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SCENAR-therapy is based on the following principles [1, 2, 3]:

1. The neuropeptides (NP) together with the classical neuromediators (NM) and the other humor regulators ensure all compatible biological activities in norm and pathology (the concept of functional continuum of regulative peptides). NP are characterized by the ability to create complex regulative chains and cascades, their long life span, their distant effects and action onto the genome activity. The following vector represents a formal description of this concept

$$X = \{x_1, x_2, \dots, x_n\} (1),$$

where x_i (i - from 1 to n) are its components, e.g. the quantitative values of mediators (amines, amino acids, purine nucleitides) and regulative peptides (RP).

2. The neuro-secretive cells, obtaining dual characteristics – of a neuron and of an endocrine cell, are scattered around the whole organism and are localized both in the different parts of the brain and in the peripheral nervous fibers (the concept of distribution in space). Formaly vector (1) can be defined (measured) at any point of the organism, its components being different in the general case.

3. Any physical action on the organism, in this case electro-action, is always a disturbance of homeostasis. The neuro-endocrine system coordinates all vital processes in the organism, forms a functionally united mechanism and ensures the regulation of homeostasis in case of its disturbance (the principle of reaction). There is a hierarchy that exists among the neuro-endocrine mechanisms of regulation, which is closely connected to the speed of development and decrease of hormonal signals and also to the molecular mechanisms of their actions.

In case of deflection from the norm of one or another process of vital activity, the nervous system is the first to get involved, NM are secreted (a certain part of the components of vector 1), which by changing the activity of ion channels will cause hyper- or de-polarisation of membranes. This regulation of cell activity, which is due to physical processes, develops and diminishes in fractions of a second (seconds).

If the nervous system of regulation is not able to bring one or another factor of homeostasis back to the norm, the peptide hormones will be involved, acting through membranous receptors and the system of secondary mediators stimulating the chemical modification of proteins. Concomitant accumulation of peptides with stress-limiting spectrum of action is taking place. This regulation is due to chemical processes, develops and diminishes for minutes or tens of minutes.

If the deviation from the norm reaches dangerous for the body values, steroid and thyroid hormones will be involved, which due to the specificity of their receptors have an influence on the gene expression. This reaction is realized in 3-6 hours and diminishes in 6 – 12 hours after the deviation of the process from the norm. The growth factors take an intermediate position, as their receptors are capable of penetrating into the nucleus and leads to proliferation of the cells.

4. In order to achieve therapeutic effect, the physical action has to provide the release of effective dose of RP at minimal damaging for the organism effect (the principle of effective therapy). The therapeutic action is also a disturbance of homeostasis. It leads to its deflection from the norm established at the moment in the organism or at the region of action. Accumulation of peptides (with stress-limiting spectrum of action including and part of the components x_i of vector 1) is taking place, and they are practically aiming to cope with the disturbance induced by the therapeutic process. Their excess, if I may say so, is used by the organism in the struggle with pathology.

5. The organism is capable to react adequately (in its own benefit) to the disturbance of homeostasis, at least to these changes, which are induced by the therapeutic (not big) doses of the physical action (the principle of self-regulation). This is the most important principle of vital activity – the organism is aiming to achieve a beneficial adaptive result.

The principle of self-regulation is closely connected with the principle of reaction, it only gives accent on the achievement of a beneficial adaptive result from the reaction. The principles described above make it possible to explain the therapeutic results, to make a comparison of the therapeutic methods (not only of electrotherapy) and alongside with model (1) to introduce a number of terms.

We will define X_n with components X_{in} as the vector corresponding to the condition of organism in norm and X_p with components X_{ip} as the vector corresponding to the condition of organism in pathology. This idea is confirmed by the change in X_i (in correspondence with the principle of reaction) in the neuro-humour regulation of cardio-vascular, respiratory system, reproductive function, gastro-intestinal tract, inflammatory and tumour processes as well as during shock.

The transformation of X_n into X_p – these are the compensatory reactions of the organism to the biological, anatomical and functional disturbances in accordance with the principle of self-regulation, the “wish” of the organism to preserve homeostasis under the concrete conditions of pathology. This to a considerable extent resembles the dominating nowadays molecular concept of pathology: a predominant number of pathological processes start with a certain damage of cell membranous structure and as a consequence a change in the components of vector X follows.

