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Abstract
Conservation medicine, a sub-specialty within the field of conservation biology is concerned about the application of medicine to enhance the conservation of wildlife. Hence, this paper was aimed at reviewing conservation medicine practices on wildlife genetic diversity. As well, lessons for sustaining eco-healthy in wildlife biodiversity of Ethiopia were also drawn. The information presented in this review was collected from previous studies of existing eco-health literatures. Besides, fact sheets, full length manuscripts, review articles, country reports and various valuable Webpages were used. The field of conservation medicine is an emerging discipline that links human and animal health with ecosystem health and global environmental changes. Biodiversity has an important role to play in protecting human health and can, in some cases, act as a buffer to the transmission of infectious diseases. Thus, management of wildlife disease may be directed at the disease agent, host population, habitat or be focused on human activities. Hence, from conservation medicine perspectives, Ethiopian protected area system require establishment of satellite clinics of fully equipped wildlife veterinary staffs within its key conservation areas. Furthermore, research practices and policy landscape of conservation importance wildlife biota should be supported with zoological medicine practices. In view of the conservation status of wildlife population, multidisciplinary disease response personnel comprising mandated institutes and other stakeholders should be formed to conduct surveillance, research, and response on diseases affecting wildlife genetic diversity in Ethiopia. In general, conservation medicine trained wildlife veterinary professionals need to be departmentalized within institutions authorized to conserve wildlife genetic diversity of Ethiopia.

Keywords: Conservation medicine, Disease management, Eco-health, Ecosystem health

1. Introduction
Conservation medicine is the practice of achieving ecological health, and a solution-oriented approach for predicting, preventing and controlling the health implications of anthropogenic environmental changes. Furthermore, by bringing the health sciences, ecology and conservation biology together, conservation medicine is an effort to examine the world in a wide-ranging way, since health impacts affect populations and ecosystems. The central principle of this discipline is that health connects all species, because it is inextricably linked to the ecological processes that govern life on the planet (Aguirre et al., 2002) [3]. As well, zoological medicine and wildlife medicine have been recognized disciplines within the veterinary profession for several decades (Aguirre, 2009) [2].
In recent years, the term ‘conservation medicine’ has been used in various contexts by different scientific communities, research groups and national and international organizations. This novel approach to the protection of biological diversity challenges scientists and practitioners in the health, natural and social sciences to think about new, collaborative and transdisciplinary ways of addressing ecological health concerns in the current biodiversity crisis. However, conservation medicine strives to understand health in an ecological context (identifying the environmental determinants of health) and use that understanding to develop preventive or corrective approaches and to maintain the health of all species in a sustainable fashion (Aguirre and Gómez, 2009) [1]. Just as the world has changed rapidly, the approach used in wildlife disease management have also taken a dramatic turn in recent years (Richard et al., 2010) [17]. As the prevention of disease continues to be a primary challenge of wildlife health, wildlife veterinarians have increasingly changed their attention to way out measures that can make positive, sustainable change (Richard et al., 2010) [17]. Besides, Eco-health is a comprehensive approach for understanding health at its human, animal and environmental interface in a socio-ecological systems context. It focuses on the linkages between nature, society and health (Nguyen-Viet et al., 2015) [10].

Wildlife disease is an ever-evolving challenge in conservation and management of biodiversity (David et al., 2012) [7]. Rapid and accurate diagnosis of conditions and diseases affecting wildlife is essential for facilitating timely treatment, reducing mortalities, and preventing the spread of disease. This also makes it possible to have an early warning of disease outbreaks, including those that could spread to livestock and humans. Besides, reducing the cost of such epidemics, such an approach ensures healthy wildlife populations (David et al., 2012) [7].

Ecological, epidemiological, and evolutionary principles guide our understanding of disease emergence, epidemic spread, host-pathogen co-evolution, and the cascading repercussions of disease on the dynamics of all host-pathogen or host barriers to infection, as well as the barriers that prevent outbreaks from developing, that likely result from complex pathways of ecological change. Using this knowledge for infection control or prevention will require understanding the population and community dynamics of the non-human and non-agricultural host species (Elizabeth et al., 2011) [9].

