

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000100030052-0

22 MARCH 1979

(FOUO 10/79)

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JPRS L/8349

22 March 1979

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY
BIOMEDICAL AND BEHAVIORAL SCIENCES
(FOUO 10/79)



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BIBLIOGRAPHIC DATA SHEET		1. Report No. JPRS L/ 8349	2.	3. Recipient's Accession No.																
4. Title and Subtitle TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY BIOMEDICAL AND BEHAVIORAL SCIENCES, (FOUO 10/79)			5. Report Date 22 March 1979																	
7. Author(s)			6.																	
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			8. Performing Organization Rept. No.																	
			10. Project/Task/Work Unit No.																	
			11. Contract/Grant No.																	
As above			14.																	
15. Supplementary Notes																				
16. Abstracts The report contains information on aerospace medicine, agrotechnology, bionics and bioacoustics, biochemistry, biophysics, environmental and ecological problems, food technology, microbiology, epidemiology and immunology, marine biology, military medicine, physiology, public health, toxicology, radiobiology, veterinary medicine, behavioral science, human engineering, psychology, psychiatry and related fields, and scientists and scientific organizations in biomedical fields.																				
17. Key Words and Document Analysis. 17a. Descriptors <table border="0"> <tr> <td>USSR</td> <td>Medicine</td> </tr> <tr> <td>Aerospace Medicine</td> <td>Microbiology</td> </tr> <tr> <td>Agrotechnology</td> <td>Physiology</td> </tr> <tr> <td>Biology</td> <td>Psychology/Psychiatry</td> </tr> <tr> <td>Botany</td> <td>Public Health</td> </tr> <tr> <td>Epidemiology/Immunology</td> <td>Radiobiology</td> </tr> <tr> <td>Human Engineering</td> <td>Toxicology</td> </tr> <tr> <td>Marine Biology</td> <td>Veterinary Medicine</td> </tr> </table> 17b. Identifiers/Open-Ended Terms 17c. COSATI Field/Group 2, 5E, 5J, 6, 8A					USSR	Medicine	Aerospace Medicine	Microbiology	Agrotechnology	Physiology	Biology	Psychology/Psychiatry	Botany	Public Health	Epidemiology/Immunology	Radiobiology	Human Engineering	Toxicology	Marine Biology	Veterinary Medicine
USSR	Medicine																			
Aerospace Medicine	Microbiology																			
Agrotechnology	Physiology																			
Biology	Psychology/Psychiatry																			
Botany	Public Health																			
Epidemiology/Immunology	Radiobiology																			
Human Engineering	Toxicology																			
Marine Biology	Veterinary Medicine																			
18. Availability Statement For Official Use Only. Limited Number of Copies Available From JPRS			19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 47																
			20. Security Class (This Page) UNCLASSIFIED	22. Price																

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JPRS L/8349

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USE ONLY. The new publication number is
JPRS 73021, 16 March 1979.

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ENVIRONMENTAL AND ECOLOGICAL PROBLEMS

UDC 661.12.004.183

CONSERVING FUEL AND POWER

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 1, 1979 pp 3-7

[Article by Yu. P. Borkov, Deputy Chief, Administration of the Senior Mechanic and Senior Power Engineer, Ministry of Medical Industry]

[Text] One of the most important tasks having the goal of heightening production effectiveness is sensible use of raw materials, materials, fuel, and electric power, and greater economy.

According to the "Basic Directions for Development of the USSR National Economy in 1976-1980" approved by the 25th CPSU Congress, consumption norms must be reduced by 3-4 percent for boiler and furnace fuel and by 5 percent for electric and thermal power in the 10th Five-Year Plan.

Actively participating in the All-Union Public Review of the Effectiveness of Resource Utilization, many labor collectives of the Ministry of Medical Industry are competently utilizing internal reserves for reducing specific fuel and power consumption norms with high results.

In 3 years of the current five-year plan all of the ministry's enterprises saved the following amounts in relation to the set norms: Fuel--over 60 thousand tons (corrected to comparison fuel), electric power--about 210 million kw·hr, and thermal power--about 800,000 Gcal.

Socialist pledges adopted by the ministry for 1978 were surpassed--by more than 15 million kw·hr in relation to economization of electric power, and by more than 50,000 Gcal in relation to thermal power.

Growth in the production volume of medicines, medical equipment, and other of the sector's products means enlargement of the demand for energy resources, but as a result of implementing organizational and technical measures and, on this basis, reducing specific consumption norms, we are enjoying a relative savings of fuel and power.

The content of the organizational and technical measures is defined mainly by the particular features of the production processes. In antibiotic

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production, for example, the largest consumers of electric power are the air compressors, while fermentation and end product isolation and purification processes are the greatest consumers of thermal energy.

A large quantity of fuel, especially liquid, is consumed in glass cooking, and so on.

Almost two-thirds of the total demand for fuel in the sector as a whole comes from boiler facilities used in the production of thermal energy. This is why fuel economy depends to a significant extent on the technical level and quality of operation of boiler units, on maintenance of the most economical working conditions, on the time and quality of equipment repairs, and on proper organization of records on and standards of fuel consumption. Sensible use of the produced thermal energy as well as thermal energy obtained as a byproduct by a number of enterprises, mainly thermoelectric power plants, is another very important factor of fuel economy.

Special emphasis should be laid on the fact that the best results in economization of energy resources are enjoyed as a rule by those labor collectives in which competently organized socialist competition encourages the collective's workers and specialists to fight for economical use of fuel and power at every workplace and in every section, shop, and production operation.

An efficient system for accounting and monitoring compliance by shops, sections, and the combine as a whole with the specific consumption norms for electric and thermal power, and for monitoring compliance with established consumption limits has been organized at the Usol'ye-Sibirskoye Chemical-Pharmaceutical Combine (director--N. A. Stetsenko, senior power engineer--V. P. Paramonov). The problems of economical and sensible expenditure of energy resources are regularly examined by the combine's board of directors, and they are reflected in the plant press and in visual agitation. The enterprises hold competitions for the best proposal pertaining to economization of electric and thermal power. Thus in 1977-1978 the combine's efficiency experts submitted and introduced proposals to reconstruct the water heating system, alter the lighting control system, alter the system for heating reagents in the alcohol regeneration process, and so on, which made it possible to economize on hot water and electric and thermal power, and enjoy an annual economic impact over 10,000 rubles. Utilizing the experience of the Kurgan Sintez Medicinal Preparations and Articles Combine, the Usol'ye-Sibirskoye Combine is centralizing control of power facilities and thermal, electric, and water supply units, which will make it possible to improve control over these facilities and reduce the number of maintenance personnel. In 3 years of the 10th Five-Year Plan the combine has saved over 1.5 million kw·hr of electric power and 12,000 Gcal of thermal power.

