

HJOG 2026, 25 (4), 367-375. | DOI: 10.33574/HJOG.0643

Bioethics and the Use of Stem Cells

Theoklitos Pantelides

Metropolis of Patras and Faculty of Medicine, University of Patras, Patras, Greece

Correspondence

Archimandrite Theoklitos Pantelides, Metropolis of Patras and Faculty of Medicine, University of Patras, Patras, Greece. E-mail: ptheoklitos@gmail.com

Abstract

Bioethics is an interdisciplinary scientific field that examines ethical, legal, and social issues arising from advances in medicine and biotechnology. Among the most debated topics in contemporary bioethics is the use of stem cells, particularly embryonic stem cells, which raise fundamental questions regarding the moral status of the human embryo. Although stem cell research offers significant therapeutic potential, ethical concerns remain unresolved at both societal and theological levels.

This study investigates public knowledge, attitudes, and ethical perceptions regarding stem cell research and applications through a questionnaire-based survey conducted among 105 participants. The findings reveal high awareness of stem cell terminology but limited in-depth scientific understanding. While the majority acknowledge the therapeutic value of stem cells, strong ethical reservations persist, particularly regarding embryo creation and destruction. Religious beliefs and the position of the Church appear to significantly influence public opinion.

The results highlight the need for enhanced bioethical education, transparent scientific communication, and robust ethical oversight to ensure that biomedical progress respects human dignity and fundamental moral principles.

Keywords: Bioethics, Stem Cells, Embryonic Stem Cells, Public Attitudes, Ethics, Religion

Introduction

Bioethics undoubtedly constitutes a newly established scientific field aimed at addressing medical ethical issues. It is an area where various scientific disciplines intersect, focusing on ethical, legal, and

social matters that arise from the advancement of medicine, science, and biotechnology. In recent decades, significant progress has been made in molecular biology and practical applications related to genetic modification. For example, it is now possible in modern times to remove a segment of DNA from

one organism and link it to a segment of DNA from another, creating recombinant DNA (rDNA). This scientific development enables the isolation, recognition, and combination of genes, creating a genetic pool to be used for future purposes. It is now well-known that many human diseases originate from some malfunction in genes. Gene therapy aims to address these conditions, either by replacing or even repairing the defective gene (1).

Genetic modification, both in its scientific and legal aspects, relies on a purely artificial method in which genetic material is transferred from one living organism to another. This process does not occur naturally but is instead a laboratory procedure carried out under specific, controlled conditions. However, the development of science, particularly in the field of biotechnology, has a dual dimension. On one hand, it improves the daily lives and living standards of individuals; on the other, significant practical and ethical issues arise regarding the organization and development of scientific research. Therefore, there is an urgent need for the addition of bioethics, which provides a different orientation to philosophy by utilizing both logic and ethics.

Biomedical advances offer new possibilities, notably in the case of artificial fertilization, which raised significant concerns and issues upon its emergence. At the heart of biotechnology and, more generally, bioethics, is the human being. The human being is unquestionably the most perfect creation in the universe, given that from the cellular form, they have evolved into an individual and a spiritual being. From birth, the human exists as an individual but also possesses an inherent ability to evolve into a person (2).

Stem cells constitute a fundamental field of modern biotechnology, as they possess the unique ability to differentiate into various types of cells, making them essential for regenerative medicine and the treatment of chronic or degenerative diseases. This

study examines not only the scientific knowledge of the participants but also the ethical and social implications associated with the use of these cells, especially when they are derived from embryos.

The etymological origin of the term "person" can be traced back to the ancient Greek world. It is a compound word, consisting of the preposition *pros* (meaning "towards") and the noun *ōps* (meaning "eye" or "face"), which is feminine. The preposition *pros* indicates direction, while *ōps* refers to the "eye" or "face." With the advent of Christianity, the concept of the person is deeply connected to the incarnation of God, through which God reveals Himself to the world (3).

Materials & Methods

This research deals with the issue of stem cells and their applications, exploring the level of knowledge, attitudes, and perceptions of the public regarding this area of biomedical science. The study was based on a questionnaire completed by 105 participants of various ages, genders, and educational backgrounds. The goal was to capture the level of awareness and understanding of the social, ethical, and religious factors that influence individuals' perceptions of the use of stem cells in research and medical practice.

