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Cellular synchronization in constant magnetic field: A new approach to the magnetic therapy application

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Abstract
Electromagnetic mechanisms of intercellular synchronization of biological processes within the whole system (cellular synchronization principle) function in every multicellular organism. These mechanisms can take part in the formation and maintenance of organism stability but at the same time support the persistence of pathologic processes and senescence. Further studies may be useful for various diseases prevention. The new method for treatment of various pathologic processes based on cellular synchronization conception was worked out.

Keywords: magnetic field, magnetic therapy, cellular interactions, synchronization.

Introduction

Magnetic therapy is the use of magnets to treat various diseases and relieve pain in various parts of the body. Magnetic therapy goes back as far as the ancient Egyptians who applied it for a very long time.

There are two main theories explaining the magnetic therapy application. The first one considers that magnets produce an electrical current. According to the other: magnets being applied increase blood circulation and ion exchange.

One very general scheme was used for obtaining experimental results: the cells and tissues (or whole organism) are exposed to magnetic field influence; the parameters of magnetic field can vary; the experiments are evaluated as the result of magnetic field and cells (tissues) interaction.

Research Methodology

We planned our work basing on the other point of view: how cells being exposed to magnetic field influence each other? The main idea was to examine the changes in primarily diverse physiologic conditions of cells being exposed to constant magnetic field. While a traditional scheme of the experiments can be presented as a system "magnetic field + tissue (cells, organism)"; the applied scheme was different - "magnetic field + tissue1 + tissue 2". The last two items were the tissues in physiological states which differ greatly.

The main principle of our experiments was the influence of magnetic field on the system which consisted of an isolated cell layer in the definite physiological state and organism.

In experiment two animals (Ttichogaster trichopterus) were placed into containers where permanent magnets (100 mT) had been installed. A certain type of cell layer was put on the magnet surface in one of the containers. Animals were exposed to static magnetic field in different experimental series. The time of exposition for experimental and control groups was 2 hours. The results were estimated by means of cytological methods including cytomorphometry.

Results

Two series of experiments were carried out to reveal the main principle of magnetic field influence occurring in the elaborated scheme.

1. Neural cell layer in the state of necrosis attached to the surface of permanent magnet was used in the experiment. After the exposition time the state of neural cells, muscular cells and intestinal glandular cells was studied by means of cytological method including morphometry.

The results revealed the development of dystrophic processes in brain neurons in experimental group. The results are presented in a Table 1.

Table 1: Morphometric results (mean quantities)

	Experiment	Control
Number of altered cells, 1000	197,14	40,25
Nucleus volume ($x10^{-6}$ mm^3)	1,097x10	1,4x10

The decrease of nucleus volumes in experiment was about 8 per cent being compared with control group. Other tissues expressed no signs of dystrophy.

2. A section of intestinal mucosa with signs of nerosis was put to the surface of permanent magnet. After the exposition time the state of intestinal mucosa glandular cells, neural cells and muscular cells was examined by means of cytological method. The following results were

Obtained: decrease of morphofunctional activity in the intestinal glandular cells and signs of increasing proliferative activity were observed.

Morphometric results: there was 8, 11 per cent decrease of nucleus volumes in experiments being compared to the control group. All other tissues were intact in both series of experiments.

The experiments revealed the possibility of permanent magnetic field to synchronize the state of cell structures from one cell group to another. This phenomenon was called cellular synchronization. This feature is tissue-specific. The theoretical basis of the phenomenon has not been worked out (1).

Discussion

The cellular synchronization principle can be one of the basic control and regulation mechanisms in complex multicellular organisms. We revealed and studied this phenomenon in laboratory experiments. The magnetic field ability to synchronize the biological processes in analogous cells and cell associations- tissues- can the universal characteristic feature of a live matter. Our experiments are in fact a piece of knowledge about more general phenomenon.

Electromagnetic fields and radiation are obligate components of any substance in general and any creature in particular (2, 3). A great number of biochemical reactions that take place in cells generate electromagnetic radiation of various frequencies and intensities. Therefore the cellular synchronization principle can be the basis for electromagnetic regulation mechanisms in complex organisms. This phenomenon can be one of control and stability maintenance mechanisms of cellular populations. As the electromagnetic fields and radiation of a great number cells are summarized, we can observe the synchronization effect that spreads within the organism controlling the life cycles of similar cells. Thus, the cellular synchronization phenomenon can stabilize and synchronize the life cycles of cells and cellular associations in the organism as unity. It can be considered to be a universal mechanism of biological synchronization and stability of the organism. On the other hand, when the region of destruction occurs, the transcription of negative cellular conditions upon undamaged cellular associations may take place. Thus, the cellular synchronization phenomenon can be the additional basis for the development of pathological processes.

Anthropogenic factors can also play a role in the global electromagnetic system of disease predisposition formation. The sources of artificial electromagnetic fields are various- radio and TV transmitters, electricity distribution systems, mobile phone systems, etc. These artificial sources function at a regional scale but they are able to influence a great number of people. It is well-known that artificial electromagnetic forces are able to produce numerous alterations within the living organism (3). We suppose these effects to function on the basis of cellular synchronization principle.

Practical application

The method of cellular synchronization based on conducted experiments was worked out. This is a new system for stimulation of recovery processes in cells, tissues and organs within the human body. This system is based on the ability of magnetic field to synchronize the state of cells in organism, so it differs from traditional magnetic therapy conceptually.

Practically, it's a new application of magnetic therapy due to the revealed properties of the magnetic field. This system makes it possible to stimulate the recovery processes in organism in the case of various diseases or to prevent their appearance.

Additional series of experiments revealed the expression of regeneration in tissues which undergone the influence of synchronization in magnetic field with altered cellular layers. This is so called “regeneration wave” following the restricted dystrophy stimulation. The effect was observed in cells of the same type as of the cell layer. The experiments revealed that the application of the magnetic field wasn't probably conditioned only by its direct influence on the cells but by the cell interactions under the influence of permanent magnetic field as well.

Such effect has been obtained on different species of laboratory animals and cells of various types. The experiments revealed the effect had high specificity, i.e. the changes in the organism usually occurred in the cells of the type which had been used as the inductor.

The area of application of new method is wide. It is useful in treatment of gastrointestinal diseases, some cardiovascular diseases, chronic respiratory diseases, etc.

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