

Bioelectronic Medicine and Non-Communicable Diseases: Rationale for Clinical Significance, Prospects and Problems

Ganna V. Nevoit,^{a,b} Inga A. Bumblyte,^a Maksim M. Potyazenko,^b Olena Filyunova,^c
Alfonsas L. Vainoras,^a Ozar P. Mintser^d

^aLithuanian University of Health Sciences, Kaunas, Lithuania

^bPoltava State Medical University, Poltava, Ukraine

^cPreventive Medicine Center of Genesis Center LLC, Kyiv, Ukraine

^dShupyk National Healthcare University of Ukraine, Kyiv, Ukraine

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ABSTRACT

The results of a theoretical study of the possibilities and prospects for solving the problem of non-communicable diseases (NCDs) are reported in the article. The authors present the ideas of the educational and scientific project “Bioelectronic Medicine or Look at Medicine Differently”, which is the result of the research. The aim of the study was to introduce the ideas of bioelectronic medicine as a promising direction for solving the problem of NCDs. This study is a fragment of the research work on "The development of algorithms and technologies for implementing a healthy lifestyle in patients with non-communicable diseases based on the study of functional status" (state registration number 0121U108237: UDC 613 616-056-06: 616.1/9-03). General scientific methods and theoretical methods were used in this theoretical study. Conclusions: Bioelectronic medicine is a promising direction for the further development of medicine and for solving the problem of NCDs because its ideas integrate modern biophysical knowledge about the structure and functioning of the nanolevel of living matter in vivo into knowledge about the functioning of the human body. This opens up new perspectives for studying the pathology of NCDs. Bioelectronic medicine, as a promising direction for solving the problem of NCDs, needs to be further developed and its ideas need to be popularized among the world's scientific community.

KEYWORDS

Non-communicable diseases, Magneto-electrochemical Theory of Metabolism, bioelectronic medicine, quantum medicine

1. Introduction

Chronic non-communicable diseases (NCDs) are an important health and social problem worldwide. Significant advances have been made in the pharmacological and surgical treatment of NCDs, but morbidity and mortality from NCDs continue to be high. It is recognized that NCDs are a pandemic [1–3]. This was why that the World Health Organization formulated new goals and targets to combat

NCDs until 2030 [4, 5]. Therefore, searching for new medical approaches to solve the problem of NCDs is an urgent scientific task.

Nowadays, fundamental knowledge about the structure of the human body has significantly increased and deepened. Science has studied the nano-level structure of matter and the human body [6–10]. This has opened up further prospects for finding new approaches to solving the problem of NCDs. Deepening the scientific understanding of the pathogenesis of NCDs has been made possible by extrapolating modern biophysical knowledge to medical knowledge about the functioning of the human body [11]. A foundation of new knowledge about the functioning of the human body at the quantum level has emerged that should deepen the current paradigm of knowledge about NCDs. This requires further theoretical research and constitutes a promising direction for science in the further development of medicine and in solving the problem of NCDs.

Therefore, the aim of this theoretical study was to present the ideas of bioelectronic medicine as a promising direction for solving the problem of NCDs.

An Explanation of the Methodology

The analysis of the presented data is a fragment of the research work of the Department of Internal Medicine and Emergency Medicine of Poltava State Medical University (23, Shevchenko St., 36011, Poltava, Ukraine) on the "Development of algorithms and technologies for implementing a Healthy Lifestyle in patients with NCDs based on the study of functional status" (state registration number 0121U108237: UDC 613 616-056-06: 616.1 / 9-03).

Scientific work is carried out in conjunction with the following scientific institutions: 1) Poltava State Medical University (23, Shevchenko St., 36011, Poltava, Ukraine), the cooperation coordinator is the Head of the Department of Internal Medicine and Emergency Medicine, Prof. DM M. Potyazenko; 2) Shupyk National Healthcare University of Ukraine (9, Dorogozhytska St., 04112, Kyiv, Ukraine), the cooperation coordinator is the Head of the Department of Fundamental Disciplines and Informatics, Prof. DM O. Mintser; 3) Lithuanian University of Health Sciences (9, A. Mickevičius St., LT-44307, Kaunas, Lithuania), the cooperation coordinators are the Head of the Nephrology Department, Prof. DM I.A. Bumblyte and Senior Researcher of the Laboratory of Automation of Cardiology Research of the Institute of Cardiology of the Lithuanian University of Health Sciences, Prof. DM A. Vainoras. General scientific methods (dismemberment and integration of elements of the studied system, imaginary experiment, logical, historical research, analysis, induction, deduction, and synthesis of knowledge) and theoretical methods (method of constructing theory, logical methods, and rules of normative nature) were used in this theoretical study.

To search for information at different stages of the long-term study, the following scientometric databases were used: Scopus, Web of Science, PubMed, ScienceDirect, Directory of Open Access Journals (DOAJ), and JSTOR.