There are unknown barriers and bridges in making use of wildlife veterinary and capture services department in Ethiopian protected area system. As well, satellite clinics strategically located in key conservation areas to ensure quick response and effective monitoring of diseases in wildlife are poorly considered. But, the dynamic landscape of research and application of conservation medicine approach provides a wider space to address the interlinkages of health and the environment health (Nguyen-Viet et al., 2015) [10]. Thus, the paper is intended to review conservation medicine practices on wildlife as a lesson for sustaining eco- healthy in wildlife genetic biodiversity of Ethiopia.

2. Conservation Medicine in Theory and Research Scenario
Conservation medicine, a sub-specialty within the field of conservation biology, is the application of medicine to supplement the conservation of wildlife biota and ecosystems. Furthermore, it works to contest the wildlife disease and health problems that increasingly complicate the process of wildlife conservation (Sharon et al., 2000) [19]. The main concern of conservation medicine is managing the direct threat of disease epidemics to the survival and health of all wildlife populations, with emphasis on endangered wildlife populations. Similarly, issues relating to public health, livestock production, and rural livelihoods, each of which has important consequences for wildlife management (David et al., 2012) [7].

The approach applied to disease management in wildlife includes diagnosis and treatment of sick animals. Both passive and active surveillance are critical initiatives that mainly focus on diseases that cause mortalities in wildlife, those that have a negative impact on livestock economies and livelihoods, and diseases of public health importance. All outbreaks of diseases can be conclusively investigated and appropriate control and monitoring systems scaled up (David et al., 2012) [7].

A critical aspect of conservation medicine principles is that it provides bridges between disciplines separated by tradition or by the lack of a common language. By creating these bridges, conservation medicine becomes transdisciplinary, that is, it rise above classical disciplinary paradigms and integrates research approaches for the creation of solutions to real-world problems (Wilcox, 2008) [22]. Moreover, by reaching out to multiple disciplines, conservation medicine provides new skills, tools and vision to the field of both conservation biology and medicine. This includes bringing biomedical research and diagnostic resources to address conservation problems, e.g. development of new non-invasive health monitoring techniques; training veterinarians, physicians, and conservation...
biologists in the promotion and practice of ecological health; and by establishing transdisciplinary teams of health and ecological professionals to assess and address ecological health problems (Tabor et al., 2001) [21]. Generally, the existing understanding in the scientific body of conservation medicine literatures and the research grounds help to sustain eco-healthy breeding wildlife population along the existing human development efforts.

Conservation of genetic diversity is essential to the long-term survival of any species, particularly in light of changing environmental conditions. Reduced genetic diversity may negatively impact the adaptive potential for a species. In addition, low genetic diversity leads to an increased risk of inbreeding effects, through the uncovering of deleterious recessive alleles. Consequently, management of genetic diversity is an important component of recovery strategies for threatened and endangered wildlife (Keri et al., 2006) [12]. The field of zoological medicine has seen an extensive broadening and it now includes the study of free-ranging wildlife, conservation medicine, and ecosystem health (Aguirre, 2009) [3]. As well, zoological medicine integrates veterinary medicine and the principles of ecology and conservation as applied in both natural and artificial environments’ (Stoskopf, 2001) [20]. The broadly comparative and health-maintenance basis of zoological medicine greatly increases the potential for veterinary medicine to make important contributions to the concept of the integrated health of the planet. Emergence of key zoonotic and production animal diseases derived from and within wildlife populations has increased awareness worldwide of the importance of zoological medicine in protecting both livestock and public health (Aguirre et al., 2002) [3].

4. Ecosystem Health and Wildlife Conservation
The concept of ecosystem health, initially termed ‘ecosystem medicine’, was established in the late 1970s when researchers began looking at ecosystems as patients with ‘vital signs’ (Rapport and lee, 2004) [16]. Common signs of ecosystem degradation were characterized as the ‘ecosystem distress syndrome’. The field of conservation medicine is an emerging discipline that links human and animal health with ecosystem health and global environmental changes (Aguirre and Gómez, 2009) [1]. The biosphere is threatened by several persistent and synergistic phenomena that are the result of increasing human pressures on the planet: climate change, biological insolvency (loss of biodiversity and ecological processes), emerging infectious diseases (pathogen pollution) and global toxification (pollutants such as endocrine-disrupting chemicals). These factors are working in way to lessen human, domestic animal, wildlife and environmental health of this planet (Aguirre and Gómez, 2009) [1].

