



Zoonosis from “One Health”: Ethical Reflections on its Relevance

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Abstract

Throughout Humankind history, has had to face several zoonotic diseases, which make them one of the most persistent health concern for societies, health systems and, specifically, people's lives. Due the scientific, technological and research advances, it is now known that around 60% of the emerging infectious diseases reported in the world come from animals, both wild and domestic, and an increase in the last decades have been observed have been detected. From 30 new human pathogens, 75% have their origin in animals, hence the growing interest in these diseases globally.

In the response to emerging and non-emerging zoonotic diseases, it is necessary to adopt a multidisciplinary and integrated approach; which demands the adoption of the “One Health” approach that recognizes the interdependence between human, animal and environmental health. The constraint of used the term approach has stated ethical content as it comprises a process of assessment and provides the reasons to evaluate why human activities and their effects on ecosystems are good or bad, fair or unfair; since the decisions made by people and institutions create conditions conducive to the appearance and spread of such diseases. Through an approach, given the breadth of the topic to be discussed, We aimed to reflect on the ethical reasons that underpin the relevance of the “One Health” approach to zoonotic diseases.

Keywords: Ethics; Zoonotic Diseases; One Health; Ecosystems; Interdependence between Human, Animal and Environmental Health

Abbreviations

WHO: World Health Organization; IAEA: International Atomic Energy Agency

Introduction

Throughout the text, terms that need to be conceptualized will be addressed. These should be taken only as a starting

point; definitions necessarily are dynamic according to the advances in knowledge. In this study we understand “One Health” as a multidisciplinary and integrated approach to emerging and non-emerging diseases, which recognizes the interdependence between human, animal and environmental health. Likewise, the term “zoonoses” is understood as infectious diseases of different types, naturally transmissible from vertebrate animals to humans that are caused by harmful germs such as viruses, bacteria, parasites and fungi.



Such zoonoses can cause many effects in people and animals, from mild to severe illness, lifelong threatening and even the death.

In regard to emerging or re-emerging diseases, the following OIE definition was adopted: “Emerging diseases are defined as new infections resulting from the evolution or modification of an existing pathogenic agent or parasite, which changes the host spectrum, vector, pathogenicity or strain; they also include infections or diseases unknown until the moment of their appearance. A re-emerging disease is a known infection that changes geographic location, whose host spectrum expands, or whose prevalence increases considerably” [1].

The evolution of the human species has been significantly marked by the emergence and re-emergence of various zoonoses. Currently, due to scientific, technological and research advances, it is defined that around 60% of the emerging infectious diseases registered in the world come from animals, both wild and domestic, and an increase in the last three decades have been detected; From 30 new human pathogens, 75% of which have their origin in animals [2]. Likewise, the recent COVID-19 pandemic highlighted three weaknesses in the responses to outbreaks of zoonotic diseases: a) lack of multidisciplinary preparation worldwide and, particularly in the LMICs framework, to respond efficiently to outbreaks of these diseases; b) insufficient interdisciplinary collaboration between researchers from various areas of knowledge to develop articulated responses to emerging and non-emerging zoonotic diseases; c) limited multilateral, regional, bilateral and national actions in search of intersectoral solutions to these diseases [3,4].

In an exponential manner, the insufficiencies of the classical epidemiology paradigm, as the main discipline of public health, transcend more noticeable to address the social and complex nature of the relationship between nature and health: human, animal and environmental, that is, ecosystemic [4,5]. In this scenario, communication, cooperation and interdisciplinary coordination between researchers, actors and decision-makers at the global, regional, national and local level; as well as the activism of interdisciplinary the strengthening of capacities and inclusive research networks are essential to fight against the threat of zoonoses. The defence of health against zoonoses emerging as a priority, from a holistic, multidisciplinary and integrated vision given the interdependence between human, animal and environmental Health is required such as that determined by the “One Health” approach [6,7].

The constraint of the relevance of the assumption of the “One Health” approach in the study of zoonoses has stated ethical content as it includes a process of assessment and

provides the reasons to evaluate why human activities are good or bad, fair or unfair. And its effects on ecosystems, also reflecting the reality and context of people. Likewise, it not only taking in to the account what is done, but also what is not done due to negligence, poor planning and lack of foresight in the decisions made by people, institutions, societies and multilateral organizations, that promote conducive conditions to the emergence and spread of zoonotic diseases.