The collective of the Ufa Vitamin Plant (director--M. S. Ukader, senior power engineer--G. I. Samofeyev) has been active in economization of energy resources. The plant has introduced a number of proposals that have earned prizes at all-union competitions for the best proposal for economization of

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electric and thermal power: Alterations in the fuel oil heating system, automation of condensate collection, purification, and removal, and so on. The plant collective is a perpetual participant of competitions for the best proposal for economization of power sponsored by the (Bashkirenergo). The plant's proposals have won prizes many times. Over a period of a number of years this enterprise had been holding intraplant competitive reviews for the best measure for economization of fuel and energy resources; each shop has a power economization assignment for the year, quarter, and month; the competition for economization of energy resources has assumed broad scope. In 3 years of the 10th Five-Year Plan the enterprise has saved over 1.4 million kw·hr of electric power and 12,000 Gcal of thermal energy.

Compressor stations producing compressed air consume 50 percent and more of all electric power in some of the sector's enterprises. This is why reducing specific consumption of electric power for compressed air production has such great significance. Such a reduction can be achieved by ensuring optimum working conditions for both individual compressors and the compressor unit as a whole, by reducing losses of compressed air in pipelines, by making optimum use of compressed air and reducing losses at the points of consumption, and by improving the quality of compressor operation and repair.

Thus special tests were conducted at the Penza Medical Preparations Plant (director--A. N. Polunin, senior power engineer--A. G. Funtikov) to determine efficient working conditions for compressors. Schedules indicating the sequence for starting up machine units depending upon load and productivity were written on the basis of the obtained data; these schedules also consider the minimum number of start-ups and shut-downs. When the cumulative load of jointly operating compressors is relatively stable, the optimum variant of the working conditions can be composed by sensible combination of the machine units with the goal of achieving the lowest specific consumption of electric power.

An additional air compressor of lower productivity than that of the existing compressors has been installed at the Kiev Medical Preparations Plant (director--I. T. Butsenko, senior power engineer--O. A. Parfenov), which has made it possible to use a more flexible system for regulating production of compressed air depending upon the demand for it in the process shops, and thus to economize on electric power.

Significant economization of electric power can be achieved by automating compressor units using piston-type compressors; this makes it possible to regulate the productivity of the machinery when consumption of compressed air fluctuates, and to turn off some of the compressors in the event of a sharp decline in consumption. Thus following installation of an automatic system for regulating the working conditions of the compressor station, the Leningrad Medical Polymers Plant (director--O. P. Nikitin, senior power engineer--A. Ya. Saygin) enjoys an annual savings of electric power of about 32,000 kw·hr.

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Many other enterprises in the sector are also actively economizing on fuel and electric and thermal power. The plant boards of directors, the party and trade union organizations, and the power supply services of the Novosibirsk Chemical-Pharmaceutical Plant, the Uman' Vitamin Plant, the Mozhaysk Medical Instruments Plant imeni P. V. Gusenkov, and other enterprises are focusing their attention on the problems of improving accounting and control of energy resources consumption, intraplant standardization and limitation, improvement of equipment operating conditions, publicity on the results of economization efforts, visual agitation, and so on.

At the same time some of the sector's enterprises are not completing the planned assignments pertaining to energy resources economy.

In 1976-1978 the fuel economy assignments were failed by the Krasnodar Biochemical and Vitamin Preparations Combine imeni K. Marks (director--A. I. Solodukhin, senior power engineer--V. A. Zinov'yev), the Anzhero-Sudzhensk Chemical-Pharmaceutical Plant (director--V. I. Redekop, senior power engineer--A. K. Panasenko), and some others.

A number of enterprises are still responsible for cases of inefficient consumption and losses of fuel and energy resources due to incomplete loading of boilers and electrothermic furnaces, violations of operating schedules and production processes, errors in production organization, unsatisfactory work of condensate removal equipment and of condensate collection and recycling systems, inadequate insulation of heat pipelines and equipment, leakage of steam and hot water due to faulty seals, and so on.

A significant share of the electric power is consumed inefficiently in lighting networks. Electric lighting in the shops, sections, and other rooms of a number of the sector's plants is not turned off during the day. Thus an inspection made by the power marketing inspection agency at the Olaynfarm Chemical-Pharmaceutical Production Association (general director--I. Kh. Penke, senior power engineer--V. ...) revealed that the association was losing about 44,000 kw·hr of electric power per year due to dirty windows and light fixtures and inefficient lighting control. In order to eliminate inefficient consumption of electric power in lighting systems, steps must be taken to replace uneconomical light fixtures by improved ones characterized by a higher light production coefficient, to clean and replace dirty windows and fixtures, to paint rooms, and to reconstruct lighting circuits to permit more efficient automatic control of lighting systems, and so on.

One of the most important elements in the use of internal reserves is the secondary fuel and power resources, such as spent steam, condensate, hot gases and other energy carriers. Spent steam, condensate, and hot water are used at the Minsk Minmedpreparaty Production Association (general director--G. P. Andreyevskiy, senior power engineer--A. L. Gladkiy) to heat warehouses, the nursery, shower rooms, and shops, and for other purposes, producing a significant economic impact.

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One of the as yet unused forms of secondary energy resources in enterprises producing medical glass is hot gases from glass cooking furnaces, which have a temperature of 300-500°C. This heat can be used to produce steam by means of heat exchange units. Another source of secondary energy resources is heat lost through furnace drainage basin linings. We must utilize the experience of enterprises in other industrial sectors, which are introducing a system of evaporative cooling of the drainage basins of glass cooking furnaces, making it possible to utilize this heat to produce steam.

Adequate attention is still not being devoted everywhere to the use of secondary fuel and power resources, unfortunately. Hot water with a temperature of about 80°C in the alcohol distillation section of the Saransk Medical Preparations Plant (director--L. N. Krupnov, senior power engineer--V. I. Molev) is dumped into the city sewer. Losses of heat together with spent condensate and steam are more than 5,000 Gcal per year in the Organika Chemical-Pharmaceutical Production Association (general director--I. Ye. Polozkov).

The ministry is devoting a great deal of attention to improving standardization, accounting, and control of consumption of fuel and power resources. These problems are having a significant influence on careful, economical expenditure of energy. Although in the last 3-4 years a certain amount of work has been done in this direction, a number of enterprises still have serious shortcomings requiring immediate measures for their correction.

The main criterion of the effectiveness with which energy resources are used is the technically grounded specific consumption norms for fuel and electric and thermal power.

