

Biological Effects of Concave Reflective Geometries: A Critical Review of Focused Reflective Chamber Research and Its Implications for Clinical Medicine

Mikhail Artamonov^{1*} , Evgeniy Komrarov²

¹Penn Medicine Princeton Health, Plainsboro, NJ 08536, USA

²Niadis Longevity Institute, Moscow, Russia 107076

*Correspondence author: Mikhail Artamonov, MD, Penn Medicine Princeton Health, Plainsboro, NJ 08536, USA;

Email: mikhail.artamonov@pennmedicine.upenn.edu

Abstract

Background: Concave reflective chambers are metallic enclosures that use curved geometries to focus electromagnetic radiation, including ultraweak biophoton emissions from biological systems, on a specific area. Originating from Soviet-era research, these devices remain largely unknown in Western clinical medicine. This review critically evaluates the available research on physiological and cellular responses to focused reflection settings.

Objective: This systematic review examines published experimental and clinical literature on concave reflective geometries to identify credible biophysical mechanisms, evaluate study quality, assess reproducibility and determine whether sufficient evidence exists to support controlled clinical research.

Methods: An in-depth literature review was conducted using PubMed, Google Scholar, Scopus, Journal of Scientific Exploration archives and the Russian Science Citation Index (RSCI). Search terms included “concave reflective geometry,” “biophoton reflection,” and “ultraweak photon emission.” Russian and English periodicals were included. Modified GRADE criteria tailored for emerging technology were applied.

Results: Between 1990 and 2025, 47 pertinent publications were identified. Variations in the autonomic nervous system, intensity of ultraweak photon emission, electroencephalogram patterns and organism survivability in model systems have been reported. The most methodologically rigorous investigation showed that concave reflective surroundings changed the emission of ultra-weak photons from neural stem cells and affected the patterns of differentiation. *Caenorhabditis* worms subjected to biological radiation concentrated using sector-geometry reflectors showed lifespan increases of 19-30%, according to animal model studies. However, the lack of blinding, inconsistent methods, small sample sizes and independent replication undermine the overall body of evidence.

Citation: Artamonov M, et al. Biological Effects of Concave Reflective Geometries: A Critical Review of Focused Reflective Chamber Research and Its Implications for Clinical Medicine. *Jour Clin Med Res.* 2026;7(1):1-8.

<https://doi.org/10.46889/JCMR.2026.7115>

Received Date: 26-02-2026

Accepted Date: 22-03-2026

Published Date: 29-03-2026



Copyright: © 2026 The Authors. Published by Athenaem Scientific Publishers.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

License URL:

<https://creativecommons.org/licenses/by/4.0/>

Conclusions: The currently available evidence is insufficient for therapeutic use, despite the exciting preliminary evidence in the literature suggesting that focused reflective geometries may have an impact on biological systems. Standardized procedures should be used in a thorough, independently reproduced investigation of repeatable effects observed under controlled laboratory conditions. Experimental frameworks are suggested for further research in this review.

Keywords: Concave Reflective Geometry; Ultraweak Photon Emission; Biophotons; Focused Reflective Environment; Electromagnetic Biology; Psychophysiology; Critical Review

Abbreviations

UPE: Ultraweak Photon Emission; EEG: Electroencephalography; ANS: Autonomic Nervous System; HRV: Heart Rate Variability; ROS: Reactive Oxygen Species; NSC: Neural Stem Cell; ISRICA: International Scientific Research Institute for Cosmic Anthropeocology

Introduction

Concave reflective chambers are apparatuses that use curved metal surfaces to focus electromagnetic energy on specific areas. The physical principle is simple: incident radiation is focused on concave reflective geometries and when biological objects are placed within such environments, the reflected biological emissions are redirected back toward the focal area [3,4]. Biological objects emit ultra-weak photon radiation, which ranges from several to hundreds of photons per second per square centimeter (Fig. 1) [1,2].