Results and Discussion

Knowledge about the existence of a nano-level structure and the functioning of the human body is the main theoretical concept of bioelectronic medicine. To extrapolate this biophysical knowledge, work has been underway to conceptualize the Magneto-electrochemical Theory of Metabolism in the human body from 2019 to the present [12]. Key conclusions were that the human body at the nanoscale ($\leq 1\text{nm}$) consists of conglomerates of electromagnetic fields [13, 14]. This made it possible to deepen the paradigm of medical scientific knowledge and highlight the quantum level of the structure and functioning of the human body (Figure 1 and Figure 2) [15].

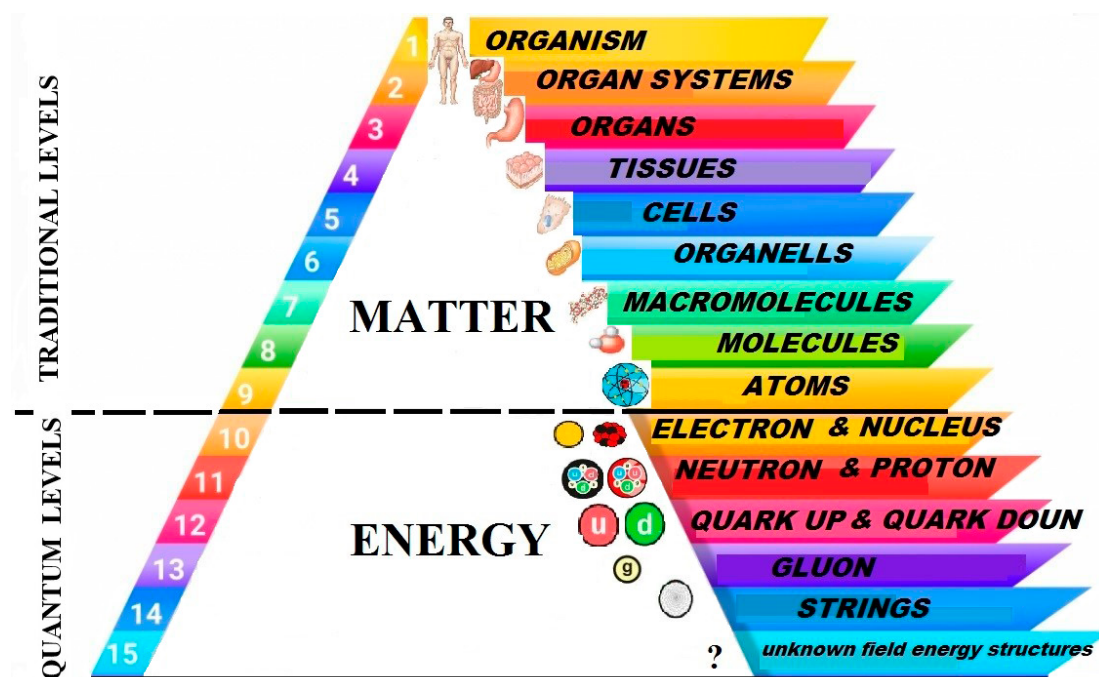


Figure 1. Graphic representation of the structural levels of organization of the human body, considering modern fundamental biophysical knowledge [15].

