, it encompasses entomology, ethics (ensuring safe food and water supply, public policy regulatory enforcement); global trade and commerce, conservation of natural resource and disaster preparedness; health communications and outreach, environmental health; infectious disease, ecology; integrated systems for detection of land use and production systems. Moreover, microbiology education, occupational health; public awareness and communications, scientific discovery and knowledge creation; support of biodiversity, training veterinarians and environment health professionals are to name few (American Veterinary Medical Association, 2008).

2.4 One Health Task Force

Multidisciplinary groups of professionals (Physicians, Veterinarians, Biologists, Epidemiologists, Public health advisors, Medical Public Health, Sanitary Engineers, Industrial Hygienists, Environmental Specialists, Laboratory Scientists, Social Workers, Health Educators, Wildlife Biologists, Agricultural Animal Scientists, Statisticians, Information Technology specialists, Entomologists, Lawyers) that cooperate to improve public health (Ayele *et al*., 2014).

2.5 Evolution of One Health

Human and veterinary medicine have many commonalities. The split into distinct disciplines occurred at different times in the different places. In Europe, the establishment of the first veterinary university toward the end of 18 century was triggered by ravaging Rinderpest epidemics and the increasing importance of livestock for draft, food, supply and war fare (Anjaria, 1996).

A German scholar from the mid 1800's, Rudolf Virchow, who came from a farming family, was a nearly proponent of OH. He said, "Between animal and human medicine there is no dividing line nor should there be. The object is different but the

experience obtained constitutes the basis of all medicine." Approximately 75% of emerging infectious diseases of humans have been zoonotic; this encouraged modern proponents of OH. Unified Medical and Veterinary approach to combat zoonotic diseases, providing the modern foundation for OH. The concept was advanced further when the Wildlife Conservation Society hosted a symposium that brought together an international group of human and animal health experts to discuss shared diseases among human, wild animal, and domestic animal populations. This symposium introduced a set of priorities for an international and interdisciplinary approach to combat joint threats to human and animal health (Calvin, 1984).

In 2007, The American Veterinary Medical Association and the American Medical Association, adopted a vision supporting the concept of OH and formed the One Health Initiative task force. This brought together U.S. human and animal health agencies, Medical doctors, and Veterinarians. In addition, the National Strategy for Pandemic Influenza and its Implementation Plan resulted in several International Ministerial Conferences culminating in 2007 that involved the United Nations' Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE), and the WHO. It has also gained ground throughout the US government, led by the president's new initiatives for coordination and collaboration on national security and global development policy (USDA, 2015).

3. Objectives Of One Health Program

3.1 Aims

Aim of One Health is to improve health and well-being through the prevention of risks and the mitigation of effects of crises that originates at the interface between humans, animals and their various environments. For that purpose: to promote a multi-sectorial and collaborative approach and to promote a whole society approach to health hazards, as a systemic change of perspective in the management of risks (One Health Global Network, 2015). Meeting new global challenges head-on through collaboration among multiple professions: Veterinary Medicine, human medicine, environmental, wildlife and public health **(**American Veterinary Medical Association, 2008**).**

3.2 Potential Outcomes of OH Program

More interdisciplinary programs in education, training, research and established policy; more information sharing related to disease detection and diagnosis and as well as education and research; more prevention of diseases, both infectious and chronic disease; new therapies and approaches to treatment for unmet needs (One Health Commission, 2015). One Health can add value and reduce costs in five ways: (1) sharing health resources between the medical and veterinary sectors, (2) controlling zoonosis' in animal reservoirs, (3) early detection and response to emerging diseases, (4) prevention of pandemics and (5) generating insights and adding value to health research development (Delia, 2014).