The Literature review carried out reveals that in the last five years various authors have investigated the relationship between ethics and the “One Health” approach, among which are: Meagher K; Degeling C, et al.; Sheather J; LeBlanc A, et al.; Coghlan S, et al. [8-12]. However, these studies are carried out in an abstract manner and with a generalizing nature without taking into account the Real life reference; which limits the instrumental, purposeful and transformative impact of said research.

This study, through an approach, given the breadth of the topic to be discussed, aimed to reflect on the ethical reasons that support the relevance of the “One Health” approach in the management of zoonotic diseases. Initially, the analysis addressed the conceptual problems around what is called “One Health”, the scope and limitations. Secondly, a reflective exercise was established on how the authors conceive the relationship between ethics and the “One Health” approach. Finally, culminate with concluding reflections. This topic is highly Interest or appropriated given the need to propose theoretical responses with an instrumental nature That showed the relevance of used approach in responses to outbreaks of zoonotic diseases.

One Health: A conceptual problem

For some authors, the “One Health” approach is based on the fact that “...the health of people is closely linked to the health of animals and the environment we share” [13]. Despite this, the scientific achievements produced today do not show a complete conceptualization of what “One Health” is. Furthermore, the abstraction and generalizing content regarding what is considered “One Health” denote that the conceptual issue is open, while the epistemic contents that make up the revised denominations indicate insufficiencies in its construction, so it has not been reached to a finished consensus.

“One Health” is defined by the WHO [5] as an “... approach designed to design and implement programs, policies, laws and research in which multiple sectors communicate and collaborate to achieve better public health outcomes.” This meaning carries a vision focused on results; however the necessary coherent relationships that must be established between programs, policies, laws and research

are not clarified. Nothing is it stated on the conditions that could affect the communication and collaboration of the sectors involved; that are made visible indeterminate in the expression “multiple sectors”.

Likewise, Zunino P [14] focuses on “One Health” as:

New way of facing the challenges currently posed by global Health promotion from a systemic and multidisciplinary perspective. From an operational point of view... it can also be conceived as a strategy to design and implement practices, programs, policies, legislation and research, in order to achieve better results in Public Health (2018: 47).

This conceptualization assumes the operational nature of the previously discussed WHO definition, although at first it limits “One Health” to the frontiers of health promotion.

While other authors emphasize a descriptive perspective, as they express a set of thematic areas, object of study, of the “One Health” approach, such as Rocamora A, et al. [15], who maintain that:

The One Health approach proposes an interdisciplinary and holistic view of health, which considers the links between human and animal physiology and pathology, and how they relate to the environment. This framework is very useful for studying diseases communicable between humans and animals. The One Health approach also addresses the transmission of emerging contaminants, both chemical and biological, and their effects on human and animal health, and on the environmental microbiota, or addresses antimicrobial resistance (2022: 2).

Recently the WHO [6] states that “One Health” is:

An integrated and unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes that the health of humans and the health of domestic and wild animals, plants and the wider environment (including ecosystems) are closely linked and interdependent (2023: 6).

The latest concept provided by the WHO carries a higher level of precision, becoming more focused on the sustainability of people’s health, consistent with that of animals and ecosystems. This definition has the advantage of not reducing “One Health” to exclusively operational and descriptive criteria, although it is limited to a simplistic “integrated and unifying” approach, thereby neglecting important aspects of its scope, impact, projection and sustainability.

These conceptualizations, and others that could be cited, despite expressing “One Health” in various manners and

statements, contribute to a new global perspective of health where they show consensus regarding the interdependence between human, animal and environmental health. The distinctive feature of the “One Health” approach lies in its multidisciplinary and integrated nature, embodied in the interdisciplinary collaboration between researchers from various areas of knowledge, including medicine, agronomy, zootechnics, veterinary science, ecology, epidemiology and social sciences, to develop projects with a holistic approach to response to zoonotic, emerging and non-emerging diseases. The results of this approach are decisive, since the vision of human health proceeds not separated from animal and environmental health as an ontological entity, absolutely opposite and independent. Likewise, this perspective considers the interdependence and complementarity between these forms of health and their conditions; all these achievements have led, and will increasingly lead, to the clearer definition of what is understood by “One Health”.