From the demographic data, it emerged that 59% of the participants were women and 41% were men, with the majority having a high level of education. Specifically, 45.7% held a master's or doctoral degree, while 33.3% were university graduates. The age distribution ranged from 20 to 60 years, with a significant presence of individuals aged 45-55. These characteristics make up a sample with a relatively high educational background and sufficient representation of both genders (4).

Demographics	59% ♀	41% ♂
Level of education	45.7% Postgraduate degree	33.3% University graduates

Results

Regarding the basic knowledge of the term "stem cells," nearly all participants (99%) stated that they were familiar with the term, with the main sources of information being healthcare professionals (32.4%) and the internet (21%). Although the recognition of the term is high, only 53.3% claimed to have adequate knowledge about the nature and applications of stem cells. Additionally, 54.3% knew the categories of stem cells, while only 55.2% understood the difference between adult and embryonic stem cells. These findings suggest that although the term is widely known, in-depth understanding of the subject remains limited. The public possesses superficial knowledge that is primarily based on general information rather than specialized scientific understanding (5).

Regarding participants' attitudes towards the applications of stem cells, the overwhelming majority (91.4%) believe that their use can significantly contribute to the treatment of diseases. This finding reveals broad social acceptance of biomedical research and trust in scientific progress. Most participants believe that stem cells offer new possibilities for treating diseases such as neurodegenerative disorders, cardiovascular diseases, and cancer. At the same time, the public recognizes the importance of continuing research in this area, with approximately 90% supporting the use of stem cells for research purposes. This optimism reflects confidence in medical science, although it is often not accompanied by full awareness of the technical or ethical parameters that govern it (6).

Regarding ethical issues, 69.5% of respondents believe that there are ethical dilemmas in the use of embryonic stem cells, while 96.2% believe that there is insufficient public information on the matter. This concern highlights the need for more transparent and understandable communication between the scientific community and society. The lack of information

often leads to misunderstandings about whether the use of stem cells involves the destruction of embryos or other ethically sensitive procedures.

When participants were asked to express their stance on the use of embryonic stem cells, 60% responded positively, while 18% stated they did not know enough to form an opinion. At the same time, 76.2% stated that they do not agree with the creation of embryos solely for research purposes, which indicates that the ethical framework surrounding the issue of life remains strong. Furthermore, 89.5% expressed concern about the destruction of embryos for the extraction of stem cells, highlighting the intense ethical debate that still exists in society (7).

The participants also differentiated the moral status of an embryo from that of an adult human. About 52% believe that an embryo holds a different moral status, which may influence their stance on the use of embryonic stem cells. This differentiation underscores the philosophical and religious dimensions of the issue, which remain pivotal in shaping people's perceptions.

Regarding the legal and institutional framework, participants expressed the need for clear ethical guidelines in scientific research. 89.4% supported the idea that ethical restrictions and oversight should exist in the research of embryonic stem cells, while 56.2% believed that ethical dilemmas should not be overlooked in the name of scientific progress. This viewpoint reflects the maturity of the public, which recognizes that science must advance responsibly and with respect for ethical values (8).

When asked whether they would accept treatment based on embryonic stem cells, 47% responded positively, while 53% responded negatively. This nearly even distribution reflects a deep societal divide between the desire for treatment and the need for ethical consistency. Some accept the use of embryonic stem cells when it serves a therapeutic purpose, while others consider the process

Table 1. Results regarding SC

Source of information	32.4% healthcare professional	21% internet
Adequate knowledge	53.3%	46.7%
Knowledge of the categories	54.3%	45.7%
Understanding of the difference between adult & embryonic SC	55.2%	44.8%
Attitudes towards the applications of SC	91.4% The use of SC can contribute to the treatment	7.6%
Use of SC for research	90% agree	10%
Ethical Issues	69.5% there are ethical dilemmas in the use of embryonic SC	96.2% there is insufficient public information
Use of embryonic SC	60% positive	18% did not know enough
Creation of embryos solely for research purposes	76.2% negative	33.8%
Destruction of embryos for the extraction of SC	89.5% concerns	10.5%
Moral status	52% believe that an embryo holds a different moral status	48%
Ethical restrictions and oversight should exist in the research of embryonic SC	89.4% agree	10.6%
Ethical dilemmas should not be overlooked in the name of scientific progress	56.2% agree	43.8%
Acceptance of treatment based on embryonic SC	47% positive	53% negative
Knowledge of the position of the Church	45.7% know	54.3%
Church's stance greatly influences public opinion	83.8% agree	16.2%

unacceptable regardless of potential benefits. This difference reflects diverse ethical frameworks, ranging from utilitarianism to the absolute protection of human life from the moment of conception.

