

One Health, Ecological Bioethics, and the Ethics of Zoonoses: A Call for Global Action

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ABSTRACT

Ethics of zoonoses or zoonoethics refers to the ethical issues surrounding zoonotic diseases, which are diseases that can be transmitted from animals to humans (WHO, 2023). With the rise of emerging infectious diseases globally, these issues have become increasingly important. There are over 200 known types of zoonoses, and many of them are influenced by socioeconomic factors like climate change, biodiversity loss, and antimicrobial resistance. Zoonoses and diseases of infectious origin account for 70% of new and existing diseases affecting both humans and animals. Examples of zoonoses include but are not limited to anthrax, brucellosis, influenza, hantavirus syndromes, plagues, rabies, SARS-CoV, swine flu, MERS-CoV, Ebola, and SARS-CoV-2. While diseases like rabies can be prevented with vaccinations, others like Ebola and SARS-CoV-2 are extremely deadly. The management of these diseases will require the adoption and acceleration of the “One Health” approach, which recognizes the interconnectedness and interdependence between human, animal, and environmental health.

Keywords: One-health; Zoonotic diseases; Global bioethics; Animal slaughter; Zoonoethics

INTRODUCTION

Incremental risks of zoonotic diseases

Zoonotic pathogens can spread to humans through contact with domestic, farm or wild vertebrate animals ^[1]. However, invertebrates and other intermediate hosts can intervene in the complex network of emergence and transmission of zoonotic diseases ^[2-6].

Some zoonotic diseases of animal origin are Severe Acute Respiratory Syndrome (SARS), Ebola and, recently, SARS-CoV-2. As shown by Jones, most EIDs are zoonoses (60.3% of EIDs), and more than 70% originate from wild animal trafficking, increasingly close contact with farm and wild animals, intensive agriculture, unsustainable global food systems, and crimes against biodiversity [7-16]. The objective of this article is twofold. On the one hand, I want to join the recent call to action to accelerate the operationalization and implementation of the One Health approach (OH), made by the Quadripartite organizations working on One Health [17]. On the other hand, the article emphasizes that the tools and methods of Multispecies Justice (MSJ) and ethics of zoonoses can help resolve conflicts between competing moral claims that arise in relation to both human and non-human life. This approach can help address the challenges facing the OH framework. In this article, I address the more established definition of One Health offered by the One Health High-Level Expert Panel (OHHLEP) and the Quadripartite: “One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. The approach mobilizes multiple sectors, disciplines, and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for healthy food, water, energy, and air, taking action on climate change and contributing to sustainable development.” Today, there is ample evidence that working transdisciplinary and collaboratively across sectors to accelerate and implement the One Health approach will help build long-term capacities for preparedness, resilience, mitigation, and effective prevention of future epidemics including, but not limited to zoonotic and (re-)emerging infectious diseases, non-communicable diseases linked to environmental risk factors, Antimicrobial Resistance (AMR) and climate adaptation [18,19]. In this article, I suggest that the emergence and re-emergence of epidemic outbreaks is strongly related to the drivers of anthropogenic climate change, such as abrupt changes in land use, deforestation, ecological racism, ecocide, environmental crimes, and accelerated loss of biodiversity. Although there is still a strong debate between the scope, relevance, and epistemic and normative potential of the One Health and Planetary Health approaches, I agree that the best way forward is to articulate these approaches and bring them into dialogue to work together [20,21].

According to the above, in this work I would like to highlight two primary objectives for accelerating and implementing the OH approach. The first priority can be stated in a negative way: We cannot expect zoonotic diseases to decrease unless we urgently take prudent and precautionary measures to halt the systematic destruction of wildlife and put a stop to the ongoing ecocide of the planet [22-26]. As numerous scholars have confirmed, a strong correlation exists between defaunation, environmental crimes, ethnocide, and the mechanisms involved in the emergence and spread of zoonotic diseases [27]. Secondly, to reduce the risks of Emerging Infectious Diseases (EIDs) and zoonoses in the Anthropocene, it is crucial to deepen inter-epistemic and transdisciplinary communication to develop a holistic and non-anthropocentric perspective on EIDs and zoonoses [28-33].

Zoonoses should not be understood as single-cause events reduced to the world of veterinary medicine but as systemic ecosocial phenomena of increasing complexity that are produced by the confluence of environmental, sociocultural and economic factors linked to the dynamics of anthropogenic climate change, the flows of global capitalism, the intensification of agriculture, the concentration of waste and garbage from animal farms, the pollution of the seas, and the increase in global trade and travel, among other factors as shown in figure 1 [34].

Figure 1. Illustrates the network of factors associated with the emergence and spread of zoonoses.

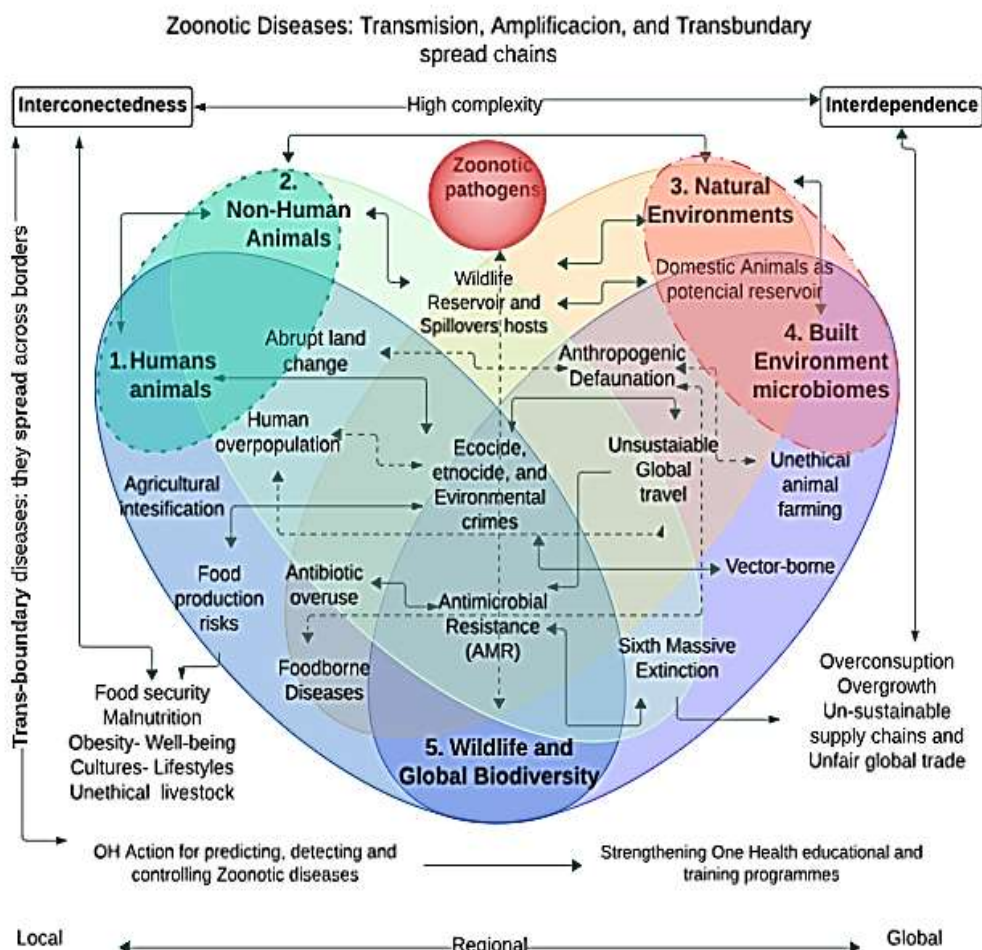


Figure 1 illustrates some of the interdependencies and linkages that stress the health of planet Earth, including but not limited to (i) the widespread use of antimicrobials in the various stages of intensive production of plants and animals for human consumption; (ii) the advance of agricultural intensification is linked to the dynamics of global population growth, abrupt changes in land use, and ongoing crimes against biodiversity; and (iii) the progressive loss of wildlife and anthropogenic deforestation are linked to political and social phenomena such as ethnocide, ecocide, and environmental crimes. This model is intended to convey the idea that the health of human animals is not only inseparable from the environment in which they exist, but is intimately interconnected to the health of animals, plants, and the environment (natural and built). The dotted lines within the diagram allude to the deep interdependence and interconnectedness that affects all elements and layers of the sub-level in question. Finally, the outer lines emphasize that the interdependence and interconnectedness that govern the entire system are driven by dynamics of high complexity.

MATERIALS AND METHODS

Zoonotic diseases can emerge and spread rapidly among the population, surpassing the capacities of the institutions in charge of epidemiological surveillance due to the flows of global capitalism, accelerated population growth, intensification of travel and international trade, among other factors [35-43]. Other anthropogenic drivers that

increase the risks of zoonoses are pollution of the seas, overfishing, excessive use of antibiotics in the global food production chain and the advance of “green” extractivism. As is well known, every year millions of animals are intensively farmed on industrial animal farms that use excessive doses of antimicrobials in different phases of livestock production. In fact, the call to “Curb the silent pandemic of AMR” is one of the main red traffic lights that we find in the “One Health Joint Plan of Action, 2022–2026”. The ethical and prudential use of problematic bactericidal and antimicrobial preparations has ceased to be a question for experts and is becoming one of the great ethical imperatives for the construction of viable and sustainable health systems [44-46]. The widespread and prolonged use of antimicrobials in the different stages of intensive animal agriculture represents one of the main drivers for the development of resistant bacterial populations. The ethical use of antimicrobials has strong implications for both human ethics and animal ethics, although this difference is becoming increasingly blurred, and it is noted that the prudent management of zoonoses requires transdisciplinary approaches and interdisciplinary discussions [47-55].

