



The human as consumer of biotechnology: Risks and prospects of the technological boom

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Abstract. The relevance of this article was driven by the need to identify the risks faced by humans as consumers of biotechnology. Enthralled by its possibilities, consumers often overlook how the resulting changes may impact their lives. The study aimed to explore the ambiguities associated with using biotechnology in contemporary society. To achieve this, phenomenological, interpretative, and analytical methods were employed. The findings confirmed that modern advancements offer boundless opportunities – in medicine (such as artificial organ creation and life extension), energy (including biofuel production and environmental remediation), and genetic modification (of both humans and animals). However, these advancements also pose immense challenges, demanding a high level of responsibility from both scientists, who are increasingly conducting various experiments, and individuals, who must navigate the choices presented to them. The very concept of humanity is under threat as biotechnology reshapes and transforms not only this perception but also the understanding of one's place in the world. The absence of ethical principles and criteria for assessing the work of scientists implementing biotechnology raises further concerns. This article, therefore, focused on the position of modern individuals as consumers of biotechnology who find themselves at a crossroads. Despite the benefits offered by biotechnology, it also entails a range of risks and uncertainties regarding the future of human existence. The practical significance of this study lies in encouraging consumers to make informed choices and use biotechnology responsibly while also fostering an open dialogue among scientists. The research itself remains open to discussion, aiming to unite the efforts of scientists, public figures, and consumers

Keywords: anthropological perspective; genetic modification; body; responsibility; ethical aspects; transhumanism; identity

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Introduction

Biotechnology refers to the area of science that involves the use of living organisms, their components, or their biological products to create new products or processes. This broad concept encompasses numerous scientific fields, ranging from medicine to industry. Biotechnology acts as a powerful tool, enabling the modification of living organisms at a molecular level. These technologies open up vast opportunities for humanity, from developing new medicines to treat serious illnesses to creating sustainable crops. However, alongside these possibilities arise numerous challenges and a host of philosophical questions, prompting reflection on the very nature of life, the role of humans in the world, and the ethical boundaries of scientific progress (Sinclair & Whistler, 2024).

The question of biotechnology and its impact on humans is being addressed by numerous Ukrainian and international researchers. For instance, I. Klyuchka & M. Kitov (2020) in their study provide evidence of the existing threat: "Biotechnological experiments frequently disrupt social peace and stability, posing a real threat to human existence, leading to concerns about biological security. Therefore, it is crucial to analyse this issue from a philosophical perspective to mitigate the consequences of the rapid development and implementation of modern technologies without proper investigation and consideration of potential negative trends and threats to human life and humanity as a whole". Polish researcher W. Stomski (2018) repeatedly emphasises the lack of clear ethical regulations in the use of biotechnologies. Despite the rapid advancement of technologies capable of altering living organisms and their widespread use, there is still no robust regulatory framework for such consumption, which could lead to extremely catastrophic consequences.

As T. Teslenko & B. Kandel (2024) note in their article, the current stage of societal development is characterised by the rapid proliferation of Fourth Industrial Revolution technologies, which are blurring the lines between the physical,

digital, and biological realms. This phenomenon, building upon the achievements of previous technological eras, is distinguished by the integration of diverse technologies, such as nanotechnology, biotechnology, artificial intelligence, and others, leading to qualitative changes in all spheres of human activity. It is particularly important to recognise that these technologies not only impact the economy and industry but also have a direct influence on biological systems, including humans, necessitating a thorough analysis of their ethical and social implications. O. Ptashchenko & D. Arkhypova (2020) also point out that the successes of the scientific and technological revolution in production and everyday human life offer great potential for solving pressing economic and social problems but at the same time create serious contradictions that sometimes threaten sustainable development.

P. Diamandis & S. Kotler (2020), in their book, analyse how the convergence of various cutting-edge technologies (artificial intelligence, robotics, biotechnology, 3D printing, virtual reality, etc.) is accelerating changes in the economy, society, and everyday life. The authors argue that technological progress is happening exponentially, which will lead to radical transformations in the coming decades. They stress that businesses, governments, and individuals must be prepared for rapid changes and embrace these opportunities rather than fear the future. In turn, J. Rožker (2020) writes that various ethical models, including Eastern philosophical approaches (such as Confucianism), can offer new strategies for addressing crisis situations, including pandemics, and that these approaches should be considered in the context of the global challenges posed by biotechnologies. M. Mustafai (2022) points out that ethics, as a branch of philosophy, examines moral values and principles that determine what is good or evil and that in the context of modern technological progress, particularly in biotechnology, there is a need to develop new ethical approaches to assess actions and their consequenc-

es. Thus, ethical considerations are an integral part of the development of biotechnologies, and moral aspects must be taken into account in their application. T. Bukina & N. Marynets (2024) note that contemporary philosophy seeks to re-evaluate traditional concepts of humanity, such as rationality, free will, and morality, through an interdisciplinary approach. This involves integrating philosophical reflection with scientific research in fields such as psychology, neuroscience, and sociology, as well as considering diverse philosophical perspectives, from humanistic to post-humanistic, existential, and feminist.