Large-scale anthropogenic habitat alteration and biodiversity loss have led to ecosystem disruptions that include, among other impacts, the modification of disease transmission patterns, the accumulation of toxic pollutants, and the introduction of alien species and pathogens. As the natural resilience of ecosystems is reduced and ecological barriers to disease transmission are weakened or eliminated, there is a highest probability of the emergence and redistribution of infectious diseases and other symptoms of deteriorating global health (Aguirre and Gómez, 2009) [1]. Further, common signs of ecosystem degradation were characterized as the ‘ecosystem distress syndrome’. Although defining the concepts of ecosystem health and ecosystem medicine can be challenging, one definition is: ‘a systematic approach to the preventative, diagnostic, and prognostic aspects of ecosystem management, and to the understanding of relationships between ecosystem health and human health. As well, it seeks to understand and optimize the intrinsic capacity of an ecosystem for self-renewal while meeting reasonable human goals. It also encompasses the role of societal values, attitudes and goals in shaping our conception of health at human and ecosystem scales (Anon, 2009) [6]. Other definitions include a greater emphasis on biodiversity and conservation, but all of them take a broad, ecosystem-wide view of health and disease (Aguirre and Gómez, 2009) [1].

5. Eco-health and its Public Health Maintenance Facets
Eco-health is an emerging field which looks at the complex linkage between human, animals and environment (Biological, Physical, social, economic) in order to improve the health and wellbeing of people, animals and the general ecosystem components (Diaz et al., 2006) [8]. Biodiversity has an important role to play in protecting human health and can, in some cases, act as a buffer to the transmission of infectious diseases (Diaz et al., 2006) [8]. It is clear, therefore, that the long-term maintenance of global human health requires the preservation of biodiversity and ecosystem functioning. Because changes to the ecosystem have had an obvious effect on disease emergence and transmission, there is a growing awareness of the relationship between health and the environment. The complexity of this interconnectedness means that there is a need to develop novel strategies for disease
prevention, environmental management and biodiversity conservation (Tabor et al., 2001) [11].

As human influence over the global environment increases, the training of wildlife veterinarians in ecosystem health and conservation medicine becomes a critical priority (Mazet et al., 2006) [13]. As well, the spread of disease to endangered wildlife species from contact with humans and domestic animals increases as humans and their domestic animals encroach on the land available for these species (Sharon et al., 2000) [19]. Therefore, the author believes that underlying causes of environmental changes should be addressed so as to keep the public health and the entire ecological health of the ecosystem under human existence.

6. Wildlife Species of Epidemiological Significance
Management of disease in wild animals should be sustainable, based on sound epidemiological and ecological knowledge, and must balance the requirements for preserving biodiversity, and protecting human health and economic well-being (Richard et al., 2009) [18]. There is no doubt that recent years have seen a growing recognition of the potential importance of wild animals in the epidemiology of diseases that impact on global human health, agriculture and biodiversity.

Wild animals are of particular interest because they share so many common pathogens with domestic livestock and humans, and consequently play a prominent role in the dynamics of diseases of public health and agricultural concern. Most known zoonotic diseases infect carnivores, livestock and commensal rodents, probably as a result of the historical and evolutionary associations with humans (Richard et al., 2009) [18]. Wildlife is considered as natural reservoirs of pathogenic organisms. The interface between human, animals and the natural environment is being narrowing due to the heavy dependence of the global community on natural resources. Owing this the emergence of disease of public and animal health is gaining a global concern. Hence, the wildlife species of epidemiological significance are poorly known. This section of the review will deal with certain disease ecology importance species.

7. Wildlife Diseases of National and International Importance
Depending on the nature of the disease in the national economy, global public health and the emerging changes of the global environment it can be grouped in to national and international arena. Disease of national importance can be defined as a wildlife disease characterized by posing negative impact on the link between human and natural environment at regional level. As well, disease of international significance is a diseases spanning across the international continuum with negative impact on the human and animal health along ecological setting.