Another factor that increases the risk of zoonotic diseases is the unsustainable transport of livestock and poultry, since these farm animals are often transported in unsanitary conditions over long distances, which deepens both animal abuse and the risks of spreading zoonotic diseases [56]. In other words, the crisis of the global food system, which has caused a decrease in the intake of healthy foods with high nutritional value, overlaps with other crises, such as the loss of biodiversity, the water crisis, the energy crisis, deficiencies in water treatment plants, unhealthiness problems and the transportation crisis [57-59]. As Vercauteren stated that: “The livestock compartment and its interfaces with humans and wildlife appeared after domestication [60]. These epidemiological interfaces have constituted opportunities for horizontal transmission between species and a new space for evolution, emergence, and maintenance of pathogens.” Due to anthropogenic stressors and accelerated changes driven by intensive agriculture, new chains of pathogen transmission have emerged that can range from human host epidemics with zoonotic genetic source contribution to animal host epidemics with human genetic source contribution.

These chains of pathogen spread can involve primary reservoirs (wildlife), domestic animals as potential reservoirs, intermediate hosts, vector-borne, foodborne, and human hosts [61-66]. Humans tend to have close relationships with both companion and wild animals. We can still find people, such as beekeepers, who commonly develop deep relationships with insects; others, from people in indigenous communities to divers, filmmakers, and researchers, can even cultivate relationships of friendship, solidarity, and empathy with mammals such as whales and sharks, or with cephalopods, primates, or elephants. The chains of pathogen spread may involve primary reservoirs (wildlife), pets as potential reservoirs, intermediate hosts, vector-borne, food-borne, and humans. Humans often have close relationships with both domestic and wild animals. In certain situations, nonhuman animals and humans can thrive healthily in overlapping communities, but due to increased technoscientific activity and accelerated loss of wildlife and biodiversity, contact between nonhuman animals and humans is becoming a factor that increases vulnerability and zoonotic risks. “Zoonotic diseases are caused by harmful germs like viruses, bacterial, parasites, and fungi. These germs can cause many different types of illnesses in people and animals, ranging from mild to serious illness and even death.” The chains of spread of zoonotic diseases can be direct: By being in contact with saliva, blood, urine or mucous membranes of an infected domestic or wild animal, or indirect, by coming into contact with areas, surfaces or objects that have been contaminated by germs (CDC, 2021).

To understand the complexity of the interdependencies and linkages behind the long chains of zoonotic disease spread, we must continue to deepen the holistic perspective of One Health, which seeks to build bridges to address all risks and vulnerabilities that arise in overlapping communities of life [67-70]. In an era of technological change, global trade and the air and ground transportation of vast quantities of food, animals, and people are key factors in pathogen transmission networks. Viruses, microorganisms and pathogens spread as quickly as people do in a hyper-connected and interdependent world. As Baker states: “In modern times, air travel resulted in the importation of Severe Acute Respiratory Syndrome (SARS) coronavirus to 27 countries before transmission was halted.” And indeed, advances in health systems, sanitation, and tools for disease detection and tracking have led to reductions in overall mortality and morbidity from infectious diseases, particularly in high-income countries. As usual, however, scientific progress has not been evenly distributed around the world. As Baker stated that, caution: “Infectious disease burden remains substantial in countries with low and lower-middle incomes, while mortality and morbidity associated with neglected tropical diseases, HIV infection, tuberculosis and malaria remain high [74]. This points to a possible new era of infectious disease, defined by outbreaks of emerging, re-emerging and endemic pathogens that spread quickly, aided by global connectivity and shifted ranges owing to climate change”.

One health and ecological bioethics: We need one bioethics?

In this section, I introduce a set ethical principles and potential strategies that zoonoethicists concerned with preventing emerging zoonotic diseases in the Anthropocene epoch should consider. These guidelines aim to inform public policy and guide decision-making for communities, citizens, decision makers, and stakeholders. On the one hand, Zoonoethics, understood as a field of research in applied ethics and veterinary medicine, can promote rational, evidence-based discussions to exercise prudent judgment and public deliberation based on constructive conflict to resolve normative disputes about “conflicting value claims” linked to the health of humans, animals and environments (Statement 1). On the other hand, zoonoethics must be rooted in the precautionary principle and provide normative and descriptive knowledge to inform decision makers and interested parties in the construction of public policies aimed at preventing EIDs (Statement 2) [72-77]. In light of the statements above, it is possible to sustain a third claim: Zoonoethics can serve as a “bridge” to unite diverse epistemic fields and establish transdisciplinary and interparadigmatic debates between scientific, religious, cultural and ecosocial pluriverses [78,79]. At the epistemic level, zoonoethics could help weave networks of understanding between knowledge from veterinary medicine, biomedical sciences, animal agriculture, epidemiology, antimicrobial resistance, global bioethics, human ecology, and environmental humanities, among other fields [80-84]. In this article, I introduce the term zoonoethics because I believe that we urgently need an interdisciplinary field of work that integrates normative ethics and veterinary medicine. The zoonoethics should be focuses on the management and prevention of zoonotic diseases in three specific areas: i) Zoonoethics can provide normative resources and practical guidance in the identification and prevention phase of zoonotic diseases (secuandary prevention); ii) Zoonoethics, in close collaboration with the emerging One Health ethics, can also provide descriptive and epistemic resources for transforming our understanding of and relationships with nonhuman beings and environments (both natural and built) and help clarify our relationships with them (primary prevention); iii) Zoonoethics can help to address the problems associated with antimicrobial resistance and to develop a more robust and comprehensive approach to antimicrobial stewardship [85-89].

One of the first issues that zoonoethics must address is the fair, careful and ethical treatment of companion animals, farm and wild animals. In our techno-scientific society, it is generally assumed that the slaughter and killing of farm animals is justified in regard to ensuring food security for a voracious and exponentially growing human population [90-93]. However, as scholars from a variety of fields interested in animal welfare, animal rights animal justice, interspecies ethics, and animal studies have emphasized this speciesist and anthropocentric argument has large gaps and leaves the question of the appropriate ethical treatment of animals unanswered [94-113]. However, in this work, I will try to approach the question of the appropriate treatment of animals from an alternative approach, that of ecological and global bioethics. Now, it is necessary to clarify that my vision of bioethics is opposite to the vision of Fiore, who maintains that the term environmental bioethics “seems qualified, derivative: A subgenre of biomedical ethics or environmental ethics rather than the ground for both.” My vision of global bioethics, grounded by the Potter’s works, is nearer to that of authors. By rediscovering the normative significance and global appeal of bioethics and its interest in nonhuman ethics, global public health, and climate justice, we can build bridges and pathways between multispecies justice, ecological bioethics, and zoonoethics [114-130].

Currently, there is renewed interest in rethinking and expanding the global agenda of bioethics, as it was conceived at the time by van Rensselaer Potter [131-142]. In recent works, I have shown that the One Health and Planetary Health approaches would gain much more traction and be easier to operationalize and put into practice if we reinvigorated the globality of bioethics in light of recent discoveries about the complex mechanisms of emergence, transmission and massive propagation of EIDs and zoonoses revealed during the pandemic. If we recover the globality and multidimensionality of bioethics, we can imagine a bridging, comprehensive, and intersectional bioethics that serves to deepen dialog, transdisciplinary communication and cooperation between countries and regions for an early and prudent response to future outbreaks of EIDs and zoonoses.

This tension between One Global Bioethics and grassroots justice claims, or, in other words, between the globality of bioethics and the and context-dependent character of justice claims, is very interesting and complex, but it is beyond the scope of the present paper. Here I can only offer a few hints: i) Bioethics, both in its epistemic roots (Potter and Jahr) and in its practical scope, can and should be both local (context-dependent) and global, because the problems it addresses—related to technological change, transhumanism, biomedicine, AI in health care, climate change, etc.—are both local and global, and require global action, but they also require deliberation and situated hermeneutics. Moreover, bioethics must be sufficiently dynamic and open to dialogue to remain relevant across cultures. Once again, one of the most challenging issues in One Bioethics requires the elaboration of “bridges” and inter-epistemic dialogues between different epistemologies, value systems, cultures, religions, disciplines, worldviews, and social practices [143,144].

While it is true that different people assign different values to different “things”, non-human animals or entities (e.g., a painting, a forest, a violin, a plant, a river, or non-human animals), and that value is contextual and cultural, this should not undermine the globality of bioethics, as long as we understand bioethics in a much more humble, dialogical, and open-ended way [145,146]. The globality of global bioethics is also an invitation to create a window for broad collaborative and interdisciplinary work, and there can and should be room for diverse symbolic universes, values and norms, and ultimate belief systems [147-149]. Ethical evaluation and deliberation, in short, must be contextualized, but the global vision of vital problems can also serve as an impetus to tighten the thread of ethical reflection, which, as we know, can sometimes be transboundary, interspecies, transgenerational, and intercultural.

Of course, the question of cross-cultural moral evaluation is closely related to the very possibility of engaging in inter-paradigmatic dialogues, and raises the very serious question of intercultural, interreligious dialogue and tolerance. The question is how willing we are to accept as legitimately valid ways of evaluating and assigning different kinds of moral value to different objects or entities from other cultures, symbolic universes, and non-Western value and belief systems ^[150].