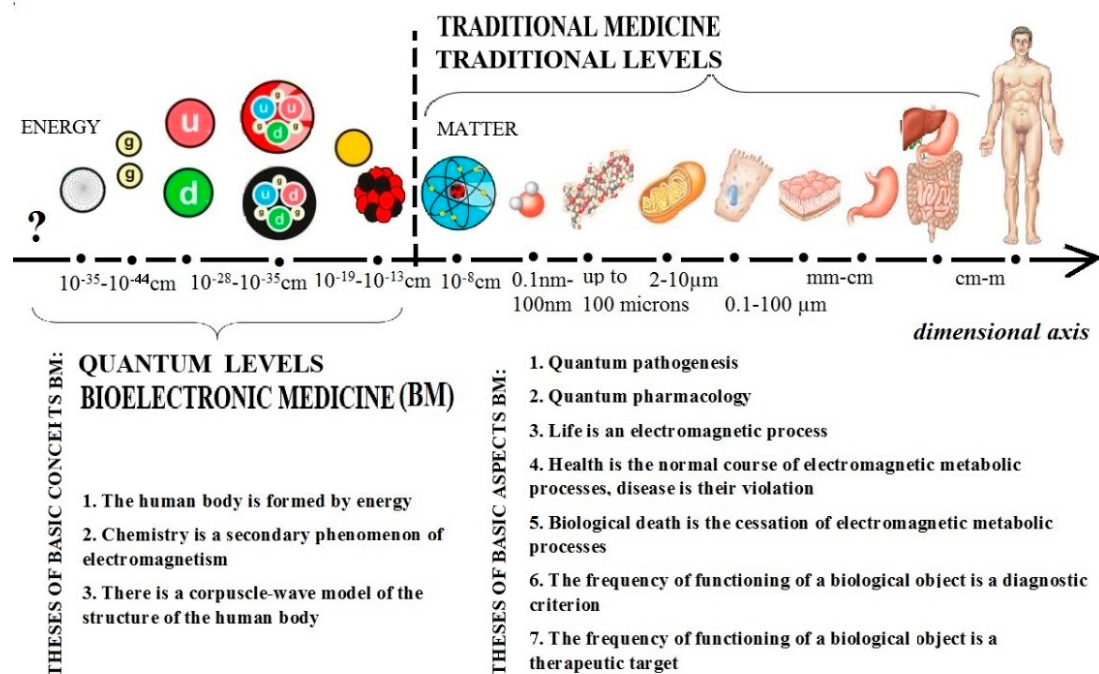


Figure 2. Diagram of the dimensional axis of the structural levels of the organization of the human body, indicating the levels of theoretical concepts of medicine and bioelectronic medicine, as well as theses of the main basic concepts and aspects of bioelectronic medicine, developed in the theoretical study [15].

Key conclusions were made that the basis of molecular metabolism at the quantum level is the quantum processes of magnetoelectrochemical interaction [12–15]. In this case, chemical reactions between molecules are the visible, recorded result of the interaction of the magnetoelectric fields of atoms and subatomic structures that form these molecules [12–15]. It is magnetoelectrochemical processes at the nano level that are the biophysical basis of metabolism in the human body and the basis for the phenomenon of its biological life [12–15]. Magnetoelectric processes, as the basis of metabolism and the phenomenon of biological life, are present at all hierarchical levels of the structure of the human body (Figure 3) [16].

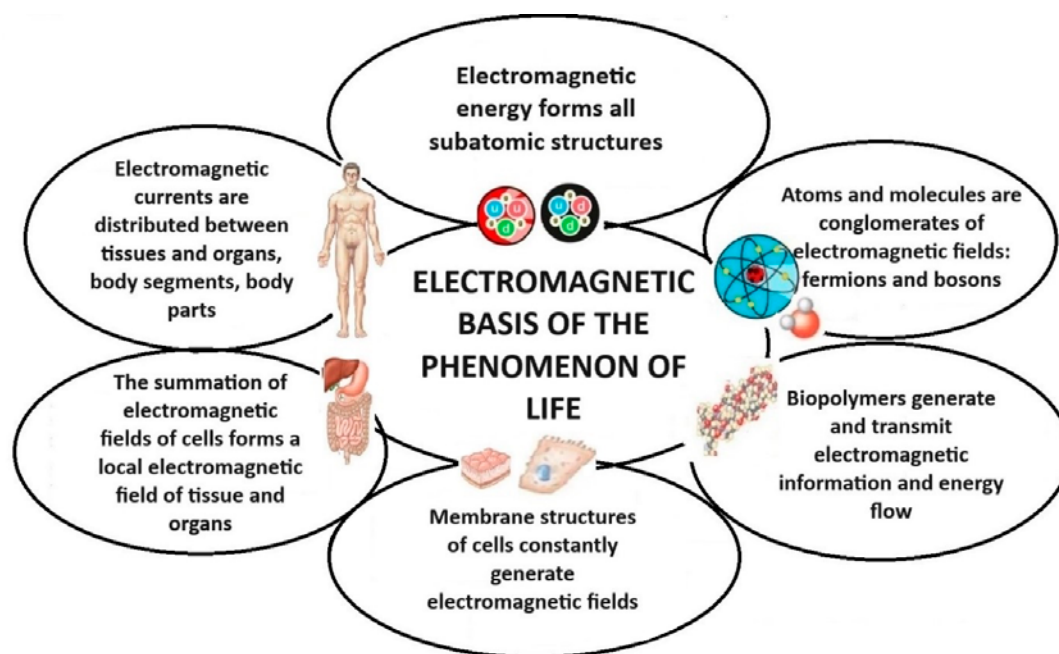


Figure 3. Participation of electromagnetic processes in the implementation of the phenomenon of life at all structural levels of the human body [16].

During the study, the role of electromagnetic processes in the functioning of cell membranes [17] and the biological role of water [18] were conceptualized. The role of biophotons in the functioning of the human body was also conceptualized [19]. The presentation of a newly developed concept of biophoton signaling makes it possible to explain the mechanisms of intercellular signaling at the level of tissues, organs, and the entire organism as a whole [20]. All this became the scientific foundation for further consideration and study of the human body from the standpoint of the frequency-wave model of the body structure and the further development of the ideas of bioelectronic medicine [15, 21].

