## Bioelectricity and its scientific Value

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The paper tries to make some discussions on the definitions of Bioelectricity and Bioelectricity Medicine.

1. **Discovery of Bioelectricity**

It was at a very early time that our ancestors gained knowledge by intuition and experience about some electromagnetic phenomena of electrification by friction and magnet. Until the end of European Renaissance, experiments had made to study the static and static magnetic phenomena. Royal Dr. Gilbert (1540-1603) first proposed the initial electromagnetic theory. In 1752, American scientist Franklin (1706-1790) had done a famous experiment of catching the thunder and lightning with the kite, which proved that the lightning was the same electric discharge phenomenon as the electrification by friction; thereby, it was realized that there exists two kinds of electricity, positive and negative, as the like charges repulse, the unlike charges attract.

The current was discovered by an Italian biologist Galvani (1737-1798) who made a frog experiment in 1780. In the experiment, Galvani found that when two different metals were connected to the nerves and muscles of the frog, forming a closed loop, there would appear current and the frog legs would twitch due to the current. He termed it as "bioelectricity".

1. **Micro- and macro bioelectricity**

Bioelectricity is a variety of electromagnetic phenomena of all kinds reflected in the activities (including thinking, mental activities) of living bodies at different levels (electronic, ion, atomic, gene, cell, tissue, system, whole, etc.), as well as in the interaction between living bodies and external stimuli (including environment).

1. **Disciplines of bioelectricity and electrophysiology**

Physiology is the study of living organisms’ functions, which is an important part of life science. The focus of physiological functions study is to reveal the law of life activities and regulations.

As Karl Marx has said, "almost none in the world happened and developed without the companion of the generation of electrical phenomena."

Physiological research was quickly connected to electricity. For example, "ECG" is the wave generated by the heart beat, "EEG" is generated when the brain functions, "EMG" is produced by the action of human diaphragm and the nerves.

"Neural signal" (electroneurography, ENG) is the only most important finding in exploring the neural mechanism, indicating that nerve impulse is consistent with the potential change. The neural activity signal provided the researchers with a means of studying the functions of nerve system; as a missing object, the signal can be traced in the living bodies with complex structure by the researchers, while it is the key to understand how the information is coded in the nerve system.

"Cell Bioelectricity" means that there are many charged ions (potassium ions, sodium ions, chloride ions etc.) inside and outside of the cell membrane. Potassium ions are mainly in the cell while sodium ions outside. They are kept relatively stable in the resting state, but when stimulated, the force of the membrane permeability changed, a variety of ions became active moving in and out of the cell membrane and the bioelectricity was produced by the exchange of potassium ions and sodium ions. Besides, it is true of the ERG, EGG and intestinal electrogram and etc.

Among the electrophysiological studies above, every measurement was carried out by using micro-electrode measurement except ECG and EEG, all of which were termed as micro-bioelectricity measurements. （An EEG is measured by the electrodes in the cerebral cortex. Usually 16-32 electrodes would be put on reflecting the scale of the brain information, so it can not be considered as a micro-measurement. Electrocardiogram is usually measured by putting the electrodes on the chest even the foot, so it belongs to a macro-bioelectricity measurement. The macro-bioelectricity measurement was always used to induct inversely the signals from micro-parts of the heart.

1. In terms of disciplines, there is no difference between the early or conceptual bioelectricity research and electrophysiological studies.

But with the penetrating of research, the scope of the concept of electrophysiology gradually became narrower, focusing on micro-level study of bioelectricity. This is consistent with Western medical tradition emphasizing on analysis. Thus, electrophysiology was defined with such words: "Physiologically, the method of studying bioelectrical phenomenon at the cellular level was known as electrophysiological study. You can record the electrical changes of a few cells, or a single cell, or an area of cells, or the single ion channels. You can record outside and in the cell. You can record change of action potential as well as the discharge frequency.”

1. Bioelectricity circulatory system and theory of bioelectricity medicine

Proposed by the Chinese scholar, Dr. Wang Yuling, the human bioelectricity is not a simple electrophysiological issue, but an interaction system among molecular charges, cellular bioelectricity, organic bioelectricity, body bioelectricity, environmental magnetic fields and their transformations. The concept of bioelectricity enjoys larger range with more emphasis on the macro aspects of bioelectricity. Brief descriptions of bioelectricity are as follows:

1. Basic contention

With the same anatomical structure (gene, cell, organ, system), the different status quo of people’s health (at least in part) can be represented by whether the bioelectricity is normal. This argument is based on the following understandings :

1. The bioelectricity function is one of the most essential and basic interactions among various parts (including molecul, cell, organ, system and etc.) of living creature. Other interactions included Van der Waals force, concentration gradient; PH gradient, and forces formed by fluid pressure and etc.
2. The human body is a complex biological process. We need to consider the role of various structures and that of the bio-electricity (electron, current, electric fields, and magnetic fields) in the body, as well as the influence the magnetic field of the environment on human bioelectricity.

2. Research contents

Bioelectricity discipline covers the contents of current electrophysiological studies, while focusing more on the test method of the overall or partial bioelectricity; on the relationship between the overall or partial electricity and the health; on the therapeutic theories and methods of overall or partial bioelectricity; on the overall bioelectrical therapies of a number of complex diseases.

Bioelectricity treatment has better effectiveness on such complex diseases as pains in waist and legs caused by spinal column disease, arthritis ache, cancer ache, flesh wound paraplegia, spinitis paralysis, apoplexy paralysis, losing sleep and so on.

1. Is bioelectricity Western medicine or Chinese medicine?

The bioelectricity (bioelectricity circulatory system) is an electromagnetic phenomenon appearing in the process of life, which is the natural law. The bioelectricity itself does not belong to the Western medicine or the Chinese medicine. But in terms of electrophysiological research, bioelectricity was more studied by western medicine, while the current theory of Bioelectricity Medicine was proposed by Chinese. The bioelectrical theory has provided a new explanation for the Chinese vitality theory and the channels theory and also makes it feasible to communicate between Chinese medicine and Western medicine.

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