



How the Anthropocene is changing bioethics

PAOLO DONADONT¹, ROSAGEMMA CILIBERTI²¹ University of Genoa, Genoa, Italy;² Department of Health Sciences, Section of Bioethics and History of Medicine, University of Genoa, Genoa, Italy

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Anthropocene • Ethics of the Earth • Bioethics • Environment • One health

Summary

The complex challenges of the Anthropocene imply a careful reconsideration of the ethical boundaries of human morality and a heightened sensitivity to the interconnectedness among all living beings. This means that bioethics, traditionally anchored in interhuman relations within the healthcare domain, is called upon to broaden the scope of its operational horizon, encompassing issues related to interspecific relations, environmental health, sustainability, equitable distribution of natural resources, and responsibility for environmental damages. This article explores

the intersection between the anthropocentric era and the ethical challenges arising from our increasing influence on the environment and other life forms with which we share the planet. The teaching of fundamental ethical concepts such as solidarity, social responsibility, and equity becomes crucial for nurturing informed and responsible citizens. In doing so, not only is greater awareness promoted regarding global challenges related to health and the environment, but critical skills are also developed to address them proactively.

Introduction

THE COMPLEXITY OF BIOETHICAL LANGUAGE: BETWEEN INTERDISCIPLINARITY, AMBIGUITY, AND CONCEPTUAL EVOLUTION

In bioethics, a field that thrives on interdisciplinarity as a vital source of inspiration, terminology often undergoes changes in both extension and intension when transitioning from one area of knowledge to another. At times, terms are stretched beyond their original technical meanings or are characterized by ambiguity and misunderstandings. The language of bioethics, therefore, inherently possesses certain complexities for specific and natural reasons.

An intrinsic and fascinating characteristic, yet simultaneously a genetic flaw, of bioethical debate is its interdisciplinary nature. Bioethics traverses disparate fields of knowledge that not only intersect but also establish enduring relationships, giving rise to mutual hybridizations [1]. Today, to illustrate briefly, legal discourse discusses "transplants" and "determination of death," medicine addresses "informed consent" and "living wills," while philosophy engages with "stem cells" and "embryos," among others.

In some cases, for instance, words can have different meanings in different contexts (plurality of intentions). Consider the term "donation," which in legal contexts refers both to civil law in private contexts and to the specialized discipline of organ transplantation, with entirely non-overlapping meanings [2, 3].

For those involved in bioethical debate, therefore, it is not automatic to assume that the same words convey the same meanings. But let's start from the beginning: the

very term "bioethics," coined as a neologism in the 1970s, still today – though considered part of ordinary language – does not have a content (extension of meaning) that can be unequivocally agreed upon. In fact, it is evolving even in terms of thematic priorities [4].

THE BROADENING OF THE EXTENSION OF THE TERM "BIOETHICS"

In bioethical literature from the early millennium, various scenarios are included that do not always address the themes of ecology and our relationship with non-human animals. For example, the topic of animal rights is found in Leone's work but not in Sgreccia's [5, 6]. Tettamanzi addresses the ecological issue (chapter 24), but only briefly touches on animals (see, for example, p. 337 and pp. 407-408, where, while considering legitimate – in the absence of valid alternatives – experimentation on animals for the benefit of humans, he specifies: "especially in the field of experimentation, animals should be recognized as having genuine moral and legal rights, thus ensuring adequate protection for them") [7]. Ciccone and Mori dedicate about ten pages to the topic, while Lecaldano, for "economic reasons of control over the material treated and the need for unity," excludes "issues related to the treatment of non-human animals," although specifying that "there are no solid arguments to exclude non-human animals from moral consideration" [8-10] (p. 5). Engelhardt Jr. devotes barely three pages – he calls it an "excursus" – to animals, inviting us to the morality of non-maleficence, consisting of negative duties of beneficence towards humans (pp. 166-168) [8-11]. These are just a few examples, but sufficient to outline a general picture. Indeed, in light of the discourse on bioethics presented,

it would be intriguing to investigate how Aristotle's ethical principles could enhance the approach to the subject. While contemporary bioethics often emphasizes individual rights and autonomy, Aristotelian ethics offers a perspective grounded in the concept of virtue and the pursuit of the common good. Delving into this connection could lead to a deeper understanding of the moral issues intersecting contemporary biomedicine.