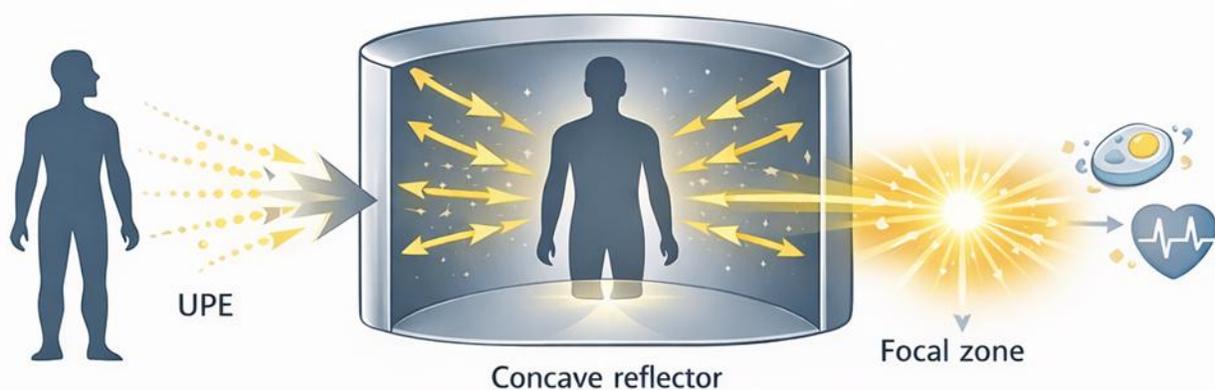


Figure 1: Biological systems produce Ultraweak Photon Emission (UPE; 200-800 nm), which can be reflected by concave metallic surfaces and redirected onto a focus region, potentially enhancing local photon density. The ensuing exposure is thought to alter cellular or physiological processes. The biological implications of this photon concentration is still under investigation.

These devices first appeared in the Soviet Union's research initiatives in the late 1980s and the early 1990s. The astrophysicist N A Kozyrev (1908-1983) proposed that concave reflective geometries could concentrate various forms of radiation beyond the conventional electromagnetic spectrum [3,5]. Building on this framework, VP Kaznacheev and AV. Trofimov at the International Scientific Research Institute for Cosmic Anthropeocology (ISRICA) in Novosibirsk applied these geometries to biological research [3,4]. The reported effects are diverse, ranging from quantifiable changes in cellular behavior and organism lifetime in model systems to psychophysiological changes in humans. Emerging research further suggests that neural cells may possess waveguiding capabilities enabling optical communication pathways [21], lending additional theoretical context to biophoton-based interactions. Despite these claims, Western clinical medicine remains largely unaware of this technology. The dominance of Russian-language publications, their affiliation with non-traditional theoretical frameworks, the isolation of Soviet research projects throughout the Cold War and the lack of rigorous critical evaluation in the mainstream biomedical literature are some of the factors that contribute to this obscurity.

The current review seeks to close this gap by presenting the first thorough and critically examined synthesis of the known research. Importantly, this study assessed the experimental findings irrespective of the theoretical frameworks within which they were originally housed. Whether or not one accepts the original theoretical motivations, the empirical question of whether concave reflective geometries affect biological systems is susceptible to ordinary scientific research.

Historical and Theoretical Foundations

From Archimedes to Biophysics: Concave Reflective Geometries in Science

The use of concave reflective geometries to concentrate energy has a long history. Archimedes reputedly utilized parabolic

reflectors to focus on solar energy and concave reflective surfaces have long been important instruments in astronomy and optics. Concave geometries have recently been used in biological systems. The theoretical foundation is based on a simple physical principle: concave reflecting surfaces concentrate the incident radiation into a focal zone. When biological objects that emit ultra-weak photon radiation ranging from 200 to 800 nm are placed in such situations, their reflected emissions are steered back into the focus area [1,2,13]. Human biophoton emission, although modest, has been observed consistently across numerous body regions and corresponds with physiological conditions [16,18]. The crucial question is whether the concentration of ultra-weak biological radiation reaches biologically relevant levels.

Soviet-Era Research Programs

N.A. Kozyrev (1908-1983) was a renowned Soviet astronomer who made significant contributions to astronomy, including predicting volcanic activity on the Moon, for which he received the International Academy of Astronautics gold award in 1969 [5]. His more contentious work hypothesized that concave reflective geometries might focus various types of radiation beyond the traditional electromagnetic spectrum [3]. Following Kozyrev's theoretical work, V.P. Kaznacheev, an academician of the Russian Academy of Medical Sciences and AV Trofimov founded a research program at ISRICA in Novosibirsk in the late 1980s. Their art features cylindrical concave chambers made of polished aluminum, with human beings seated within the focal zone. Over the next several decades, they observed various psychophysiological effects in over 500 patients [4].

