Interfaces between collective health and bioethics: nanotechnology as an object-model

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Abstract

This article deals with the interfaces between bioethics and collective health, which has as the main common denominator the conflicts that affects the right to health in a plural cultural environment. Being interdisciplinary fields, both bioethics and collective health are here understood as practical and scientific endeavours within their times. They represent a scientific effort to comprehend – in order to transform – a complex and dynamic world, and are a reflex of that same complexity. In order to show how these fields interconnect regarding their forms of analysis and theoretic articulations, we will use the example of nanotechnology, approached here as an object-model that illustrates the ways in which new biotechnologies cut through and transform already existing iniquities, thus determining novel representations human beings have of themselves, their health and their diseases.

Keywords: Bioethics. Public health. Nanotechnology.

Resumo

Interfaces entre saúde coletiva e bioética: a nanotecnologia como objeto-modelo

Este artigo trata das interfaces entre bioética e saúde coletiva, que têm como principal denominador comum a conflituosidade que afeta a garantia da saúde como direito em meio cultural plural. Como campos interdisciplinares, tanto bioética quanto saúde coletiva são aqui entendidas como empreendimentos científicos e práticos situados em seu tempo. Representam esforço científico de compreender – para transformar – um mundo complexo e dinâmico e são reflexo desta mesma complexidade. Para demonstrar como esses campos se entrecruzam em suas formas de análise e articulações teóricas, toma-se o exemplo da nanotecnologia, abordada aqui como objeto-modelo que ilustra a maneira pelas quais as novas biotecnologias interceptam e transformam iniquidades já existentes, determinando novas representações que o ser humano tem de si, de sua saúde e de sua doença.

Palavras-chave: Bioética. Saúde pública. Nanotecnologia.

Resumen

Cruces entre salud colectiva y bioética: la nanotecnología como objeto-modelo

El artículo aborda los cruces entre bioética y salud colectiva, que tienen como denominador común principal la conflictividad que afecta la garantía de la salud como un derecho en un medio cultural plural. Como campos interdisciplinarios, tanto la bioética como la salud colectiva son aquí entendidas como iniciativas científicas y prácticas situadas en su tiempo. Representan el esfuerzo científico de comprender – para transformar – un mundo complejo y dinámico, y son reflejo de esta misma complejidad. Para demostrar cómo estos campos se entrecruzan en sus formas de análisis y de articulación teórica, se toma el ejemplo de la nanotecnología, abordada aquí como un objeto-modelo que ilustra la manera en que las nuevas biotecnologías interceptan y transforman inequidades ya existentes, determinando nuevas representaciones que el hombre tiene de sí mismo, de su salud y de su enfermedad.

Palabras clave: Bioética. Salud pública. Nanotecnología.

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Declaram não haver conflito de interesse.

The exercise of thinking about the origins of bioethics, as well as those of public health, raises several controversies and contradictions not only about its emergence, but also about its current and main theoretical and practical contributions. This finding is certainly common to attempts to construct historical narratives of any discipline, but perhaps most evident in the cases of bioethics and public health, which may be considered interdisciplinary from the start.

This shared basic characteristic of knowledge production is due to the fact that they are at the same time: 1) production of scientific knowledge about the object they analyse (or build), which has become inseparable from the moral evaluation of their practices; 2) social movement, as they constitute an organized proposal of permanent political criticism from the conflict involved; and 3) transformative practice, because, based on the theoretical framework and normative approach of the practices involved, they act (or instrument actions) to transform the reality in which they act [1,2]. It is the three-dimensionality of both – as scientific knowledge, transformative practice and social movement – that generates the multiple origin narratives of these constitutively interdisciplinary fields.

In the case of public health, its genesis is sometimes attributed to the first critical glances of sociology and anthropology at medicine as a strategy for the technification of life [3]. In other narratives, the birth of the discipline took place in the post-World War II context with the American initiative (later replicated by other countries) to call researchers from the humanities and social sciences to think about the relationship between social phenomena and health, and thus collaborate with health practices [4]. There are also narratives that privilege the local context of the movement Brazilian Health Reform as the founding event of the field [5,6].

Similarly, bioethics is both pointed to as a response to the practical need of physicians who act in situations of moral conflict imposed by technological development [7] and in a broader context, such as that of public health [8-10]. It is also seen as a "bridge" between the natural sciences and the humanities to produce integral knowledge, given the ecological scenario as perceived [11] or as a result of civil rights movements [12].