Therefore, as the analysis of literature demonstrates, biotechnologies offer unprecedented opportunities to improve lives but simultaneously create serious ethical and social challenges that require deep reflection. Consequently, this article aimed to identify the ambiguities surrounding the use of biotechnologies by modern humans in any sphere (medicine, industry, etc.).

Materials and Methods

To achieve the aims and objectives of this study, phenomenological, analytical, and interpretative methods (including literature and source analysis, structuring, and others) were employed. Specifically, the phenomenological method was used primarily to track how biotechnology is perceived by individuals and how they conceptualise their coexistence with it. Additionally, this method facilitated the identification of the meanings ascribed to emerging technologies, which is particularly significant in understanding the consumerist context.

The analysis method facilitated the identification of biotechnology's impact on social structures, power dynamics, and justice. Concurrently, it helped uncover a range of fundamental questions about the nature of life, humanity, and reality that arise in connection with the development of biotechnologies. Another aspect of this method, namely logical analysis, was used to clarify specific concepts (for example, the concept of transhumanism) and arguments

related to biotechnology. As for the hermeneutic approach, namely the method of interpretation, its versatility aided in the interpretation of texts and discourses related to biotechnology, helping to understand how perceptions of them are formed in society. For example, the method of interpretation highlights a range of moral dilemmas that arise in connection with the chaotic application of biotechnologies, such as issues of cloning, genetic modification, and bioethics.

For the purposes of information provision, the philosophical foundation of this research was grounded in the ideas of M. Heidegger, J. Baudrillard, and others. Specifically, to articulate the unique character of the human consumer, the author turned to the classics of philosophical thought, namely J. Baudrillard (1970) and A. Badiou (1993). The former makes it clear that the world of consumption itself is built on principles that entice individuals to desire anything that might seem "necessary", without considering the consequences until they manifest. The latter argues that the human body, which individuals constantly seek to modify by transcending the "soul-body" or "spiritual-physical" dichotomy, loses its human characteristics and becomes something else, requiring a different definition and new rules for its functioning.

Results and Discussion

Biotechnological progress as a path to transhumanism and the "posthuman"

While the technical aspects of biotechnology are primarily the domain of applied specialists such as medical professionals, engineers, and environmental scientists, the field also necessitates philosophical analysis. Understanding the implications of biotechnology significantly clarifies the comprehension of human life, the principles governing societal function, and changes in the natural world. Biotechnology is not merely a tool for scientific advancement; it is a phenomenon that touches upon fundamental questions of existence, morality, freedom, and responsibility. In popular scientific studies, one increasingly

encounters assertions that the biotechnology boom is a powerful means of enhancing human capabilities. These assertions primarily correlate with the anthropocentric paradigm, which posits that throughout human history, humanity has continually strived to improve life, overcome natural limitations, and reach new developmental horizons. However, as is often the case, there is a flip side to every coin. Whether the biotechnology boom will ultimately represent progress or a significant leap towards regression remains to be seen. For now, researchers can only put forward hypotheses.

Among the advantages, the undeniable contribution of biotechnologies to the medical field of scientific knowledge takes precedence (Kotvitska *et al.*, 2022). Various technological advancements promote possibilities that ensure the achievement of a near “ideal” level of human organism perfection. Technologies that slow down ageing, enable tissue regeneration or restore them at the cellular level entice specialists with the prospect of life extension. Alongside genetic engineering and neurotechnologies, which promise humans almost “superhero” abilities (for example, enhanced cognitive abilities, improved endurance, emotional resilience, etc.), an image of an enhanced human is emerging. It is precisely for this reason that many new theories related to the idea of transhumanism arise. Proponents of this idea believe that humans are capable of transcending their biological nature and that biotechnology tools can facilitate this. Transhumanists see in biotechnologies the possibility of creating a “posthuman”, a being free from diseases, ageing, or even death. In philosophical theories by N. Bostrom (2014) and R. Kurzweil (2024), the idea of transhumanism emerges as an opportunity for radical changes and improvements in human life. As one of the founders of the Future of Humanity Institute (Oxford), N. Bostrom is at the forefront of the idea that technology enhances not only the physical state of humans but also their moral capabilities, bordering on transcending human limitations and conventional notions of “humanity”. On one hand, this theory is based on the concept