From the methodological point of view, with the “One Health” approach, health given its Global content reaches a systemic, integrative character, not reducible to the field of a particular scientific discipline. Focused on this way, health is given a holistic character in the face of hegemonic reductionism; the assessment of the integrality of health implies assuming that human health cannot exist or be sustained separate and detached from animal and ecosystem health. When addressing human health, it is pertinent to consider environmental, biological, socioeconomic, cultural, sociodemographic, climatic, agricultural factors, among others, related to the appearance of current zoonotic, emerging and re-emerging diseases and others to come.

The “One Health” perspective provides a transdisciplinary dialectic to find solutions to health problems, including zoonoses, and questions one of the bases of scientific thought, by revealing the concatenation of planetary phenomena and the impossibility of continuing the models of development based on scientific ideas that legitimize man’s dominion over nature based on knowledge, presumably objective and true, capable of guaranteeing it [16]. Likewise, it specifies globality and holistic thinking, traditionally projected as vague and diffuses, to the problem of health, particularly in the effective management of zoonoses.

Undoubtedly, the “One Health” approach contributes to the epistemological analysis of the cultural limits of scientific knowledge and objectivity, to the reconsideration of man’s role in the world and values in questioning the limits of our notion of good and bad, just regarding the problem of human health interrelated with animal and ecosystem health. Therefore, this approach means overcoming the ethical projection of deterministic and reductionist anthropocentrism that defends the interests of human

beings as those who should receive moral attention above anything else.

Human nature, Life styles, well-being and, particularly, its health, from the prism of anthropocentrism, understood as different and peculiar in relation to other living beings, would be the only principles of judgment according to which other beings, and in general should really be evaluated the organization of the world as a whole. Likewise, moral concern for any other species or member of another should be subordinated to that which must be expressed for human beings. At this point, it is necessary to address, in the following pages, the ethical foundations of the relevance of the study of zoonoses with the “One Health” approach, as it includes an assessment process and provides the reasons to evaluate why they are good and fair human activities, what is necessary to make them sustainable with ecosystems; since the decisions made by people and institutions create conditions conducive to the emergence and spread of zoonotic, emerging and non-emerging diseases.

Responses to zoonoses with a “One Health” approach. Ethical foundations of its Relevance

A group of diseases that relate human health to that of animals and the environment are zoonoses. They can be direct, when the pathogenic agent is transmitted directly between animals and humans, or indirect when a vector is involved [17]. Zoonoses are linked to the main areas of “One Health”, which, at the same time, are the three major current challenges in global health: a) food security, b) the control of zoonoses and c) antimicrobial resistance [18].

People Involve in different activities with animals in a certain ecosystem; one of the spheres of interactions is health. The negative consequences of human action on ecosystems caused by the destruction of native fauna and flora, the implementation of unsustainable development models based on extensive crops, the expansion of the agricultural frontier, the inadequate disposal of solid and liquid waste, the massive use of non-biodegradable packaging, the contamination of soil and water sources, extensive urbanization he increase in

the greenhouse effect due to the accumulation of CO₂ in the atmosphere, and the generation of emissions associated with respiratory problems.

Furthermore, by degrading ecosystems, people alter organic functions, as in the case of micro and nanoparticles of toxic chemicals that are in practically all things of daily use, and their degradation ends up being incorporated into the various food chains, the expansion of radiation caused by the communications system, overcrowding in cities, inequality, unemployment and poverty; along with many other causes such as the increase in transportation, the movement of people and goods in recent decades [19-21]. Climate changes on the planet have also produced alterations in the behavioural patterns of hosts and vectors, extractive industries and the invasion of wild areas by extensive urbanization [2].

From the perspective of classical (conventional) epidemiology, as the main discipline that accompanies public health, the predominant approach is that of the risk in the linkage between humans and animals, directly or through their pathogens, their products or their breeding systems. The risk is based, mainly in the case of productive animals, on the morbidity and mortality of animals and humans, on economic losses due to costs in the management of epizootics, disease and death of animals and on the obstruction of Trading.