As Gardiner emphasizes, “conventional bioethics has largely failed to engage, and so is left mainly to contribute to damage limitation, emergency management, and redress.” A way to overcome this limitation and avoid falling into the vices of a superficial and overly technical bioethics that only limits itself to acting when it is too late, but is incapable of providing normative, descriptive knowledge and practical wisdom to guide decision-making and anticipate risks, is to move toward what some authors have called “One Bioethics” ^[151-153]. Ecological bioethics and One Bioethics could offer valuable normative and epistemic resources to prudently address the risks derived from the emergence and spread of EIDs and zoonoses in the Anthropocene Age.

The ethical dilemmas of one health: The case of animal slaughter, outline of one-zoonoethics

In what follows, I briefly discuss the dilemma of mink culling in the pandemic scenario from the perspective of One Health. In 2020, the Prime Minister of Denmark, Mette Frederiksen, made the decision to sacrifice approximately 15 million minks due to a COVID-19 mutation identified on farms in the Nordic country. Denmark is the world's leading producer of mink fur. The main argument in support of this decision was that the mutation detected among minks could infect humans and put the effectiveness of a new vaccine at risk. As illustrated in this case, certain anthropocentric measures to control zoonoses could give rise to ethical dilemmas related to the improper treatment of animals when human health is at risk. In order to resolve ethical dilemmas between competing value claims, we need to deepen the debate on multispecies justice ^[154-157]. In addition, we need to clarify what we say when we want to include the value claims of animals, ecosystems, and ecological collectives within One Health ^[158-164]. To advance the revitalization and acceleration of One Health, we need to develop a long-term vision of One Health policy that can positively value “entangled empathy” and relational vulnerability between different species.

In the case of zoonotic diseases, the moral meaning that people attribute to animals is context dependent; the statements and emotions pro- and against animal culling change meaningfully depending on the uncertainty and risks involved: The decisions made in a “normal scenario” are not the ones the same as those made under catastrophe scenarios. As van Herten et al. state, “In cases where human health is at risk, most people justify the culling of healthy animals. In situations where there is no danger that humans become infected, culling is less accepted” ^[165]. The effectiveness and impact of measures to address emerging and re-emerging zoonotic disease risks depend on the belief systems, values, and assumptions of individuals and communities ^[166]. Many times, unproven beliefs concerning wildlife and anthropo-centric value schemes can become strong agencies that hinder the adoption of holistic health measures from a comprehensive One Health perspective ^[167,168].

Since 2008, The American Veterinary Medical Association established the concept of OH, envisioning the possibility of fighting for the maintenance of certain levels of “optimal health” and establishing win-win solutions for all parties involved: Human life, nonhuman life and environments: “One Health is the collaborative effort of multiple disciplines—working locally, nationally, and globally—to attain optimal health for people, animals and our environment.” Only the implementation of a comprehensive and nonanthropocentric ^[169]. One Health vision can accomplish the promise of discovering fair and equitable solutions considering the vital interests of all parties

involved, including both humans and nonhuman entities. To establish networks of care, solidarity, and kinship between populations, communities, and environments, it is necessary to reevaluate the normative and descriptive content of health and a healthy environment as common goods. This entails accounting for the value claims of diverse actors, human and nonhuman, that are linked to a shared network of interests.

As emphasized recently by Nussbaum and Pelluchon, the unjustified suffering and harm caused to animals – although long forgotten thanks to rigid value and belief systems that normalize animal slaughter and sacrifice – is illogical and immoral ^[170,171]. In the case of mink, the decision in favor of animal sacrifice could be justified under the “harm principle”, initially introduced by Mill, which authorizes, under exceptional circumstances in which certain human assets are at serious risk, the 'legitimate' use of violence. The crucial point here is to precisely determine what is truly at stake when a government attempts to take exceptional measures to protect economies and public health. This decision, based on political exceptionalism, created a domino effect and spread to other countries such as Holland, Sweden, Greece and Spain ^[172,173]. This case illustrates the need for zoonoethics articulated to a comprehensive, multidimensional and nonanthropocentric vision of One-Health. In the case of the minks slaughtered in Europe, we must face two relevant ethical questions: First, is this an attitude of caution or an overreaction driven by panic? And, second: Who loses and who wins after the sacrifice of animals that are conceived as an “extra factor” in the global fur industry, with an annual value of more than 22 billion dollars a year? Finally, it is necessary to articulate a cautious perspective of the precautionary principle to zoonoethics to prevent control methods for managing zoonoses from bringing unforeseen consequences and unwanted harm to humans, animals and environments ^[174]. As warned by Resnik: “Some of the methods used to prevent mosquito-borne diseases, such as draining swamps and spraying pesticides (especially DDT), can have adverse environmental impacts, such as the destruction of habitats and species”. Other cases that can illustrate the ethical dilemmas within One Health are the sacrifice of healthy surplus farm animals. Palmer and euthanasia or the “good death” of animals at zoos ^[175]. These cases, as seen by several scholars, are complex and go beyond the traditional tension between the positions of “welfarists” and “animal rights advocates” ^[176-179].

In this section, I want to take up the WHO's calls to reinvigorate and accelerate the implementation of the One Health approach. First, the best way forward in implementing a planetary health approach is to act preventively under the kaleidoscope of caution, eco-wisdom and responsibility from a comprehensive One Health for all, including value claims and the interests of humans, animals and environments ^[180-187]. As noted early by Potter, human and animal healthcare practices generate a large amount of waste and pollution that can harm the environment and have long-term and systemic effects on planetary health ^[188]. The ecological footprint due to plastics, syringes, solid and liquid waste, etc., and the energy expenditure of hospitals is a problem of growing concern for the management of zoonotic diseases and EIDs. Pest control, “invasive species,” logging, and the unsustainable global food industry based on animal slaughter illustrate a long-ignored truth: Many times our choices are based on a cost/benefit analysis rather than a deep and serious ethical reflection on what should be the correct treatment and win–win action to confront zoonotic diseases and climate change with wisdom, prudence and responsibility from a comprehensive and long-term vision ^[189-192].

Second, today, we have solid evidence about the incredible complexity of the mechanisms of spread of EIDs and zoonoses that originate largely from the same drivers of global climate change. From the One-Health approach, it has become commonplace to say that addressing zoonoses and EIDs requires greater communication, collaboration and interdisciplinary work between zoologists, virologists, veterinarians, foresters and environmental

humanities scholars. However, in practice, collaboration and interepistemic collaboration between experts in the medical and biological sciences, on the one hand, and bioethicists, environmentalists, researchers in animal studies and scholars of the environmental humanities, on the other, remain quite low ^[193,194]. Another problem is that very few public policy experts understand the high complexity of the issues involved in zoonoses and the challenges of One-Health from a complex and multispecies justice approach. As noted by Waltner-Toews: “However, few animal science researchers, standing in their hazard suits and masks in a conventional chicken broiler barn, have made the mental connections between poultry rearing and ducks flying overhead, or between agribusiness and viruses and bacteria for which the ducks are a quiet, accessible vehicle for long-distance air travel” ^[195-201].

At a meeting in March 2023, the WHO made an emphatic call to accelerate the implementation of the One-Health approach to respond in a coordinated and multisectoral manner to 'recent international health emergencies, such as the COVID-19 pandemic, mpox, Ebola outbreaks and ongoing threats from other zoonotic diseases, food safety, Antimicrobial Resistance (AMR) challenges', among others. This brings me to my third and final call. Perhaps one of the problems that best illustrates the importance of zoonoethics is the problem of AMR. Until approximately fifty years ago, the problem of AMR was basically understood as a problem of interest to microbiologists, virologists and a small group of economists interested in the development of antibiotics and new drugs. However, as a result of the effort and transdisciplinary collaboration in the last two decades and the hard learning during the COVID-19 pandemic, it was understood that the indiscriminate use of antimicrobials is one of the main drivers of the development of pathogens resistant to antimicrobials. Medicines, in other words, the problem of AMR became one of the ten ethical and political challenges facing humanity. This problem, once again, is not disconnected from other crises but is closely connected to the problems of food insecurity, poverty, unhealthiness, lack of sources of clean water and basic sanitation, deep gaps in care primary, serious shortcomings in sewage systems and water treatment plants, failures in the management and disposal of intrahospital solid and liquid waste and structural failures in public health policies aimed at infection control ^[202-204]. The WHO has corroborated that all of these factors promote the spread of microbes, some of which may be resistant to antimicrobial treatment. This explains why the concept of antimicrobial stewardship has gained so much worth in recent years ^[205-207]. Reducing the AMR issue to a hospital issue would be irrational and could perpetuate injustices. The widespread use of bactericides in the care of humans, animals and agriculture means that we are in the middle of a malignant circle of bioaccumulation of bacteria and microorganisms resistant to antibiotics, as pointed out by Osińska ^[208].

However, the presence of Antibiotic-Resistant Bacteria (ARB) and Antibiotic Resistance Genes (ARGs) is not restricted to hospital environment. There are numerous investigations into the resistance to antibiotics among environmental strains, suggesting that clinical strains of bacteria with greater resistance often originate from the natural environment, including soil and water habitats. These environmental bacteria resistant to antibiotics can carry ARGs onto microorganisms which are pathogenic to man. Hence, identification of sources of drug-resistance genes, their distribution in the environment and an analysis of anthropogenic factors involved are necessary for the development of a strategy for combating antibiotic resistance.