of advanced artificial intelligence that could surpass human cognitive abilities and thus not be limited by any algorithms. On the other hand, N. Bostrom is guided by a somewhat naive belief in “moral progress”, which, alongside technological advancement, can improve human living standards. This is an illusion, as such “moral progress” would require humans to already be “posthuman”. The evolutionary path to this could prove to be an unproductive “road to nowhere”. Of course, N. Bostrom (2014) outlines various scenarios for achieving this prospect. There are three classes of scenarios, represented by slow, rapid, and moderate take-offs, but even these seem fantastical.

R. Kurzweil’s (2024) model appears more realistic. The concept of “technological singularity”, which is based on the idea of technologies reaching a level where human intelligence can no longer control their development, is thought-provoking. R. Kurzweil emphasises the exponential growth of technology. Unlike linear development, exponentiality suggests that each new generation of technology provides a foundation for the faster development of its successor. An example of this is Moore’s Law, which states that the computing power of computers doubles approximately every two years. Therefore, considering this, R. Kurzweil concludes that technologies such as genetics, nanotechnology, and robotics are capable of causing radical changes in society. Under such conditions, technological singularity – the point at which artificial intelligence can improve faster than human intelligence – no longer seems like such a fantastical phenomenon.

In R. Kurzweil’s (2024) calculations, superintelligence will cross the singularity threshold around the year 2045. It is during this period that significant changes in the development of civilisation will occur. Currently, humans are gradually moving towards a fusion of humans and machines, and they are doing so naturally through the pursuit of “longevity escape velocity”. The application of technologies that allow tissue regeneration, thereby slowing down ageing, the replacement of organs with artificial ones, cos-

metology, and many other things that increasingly attract the modern consumer, are bringing humanity closer to the human-posthuman boundary. However, it is important to note that these are merely assumptions. As M. Beilin & O. Zheltoborodov (2023) point out, the creation of “living” artificial intelligence, as a natural one that has undergone certain changes due to genetic engineering intervention, is predicted to take place in this context. At the same time, artificial intelligence is understood as “non-living”, technical intelligence.

Ideological aspects of biotechnology consumption in a consumer society

Despite addressing seemingly significant issues for humanity, a range of what J. Baudrillard (1970) would call “obscene” and almost imperceptible, yet highly significant, concerns emerge. The fact is, that humans exist in an era of consumerism, which has its corresponding ideology subtly present in all processes and often overlooked. Within a consumer society, biotechnology adds ideological constants of control and immortality. For the average consumer, biotechnology is often associated with control and immortality. Technologies aimed at extending life (anti-ageing) create the illusion of control over time and nature. Individuals begin to believe that all technical “investments in themselves” will allow them to be “their own gods”. However, following J. Baudrillard’s logic regarding consumerism and the consumer, is in the pursuit of illusory immortality, individuals destroy themselves: they deprive life of any meaning, as it is the finiteness of human existence that makes life unique and valuable. As the French intellectual argues, such a desire for immortality can lead to new forms of exploitation and inequality, as access to such technologies cannot always be provided to everyone without exception. Consequently, new privileged strata of society may emerge, as often depicted in science fiction films.

It is not just the ideological component of consumer society that can cause a range of problems in connection with the use of biotechnologies. In a consumer society, reality is constantly

replaced by simulation, where signs and symbols dominate over real objects. This is why bioethical issues, which are the subject of widespread discussions (for example, manipulation with genetic engineering or cloning), can themselves become part of a symbolic order that conceals the true mechanisms of power and control (Nabavizadeh *et al.*, 2016; Almeida & Ranisch, 2022). For example, advertising narratives about the salvation of humanity, improving the quality of life, or extending it to justify the implementation of these technologies often ignore the potential risks and consequences that should be considered. Another variant of this state of affairs can be any refusal of direct, open discussion. Often, those involved in the implementation of a particular technology refuse open discussion, although this is an extremely negative phenomenon, as it complicates the further situation of a person who does not fully understand the possible consequences of their impact (Stomski, 2007).

