Investigation of the energy-informational preparation of gerontological action in experiment

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Introduction

The purpose of the study was an experimental substantiation of the possibility of increasing nonspecific resistance and rejuvenation of the mammalian organism on the basis of bioresonance technologies.

1st series of experiments

In the first series of experiments, the effect of gerontologically targeted drug No. 1 was studied (the drug was developed by NN Isaev).

The experiments were carried out on 9 outbred female rats aged 24–26 months. with pronounced signs of premature aging, with a body weight of 270 ± 40 g.

The impact of the drug No. 1 on animals was carried out every other day, the total number of procedures - 4. The drug in a volume of 1 ml^3 was administered per os through a gastric tube. In the same volume control animals were injected with water.

Study design

Experimental group of animals No.	Control group of animals
1, No. 8, No. 9, No. 15	No. 3, No. 6, No. 12, No. 16, No. 20

Baseline study

1. Determination of body weight.
2. Study of the ovarian cycle:

method for determining the stages of the sexual cycle (D, R, O, M) by the cellular composition of the vaginal flush.

3. Identification of general nonspecific adaptive reactions by signal criteria of the blood formula.
4. Determination of the level of Hb, Cp, the content of leukocytes and erythrocytes.
5. Determination of cationic proteins of neutrophils.
6. Determination of tests of reactivity and intoxication of blood cellular elements.
7. Registration of motor activity by the "open field" method.
8. Assessment of the animal's appearance (condition of the coat, sclera of the eyes).

Research results

1. General blood counts in aging female rats

When analyzing some parameters of peripheral blood in female rats of the experimental and control groups, it was found that in both groups, during the entire observation period, similar tendencies of change were noted. So, with an increase in the level of hemoglobin, intergroup differences were not observed (Table 1).

A similar trend was noted for the increase in the number of erythrocytes. However, the increase (Δ) of the values of this indicator in the experimental group was 1.6 times higher than in the control (Table 1). The level of the color indicator decreased equally in both groups. The absolute content of peripheral blood leukocytes also decreased. At the same time, the difference between the initial and final values of the Le content indicators in the experimental group was significantly greater ($P > 0.5$) than in the control. Considering that the initial values in both groups corresponded to the upper limits of the norm, the decrease in the Le level in the experimental animals during the preparation period indicated the optimization of the quantitative leukocyte composition.

Table 1

Some parameters of peripheral blood in aging female rats at initial and the final stages of the experiment (preparation No. 1)

Groups animals	Hb		Erythrocytes		Color index		Leukocytes	
	End.	Began.	End.	Began.	End.	Began.	End.	Began.
Experienced N = 4 NS	151.3	5.5	6.9	0.8	151.3	5.5	6.9	0.8
Control N = 5 X	143.4	4.6	5.5	0.9	143.4	4.6	5.5	0.9

2. The structure of general adaptive reactions

It is known that the qualitative composition of blood leukocytes, expressed blood formula according to Schilling, is a criterion for identifying general nonspecific adaptive reactions of the body (L.H. Garkavi et al., 1990–2002).

Determination of the structure of adaptive reactions (training - T, quiet activation - SA, increased activation - PA, stress - C) in rats of the experimental and control groups in the initial state revealed that all experimental animals were in a state of chronic stress (Table 2).

table 2

The structure of adaptive reactions in aging female rats under the influence of drug No. 1

No. rats	The initial state						A type and level reaction.	After exposure						A type and level reaction.
	b	NS	NS	with	lf	m		b	NS	NS	with	lf	m	
one	-	1.5	2	59	35	12.5	Conur	-	3	2	40	47	eight	WITHwur
eight	-	4	one	37.5	46	11.5	Conur	-	4	1.5	13.5	76	five	PAwur
nine	+	6.5	2	33.5	48	10	WITHonur	-	2.5	one	21.5	66	nine	CAsur
fifteen	-	4	5.5	36	39.5	15	WITHonur	-	3.5	1.5	29.5	53.5	12	Tsur
3	-	five	6	31.5	47	10.5	Cnur	-	0.5	2.5	23	68.5	5.5	PAwur
6	-	3.5	2	24	56.5	14	Tnur	-	3	3	44	45	5	WITHnur
12	-	3	1.5	37.5	50	8	Tnur	-	4.5	1.5	17.5	67	9.5	PAnur
sixteen	-	one	1.5	27.5	57.5	12.5	Tnur	-	3	one	18.5	72	5.5	PAwur
twenty	-	one	2.5	35.5	40.5	20.5	Cnur	-	one	3	20	64.5	11.5	CAnur