These approaches are by no means accidental and speak in two different ways about the reflective characteristic of these fields, which is not only effective because they reflect on the relationship between health and society, but also because they are part of this society and do not escape to reflect her, also in this sense. In this way, this multiple identity of both fields – as scientific enterprise, social movement and transformative practice – reveals both an attempt to understand the world and an undeniably fruitful scientific view of its time – multicultural and shattered –, on which they reflect and which are undeniably reflexive.

To understand this new configuration of the world, *shattered and dismantled* [13], according to Geertz, scientific research consists of patient, modest and judicious work. It does not require grandiose hypotheses or the complete abandonment of synthesizing ideas, but it does need ways of thinking that *are receptive to particularities, individualities, strangenesses, discontinuities, contrasts, and singularities* (...) *a plurality of ways of being and being, and that can derive* (...) *from it a sense of attachment* (...) *that is neither comprehensive nor uniform, primordial nor unchanging, but nevertheless real* [14]. This effort and feeling of attachment outlines those analysis carried out in fields such as public health and bioethics.

Scientific object: the relationship between health and society

These pluralities, as well as the singularities, show that biomedical knowledge is insufficient to explain life in its entirety, and that in the daily practice of health professionals, biomedical knowledge is not enough. Thus, the constitution of public health and bioethics, as fields of knowledge, is the result of this insufficiency of biomedical knowledge in addressing the totality of questions regarding the relationship between health and society.

However, in taking this scientific object for themselves, these fields are not intended to counter biomedical knowledge and traditional or popular sayings. On the contrary, they highlight the multiplicity of arrangements and trade-offs between the hegemonic Western biomedical model and other health practices, including those based on other types of rationality [15]. In this perspective, bioethics and public health are more concerned with the multiple possibilities of appropriation and transference of practices between the biomedical model and other healing and/or care systems than with the supposed danger of homogenizing cultures.

Thus, to think about public health in a multicultural country as Brazil begins with both the

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understanding that the healing systems lend practices to the biomedical model, but without completely accepting their assumptions and values [16], as much as that the fact that the Community perception affects biomedical practices [17]. In this sense, health as a right in plural cultural context is established as equally central theme for public health and bioethics.

Evidently, the relationships between individual and collective life, health and society, health practices and cultures are analysed and accessed by public health and bioethics in ways as diverse as the various theoretical contributions that support their analysis. Thus, it can be stated that the lack of identifiable single theoretical framework is also common to both fields, which are more characterized by a type of look: a reflection on the relationship of the individual with the community and the community with health. This kind of look understands health as both a fundamental right and as an arena in which different interests and cultural representations about health, body, disease and therapy, for example, are combined (and contested with each other).

Therefore, the proximity between bioethics and public health is not only about the origins and institutional relations in university institutes and departments, but also the views converge on the same object – the relationship between health and society in general – and start from some common assumptions. While public health denies a biological one-dimensionality of health and sets out to critically analyse the hegemonic biomedical model [18], bioethics denies the moral neutrality of scientific knowledge and refers, in an important part of its exercise, to the analysis and criticism of the so-called "biotechnoscientific paradigm" [19].

This paradigm, the result of technological advances in areas mainly related to biology, intends to interfere in and control organic processes, announcing the objective of improving the quality of human life [19]. However, viewed from the point of view of biopower relations, understood as the power to make live and let die [20], the biotechnological paradigm highlights what is technological in the hegemonic biomedical model, and thus what is most hegemonic in the biomedical paradigm today: Its affection for technology.

Bioethics, however, is not only devoted to issues arising from the production and appropriation of biotechnologies. Berlinguer [21], an equally important name for public health and bioethics, even names as "everyday bioethics" the academic look that identifies and analyses moral issues that happen routinely and over time but should no longer occur – a reality that is often the case. periphery, the result of social imbalances that determine unequal chances of access to health and other fundamental rights. Therefore, it approaches the discussion of health inequities, understood as unnecessary and avoidable differences and which are at the same time considered unfair and undesirable – situations later named by Garrafa and Porto [22] as "persistent".

This persistence, however, is not uniform, as contradictions and inequities persist, but are intercepted and transformed by the new social and economic scenarios. Iniquities coexist with new biotechnologies, and combined they produce new arrangements; determine new ways of being born, living and dying, and as a result, new forms of inequality and injustice.