Evidence from Human Studies

Psychophysiological Observations

The Kaznacheev-Trofimov research group described many types of human responses to concave reflective chambers [4]. These include changes in electroencephalographic activity, heart rate variability patterns, subjective reports of changed perception and changes in autonomic nervous system parameters. In their largest study, approximately 500 participants were subjected to sessions lasting 30-60 minutes inside cylindrical aluminum chambers [4]. Electroencephalographic recordings reportedly showed increased interhemispheric coherence and alterations in alpha-band power. Analysis of heart rate variability indicated a shift toward parasympathetic dominance during chamber sessions. Participants frequently described altered time perception, closed-eye visual experiences and states of deep relaxation [4]. A significant methodological limitation is the complete absence of blinding. Participants were fully aware of their exposure to the reflective chamber, making it impossible to distinguish genuine physiological responses from expectation-related effects. The visually striking and novel appearance of the chambers likely produced arousal-driven autonomic changes independent of any reflective mechanism.

Thermal and Electromagnetic Considerations

An alternative explanation for the reported physiological effects involves straightforward thermal and electromagnetic shielding mechanisms. Concave metallic enclosures alter the immediate electromagnetic environment of the subject by reflecting body heat, attenuating external electromagnetic interference and creating partially shielded acoustic spaces [6]. Any or all of these non-exotic mechanisms could produce measurable physiological changes. Studies that have not controlled for these confounding factors cannot attribute the effects specifically to the focused biophoton reflection.

Evidence from Cellular and Animal Model Studies

Ultraweak Photon Emission Studies

The most methodologically robust evidence is obtained under controlled laboratory conditions. Esmaeilpour and colleagues released a paper in *Scientific Reports* that investigated ultraweak photon emission from adult murine neural stem cells in the presence of concave reflective configurations [7]. This study assessed UPE from NSCs during serial passaging and differentiation in both reflective and non-reflective settings.

The researchers found that UPE intensity varied proportionally with differentiation state - a finding of independent biological significance, as it suggests that biophoton emission may serve as a marker of stem cell differentiation status. However, the geometry-related effects were modest compared to other interventions. Silver nanoparticles increased UPE by 21.8-28.3% relative to controls, while the concave reflective environment produced comparatively smaller effects [7]. This study remains the reference standard for this technology owing to its publication in a high-impact peer-reviewed journal, use of quantitative photon detection and well-designed controls. The principal conclusion is nuanced: while the reflective surroundings produced detectable changes in photon emission patterns, the effect sizes were small and the biological significance of these alterations

remains to be established. Complementary data from embryo viability studies have revealed that UPE patterns may accurately distinguish between live and degenerated mouse embryos, demonstrating that photon emission carries biologically meaningful information [20].

C. elegans Lifespan Studies

Caenorhabditis elegans has been studied in detail and a separate line of evidence comes from using them as a model organism. Studies using the nematode *Caenorhabditis elegans* as a model organism provide a separate line of evidence. Sector-geometry reflectors, which are curved iron surfaces meant to focus biological radiation from growing plants toward nematode cultures, were found to extend lifespans by 19-30% across numerous trials conducted between 2016 and 2021 [8]. Five independent studies were conducted using various biological radiation sources (wheat, barley, oat seedlings and young mice). Statistical significance was set at $p < 0.05$ and $p < 0.001$ [8]. Supporting cell culture results revealed a 22-23% increase in the stationary lifetime. The dose-response correlations revealed optimal exposure values. These findings are intriguing but need to be evaluated cautiously (Fig. 2). All experiments were performed by a single research team. No independent replications have yet been reported. The mechanism by which intense biophoton radiation from seedlings affects nematode lifespan remains unknown. Furthermore, *C. elegans* lifetime is affected by a range of environmental variables (temperature, humidity and bacterial food quality) and it is uncertain whether all of these confounding factors were fully controlled.