Religious beliefs seem to play a significant role in shaping attitudes. Also, the 45.7% of participants stated that they knew the position of the Church on the use of embryonic stem cells, while 83.8% believed that the Church's stance greatly influences public opinion. This influence reinforces the observation that ethical and religious values remain key factors in shaping attitudes toward biotechnological progress (9).

In parallel, the study examined knowledge about biobanks and the legal framework governing them. 85.7% were familiar with the term "biobanks," but only 13.5% indicated familiarity with the legislation that governs their operation. Regarding who should regulate the use of stem cells, 46.1% chose doctors and scientists, 30.4% selected parents or private individuals, 20.6% chose the state, and only 2.9% chose the biobanks themselves. These findings reflect the public's trust in the scientific community, combined with the need for institutional oversight.

Table 2. Table regarding the Biobanks

Knowledge about biobanks and the legal framework governing them	85.7% familiar with the term	13.5% familiar with the legislation		
Who should regulate the use of SC stored	46.1% doctors and scientists	30.4% parents or private individuals	20.6% the state	2.9% the biobanks

Discussion

The study demonstrates that, although there is widespread acceptance of the use of stem cells for medical and research purposes, significant gaps in information and ethical reservations remain. Society appears to be supportive of scientific progress, provided that it is carried out with respect for values and human dignity. The scientific community must strengthen public awareness, foster dialogue, and contribute to building an atmosphere of trust and responsibility. The research confirms the need for continuous public education on bioethics, biotechnology, and medical ethics. Strengthening scientific education and promoting dialogue between science, society, and religion are essential conditions for the sustainable and ethically acceptable progress of biomedical science. Only through this process can a balance be achieved between innovation and respect for the fundamental values that govern human life (10).

Moreover, the research highlights a significant issue regarding the relationship between society and science. Although the majority of citizens express a positive attitude toward biomedical research, a gap in trust and understanding of the true potential and limitations of science still exists. This phenomenon is particularly evident in fields like stem cells, where technological developments often outpace social and ethical discussions. Thus, the lack of organized mechanisms for public information leads to superficial knowledge, which in turn influences the way citizens perceive ethical dilemmas and form attitudes (11).

The analysis of the results also reveals the impor-

tance of bioethical education as a fundamental pillar of scientific education. Bioethics, as a discipline that connects philosophy with biology, allows for the development of critical thinking about the limits and implications of scientific progress. Incorporating such courses into secondary and tertiary education could enhance young people's ability to form informed and responsible opinions on sensitive issues, such as the use of embryonic stem cells.

At the same time, the data show that religious and cultural views function as significant influencing factors in shaping citizens' attitudes. The Church, as an institution with deep social influence, continues to play a decisive role in shaping the ethical stance toward biotechnological applications. For many citizens, the moral view of life begins from the moment of conception, which makes the use of embryonic stem cells particularly controversial. However, for others, research is considered ethically acceptable when it aims to treat incurable diseases and improve human life. This dichotomy reflects the ongoing tension between progressive science and traditional ethics (12).

From a sociological perspective, attitudes toward stem cells can be seen as a reflection of the broader social stance toward innovation and risk. Societies characterized by higher levels of scientific literacy and trust in institutions tend to more easily accept new technologies, while societies with lower levels of awareness often show caution or fear toward scientific progress. Greece, based on the findings of this particular study, seems to position itself somewhere in between: there is a positive attitude toward re-

search, but concerns related to ethical and religious criteria coexist.

Also important is the fact that most participants recognize the need for ethical guidelines and institutional oversight in scientific research. This demand does not stem from distrust in science, but from the need to ensure that scientific practices remain within a framework that respects human life and social justice. Participants seem to desire a "science with limits," which promotes progress without disregarding the human dimension.

An interesting viewpoint expressed was about who should control the use of stem cells. The majority trusts doctors and scientists, reflecting respect for scientific authority. However, the minority that prefers state control or the involvement of parents reflects the need for more democratic participation in decision-making. This finding supports the view that bioethical issues should not be the exclusive domain of experts, but should involve the wider public through dialogue and institutional processes (13).

The relationship between science and society, as portrayed in this study, reveals that scientific acceptance is not merely a matter of knowledge but also of values. Social trust is not built solely through the provision of information, but primarily through transparency, accountability, and responsibility. Scientists are called to communicate clearly the limits of their research, avoid making excessive promises, and strengthen trust through sincere cooperation with society.