Health, disease and new biotechnologies: interdisciplinary looks

The perception that health, body and biotechnology representations are determined by a dynamic and complex social context unites bioethics and public health. The announced changes and liberations of the structures of industrial capitalist society have not eliminated the distinction of opportunities and access dependent on class, gender, ethnicity, and other social determinants of health. This is why biomedical practice is under analysis, involving issues such as access to these new health technologies, respect for cultures, the power of biomedical discourse, the relationship between the health professional and the user, the economic interests involved in the development of new devices, among others.

This work of the bioethics in terms of thinking and even reconfiguring more widely shared social values dialogues with its relation to biomedical practice and the cultural importance of body, health and disease for Western society. In analysing biology and medicine as metaphorical languages and symbolic means, bioethics simply deals with fundamental beliefs, values and norms for our society, its cultural tradition and collective consciousness [23]. From this perspective, at this time, in its exchanges between biomedical sciences and social sciences and humanities, the boundaries between bioethics and public health itself become blurred: Bioethics is an ideal arena in which it is possible to develop thoughts about the creation and organization of new

professions, the social context of morality, and the role of scientific knowledge in society [24].

The articulation of these references enables the analysis that bioethics offers to interdisciplinary themes, such as the organization of health professions. In fact, the training of health professionals involves more than the space that offers the set of theoretical and practical skills necessary for their performance. Their formal education represents a socialization environment in which values and norms that measure their behavior and their identification as a *doctor* among their peers and in society are learned [25].

Beyond the concern with practice and identification in society, the education of health professionals is of dual interest. It is as much a privileged point of view for understanding how disputes for control over certain spaces of know-how [26] are established as it is a window for modifying them. In short, it is by understanding the education of health professionals as an object of scientific knowledge and as a space for transformative practice that bioethics becomes important in their professional education.

However, the introduction of bioethics in the curricular matrices of health professions faces some obstacles, as the training of professionals prioritizes aspects and technical skills and resists the introduction of disciplines of more critical and theoretical appeal. Thus, still due to reflexes of the Flexnerian model of scientific teaching of health professions, bioethics and public health are relegated to secondary positions in the attention of students and departments [27]. Bioethics, mainly, ends up being understood as an optional discipline, offered by teachers without training in the field. For this reason, the content of bioethics classes is often confused and limited to legalistic and deontological aspects of codes of professional ethics [28].

This depreciation of bioethics in undergraduate courses is related to a harsher and wider criticism that the discipline receives in the academic realm. The accusation of being "atheoretical", also made to public health itself in its early days, does not only affect bioethics and extends to many interdisciplinary fields of knowledge, such as those related to sustainability, for example [29]. In this sense, interdisciplinary areas, Scientific endeavors of their time represent attempts to understand, describe, and often modify realities in their multiple dimensions. Thus, by avoiding the reductionism of many so-called Cartesian analyses and trying to understand their objects in their entirety, in their connections rather than in their parts, the interdisciplinary fields suffer in limbo, remaining in an undisclosed and undefined space between natural and social sciences. Therefore, bioethics receives criticism at the same time for not being sufficiently objective and scientific and for not having critical or theoretical density.

In response to these criticisms, in bioethics there is a growing tendency for a broader reflection on the repercussions of biomedical knowledge on its discursive dimensions and power relations. From this reflection, it is becoming increasingly evident that biotechnologies and biomedical practice do not only intervene on organic matter, as the biologicist view would defend, but are manifested as a powerful discourse. It is noticed that the scientific discourse is seen as the statement not only valid, but it validates and legitimizes others.

In this dynamic, considering biomedicine as the current model of scientific production, bioethics seeks to understand not only the role of scientific knowledge in society, but, more precisely, how biotechnological productions determine the relations of production and consumption, the distribution of wealth. and risks, and how they influence the perceptions and conceptions about the body, health, disease and about the human being and its surroundings [30].

The search for innovation, which currently characterizes scientific knowledge, represents the product of the irreversible link between experimentation and the market. In this scenario, biomedical sciences are increasingly becoming the scope of technoscience and, in particular, biotechnoscience. As a result, the relationship between knowledge and power has never been so concentrated and efficient in modifying, controlling and reproducing life [31].

