

# A Hidden Corner of the “One Health” Concept: One Health, the Military Veterinarian, and Education

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*Public health belongs to the “One Health” umbrella. As military veterinary medicine evolved, it became embedded in national security. Many armed forces still have active veterinary services, both regular and reserve components. The military veterinarian can serve as an interface between civilians and civil organizations, can handle complex and interdisciplinary cases. Introducing the “One Health” concept both in practice and education has encountered many difficulties. Over time, “One Health” has been judged to be a “buzz word” in civilian areas; however, it is a weighty concept. Its importance is pronounced in military areas where practicing along One Health principles were present before the appearance of the term itself. Nevertheless, military “One Health” has not penetrated into the overwhelming “One Health” literature. Emphasizing the military aspects of One Health not only reveals an obscure corner but might help to regain the proper importance of the “One Health” concept.*

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## “One Health” Concept

The “One Health” concept, articulating the interactive “health triangle” of humans, animals, and the environment, is widely acknowledged and supported by veterinary legislation and organizations. [1] [2] [3] [4] [5] [6] [7] [8] The Global Health Security Agenda launched by the USA and endorsed by more than 40 countries also stresses the “One Health” approach. [4][9]

Under the umbrella of the “One Health” concept veterinarians control zoonoses, food-borne pathogens, chemical residues, risks due to companion animals to ensure safe animal products and food for human consumption, and to improve the health of people. [3][8][10] Embedding the “One Health” concept in veterinary curricula, collaboration between veterinarians, physicians and other scientific health and environmental professionals, facilitating student-driven initiatives, improving leadership and management skills, spreading information and attracting people to postgraduate education via new communication ways are considered to be ultimate goals. [5][11]

According to the American Veterinary Medical Association, out of the 1461 diseases recognized in humans, almost 60% are due to multi-host pathogens. Over the last three decades,

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approximately 75% of new emerging human infectious diseases have been zoonotic. The most effective and cost-effective way to protect humans is to control disease in the animal host. [12] According to the World Health Organization (WHO) environmental hazards account for 25% of the total disease burden worldwide. [13] Several authors list the top factors of a successful “One Health” strategy that comprises the equilibrium between the quality and cost of health. (Table 1)

Crisis situations effectively induce the adaptation of organizational structures; however, we should not wait for crises. For example, in Europe, the annual zoonoses report is jointly issued by the European Food Safety Authority (EFSA) and the European Centre for Disease Prevention and Control (ECDC). These agencies are increasingly collaborating around outbreaks, e.g. the emergence of Schmallenberg virus. Vector-borne diseases are also good candidates for the “One Health” approach. [9]

Considering local and regional socio-economical features are key issues for a successful “One Health” implementation. Within this, three stages can be identified. In stage one areas the focus point is “food security”, at stage two it is “food safety”, while at stage three the principal aim is “food acceptance” where veterinary public health has undergone evolution and has become preventive population medicine. [3]

Stage one and/or underserved communities require more attention to successfully implement “One Health” actions worldwide. One example for such communities is the mobile pastoralist community in Chad. Health service is not the only priority there; the safety of livestock, access to pastures and water, personal (in)security, lack of access to education are also huge problems. Health and “One Health” issues cannot and should not be separated from the above problems. The holistic approach [12] combines public health and nutrition, animal health and food security, resource access and pastoral security, and basic education and information in a “minimum packet of services” that would be available in each area where nomadic communities occur. This service should be flexible and should follow seasonal variations and pastoral movements. [17]

The White Paper on Food Safety of the European Commission [18] stresses the role of veterinarians and veterinary services in public health. Rubin et al. [16] states that human medicine is traditionally engaged in “One Health” while the leadership is predominantly drawn from animal health sector. The third sector, wildlife health/wildlife management is the one that struggles most with the “One Health” concept since it primarily focuses on human health, secondarily on domestic animal health, while wildlife health and ecological health is considered to be an afterthought. [16]

As Uchtmann et al. points out “a future ‘One Health’ surveillance system should unify the efficiency of public health, the depth of human medicine, the breadth of veterinary medicine, the expanse of ecology, the practicality of economics, and the wisdom of peacemaking.” [14: 13] More than 100 years ago medical training was broad. Later on, specialization advanced and medical and veterinary sciences became separated; [9] [19] and veterinary medicine was shifted to the agricultural sector. One health requires the reunion or at least the increasing overlap of these two medical branches. [9] [20] Moreover, both branches should concentrate more on public health, emerging and re-emerging diseases and environmental management. [12]