A. Badiou (1993) views the body not merely as a biological object but as a site for the realisation of truth and subjectivity. He critiques contemporary concepts that attempt to blur the lines between the physical and the spiritual, subjecting the body to endless modifications in pursuit of a new identity. A. Badiou emphasises that human subjectivity is formed not through external transformations but through fidelity to truth, which is revealed in events. If the body loses its traditional characteristics and transforms into “something else”, this may necessitate a change not only in definitions but also in the very rules of its existence. This poses new questions for philosophy about what it means to be human if physical embodiment is no longer a stable category.

Risks and ethical dilemmas of biotechnology application in the modern world

There is a significant range of other problems that lie beyond the “incentive” programs for the use of biotechnologies. Biotechnologies, despite their significant potential in solving global problems such as food shortages, diseases, and environmental

crises, can seriously negatively impact society, nature, and human health (Aziz *et al.*, 2022). According to I. Klyuchka & M. Kitov (2020), "...it is impossible to exclude the possibility that the widespread dissemination of biotechnology beyond scientific laboratories may result in new, unpredictable environmental problems for humanity. This concerns, in particular, the creation and release of new types of microorganisms into the environment that have no analogues in nature, the long-term effects of mass consumption of transgenic products, the side effects of mass vaccination, and the widespread use of new drugs. Of particular concern is the possibility of using biotechnological achievements for terrorist purposes."

Among the main risks posed by the application of biotechnologies is the possibility of creating genetically modified organisms (GMOs) that can disrupt natural ecosystems, displacing existing species or crossbreeding with them, which can lead to irreversible changes in the planet's biodiversity (Macfarlane *et al.*, 2022). Furthermore, the use of GMOs in the food industry raises concerns about the long-term effects on human health, as the impact of modified products on the body is not fully understood and may provoke quite complex diseases (Lerner *et al.*, 2024).

Another alarming aspect is the development of gene-editing technologies used in medicine, such as the CRISPR-Cas9 method, which, while having immense potential for treating hereditary diseases, also carries ethical concerns and risks in creating "designer babies" with predetermined characteristics, which again can exacerbate social inequality and lead to new forms of discrimination (Yulevych *et al.*, 2022). The CRISPR-Cas9 method is considered a revolutionary gene-editing technology that allows for highly precise editing of the genomes of living organisms, including humans, by using a system that was initially discovered in bacteria as a defence mechanism against viruses. According to O. Yulevych *et al.* (2022), CRISPR is a sequence of repeating DNA segments capable of "remembering" fragments of foreign genetic information, and Cas9 is a protein that acts as

"molecular scissors", cutting DNA at a specific location, allowing for the deletion, addition, or alteration of specific genes. While CRISPR-Cas9 has made it possible to treat a range of serious diseases, its application in "modelling" and "designing" future humans raises serious questions, and not just ethical ones. As O. Yulevych *et al.* (2022) note, "the use of the CRISPR-Cas9 technology in gene therapy allows for precise changes to the DNA of cells. If combined with vector-based delivery systems, it would enable systemic influence on the body and modification of the genomes of large numbers of cells."

The list of problems arising from the use of biotechnologies could be extended. However, it is crucial to understand that their application touches upon quite diverse aspects of human existence. Without proper control and regulation, biotechnologies, instead of solving problems, can become a source of new challenges for humanity, affecting ecology, economy, ethics, and security. Therefore, in the author's opinion, the key advice for the modern consumer should be a reminder of their own finitude. As M. Heidegger (1927) argued in the 20th century, reflecting on human finitude, he considered it an inherent boundary of existence. In his seminal work *Being and Time*, he introduced the concept of "Being-towards-Death" (*Sein zum Tode*) to emphasise that death is not merely a biological end to life but a fundamental characteristic of human beings, which defines its meaning and structure. And, arguably, its value-laden content. For M. Heidegger, humans, in general, differ from other forms of being in their ability to recognise their own finitude. This awareness is not something abstract or distant; on the contrary, it permeates all existence, setting the unique tone of everyday life. Finitude is revealed through temporality: humans live in time, and their lives are limited. It is in this awareness of their temporal nature that humans find the possibility of the fullness and authenticity of their existence. This authenticity is made possible when individuals accept their death as inevitable and cease to flee from it into everyday worries,

social roles, or illusions of immortality (to which “biotechnological immortality” can be added). Accepting finitude allows individuals to live more fully, focusing on what truly matters and rejecting socially imposed patterns. Without such acceptance, individuals find themselves immersed in a kind of anonymous existence, *das Man*, where decisions and values are determined by external forces rather than personal choice.