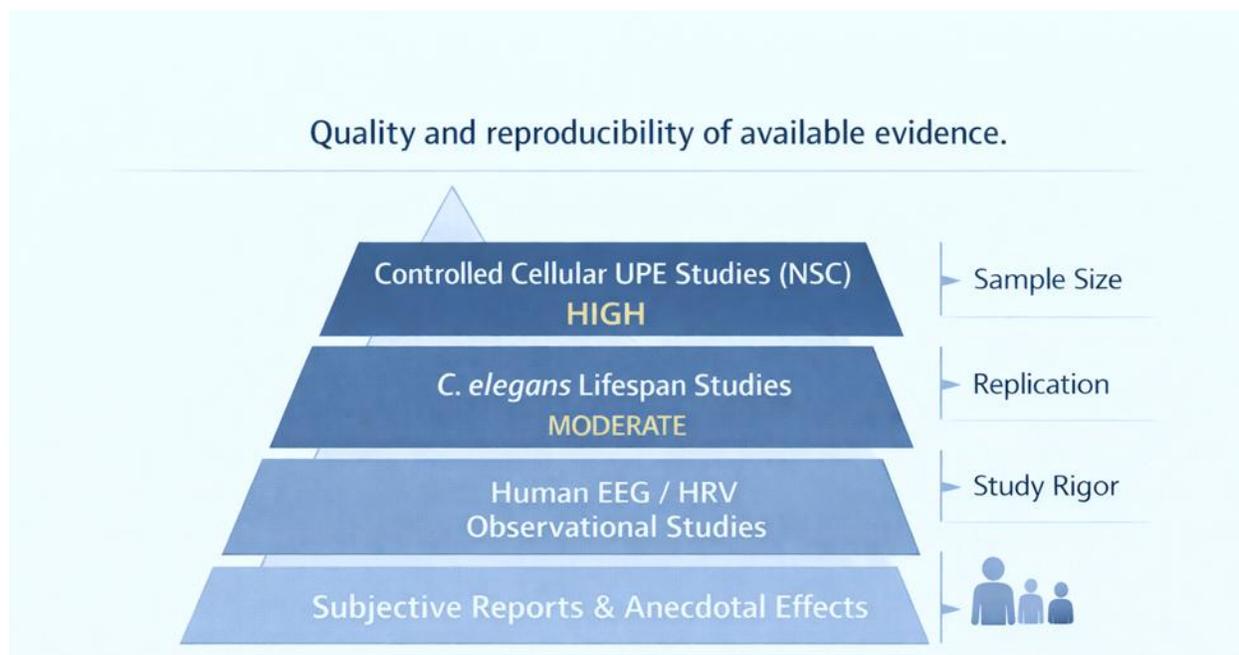


Figure 2: Evidence strength is ranked according to methodological rigor, sample size and independent replication, with controlled cellular UPE studies at the top and observational human studies and anecdotal reports at the bottom.

Cell Communication Studies

Broader evidence for biophoton-mediated cell communication provides indirect support for the reflecting geometry hypothesis. Gurwitsch's 1923 research showed that onion root cultures separated by quartz might encourage each other's growth [14]. Albrecht-Buehler, later showed that cells have a rudimentary sort of "vision," responding to infrared photon signals from neighboring cells [15]. When chemically segregated Paramecium populations were visually connected through quartz barriers, Fels, discovered that their growth rates influenced each other [9]. When the optical connection was broken, the effect disappeared. Levac and Dotta, discovered that structured light stimulation of melanoma cells influenced both directly exposed and proximal unexposed cell populations [10]. These findings collectively suggest that biophotonic cell-to-cell signaling is a real phenomenon; nevertheless, extrapolating from quartz-barrier testing to room-scale reflecting chambers necessitates considerable assumptions regarding signal intensity and transmission.

Evidence Quality Assessment (Table 1)

Evidence Category	Source	Sample	Effect	Quality	Replicated?
UPE modulation in NSCs	Esmailpour 2020	Murine NSCs	Modest UPE change	High	No
<i>C. elegans</i> lifespan	Unpublished series	Nematodes	19-30% extension	Moderate	Same lab only
Human EEG changes	Kaznacheev group	n>500	Hemispheric coherence	Low	No
Autonomic modulation	Kaznacheev group	n>500	HRV shifts	Low	No
Cell communication	Fels 2009; Levac 2025	Paramecium; melanoma	Optical signaling	High	Yes (indirect)
Subjective reports	Multiple groups	Varied	Altered perception	Very Low	Anecdotal

Table 1: Evidence grading for concave reflective-geometry effects.