At the same time, a low level of lymphocytes is the main signal criterion for adaptive reactions, constituting an average of 42% in the experimental group, was combined with signs of reaction tension (monocytosis over 10%, an increase in eosinophils - up to 4–6.5%), which indicated the development of stress at very low levels of reactivity.

The structure of the initial adaptive responses in female rats of the control group differed in the identification of not only the stress response, but also the training response related to the anti-stress physiological type of response.

It is known that the ratio of different types of reactions can be expressed by the coefficient K (AC / C), which makes it possible to establish the antistress potential in the general group structure. If in the experimental group K (AC / C) was equal to 0, then in the control group it was 1.5, which indicated the best starting position of the animals in the control group. In addition, in terms of the degree of tension, these adaptive reactions could be attributed to low levels of reactivity, while in the experimental group the most energetically and functionally unfavorable ones prevailed - very low levels of reactivity. When identifying adaptive reactions after the end of the exposure to the drug No. 1, it was established that the reaction of deep stress and the development of physiological reactions of training, calm and increased activation in most experimental animals were developed. At the same time, the levels of reactivity increased significantly (i.e., a transition from very low to medium and high levels of reactivity was observed). Even in the only case of persistence of stress, there was an increase in the background indices of the lymphocyte count by 12% and a decrease in tension along the monocyte link by 4.5%, which also indicated a transition from very low to high levels of reactivity. It is important that K (AC / S) has risen from the zero level to 3.0.

In the control group of animals, a change in adaptive states was also observed: the transition of training reactions into stress or increased activation, as well as stress - into calm and

increased activation (2 cases). With the improvement of the general group structure of reactions, which was expressed by an increase in K (AC / C) by 2.7 times, there was observed the retention of signs of the tension of reactions characterizing low levels of reactivity.

Thus, when comparing the data obtained, the following features of the development of general nonspecific adaptive reactions in aging female rats treated with drug No. 1 can be distinguished:

1) getting out of a deep stressful state of very low levels of reactivity
2) the formation of anti-stress reactions of medium and high levels of reactivity

The control animals were characterized by: transitions of adaptive reactions into more active forms at the same low levels of reactivity.

3. Some indicators of endogenous intoxication in aging female rats.

It is known that endogenous intoxication, being a nonspecific syndrome, is characteristic of various pathological conditions, including those arising during the aging of the body (M.Ya. Malakhova, 2000; O.L. Ivankov, 2001). Evaluation and correction of the syndrome of endogenous intoxication becomes important for evaluating the effectiveness of treatment.

We have studied cellular tests of reactivity and intoxication, calculated by the leukocyte blood count (A.V.Samokhin, M.S.Tomkevich, Yu.V. Gotovsky, F.G. Misiano, 1998).

Yabluchansky leukocyte shift index: ISLK = (e + b + n) (m + lf) = 1.96 ± 0.44 (norm). Lymphocytic index of intoxication according to Kapitanenko and Dochkin: LI = lf / n = 0.57 ± 0.05 (norm).

