The relationship of bioinformatics, clinical bioinformatics and informotherapy

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Comparing the terms "clinical bioinformatics" and "informotherapy", it can be concluded that these two sciences have many common tasks. "Bioinformatics" is a science, the subject of which is the study of the information state and information processes in biological systems (Skrypnyuk, 1999, 2002; Chailakhyan, 2005). "Clinical
bioinformatics "is a science, the subject of which is the study of the information state (structure) and information processes in the process of pathogenesis and sanogenesis of biological systems (Skrypnyuk, 2005). "Informotherapy" is a branch of medicine that studies the influence of information on physiological, biochemical, biophysical and pathological processes in humans and animals, the processes of receipt, coding, storage, decoding and use of information, develops methods of therapeutic and preventive use of information (Skrypnyuk, 1989, 1994).

Currently, significant advances have been made in the study of problems that are common to bioinformatics, clinical bioinformatics and information therapy.

The primary mechanisms for receiving individual information signals, carried by some carriers of information signals, have been studied. The mechanisms of reception of information signals carried by mediators: acetylcholine, adrenaline have been investigated (Vulfius, Kovalenko, 1978; Glebov, Kryzhanovsky, 1978; Zeimal, Shelkovnikov, 1989; Anichkov, 1982; Nozdrachev, 1983; Sergeev, Shimanovsky, 1987; Bertram, Kattsung, 1998). It has been established that receptors for protein, peptide hormones and many biologically active substances are located on plasma membranes, while receptors for steroid hormones are located in the cytoplasm (Rosen and Smirnov, 1981; Golikov, 1988).

The role of various secondary mediators in the mechanism of information transmission received by the plasma membrane under the action of mediators (Bogach, Skrypnyuk, Burdyga, 1980; Bogach et al., 1981; Kostyuk, 1986; Skok, Shuba, 1986), hormones (Skrypnyuk, 1989), peptides (Klimov, 1983; Skrypnyuk, 1989, 1995) into intracellular structures.

The study of biological languages begins with the study of "letters", "sounds", "words" and "sentences". Each cell "knows" several languages. At present, the languages of DNA, RNA, and protein molecules are well studied. The "letters" of the DNA language are nucleotides: adenine, cytosine, guanine and thymine; The "letters" of the RNA language are nucleotides: adenine, cytosine, guanine and uracil. The "words" of the DNA and RNA languages consist of three letters - triplets of nucleotides. "Sentences" - genes consist of a different number of "words". The "alphabet" of the protein language consists of 20 "letters" - amino acids. As a result of decoding the genetic code, it was found that each "letter" of the protein language corresponds to a "word" of the RNA language - a triplet of nucleotides (Crick, 1962, Ichas, 1971).

In the language of biological membranes, "letters" are secondary mediators: calcium ions, cyclic nucleotides, diacylglycerol,

inositol triphosphate. you "languages of the intercellular and interorganic
“Beech communications are primary mediators: mediators, hormones,
biologically active substances. Biological information can
carried not only by material carriers - "letters", but also by energy carriers - "sounds". Action potentials, slow waves act as such "sounds" in transmembrane information transfer, and in intercellular information transfer -

electromagnetic waves, mechanical vibrations, etc. Usually biological information is transmitted not by separate “letters” or “sounds”, but by “files”, which consist of “sentences” and “words” (Skrypnyuk, 1999 A, 1999 B, 2000).

To study the content of information exchanged by excitable cells, electrical complexes of smooth muscle cells of the ureter, intestine, stomach, uterus, oviduct of guinea pig, cat stomach, ureter and human uterus (slow waves, peak and plateau-like action potentials) were recorded using the technique of double sucrose bridges ... The mechanical (functional) activity of smooth muscles was recorded using a mechanotron.

In response to electrical stimulation, the smooth muscle cells of the ureter of the guinea pig, human, and cat stomach generated complex action potentials, which consisted of peak potentials and plateaus. The parameters of the functional activity of smooth muscles (amplitude, speed and duration of contraction and relaxation) depended on the number of peak potentials, the duration of the plateau, and the rate of increase in action potentials. In sodium-free solution, the rate of rise and the number of peak potentials, the duration of the plateau of action potentials, the amplitude and rate of contraction decreased. Similar qualitative changes in the parameters of action potentials and functional activity were observed in hypocalcium solution, hypon sodium, hypochlorous solution, and hypermagnesium solution. The results obtained allow us to conclude that

In normal Krebs solution, smooth muscle cells of the longitudinal and annular layer of the guinea pig intestine, antrum of the guinea pig and cat stomach generated slow waves, peak and complex action potentials and contracted. If the peak potentials, the plateau of action potentials can be considered as separate sounds, and the action potentials as a whole as separate words, then the electrical complex, which consists of slow waves and action potentials, can be considered
how "suggestions". Selected "suggestions" make up "file" ("writing").