Zoonoethics, human ecology and the ecotheological turn

Finally, I want to conclude by evoking two powerful and enduring ideas that we find in three texts that, although they belong to different traditions, have a common root: Pope Francis' *Laudato Si* Encyclical, Arne Næss' *Ecology, community, and lifestyle* (1990), and Aldo Leopold's *Land Ethics* ^[209-211]. Pope Francis emphasized that although all human beings have a universal dignity—which prevents us from being treated as mere “things” or “commodities”

that can be produced, consumed and then become “disposable” –we are not the pinnacle of creation, nor do we have the right to abuse other species and destroy wildlife for our own benefit or to satisfy our selfish needs. He points out, “Just as the different components of the planet–physical, chemical and biological–are related to each other, living species also make up a network that we never fully recognize and understand”. In other words, Pope Francis recognizes that humans are not isolated from nature and the environments we inhabit but rather “we are included in it, we are part of it and we are interpenetrated”. In the 1980s, Næss, a precursor of ecosophy, made a similar call and maintained that human beings are relational beings and are not condemned to make decisions from a self-centered perspective and guided by selfish interests; however, we could cultivate and expand our self and develop a kinder and happier vision of ourselves to care for and empathize with other beings and environments [2012-215]. Leopold, he emphasized that we needed to ‘reduce human violence exerted on the biotic community in our struggle for survival’ [216-218]. And he added, “All ethics developed so far are based on a single premise: That the individual is a member of a community of interdependent parts”. The careful study of the fine *interdependence* between all forms of life can lead us to better manage zoonotic diseases to try to act prudently to prevent the next pandemic. The One Health approach can be grounded in the profound vision of interdependence and interconnectedness embedded in the intercultural wisdom of indigenous peoples and the ethnomedical practices of diverse local communities [219-224]. Central to One Health is the concept of connecting the human, animal, and environmental health interfaces. OH's approach can benefit from the insights of human ecology, a discipline that has long demonstrated the complex interrelationships among ecology, human health, and the ecosystems, habitats, and build environments we share with wild animals and other entities [225,226]. By incorporating human ecology and the ethics of zoonosis, we can expand our inquiry from ecology and exclusively climatological studies to one of interconnectedness, entanglement and complexity. In this sense, the idea of vincularity can be enlightening: “Vincularidad is the awareness of the integral relation and interdependence among all living organisms (in which -humans are only a part) with territory or land and the cosmos. It is a relation and interdependence in search of balance and harmony of life in the planet” As stated by Waltner-Toews.

DISCUSSION

It is a grievous mistake to imagine that pandemics can be understood and managed by studying the pieces separately (viruses, birds, pigs, people). To understand the challenges of learning to live with diverse microbial populations, we need to re-imagine the world in deeper, more complex, more evidence-based ecosystem terms. It is one thing to document in detail the cellular and biochemical structure of dead ducks in a marsh in Saskatchewan, as well as, more recently, the microbiomes they carry, or those of dead chickens in a barn in British Columbia. It is quite another thing to understand the relationships among multiple species at multiple scales.

To deal ethically and prudently with emerging infectious diseases, we need to improve the intercultural collaboration between veterinary medicine, cutting-edge Western knowledge and the ancestral knowledge of traditional systems of indigenous peoples [227-229]. All of these efforts would lead us to a more modest vision of ourselves and would help us move toward policies of solidarity, care, and interspecies cooperation [230-234]. Implementing the "One Health" approach necessitates integrating various disciplines' symbolic universes and techniques, while also instigating constructive conflict and establishing the groundwork for intercultural and interreligious discussion. This will allow us to craft fresh "interwoven narratives" that foster sustainable ways of inhabiting the future [235-238]. In order to tell and pass on stories of resilience and planetary health to future generations, it then becomes imperative to recognize the ignored interests and perspectives of value, the

differences in political and economic power and how gender impacts policies to confront AMR, climate change and zoonoses. All this has a lot to do with multispecies justice. As stated by Waltner-Toews: “The real costs of producing low-cost chicken are being paid in economic subsidies to fossil fuels and corn, in lost biodiversity in Brazil and in the oceans, and in urgent adaptations to dramatic, unstable climate change.” As I previously showed in the case of mink, the costs of mismanagement of zoonotic diseases and the reactive approach to dealing with pandemics are being paid through animal culling and slaughter. In addition, this is unfair, painful and immoral. The costs of developing new products for the cosmetic industry and drugs to stop aging are being paid by animals that are used in laboratories as “test objects” that at some point become “disposable.” The costs of so-called development and postponing solutions to climate change are being paid by millions of animals that are slaughtered annually on farms to feed a growing population and by impoverished farmers and food industry workers. The costs of our immense loneliness and dementia are being paid for by the suffering we cause to animal species and populations that we are pushing to the brink of extinction ^[239-241]. Terrestrial and aquatic ecosystems, large rivers, seas and lakes are also paying a high price for our immoral lifestyles and our excessive consumption of raw materials.

It is absurd and shameful to see that the cost of wars, techno-scientific development and testing of unconventional weapons in the oceans can be paid at a very high price by our grandchildren or great-grandchildren, and thus each generation can take part, almost unsuspected, in what Gardiner calls a “severe intergenerational tyranny” ^[242]. In order not to end with such a discouraging panorama, I would like to evoke the words of Pope Francis: “Given that everything is closely related and that the current problems require a look that takes into account all the factors of the world crisis, I propose that we stop now to “think about the different aspects of an integral ecology, which clearly incorporates the human and social dimensions”. If “everything is related to everything else”, as the American biologist and environmentalist Barry Commoner also thought, then we still have the possibility of building what Lori Gruen calls “the entangled empathy”, which is not only the impulse to go out to meet the other or try to “put oneself in the shoes of the other who suffers” but also requires a motivational effort, conscious to change our perspectives. Entangled empathy has an emotional, cognitive, and psychological component, perhaps in the Aristotelian sense of cultivating a set of virtues and emotional responses such as solidarity, respect, and understanding, especially when we lack relevant information about the intentions, values, and belief systems at the table. Thus, entangled empathy has to do with our dispositions or habits; it also implies “moral courage” and practical-motivational components. Gruen adds: “Entangled empathy requires a certain amount of perspective taking. In this sense, it is more akin to some of the other ways of understanding empathy. Perspective taking means trying to get outside of your own sensibility even though of course we are limited, in some ways, by our own perspectives on the world”. In the case of prudent management of zoonoses, contextual observations are relevant because they help establish guidelines for action: For example, in the case of the COVID-19 pandemic, great panic and certain feelings of rage, fear and hatred spread. Punitive toward bats and pangolins, which were seen as scapegoats at the beginning of the pandemic; many media outlets and some politicians also inoculated their audiences with feelings of retaliation and revenge toward “the Chinese” and even toward wet markets and wildlife as a whole. Gruen adds: “With some animals, dangerous wild animals, for example, it is not going to be possible or wise to get close to those individuals. However, there are usually trained ethologists and zoologists who study these individuals.” When dealing with certain wild animals, such as lions, whales, bears, bats, and others, empathetic treatment means staying as far away from their environment as possible and learning to appreciate the network of interspecies assemblages of their ecological communities from a healthy distance. To do this, it is not needed do a thorough analysis, but rather exercise our common sense and follow our “best judgment.” Experts in wildlife

management could tell us storytelling about how they learned to live with them, and the *narratives* also become a powerful resource to enhance entangled empathy and prudent treatment toward wildlife [243-253].

CONCLUSION

Finally, Gruen hits the bullseye when she says: “The process of entangled empathy then involves emotion, imagination, cognition, justice and care. It focuses on flourishing there is also room in the process for emotions like outrage and indignance and anger and shame. When we recognize that other human beings and other animals are not flourishing, when we recognize that other animals and other human beings are thought to be disposable and killable.” In short, a zoonoethics that aims to provide guidelines for prudently managing zoonoses and EIDs must recover the idea that all forms of life are valuable in themselves and are finely intertwined. No form of human or nonhuman life on planet Earth should become something “sacrificeable”, something “disposable”, or something “superfluous”. I believe that this type of ethical stance and this mood are what should accompany and encourage future developments in zoonoethics.

A call for urgent action: Policy recommendations for an inclusive, intercultural and gender-sensitive one health approach

1. Advance international legislation to recognize the international crime of ecocide and crimes against biodiversity, not only as circumscribed and peripheral damages that affect human health, but as damages that affect the health of humans, animals and environments and constitute an attack against future generations.
2. We need closer transdisciplinary collaboration, including gender and intercultural perspectives, to study the socioeconomic, cultural and environmental determinants and drivers of zoonotic diseases: “Developing a multi-sectoral preparedness and response plans for control of zoonotic diseases through a comprehensive risk assessment, improving laboratory diagnostic capacities, joint surveillance activities at the animal-human interface”.
3. Strengthen political commitment, national planning and regional coordination mechanisms, this requires working towards a One Health approach based on principles of intersectionality, interculturality and global solidarity. These plans and long-term strategies should be evaluated from a complexity approach at the local, regional and global levels.
4. Promote equitable and long-term synergies between Western health systems and local and indigenous community health knowledge systems and practices. In addition, we need to develop novel strategies and regional and global information networks to share knowledge and work collaboratively and cross-sectorally to address the various One Health interfaces. In particular, the wildlife-livestock-human interface is one of the areas of greatest risk and vulnerability.
5. Promoting a One Digital Health approach: Europe, the United States, and other high-income countries have strong epidemiological surveillance systems that provide access to comprehensive data, tables, and maps on infectious diseases, but low- and middle-income countries in regions such as South and Central Asia, Africa, and Central and South America do not yet have robust surveillance systems to develop systemic preparedness, mitigation, and prevention plans and strategies for zoonotic diseases. Given the growing importance of AI and accelerating digitalization in health systems, countries and regions should develop synergies and share resources to overcome gaps in access to resources through a One Digital Health equity approach.

