

THE POSSIBLE ROLE OF GENETIC MEMORY IN THE PROTECTIVE ADAPTATION OF AN ORGANISM TO A SOLAR MAGNETIC STORM

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Abstract. On the basis of data on the frequency of appeals medical care during the period between a solar flare and human exposure to a geomagnetic storm caused by an outbreak is being considered of the possibility in the process of evolution of living organisms of generating genetic codes that trigger at the cellular level and for the whole organism the mechanism of the predicted protective adaptation to the effects of geomagnetic storms.

Key words: solar activity, electromagnetic and corpuscular radiation, geomagnetic storm, stress, cardiovascular and nervous diseases.

During the period of solar activity, flares on the Sun within a few minutes lead to the release of a huge amount of energy in the form of electromagnetic and corpuscular radiation. Electromagnetic waves reach the Earth in about 8.5 minutes, while a powerful plasma cloud formed by emitted ionized particles reaches it only in two to three days.

The Earth is well protected by its magnetic field from hard X-ray radiation caused by a solar flare, while a cloud of plasma causes the occurrence of geomagnetic storms, which lead to low-frequency oscillations of the Earth's magnetic field. The level of these oscillations is small and is in the range of hundreds of nanotesles. However, biological organisms are very sensitive to low-frequency fluctuations of the magnetic field, and this level is sufficient for the disturbance of their functioning and even to transition to a stress state [1].

One of the first to draw attention to the influence of solar activity on human health was the outstanding scientist A.L. Chizhevsky [2]. Chizhevsky and a number of subsequent researchers revealed that geomagnetic storms affect the fact that many people have high blood pressure, headaches, and chronic diseases. This is very clearly manifested in people suffering from cardiovascular diseases and mental disorders, leading to an increase in the number of hospitalizations of such people. So in [3], data on the influence of geomagnetic activity on the frequency of patients' appeals to doctors regarding hypertensive crises are presented. The data were obtained on the basis of the analysis of the appeals to the Kislovodsk ambulance station, from which it follows that during the period of magnetic storms the appeals were greater in relation to the average number annuals daily appeal of patients.

In [3], cases of single magnetic storms were investigated, which should exclude the influence of geomagnetic disturbances neighboring in time. The table shows the data of [3], obtained using the superimposed epoch method for 5 events of geomagnetic storms in the time range from 2 days to a geomagnetic storm to 2 days after it, for 3-year periods 1969 - 1971 years.

The final row of the table shows the total number of appeals for the investigated cases of geomagnetic storms.

As can be seen from the table, the largest number of patients was recorded a day after a magnetic storm.

Table

Year	Days before and after a geomagnetic storm				
	-2	-1	0	1	2
1969	262	228	265	272	256
1970	157	157	152	181	145
1971	253	227	224	241	251
Total	672 (96.8%)	612 (88.2%)	641 (92.4%)	694 (100%)	652 (93.9%)

From the data of the table, an interesting feature is also visible, associated with an increase in the patients appeals two days before the magnetic storm on Earth, i.e. about right after the flash on the sun. At the same time, the next day before the start of the geomagnetic storm, there was a decline in the number of patients being treated.

In studies [4,5], a similar reaction of the human body to a magnetic storm was revealed. According to these results, the human body begins to react one day before the onset of a magnetic storm and its reaction continues for two days after it ends. It was found that blood viscosity during a magnetic storm increased sharply and, in some cases, almost doubled, red blood cells clumped, and blood flow slowed down.

Geomagnetic storms affect healthy people. For many people, their working capacity decreases, the level of anxiety increases, and their stressful state affects the relationship in the team. This is especially true if people are in some kind of extreme conditions, for example, astronauts in orbit. Studies have shown that magnetic storms cause their heart rate to fail. And as in sick people, the peak of ailments among astronauts occurred on the second day of the storm, and they needed medication to restore their heart rate [6].

Recent studies have shown sensitivity the human brain to changes in the magnetic field [7].

There is an opinion among medical scientists that a person instinctively perceives fluctuations in the Earth's magnetic background as a threat to his life [6]. The body begins to fight this threat by increasing the production of stress hormones (cortisol and adrenaline), which leads to vasospasm and increased pressure.