The use of the term “bioelectronic medicine” is justified by the fact that the electron is, in the understanding of a significant number of modern scientists, a material carrier of an energy charge through which energy exchange and magnetoelectrochemical interaction between atoms of molecules in the cells and tissues of the human body are carried out *in vivo*. Therefore, this term is understandable to modern scientists and exists in modern science [15, 21–23]. In our opinion, the use of this term in science is sufficient today to explain/describe the processes of biophysical interaction in the molecules of the human body's tissues. To a certain extent, it is synonymous with the term “quantum medicine”, but it seems to more specifically specify electrons as the final material target in treating NCDs. Indeed, from the standpoint of bioelectronic medicine, the treatment task should be precisely the improvement/optimization of magnetoelectrochemical processes at the nano level of the structure of human tissues, and the electron is the material component to which treatment should be directed.

To further popularize and develop these ideas, the educational and scientific project “Bioelectronic Medicine or Look at Medicine Differently” was launched in 2024. This project is being implemented based on the Department of Internal Medicine and Emergency Medicine of the Educational and Scientific Institute of Postgraduate Education of Poltava State Medical University and the Department of Fundamental Disciplines and Informatics of the Shupyk National Healthcare University with the assistance of partner scientists from the Lithuanian University of Health Sciences. The project was supported by scientists from the Faculty of Medicine of Kherson State University, whose website lectures are posted [24]. The implementation of the project involves the creation of new educational and methodological material for introducing quantum medicine issues into education and conducting further scientific research to study the mechanisms of the possible effectiveness of existing bioelectronic medicine techniques in the management of patients with NCDs.

Bioelectronic medicine is a promising direction for the further development of medicine and the understanding of the pathogenesis of NCDs. The further development of the ideas of bioelectronic medicine may have such scientific prospects as:

- To study and conceptualize the values of quantum magnetoelectric indicators of tissue functioning and magnetoelectrochemical metabolic processes of the human body in normal and pathological conditions;
- To study and conceptualize aspects of magnetoelectric interaction/mutual influence between organs of the human body in health and disease, which may help to reveal the mechanisms of the occurrence of polymorbidity and comorbidity in NCDs in the future;
- To study and conceptualize the quantum pathogenesis of the occurrence of pathology of internal organs in NCDs;
- To study and conceptualize aspects of quantum pharmacology as a result of quantum magnetoelectrochemical interaction of molecules of pharmacological substances with molecules of the human body;
- To carry out a new theoretical clinical and pathogenetic substantiation of the feasibility of using existing bioelectronic medicine methods in medicine for the treatment of NCDs and to develop new therapeutic and diagnostic approaches.

A significant achievement of fundamental science of our time is a large number of results of scientific research into electrical and magnetic processes in nature and the human body, as well as scientific breakthroughs in quantum physics. This is a challenge for medicine and this necessitates its further development in this direction as well. However, there may be difficulties in overcoming the inertia of some medical scientists' thinking. This can be a big problem in the development of bioelectronic medicine. Also, a significant obstacle to the extrapolation of modern biophysical knowledge to the physiology of the functioning of the human body is the lack of a biological theory that could fully and logically describe the course of magnetoelectrochemical processes at all hierarchical levels of the structures of the human body, fitting them into one single whole. Therefore, the educational and scientific project “Bioelectronic Medicine or Look at Medicine Differently” is one of the possible options for overcoming these problems. This project continues to conduct theoretical research into the conceptualization of many aspects of quantum/bioelectronic medicine and to popularize these ideas. Discussing the issues of correspondence between the ideas of the Magnetoelectrochemical Theory of Metabolism and the educational and scientific project “Bioelectronic Medicine or look at Medicine differently,” we, as the authors, want to note the absence of contradictions to the existing paradigm of scientific knowledge. The ideas, concepts, and theory we present deepen and continue learning within the boundaries of existing knowledge. The data we presented results from systematization and systematic analysis of existing scientific data from various biophysical and biological areas of scientific research.

Therefore, the study of electromagnetic mechanisms of cellular communication/biophotonic signaling [19, 25, 26], biophotonics of the human body [11, 16, 19, 27], and interactions of the human body with the electromagnetic field of the Earth [28] are avant-garde directions in science that are already being

successfully developed and require further attention from scientists.

2. Conclusions

Bioelectronic medicine is a promising direction for the further development of medicine and solving the problem of NCDs because its ideas integrate modern biophysical knowledge about the structure and functioning of the nano level of living matter in vivo into knowledge about the functioning of the human body. This opens up new perspectives for studying pathology in NCDs. Bioelectronic medicine, as a promising direction for solving the problem of NCDs, needs to be further developed and its ideas need to be popularized among the world's scientific community.

3. Conflict of interest

The authors declare that there is no conflict of interest.

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