Methodological Limitations

There are several recurring problems in the evidentiary foundation. First, most human studies lack sufficient blinding to reduce bias. When individuals sit in a visually striking metallic chamber, anticipation effects become unavoidable. Sham-controlled designs with non-reflective or variably shaped chambers with the same appearance are necessary but have rarely been used.

Second, the sample sizes in most studies are insufficient for accurate effect estimation. Even the Kaznacheev group's greatest series (n>500) did not use randomization or stratification techniques consistent with the current clinical research guidelines. Third, there is almost no independent replication of the results. Most of the data were derived from a few study groups, especially in Russia. Fourth, mainstream physics does not embrace the theoretical frameworks under which this study was originally conducted, particularly Kozyrev's causal mechanics. While empirical findings should be examined independently of their theoretical context, their association with non-standard theories has inhibited participation from the larger research community.

Plausible Mechanisms

Setting aside non-standard theoretical assumptions, various common biophysical mechanisms can explain the observed effects. Concave metallic surfaces generate electromagnetic shielding environments that modify the ambient electromagnetic fields encountered by biological systems. This alone has the potential to alter cellular processes that are sensitive to electromagnetic fields [11,12]. The well-established science of photobiomodulation indicates that specific wavelengths of light influence cellular function through mitochondrial cytochrome C oxidase providing a plausible biochemical mechanism through which reflected biophoton radiation acts [17,19]. The concentration of biophoton radiation is physically real, as reflective surfaces redirect photons; however, the question remains whether the intensities produced are biologically significant. Given that UPE is on the order of a few hundred photons per second per square centimeter, even perfect concentration would result in intensities significantly lower than those utilized in photobiomodulation experiments (milliwatts per square centimeter) [1]. To prove biological relevance, the biophoton concentration hypothesis requires more evidence. The more commonplace explanations of thermal effects (infrared reflection making the microenvironment warmer), acoustic effects (changed reverberation patterns) and sensory deprivation effects (less visual and electromagnetic stimulation) have not been sufficiently studied in previous studies indicated in Fig. 3.

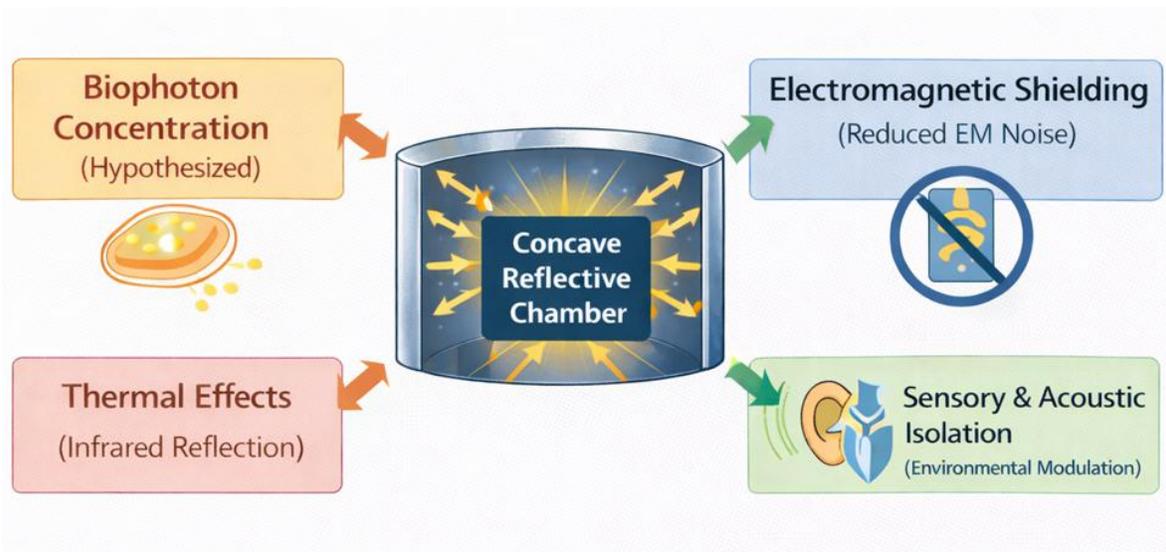


Figure 3: Proposed pathways for biological impacts in concave reflecting settings. Potential contributors include biophoton concentration, electromagnetic shielding, thermal reflection and sensory/acoustic ambient modification.