In particular, the discovery of the genetic code and the expectation of programming it according to human desires and projects reconfigure biomedical knowledge and its potentialities. By allying information technologies with biology, a know-how is formulated that is not limited to understanding and describing life, but intends to transform it from the information from which it derives. Obviously, these epistemological, technological and anthropological transformations, announced by advances in biomedical know-how, generate important moral, social and economic developments for bioethics and public health [19].

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When looking at biotechnologies this way, it is clear that those instituted analogic techniques that shape and sculpt bodies in order to normalize them, new digital techniques are added to program changes in the bodies so they evolve and increase their performance. Transformations, previously consummated by material intervention on health, find more fluid nuances, mediated by information [32].

This causes not only a change in the conception of illness of researchers and health professionals, but also broader cultural reflexes. The disease, formerly associated mainly with the idea of contamination, of an evil that enters the body and which we need to get rid of, is now understood as something previously determined by our genes. The pathological, therefore, becomes something constituent of the individual and it is at the genetic level that, ideally, the technical intervention on him occurs [32]. In this perspective, since birth we are all patients waiting in line [33].

Impacts of nanotechnology: interface between bioethics and public health

In this context, nanotechnology, the result of the contribution between quantum physics, molecular biology, electronics, chemistry and materials engineering [34], emerges as the latest biotechnological advance. By illustrating the rich and complex context of technoscience of its time so well, nanotechnology becomes an object of study even to understand and evaluate the current bioethical approach to technoscience in general. Facing it as a result of the convergence of scientific, technological, political and economic configurations, an interwoven of relationships, creates more space to integrate the reflections of the human and social sciences and health, an exercise of fundamental articulation for both bioethics and public health [35].

In the case of nanotechnology, the possibility of rearranging atom to atom seems to be what was needed to know and manipulate the universe, since its smallest part. Its technological arsenal would allow to interfere in human evolution, providing perfect bodies and minds. This type of speech is known and called by some as "Holy Grail Syndrome" [36]. This fascination for biomedical developments reaches extreme levels, leading us to always believe that every advancement is the discovery that was needed to understand the universe, reaching the "eternal life", either by means of a perfect body, improved, or the mind, more and more powerful, compatible with current machines [37].

Thus, to ethically analyse new biotechnologies, it is not enough to know their impact on human health and the environment. It is also necessary to consider scientists as creative cultural producers and to understand the ways in which the instruments and material infrastructures of science shape the socially shared understanding of biomedical practice. It is necessary to clarify what their discourse intends to reveal and what they choose to obscure, repress and remove from the scenario by presenting new biotechnological advances to society [33].

Therefore, to qualify the analysis of a theme as complex as the impacts of nanotechnology on health, it is necessary to theoretically articulate contributions from applied ethics, bioethics, social and human sciences, but also from biomedical sciences. All are fundamental to understand the advancements of biotechnology, its appropriation by biomedicine and its results in health and disease in its social, symbolic and discursive dimensions.

Epidemiological indexes and indicators are important as they poignantly portray social inequalities in numbers and how often they result in a shorter and less healthy life without access to biotechnological advancements [38]. It is also important to understand the physiological and technical aspects involved in the production and use of new biotechnologies.

However, these aspects are not enough to analyse bioethics and public health about the increasing introduction of biotechnologies in a scenario in which social inequities and environmental damage not only exist, but are fueled by institutions and social practices that favour large industries at the expense of the welfare of the population. This finding highlights one of the reasons why risk analysis are not sufficient to think about the impact of new biotechnologies on human health and the environment: The geoeconomic distribution in urban and rural areas of possible access, benefits and risks of nanotechnology will not be uniform [39].

For the coming years, the social inequities characteristic of the globalized economy are expected to be intensified by factors such as the introduction of nanotechnology in the food market, the increasing presence of large biotechnology industries, and patent and intellectual property issues. in the pharmaceutical industry [40].

To understand the breakthrough that biotechnological advancements herald, it is necessary to understand that the symbolic dimension of these advancements goes beyond their fields of biomedical application. An example is the profound transformation in the conception of society and kinship that the study of genetics has introduced in the Western world. The way of narrating and understanding family relationships and explaining personality characteristics has undergone significant changes [41].