Most of the sector's enterprises have developed technically substantiated norms and are presently working with these norms. But specific norms are not constant; they must be improved and made more precise as organizational-technical measures are implemented in production.

Well organized accounting of fuel and power resource consumption combined with standardization and control is one of the main tools of their economical consumption. Intraplant standardization in relation to particular shops and sections consuming considerable quantities of power is still absent from some of the sector's enterprises. Nor do these enterprises establish limits for consumption of electric and thermal power, or set assignments for their economization. Shop and section accounting instruments are absent at a number of enterprises. All of this creates conditions for lack of control in expenditure of resources in individual sections. Such facts of a poor attitude towards these problems were revealed in an inspection of the Medical Instruments Plant imeni V. I. Lenin (director--Yu. N. Tarasov, senior power engineer--M. A. Krutikov), the Novosibirsk Medical Preparations Plant (director--I. T. Lazarev, senior power engineer--V. P. Kuznetsov), and some other plants.

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Mass organizational work aimed at economizing on fuel and power resources is being conducted poorly at enterprises such as the Poltava Medical Glass Plant (director--K. A. Puchikhin, senior power engineer--Ya. M. Kiss), and the Kursk Chemical-Pharmaceutical Plant (director--F. P. Vyshkvarkin, senior power engineer--V. K. Yarmolyuk). Commissions to promote sensible use of power are not working satisfactorily; a socialist competition for economization of energy resources has not been organized between shops and sections. The collectives of these enterprises are not participating in oblast and all-union competitions for the best proposal for energy economization.

Most enterprises have made tests of the settings of their boiler machine units with the purpose of determining the optimum conditions for their work and their efficiency. This has made it possible to improve the working conditions of boiler facilities and reduce specific fuel consumption to produce thermal energy. But operation of boiler facilities is not everywhere at the level corresponding to optimum working conditions, as a result of which fuel losses exist. Conversion from steam heating to water heating at a number of enterprises is also promoting more-economical use of available energy resources. These projects are still to be completed in some enterprises, and they will be completed in accordance with the plan for 1979-1980.

Until recently the scientific organizations and enterprises have turned insufficient attention to improving production processes in terms of reducing energy outlays and developing new processes which as a rule have not been foreseen by the plans of organizational and technical measures aimed at energy resource economization. In compliance with an order of the Ministry of Medical Industry, the all-union industrial associations are obligated to organize development of new production processes aimed at reducing energy consumption and decreasing specific consumption of energy resources, and at introducing them into production. The order also foresees measures for reconstructing the power systems of enterprises, to include replacing obsolete equipment, increasing the reliability of power supply, centralizing control of power supply facilities, modernizing equipment, and other measures insuring sensible use of fuel and power.

One of the important measures for increasing the effectiveness with which fuel and power resources are used is to train the personnel, to upgrade their qualifications. Advanced training courses will be organized in 1979 for enterprise senior power engineers and their assistants; the training of the chiefs of heat and power shops will continue.

The plan for economic and social development of medical industry in 1979 has established assignments for additional economization of fuel and electric and thermal power totaling not less than 3 percent of the existing standards. Correspondingly the ministry has made differentiated assignments to each all-union industrial association, production (scientific-production) association, and enterprise. It is the duty of every labor collective to join the widely

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supported socialist competition for predeadline completion of the 1979 plan and the 10th Five-Year Plan as a whole with the goal of persistently fighting for sensible and economic use of fuel and power resources, decisively correcting the existing shortcomings in this important matter, and insuring unconditional completion of the fuel and energy economization assignments of 1979.

The boards of directors of the associations and enterprises and their power supply services must work jointly with party, trade union, and Komsomol organizations to implement the organizational and technical measures in support of these goals, actively disseminate the experience of the best collectives, and develop the creativity of the collective as much as possible under the slogan "Save Fuel and Power!"

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PHYSIOLOGY

A COMPARATIVE INVESTIGATION OF THE LYMPH ORGANS OF RATS SUBJECTED TO WEIGHTLESSNESS AND ARTIFICIAL GRAVITATION DURING SPACE FLIGHT

Leningrad ARKHIV ANATOMII, GISTOLOGII I EMBRIOLOGII in Russian No 11, 1978 pp 41-46.

[Article by G. N. Durnova, Institute for Biomedical Problems of the USSR Ministry of Health, Moscow, submitted 19 Jun 78]

[Text] In previous investigations it was shown that one of the causes of accidental involution of the lymph organs in rats killed several hours after termination of prolonged space flights is the development of acute stress. Morphological signs of the latter in the form of massive degeneration of lymphocytes in the thymus and lymph nodes and neutrophilic infiltration of the spleen were demonstrated in a study of the lymph organs of rats which had been exposed on the biosatellite Kosmos-782. Meanwhile the etiology of acute stress in rats which have flown on biosatellites remains unclear, and it can only be conjectured that the cause of its emergence is the action on the rat of a complex of factors accompanying the landing of the biosatellite or the transition of the animals from the weightlessness conditions to the conditions of terrestrial gravitation or both together (Durnova, G. N., Kaplanskiy, A. S. and Portugalov, V. V., 1977).

The present report presents the results of a comparative study of the thymus, spleen and inguinal lymph nodes of rats which had flown on the biosatellite Cosmos-936, part of the animals flying under weightlessness conditions while the other part were subjected to artificial gravitation imitating terrestrial gravitation.

Materials and Methods

The material of the investigation was the thymus, spleen and inguinal lymph nodes of 24 Wistar rats of the SPF line which had been exposed for 16.5 days on the biosatellite Cosmos-936. Fifteen of these rats were kept under weightlessness conditions the whole time, and nine were rotated for the entire flight on a centrifuge (acceleration 1 g, orientation dorso-ventral), which imitated terrestrial gravitation. The terrestrial control was the same

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organs of 20 rats from the model experiment, in which all the conditions of space flight were reproduced with the exception of weightlessness, and 15 intact rats which were kept during the experiment in a vivarium (a detailed distribution of rats by group is presented in the table).

Material for the investigation was taken 4.5-13 hours and 25 days after termination of the space and terrestrial experiments. The lymph organs were weighed, fixed in Carnoy's Fluid, and embedded in paraffin. Sections of the thymus, spleen and lymph nodes were stained with hemotoxylineosin, methyl green-pyronine and picrofuchsin, and, in addition, iron was demonstrated in the spleen sections by Perls' method. The figures were statistically analyzed, and the differences in the results obtained were considered reliable at $p < 0.05$.