Implications and Future Directions

Research Priorities

If this technology is to be taken seriously in mainstream biomedical research, certain priorities must be established. The most immediate need is for rigorous double-blind, sham-controlled trials on human participants. The sham condition must have the same optical, thermal and auditory features as the active chamber but without the focusing geometry.

Independent replication of *C. elegans* longevity data by uninvolved laboratories would significantly improve the evidence. The experimental methodology is simple and affordable, making it an excellent choice for multicenter replication. To establish dose-response relationships, mechanistic investigations should systematically alter the exposure parameters, reflective shape and material composition. It is crucial to distinguish between biophoton-specific and non-specific electromagnetic shielding effects. To establish dose-response connections, the reflective shape, material composition and exposure parameters should be modified repeatedly, as per illustrated in Fig. 4. It is critical to distinguish between biophoton-specific and non-specific electromagnetic shielding effects. The recent development of ultrasensitive photon detection technologies, including purpose-built UPE measuring equipment, may aid in the consistent quantification required for future studies [22].

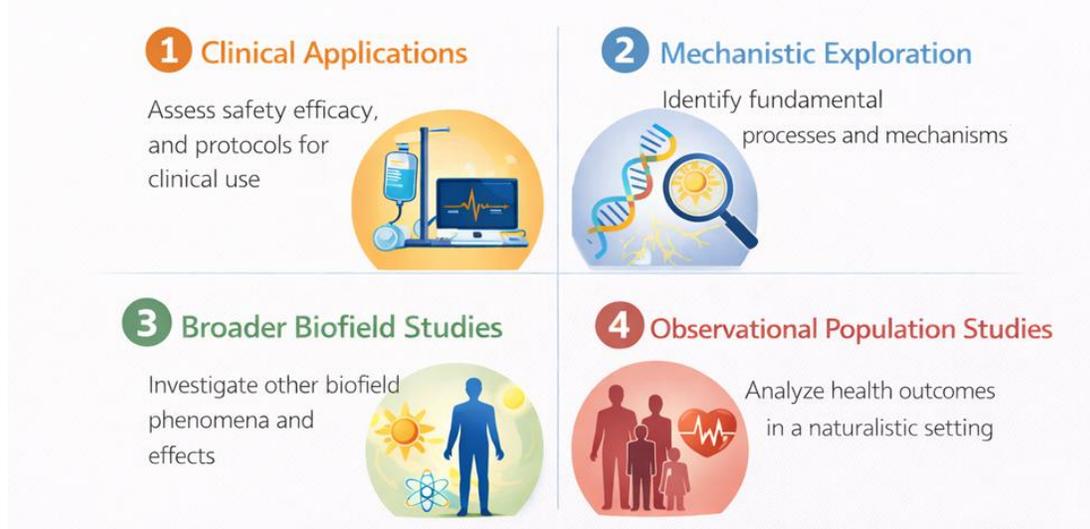


Figure 4: Priority research areas for concave reflective geometries. Controlled clinical evaluation, mechanistic investigations, large-scale biophysical studies and population-level observational research are all important avenues.

Limitations and Clinical Readiness

If robust evidence is developed, prospective applications could include adjunctive use in regenerative medicine settings (optimizing electromagnetic environments for stem cell therapies), stress-reduction protocols and investigative tools for biophoton biology research. However, clinical application remains premature given the current evidence base.

Conclusion

Concave reflective chambers represent an understudied technology with a long but inconsistent research history. Although biophoton emission from biological systems is well established, whether focused reflection achieves biologically meaningful intensities remains unresolved. The *C. elegans* lifespan data are intriguing yet unreplicated and human studies remain insufficiently controlled. This review does not support clinical use at present, but concludes that the existing data justify well-designed, independently replicated studies. Such investigations are feasible, affordable and could carry substantial implications for biophotonic biology if findings are confirmed.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

Acknowledgement

None.

Data Availability Statement

Not applicable.

Ethical Statement

The project did not meet the definition of human subject research under the purview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement

Informed consent was taken for this study.