7.1. Avian influenza in wild birds
Migratory wild birds are reservoirs of low pathogenic avian influenza (LPAI) viruses (Alexander, 2000) [4] but their role in transmission of highly pathogenic avian influenza (HPAI) viruses is still not clear and requires further investigation and research (Munster et al., 2005 [14], Normile, 2006) [15].

7.2. Rinderpest
Rinderpest, also known as cattle plague, is historically the most important disease in African wildlife. In eastern Africa, its impact in wild ungulates was significant and a major contributor to the decline of animals in epidemic areas. It poses a negative effect on biodiversity and environmental stability and health. As of a few years ago, the disease had been eradicated in most parts of the world and the remaining suspected foci of infection was the so-called Somali ecosystem, comprising Somalia, northeastern Kenya, and southeastern Ethiopia. These countries were the last in the world to fulfill the OIE (World organization for animal health) pathway to be declared free from rinderpest in 2009. The presence of the disease in this region was attributed to the breakdown of effective surveillance and vaccination programs in Somalia (David et al., 2012) [17].

7.3. Trypanosomiasis
Tsetse fly (Glossina spp.) The flies are the main vectors of most of the African trypanosomes that cause chronic wasting disease in livestock, wildlife, and humans (David et al., 2012) [17].

7.4. Anthrax
Anthrax is a disease caused by the bacterium Bacillus anthracis which causes acute and peracute deaths in domestic and wild animals. Anthrax is endemic in sub-Saharan Africa and is one of the diseases that cause significant mortalities of multiple wildlife species across Africa. In 2005–2006, anthrax caused the deaths of about 53 Grevy’s zebra (Equus zebra) (David et al., 2012) [17].

7.5. Bovine tuberculosis
Bovine tuberculosis (BTB) is caused by a bacterium, Mycobacterium bovis, an infectious organism that is emerging as a threat to diverse wildlife populations in Africa. Ungulates, cheetah, and lion are some of the wild species threatened by bovine tuberculosis infection in South Africa (David et al., 2012) [17].
7.6. Clostridial enterotoxemia
Two types of amphibian diseases are of particular international importance – the fungal disease chytridiomycosis and diseases caused by rana viruses. Both are associated with the critical decline of amphibian populations that is occurring globally. Chytridiomycosis has become epizootic in wild amphibians, resulting in loss of amphibian populations across the five continents. The scale of the international trade in amphibians is considerable - animals are transported as a food source, for the pet, for additions to zoological institutions and for bio-control purposes – and this trade constitutes a predisposing factor to unchecked spread of diseases (Munster et al., 2005) [14].

8. Applied Epidemiology, Surveillance and Risk Assessment
The ongoing threat of new and emerging diseases, the dynamic relationship between host, pathogen and the environment in endemic disease, and ongoing research highlight the requirement of this strategy to be reviewed and adapted as information and priorities change. Whilst disease surveillance can be undertaken by a range of wildlife health managers and researchers, there is a need for a veterinary officer to collate data, priorities disease intelligence, adapt strategies to changing dynamics, and effect management guidelines (Annie & Michel, 2008) [8]. Risk analyses have become an essential tool for government primary industry departments worldwide in managing the risks of importing and/or spreading animal diseases in commodities. The Import Risk Analysis (IRA) framework is used to assess the potential risks of allowing entry of biological material from outside and the movement of material across State borders (Annie & Michel, 2008) [8].

9. Veterinary Techniques and Interventions for Conservation Medicine
Disease can affect individual hosts by reducing growth rates or fecundity, increasing metabolic requirements, changing patterns of behavior and ultimately may cause death. Veterinary techniques can help to halt all outbreaks of diseases to conclusively investigate and institutionalize appropriate control and monitoring systems (David et al., 2012) [7]. The conservation medicine approach shares similar values to Eco-health and the parallels in both approaches have recently led to an increasing convergence of the two. This has led to a broader discipline incorporating infectious and non-infectious diseases, epidemiological and ecological methods, and disease control and development (Zinsstag, 2012) [24]. Various threatening factors are operating in concert to diminish human, domestic animal, wildlife and environmental health on this planet. By including conservation medicine and ecosystem health into veterinary curricula worldwide we can train young veterinarians that will help change paradigms and be able to form trans-disciplinary teams. These veterinary professionals will develop new tools for assessing and monitoring ecological health and will be prepared to fulfill critical roles in sustaining global ecological health.