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REFERENCES

1. Horefti E, et al. The importance of the one health concept in combating zoonoses. In Pathogens. Multidisciplinary Digital Publishing Institute (MDPI). 2023;12:8.
2. Eidson S, et al. Encyclopedia of Epidemiology. Sage Publications, Inc. 2008:1-6.
3. Konda M, et al. Potential zoonotic origins of SARS-CoV-2 and insights for preventing future pandemics through one health approach. Cureus. 2020;12:6.
4. Rüegg SR, et al. Integrated approaches to health: a handbook for the evaluation of One Health. Wageningen Academic Publishers. 2018.
5. Uretsky C, et al. Zoonosis. In Gale Encyclopedia of Public Health. 2020.
6. WHO. A health perspective on the role of the environment in One Health. 2022.
7. Bezerra-Santos MA, et al. Illegal wildlife trade: A gateway to zoonotic infectious diseases. In Trends in Parasitology. 2021;37:181-184.
8. Cardoso P, et al. Scientists' warning to humanity on illegal or unsustainable wildlife trade. Biological Conservation. 2021;263.
9. Nijman V, et al. Illegal and legal wildlife trade spreads zoonotic diseases. In Trends in Parasitology. 2021;37(5):359-360.
10. Ortiz Millán G, et al. Pandemias, zoonosis y comercio de animales silvestres. Revista de Bioética y Derecho. 2020;50:19-35.
11. Ortiz-Millán G, et al. Bioethics, globalization and pandemics. Global Bioethics. 2022;33(1):32-37.
12. Roe D, et al. Beyond banning wildlife trade: COVID-19, conservation and development. In World Development. 2020;136.
13. Boratto J, et al. Wildlife Crime. In H. Pontell (Ed.), Oxford Research Encyclopedia of Criminology and Criminal Justice. Oxford University Press. 2017;1-30.
14. Gladkova E, et al. The harms and crimes of farming/food. In H. Pontell (Ed.), Oxford Research Encyclopedia of Criminology and Criminal Justice. Oxford University Press. 2023.
15. Sollund R, et al. Nonspeciesist criminology, wildlife trade, and animal victimization. In H. Pontell (Ed.), Oxford Research Encyclopedia of Criminology and Criminal Justice. Oxford University Press. 2021;1-28.
16. Wong R, et al. The harms and crimes against terrestrial wildlife (nonhuman animals). Oxford Research Encyclopedia of Criminology and Criminal Justice. Oxford University Press. 2023;1-9.
17. FAO; UNEP; WHO; WOA. One health joint plan of action, 2022–2026. Working together for the planet of humans, animals, plants and the environment. One Health Joint Plan of Action. 2022–2026. 2022.

18. Adisasmito WN, et al. One health: A new definition for a sustainable and healthy future. *PLoS Pathogens*. 2022;18(6).
19. European Union Agencies. Cross-agency knowledge for one health action Joint statement by European Union Agencies. 2023.
20. De Castañeda RR, et al. One health and planetary health research: leveraging differences to grow together. In *The Lancet Planetary Health*. 2023;7(2):e109-e111.
21. Zinsstag J, et al. Advancing one human–animal–environment Health for global health security: what does the evidence say? In *The Lancet*. 2023;401:591-604.
22. Baquedano JS, et al. Ecocide or environmental self-destruction? *Environmental Ethics*. 2019;41(3):237–247.
23. Gibbs, et al. Environmental Crime. In H. Pontell (Ed.), *Oxford Research Encyclopedia of Criminology and Criminal Justice*. Oxford University Press. 2017;1-33.
24. Gray MA, et al. The international crime of ecocide. *California Western International Law Journal*. 1996;26(2):215–272.
25. Schwegler V. The disposable nature: The case of ecocide and corporate accountability. *Amsterdam Law Forum*. 2017;9(3):71–99.
26. White R, et al. Loving the planet to death: Tourism and ecocide. *Deviant Leisure*. Palgrave Studies in Crime, Media and Culture. 2019;285-304.
27. Rodríguez Goyes Whitehouse. Toward a deeper bioethics. Center for Humans and Nature. 2016.
28. Filho W, et al. Encyclopedia of the UN sustainable development goals. Series Editor: Partnerships for the Goals. 2021.
29. Guilherme M, et al. Intercultural responsibility: Critical inter-epistemic dialogue and equity for sustainable development. Partnerships for the Goals. *Encyclopedia of the UN Sustainable Development Goals*. 2021;599-610.
30. Guilherme, et al. Global debates, local challenges: the south talks back. *Language and Intercultural Communication*. 2023;23(1):7–22.
31. R'boul H, et al. Epistemological plurality in intercultural communication knowledge. *Journal of Multicultural Discourses*. 2022;17(2):173–188.
32. Salas Astrain R, et al. Poderes y asimetrías globales. Aclaraciones sobre la metáfora de la traducción como modelo teórico-práctico en Filosofía Política. *Utopía y Praxis Latinoamericana*. 2021;26(93):300–311.
33. Salas RS, et al. Crisis sociocultural, justicia contextual y pensamiento crítico latinoamericano. 2020.
34. Valera, et al. Tecnología, ecología y la ciencia de la supervivencia: Una mirada al pensamiento de Barry Commoner para el futuro. *Sociedad Tecnológica y Futuro Humano. El Ser Humano en la Era Tecnológica*. Editorial Tirant Lo Blanch S.L./Universidad Mayor. 2021;165-188.
35. Antoine-Moussiaux N, et al. The good, the bad and the ugly: framing debates on nature in a One Health community. *Sustainability Science*. 2019;14(6):1729–1738.
36. Field HE, et al. Bats and emerging zoonoses: Henipaviruses and SARS. *Zoonoses and Public Health*. 2009;56(6–7):278–284.
37. Layton DS, et al. Breaking the chain of zoonoses through biosecurity in livestock. *Vaccine*. 2017;35(44):5967–5973.
38. Rahman MT, et al. Zoonotic diseases: Etiology, impact, and control. *Microorganisms*. 2020;8(9):1–34.

39. Schrecker T, et al. Globalization and health: political grand challenges. *Review of International Political Economy*. 2020;27(1):26–47.
40. Sell SK, et al. Review of international political economy health under capitalism: a global political economy of structural pathogenesis. *Review of International Political Economy*. 2020;27(1):1–25.
41. Shaheen MN, et al. The concept of one health applied to the problem of zoonotic diseases. In *Reviews in Medical Virology*. 2022;32(4).
42. Weitzel, et al. *Travel medicine and infectious disease*. 2022.
43. Zinsstag J, et al. *One health. The theory and practice of integrated health approaches*. CAB International. 2021.
44. Littmann JR, et al. Antimicrobial resistance and distributive Justice. *UCL Discovery*. 2014;1–211.
45. Rollin B, et al. Ethics, science, and antimicrobial resistance. *Journal of Agricultural and Environmental Ethics*. 2001;14(1):29–37.
46. WHO. *Global Action Plan on Antimicrobial Resistance*. 2015.
47. Anthony R, et al. One health animal disaster management: an ethics of care approach. *Journal of Applied Animal Welfare Science*. 2022;25(2):180–194.
48. Collignon PG, et al. One health-its importance in helping to better control antimicrobial resistance. *Tropical Medicine and Infectious Disease*. 2019;4(1).
49. Jasovský D, et al. Antimicrobial resistance—a threat to the world’s sustainable development. *Upsala Journal of Medical Sciences*. 2016;121(3):159–164.
50. Lammie SL, et al. Antimicrobial resistance, food safety, and one health : The need for convergence. *Annu. Rev. Food Sci. Technol*. 2016;7:287–312.
51. McEwen SA, et al. Antimicrobial resistance: A one health perspective. *Microbiology Spectrum*. 2018;6(2):1–26.
52. Millanao AR, et al. Antimicrobial resistance in Chile and the one health paradigm: Dealing with threats to human and veterinary health resulting from antimicrobial use in salmon aquaculture and the clinic. *Revista Chilena de Infectología*. 2018;35(3):299–303.
53. Zhu YG, et al. Soil biota, antimicrobial resistance and planetary health. *Environment International*. 2019;131:105059.
54. Belay ED, et al. Zoonotic disease programs for enhancing global health security. *Emerging Infectious Diseases*. 2017;23:S65–S70.
55. Marchese A, et al. Zoonoses transfer, factory farms and unsustainable human–animal relations. *Sustainability*. 2022;14(19):1–10.
56. Sánchez CA, et al. Spillover of zoonotic pathogens: A review of reviews. In *Zoonoses and Public Health*. 2021;68(6):563–577. John Wiley and Sons Inc.
57. Broom DM, et al. Animal welfare complementing or conflicting with other sustainability issues. In *Applied Animal Behaviour Science*. 2019;219.
58. Steenson S, et al. The challenges of defining a healthy and ‘sustainable’ diet. *Nutrition Bulletin*. 2020;45(2):206–222.
59. Stoll-Kleemann S, et al. The sustainability challenges of our meat and dairy diets. *Environment*. 2015;57(3):34–48.