From an educational perspective, the research reveals the need to strengthen scientific literacy. Citizens must possess the basic knowledge that will enable them to understand the nature of the scientific process and critically evaluate the information they receive from the media. Education in bioethics, the development of scientific communication programs, and the inclusion of such topics in the school curriculum could be decisive steps in this direction.

Furthermore, the research highlights the role of the media in shaping public perceptions. Often, scientific issues are presented in an exaggerated or sensationalized manner, leading to misinformation. Participants who reported primarily getting their information from the internet seem to have more unstable or superficial knowledge. This underscores the importance of credible scientific journalism and the responsibility of the media to provide accurate and balanced information (14).

Moreover, the fact that the majority of participants accept the use of stem cells for medical purposes but reject the creation of embryos exclusively for research purposes suggests a balanced ethical stance. The public recognizes the value of science but sets boundaries related to respect for life. This "conditional acceptance" indicates social maturity and an awareness of the responsibilities arising from scientific progress.

Thus, the research offers a representative picture of contemporary Greek society's stance on bioethical dilemmas. Greece seems to be moving in a direction that combines a positive attitude toward progress with respect for traditional values. Citizens do not reject science; on the contrary, they wish to actively participate in defining its boundaries.

Finally, the results of the study can serve as a valuable tool for policymakers. Understanding public attitudes can help shape strategies for information dissemination and education, as well as establish legislative frameworks that balance scientific freedom with social responsibility. For example, the creation of public forums, ethics committees, and dialogues with civil society could enhance democratic participation and reinforce transparency (15).

In summary, this research is not merely a reflection of knowledge but a reflection of humanity's relationship with science. Stem cells, beyond being a subject of biological study, represent a symbol of the limits and possibilities of human beings. The path to scientific progress must be accompanied by self-

awareness, dialogue, and respect for the values that constitute society.

In the future, continuing such research could provide valuable data for understanding social attitudes and developing policies that support the responsible and ethically acceptable use of new technologies. Only through the collaboration of science, the state, and society can a framework be created in which innovation and respect for life coexist harmoniously, serving the common good and the progress of humanity.

In conclusion, based on the Christian teaching regarding the creation of humans, the Church accepts that life originates from God, and consequently, respect for life is due from the moment of conception until the point at which the soul is returned to Him from whom it came. This teaching forms the core of Christian ethics. The scriptural texts speak of a psychosomatic existence, which is considered a unified whole from the moment of conception. The teaching of the Church Fathers regarding the life of the embryo is built around the idea of the union of soul and body (16).

As for the embryo's nature, it is considered a complete human being, although it is on a path toward perfection in terms of its phenotype. The Church rejects the characterization of the embryo as a potential human being, as it regards it as already a human in its entirety, just as the God-man Christ retained His full characteristics from the embryonic stage. However, while the "image" is affirmed, there is also the potential to fulfill the "likeness" in the future. The "image" is provided automatically by God and can be preserved even if the person commits sins. However, to achieve the "likeness," the exercise of free will and the conscious inclination toward the good are prerequisites.

The potential in the embryonic state signals the existence of the "likeness" within the embryo and indicates the expectation of its completion. If the embryo is destroyed, it also destroys and violates the inherent

image of God as its Creator. The development of the psychosomatic entity of the embryo is evident through the biological process of its maturation (17).

The embryo is in a process of striving to attain form, reason, logic, free will, uniqueness, and the characteristics of human nature that together constitute the "likeness." The obstruction of this struggle to attain the "likeness" is unacceptable within a theological framework and is considered a grievous offense, violating the divine creation. Whether the embryo is visualized or not, it is always considered by the Orthodox Church as a complete existence.

Since embryonic stem cells are considered a potential human being, any intervention on them is regarded as intervention in the human being. A human being is a complete existence with the image and likeness of God. The likeness to God is achieved through purity, the absence of passions, and the elimination of all evil. A human being is a sacred legacy of the divine will, and as such, their nature deserves respect. Therefore, intervention in embryonic stem cells is considered an intervention in the archetype.

In the Orthodox Church, what is ethically acceptable is defined by the theology concerning the person, as the concept of the person is its central core. The Church accepts the achievements of science on the basis that humans have received the necessary tools from God to develop skills and use them for the good of humanity. However, it requires that no embryos' lives have been interrupted, even in the earliest days of their existence, in order to obtain stem cells.