Hand over physiological information can at help "Biological letters", which are mediators and hormones, pain mediators, and other biologically active substances. At every moment, the cell is simultaneously influenced by several biologically active substances that make up the "word". To study the influence of individual "letters" and "words" on the electrical and functional activity of smooth muscles, the influence of mediators (acetylcholine, norepinephrine), hormones (oxytocin, vasopressin, insulin, parathyroidin, hydrocortisone, cortisone,

corticotropin, thyrotropin, angiotensin), pain mediators (histamine, bradykinin, substance P, potassium ions), biologically active substances (dibutyryl-cAMP, papaverine, caffeine, D600, actinomycin D, puromycin, vinblastine, vincristine, sodium vanadate, ruthenium red
prednisolone). The obtained results showed that smooth muscle cells of the ureter, gastrointestinal tract, uterus and oviduct respond to the action of bradykinin, angiotensin, oxytocin, insulin, parathyroidin, cortisone, hydrocortisone and indicate that these cells are competent to the indicated biologically active substances. These findings expand our understanding of hormone target cells. The threshold concentrations that caused changes in the electrical and contractile activity of smooth muscle cells of various organs and systems (ureter, stomach, intestines, uterus, oviduct) differ from each other. This indicates that the density of hormone receptors on the cells of various organs is different. Studies have shown that that protein-peptide and steroid hormones have an exciting or modulating effect on the electrical and contractile activity of smooth muscle cells. The electrical and contractile activity of smooth muscles is determined by the concentration of a complex of biologically active substances that currently act on the cells. Thus, the transfer of information from cell to cell is carried out not by separate “letters” (mediators), but by “sentences”, which consist of constantly changing “words” - a certain set of mediators, hormones and other biologically active substances at a given moment in time.

Recently, an attempt has been made to study the phonetics, morphology, and syntax of cellular languages (Skrypnyuk, 2001).

The structure and functions of information transmission channels in humans and animals (Skrypnyuk, 1994; B. Sudakov, 1995), memory mechanisms (Ashmarin et al., 1987), mechanisms of generation of a biological response to information signals (Skrypnyuk, 1976; Klevets, 1993 ; Bogach, Skrypnyuk, 1977), mechanisms of feedback formation in living systems (Anokhin, 1973, 1980; Sudakov, 1984).

Unfortunately, before present time insufficiently researched processing mechanisms and interaction information, dynamics information messages in living systems.

Various diseases human and animals due to and are accompanied not only by metabolic disorders in the body, but also by errors in the exchange of information. If normal bioinformatics studies the exchange of information in normal cells, organs, systems and the body as a whole, then clinical bioinformatics studies the exchange of information in diseased cells, organs, systems and the body as a whole and the mechanisms of sanogenesis.

To study the mechanisms of the onset and development of cell disease using the technique of double sucrose bridges, the influence of chemicals (acids, esters, chloroform, nitrogenous compounds, etc.), physical (high temperature, electric current) and informational (mediators, hormones, pain mediators, frequent and aperiodic stimuli) factors on the functional activity of cells. It was found that one of the early violations of the functional activity of cells in

the action of pathogenetic chemical, physical and information factors is a change in the spontaneous electrical and functional activity of cells, ionic conductivity of the plasma membrane, inhibition of the ion pumps of these cells and a decrease or complete disappearance of the reaction to the action of signal molecules or signal electrical impulses.

The development of bioinformatics is important for the development of information technology in practical medicine. In 1989, we proved that information, along with matter and energy, has healing properties.
properties. It was proposed a section of medicine that studies the influence of information on physiological, biochemical, biophysical and pathological pr processes in humans and animals, processes receipt, coding, storage, decoding, information processing, develops methods of therapeutic and prophylactic use
information, called informotherapy.

The main difference between informotherapy and pharmacotherapy is that information therapy uses energy stored in the form of ATP, creatine phosphate and other high-energy substances in the human body (patient), uses various chemicals that are available in the patient's body and which can be synthesized his body, i.e. When using information therapy, the information received by the body causes the formation of internal therapeutic agents in the body, which can be both a substance and the energy of internal physical processes. This makes it possible to use in the process of informotherapy the minimum amount of substance or energy that is needed only as a carrier of information, therefore, the possibility of side effects in informotherapeutic treatment is reduced approximately as many times as the dose of the substance or energy used in informotherapeutic treatment is less than the dose of the substance or energy used in pharmacotherapy or physiotherapy. When informotherapy treatment, the dose of a therapeutic agent is measured in units of information (bits).