If we consider the view of doctors that the body is trying to deal with such a threat as a magnetic storm. And take into account what was noted in [3,4,5], that even before the perturbation of the Earth's magnetic field in the period from a solar flare to the arrival of a plasma cloud, the functioning of the human body changes, then the following assumptions can be made. First, the body can somehow predict the geomagnetic disturbance from a solar flare, and second, on the basis of this prediction, the mechanism of organism restructuring is launched. At the same time, the decrease in the number of patients' appeals after its increase during a flash on the Sun noted in [3] is probably due to the fact that there are a finite number of people suffering from cardiovascular diseases and the first wave of appeals has led to a decrease in the number of patients with hypertensive crises until the moment of a geomagnetic storm. After that, the increased load from the geomagnetic storm on cardiovascular activity again increases the number of patients.

Attention should be paid to a number of studies that have revealed that geomagnetic activity affects the functioning of animal and plant cells. Moreover, there is a fairly widely developed genetic mechanism for the expression of several types of proteins that respond to changes in the magnetic field [8, 9]. And we can assume that, first of all, the cells of the body try to adapt based on the forecast of the upcoming geomagnetic disturbance, and the reaction of the whole organism is a consequence of the metabolic stress reaction of the cells.

In this regard, the question is posed in [10]. What would happen to human cells during sharp fluctuations in the Earth's magnetic field if there weren't such a preliminary restructuring of his metabolic system. And isn't such a restructuring a biological evolutionary process that has

formed a program for restructuring its functioning in the genetic memory of cells when information about brewing oscillations of the Earth's magnetic field comes. Such an external information mechanism that triggers the stress response of cells can be the cell's perception of hard x-ray radiation coming from the Sun, which is formed only during a solar flare and comes to the ground a few days before the start of geomagnetic disturbance, or another, high-frequency radiation derived from this.

The sensory elements of the cell, responding to such high-frequency electromagnetic waves, significantly attenuated by the atmosphere, call codes from the genetic memory that trigger the production of proteins by the cells, which stimulate the functioning of the cell's protective mechanism by restructuring their metabolism. And such metabolic stress response of cells as a result leads to activation of the human parasympathetic system, a change in the activity of his cardiovascular system and the work of the brain. In sick people, such an increased load on the cardiovascular system can lead to negative consequences.

With such a reaction, a person goes into a kind of anxious state, similar to the one that occurs when a person perceives a certain threat from the outside, which requires the mobilization of his body. The presence of such a stressful state can be judged by the information given in [1] about the change in heart rate variability (HRV) observed in people with geomagnetic activity. And as know, the HRV indicator is a very reliable indicator of a person's anxiety state [11].

Such an additional load, of course, affects the functional capabilities of a person. The nervous system is partially distracted by this threat. And the ability of a person to respond to external stimuli decreases due to a decrease in the useful throughput of short-term memory, which has the limit of simultaneous processing of semantic images (chunks) [12]. This leads to an increase in errors in work and, in particular, to an increase in road accidents. At the same time, an increase in the level of anxiety puts the body in a state of high alertness and, at the same time, significantly limits the number of options when making decisions, lowering their level of reliability [13].

For the process under consideration, can recall that there are examples of the formation of genetic memory that help some animals to survive during natural disasters [14,15]. According to a number of external signs, they feel their approach, and try to change their whereabouts. And according to NASA geophysicist Fredemann Freund, such animal behavior can become part of the process of earthquake prediction [16].

Considering this mechanism of using genetic memory to protect cells and the whole organism from the effects of solar flares, the following question arises related to the development of modern technologies. Could weak electromagnetic radiation in certain frequency ranges lead to a false start of such a mechanism for protecting cells and the body as a whole from solar flares? Further, will this not lead in the future to an evolutionary disorder of codes of such genetic memory due to frequent false positives and getting used to such radiations? If this is the case, then it will be necessary to reconsider the attitude to weak electromagnetic radiation in certain frequency ranges.

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