Results and Discussion

The data presented in the table indicate that in the rats which were subjected to weightlessness during the space flight we observed a statistically reliable decrease in the relative mass of the thymus and a distinct tendency to decrease in the relative mass of the spleen and lymph nodes in comparison with animals which were subjected during the space flight to artificial gravitation. An analogous pattern was noted when comparing the mass of the lymph organs of the rats subjected to weightlessness with that of the animals from the terrestrial model experiment. Reliable differences were not demonstrated between the weights of the lymph organs of the rats subjected to artificial gravitation during the space flight and those of the rats from the terrestrial model experiment.

In comparison with the intact animals, the mass of the lymph organs in rats from the terrestrial model experiment did not change. At the same time, a reliable decrease in the relative weight of the thymus was observed in rats from the terrestrial model experiment which had revolved in the centrifuge (acceleration 1.4 g).

Histological investigation of the thymus, spleen and lymph nodes of rats subjected to weightlessness and killed 4.5-13 hours after termination of the space flight demonstrated free-lying nuclear detritus and macrophages with phagocytized remains of the nuclei of lymphocytes in the cortical substance of the thymus, the parafollicular zone of the lymph nodes and the thickness of the splenic lymph follicles (fig 1a, 3a). The massive degeneration of lymphocytes was most strongly pronounced in the cortical substance of the thymus. In the lymph nodes, macrophages with phagocytized nuclear detritus were found not only in the parafollicular region of the cortical substance but also in the lumen of the sinuses.

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Weight of the Lymph Organs in mg/m Body Weight

Вес лимфатических органов в мг/г массы тела

(1) № группы	(2) Эксперимент	(3) Тимус		(4) Селезенка		Лимфатические узлы (5)	
		M ± m	P	M ± m	P	M ± m	P
(6) 4,5-13 ч после окончания эксперимента							
(7) 1.	Невесомость (0 g)	1,43 ± 0,09	P ₁₋₂ < 0,05 P ₁₋₃ < 0,1 P ₁₋₅ < 0,7	1,60 ± 0,11	P ₁₋₂ < 0,2 P ₁₋₃ < 0,1 P ₁₋₅ < 0,001	0,12 ± 0,006	P ₁₋₂ < 0,2 P ₁₋₃ < 0,001 P ₁₋₅ < 0,05
(8) 2.	Невесомость + центрифуга (1 g)	1,94 ± 0,19	P ₂₋₃ < 0,3 P ₂₋₅ < 0,05	1,87 ± 0,21	P ₂₋₃ < 1,0 P ₂₋₅ < 0,6	0,16 ± 0,023	P ₂₋₃ < 0,8 P ₂₋₅ < 0,8
(9) 3.	Наземный модельный эксперимент (1 g)	1,69 ± 0,11	P ₃₋₅ < 0,2	1,84 ± 0,14	P ₃₋₅ < 0,3	0,17 ± 0,010	P ₃₋₅ < 1,0
(10) 4.	Наземный модельный эксперимент + центрифуга (1,4 g)	1,40 ± 0,08	P ₄₋₃ < 0,05	2,05 ± 0,23	P ₄₋₃ < 0,5	0,17 ± 0,026	P ₄₋₃ < 1,0
(11) 5.	Виварный контроль (1 g)	1,48 ± 0,06		2,06 ± 0,09		0,17 ± 0,020	
(12) 25 сут после окончания эксперимента							
(7) 1.	Невесомость (0 g)	1,38 ± 0,12	P ₁₋₂ < 0,8 P ₁₋₃ < 0,05 P ₁₋₅ < 1,0	1,76 ± 0,08	P ₁₋₂ < 0,7 P ₁₋₃ < 1,0 P ₁₋₅ < 0,7	0,11 ± 0,014	P ₁₋₂ < 1,0 P ₁₋₃ < 0,6 P ₁₋₅ < 0,6
(8) 2.	Невесомость + центрифуга (1 g)	1,49 ± 0,25	P ₂₋₃ < 0,2 P ₂₋₅ < 0,7	1,80 ± 0,06	P ₂₋₃ < 0,9 P ₂₋₅ < 0,3	0,11 ± 0,009	P ₂₋₃ < 0,6 P ₂₋₅ < 0,8
(9) 3.	Наземный модельный эксперимент (1 g)	1,06 ± 0,06	P ₃₋₄ < 0,05	1,76 ± 0,26	P ₃₋₄ < 0,9	0,13 ± 0,03	P ₃₋₄ < 0,8
(11) 4.	Виварный контроль (1 g)	1,36 ± 0,12		1,72 ± 0,06		0,12 ± 0,008	

Примечание. Цифры у основания «P» означают порядковый номер сравниваемых групп животных; в графе «Эксперимент» в скобках проставлена величина ускорения в g'.

Key:

- | | |
|---|--|
| 1. Number of group | 7. Weightlessness (0 g) |
| 2. Experiment | 8. Weightlessness plus centrifuge (1 g) |
| 3. Thymus | 9. Terrestrial model experiment (1 g) |
| 4. Spleen | 10. Terrestrial model experiment plus centrifuge (1.4 g) |
| 5. Lymph nodes | 11. Vivarium control (1 g) |
| 6. 4.5-13 hours after end of experiment | 12. 25 days after termination of experiment |

Note: The subscripts of P designate the ordinal numbers of the groups of animals compared; in the "Experiment" column the rate of acceleration in g's is stated in parentheses.

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While in the thymus, despite the massive degeneration of lymphocytes, a discernible narrowing of the cortical substance was not observed, in the spleen and lymph nodes pronounced hypoplasia of the lymph tissues was noted in the presence of a comparatively small number of degenerating lymphocytes. The hypoplasia was manifested in a decrease in the number and sizes of the lymph follicles and their light centers in the spleen and the lymph nodes and also in the narrowing of the parafollicular zone of the cortical substance of the lymph nodes. The degree of hypoplasia of splenic lymph tissue increased progressively with increase in the time elapsed from the moment of the animals' landing to the moment of their sacrifice. The last circumstance permits us to conjecture that the hypoplasia of the white pulp of the spleen is caused not so much by the degeneration of lymphocytes in it as by their migration into the bone marrow, since it is known that such a redistribution of lymphocytes takes place under extreme conditions (Zimin, Yu. I., 1971; Zimin, Yu. I. and Khaitov, R. M., 1975; Gorizontov, P. D., 1975; Ernstrom, U. and Sandberg, G., 1969).

Along with the hypoplasia of the white pulp and degeneration of lymphocytes in it, a diffuse neutrophilic infiltration was observed in the red pulp of the spleen (fig 2a). The number of foci of erythropoiesis in the red pulp of the spleen decreased, and the quantity of extra- and intra-cellular hemosiderin increased significantly.