In soap operas, newspapers, television programs, books on motherhood, all human dimensions can be reduced to genetic characteristics: the genes explain obesity, criminality, shyness, intelligence, and sexual preferences. Genes of selfishness, violence, celebrity, homosexuality, depression and even genius are cited. Thus genetics would allegedly explain even the family constitution: there would be genes related to the biological need to raise families and transmit their genetic load. In this view, kinship relationships are redefined and structure families in which the bonds of tradition, history, experiences, and common memories would be less important than sharing the same DNA [42].

The main aspects of interest for bioethics and public health derive precisely from this characteristic objective of biomedical know-how, not only to know and explain life, but mainly to interfere in and control organic processes [19]. We highlight curing cancer as the most prominent task nanotechnology has set itself, with all the symbolic character of the disease [43]. For biomedicine, cancer represents the disorganization, the uncontrollable reproduction of primitive, undifferentiated cells. It represents the escape from intelligent genetic control that triggers the mechanisms of programmed death in defective cells [44]. However, outside the office, cancer gains other contours: an evil that escapes the natural order, the balance of the body, and consumes it in disorganization. In this sense, cancer, among other expressions of military rhetoric, is metaphorically identified as the enemy against which medicine and society must battle [45].

In this context, nanotechnology is a powerful weapon. It is precisely its proposal to organize matter, atom by atom, that seems to provide the necessary control to offer the right tool for the cure of cancer. The symbolic character of the proposal could not be more evident: nanotechnology, combined with genetics, would allow total control over organic processes, so that it could finally combat the disorganization represented by cancer.

The second important aspect is the revolution heralded by the massive manipulation of DNA, which from the code of life becomes a profaned, available, and trivialized material. In describing their research, scientists invite us to strip the molecule of the metaphorical character of DNA as a code of life, characteristic of its simpler presentation [46]. Nanotechnology invites you to look at the molecule in a new and even more promising way: the infinite possibility of obtaining diverse conformations of DNA. Due to its flexibility for manipulation and its self-replication capacity according to the programmed conformation, this molecule could be used for as many purposes as those proposed by the human imagination [47].

Certainly the toxicity to humans and the environment will be questioned, but the announced social and cultural transformations are even deeper. This is because the human condition will not only be altered by the possibility of more frequent and efficient biological intervention on DNA, but also because, by announcing it as its most promising raw material, nanotechnology alters its symbolic function as a code of life and, thus, it proposes to reframe the representation that human beings make of themselves.

Thus, it is necessary to analyse biotechnologies, but also the practices of health professionals, as objects (scientific) of their time: hybrid objects in which the biological and social dimensions are inseparable [48]. The articulation between the human and social sciences and health sciences is fundamental to analyse topics such as the organization of health professions and the relationship between health practices and social realities, already so exploited by bioethics and public health.

However, it is the new health biotechnologies that increasingly demand a visit to these theoretical frameworks. Contrary to what one might think, and as the construction of knowledge in the public health itself reveals, facing new scientific issues is not, in no way, an invitation to discard previous scientific references. The task of weaving analysis between interdisciplinary fields is not to "reinvent the wheel" but to articulate established theoretical knowledge and frameworks. Confronting these scientific objects, the fruit of complex and plural temporality, not only requires creativity to think and solve new problems, but to look carefully at previous references, even to understand their limitations. *There is always something better to do with an even problematic inheritance than to throw it in the trash* [49].

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Final considerations

Understanding that at the interface between bioethics and public health is the concern with the link between health and society, between biomedicine and other health practices, highlights the importance of new biotechnologies and their impact on health and quality of life of the population. However, this impact must be understood broadly, not only in terms of risks to human health and to the environment. At stake is how these new biotechnologies intercept long-standing social inequalities and come to live with them, to feed them. Analysing the results of new health biotechnologies is not only understanding if they present toxicological risks, but understanding how these risks will be distributed and what social factors affect these settings.

In this sense, intervention and biomedical control over organic processes seem to reach their peak with the use of DNA as nanotechnological material. This technology thus illustrates the capacity that biomedical know-how, in its scientific, social and discursive dimensions, has to affect humans in their health, the world in its socioeconomic conjuncture, and all the representation that the human being makes of himself and herself and of their surroundings.

This perspective justifies the articulation of diverse theoretical references to analyse plural contexts. New biotechnologies highlight the need to understand local and global, individual and collective, culture and nature in their connections and continuities. Bioethics and public health share this not so easy task: combine scientifically diverse references to understand (and transform) a globalized, increasingly technological and unequal world.

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