It seems that some issues, namely the critical examination of certain areas of reflection, are preferably found in specialized works rather than in general bioethics manuals. Among the authors who have extensively addressed bioethical issues related to the relationship between humans and animals, we recall, for example, Silvana Castignone and Luisella Battaglia who were among the first to initiate the debate on animal rights in Italy in the 1980s [12-18].

As further evidence of this variety (and, at times, vagueness) in the extension of the term's meaning, it can be observed that other authors include topics rarely found in bioethics manuals. For instance, Ciccone devotes chapters to drug abuse, alcoholism, smoking, and AIDS [19].

Angelini asserts that defining exactly what "bioethics" entails is no easy feat. Its vagueness constitutes a primary source of dissatisfaction [20]. Moreover, referring to bioethics in the singular is not an obvious choice; it seems rather risky. Indeed, it would be extremely challenging to identify a consensus in the theoretical definition of this new "science" within the literature dedicated to its epistemological profile. Likewise, finding a reason for unity within the field of bioethics, both in terms of treaties and public culture, would be complex. However, the unity of the bioethical field does exist to some extent [21]; this unity is guaranteed more by the overall societal context in which bioethics originates than by specific theoretical elaboration.

The term "bioethics" itself expresses a critical aspect of its scope and the determination of its extension [22]. However, what is important to note here is the lack of necessary inclusion (or their minimal development, sometimes almost irrelevant) of ecological themes and our relationship with non-human animals in early Millennium manuals. Will this be the case in mid-Millennium manuals as well? Indeed, the Anthropocene compels us today to no longer ignore the priority of our ecological and interspecific relationships.

New topics will have to rightfully enter the field of bioethics, such as invisible pollution (in marine depths and outer space, areas that escape direct human perception but will be at the center of debate in the near future, for instance, to establish shared guidelines for the use of international waters and space, to address pollution cessation, the necessity of cleanup activities, and to use biodegradable materials...) and the ethical treatment of plants (given that life sciences confirm they possess sensory qualities similar to ours, as well as learning, memory, and thinking capacities), as well as a new balance between sapiens and animals (no longer assimilable to mere objects; moreover, chimpanzees belong to our own tribe, that of hominins, and in

mammals, basic structures of consciousness and thought akin to ours are recognized) [23-27].

However, the impact of the Anthropocene on the delineation of bioethical issues cannot be considered confined to ecology in the broad sense, as it involves the emergence of specific profiles of human activities: big data, body hybridization, and personal identity (not only concerning human-animal commingling but also regarding developments in robotics), topics not yet institutionalized in bioethics manuals but which presumably will chart the future paths of this discipline.

THE SHIFT IN PRIORITIES IN THE BIOETHICAL DEBATE

Regarding the second aspect, the shifting priorities in the bioethical debate make it clear that human survival automatically becomes a species priority that precedes any individual priorities related, for example, to the principles of autonomy and self-determination (as a matter of logical, these principles are practically inapplicable if human survival is not ensured first).

The Anthropocene, through the awareness of the fundamental role of interspecific relationality and our interaction with planet Earth, as well as their incorporation into bioethical debate, is likely to overshadow the developmental trajectories that characterized the end of the twentieth century and the beginning of the new millennium: the claims of individual rights and the discipline of intra-human relationships inspired, for example, by the right of choice of the individual or the couple, or decisions arising from the doctor-patient dyad. There will emerge a dual polarity: a planetary and global ecological perspective (which somehow evokes and resumes the impetus of the original bioethics, Potter and the like, for instance) and, within the framework of rediscovered biological familiarity with non-human living beings, the vast acquired (or in the process of being acquired) potentialities for intervention on the foundations of human nature – biological, anthropological, psychological, identity-related – and thus also for legal regulation.

The themes of ecology and our relationship with non-human animals [28] are precisely those that assume greater relevance in terms of the current change in bioethical priorities. This is evidenced by the establishment of dedicated chairs, such as those in Plant Psychology at the University of Padua (Umberto Castiello) and Plant Neurobiology at the University of Florence (Stefano Mancuso), or the chair in Private Law of Animals at the University of Turin (Luciano Olivero). This trend calls for a paradigm shift in the biological, cultural, and philosophical concept of the human being and their place in the balance of planet Earth. This aligns with the spirit of the Italian Recovery and Resilience Plan (PNRR), which sees ecology (and eco-sustainability) as the guiding principle characterizing investment mission No. 2 ("Green revolution and ecological transition"), but actually permeating all others as well.