Collaboration between human and veterinary medical experts is hindered by many factors; not only by precautions but the separate data recording systems. One example of a joint

database is the Global Early Warning System (GLEWS) which is gathered by the Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE) and WHO, and confirmed by the national authorities. In Egypt, Vietnam and Indonesia, so-called “4-way linking” platforms were established: a joint public health-animal health risk assessment based on data from epidemiology units and laboratories. In Canada, information on risk factors prevalence and resistance data for enteropathogens are collected along the food chain including animal and human sampling. This integration yields enhanced early detection of emerging threats. [9]

## “One Health” Concept and the Military Veterinarian

Public health is increasingly considered a national security issue. National security information is expected to be accurate and timely so such issues can be quickly elevated to the highest levels of government. [21] Public health got embedded in national security when military veterinary medicine evolved. General George Washington demanded a farrier for a regiment of horses in 1776, in the USA. [22] Up until the end of the First World War, horses and other animals were commonly ordered to the battlefield or to the supplying regiments. By the late-19<sup>th</sup> and early-20<sup>th</sup> centuries, veterinary corps appeared in national armed forces to protect and treat military animals. For example, in the Republic of Korea Army, Veterinary Corps were integrated in the Army Medical Department in 1948. Their mission was to provide food safety and inspection services, zoonotic disease prevention and control; laboratory animal medicine works for medical research support, clinical veterinary service for government owned animals. [23] (Table 2) When mechanized warfare spread, the majority of service horses were retired, and the supporting veterinary corps were often disbanded. [24]

Many armed forces still have active veterinary services, both regular and reserve components, such as the United States Army Veterinary Corps and the Royal Army Veterinary Corps (UK). Both International Security Assistance Force and North Atlantic Treaty Organization (NATO) have used veterinary programs in Afghanistan. However, military veterinarians are also applied in Domestic Operations such as in case of disasters. The Canadian Veterinary Medical Association established the Canadian Veterinary Reserve (CVR) as a civilian tool for emergencies. Noteworthy, it was formed to give the Canadian Food Inspection Agency an extra capacity for a foreign animal disease outbreak. [24]

In the USA, the former U.S. Army Veterinary Command (VETCOM) and the former U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) was merged and the U.S. Army Public Health Command (USAPHC) was formed in 2011. The mission statement for this new command is “to promote health and prevent disease, injury and disability in soldiers and retirees, their family members, and Army civilians and to assure effective execution of full-spectrum veterinary services for the Army and Department of Defense”. [25: 1] This induced the embracing of the One Health concept in the military. The USAPHC started to elaborate a Zoonotic Disease Report (ZDR) in the same year. ZDR combines zoonotic disease risk assessment and zoonotic disease data from human, entomological, laboratory, and animal data sources; however, animal disease data is currently limited to that available from public data sources. [26]

According to Burke [4] the US army is uniquely positioned to implement the “One Health” concept since it applies health personnel from all the three disciplines (medical, vet-

erinary, and environment) to protect and promote health. The awareness of the “One Health” concept and the often stovepipe-like organizational structure are identified as weaknesses. In case of deployment, medical personnel need – preferably joint – training to accomplish missions that are non-traditional for their career field and must have knowledge about other mission requirements and gaps in responsibilities. So the creation of USAPHC is not enough by itself. Awareness must be increased and predeployment training is inevitable. However, not all responsibilities can be shared between disciplines because certain functions require special training and certification e.g. pasteurized milk audits. Another opportunity to promote the One Health concept is the U.S. Army Medical Department (AMEDD) Basic Officers Leaders Course (BOLC).

The spectrum of USAPHC’s public health responsibilities is broad: beyond humans, it includes animals and the environment, where some of the causes of human diseases, injuries and disabilities originate; unsafe drinking water, spoiled food, ineffective sanitation measures, mold in the workplace etc. The emphasis in Army Medicine should be shifted towards prevention and USAPHC is a key organization in the above process. [25]

In USAPHC, many military veterinarians serve. According to the US Army Field Manual 4-02.18, Veterinary Service Tactics, Techniques and Procedures the three main functions of the military veterinarian are:

- food safety, food security, and quality assurance;
- veterinary medical care;
- veterinary preventive medicine. [27]

All these veterinary functions in fact express the One Health concept. [24]

The modern military veterinarian can employ the above three functions in support of three broad military roles:

- support to conventionally-deployed forces;
- support to civil authorities;
- support to operations other than war. (Table 3)

The military veterinarian can serve as an interface between civilians and civil organizations assisting with disasters, can handle complex and interdisciplinary cases and also can help his/her liaison with orienteering in the specific, often emotional environment around pet animals and livestock. [24]

Military veterinarians often work with local communities within an area of operations, provide basic training to local veterinarians and farmers, and facilitate the delivery of products (e.g. vaccines, de-worming medicine). The improvement in overall conditions of the people and the society can result in a shorter period between the commencement of military operations and the handover of a secure area of operations to civilian authorities. Such projects can be relatively inexpensive and short-term, but can also yield long-lasting benefits. [24] Military veterinarians also help in obtaining horses, mules and donkey from local stocks [22] [24] [28] and have a key role in caring for military working dogs (MWD) [29] and using them as sentinels for different zoonoses such as Lyme borreliosis. Evans [26] found strong positive correlation between military human borreliosis data and military pet dog *Borrelia burgdorferi* seroprevalence data by location in a pilot study.

Within NATO, the Committee of the Chiefs of Military Medical Services (COMEDS) has the authority to develop and maintain medically-related standardization agreements. One of the expert panels is the Food and Water Safety and Veterinary Support Expert panel

(FWSVS), charged with “initiating and developing common principles, policies, doctrines, concepts, procedures, programs and techniques for advice to COMEDS and for standardization and coordination in order to enhance interoperability within food and water safety, environmental health, and for veterinary medicine aspects, in the operational environment”. [4: 1] NATO has recently ratified a revised Standardization Agreement (STANAG) that covers all aspects of the food chain from the audit of food processing establishment to the inspection of catering operation on the battlefield. STANAG 2556 includes three standards. [30] [31] [32]

At the flooding of the Indus river in Sindh Province, Pakistan, one of the initial preventive medicine issues was an Occupational and Environmental Health Site Assessment (OEHSA) for each of the 3 USA military base camps to identify health threats (such as exposure to arthropod, particularly mosquito-borne diseases) and develop recommendations to minimize their potential impact on US service members. Medical personnel must frequently cover gaps and undertake responsibilities traditionally performed by other personnel having other military occupational specialty. [33]

## Veterinary Public Health Education

Incorporating the “One Health” concept in veterinary curricula supposes versatile veterinary training. However, the idealistic picture of the omnipotent veterinarian has been questioned in the past decade. [34] Halliwell [35] argues that veterinarians should remain omnipotent (rather than omnicompetent) so as to be able to change their scope later in their career; however, on an institutional level, covering all aspects of veterinary medical education might lead to mediocre instruction. To avoid this, establishing collaborative programs are needed. [11] [35] [36] [37] [38]

Ortega et al. [39] also emphasizes that the role of veterinarians is transforming from “traditional animal doctors” to “quality assurance managers” and “VPH policy negotiators” and the need of reflecting such changes in veterinary curricula. Many international organizations elaborated the list of core areas, minimum requirements and skills for veterinary medical education. Those areas according to the World Veterinary Association:

- disease control (both for domestic animals and zoonoses);
- food inspection;
- safety of food of animal origin;
- animal health and welfare;
- research on topics related to animal health, animal welfare and public health”. [40]

Rubin [16] added leadership, communication, and organizational management skills as core competences to “One Health”.

The American Veterinary Medical Association Council on Education specifies veterinary curricula should include “instruction in the principles of epidemiology, zoonoses, food safety, the interrelationship of animals and the environment, and the contribution of the veterinarian to the overall public and professional healthcare teams”. [41: 1] To satisfy societal demands, Smulders et al. [42] highlights that veterinary professional curricula should be reviewed and FH/VPH elements should be upgraded.

The main duties of Public Veterinary Services should also be considered when designing/updating veterinary curricula: “improved animal health, leading to increase in the quality and quantity of animal protein production and decrease in poverty and malnutrition; public

health, including prevention and control of zoonoses transmitted by animals and foods; international veterinary certification, for better access to regional and world markets (including for certain populations of nomadic livestock keepers); the prevention and control of any potential use of animal pathogens in bioterrorism; the protection of animals, biodiversity and the environment.” [43: 18]