60. Vercauteren KC, et al. Host community interfaces: The wildlife-livestock. Diseases at the Wildlife - Livestock Interface. *Wildlife Research Monographs*. 2021;3:3–32.
61. Bengis RG, et al. The role of wildlife in emerging and re-emerging zoonoses. In *Rev. sci. tech. Off. int. Epiz.* 2004;23(2).
62. Daniels PW, et al. Infection and disease in reservoir and spillover hosts: Determinants of pathogen emergence. *Wildlife and Emerging Zoonotic Diseases: The Biology, Circumstances and Consequences of Cross-Species Transmission*. *Current Topics in Microbiology and Immunology*. 2007;315.
63. Escudero-Pérez B, et al. Host-pathogen interactions influencing zoonotic spillover potential and transmission in humans. In *Viruses*. 2023;15(3).
64. Marie V, et al. The (re-)emergence and spread of viral zoonotic disease: A perfect storm of human ingenuity and stupidity. *Viruses*. 2023;15(8).
65. Tomori O, et al. Domestic animals as potential reservoirs of zoonotic viral diseases. 2023(a).
66. Tomori O, et al. Domestic Animals as Potential Reservoirs of Zoonotic Viral Diseases. *Annual Review Of Animal Biosciences*. 2023(b);11:33–55.
67. Alexander KA, et al. The ecology of pathogen spillover and disease emergence at the human-wildlife-environment interface. 2018;267–298.
68. Benbow ME, et al. Interkingdom community interactions in disease ecology. *The Connections Between Ecology and Infectious Disease*, *Advances in Environmental Microbiology*. 2018;85:3–38.
69. Grubaugh ND, et al. Tracking virus outbreaks in the twenty-first century. In *Nature Microbiology*. 2019;4:(1)10–19.
70. Plowright RK, et al. Pathways to zoonotic spillover. In *Nature Reviews Microbiology*. 2017;15(8):502–510.
71. Baker RE, et al. Infectious disease in an era of global change. In *Nature Reviews Microbiology*. 2022;20(4):193–205.
72. Marshall P, et al. Intercultural reasoning: The challenge for international bioethics. *Cambridge Quarterly of Healthcare Ethics*. 1994;5:321–328.
73. Baker R, et al. A theory of international bioethics: multiculturalism, postmodernism, and the bankruptcy of fundamentalism. *Kennedy Inst Ethics J*. 1998;8(3):201–231.
74. Jonas H. *The imperative of responsibility: in search of an ethics for the technological age*. University of Chicago Press. 1984.
75. O’Riordan T, et al. Interpreting the precautionary principle. *Earthscan*. 1995.
76. Read R, et al. The precautionary principle under fire. *Environment: Science and Policy for Sustainable Development*. 2017;59:4–15. [Crossref] [GoogleScholar]
77. Van Herten J, et al. The precautionary principle in zoonotic disease control. *Public Health Ethics*. 2021;14(2):180–190.
78. Fornet-Betancourt, et al. In *Interculturalidad crítica y descolonización Fundamentos para el debate*. De la importancia de la filosofía intercultural para la concepción y el desarrollo de nuevas políticas educativas en América Latina. 2009;171–180.
79. Mignolo WD, et al. *On decoloniality. concepts, analytics, praxis*. Duke University Press. 2018.
80. Coghlan S, et al. One health, bioethics, and nonhuman ethics. In *American Journal of Bioethics*. 2018;18(11):3–5.
81. Bennett B, et al. *Health, Rights and Globalisation*. Routledge.2006.

82. Wallach AD, et al. Recognizing animal personhood in compassionate conservation. *Conservation Biology*. 2020;34(5):1097–1106.
83. Zinsstag J, et al. The promotion and development of one health at swiss TPH and its greater potential. *diseases*. 2022;10(65):1–14.
84. Zinsstag J, et al. Climate change and one health. In *FEMS Microbiology Letters*. 2018;365(11). Oxford University Press.
85. Beever J, et al. Interconnectedness and interdependence: challenges for public health ethics. *The American Journal of Bioethics*. 2017;17(9):19–21.
86. Beever J, et al. The epistemic and ethical onus of “One Health.” *Bioethics*. 2018;1–10.
87. Capps B, et al. One health, vaccines and ebola: The opportunities for shared benefits. *Journal of Agricultural and Environmental Ethics*. 2015;28(6):1011–1032.
88. Capps B, et al. One health ethics. *Bioethics*. 2022;36(4):348–355.
89. Meagher KM, et al. Can one health policy help us expand an ethics of interconnection and interdependence? *AMA Journal of Ethics*. 2024;26(2):162–170.
90. Rawlinson MM, et al. *The Routledge handbook of food ethics*. Routledge. 2017.
91. Sandler R, et al. *Food Ethics: The Basics* (R. Sandler, Ed.). Routledge. 2015.
92. Thompson PB, et al. The emergence of food ethics. *Food Ethics*. 2016;1(1):61–74.
93. Benatar SR, et al. Global health ethics: the rationale for mutual caring. *International Affairs*. 2003;79(I):107–138.
94. Singer P, et al. Animal liberation or animal rights? In *Source: The Monist*. 1987;70(1).
95. Singer P, et al. *Animal liberation: a new ethics for our treatment of animals*. Open Road Media. 2015.
96. Ventura BA, et al. Animal welfare concerns and values of stakeholders within the dairy industry. *Journal of Agricultural and Environmental Ethics*. 2015;28(1):109–126.
97. Ventura B, et al. What difference does a visit make? Changes in animal welfare perceptions after interested citizens tour a dairy farm. *PLoS ONE*. 2016;11(5).
98. Weary DM, et al. Review: Using animal welfare to frame discussion on dairy farm technology. In *Animal*. 2023;17.
99. Bostock S, et al. *Zoos and animal rights. The ethics of keeping animals*. Roudledge. 1993.
100. Francione GL, et al. *Animals—property or persons? Animal rights: current debates and new directions*. Oxford University Press. 2004;108–142.
101. Milburn J, et al. Robert Nozick on nonhuman animals: Rights, value and the meaning of life. In *Ethical and Political Approaches to Nonhuman Animal Issues*. Springer International Publishing. 2017;97–120.
102. Regan T, et al. Animal rights, human wrongs. *Environmental Ethics*. 1980;2(2):99–120.
103. Rowlands M, et al. Contractarianism and animal rights. In *Journal of Applied Philosophy*. 1997;14(3).
104. Sunstein CR, et al. *Animal rights: Current debates and new directions*. In *Animal Rights: Current Debates and New Directions*. Oxford University Press. 2012.
105. Celermajer D, et al. A political theory for a multispecies, climate-challenged world: 2050. *Political Theory*. 2023;51(1):39–53.
106. Garner R, et al. *A theory of justice for animals*. In *a theory of justice for animals*. Oxford University Press. 2013.
107. Nussbaum MC, et al. *Justice for Animals: Our Collective Responsibility*. Simon & Schuster.

108. Nussbaum MC, et al. Frontiers of justice: Disability, nationality, species membership. In *Modernism/modernity*. The Belknap Press. 2008;15(1).
109. Schlosberg D, et al. Ecological justice for the anthropocene. *Political animals and animal politics*. 2014;75–89.
110. Willett C, et al. *Interspecies ethics*. Columbia University Press. 2014.
111. Gruen L, et al. *Entangled empathy: an alternative ethic for our relationships with animals*. Lantern Press. 2015.
112. Gruen L, et al. *Critical terms for animal studies*. The University of Chicago Press. 2018(a).
113. Gruen L, et al. *Entangled empathy: politics and practice*. In *Animal Encounters Kontakt, Interaktion und Relationalität*. The University of Chicago Press. 2018(b);77–83.
114. Lecaros JA, et al. Ecological ethics: The road of responsibility towards global bioethics. *Ramon Llull Journal of Applied Ethics*. 2013;04:201–215.
115. Ortiz Millán Nussbaum MC, et al. *Justice for animals: Our collective responsibility*. Simon & Schuster. 2022.
116. Ten Have H, et al. Global Bioethics. In *Handbook of Global Bioethics*. 2014:3–18.
117. Valdéz E, et al. *Handbook of bioethical decisions. Decisions at the Bench*. 2013.
118. Valdéz E, et al. *Handbook of Bioethical Decisions. Volume II Scientific Integrity and Institutional Ethics*. 2013.
119. Marshall P, et al. Accountng for culture in a globalized bioethics. *Journal of Law, Medicine & Ethics*. 2004;32:252–266.
120. Potter VR, et al. Global bioethics with humility and responsibility. *StBob*. 2003;4:97–104.
121. Potter VR, et al. Deep and global bioethics for a livable third millennium. *The Scientist*. 1998;5(12):9.
122. Potter VR, et al. Deep and Global Bioethics for a Livable Third Millennium. *The Scientist*. 1998;5(12):9.
123. Gardiner SM, et al. Environmentalizing bioethics: Planetary health in a perfect moral storm. *Perspectives in Biology and Medicine*. 2022(a);65(4):569–585.
124. Lee LM, et al. A bridge back to the future: Public health ethics, bioethics, and environmental ethics. *The American Journal of Bioethics*. 2017;17(9):5–12.
125. Macklin R, et al. A global ethics approach to vulnerability. *IJFAB: International Journal of Feminist Approaches to Bioethics*. 2012;5(2):64–81.
126. Macklin R, et al. A new definition for global bioethics: COVID-19, a case study. *Global Bioethics*. 2022;33(1):4–13.
127. Valera L, et al. Depth, ecology, and the deep ecology movement: arne næss's proposal for the future. *Enviromental Ethics*. 2019(a);41(4):293–303.
128. Valera L, et al. Human ecology and food. In D. M. Kaplan (Ed.), *Encyclopedia of Food and Agricultural Ethics*. 2019(b);1549–1555. Springer Netherlands.
129. Valera L, et al. Human ecology. New challenges for ecology and philosophy. *Arbor*. 2019(c);195(792).
130. Valera L, et al. New technologies. *Rethinking Ethics and the Environment*. 2020.
131. Macpherson C, et al. Global bioethics: it's past and future. In *Global Bioethics*. 2022;33(1):45–49.
132. Ten Have H, et al. The challenges of global bioethics. *Global Bioethics*. 2022;33(1):41–44.
133. Tong R, et al. Towards a feminist global ethics. *Global Bioethics*. 2022;33(1):14–31.
134. Bonilla-Aldana DK, et al. Importance of the One Health approach to study the SARS-CoV-2 in Latin America. *One Health*. 2020;10:40–43.