Despite the contributions of classical epidemiology, the prevalence of emerging and non-emerging zoonotic diseases, among other factors, has shown the limitations of this approach given the fragmented and insufficient vision to conceive the magnitude and complexity of the interactions between human, animal, plants and environment health. Emerging and re-emerging zoonoses have been responsible for the large epidemic outbreaks and pandemics in of recent decades (Table 1). This situation has made clear a general concern about the lack of international security to control these pathogens, as well as the unavoidable need for constant multidisciplinary work aimed at protecting the health of all populations (human, animal, Plant and environment) at a global level.

Pathogen	Initial outbreak	Geographic distribution	Reservoir	Vector	Lethality
West Nile virus	1999	All over the world	Birds	Culex pipiens	10-20%
SARS	2004	United States, Canada and East Asia	Bats	None	11%
Influenza H1N1	2009	America, Europe, Middle East, Asia and Pacific	Birds	None	2-5,4%

MERS-CoV	2012	Middle East, East Asia, Europe and United States	Dromedary camels	None	35%
Chikungunya	2014	South America, Europe, Sub-Saharan Africa, East Asia and the Middle East	Primates, rodents, birds and small mammals.	Aedes aegypti and A. albopictus	Queer
Zika	2015	America, Africa and Asia	Primates	Aedes aegypti and A. albopictus	Low
Ebola	2018	West and central Africa	Bats	None	70%
Crimea Congo	2018	Sub-Saharan Africa, East Asia and Middle East	Birds	Ticks	10-40%
Yellow fever	2019	South and Central America; Sub-Saharan Africa	Primates	Aedes species	50%

Table 1: Emerging viral zoonoses of the last two decades

Source: Re-emerging zoonoses under the “One Health” approach [22].

Given the limitations of classical (conventional) epidemiology, previously addressed the need for a more comprehensive and articulated vision of zoonotic diseases emerges is mandatory. Thus, the “One Health” approach emerges, as a response to zoonoses that assumes the factorial complexity where they emerge, a context in which animal, human and environment health are closely related [7]. The management of these diseases also involves generating and offering viable alternatives for their care from a comprehensive perspective that, beyond a case list, considers their determinants. This would allow, on a real and certain basis, significant achievements in terms of its control, prevention and eradication [23].

Therefore, it is advisable to substantiate the rational and argued justification of the courses of action that outline the relevance of configuring a response to zoonoses from the “One Health” approach, as a preferable perspective among several alternatives. Therefore, it is necessary to reveal the ethical foundations of said relevance; It is not simply a matter of doing what is believed to be ethical, because apparently a wide accepted rule or principle, but it is taken into account, much as possible guaranteeing that the outcome is that with most benefits all stakeholders most benefits the actors, Including probable circumstances; relevant to the Real-life situations, where it is necessary to assess the application of certain principles to global health, particularly to response to zoonoses.

“One Health” is opposed to the anthropocentric conception, which conceives the human species as the center of the universe due to its ability to reason and act. From this perspective, the model of economic and political development promoted an absence of sustainability contemplation. The assumption of the new approach drives essential changes in the health management of zoonoses

in human, plant and animal populations; The health and disease of these populations has involved the sensitive interaction between three factors: the environment (social, geographic, economic, cultural, political, ecosystem), the pathogens, and the populations (human, forest and animal). Any imbalance in any of the above can trigger the activation of new (emerging) agents or the re-emergence of forgotten or neglected diseases, with serious consequences from a health perspective, the local economy and international trading.

Moreover, the “One Health” approach in the treatment of zoonoses conditions, the construction of a new ethos or manners of being of humanity, based on the progressive repetition of acts that give rise to the formation of habits where global health (including human, animal, plant and environment) is a priority outlining the content of human behavior in a specific ecosystem. In a practical sense, the “One Health” context generates guiding ethical purposes that serve as a guide to the way in which people’s behaviour determines their character, their altruism, their virtues and the teaching regarding the best way to act, and behave in an ecosystem, a society, community and family in search of global health against zoonotic diseases.