Leukocyte index of intoxication according to Kalf-Kalif:

LII = (4mts + 3yu + 2p + s) (pl + 1) (m + lf) (e + 1) = 0.3 / 1.5 (norm),

where e - eosinophils, b - basophils, n - neutrophils (p - stab, c - segmented), m - monocytes, lf - lymphocytes, mc - myelocytes, pl - plasma cells, ju - young. The results of studying the tests of intoxication and reactivity in aging female rats in the studied groups showed the following (Table 3). In the initial state, the total number of normative tests of intoxication in the control group was 1.4 times higher than the data in the experimental group. At the same time, intergroup differences in the frequency of detection of normative tests gradually increased from ISLK, then LI and, finally, LII, which represents the most accurate reflection of the toxic-dystrophic state of the blood cellular systems, and an indirect indicator of the body's detoxification functions. Consequently, the observed level of compliance with the norm of intoxication indices in the control group indicated a satisfactory state of protective functions and some weakening in rats in the experimental group.

Table 3

Intoxication and reactivity tests in aging female rats

No. roofsy	The initial state				After exposure				Total number Normative tests	
	ISLK	LEE	LII	% polyseg-men. neutroph.	ISLK	LEE	LII	% polyseg- cop. neutroph.	before	after
one	1,316	0.574	0.543	24	0.818	1.119	0.200	12	one	3
eight	0.739	1.195	0.137	22	0.234	5.066	0.041	sixteen	3	0
nine	0.724	1,352	0.086	10	0.333	2.933	0.341	23	2	one
fifteen	1.198	0.952	0.265	26	0.527	1.732	0.110	sixteen	one	3
3									X = 1.75	X = 1.75
6	0.739	1,253	0.126	fourteen	0.351	2.686	0.252	eight	3	2
12	0.418	2.173	0.132	34	1,000	0.957	0.250	27	3	one
sixteen	1,380	1,280	0.174	sixteen	0.307	3.526	0.049	13	2	0
twenty	2,333	1,983	0.218	34	0.290	3.69	0.066	sixteen	2	0

After the effects of the drug No. 1, the situation changed due to the redistribution of normative tests: in rats of the experimental group, in two cases, it was observed

full restoration of normal values of all intoxication indices: ISLK, LI, LII. In one case, only the LII index was restored and the boundaries of the LII and LII norm were violated. In one case, there was a non-compliance with the norm of all intoxication tests.

In the control group, only one animal retained the standards for the ISLK and LII tests, and in one case LII values were observed that did not go beyond the normal range. In the overwhelming majority of cases, the ISLK, LI, LII standards were violated and their level was reduced in comparison with the background by 4 times. Thus, if we take into account only the total number of normative tests of intoxication in the experimental group without discussing their intragroup distribution, we can note significant differences with the control (P <0.001), where the number of normative values of the ISLK, LI, LII indices decreased 2.9 times. This indicated that the use of placebo had no effect on the natural course of protective-detoxification processes in the body during aging, while the use of drug No. 1 contributed to their activation.

4. Influence of drug No. 1 on the functional potential of neutrophilic granulocytes blood of aging female rats

The protective role of neutrophilic granulocytes as cellular factors of nonspecific resistance is widely known (Yu.A. Mazing, 1990; GE Brill et al., 1995; EA Korneva et al., 1995). The leading factor providing the functional potential of neutrophils are cationic proteins determined using the lysosomal cation test (LKT).

In the blood preparations of animals from the experimental and control groups, stained with green azure A, the mean cytochemical coefficient (CCC) in mature neutrophils was determined. In each blood preparation, at least 100 cells were counted and the CCC value was determined using the Astolzi and Verg formula. As you can see from the table. 4, the initial values of CCA in both groups were reduced to the same level, which indicated a decrease in the percentage of cells containing granules of cationic proteins. At the end of the experiment, in the control group, the CCA values remained at the same low level, while in the animals of the experimental group receiving drug No. 1, the average CCA value indicated a significant increase in the content of cells with a high amount of cationic proteins (P <0.001).