In distinction from the lymph organs of rats subjected to weightlessness, in animals subjected during space flight to artificial gravitation (acceleration 1 g), morphological signs of pronounced hypoplasia of the lymph tissues and mass degeneration of lymphocytes were not present (fig 1b, 3b), and neutrophilic infiltration of the red pulp of the spleen was not observed (fig 2b). The number of erythropoietic foci in the spleen decreased insignificantly (in 2 rats out of 4). As a whole, the histological picture of the lymph organs of the rats subjected during flight to artificial gravitation was closer to that in the rats of the terrestrial model experiment, regardless of whether the animals had revolved in the centrifuge or not. The structure of the lymph organs of the rats from the terrestrial model experiment differed little from that of the intact animals, and only in the spleen was it possible to observe a certain decrease in the number of accumulations of immature red blood cells, a finding which indicated a decrease in the erythropoietic activity of the spleen.

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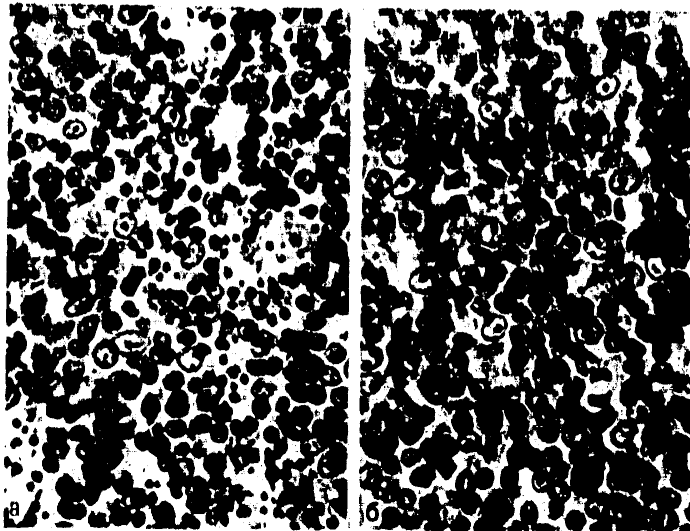


Fig 1 Cortical substance of the thymus of rats subjected to weightlessness (a) and artificial gravitation (b) during space flight. a - massive degeneration of lymphocytes; b - lymphocytic mitoses, absence of morphological signs of cell degeneration. Hematoxylin-eosin. Ob. 60, oc. 6.3.

Twenty-five days after termination of the flight and terrestrial experiments, the mass of the lymph organs and the histological picture of thymus, spleen and lymph nodes had normalized, and the intensity of erythropoiesis in a number of cases even exceeded that in intact animals.

The results of the present experiment confirm previous observations (Durnova, G. N., Kaplanskiy, A. S., and Portugalov, V. V., 1977) and indicate that in the lymph organs of rats subjected during space flight to weightlessness, changes characteristic of acute stress develop soon after their return to earth (degeneration of lymphocytes in the cortical substance of the thymus, the lymph follicles of the spleen, and the parafollicular zone of the lymph nodes; neutrophilic infiltration of the red pulp of the spleen. Since elimination of nuclear detritus from the lymph organs occurs relatively quickly (within 24 hours), its presence in the thymus, lymph nodes and spleen indicates that the degeneration of lymphocytes occurred recently, apparently several hours before sacrifice of the animals. The absence of morphological signs of acute stress in the lymph organs of the rats subjected during space

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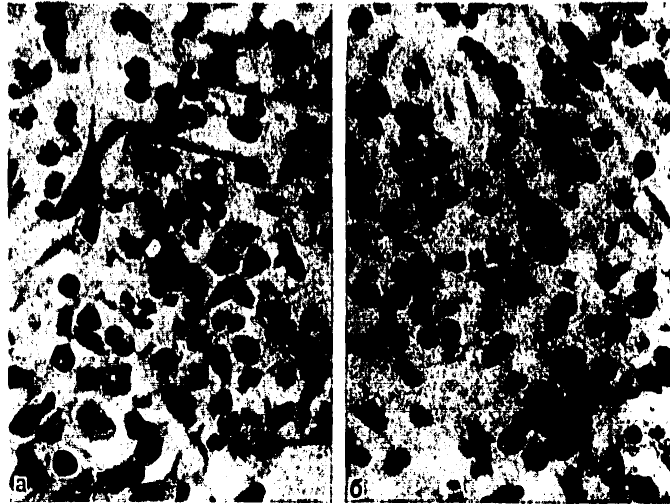


Fig 2 Red pulp of spleens of rats subjected to weightlessness (a) and artificial gravitation (b).

a - neutrophilic infiltration; b - absence of neutrophils; mitosis. Hemotoxylin-eosin. Ob 60, oc. 6.3.

flight to artificial gravitation corresponding to terrestrial gravitation gives us reason to believe that one of the basic causes of the occurrence of stress in animals which have been subjected to weightlessness is the transition from weightlessness to terrestrial gravitation ("gravitational stress"). Since the development of stress depends not only on the strength of the acting stimulus but also on the condition of the macro-organism (Gorizontov, P. D., 1975), the possibility has not been excluded that a prolonged stay in weightlessness lowers the resistance of the animals to the action of such stimuli as terrestrial gravitation.

The question of whether weightlessness is an etiological factor of stress remains open, and at present it is clear only that weightlessness is not a strong and long-acting stress agent, since in rats killed soon after termination of space flight there is no significant atrophy of the thymicolymphatic apparatus, which is observed in stress provoked by prolonged stay in conditions of severe hypokinesia (Portugalov, V. V., Kaplanskiy, A. S., and Durnova, G. N., 1971).

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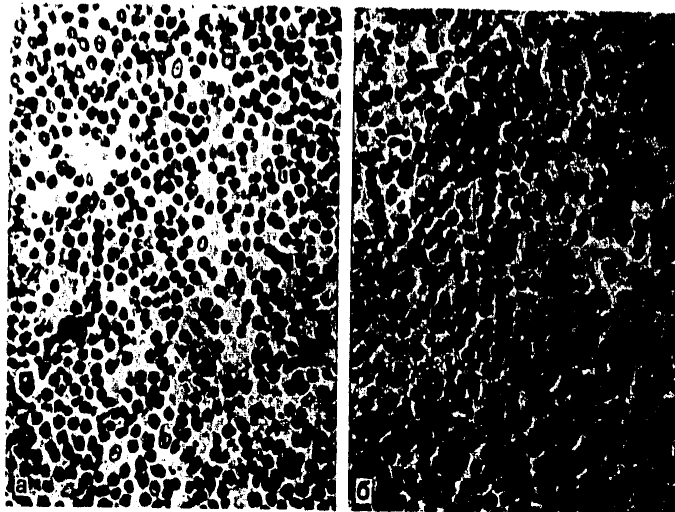


Fig 3 Parafollicular zone of the lymph nodes of rats subjected to weightlessness (a) and artificial gravitation (b).

a - macrophages with nuclear detritus; b - absence of any morphological signs of degeneration of lymphocytes. Hematoxylin-eosin. Ob. 40, oc. 6.3.