Simultaneously, processes directed from X_p to X_n are taking place in the organism. But it is possible that the organism will not go back to X_n , but it will put up with” a certain conditional norm X_{nc} (e.g. a condition of chronic pathology). And as X_n depends on time, it is always better to accept it as a certain conditional norm.

When the regulatory reactions are not adequate, which leads to unfavourable course of disease, quite often long lasting, therapy has to be provided. Within the frames of the accepted formalization, therapy is a special external action on vector X_p

(opposite to the compensatory reactions, which take place even without this action) leading it to X_n (X_{nc}). Specific therapy is a deliberate (direct or indirect) action on a certain part of components $x_k \dots x_l$ (where $m = (l-k) \ll n$). Nonspecific therapy is the activation of those components, due to which normalization of vector X occurs independently from the causes for its alteration.

The above principles and model (1) aim to explain the questions about therapy.

The interaction electrode / skin plays a substantial role for studying the processes, concerning biofeedback, expertise, diagnostics, as well as for the exploration of the processes of interaction of the current with organism and the evaluation of the influence of the place of applying the electrodes [4].

In direct contact of the metal (or an equivalent) electrode of the device with the skin, the metal come in contact with a complex water solution, containing a number of electrolytes – inorganic as well as organic. The arising potential difference (a double electric layer) along the border metal/ solution is called an electrode potential. Its equivalent electrical scheme –the parallel connection of capacity and resistance. The formation of the double electric layer is accomplished for a certain interval of time. [5] Later on, electrochemical reactions between the metal and the solution arise, which are connected with the local metabolism. A change in the electrode potential and capacity of the double layer takes place.

The resistance to constant current on the metal-skin boundary is very high, while that to the alternate current is considerably lower and is determined by the frequency of the latter. But even for the alternate current the resistance of the subcutaneous liquor of the organism is considerably lower especially when using electrodes with comparatively small surface. From the above it follows that:

-for electrotherapy what is important is not the way of current passage through the organism but the concrete places for applying the electrodes;

-respectively, the difference between compact and scattered application of the electrodes is not of principle importance;

-the basic processes in electrotherapy are taking place in the interaction with the peripheral nervous structures (see Table).

In the light of the above, we will dwell in greater detail upon the perspectives of SCENAR diagnostics.

As it was mentioned earlier, the initial formation of the double electrical layer is accomplished for a certain interval of time. This determines the first (fast) phase of management of parameters of the device acting signal.

Electrochemical reactions between metal and the solution, connected with local metabolism, take place later on. A slow change in the electrode potential and the capacity of the double layer occurs. This, together with the reaction to the acting signal, determines the subsequent dynamics of the signal. It is the characteristics of this dynamics, along with the skin reactions to the action – asymmetries, small asymmetries, secondary signs [6,7], which are used for SCENAR expertise. These very characteristics are also the basis of development of SCENAR diagnostic procedures.

LAYERS OF IRRITATION RECEPTORS FIBRES

LAYERS OF IRRITATION	RECEPTORS	FIBRES
Epydermal	Tactile electroreceptors	Ab
Dermal	Tactile, pain and temperature exteroceptors, endings of the vegetative perivascular nerve fibres	Ab, Ad, B, C
Subdermal (myofascial incl.)	Proprioceptors, endings of the vegetative perivascular nerve fibres	Aa, Ag, B, C
Periostal	Pain, tactile and temperature exteroceptors, endings of the vegetative perivascular nerve fibres	Ab, AD, B, C

At the same time the problem of choosing of the zones (points) of influence of signal parameters, materiel, size and configuration of the electrodes still remains to be solved as well as the necessary statistical studies to be conducted. Mind that in using metal electrodes the omic resistance electrode-skin is very high (tens of KiloOm), while the resistance to alternate current is substantially lower. Nevertheless, especially in using point electrode, this resistance is much higher than the one measured in the liquid medium of the organism. That is why the basic voltage drop occurs on a limited (in depth) area of the skin. Respectively, when studying the mechanisms of diagnostics, it is necessary to pay special attention to the processes taking place in the superficial layer and the corresponding nerve endings (see table).