This new ethos against zoonoses entails the assessment of the perception of the human being, his interests and the logic of his actions as individual, in the community and also with respect to the biosphere where life is sustained. Although people have the rational capacity, the understanding of human responsibility regarding the health and life of the rest of the species has not been predominantly assumed by imposed development models, as Leyton F [24] maintains: The humankind is the only specie with rational capacity, however, with its actions it has increased the environmental crisis derived from the economic and political model, prevailing in our society, the product of a conception that has

placed it as the center and vital axis of existence in the planet (2008: 10).

As can be seen, this author criticizes the irrational basis of the models based on an ethics that he describes as anthropocentric because the moral reflection he carries out on the environment revolves around the human being, projecting a utilitarian and hedonistic conception, configuring people into completely egocentric beings. This rationality has created the cultural crisis where reductionist approaches have been developed regarding zoonoses as they promote the fragmentation of human consciousness, making humanity indifferent to the destruction and devastation of ecosystems and nature, so in the medium and the long term, respect for health and with all life is lost. However, this paradigm recognizes the need for favourable environmental conditions for survival, well-being and short-term development, according to the interest of reproducing the status of life under the prism of hegemonic comfort to the detriment of the rest of the species and the ecosystem in general.

In this sense, it should be taken into account that the ethical foundations provide a set of knowledge derived from research into human behavior, explaining and configuring the theoretical basis to assess why the “One Health” approach is good and fair to ensure prevention and efficient control of zoonotic diseases, through comprehensive programs, interdisciplinary management and intersectoral cooperation (agriculture, zootechnical, agriculture, socioeconomic, sociodemographic, health, environment) at local, national, regional, international and ecosystem levels, As the overall framework.

Through promoting interdisciplinary collaboration between researchers from various areas of knowledge, including: medicine, veterinary science, ecology, epidemiology, agriculture, zootechnics and social sciences, to develop research, actions and decisions with a holistic response perspective, allowing the accurate diagnosis of the factors as ecosystemic, biological, socioeconomic, sociocultural and sociodemographic determinants related to the appearance of zoonotic diseases, an essential condition for their articulated and effective management.

The “One Health” approach challenges is overcomes the conception where the human species appreciates nature as useful elements and factors to satisfy their individual needs and interests, focusing and applying science and technology related to the justification that nature should be available Particular and for few purposes and purposes. The ethics projected by “One Health” consider not only human beings to be morally relevant, but that they, as subjects with ethical rights and duties, must be rational changing agents

capable of making decisions and assuming responsibilities regarding their own health, that of the rest of the species and ecosystems, that is, humanity must consciously assume its responsibility with global health to coherently guarantee its own health.

From the “One Health” approach, not only the health of human beings is considered morally relevant in the management of zoonoses, but also the health of animals and the rest of nature, with which it shares the special characteristic of life. From this perspective, people must establish a harmonious relationship with animals, domestic and in their native ecosystems, in a protected and sustainable environment. The ethical foundations promote rethinking the position with the ecosystems, the environment, which involves changes in behaviors, values and attitudes.

Conclusions

There is a growing consensus in the results of facts, research, science and technology that in responses to emerging and non-emerging zoonotic diseases, it is necessary to adopt a multidisciplinary and integrated approach. Therefore, it is pertinent to adopt the “One Health” approach that recognizes the interdependence between human, animal and environmental health. Throughout the study it has been clarified that this issue has marked ethical content as it includes an evaluation and re-engineer processes, providing the reasons why human activities are good, fair and necessary considering their effects on ecosystems; since the decisions made by people and institutions create conditions conducive to the appearance and spread of such diseases.

Reflections, at least basics, on the ethical reasons that support the relevance of the “One Health” approach to zoonotic diseases require starting from the conceptual problems around what is called “One Health”, its scope and limitations that indicate acceptance of the need to achieve a multidisciplinary and integrated approach to zoonotic, emerging and non-emerging diseases, recognizing the interdependence between human, animal and environmental health. From “One Health” a new ethos is configured that needs to do more for nature, human and non-human, where the human species in general must value and respect the rest of the species in their ecosystem dimension. Recognizing from the inter and transdisciplinary perspective, the biological, chemical and physical aspects as integrated, non-linear processes and in constant dynamics of interdependence.