Considering that Legislative Decree 254/2016 requires listed companies with more than 500 employees and

€40 million in revenue to declare their non-financial statements annually (advancing the concept of ethical capital, which irreversibly undermines the supremacy of GDP and introduces ecological, social, and moral values into the heart of the evaluation system), it is likely that sustainability will become a filter, a precondition, for all investments financed with public funds in the future [29]. Thus, the Anthropocene brings bioethics back to its pragmatic profile, to its economic relevance in terms of the depletion of non-renewable resources and the allocation of economic resources. Every year, the Global Footprint Network, an international sustainability organization focusing on environmental accounting, calculates the planetary ecological footprint and identifies the day when the Earth's capacity to regenerate resources for the current year is exhausted. The Earth Overshoot Day for the world fell on July 28, 2022 (in 2021, it was July 29, and in 2020, it was August 22). On May 15, 2022, however, it was Italy's Overshoot Day, the day when Italy surpasses its ecological footprint (thus consuming nearly 3 planets instead of 1) [30]. The United States leads the ranking: they consume the equivalent of 5 planets [31].

THE ANTHROPOCENE AND ETHICAL CHALLENGES

The interaction between industrialization, urbanization, and economic development has led to significant improvements in human health, including increased life expectancy, reduced infant mortality, and a decline in extreme poverty. However, these benefits, distributed unevenly, have also resulted in unprecedented exploitation of the Earth's life support systems.

We cannot overlook the contribution of the healthcare sector to this profound alteration of natural ecosystems. Inadequate policies regarding the use and disposal of pharmaceuticals and medical devices can significantly contribute to water and soil pollution, negatively impacting biodiversity and ecosystem health. Similarly, intensive farming and livestock practices, often associated with the healthcare sector, contribute to deforestation, soil erosion, and air and water pollution. As emphasized by the American ecologist Aldo Leopold, the Ethics of the Earth raises crucial questions that challenge many implicit assumptions of a bioethics focused solely on the present temporal dimension, necessitating a profound reconsideration of the ethical relationship that humans have traditionally established with the Earth community and the ecosystems upon which they necessarily depend [32].

In the materialistic and functionalistic perspective typical of modernity, nature is seen as a mere source of resources to be exploited limitlessly and a dumping ground for activities aimed at maximizing productivity and income. However, not only the recent SARS-CoV-2 pandemic but also the various health emergencies that have occurred over time have highlighted the fragility of the traditional paradigm that allows for any possible use of these resources solely based on mere technical possibility.

As philosopher Isabelle Stengers reminds us, the "intrusion of Gaia" warns us that the Earth is much more than just a reservoir of resources to be

exploited; it is a living organism, interconnected and interdependent, responding to human actions and their consequences [33, 34]. This concept challenges us to reconsider our traditional relationship with nature and to revise how we treat it to adopt a more respectful and responsible approach, recognizing its intrinsic value and its capacity for self-regulation.

In a different and necessary perspective, humans –as simple members among other living community members – take on an ethical responsibility towards present and future generations in a broader ecological context, capable of considering the connections between humans and the environment in a more complete and conscious way.

By recognizing the intrinsic value of the community itself, beyond the well-being of its individual members, the Ethics of the Earth moves away from the individualistic approach that often still permeates contemporary bioethical reflection to promote an ethics of interconnectedness, which acknowledges and respects the vitality and balance of the community as a whole.

The issue of equity in the use of resources and the distribution of environmental harms represents another crucial point. Who is responsible for mitigating the negative impacts of the Anthropocene, and how should these responsibilities be distributed? As Leopold reminds us, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise" [35].

An ethical approach to managing the Anthropocene thus requires a cultural and social change. This includes promoting sustainable technologies, responsible environmental policies, and a new paradigm of values focused on the interconnectedness between humanity and the global ecosystem.

In this context, considering ourselves citizens of the Earth community broadens the moral horizons of healthcare, moving beyond an exclusively anthropocentric focus.

This approach implies a broader and more inclusive ethics that recognizes our connection to the entire ecosystem and promotes care not only for humans but also for the Earth and all forms of life inhabiting it. It is indeed a fact that our well-being depends not only on the medical care we receive but also on the quality of the air we breathe, the water we drink, and the soil we cultivate for food. A broader and more inclusive ethics thus entails a commitment to caring not only for individuals' immediate medical needs but also the responsibility to adopt practices and policies that protect and preserve the environment in which we live, ensuring long-term health for all forms of life on Earth. This structural interconnectedness among the various components interacting to determine well-being and health is well expressed in the One Health framework, which proposes an integrated approach to holistically address health threats [36].