3.3 One Health from Veterinary Perspective

The three strongly interlinked pillars of veterinary medicine are: Animal health, Public health and Animal welfare. The Core domains of Veterinary Public Health are diagnosis, monitoring, surveillance and epidemiology; control and prevention of zoonoses; food safety; biomedical research; management of wildlife populations' management of public health emergencies (FVE, 2007). The following are veterinary perspectives in One Health Program:

3.3.1 Zoonotic disease

Any disease or infection that is naturally transmissible between animals and humans (IOM, 2009). The current epidemic of Ebola virus in West Africa and the 2009 influenza A (H1N1) pandemic serve as stark reminders of the unpredictable nature of pathogens and the importance of animals in the ecology and emergence of viral strain (Gebreyes *et al*., 2014). Over 70 % human pathogens originate from animals for instances: Anthrax, Influenza, BSE, Brucellosis, Campylobacteriosis, Lyme Borreliosis, Rabies, Toxoplasmosis, Tuberculosis, Salmonellosis, Leishmaniasis, Echinococcosis (FVE, 2007). About 75% of emerging infectious diseases over the past ten years have been caused by pathogens originating from animals or their products. Veterinarians find themselves on the front lines in recognizing, diagnosing, and responding to these diseases (Clifford and Coppolillo, 2009).

3.3.2 Antimicrobial resistance

The cause of treatment failure in animals and humans attributable to AMR arising from the use of antimicrobial agents in food-producing animals or companion animals is a serious concern. Internationally, it is estimated that the volumes of antimicrobials used in food animals exceeds the use in humans worldwide. Infections in humans with organisms that exhibit AMR are found most commonly among people who have been in hospital. However, people in community settings, including overseas travelers and farmers, also present with antimicrobial resistant infections, and the relative contributions of AMR acquired from community settings, food animals and companion animals is not known (Australian Commission on Safety and Quality in Health Care, 2013).

3.3.3 Disaster preparedness

The challenge to be better prepared for natural and man-made disasters is a huge concern for all, but veterinarians are in a unique position to appreciate the implication of disasters on both human and animal communities. Currently the over whelming majority of disaster relief efforts are targeted only, but veterinarians understand an extricable link between humans and animals. Drawing on their knowledge of animal epidemiology, health husbandry, and behaviour, veterinarians can uniquely contribute to improving quality of life for both animals and humans in the event of disaster (Jones, 2009).

3.3.4 Food safety

The convergence of people, animals, and our environment has created a new dynamic one in which the health of each group is inextricably interconnected. The challenges associated with this dynamic are demanding, profound, and unprecedented. While the demand for animal-based protein is expected to increase by 50% by 2020, animal populations are under heightened pressure to survive, and further loss of biodiversity is highly probable (Delgado *et al*., 1999). It's increasing important to provide safe and adequate food and water for the world as the global population to the brink of seven billion consumers. Veterinarians have the expertise to address food production practices, ecosystem management and microbial contamination problems associated with food safety (Scott, 2008).

3.3.5 Public health

Factors which contribute threats and degradation of environmental resources that sustain life are: changes inland and water use, over grazing, encroachment of farming and human activities in to wild life habitat and toxins induced by sewage pollutants. Global trading mass transportation, industrialization of food processing, altered tropism (organism's natural response to stimuli) also contributes to the increasing and hygiene, the center for disease control prevention, pressure and spread of diseases and contamination. Veterinarians, their education in multi- and cross species biological interactions, clinical approaches, and preventive medicine make ideal and critical public health collaborators (American Veterinary Medical Association and Western Veterinary Conference, 2008).

3.3.6 Wild life

Over 60% of existing and emerging pathogens affecting humans originate from animals; of those, 75% came from wildlife (FAO, 2011). Human encroachment into wild life habitats invites these infectious agents to become pathogen for human populations. It is important to identify the routes by which these agents find their way to the human host and to understand their impact on the animals that serve as the primary and intermediate hosts. Veterinarians are in a unique position to deploy their back grounds and understanding of animal diseases to identify, manage and control these diseases (Jones, 2009).