Specific “One Health” courses and graduate programs that merge technical and leadership/networking training were launched mostly in the past 5 years. Graduates are expected to be employed around outbreak investigations or in the area of public policy. [9] In London, an MSc in “One Health” (Infectious Diseases) program is offered jointly by the London School of Hygiene and Tropical Medicine and The Royal Veterinary College in London. The University of California – Davis launched the Calvin Schwabe “One Health” project that aims to develop a new generation of veterinarians gaining “One Health” experience during their studies. [44] At the Royal (Dick) School of Veterinary Science, University of Edinburgh, United Kingdom, in the bachelor degree program an “Animal health, welfare and food safety” module is offered. After the bachelor degree, a Program for Master’s degree in “One Health” (with a “Zoonoses and emerging diseases” module) can be completed. [45]

Bellemain [46] highlights that about 10% of the veterinarians are involved in areas related to Public Veterinary Services activities worldwide yet most of them are not expected to take part in specific training. Therefore key concepts and tools of public veterinary services (e.g. links between veterinary services and stakeholders, importance of the veterinary monitoring of slaughterhouses) should be incorporated into veterinary curricula. After graduation, post-recruitment initial trainings and Continuing Professional Development (CDP) might help to complete and maintain those competencies. [47]

## Education for Veterinary Corps Officers

Veterinary medicine evolved from para/military education worldwide. For example, in Turkey, civil veterinary education started in 1871 at the Military Academy. Later on, the first Civil Veterinary School was founded in 1889. [48]

In the AMEDD the duties of different Corps are usually clearly differentiated. However, food inspection is an exception since it is performed by both veterinary and preventive medicine personnel. Before entering into military service, officers complete 4 to 8 or more years of formal education. Additional Corps specific training and/or annual professional continuing education is also completed. [4]

Torrington and Mey [49] introduced a First Year Graduate Veterinary Education Program (FYGVE) that aims to prepare newly commissioned Veterinary Corps officers (VCOs) for the wide variety of technical and leadership challenges that occur at their first military duty location. VCOs should have broad, well-established, and practice-oriented training to:

- “ensure food safety, wholesomeness, and related quality assurance standards;
- perform inspections of operational rations and other service-owned subsistence;
- perform sanitation audits of commercial facilities that produce food for Department of Defense procurement and military food establishments;
- perform risk-based evaluations of food sources in a deployed or austere environment;
- evaluate laboratory test results pertaining to submitted food samples”. [49: 39]



Although veterinary graduate programs include training in microbiology, virology, and epidemiology; they contain “little to no specific food safety training”. [49] [50] The FYGVE program curriculum includes hands-on experience in: sanitation audits, operational food and water risk mitigation and installation-level food protection, veterinary medical care, veterinary preventive medicine, and the veterinarian’s role in the “One Health” concept (topics include zoonotic diseases, installation rabies board policy, bite reports, foreign animals diseases, response to refrigeration failures, human-animal bond, inspection of operational rations etc.). The program also comprises a leadership curriculum with the following topics: interpersonal skills, team dynamics, cultural awareness, military and civilian resource management, resources for leadership challenges. The program is launched in different locations across the US. [49]

## Summary

“One Health” appeared at the beginning of the 2000s and has been developed as an umbrella concept embracing human health, animal health and the environment. Global disease statistics underline the importance of the concept: almost 60% of human diseases are due to multi-host pathogens, 75% of new emerging human infectious diseases proved to be zoonotic, and one quarter of total global disease burden can be attributed to environmental hazards. Under the umbrella of the One Health concept veterinarians perform public health tasks. [8] Introducing the One Health concept both in practice and education encounters many difficulties, however, general and individual factors that enhance its articulation can be identified. [9] [14]

Public health is an integral part of national security. One of its branches, military veterinary medicine [21] [24] is expressed as active veterinary services, both regular and reserve components, within armed forces. The military veterinarian can serve as an interface between civilians or civil organizations and the army. [24]

Veterinary profession, especially veterinary education must react to the recent challenges and should foresight future trends and possibilities. To take this step forward, the core paradigm – i.e. focus on individual animal medicine – of veterinary education must be changed. While preserving animal medicine, new priorities such as public health, environmental issues, and ecosystem should be established [38] preferably within collaborative programs [37] [38] that resembles the real work environment of a veterinary corps officer. Although “One Health” courses and graduate programs were launched, less is available for veterinarians entering into military service; [4] however there are encouraging examples such as the First Year Graduate Veterinary Education Program in the U.S. [49]

“One Health” has been used in a wide variety of contexts and thus has been judged to be a “buzz word”; [9] however, it is a weighty concept. In the army, “One Health” principles were already applied for a long time when the term One Health appeared. A good example for the above is a military veterinarian deployed in a military area where the next colleague holding a medical degree is stationed hundreds or thousands of kilometers away. Although “One Health” literature is overabundant, that of military “One Health”, which was the cradle of the concept, is scarce. According to the author’s views, military “One Health” should be scientific awareness both for acknowledging its key role and for making the “One Health” concept regain its significance. Most options are in the hands of veterinary medical schools as places of graduate and postgraduate veterinary education. Emphasizing the military aspects of “One Health” not only reveals an obscure corner but might help to regain the proper importance of “One Health” concept.