Authors' Contributions

Authors approved the final version of this paper.

References

1. Cifra M, Pospíšil P. Ultra-weak photon emission from biological samples: definition, mechanisms, properties, detection and applications. *J Photochem Photobiol B*. 2014;139:2-10.
2. Mould RR, Mackenzie AM, Kalampouka I. Ultra weak photon emission-a brief review. *Front Physiol*. 2024;15:1348915.
3. Kozyrev NA. On the possibility of experimental investigation of the properties of time. In: *Time in Science and Philosophy*. Prague: Publishing House of the Czechoslovak Academy of Sciences; 1971:111-32.
4. Kaznacheev VP, Trofimov AV. Reflections on life and intelligence on planet Earth: Problems of cosmo-planetary anthropoecology. Novosibirsk: Nauka; 2004.
5. Kozyrev NA. Observations of the luminescence of the lunar surface during a lunar eclipse. *Dokl Akad Nauk SSSR*. 1959;129:292-4.
6. Funk RHW, Monsees TK. Effects of electromagnetic fields on cells: physiological and therapeutical approaches and molecular mechanisms of interaction. *Cells Tissues Organs*. 2006;182(2):59-78.
7. Esmaeilpour T, Fereydouni E, Dehghani F. An experimental investigation of ultraweak photon emission from adult murine neural stem cells. *Sci Rep*. 2020;10:463.
8. Artamonov MJ. Ultraweak electromagnetic radiation and biological lifespan: experimental evidence from nematode and cell

- culture models. Manuscript in Preparation. 2025.
9. Fels D. Cellular communication through light. *PLoS One*. 2009;4(4):e5086.
 10. Levac SJ, Dotta BT. Light modulation and biophoton emissions: A proof-of-principle study of direct and proximal cellular effects. *Appl Sci*. 2025;15(18):9858.
 11. Pall ML. Electromagnetic fields act via activation of voltage-gated calcium channels to produce beneficial or adverse effects. *J Cell Mol Med*. 2013;17(8):958-65.
 12. Maziarz A, Kocan B, Bester M. How electromagnetic fields can influence adult stem cells: Positive and negative impacts. *Stem Cell Res Ther*. 2016;7:54.
 13. Pospíšil P, Prasad A, Rác M. Role of reactive oxygen species in ultra-weak photon emission in biological systems. *J Photochem Photobiol B*. 2014;139:11-23.
 14. Gurwitsch AG. Die Natur des spezifischen Erregers der Zellteilung. *Arch Entw Mech Org*. 1923;100:11-40.
 15. Albrecht-Buehler G. Rudimentary form of cellular "vision". *Proc Natl Acad Sci U S A*. 1992;89(17):8288-92.
 16. Popp FA, Nagl W, Li KH, Scholz W, Weingärtner O, Wolf R. Biophoton emission: New evidence for coherence and DNA as source. *Cell Biophys*. 1984;6(1):33-52.
 17. Hamblin MR. Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. *AIMS Biophys*. 2017;4(3):337-61.
 18. Van Wijk R, Van Wijk EP. An introduction to human biophoton emission. *Forsch Komplementmed Klass Naturheilkd*. 2005;12(2):77-83.
 19. Karu TI. Multiple roles of cytochrome c oxidase in mammalian cells under action of red and IR-A radiation. *IUBMB Life*. 2010;62(8):607-10.
 20. Kozma-Bognár V. Unique algorithm for the evaluation of embryo photon emission and viability. *Sci Rep*. 2024;14:12987.
 21. Murugan NJ. Exploring ultraweak photon emissions as optical markers of brain activity. *iScience*. 2025;28(3):112019.
 22. National Research Council Canada. World's first ultraweak photon emission technology holds promise for medical forecasts. *NRC News*. 2024.

About the journal



Journal of Clinical Medical Research is a peer-reviewed, open-access scholarly journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, reviews, editorials, and commentaries within its defined scope, with the aim of supporting scientific research and clinical knowledge in clinical and medical research.

All manuscripts are evaluated through an independent peer-review process conducted in accordance with the journal's editorial policies and established publication ethics. Editorial decisions are made solely on the basis of academic merit.

Manuscript submission: <https://athenaeumpub.com/submit-manuscript/>