

Some Approaches and Prospectives of Polyfactor Impact Studies on the Organism

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ABSTRACT. Study of polyfactor impact on the organism presents special interest from the point of view of determination of new and presently forming protective mechanisms and homeostasis as evolutionary response on environmental impact on live system. Main object of investigation is evaluation of the survival potential on the level of lethal influences of different trends defining concrete segments of the protective mechanism of a live system. The investigation carried out by us shows complexity of the study of separate links of the organism's protective reactions at polyfactor impact of various natural stresses (chemical, physical, biological). Absence of lethal results even in single cases at mean statistical lethal impact is of special interest. Studies in the above direction will create real methodological and experimental background for introduction of effective ways of treatment of uncured for today diseases of different etiology. Some of the possible approaches to solve the task are offered in the paper. © 2016 Bull. Georg. Natl. Acad. Sci.

Key words: environment, polyfactor impact

At present Polyfactor impact as the subject of separate investigation has not been formulated well enough from both aims and facts of the studies and position of methodological views. Fundamental and applied investigations in modern biology often loose potential possibilities because of the absence of systematic understanding of this phenomenon. First defective investigations of polyfactor impact on the organism were connected with the cosmic medicine in order to support vital activity of the organism in extreme environment of the flight. Most of the tasks were successfully solved. However, successful solution of the tasks did not advance the searches for new approaches of polyfactor impact on the organism neither in theory nor in practice.

Nonsystematic trials of detection and use of peculiarities of polyfactor effect of series of studies, for example, ecological, point more to the absence of the necessary approaches, than contributing to their elaboration. From methodological point of view we try to answer how the organism can afford to support its sustainability as a system.

While investigating behavioral manifestation of hormesis phenomenon (effect of oxidative stress) by means of combined action on rats by hyperthermobility and chronic introduction of hydrogen oxide it was revealed different changes of behavioral reaction of animals in maze subjected to test. Motor activity was significantly changed, while up to now it was revealed only on drosophila. It was

interesting that quantity of the errors of statistically true difference in the process of learning while passing the maze was not noted at true difference on motor activity. Animals subjected to the action of hydrogen oxide or hyperthermobility significantly increased their behavioral activity, while at their combined action their activity sharply decreased (about 2-3 times, according to the groups) [1].

Studying toxicology of pesticides in sharp and chronic tests using LD_{100} , LD_{50} , $LD_{0.5}$; $1/20 LD_{50}$; $1/30 LD_{50}$ and etc. We also studied response of the organism on chemical stroke by general and specific parameters proceeding from the toxic dynamics of the pesticides (dalanone, 2,4 – D, copper oxychloride, cineb, etc.) and their combinations (e.g. cineb + copper oxychloride + copper sulphate, etc.).

In the experiments with combination of pesticides the problem of imperfection of the system of control of MAL (maximal admissible levels) of their residues in food products was solved. The coefficient of additivity with the following MAL and LAC (limiting admissible concentrations) was defined [2]. For example, MAL of copper sulphate in grapes made 6 ml/kg saving quantitative value mixed with copper oxychloride and cineb, toxic effect of it became 40% higher (9.8 mg/kg). [3]. From toxicodynamic point of view it is not clear why cineb gave synergy as when using the mixture of copper oxychloride and copper sulphate on hemolysis being the main index it has not been observed earlier.

Studying the additivity in sharp test for LD_{100} we also observed cases of survival of some test laboratory animals (rats, rabbits) while introducing lethal doses (principle of analogues was fully observed).

Mathematical description of survival (e.g. function of survival, density survival probability, risk function, etc.) means knowledge of the dynamic process of the main biological indexes. Otherwise the mathematical model is limited by indication of the true level of the investigated deviations.

When we studied separate indexes, such as quantity of erythrocytes, leucocytes, biochemistry of liver,

fermentative components of blood plasma, change and composition of hair cover, etc, we came to conclusion that it is effective for treatment of some types of diseases. However, it is not enough at polyfactor impact on the organism.