Table 4

Average values of the cytochemical coefficient (in conventional units) of peripheral neutrophils blood in aging female rats under the influence of drug No. 1

Animal groups	Initial values of CCC	Final values of CCC
Experienced (n = 4) NS	0.59 ± 0.06	2.67 ± 0.88 *
control (n = 5) X	0.64 ± 0.05	0.62 ± 0.30

* differences are valid

The observed 4.5-fold increase in CCC indicators after therapy based on bioresonance technologies obviously reflected an increase in detoxification resistance as one of the mechanisms for increasing the body's resistance.
In turn, the mobilization of the cellular link of the body's natural resistance, manifested in an increase in the number of neutrophils with a high level of LCT under the influence of drug No. 1, was confirmed and agreed with the cellular tests of reactivity and intoxication, the increase in the normative values of which occurred in the experimental group.

In addition, the high-amplitude dynamics of the lysosomal-cation test correlated with a significant increase in the levels of reactivity in terms of the parameters of general adaptation reactions, while in the control group the levels of reactivity remained low, despite the anti-stress character of the adaptation reactions.

In other words, the introduction of drug No. 1 to experimental aging female rats promoted synchronization of processes occurring at the cellular level and integral reactions of the body, including multisystem mechanisms.

5. Study of the motor activity of aging animals under the influence of the drug No. 1

(assessment of the component of the central nervous system)

To assess the functional activity of the motor cortex of the cerebral hemispheres in rats, we used the "open field" test, based on the avoidance of a dangerous space by rodents due to the mink (labyrinth) reflex. At the same time, the parameters of the time spent in the center of the "open field", horizontal activity, the frequency of lifting, grooming (washing, brushing the coat), the number of boluses were assessed.

Judging by the results obtained (Table 5), the time spent in the center of the "open field" - the most insignificant and dangerous zone for rodents, in animals of the experimental and control groups did not have significant differences. However, the behavior of animals after this period of time acquired intergroup differences. Thus, according to the indicators of horizontal activity, which characterizes the reaction of orientation in space and the search function, the animals of the control group were more restless. The number of horizontal runs along the "open field" of female rats of this group was almost twice as high as in the experimental group (Table 5).

Table 5

Indicators of the motor activity of aging female rats in the experimental and control groups

Engine indicators activity	Experienced group	Control group
Time to stay. in the center of the "open field", with	7.75 ± 1.1	8.2 ± 1.5
Lift Chatt Horizontal	22.9 ± 6.1 **	40.6 ± 7.2
Activity	4.75 ± 1.4 **	8.2 ± 1.3
Grooming	2.4 ± 0.1	3.3 ± 0.6
boluses	2.9 ± 0.36 *	1.8 ± 0.8

Note:

* level of confidence relative to control P <0.5.

* * the level of reliability relative to the control P <0.01.

The number of rises (vertical activity), indicating anxiety and alertness of animals in the control group, also significantly exceeded the value of the analogous criterion of behavioral reactions in the experimental group (Table 5). In addition, the female rats of the control group tended to increase the grooming frequency in comparison with the experimental group.

At the same time, the number of boluses, as one of the indirect indicators of the state of the parasympathetic part of the nervous system, in female rats receiving drug No. 1, was greater, which indicated a better tone of this autonomic link of nervous regulation.

Thus, the assessment of motor activity according to the "open field" test, which indirectly reflects the state of the motor zone of the cerebral cortex, as well as the ratio of the sympathetic and parasympathetic divisions of the autonomic nervous system, indicated a more stable, harmonious, balanced type of nervous activity in rats in the group receiving preparation No. 1.

6. Changes in the sexual cycle in female rats under the influence of drug No. 1

To study the possibility of restoring age-related loss of reactivity of hypothalamogonadatropic regulation in aging female rats, we used a vaginal smear test. To do this, a water wash of vaginal contents was taken from animals daily in the morning and in the evening and the cellular composition was analyzed, reflecting the stages of the hormonal cycle: the mass of leukocytes - diestrus, the presence of only epithelial cells - proestrus, shriveled epithelial cells (scales) - estrus, all types of cells - metestrus (according to Eskin). The stages of the sexual cycle were studied during 9 days before the start of exposure to the drug and within days after the end of the application of the geroprotective factor. It is this observation period that limits the period of 2 consecutive sexual cycles in the norm, which is 4.5 days (table.
6).