135. Cediel Becerra NM, et al. A survey on one health approach in Colombia and some latin American countries: From a fragmented health organization to an integrated health response to global challenges. *Frontiers in Public Health*. 2021;9.
136. Cediel-Becerra NM, et al. Woman-sensitive one health perspective in four tribes of indigenous people from Latin America: Arhuaco, Wayuú, Nahua, and Kamëntsá. *Frontiers in Public Health*. 2022;10.
137. Hemida HD, et al. The SARS-CoV-2 outbreak from a one health perspective. *One Health*. 2020;100127.
138. Ishii M, et al. The code of pangolins interspecies ethics in the face of sars-cov-2. *Current Anthropology*. 2021;62(5):641–646.
139. Konda M, et al. Potential zoonotic origins of SARS-CoV-2 and insights for preventing future pandemics through one health approach. *Cureus*. 2020(b);12(6):1–7.
140. Leroy EM, et al. The risk of SARS-CoV-2 transmission to pets and other wild and domestic animals strongly mandates a one-health strategy to control the COVID-19 pandemic. *One Health*. 2020;4–7.
141. Turcios-Casco MA, et al. Do not blame bats and pangolins! global consequences for wildlife conservation after the SARS-CoV-2 pandemic. *Biodiversity and Conservation*. 2020;29(13):3829–3833.
142. Zhao Z, et al. The potential intermediate hosts for SARS-CoV-2. In *Frontiers in Microbiology*. 2020;11. Frontiers Media S.A.
143. Finkler K, et al. Can bioethics be global and local, or must it be both? *Journal of Contemporary Ethnography*. 2008;37(2):155–179.
144. Gielen J, et al. Dealing with bioethical issues in a globalized world. *Normativity in Bioethics*. 2020.
145. Brescia T, et al. The rediscovery of potterian bioethics. *Global Bioethics*. 2015;26(3–4):190–197.
146. Macklin R, et al. Ethical relativism in a multicultural society. *Kennedy Inst Ethics J*. 1998;8(1):1–22.
147. Valera L, et al. La bioética de Potter: la búsqueda de la sabiduría en el origen de la bioética y de la ética ambiental. *Medicina y Ética*. 2017;2:393–411.
148. Whitehouse PJ, et al. Toward a deeper bioethics. *Center for Humans and Nature*. 2016.
149. Whitehouse PJ, et al. The rebirth of bioethics: Extending the original formulations of van renselaer potter. *American Journal of Bioethics*. 2003;3(4):W26–W31.
150. Ten Hav H, et al. Handbook of global bioethics. *Handbook of Global Bioethics*. 2014;1–1685.
151. Thompson PB, et al. Ebola needs one bioethics. *Ethics, Policy and Environment*. 2015;18(1):96–102.
152. Thompson PB, et al. From synthetic bioethics to one bioethics: A reply to critics. *Ethics, Policy and Environment*. 2015;18(2):215–224.
153. Thompson PB, et al. One bioethics for COVID 19? In *Agriculture and Human Values*. 2020;37 (3):619–620.
154. Celermajer D, et al. Justice through a multispecies lens. *Contemporary Political Theory*. 2020;19(3): 475–512.
155. Healey R, et al. Interspecies justice: agency, self-determination, and assent. *Philosophical Studies*. 2021;178(4):1223–1243.
156. Thaler M, et al. No other planet. Utopian visions for a climate-changed world. In *No Other Planet*. Cambridge University Press. 2022(a).
157. Thaler M, et al. What If: multispecies justice as the expression of utopian desire. *Environmental Politics*. 2022(b);31(2):258–276.
158. Attfeld R, et al. *The Ethics of the Global Environment*. Edinburgh University Press. 2015(a).
159. Attfeld R, et al. *The Ethics of the Global Environment*. Edinburgh University Press. 2015(b).

160. Callicott J, et al. Biocomplexity and conservation of biodiversity hotspots: Three case studies from the Americas. *Philosophical Transactions of the Royal Society B: Biological Sciences*. 2007;362(1478):321–333.
161. Rolston H, et al. Wild animals and ethical perspectives. In *Encyclopedia of Animal Rights and Animal Welfare*. 2010;603–606.
162. Rozzi R, et al. Linking ecology and ethics for a changing world. 2013.
163. Rozzi R, et al. Un centinela para el monitoreo del cambio climático y su impacto sobre la biodiversidad en la cumbre austral de América: la nueva red de estudios a largo Plazo Cabo de Hornos. *Anales Instituto Patagonia*. 2020;48(3):45–81.
164. Rozzi R, et al. Implications of the biocultural ethic for earth stewardship. *Earth Stewardship. Ecology and Ethics*. 2015;113–136.
165. Van Herten J, et al. One health as a moral dilemma: Towards a socially responsible zoonotic disease control. *Zoonoses and Public Health*. 2019;66(1):26–34.
166. Ryan EB, et al. Public attitudes toward the use of technology to create new types of animals and animal products. *Animal Welfare*. 2023;32.
167. Lerner H, et al. A comparison of three holistic approaches to health: One health, ecohealth, and planetary health. *Frontiers in Veterinary Science*. 2017;4:1–7.
168. Roger F, et al. One health and ecohealth: the same wine in different bottles? *Infection Ecology and Epidemiology*. 2016;6(1).
169. AVMA. One health initiative task force: a new professional imperative. 2008.
170. Pelluchon C, et al. Animal Ethics. *Encyclopedia of Global Bioethics*. 2016;118–125.
171. Pelluchon C, et al. Manifiesto animalista. Politizar la causa animal. Reservoir Books. 2018.
172. Arato J, et al. The Perils of Pandemic Exceptionalism. *American Journal of International Law*. 2020;114(4):627–636.
173. Kirk J, et al. The politics of exceptionalism: Securitization and COVID-19. *Global Studies Quarterly*. 2021;1(3).
174. Origgì G, et al. Fear of principles? A cautious defense of the Precautionary Principle. 2014;13:215–225.
175. Palmer, et al. Ethicists' commentary on humane killing of healthy surplus animals. *Canadian Veterinary Journal*. 2022;63(6):581–582.
176. Browning H, et al. No room at the Zoo: Management euthanasia and animal welfare. *Journal of Agricultural and Environmental Ethics*. 2018;31(4):483–498.
177. McCulloch SP, et al. Bovine tuberculosis and badger control in Britain: Science, policy and politics. *Journal of Agricultural and Environmental Ethics*. 2017;30(4):469–484.
178. McCulloch SP, et al. A proposal for a UK Ethics Council for animal policy: The case for putting ethics back into policy making. *Animals*. 2018;8(6).
179. Rollin BE, et al. Animal ethics and the culling of badgers: A reply to McCulloch and Reiss. *Journal of Agricultural and Environmental Ethics*. 2017;30(4):565–569.
180. Rechnitzer T, et al. Applying reflective equilibrium. towards the justification of a precautionary principle. 2022.
181. Sandin P, et al. Dimensions of the precautionary principle. *Human and Ecological Risk Assessment: An International Journal*. 1999;5(5):889–907.

182. Van Herten J, et al. Considerations for an ethic of One Health towards a socially responsible zoonotic disease control. Wageningen University. 2021.
183. Muzur A, et al. The real wisconsin idea: The seven pillars of van renselaer potter's bioethics. *Agric Environ Ethics*. 2016;29:587–596.
184. Potter VR, et al. The ethics of nature and nurture. *Zygon*. 1973;8(1):36–47.
185. Potter VR, et al. Global bioethics as a secular source of moral authority for long-term human survival. *Global Bioethics*. 1992;5(1):5–11.
186. Potter VR, et al. Real bioethics: Biocentric or anthropocentric? *Ethics and the Environment*. 1996;1(2): 177–183.
187. Potter VR, et al. Global bioethics: Converting sustainable development to global survival. *Global Bioethics*. 2001;14(4):9–17.
188. Valera L, et al. La bioética de Potter: la búsqueda de la sabiduría en el origen de la bioética y de la ética ambiental. *Medicina y Ética*. 2017;2:393–411.
189. Alam MU, et al. Human exposure to antimicrobial resistance from poultry production: Assessing hygiene and waste-disposal practices in Bangladesh. *International Journal of Hygiene and Environmental Health*. 2019;222(8):1068–1076.
190. Behnam B, et al. Inadequacies in hospital waste and sewerage management in chattogram, Bangladesh: Exploring environmental and occupational health hazards. *Sustainability*. 2020;12(21):1–21.
191. Dias LL, et al. Hospital liquid waste contaminated with multidrug-resistant bacteria raises a public health hazard alert in Brazil. *Environmental Monitoring and Assessment*. 2021;193(11).
192. Savin M, et al. Antibiotic-resistant bacteria and antimicrobial residues in wastewater and process water from German pig slaughterhouses and their receiving municipal wastewater treatment plants. *Science of the Total Environment*. 2020;727.
193. Van Herten J, et al. Ethical decision - making in zoonotic disease control. *Journal of Agricultural and Environmental Ethics*. 2020;33(2):239–259.
194. Lerner H, et al. The concept of health in One Health and some practical implications for research and education: what is One Health? *Infection Ecology & Epidemiology*. 2015;5(1):25300.
195. Mackenzie JS, et al. One Health: The human– animal–environment interfaces in emerging infectious diseases. *The Concept and Examples of a One Health Approach*. 2013.
196. Barrett BA, et al. *One Health: Interdependence of people, other species and the planet*. Saunders Elsevier. 2013.
197. Leboeuf A, et al. *Making sense of one health. Cooperating at the Human-Animal-Ecosystem Health Interface*. 2011.
198. Nieuwland J, et al. One health: How interdependence enriches veterinary ethics education. *Animals*. 2020;10(1).
199. Nieuwland J, et al. One-health as a normative concep: implications for food safety at the wildlife interface. In *Know your food: Food ethics and innovation*. 2013;132–137.
200. Waltner-Toews D, et al. Zoonoses, One Health and complexity: wicked problems and constructive conflict. *Phil. Trans. R. Soc*. 2017;372:1–9.
201. Wilkes MS, et al. One health–one education: Medical and veterinary inter-professional training. *Journal of Veterinary Medical Education*. 2019;46(1):14–20.