The main problems of informotherapy are:

1. Study of molecular and cellular mechanisms of admission information by human and animal organisms and its coding.
2. Study of the structure and function of information transmission channels in human and animal organisms (information channels).
3. Research of mechanisms of memorization, storage, processing information in the human body and the generation of a biological response.
4. Investigation of the role and mechanisms of feedback formation in the human body.
5. Investigation of the etiopathogenetic role of information.
6. Research of the healing properties of information, determination of the optimal doses, effective carriers and methods of using the information for therapeutic purposes.

Many of these problems are solved by related disciplines. However, the study of most of them is scattered across different disciplines, and many questions of one or another problem were not raised at all. So,

for example, the reception of information by a person is carried out both with the help of sensory systems, and bypassing them. In physiology and biophysics of sensory systems, molecular and cellular mechanisms of receiving and coding information coming through the senses are studied. However, these disciplines do not study the molecular and cellular mechanisms of receiving information by the body when exposed to X-ray radiation, radiation, viruses, microwave, EHF radiation. The mechanism of receiving and coding information under the action of radiation is studied by radiobiology, viruses - virology, the actions of microwave, EHF radiation - physiotherapy, hygiene, however, the mechanism of reception and coding of information has not been studied enough. (Skrypnyuk, 1994 A).

Information therapy has a lot in common with bioinformatics and clinical bioinformatics. However, informotherapy pays more attention to the pathogenetic and therapeutic effects of information, creates informational messages that have therapeutic and prophylactic value, bioinformatics - theoretical and experimental problems of information exchange in living systems, clinical bioinformatics - informational mechanisms of pathogenesis and sanogenesis.

Experimental studies have shown what certain information signals, sentences, files can restore the functional state of cells, organs and systems after the damaging effects of various factors, as well as increase the resistance of cells, organs and systems to subsequent damaging influences. The results of these studies allowed us to conclude that information can act as not only a therapeutic agent, but also a preventive one, i.e. we can talk not only about informotherapy, but also about informal prophylaxis.

In 1990, we developed special microgenerators (microprocessors) of electromagnetic waves, which carry certain information files capable of restoring functional activity of individual cells, organs and functional systems of a person. With the help of the developed microgenerators, a microprocessor (microgenerator) informotherapy.

Information therapy methods are divided into direct information therapy methods, when information signals directly act on damaged cells (microprocessor information therapy, partly homeopathy and reflexotherapy), and indirect information therapy, in which information signals affect the sensory organs, where they are converted into receptor potentials and action potentials that cause changes in the functional activity of the nervous and endocrine systems. These systems, with the help of mediators or hormones, can restore functional activity of damaged cells, organs and systems aromatherapy, (psychotherapy, music therapy, chromotherapy, etc.).

Efficiency the therapeutic effect is determined using informodiagnostics, the essence of which is to determine changes in electrical impedance and potentials of cells, organs and tissues before and after exposure to certain signals.

Based on the presented data, it can be concluded that the formation and development of the information technology system of practical medicine is based on the development of normal and clinical bioinformatics,

informodiagnostics, direct and indirect informotherapy, informal prophylaxis.

Further development of bioinformatics will make it possible to create whole health programs in the languages of intracellular, intercellular, interstitial, interorgan and intersystem communication. The transfer of these programs to the cells of the body with the help of a convenient information carrier will allow them to restore the metabolism, energy and information in the human body and make a person healthy.

Literature

1. Anichkov S.V. Neuropharmacology. - L .: Medicine, 1982 .-- 384 p.

2. Anokhin P.K. Fundamental questions of the general theory of functional systems // Principles of systemic organization of functions. - M .: Nauka, 1973 .-- S. 5-61.

3. Anokhin P.K. Key questions of the theory of functional systems. - M .: Science, 1980 .-- 197 p.

4. Ashmarin I.P., Borodkin Yu.S., Bundzen P.V. and other Memory mechanisms. - L .: Nauka, 1987 .-- 431 p.

5. Bertram G. Katzung Basic and clinical pharmacology. - M .: Binom, 1998. - T. 1. - 612 p.

6. Bogach P.G., Kurskiy M.D., Kucherenko N.E., Rybalchenko V.K. Structure and the function of biological membranes. - K .: Vishcha school, - 1981 .-- 335 p.

7. Bogach P.G., Skrypnyuk Z.D., Burdyga F.V. The role of magnesium ions in regulation electrical processes, contraction-relaxation and sensitivity of smooth muscles to acetylcholine // Molecular geneticist and and biophysics, 1980. - Vol. 5.S. 51-56.