As previously mentioned, in the spleen of rats subjected to weightlessness during space flight, a decrease in the intensity of erythropoiesis was observed together with hypoplasia of the white pulp. An analogous inhibition of erythropoiesis in the spleen and bone marrow was demonstrated in after-flight investigation of rats exposed on biosatellites Kosmos-605 and Kosmos-782 (Durnova, G. N., Kaplanskiy, A. S., and Portugalov, V. V., 1976; Shvets, V. N. and Portugalov, V. V., 1977). In distinction from the rats subjected to weightlessness, in animals subjected to artificial gravitation during space flight, inhibition of erythropoiesis in the spleen was expressed to a significantly lesser degree and was not observed in all animals. In analyzing the causes of depression of erythropoiesis during weightlessness, it may be supposed that it is most likely connected with the sharp decrease in energy expenditures on muscle activity, since in rats as animals with horizontal orientation of the body material redistribution of the blood is not observed, and consequently the inhibition of erythropoiesis cannot be explained by the Henry-(Gauer) effect.

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Thus, the creation of an artificial gravitational force imitating terrestrial gravitation on the biosatellite Kosmos-936 prevents the development in the lymph organs of the rats of the morphological changes characteristic of acute "gravitational" stress which were discovered after termination of the space flight in the animals subjected to weightlessness. In this case, inhibition of erythropoiesis in the spleen of rats subjected to artificial gravitation during space flight was insignificantly expressed in comparison with animals which had been subjected to weightlessness.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

E. N. PAVLOVSKIY GOLD MEDAL AWARDED TO N. G. OLSUF'YEV

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 7, 1978 p 132

Text



The presidium of the Academy of Sciences USSR has awarded the 1978 E. N. Pavlovskiy gold medal to member-correspondent of the Academy of Medical Sciences USSR Nikolay Grigor'yevich OLSUF'YEV for his total work on the natural source of tularemia. N. G. Olsuf'yev is a major Soviet parasitologist, one of the first students and long-term collaborator of E. N. Pavlovskiy. The gold-medal-winning works of the scientist are the result of research on the natural source of tularemia and gadflies of various regions of the country.

Detailed zoologo-parasitological and epidemiological study of the natural sources of tularemia allowed N. G. Olsuf'yev to establish the geography of their dissemination and to work out classification on a regional basis. He devoted great attention to elucidation of the biological features of the stimulus in natural sources of various species; as a result he has succeeded in describing intraspecific taxa of the microbe of tularemia and showing differences in their geographic dissemination. In the works of

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N. G. Olsuf'yev on the model of tularemia the problem of the biological interrelations of the pathogenic microorganism and its bearers--vertebrate animals and also carriers--bloodsucking arthropods--was first raised and subjected to experimental elaboration. This research led to establishment of the most important paths of circulation of infection.

Ixodid ticks have been studied in detail by N. G. Olsuf'yev as specific carriers and long-term keepers of tularemic infection in nature, and the method of revealing the natural sources of tularemia by means of collection and bacteriological research on ticks has been elaborated and introduced into practice. He also corroborated in experiment epidemiological observations on the ability of bloodsucking dipterous insects, especially gadflies and mosquitoes, to transmit the stimulus of tularemia in the process of bloodsucking.

Study of the natural source of tularemia in the USSR, which has served as the theoretical basis for carrying out purposeful prophylactic measures, has had great significance for public health care and for elimination of human infection with tularemia in our country.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

NEW MEMBERS OF THE ACADEMIES OF SCIENCES OF THE LATVIAN, MOLDAVIAN, TURKMEN,
UKRAINIAN AND ESTONIAN SSR

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 7, 1978 pp 133-134

[Text] At the general meetings of the academies of sciences of the Latvian, Moldavian, Turkmen, Ukrainian and Estonian SSR elections of new members took place.

To the ACADEMY OF SCIENCES OF THE LATVIAN SSR were elected:

as academicians--E. Yu. Gudriniyetse (chemistry), M. E. Beker (technical microbiology), A. F. Blyuger (medicine), V. A. Shteynberg (philosophy), A. P. Grigulis (Lettish literature);

as member-correspondents--P. T. Prokof'yev (nuclear spectroscopy), M. Yu. Lidak (chemistry of natural compounds), R. Ya. Karklin' (technical microbiology), A. A. Kalnyn'sh (economics of agriculture), I. K. Aline (history of the CPSU), A. Ya. Blinkena (Lettish language).

To the ACADEMY OF SCIENCES OF THE MOLDAVIAN SSR were elected:

as academicians--M. F. Lupashku (botany), D. T. Ursul (philosophy);

as member-correspondents--A. M. Andriyesh (physics of semiconductors and dielectrics), M. K. Bologa (heat physics), S. I. Toma (agrochemistry), M. Ya. Moldovan (virology), V. D. Siminel (genetics and selection), T. S. Chalyk (genetics and selection), S. S. Chibotaru (literary criticism).

To the ACADEMY OF SCIENCES OF THE TURKMEN SSR were elected:

as academicians--O. O. Ovezgel'dyyev (radiophysics), Sh. T. Tashliyev (history of the CPSU);

as member-correspondents--Ya. A. Agayev (physics of semiconductors and semiconductor energy transducers), M. A. Annanepesov (USSR history), V. M. Masson (archaeology).

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To the ACADEMY OF SCIENCES OF THE UKRAINIAN SSR were elected:

as academicians--I. N. Kovalenko (mathematical theory of reliability), V. I. Skurikhin (systems-engineering, systems theory), B. B. Timofeyev (systems-engineering, systems theory), A. N. Guz' (mechanics), V. L. Rvachev (mechanics), V. G. Bar'yakhtar (solid-state physics), V. V. Yeremenko (solid-state physics), O. F. Nemets (experimental nuclear physics), B. A. Nelepo (marine physics), D. A. Dudko (materiology, strength of materials), B. A. Movchan (materiology, strength of materials), V. V. Panasyuk (materiology, strength of materials), A. V. Gorodyskiy (electrochemistry), P. G. Bogach (physiology, medicine), F. N. Serkov (physiology, medicine), A. A. Shalimov (physiology, medicine), A. A. Sozinov (genetics), P. T. Tron'ko (USSR history), V. I. Shinkaruk (philosophy), A. T. Gonchar (literary criticism), M. A. Stel'makh (literary criticism);