202. Da Silva C, et al. Food or extinction? Analysis of differing perceptions among residents and conservation experts of columbids (aves: columbidae) hunting in Sergipe, Northeastern Brazil. *Human Ecology*. 2023;51(3):471–481.
203. Hooks SK, et al. Can global policy impact local environmental justice? Using CASPER to assess perceived health effects of an incinerator. *Human Ecology*. 2020;48(1):119–125.
204. Van Vliet N, et al. Understanding factors that shape exposure to zoonotic and food-borne diseases across wild meat trade chains. *Human Ecology*. 2022;50(6):983–995.
205. Cox JA, et al. Antibiotic stewardship in low- and middle-income countries: the same but different? In *Clinical Microbiology and Infection*. 2017;(23)11:812–818.
206. Doron S, et al. Antimicrobial stewardship. *Mayo Clinic Proceedings*. 2011;86(11): 1113–1123.
207. Dyar OJ, et al. What is antimicrobial stewardship? In *Clinical Microbiology and Infection*. 2011;23(11):793–798.
208. Osińska A, et al. Small-scale wastewater treatment plants as a source of the dissemination of antibiotic resistance genes in the aquatic environment. *Journal of Hazardous Materials*. 2020;381.
209. Francisco P, et al. Laudato si'. Sobre el cuidado de la casa común. Salesianos impresores-PUC. 2015.
210. Naess A, et al. Ecology, community and lifestyle: Outline of an ecosophy. Cambridge University Press. 1990;323–324.
211. Leopold A, et al. A Sand County almanac, and sketches here and there. Oxford University Press. 1949.
212. Naess A, et al. Gestalt ontology and gestalt thinking. In *The Selected Works of Arne Naess*. 2005(a);2727–2733.
213. Naess A, et al. Self-realization: An ecological approach to being in the world. In H. G. & A. Drengson (Ed.), *The Selected Works of Arne Naess*. 2005(b);515–530.
214. Diehm C, et al. Connection to nature, deep ecology, and conservation social science. *Human Nature Bonding and Protecting the Natural World*. Lenxington Books. 2020.
215. Valera L, et al. The spontaneous experience to the cosmos: Arne naess's phenomenology. *Problemas*. 2018;93(93):142–153. [Crossref] [GoogleScholar]
216. Callicott JB, et al. Environmental ethics in the anthropocene. 2018;13:1–20.
217. Callicott JB, et al. How ecological collectives are morally considerable. Oxford University Press. *The Oxford Handbook of Environmental Ethics*. 2015;113–124.
218. Callicott JB, et al. Aldo leopold as educator: His legacy for field environmental philosophy. 2023;263–279.
219. Dahlberg AC, et al. Indigenous medicine and primary health care: The importance of lay knowledge and use of medicinal plants in rural South Africa. *Human Ecology*. 2009;37(1):79–94.
220. Dewan M, et al. Ethics, morality and healing: a bhil perspective. *Ethnomedicine and Tribal Healing Practices in India: Challenges and Possibilities of Recognition and Integration*. 2023;221–233.
221. Lindenfors P, et al. Divine placebo: Health and the evolution of religion. *Human Ecology*. 2019.
222. Long KN, et al. Theological virtues, health, and well-being: Theory, research, and public health. In *Handbook of Positive Psychology, Religion, and Spirituality*. 2022;395–409.
223. Nading AM, et al. Humans, animals, and health: from ecology to entanglement. *Environment and Society*. 2014;4(1).

224. Subedi M, et al. Indigenous healing practices in the himalayas: Use of medicinal plants and health development in Nepal. *Ethnomedicine and Tribal Healing Practices in India. People, Cultures and Societies: Exploring and Documenting Diversities*. 2023;95–107.
225. Bates DG, et al. *Human Ecology. Contemporary Research and Practice*. 2010.
226. Steiner FR, et al. *Human ecology. How nature and culture shape our world*. Island Press Washington, DC. 2019.
227. Estomba D, et al. Medicinal wild plant knowledge and gathering patterns in a Mapuche community from North-western Patagonia. *Journal of Ethnopharmacology*. 2006;103(1):109–119.
228. Molaes S, et al. Ethnobotanical review of the Mapuche medicinal flora: Use patterns on a regional scale. *Journal of Ethnopharmacology*. 2009;122(2):251–260.
229. Torri MC, et al. Medicinal plants used in mapuche traditional medicine in Araucanía, Chile: Linking sociocultural and religious values with local health practices. *Complementary Health Practice Review*. 2010;15(3):132–148.
230. Chao S, et al. *The promise of multispecies justice. The Promise of Multispecies Justice*. Duke University Press. 2022.
231. Coulter K, et al. *Animals, work, and the promise if interspecies solidarity*. Macmillan. 2016.
232. Deane-Drummond CE, et al. *Theological ethics through a multispecies lens the evolution of wisdom, volume I*. Oxford University Press. 2019.
233. Tschakert P, et al. *Multispecies justice: Climate-just futures with, for and beyond humans*. Wiley Interdisciplinary Reviews: Climate Change. 2020;12(2):1–10.
234. Tschakert P, et al. *More-than-human solidarity and multispecies justice in the climate crisis*. *Environmental Politics*. 2022;31(2):277–296.
235. Deane-Drummond CE, et al. *A Primer in ecotheology: Theology for a fragile Earth*. Cascade Books. 2017.
236. Deane-Drummond CE, et al. *Theology and ecology across the disciplines. On Care for Our Common Home*. 2018.
237. Mcewen Leblanc AB, et al. *Applying the Celia. Deane-Drummond e ecosystem approach to global bioethics: building on the Leopold legacy. Global Bioethics*. 2023;34(1).
238. Kirchhoffer D, et al. *How ecology can save the life of theology: A philosophical contribution to the engagement of ecology and theology. Theology and Ecology Across the Disciplines: On Care for Our Common Home*. 2018;53–64.
239. Sandler R, et al. *De-extinction and conservation genetics in the anthropocene. Hastings Center Report*. 2017(a);47:S43–S47.
240. Sandler R, et al. *De-Extinction. Costs, benefits and ethics. Nature Ecology and Evolution*. 2017(b);1(4):1–2.
241. Sandler R, et al. *On the massness of mass extinction. Philosophia*. 2021;1–16.
242. Gardiner SM, et al. *On the scope of institutions for future generations: defending an expansive global constitutional convention that protects against squandering generations. Ethics and International Affairs*. 2022(b);36(2):157–178.
243. WHO. *Zoonotic disease: emerging public health threats in the Region*. 2023.
244. Benis A, et al. *One digital health intervention for monitoring human and animal welfare in smart cities: Viewpoint and use case. JMIR Medical Informatics*. 2023;11.
245. Fiore, et al. *Bioethics: Environmental. Encyclopedia of Global Bioethics*. 2016:313–324.

246. Valdáz, et al. Digital health in medicine: Important considerations in evaluating health economic analysis. 2022;23:100476.
247. Potter VR, et al. Bioethics, the science of survival. *Perspectives in Biology and Medicine*. 1970;14(1): 127–153.
248. Potter VR, et al. *Bioethics: bridge to the future*. Prentice-Hall. 1971.
249. Potter VR, et al. Aldo Leopold's land ethic revisited: two kinds of bioethics. *Perspectives in Biology and Medicine*. 1987;30(2):157–169.
250. Stepke FL, et al. The hermeutical dimension of the bioethics enterprise. notes on the dialogical/narrative foundations of bioethics. *Nussbaum*. 2020;24(2):153–159.
251. Salas Astraín R, et al. Poderes coloniales, violencias y territorios interétnicos Colonial Powers, Violence and Inter-ethnic Territories. *Revista Wirapuru*. 2020;2(1):40–53.
252. Richardson S, et al. A framework for digital health equity. *Npj Digital Medicine*. 2022;5(1).
253. Tamburis O, et al. One digital health for more FAIRness. *Methods of Information in Medicine*. 2022;61(2):E116–E124.