At present, level of polyfactor loading on biological systems grows, which requires to answer the most topical questions.

1. Is there any biological system, which has special security system against polyfactor impact?
2. If not, then does the process of formation of the biological security system in the conditions of sharp growth of polyfactor loading continue?

It is known that sustainability of biological system grows from protozoa to complex organisms. Bacteria's vitality is $10^{-7} - 10^{-6}\%$, higher organisms have 10 – 30 % and a man has 52 %.

More complex biological systems have more perfect and specific protective systems. There is an assumption that it is more productive to study mechanisms of polyfactor of multifactor impact on them.

From methodological point of view genome presents special interest as the system indicating the level of complexity of biological system, i.e. its species. For example, in the period of evolution species *Homo* happened to have two chromosomes linked (Robertson and translocation) forming second chromosome of a human, which monkeys do not have. Given translocation sharply decreases probability of crossing and increases genetic differences between populations [4]. One of the key parameters of the evaluation is the copies of Alu-copy, which made about 10.7 % of human genome. First Alu-copy appeared in ancestors primates [5] and originated from gene coding 7SL PHK component signal of recognizing system.

To study new probably existing mechanisms of biological system sustainability, formation and its application against polyfactor extreme impact is very perspective, as the main parameter of genetic potential in evaluation of survival rate of the organism.

ადამიანისა და ცხოველთა ფიზიოლოგია

ორგანიზმზე პოლიფაქტორული ზეგავლენის შესწავლის ზოგიერთი მიდგომები და პერსპექტივები

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** საქართველოს მეცნიერებათა ეროვნული აკადემია, აგრარულ მეცნიერებათა განყოფილება, თბილისი, საქართველო

პოლიფაქტორული ზემოქმედების კვლევა ორგანიზმზე დღეისათვის წარმოადგენს განსაკუთრებულ ინტერესს, როგორც საშუალება, განისაზღვროს ორგანიზმის დაცვითი მექანიზმების ახალი, ამ ეტაპზე მიმდინარე პროცესში არსებული დაცვითი მექანიზმები, როგორც ზემოქმედებაზე ევოლუციური პასუხი. კვლევის ამ ეტაპზე პერსპექტიულად მიგვაჩნია შესწავლის ობიექტად განისაზღვროს ცოცხალი სისტემის სასიცოცხლო პოტენციალის ლიმიტი სხვადასხვა მიმართულებების ლეტალური ზემოქმედების პირობებში და მხოლოდ ამის ფონზე – დაცვითი მექანიზმების კონკრეტული სემენტები. ჩვენ მიერ ჩატარებული კვლევები გვიჩვენებს, რომ დაცვითი მექანიზმების ცალკეული სემენტის შესაძლებლობების შეფასება სხვადასხვა ზეგავლენის ფონზე (ქიმიური, ფიზიკური, ბიოლოგიური) რთულია და არასაკმარისად რელევანტური პოლიფაქტორული ზემოქმედების პირობებში.

ამავდროულად, საშუალო სტატისტიკური ლეტალური ზემოქმედების დროს ნებისმიერი არალეტალური ცალკეული გამონაკლისი შემთხვევა წარმოადგენს განსაკუთრებულ ინტერესს ცოცხალი სისტემის ბიოლოგიური პოტენციალის შეფასების თვალსაზრისით. ამ მიმართულებით ჩატარებული კვლევები, ჩვენი აზრით, ქმნის რეალურ მეთოდოლოგიურ და ექსპერიმენტულ წინაპირობას გამოინახოს ახალი ხედვები დღეისათვის განუკურნავი დაავადებების თერაპიის და პროფილაქტიკის კუთხით. ამ დაავადებების დაძლევის მიზნით ნაშრომში წარმოდგენილია ზოგიერთი მიდგომა.

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