10. Wildlife Disease Management Strategies
Management may be directed at the disease agent, host population, habitat or be focused on human activities. Disease agents may be dealt with in the environment through disinfection or in the host through treatment. Three basic forms of management strategies exist for wildlife diseases, namely; prevention of introduction of disease, control of existing disease or eradication. The desire or need to actively manage infectious diseases in wild animals is a relatively recent phenomenon, compared to health management in human and domestic animals. In the past occurrence of infectious disease among wild animals received little attention except when major events occurred, often involving the health of humans or domestic animals (Wobeser, 2002) [24]. Management of disease in wild animals is usually undertaken for some reason that will benefit humans, such as reducing or controlling zoonotic diseases, diseases shared with domestic animals, or disease conditions considered being detrimental to species valued by humans (Wobeser, 2002) [24]. Two questions should be addressed early in the discussion of management of disease in wild species. The first is the desirability of altering the course of disease in free living organisms (Wobeser, 2002) [24]. Most of the environmental disruptions result from human activity and no wild animal lives in an environment that has not been modified in some manner by humans. For this reason disease management can be viewed as an attempt to mitigate other human actions. Management of disease in wild animals is usually conducted at the population level where individual’s treatment is largely impractical. Thus, management of environmental factors to improve nutrition, sanitation, water quality and other habitat factors with manipulation of host population is possible in many wild populations, so that management of many diseases may be feasible (Wobeser, 2002) [24].

10.1. Classification of Wildlife Disease Management
Disease management can be classified in to four basic categories, namely; prevention, control, eradication and doing nothing (laissez- faire). Prevention includes all those measures designed to exclude or prevent the introduction of a disease into unaffected individual animal within a population or into unaffected population. Control applies to activities designed to
reduce the frequency of occurrence or the effects of an existing disease within an individual animal or population to an acceptable or tolerable level, or to contain the spatial spread of infection. Management of this type implies that some level of disease will persist in the population and that in most instances the control measures will have to be continued in perpetuity. Eradication involves the total elimination of existing diseases. laissez- faire or not attempting active management has been the most common approach to disease of wild animals persist in the past and may be the most appropriate method when the feasibility and probability of success of other options have been considered. The choice among these four basic techniques depends upon why management is required, whether, or not the disease is already present in the area or population, the availability of techniques for detecting diagnosing and managing the disease, the availability of funding on a continuing basis for management, the likelihood of success. Selection of the most appropriate technique requires clear understanding of the causes and ecology of the disease, including the course of the disease in the individual and the population biology of the parasite and host interaction (Wobeser, 2002) \(^4\).

11. Emerging Issues and Challenges in Managing Wildlife Diseases

There are several challenges that are evolving in management of diseases in wildlife populations. One of these is the emergence of new infections. Although little is understood about the dynamics of diseases in most wildlife populations, evidence demonstrates that wildlife plays a key role in emergence of many diseases. According to Jones et al. (2008) \(^1\), emerging infectious diseases are dominated by zoonoses (60.3%) and the majority of them (71.8%) have a wildlife origin. There are many likely reasons for disease emergence, such the consumption of wildlife, as well as ecological factors that affect patterns of contact between livestock and humans with wildlife: for example, deforestation, population movements, and intrusion of people and domestic animals into new habitats. Another reason is shifting weather patterns due to climate change that affects host-vector–pathogen dynamics. In these days of rapid human and animal movements, as well as threats of bioterrorism, diseases may spread from one continent to another very hasty (David et al., 2012) \(^7\).