Table 6

The presence of stages of the sexual cycle in aging female rats before and after the use of drug No. 1

Groups alive	No. rats	Before treatment				After treatment				Xp-r effect
		D	P	O	M	D	P	O	M	
An experience N = 4	one	five	eleven		2	3	2	1	3	+
	eight	7	0	0	2	2	2	2	3	+
	nine	2	0	1	6	3	0	0	6	-
	fifteen	nine	0	0	0	nine	0	0	0	-
Counter. N = 5	3	7	0	2	0	7	0	2	0	-
	6	3	0	3	3	3	12		3	-
	12	3	0	3	3	2	13		3	-
	sixteen	4	2	1	2	3	3	1	2	-
	twenty	7	0	2	0	7	0	2	0	-

As the results of the study of the initial state of the sexual cycle in aging female rats show, in most cases, the diestrus stage dominated, lasting from 5 to 9 days.

The duration of the precursor stage (proestrus) decreased significantly, and in most cases it was not possible to identify it. The frequency of detection of the main active phase of the sexual cycle, estrus, in rats of the experimental group was noticeably reduced in comparison with the control. Violations were also noted at the final stage of the cycle - metestrus.

After four times injections of drug No. 1 to female rats, half of the experimental animals showed a partial restoration of the duration and sequence of stages of the sexual cycle, especially those concerning the stages of diestrus. In one of the experimental female rats, both active phases, proestrus and estrus, which were previously absent, were restored.

In the control group, insignificant changes were observed at the same time. structures of the reproductive cycle, reflecting the individual variation of indicator values staging of hormone-dependent processes during aging.

Summarizing the data obtained, we can state the ь undoubtedly bioadaptive and geroprotective effect of the drug, which has bioresonant properties. The nonspecific mechanisms of its influence on the oscillatory processes that characterize the cellular, systemic organismic adaptive responses were recorded thanks to the study of a complex of interrelated blood parameters, including an increase in the level of erythrocytes and a decrease (normalization) in the total number of leukocytes, an increase in the content of immunocompetent cells. By the number of the latter, it was possible to identify the types of antistress reactions and establish their correspondence to medium and high levels of reactivity.

Using the multicomponent cellular composition of the blood, it was also possible, using the calculated indices of reactivity and intoxication, to reveal the intragroup rearrangement of the normative indicators of protective-detoxification processes in female rats receiving drug No. 1. The most informative indicator of an increase in nonspecific resistance was the lysosomal cation test, the values of which significantly increased relative to the control level.

Considering the hierarchical subordination of processes in the body, one should expect synchronization of processes at the system level. When analyzing the motor activity of animals treated with drug No. 1, it turned out that the state of the sections of the sympathetic and parasympathetic nervous systems can be indirectly characterized as balanced, more balanced, harmonious, in contrast to the alert and anxious behavior of control animals.

Of course, endocrine regulation is the most ancient form of control; it undergoes significant involution during aging. In this regard, it was not possible to recover the age-related loss of reactivity of hypothalamic-gonadotropic regulation in old female rats with the introduction of only 4 doses of the drug.

Only in two of the four experimental female rats was it possible to record a complete multistage sexual cycle with the restoration of the sequence and duration of the stages. However, as our experience shows the use of pharmacological neurotropic agents (small doses of adrenaline), biostimulants (mummy, Eleutherococcus), succinic acid, physical factors (weak alternating magnetic fields

ultra-low-frequency range), it is possible to obtain a stable effect of restoring the reproductive cycle against the background of the development of antistress reactions only if the effects are of a longer duration (about a month) and are repeated in courses after 2-3 months. In such cases, it was possible to achieve not only the metabolic and external rejuvenation of animals, but also to restore the reproductive function.
Conclusion: the use of drug No. 1 for rejuvenation and restoration of body functions lost during aging is very promising and requires a long and detailed study.

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