as member-correspondents--I. V. Ostrovskiy (mathematics), A. M. Samoylenko (mathematics), A. N. Sharkovskiy (mathematics), Ya. M. Grigorenko (mechanics), I. I. Ivanov (mechanics), V. N. Koshlyakov (mechanics), A. A. Lebedev (mechanics), I. V. Sergiyenko (computer mathematics), I. O. Kulik (physics), E. A. Zavadskiy (solid-state physics), Yu. G. Ptushinskiy (electronics physics), M. A. Krivoglaz (theoretical physics), S. V. Peletminskiy (theoretical physics), E. F. Shnyukov (geology), B. I. Beresnev (materiology, strength of materials), G. G. Maksimovich (materiology, strength of materials), V. I. Makhnenko (materiology, strength of materials), Yu. V. Naydich (materiology, strength of materials), V. I. Baptizmanskiy (metallurgy, metals technology), B. F. Zelenskiy (metallurgy, metals technology), S. I. Kuchuk-Yatsenko (metallurgy, metals technology), V. Ya. Ostrenko (metallurgy, metals technology), K. D. Tovstyuk (materiology of semiconductors), A. A. Dolinskiy (heat and power engineering), A. K. Shidlovskiy (electrical engineering), V. P. Kukhar' (organic chemistry), L. N. Markovskiy (organic chemistry), S. V. Volkov (inorganic chemistry), V. V. Skopenko (inorganic chemistry), V. S. Sazhin (chemical engineering), V. V. Klimov (physicochemistry and technology of inorganic materials), V. V. Frol'kis (physiology, medicine), N. S. Pushkar' (cryobiology), Z. A. Butenko (experimental oncology), M. A. Golubets (botany), Yu. R. Shelyag-Sosonko (botany), V. A. Topachevskiy (zoology), V. E. Zaika (hydrobiology), V. D. Romanenko (hydrobiology), A. A. Bakayev (economics), V. I. Klovov (history), G. D. Verves (literary criticism).

To the ACADEMY OF SCIENCES OF THE ESTONIAN SSR were elected:

as academicians--L. K. Yurgenson (structural mechanics and structural physics), K. L. Paaver (biology), Yu. Yu. Kakhk (USSR history);

as member-correspondent--V. A. Pal'm (chemistry).

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ACADEMICIAN V. E. SOKOLOV CELEBRATES 50TH BIRTHDAY

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 5, 1978 pp 140-141

Text



Academician Vladimir Yevgen'yevich SOKOLOV, one of the leading
theriologists of our country, is 50 years old.

V. E. Sokolov is the author of many major scientific works, including in-
depth research in the field of ecologic morphology of animals, and one of
the founders in the USSR of a new trend of zoology--hydrobionics. V. E.
Sokolov is successfully working out the problem of chemical communication
in animals, which plays a most important role in their ecology and beha-
vior. Studying the orientation of mammals, he was among the first to
begin to apply biotelemetric methods in order to observe the movement of
animals and obtain at a distance data on their physiologic condition.

V. E. Sokolov devotes much attention to problems of biogeocenology and the
biosphere, representing our country's interests in international organiza-
tions occupied with these problems. He is one of the initiators of crea-
tion in our country of a network of biosphere preserves--this new form
of conservation and study of unique ecosystems.

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V. E. Sokolov is conducting great scientific-organizational and pedagogic work. He is the director of the Institute of Evolutionary Morphology and Ecology of Animals im. A. N. Severtsov, president of the All-Union Theriological Society, chairman of the Scientific Council of the Academy of Sciences USSR on the problem "Biological Foundations of Mastering, Reconstruction and Protection of the Animal World," editor-in-chief of ZOOLOGICHESKIY ZHURNAL, chairman of the scientific-method council on biology of the All-Union Society "Znaniye," a member of the editorial boards of several journals, including VESTNIK AKADEMII NAUK SSSR, scientific leader of the Soviet-Mongolian expedition and professor of the department of zoology and comparative anatomy of vertebrates of Moscow University.

The presidium of the Academy of Sciences USSR sent the man of the hour a salutatory address, in which it noted the scientist's services in the development of science and wished him good health and successes in all areas of his activity.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

L. A. ORWELL PRIZE AWARDED TO D. A. SAKHAROV

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 3, 1978 pp 116-117

[Text]



The presidium of the Academy of Sciences USSR has awarded the 1977 L. A. Orwell prize in the amount of 1,000 rubles to doctor of biological sciences Dmitriy Antonovich Sakharov (Institute of Biology of Development im. N. K. Kol'tsov, Academy of Sciences USSR) for the monograph "Genealogy of Neurons."

In the prize-winning monograph D. A. Sakharov developed the original idea based on the results of his experimental research of the origin of nerve cells. Studying the long-obscure causes of the fact that in various species of animals the neurons which secrete the same mediator have various localization and fulfill various functions, D. A. Sakharov came to the conclusion of the unsoundness of the supposition that qualitatively different neurons descended from a common ancestral neuron which secreted a mixture of mediators and neurohormones. In the author's opinion, the mediator chemism of nerve cells is conservative and does not change even with substantial change of the functions of neurons in the process of evolution of the nerve system; however the primary chemical specificity of neurons does not mean the absence of chemical evolution. The diversity

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of neurons of higher organisms, D. A. Sakharov thinks, was formed not in the process of evolution from low-organized metazoa to highly organized, but at early stages of development of multicellularity. This statement is based on detailed electron-microscopic research, identification and classification of neurons conducted by the author with involvement of the tenets of evolutionary theory, neurophysiology and neurochemistry.

The idea of the polygenesis (plural origin) of nerve cells advanced by D. A. Sakharov has won the recognition of native and foreign physiologists.

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SECHENOV PRIZE AWARDED TO P. G. KOSTYUK

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 2 1978 p 142

[Text]



Academician Platon Grigor'yevich KOSTYUK has been awarded the 1977 I. M. Sechenov prize in the amount of 2,000 rubles for the monograph "Structure and Functions of Descending Systems of the Spinal Cord."

In the monograph which won the prize data on the neuron organization of the descending systems which connect the structures of the cephalic brain with the spinal-cord centers are cited. The author's original ideas, expounded in the book, allow him to create a single picture of the structural-functional organization of the descending control of the activity of the spinal cord.

Revealing the cerebro-spinal interrelations and their role in the mechanism of forming coordination of activities of the motor apparatus of the higher vertebrates and man is one of the most complex problems of neurophysiology.

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The author, on the basis of the data of his own works, proposes an in-principle new classification of the descending systems of the spinal cord, based on comparison of the structural organization and functional features of the spinal links of these systems. As a result of careful neuromorphological and electrophysiological research important features of the structure and function of the spinal descending systems, their synaptic connections with the segmentary neuron apparatus and neurons of the spinal afferent systems have been revealed.