Another emerging challenge is the increasing interactions between domestic animals, humans, and wildlife. Interactions are a key issue in livestock economies, where many communities live in close contact with wildlife. These interactions are increasing due to a number of reasons, including rising human population and frequent droughts, which is bringing wild animals, livestock, and humans into closer proximity at watering points and pastures. Because wildlife is generally susceptible to the same disease agents as domestic animals, it is suffering a spillover of diseases from domestic animals (David et al., 2012) \(^7\). Appropriate management of diseases in wildlife poses major challenges to wildlife veterinarians. There is still inadequate knowledge of disease dynamics in wild animal populations, which limits the development of effective strategies. Options for disease control are also limited and often have implications for wildlife welfare. Many strategies, such as culling and creation of barriers (for example, disease-free zones), invariably results in harm to wild animals. Conventional approaches to animal disease control, such as vaccination or treatment to reduce transmission, also have limitations in wildlife populations. Specific vaccines and treatments are often unavailable or untested for use in wildlife, and delivery in field settings is beset by logistic, financial, and ethical considerations. Disease management in wildlife populations is also an expensive venture in terms of required resources, such as immobilization drugs and darting equipment. Wildlife is also often found in remote areas and difficult terrain. Interventions therefore require immense resources in terms of transport; strong vehicles are needed for use in rugged terrain, and sometimes a helicopter for hurrying. In addition, laboratory capacity is still limited for diagnosis of most diseases (David et al., 2012) \(^7\). Since wildlife species span a broad taxonomic diversity and are generally free roaming, monitoring wild animal populations poses several challenges. All diseases for which wildlife act as a reservoir and have an impact on animal populations (wild and domestic) and humans or a combination of all, need extra attention from the international community.

12. Eco-Health and Emerging Infectious Research and Policy Issues

Wildlife disease monitoring, prevention and control are crucial factors for protecting biodiversity, public and animal health worldwide. Animals in the wild are both targets of and reservoirs for a pathogen capable of infecting domestic animals and humans. A series of factors amplify the movement of pathogenic agents geographically, within and between animal populations and between animals and humans. Most of these factors are man-made and the trend will intensify with climate change, globalization, demographic evolution and linked new social behaviors. With increased ‘traffic’ on a global scale infectious agents have more opportunities to mix, transmit between different species and exchange genetic material that could
An animals in the wild are both targets of and a reservoir for pathogens capable of infecting domestic animals and humans: they can transmit diseases but may themselves fall victim. It is vital to improve our knowledge of the diseases present in wildlife and the ways in which they can be transmitted to and from domestic animals and humans, in order to devise appropriate control measures (www.oie. Int, 2015) [22]. The development of science-based standards on disease detection, prevention, and control as well as safe trade measures to harmonize the policies related to disease risks at the interfaces between wildlife, domestic animals, and humans (www.oie. Int, 2015) [22].

13. Conservation Implication

Human activities and environmental changes are resulting in new infectious disease dynamics and new patterns favorable to pathogens spreading both geographically and between species as well as new opportunities for increasing genetic variability. Wildlife, farm animals and even humans fall victim to this increasingly common pattern. The international community as a whole must consider prevention and control of animal diseases in wildlife as crucial components of safeguarding of global animal and public health as well as biodiversity, while dealing with related agriculture and trade issues.

From conservation medicine sciences perspectives, Ethiopian protected area system require establishment of satellite clinics of fully equipped wildlife veterinary staffs within its conservation catchments. Furthermore, research practices and policy landscape of conservation importance wildlife biota should be supported with zoological medicine practices. This will ensure our collective efforts of wildlife management and conservation practices. The same importance and thoroughness given to the surveillance and control of diseases in farm animals must apply to wildlife as global movements and exchange of pathogens within and between the two populations are increasing. Moreover, wild animals frequently serve as sentinels for diseases of domestic animals, and can play an important role in the control policies. Finally, capacity building in conservation medicine at different levels, namely from individual to institutional levels, is needed in the region and sensitizing policy makers on Eco-health so that this approach could be happen at a larger scale in research, teaching and intervention.