4. Future Implication And Opportunities Of One Health Program

4.1 Adopting One Health

The division of labor among public institutions makes for a segmented or vertical organization of work, in which institutions operate independently of one another and from the perspective of their discipline or sector. This unavoidably leads to gaps, and sometimes to overlaps. For practitioners working in this framework, the starting point for action tends to revolve around the question "What am I responsible for?" rather than "What needs to be done?"Changing the organization of work across disciplines to start with this latter question implies a substantial reorientation along horizontal lines in which regular communication takes place between practitioners at work in different disciplines and sectors. The followings are strategies to adopt the program that are communicating consistent messages, legislation that facilitates selective interaction between medical and veterinary services, strengthening education, providing an appropriate incentive and institutional framework and establishing trust among the different actors (Agriculture and Rural Development Health program, 2010).

4.2 Major Challenges of One Health Program

With the inherent complexity and the stage of our understanding of OH issues, there are many uncertainties that need to be assessed (both in terms of time and money) and entry points for actions to be determined. It is often difficult to know where to start and how to prioritize actions, many options arise out of analysis of problems, and solutions will tend to be highly context-specific. In fact, there is an enormous challenge in assessing benefit cost ratios where there are little comparable measures (different economists) for benefits across the health domains. The limits and costs of agency interaction cannot be underestimated: cash-strapped bureaucracies have different priorities and there are frequently inter-ministerial rivalries over budget allocations (Overseas Development Institute, 2012).

The legal barriers to interaction, or other structural barriers to cooperation, considerable uncertainties on who should pay for addressing the problems between sectors, between central and local, private and public, and between countries, high transaction costs for collaboration (example, for

different ministries to come together for discussion and planning).. There may also be cultural and perception issues to overcome. It often requires cultural shifts within agencies, and new systems and capacities to be built and changes in attitudinal relationships between professions (veterinarians, doctors, extension workers, biologists and workers in the area of the environment and natural resources) (FAO, 2008).

Humanity faces many challenges that require global solutions and one of these challenges is the spread of infectious diseases that emerge and re-emerge from the interfaces between animals, humans and the ecosystems in which they live. This is a result of several trends, including the exponential growth in human and livestock populations, rapid urbanization, rapidly changing farming systems, closer integration between livestock and wildlife, forest encroachment, changes in ecosystems and globalization of trade in animal and animal products. Moreover, status thinking, education system, administrative structures and legislation hinder its future implementations (Marsha and Tewodros, 2012).

4.4 Application of One Health Program

The program gives primacy to the prevention of disease emergence and spread through dialogue, participation and community 'ownership' of interventions. Two-way communication is essential to ensure that not only is the local public informed about new health threats but that information and practices at the community level influence national and international disease response. Specifically, the following communication strategies will be required to promote preventive behaviours at the community and household levels: Civic engagement: Outreach efforts across national and sub-national levels will be important to enable the participation of the public and the community in planning, prioritizing and decision-making, to be vigilant and to respond to new and emerging health issues. Community preparedness: Using participatory approaches, community members should be involved in identifying any new health threats confronting the community. Specific actions to be promoted are: improved biosecurity measures, community-based surveillance of new and emerging diseases, and timely and responsive reporting, change in education and training, the creation of institutional linkages, and the removal of legal barriers could help overcome obstacles (Mersha and Tewodros, 2012).

Community and social mobilization: Preventive practices for new diseases will be introduced, building upon existing social and community networks that are already engaged around public and animal health issues. National public education campaigns: Promoting the larger public good and the need to be vigilant and pro-active around new and emerging health threats will create a culture of prevention among different constituent groups. Effective long-term public-private partnership (PPP) is necessary for the success and sustainability of the program. Monitoring, evaluation and implementation of this program will be a complex task, given the involvement of a large number of partners, wide geographical coverage and multidisciplinary approach. Successful adoption of the program would have the advantage of: Pooling and thus more efficient use of expertise and financial resources to address a common problem across the three health systems**,** synergy of different institutional perspectives and experiences. Coordinated multi-sectoral action that brings together those working on human, animal and ecosystems health is needed to address the impact of diseases occurring at the animal–human–ecosystems interface (FAO, 2008).