Thus, the guiding principle for the ethical acceptance of medical methods is steadfastly ethics, as derived from Christian teachings, as outlined in both the Old and New Testaments, the decisions of the Ecumenical Councils, and the God-inspired Patristic teachings. In conclusion, according to Orthodox doctrine, humanity has received from God the necessary tools and wisdom to develop skills and scientific achievements solely for the good of the common

good, without causing harm to another (18).

The limited knowledge of participants highlights the need for enhanced scientific education, particularly on bioethics and biotechnology issues. Understanding such topics is not only about scientific accuracy but also about citizens' ability to participate in informed social and political decisions concerning scientific progress. At the same time, insufficient information may lead to ethical misinterpretations or misconceptions about the actual implications of stem cell use.

Conclusion

This study demonstrates that Greek society exhibits conditional acceptance of stem cell research, balancing scientific hope with ethical responsibility. Public attitudes reflect ethical maturity rather than resistance to innovation. Sustainable progress in stem cell research requires continuous dialogue among science, ethics, theology, and society to ensure that biomedical advances serve the common good without compromising human dignity.

References

1. Moris N, Alev C, Pera M, Martinez Arias A. Biomedical and societal impacts of in vitro embryo models of mammalian development. *Stem Cell Reports* 2021;16:1021-1030.
2. Yu L, Wei Y, Duan J, et al. Blastocyst-like structures generated from human pluripotent stem cells. *Nature* 2021;591:620-626.
3. Zhang W, An S, Hou S, et al. Generation of transient totipotent blastomere-like stem cells by short-term high-dose Pladienolide B treatment. *Sci China Life Sci* 2025;68:1337-1351.
4. Yamanaka Y, Hamidi S, Yoshioka-Kobayashi K, et al. Reconstituting human somitogenesis in vitro. *Nature* 2023;614:509-520.
5. Kim SH. The politics of human embryonic stem cell research in South Korea: contesting national sociotechnical imaginaries. *Sci Cult (Lond)* 2013;23:293-319.
6. Park J, Kim J, Shin B, Sch Ler HR, Kim J, Kim KP. Inducing pluripotency in somatic cells: historical perspective and recent advances. *Int J Stem Cells* 2024;17:363-373.
7. Wei P, Bao R. Intra-articular mesenchymal stem cell injection for knee osteoarthritis: mechanisms and clinical evidence. *Int J Mol Sci*. 2022;24(1):59.
8. Xie Q, Liu R, Jiang J, et al. What is the impact of human umbilical cord mesenchymal stem cell transplantation on clinical treatment? *Stem Cell Res Ther* 2020;11:1-13.
9. Nichols J, Smith A. The origin and identity of embryonic stem cells. *Development* 2011;138:3-8.
10. Trounson A, McDonald C. Stem cell therapies in clinical trials: progress and challenges. *Cell Stem Cell* 2015;17:11-22.
11. Wei P, Bao R. Intra-articular mesenchymal stem cell injection for knee osteoarthritis: mechanisms and clinical evidence. *Int J Mol Sci*. 2022;24(1):59.
12. Trounson A, McDonald C. Stem cell therapies in clinical trials: progress and challenges. *Cell Stem Cell* 2015;17:11-22.
13. Blau HM, Daley GQ. Stem cells in the treatment of disease. *New Engl J Med* 2019;380:1748-1760.
14. Mousaei Ghasroldasht M, Seok J, Park H-S, et al. Stem cell therapy: from idea to clinical practice. *Int J Mol Sci* 2022;23:2850.
15. Paris F, Marrazzo P, Pizzuti V, et al. Characterization of perinatal stem cell spheroids for the development of cell therapy strategy. *Bioengineering* 2023;10:189.
16. Malekpour K, Hazrati A, Zahar M, et al. The potential use of mesenchymal stem cells and their

derived exosomes for orthopedic diseases treatment. *Stem Cell Rev Rep* 2022;18:933–951.

17. Song W-P, Jin L-Y, Zhu M-D, et al. Clinical trials using dental stem cells: 2022 update. *World J Stem Cells* 2023;15:31.
18. Li MD, Atkins H, Bubela T. The global landscape of stem cell clinical trials. *Regen Med* 2014;9:27–39.

Received 09-06-2026

Revised 10-07-2026

Accepted 22-07-2026