The ethical foundations are related to natural dynamics which is defined by principles such as responsibility, commitment, association and cooperation between species and other elements of the ecosystem, in order to complement the needs through the opportunities that each element can

offered against zoonotic diseases. From this focus on health everything is interconnected, zoonoses become an example of the necessary break with the anthropocentric conception and classical or “traditional” epidemiology that are projected to be insufficient and unsustainable.

“One Health”, by conceiving the holistic approach in responses to emerging and non-emerging zoonotic diseases, configures certain ethical principles articulated with the principles of eco-development, environmental knowledge and sustainable development, which agree epistemologically and axiologically with the concepts that assume conservation and ecological culture, assuming the urgent demand, for the salvation of the human species, to adopt global health as an essential element to achieve effective management of zoonotic diseases with sustainable development today and, even more, in the future.

References

- World Organization for Animal Health (2004) Emerging and re-emerging zoonoses. pp: 1-3.
- WHO (2023a) One health.
- IAEA (2021) Integrated Measures against Zoonotic Diseases (ZODIAC).
- Suzan G (2022) Veterinarian Gerardo Suzán urges us to work together to address emerging diseases. DV.
- WHO (2017) The WHO multisectoral “One Health” approach.
- WHO (2023b) The One Health Definition and Principles Developed by OHHLEP. Translations.
- Vega, JL, Martinez, E (2022) Zoonoses: basis and foundation of the One Health initiative. *Sanidad Militar* 78(3): 134-136.
- Meagher K (2024) Can One Health Policy Help Us Expand an Ethics of Interconnection and Interdependence? *AMA J Ethics* 26(2): E162-170.
- Degeling C, Dawson A, Gilbert GL (2024) The ethics of One Health. In: Merrilyn Walton (ed.) *One Planet, One Health*. Sydney University Press. pp: 340.
- Sheather J (2023) One Health and climate change-we need to get the ethics right. *BMJ* 383: 2177.
- LeBlanc AB, Jones BW, Aenishaenslin C (2022) Bio-Ethics and One Health: A Case Study Approach to Building Reflexive Governance. *Front Public Health* 10: 648593.
- Coghlan S, Coghlan B (2018) One Health, Bioethics, and Nonhuman Ethics. *Am J Bioeth* 18(11): 3-5.
- Daya P (2021) Preparedness for outbreaks of zoonotic diseases: the Scientific Forum opens. IAEA.
- Zunino P (2018) History and perspectives of “One Health” approach. *Veterinaria* 54(210): 46-51.
- Rocamora A, Marin C, Balleste C, Soto SM, O’Callaghan C (2022) The year of One Health in Spain and Europe? Instituto de Salud Global de Barcelona (ISGlobal). pp: 1-7.
- Delgado C (2004) Non-classical rationality and its methodological perspectives. In: Thalia Fung (Coord.) *A Political Science from the “South”*. Editorial Felix Varela; pp. 23-40.
- Ryu S, Kim BI, Lim JS, Tan CS, Chun BC (2017) One Health Perspectives on Emerging Public Health Threats. *J Prev Med Public Health* 50(6): 411-414.
- Aguilar MA (2016) Zoonoses and other public health problems related to animals: reflections on their theoretical and methodological approaches. *Rev Gerenc Polit Salud* 15(31): 232-245.
- Foladori G (2020) The germs are demanding new therapies Capitalist medicine is the wrong prescription for modern illnesses. *Estudios Criticos del Desarrollo* X(18): 213-259.
- Steffen W, Richardson K, Rockstrom J, Cornell Se, Fetzer I, et al. (2015) Planetary boundaries: Guiding human development on a changing planet. *Science* 347(6223): 1259855.
- Erlandsson LW, Tobian A, Ent RJ, Fetzer I, Wierik S, et al. (2022) A planetary boundary for green water. *Nature Reviews Earth & Environment* 3: 380-392.
- Castro EM, Mattar S, Gonzalez TM (2019) Re-emerging zoonoses under the “One Health” approach. *Rev MVZ Cordoba* 24(3): 7280-7284.
- Matamoros JA, Sanin LH, Santillana MA (2000) Zoonoses and their Social Determinants: A Perspective to Consider in Public Health. *Rev Salud Publica* 2(1): 17-35.
- Leyton F (2008) Environmental ethics: a review of Biocentrist ethics. *Revista de Bioetica y Derecho* 13: 34-43.