8. Vulfius E.A., Kovalenko V.A. Cholinergic receptors. Biophysics. Outcomes science and technology. - M., 1978 .-- 207 p.

9. Glebov R.N., Kryzhanovsky G.N. Functional biochemistry of synapses. - M .: Medicine, 1978 .-- 325 p.

10. P.P. Golikov Receptor mechanisms of the glucocorticoid effect. - M .: Medicine, 1988 .-- 286 p.

11. Zeimal E.V., Shelkovnikov S.A. Muscarinic cholinergic receptors. - L .: Nauka, 1989 .-- 288 p.

12. Ichas M. Biological code. - M .: Mir, 1971. - 351 p.

13. Klevets M.Yu. Electric power of secretory cells of herbs zalosis and mechanisms of activation of extrusion and enzymes. - Auth. dis. Doctor of Biol. sciences. - Kiev, 1993 .-- 40 p.

14. Klimov P.K. Peptides and the digestive system. - L .: Science, 1983. - 273 s.

15. Komissarov I.V. Elements of the theory of receptors in molecular pharmacology. - M .: Medicine, 1969 .-- 215 p.

16. Kostyuk P.G. Calcium and cellular excitability. - M .: Nauka, 1986.- 255 p.

17. Natochin Yu.V. Intracellular signal transmission in the mechanism antidiuretic action of vasopressin // Intracellular signaling. - M .: Nauka, 1988 .-- S. 113-118.

18. Nozdrachev A.D. Physiology of the autonomic nervous system. - L .: Medicine, 1983 .-- 295 p.

19. Rosen V.B., Smirnov A.N. Receptors and steroid hormones. - M .: Moscow University Publishing House, 1981 .-- 310 p.

20. Sergeev P.V. Receptors of physiologically active substances. - M .: Medicine, 1987 .-- 397 p.

21. Skok V.I., Shuba M.F. Neuromuscular physiology. - K .: Vischa school, 1986 .-- 223 p.

22. Skrypnyuk Z.D. Transmembrane electrical processes and contraction-relaxation of smooth muscles at various ratios of magnesium and calcium ions in the environment. Auth. diss. Cand. biol. sciences. - Kiev, 1976. - 20 p.

23. Skrypnyuk Z.D. Mechanisms of hormonal regulation of electrical and contractile activity of smooth muscles. - Diss. ... doct. biol. sciences. - Kiev, 1989 .-- 299 p.

24. Skrypnyuk Z.D. Informational and negentropic therapy // Informational and negentropic therapy. - 1994. - No. 1. - P. 4–8.

25. Skrypnyuk Z.D. Basic concepts of traditional Chinese medicine from the point of view of information therapist // Information and negentropic therapy. - 1994. - No. 1. - P. 19–24.

26. Skrypnyuk Z.D. Some mechanisms of receiving pain signals (pain information) effector cells // negentropic therapy. - Information and 1995. - No. 2. - P. 15-24.

27. Skrypnyuk Z.D. Problems and tasks bioinformatics // Informotherapy for 10 years. - Kiev, 1999 A. - S. 80–83.

28. Skripnyuk Z.D. Bioinformatics: subject and department // Information and negentropic therapy. - 1999 B. - S. 82–83.

29. Skripnyuk Z.D. "Alphabet", "letters" and "sounds", "words" and "speech" "Movi" kitin // Informational and negentropic therapy. - 2000. - S. 81–83.

30. Skripnyuk Z.D. Phonetics, morphology and syntax of classmates // Informational and negentropic therapy. - 2001. - S. 135-136.

31. Skrypnyuk Z.D. Clinical bioinformatics: subject and tasks // Informational and negentropic therapy. - 2005.

32. KV Sudakov General theory of functional systems. - M .: Medicine, 1984 .-- 224 p.

33. KV Sudakov Information principle in physiology: analysis with positions of the general theory of functional systems // Advances in physiological sciences, 1995. - T. 26. - No. 4. - P. 3–26.

34. Chailakhyan L.M. What is an subject science "BIOINFORMATICS"? // Biophysics, 2005, volume 50, vip. 1, pp. 152–155.

35. Bogach PG, Skrypnyuk ZD Role of Mg and Ca ions and their interrelation min regulating the transmembrane electrical processes and contractionrelaxation of smooth muscle // Abstract of 27-th Intern. Congr. of Physiological Sciences. - Paris. - 1977. - P. 84.

35. Crick FH, The genetic code, Sci. Am. - 1962.-207. - P. 66–74.