5. Application Of Oh Program In Ethiopia

5.1 History of OH in Ethiopia

One Health was launched in Ethiopia on March 16, 2013 at Harmony Hotel in collaboration of Jimma University with OHCEA Secretariat manager and various delegates from local and international organizations. Key note address was delivered through delegates of MOH and MOA and both expressed the need for OH approach in the control and understanding of emerging diseases. The issue of collaboration was not new for the Ethiopian system since the two ministries in particular and other relevant disciplines were working together to address different health problems such as the case of unknown liver disease in Western part of Tigray region and the avian influenza. They also said that, the need for working together is timely approach not only to solve communicable diseases but also the non-communicable diseases which affects both livestock and human beings (Gebreyes *et al*., 2014).

Furthermore, all representatives from governmental and private organizations appreciated OHCEA activities in Ethiopia so far and emphasized the need to consider the following points: focusing on advocacy of OH approach through creating more awareness forums to bring attitude change and get buy-in of policy makers, working on way of registering OHCEA in Ethiopia and formulating short and long term goals at national level, strengthening national committee and revising the existing membership to include all relevant OH stakeholders, soliciting funds or grants to make the present project sustainable after the current funding period expires, preparation of national strategic plan based on organized and well-designed assessment tool to know the gaps in various institutions/ organizations, documenting and sharing the lessons learnt from

previous ways of fighting pandemic threats in the form of success stories, working on gender issue to address zoonotic diseases (OHCEA, 2014).

5.2 One Health Initiation in Ethiopia

In Ethiopia One Health initiative draws its national recognition. The team includes researchers, clinicians and students from the Ohio State colleges of Nursing, Public Health, Medicine, and Veterinary Medicine, who focus on health threats such as cervical cancer, rabies, neonatology, and food and environmental quality in East Africa. The partnership has helped to install a capacity-building environment for faculty and students, created reciprocal adjunct faculty appointments, conducted workshops and field training through the One Health Summer Institute and increased opportunities for students.

The partnership integrates academics and practitioners from Ohio State, Ethiopia and East African countries to leverage their knowledge, skills and resources to contribute to improving biologic and economic health in developed and underdeveloped countries (Gebreyes, 2015).

5.3 Objectives of OH Program

Acting with professionalism in everything that they do, providing high quality education and participating in life-long learning; providing outstanding veterinary medical care, building interdisciplinary teams both within and outside the college to address the needs of students, college community, patients, and society; seeking partnerships to bring together individual knowledge and talents from across the college, university, and profession; actively participating in activities and university initiatives that impact our college, maintaining respect and appreciation for areas outside of our individual interests and expertise, creating a safe environment for engaging in candid and respectful discussion of differing opinions, recognizing that people matter, valuing the contributions that individuals, in different roles, bring to achieve the vision and missions (OHCEA, 2014).

Removing artificial boundaries that divide us, understanding and utilizing all of our strengths so that each person has the opportunity and tools to achieve their full potential, working to provide and accept honest and constructive feedback, maintaining an attitude of flexibility and adaptability, avoiding the 'it's always been done that way' trap, being open to having our opinions challenged in a constructive manner; looking for new opportunities to lead the profession in education, discovery, patient care, and public service, proactively responding to and providing creative solutions to address the needs of our society (Gebreyes, 2015).

Conclusion And Recommendations

In conclusion, humanity faces many challenges that require global solutions for the prevention and control of the spread of emerging and re-emerging infectious diseases between animals, humans and the ecosystem. Globalization, increased human population and dissatisfaction with existing health care system enforce the world to seek new health care options (One health program). Moreover; the future implication of the program will secure public health problems through designing of effective prevention and control methods of the disease. Thus, multidisciplinary cooperation, tolerance, commitment and effective communication skills should be encouraged in the globe.

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