## Notes

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## Glossary

*Arthropod*: an invertebrate animal that has an external skeleton, segmented body, and segmented legs.

*Food acceptance*: food-related behavior based on phenomenological responses that result in the acceptance or rejection of food.

*Food chain*: all steps of food production, from the primary producer to the customer (“from farm to fork”).

*Food inspection*: examination of foods, food products or systems for the control of foods, including raw materials, processing, and distribution.

*Food safety*: the assurance that food will not cause harm to the consumer and covers contamination by chemical and biological agents and concerns about inherent food nature.

*Food security*: physical and economic access to food that meets both dietary needs and preferences.

*Lyme borreliosis*: a bacterial disease transmitted to humans, dogs, horses etc. by ticks (alternative name: Lyme disease).

*Zoonosis*: a disease or infection of animals that can be naturally transmitted from animals to humans.

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Table 1. General and individual factors that enhance the articulation of One Health principles. [9] [12] [14] [15] [16]

<p><b>General factors</b></p>	<p>Unified vocabularies  Mandated reporting of complex One Health stressors  Accessible laboratory capabilities  Disease reporting  Best management practices in animal health care  Surveillance in underserved communities  Real-time processing of large diagnostic and syndromic data  Assessments including regional characteristics, economic costs of defense preparedness  Inter-professional trainings  Interdisciplinary teams  Increasing public recognition of the initiative [14]  The 5 C’s: consensus, collaboration, cooperation, coordination, commitment [15]  Cross-agency collaboration  Common external threat  International/federal funding  Nontraditional staff secondments  Sense of urgency and common purpose  Delegated authority or mandated work  Interagency steering committee or working group  Building trust  Willingness to acknowledge the other agencies’ concerns  Science-based outcomes  Legislative backing  Information sharing  Clear definition of roles and responsibilities  Compatible data systems  Building capable teams  Facing and coping with difficulties or conflicts  Commitment to outcome  Accountability  Identification of common mission and goals  Attention to results [16]  Sentinel species/animals  Public health centers where collaboration can occur  Community based projects [12]  Administrative backing  Less organizational and structural barriers [9]</p>
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<b>Individual factors</b>	Commitment and willingness to collaborate Ability to think beyond the boundaries of one’s agency or organization Ability to represent a broad array of interests Decision-making authority or influence within one’s agency or organization Experience in leadership roles and collaborative processes Science or knowledge capacity, or active engagement in One Health activities [16]
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*Table 2. Merwe [12] identified the most important tasks and underlying characteristics of military health services.*

<b>Task</b>	<b>Underlying characteristics</b>
To operationalize the “One Health” concept	Being a natural link between private practitioners, governmental and non-governmental organizations, and the public
To assist intersectoral communication	Inherent collaborative health planning capabilities and its role in especially post-conflict reconstruction
To share its research capabilities and facilities	Interest in a healthy military population that is derived from the broader community
To assist in disease surveillance	Experience in areas of unknown health status, or where all infrastructure has collapsed
To play an active role in post-conflict reconstruction and development (restoration of health services and environmental degradation)	
To advice tertiary institutions as to curriculum needs to address “One Health”	Experience on the battle field

Table 3. The three main roles of military veterinarians. [24]

<b>Role</b>	<b>Means</b>
No 1. Support to conventionally-deployed forces	Caring for military working dogs and other military animals Support to the military medical system (in the area of zoonoses and on the safety of local food procurement) Training soldiers with respect to safe practices around indigenous animals
No 2. Support to civil authorities	Reinforcing provincial and federal veterinarians during an emergency under conditions where civilian veterinarians cannot Advising commanders during domestic operations that involve livestock Animal care and welfare (also important during evacuation of civilians from an area of operations)
No 3. Support to operations other than war	Working in disaster zones or in civilian conflict areas where the quality of life (including livestock health) is the root of unrest Being on the ground first, providing veterinary services during the stabilization period