Thus, being attuned to the acceptance of finitude, individuals shed illusory illusions and do not dissipate their lives. Finitude, as a boundary and a condition for the possibility of true freedom, activates a switch for responsible existence in humans. Death becomes a horizon that delineates the space of human responsibility and opens the way to true self-understanding. Through the awareness of their finitude, individuals can transcend the confines of everyday life and begin to live as if each moment were their last, which allows for a deep connection with their own being, rather than exchanging it for fleeting trends and tendencies, no matter how alluring they may be.

Conclusions

In the opinion of the study's author, individuals consuming biotechnologies should pay attention to several key aspects. Of course, bearing in mind this being embedded in a consumerist system makes it difficult to crystallise values based on common sense and critical thinking. Firstly, it is crucial to understand the safety and quality of products (regardless of whether they are food products, beauty procedures, or the use of implants): it is necessary to ensure that products or technologies have undergone the necessary clinical trials, certification and compliance with the standards of regulatory bodies. Secondly, the scientific validity of claimed effects should be assessed, and thus, attempts should be made to avoid pseudoscientific claims and focus on reliable research. Thirdly, individual bodily characteristics must be taken into account, as the

effectiveness and tolerability of biotechnologies can depend on genetics, health status, and lifestyle. It is also worth monitoring the environmental consequences of using biotechnologies, especially when it comes to genetic engineering, etc. Finally, awareness of the legal and ethical aspects of applying such technologies is important to minimise potential social or moral conflicts. This is far from an exhaustive list of what individuals can do to safeguard themselves from the negative consequences that biotechnologies may cause.

In conclusion, it can be asserted that biotechnologies hold immense potential for improving the quality of life, but their uncontrolled and uncritical use can lead to serious consequences. Therefore, in the context of a technological boom, it is critically important to develop a consumer culture that is based on scientific validity, ethical principles, and environmental responsibility. Only a conscious and responsible attitude towards biotechnologies will allow humanity to maximise their benefits while minimising risks. The prospects for further research in this area lie in a deeper study of the ethical, social, and environmental aspects of biotechnology application. In particular, it is necessary to investigate the impact of genetically modified organisms on biodiversity, develop ethical norms and legal frameworks for the use of genetic engineering in medicine, and study the psychological aspects of biotechnology consumption in a consumer society. Additionally, it is important to explore the impact of biotechnologies on the development of artificial intelligence and their role in the formation of the “posthuman”.

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Conflict of Interest

None.

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Людина як споживач біотехнологій: ризиків перспектив технологічного буму

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Анотація. Актуальність статті умотивована необхідністю виявлення ризиків, які постають перед людиною – споживачем біотехнологій. Будучи зачарованим їхніми можливостями, споживач залишає поза увагою те, яким чином всі ті зміни, які вони дають, вплинуть на його життя. Мета роботи полягала у виявленні неоднозначностей при використанні сучасною людиною біотехнологій. Для її реалізації застосовувались методи: феноменологічний, метод інтерпретації, аналізу та ін. Результати роботи підтвердили, що сьогоднішня відкриває перед людиною безмежні можливості: в медицині (створення штучних органів, продовження життя тощо), в енергетиці (виробництво біопалива, очищення довкілля та ін.) чи генетичній модифікації (як людини, так і тварини), але й не менш безмежні виклики, адже вимагає максимальної відповідальності як від науковців, які все частіше проводять різні експерименти, так і від людини, яка робить той чи інший вибір. Під загрозою опиняється саме уявлення про людину, оскільки під дією біотехнологій воно змінюється та трансформується, як і її уявлення про власне місце у світі. Відсутність етичних принципів та критеріїв оцінки діяльності науковців, що впроваджують біотехнології, теж викликає деяку стурбованість. Тому в даній статті увагу було спрямовано на те, що сучасна людина, будучи споживачем біотехнологій, опиняється на роздоріжжі, оскільки за всіма благами, які несуть біотехнології, висновується низка ризиків та острахів за перспективи буття людини. Практична цінність дослідження полягає в тому, щоб зробити певний заклик споживачу на обдуманий вибір і відповідальне використання біотехнологій, а науковців вивести на відкритий діалог. Адже саме дослідження є відкрите до діалогу задля об'єднання спільних зусиль науковців, громадських діячів чи споживачів

Ключові слова: антропологічна перспектива; генна модифікація; тіло; відповідальність; етичні аспекти; трансгуманізм; ідентичність