Ethiopia wildlife biodiversity is characterized by typical variation in diversity. Owing this, there are several protected areas sanctuaries, community based wildlife conservation areas. The current trends of anthropogenic and natural factors are threatening wildlife biodiversity of Ethiopia. Therefore, emergence of wildlife disease from such global environmental challenge need to be addressed via conservation medicine perspectives. Conservation medicine plays a role in maintenance of ecosystem health along human, animal and environmental lines. Hence, establishment of wildlife veterinary clinics of modern type should be the lesson to be learnt in Ethiopian scenario. As well, the clinics should be capacitated with the intended human resource. Moreover, the issue should attract the interest of higher educational institutions curriculum development so as to produce competent personnel in the professional gap being formulated. On the other hand, protected area personnel should be trained of basic wildlife veterinary practices so as to rescue emerging wildlife diseases in key protected areas.

Introduction of an ecosystem health viewpoint which represents a fundamental shift in thinking or switching the emphasis from treatment to prevention can have a wider conservation implication of wildlife biota and ecosystem. In general, establishment of wildlife veterinary clinics, professional development, curriculum development need to be scaled up in the effort to introduce conservation medicine in Ethiopian protected area system.

15. Conclusion

In this review, we have outlined conservation medicine practices as a means for sustaining ecological health of wildlife genetic diversity of Ethiopia. Overall, we found, ecosystem approaches to human health
approach is action-based research premised on the notion that human health and development depends on healthy ecosystems. However, it is noted that Eco-health is not only concerned with infectious wildlife diseases but also used to deal with wider environmental issues including chemical contamination. Because changes to the ecosystem have had an obvious effect on disease emergence and transmission, there is a growing awareness of the relationship between health and the environment. The complexity of this interconnectedness means that there is a need to develop novel strategies for disease prevention, environmental management and biodiversity conservation. Conservation medicine strives to understand health in an ecological context (identifying the environmental determinants of health) and use that understanding to develop preventive or corrective approaches and to maintain the health of all species in a sustainable fashion. There are no simple solutions to address global health problems in the context of ecological settings. A multi-pronged strategy is required. By including conservation medicine and ecosystem health into our university curricula, we can train young wildlife veterinarians, conservation biologist and wildlife graduates who will be able to help find solutions to critical environmental problems by changing paradigms and forming trans-disciplinary teams. The dynamic landscape of research and application of the approach provides a wider space to address the interlinkages of health and the environment.

16. Way forward
In view of the conservation status of wildlife population, a multidisciplinary disease response committee comprising mandated institutes and other stakeholders should be formed to conduct surveillance, research, and response on diseases affecting our wildlife genetic diversity. Moreover, in order to address wildlife diseases, emerging challenges, mainstreaming the range of diseases under the surveillance programs of research institute should be considered. As well, surveillance should be stake in to act as an early warning system for any disease outbreaks in the protected area system. Concern should be given to diseases that cause wildlife mortalities, those that impact on livestock, and those of public health importance.

Emergence of wildlife diseases coupled by the rapid spread of infectious pathogens across continents demands revolutionary changes in our approach of zoological medicine. The authors believe that, use of systems that can detect early or predict emergence of existing, introduced, or novel pathogens is an important tool to be used in wildlife management scenario. To attain this, it needs the incorporation of advanced molecular diagnostic platforms and creating links with institutions that provide remote sensing outputs for use in predicting disease outbreaks.

A multi-disciplinary, multi-sectorial and systems based approach of wildlife disease management should be formulated. It also needs to be strengthened via the converging global challenges of climate change; biodiversity loss, emerging infectious diseases, wildlife conservation and sustainability with novel and effective approaches and solutions. The complexity of these challenges is such that teams of experts are needed to adequately address the issues. Transdisciplinary (TD) thinking brings together academic experts, field practitioners, community members, research scientists, political leaders, and business owners, among others. It needs working together to solve some of the pressing problems facing the world, from the local to the global, in areas such as sustainability, social science, ecology, ecosystem health and animal health. Human, animal, and environmental healths are interrelated. Thus, one eco-health policy landscape should be stake in to different sectors working in wildlife conservation and management issues. Moreover, all the scientific community need to share perspectives and ideas of integrative research on polluted environment, human health and efficient community environmental management. This will support our effort of sustaining eco-healthy ecosystem via maintenance of the health of animals, humans and the environment in general. We suggest that the way forward for conservation medicine should be from a regional perspective in terms of research, training and policy issues.

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18. References