The One Health approach, officially recognized by the European Commission and all international organizations as a relevant strategy across various sectors benefiting from collaboration between different disciplines, constitutes an ideal approach to achieve global health as it considers the wide range of factors

emerging from various interactions, thus providing a comprehensive framework. Embracing this perspective also entails a revision of the current concept of "health" identified by the World Health Organization as the ability to adapt and self-manage in the face of physical, emotional, and social challenges (2011), to expressly include the reference to the relationship that humans have with other living beings and with nature in its complexity [37]. Integrating this perspective into the definition of health allows us to better understand the critical role that environmental conservation plays in promoting human well-being and to adopt more holistic and sustainable approaches to global health.

A perspective of justice in healthcare that integrates climate and environmental justice could provide healthcare providers with a more comprehensive and relevant ethical framework for future challenges. The One Health approach could indeed imply not only treating individual diseases but also adopting healthcare policies and practices that reduce negative impacts on the environment and promote long-term sustainability. For example, healthcare services could be more involved in reducing air pollution and greenhouse gas emissions, ensuring that healthcare facilities are environmentally sustainable, and promoting a healthier diet and lifestyle with a positive impact on both human health and the environment.

In this way, healthcare workers can actively contribute to building a more equitable and sustainable future for all by considering the ethical implications of their actions not only for the present but also for future generations and the planet. Viewing ourselves as citizens of the Earth community necessarily broadens the moral horizons of care to encompass the interests of all vulnerable subjects, which include not only those who require special protection due to age, gender, social or cultural status, but also all non-human members exposed to the consequences of our actions.

TOWARDS NEW FORMS OF EDUCATION

In an era where the Anthropocene increasingly undermines the delicate balances of the planet's life support systems, bioethics can play a crucial role in educating and guiding the choices and actions of individuals, institutions, and governments. However, its impact will be truly significant only if it is able not only to address the consequences of our exploitation of the natural world but also to profoundly rethink our relationship with it.

By promoting fundamental ethical values such as environmental responsibility and solidarity, bioethics, enriched by the concept of ecoformation – which provides a theoretical framework for understanding the intrinsic link between environmental awareness, individual responsibility, and the promotion of planetary health and the well-being of future generations – can stimulate critical reflection on our behavior towards nature and the implications of our actions for the health of the planet and future generations [38].

Reimagining our relationship with ecosystems

also entails accepting the challenge of a profound reconsideration of the conventional conceptual tools of bioethics.

Emergencies such as the recent pandemic have highlighted the complexity of adequately addressing distributive justice issues where access to essential healthcare resources is limited and indivisible. The intricacy of these issues, which involved a group of people at a particular historical moment, has sparked debates and conflicts that have led to official positions being taken, such as those expressed by the Italian National Bioethics Committee (NBC) and the Italian Society of Anaesthesiology and Intensive Care (SIIARTI) [39, 40]. However, the complexity of these issues is expected to intensify when the comparison (extremely delicate and challenging) is not between an elderly and a young subject, easily identifiable within clinical parameters and different and quantifiable life expectancies, but extends to include goods and resources used by a plurality of subjects other than those competing for the allocation of vital resources, which will inevitably be affected, in ways that are difficult to quantify, by the production of materials consumed in the care of the individual.

The principles of distributive justice (GILLON) are effective when dealing with problems involving a defined group of potential beneficiaries and limited available resources influencing only those within this group. However, global environmental issues challenge this paradigm: the impacts of our actions are widespread in time and space, involving a wide range of people, both current and future, in different ways [41].

Even the category of obligations of justice based on human rights, ensuring that communities are not depleted in their resources for pharmaceutical production by more advantaged countries, cannot offer a decisive contribution to such issues. It is not always possible to establish a direct and causal link between healthcare provided to an individual and the violation of communities' rights to access uncontaminated water and environmental resources.

The dispersal of environmental causes and effects means that human actions in one place can have significant impacts on people and ecosystems distant in time and space. This interconnectedness makes it difficult to attribute responsibility and establish a clear ethical basis for our actions. Moreover, the fragmentation of human engagement implies that many of the actions contributing to global environmental problems stem from multiple actors, each playing a partial but significant role.

Addressing each of these factors separately would already be challenging using the resources of contemporary biomedical ethics; however, their convergence presents an even more daunting challenge, perhaps insurmountable with the resources currently available. This criticality implies that even when the "distant other" (in spatial or temporal dimensions, such as future generations) enters our circle of concern, it does not always lead to a corresponding active response from the subjects.

Stephen Gardiner has described this situation as a 'perfect

moral storm,' a lethal condition seemingly without an exit, highlighting the need for new forms of thought and ethical action based on a holistic and inclusive approach, recognizing the complex networks of relationships and interactions among individuals, communities, and the environment. This entails the need to cultivate a perception of environmental issues as morally relevant even when they are not easy to perceive [42].

Instead of focusing solely on individual parts or isolated individuals, the holistic approach acknowledges the importance of relationships and interactions among individuals, the biotic community, and the surrounding environment. This implies not only a revision of our conceptual models and ethical practices but also a profound transformation in our behaviors and policies, so that we can effectively address the interconnected challenges posed by human health and the well-being of the planet.

Climate change, soil and water pollution, and the decline in food resources make Potter's warning about the need for a new 'global bioethics,' based on a new understanding of humanity's position within planetary systems, more relevant than ever.

This innovative anthropological and philosophical perspective, arising from an awareness of the intricate relationships and interactions among humans, animals, and the environment, also calls for a redesign of educational programs capable of transcending rigid disciplinary boundaries and promoting broad and pluralistic thinking.

Considering the intrinsic link between human health and environmental health, bioethical education becomes crucial for developing critical thinking skills necessary to address the complex challenges posed by the Anthropocene.

Teaching bioethics can encourage the development of an interdisciplinary mindset, allowing students to understand the complexities of environmental and health issues through a global and interconnected perspective [43].

This can foster collaboration among different academic disciplines and the pursuit of innovative and sustainable solutions to address emerging challenges related to health and the environment.

This includes the ability to fairly assess the ethical implications of decisions and policies, as well as the ability to collaborate effectively with other disciplines and sectors to develop sustainable and socially just solutions.

Starting from schools, the integration of bioethics into educational curricula can promote awareness of the connection between individual actions and collective impacts on the environment and human health. Through the teaching of fundamental ethical concepts such as solidarity, social responsibility, and equity, students can gain a deeper understanding of global challenges related to health and the environment and develop critical skills to address them proactively.

Healthcare professionals who are aware of the ethical implications of their practices can also play a primary role

in engaging the general public in adopting sustainable and responsible behaviors.

Conclusions

The Anthropocene represents a critical phase in human history, necessitating a profound examination of our relationship with planet Earth and its myriad life forms. Environmental alterations resulting from human activity are contributing, for instance, to the rise in malnutrition and the spread of vector-borne and waterborne diseases within a context already marked by severe systemic imbalances. Additionally, it is crucial to acknowledge that modern healthcare, primarily developed in high-income countries and often regarded as a model to emulate, has been influenced by the same perspective threatening the well-being of future generations. This underscores the urgent need to reassess global healthcare systems to address emerging environmental challenges and ensure the protection of public health on a global scale.

Only through a fundamental revision of our ethical approaches and collective commitment to coordinated and monitored human actions can we hope to safeguard the health of current and future generations.

Investing in the education of future generations on ethical issues related to the preservation of our planet can significantly promote a culture of environmental awareness and respect for nature. Sensitizing children from an early age to environmental protection and the construction of more sustainable societies can play a fundamental role in shaping individual behaviors and collective decisions aligned with the conservation of our ecosystem and the well-being of present and future generations.

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The authors declare no conflict of interest.

Authors' contributions

The text is the result of a collaborative effort among the authors. However, for the sole purpose of scientific authorship attribution, DP is to be credited with the paragraphs: Introduction: The complexity of bioethical language: between interdisciplinarity, ambiguity, and conceptual evolution; The broadening of the extension of the term "bioethics"; The shift in priorities in the bioethical debate. CR is to be credited with the paragraphs: The Anthropocene and Ethical Challenges; Towards new forms of education; Conclusion.

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Correspondence: Rosagemma Ciliberti, Department of Health Sciences, Section of Bioethics and History of Medicine, University of Genoa, Genoa, Italy. E-mail: ciliberti@unige.it

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