The idea of the presence of descending influences of various sections of the cephalic brain on the functional activities of the spinal cord was first expressed by I. M. Sechenov. The research of P. G. Kostyuk is a major contribution to the development and deepening of this idea and its experimental elaboration.

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PUBLICATIONS

NEGATIVE, UNACCOUNTABLE EMOTIONS AFFECT PERCEPTION

Moscow VOSPRIYATIYE I EMOTSII (Perception and Emotions) in Russian 1977
signed to press 1 Apr 77 pp 2-10, 224-233, 248

[Annotation, Table of Contents, Foreword, Introduction, and Bibliography
from book by E. A. Kostandov, USSR Ministry of Public Health, Izdatel'stvo
Meditsina, 2,000 copies, 248 pages]

[Text] Negative emotions can significantly worsen perception of signals from the outside. This was noted in the presence of a number of pathological states of the central nervous system by prominent domestic clinicians, P. V. Gannushkin and S. M. Davidenkov. But this phenomenon can also be observed among practically healthy people. Despite the importance and urgency of the problem, there has clearly not been enough research on the neurophysiological mechanisms responsible for perception disturbances resulting from the influence of negative emotions. The results of psychophysiological, pharmacodynamic, and bioelectric research on healthy people and on persons suffering psychoneural diseases permitted the author to present his own point of view in this monograph on the nervous mechanisms behind changes in realization of outside phenomena under the influence of negative emotions, and on the neurophysiological substrate for the action of unrealized stimuli.

Another aspect of the "perception and emotions" problem examined in this monograph is the role of unrealized, emotionally meaningful semantic stimuli in human behavior, particularly in the genesis of so-called unaccountable emotions. A hypothesis is suggested in this monograph on the neurophysiological basis of the "unconscious," according to which the action of unrealized stimuli is the product of a difference in excitability thresholds of temporary associations at different functional levels of the dynamic system reflecting an unpleasant or threatening situation. This hypothesis is confirmed by a number of experimental facts acquired by the author and his colleagues, as well as by published data.

All of this permits the author to suggest an explanation for a large number of "unconscious" phenomena from the positions of determinism.

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The book is intended for physiologists, psychologists, and psychiatrists.

The book contains 35 figures, 6 tables, and 422 bibliographic references.

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Foreword, by USSR Academy of Medical Sciences Academician G. V. Morozov
 The effect negative emotions being experienced by a subject have on the way he perceives outside phenomena has long attracted the attention of psychologists and psychiatrists. The role of emotions in the occurring changes in realization of the surrounding world by psychopathic personalities was brilliantly described by the prominent domestic psychiatrist P. B. Gannushkin in his remarkable work "Clinical Pattern of Psychopathies

Their Statics, Dynamics, and Systematics." He expressed confidence that with time, certain "somatophysiological factors" at the basis of disturbances in conscious processing of incoming information by higher mental centers will be found. These disturbances may occur especially frequently among emotionally labile persons at times of affective stress.

Unfortunately neurophysiologists have devoted little attention to perception and emotions until recently. Abroad, this problem was mainly the realm of psychologists adhering to psychoanalytical positions, since it is closely associated with research on the "unconscious." As a rule these works do not even raise the issue as to the physiological mechanisms responsible for the phenomena of "emotional" perception and the "unconscious."

Psychophysiological research on the effects of subthreshold stimuli on the body was started in our country in the 1940's by G. V. Gershuni and his colleagues, but it soon came to a halt, and it has not been conducted systematically to date. Meanwhile work of this sort is doubtlessly needed, since we are still unclear about the physiological substrate of emotions for which the direct causes are concealed from the subject. Such "unprovoked" emotions are observed especially often among psychopathic personalities, especially emotionally labile ones, among persons who had suffered cerebrocranial injury, and in the presence of some forms of depression. Such emotions can also arise among practically healthy people in certain conditions (fatigue, postinfluenza asthenia, and work in extreme conditions).

In my opinion a successful attempt is made in this book by E. A. Kostandov at physiological study and explanation of changes in perception of outside signals in response to negative emotions, as well as of various reactions of the human body to unrealized stimuli. This work shows that a large number of "unconscious" phenomena do yield in their entirety to objective analysis in the laboratory, and that they can be explained from the positions of determinism.

Introduction

In addition to making the physical conditions of man's labor and life easier, the technical revolution is imposing higher requirements on his mental functions. As the rate of production processes accelerates and equipment becomes more complex, the number of people employed in jobs requiring the processing of a continuous flow of extremely meaningful information within very short intervals of time is increasing more and more. This is quite evident in the example of transport drivers. The growing speed of airplanes, electric locomotives, and other vehicles is doubtlessly making their control more complex. The number of instruments and gauges the individual must monitor with the aim of making required decisions depending on their readings is increasing. Considering today's high speeds, there is no time to spare in the perception and processing of a flow of information, which under certain conditions can cause psychoneural tension in the individual,

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accompanied by a negative emotion. This pertains of course not only to transport drivers but also operators working at the control consoles of electric power systems, automatic plant production lines, and computers, air and rail traffic controllers, and so on.

Clinical observations and numerous experimental studies have demonstrated that negative emotions can significantly worsen perception of outside signals. Prominent domestic psychoneurological clinicians--P. B. Gannushkin and S. M. Davidenkov--noted this in the presence of some pathological deviations in the activity of the central nervous system. In his classical monograph on psychopathies P. B. Gannushkin (3) emphasized many times the role of emotions in disturbances of perception of the environment. According to Gannushkin's observations "paling of perceptions" or, on the other hand, a decline in their threshold often lies at the basis of the inability of these people to correctly evaluate their surroundings. The temporary disturbance in perception arising in response to emotions in such cases can be one of the causes of conflicts between the psychopath and surrounding individuals, of his subsequent incorrect interpretation of the given event, and of his "deceitfulness" and "emancipation from the facts."

Davidenkov (4,5) described unique "short," "paroxysmal" neurotic states and "short reactive states" among persons with a weakened nervous system (postinfluenza asthenia overtiring, exhaustion, high arterial pressure, and so on). These states, which last several seconds, and minutes more rarely, are described by persons experiencing them as "inhibition," "eclipsing," "plugging of the ears," "confusion," "loss of all understanding," "suppression of brain activity," "stupefaction," "suppression of thoughts," and "a state of remoteness." A common characteristic of all of these short-lasting unusual states is a worsening of perception, of realization of surrounding phenomena, a dramatic rise in the perception threshold of stimuli acting at the given moment, without visible clinical signs of beclouding of the consciousness. When in such a state, the subject can proceed with whatever he is doing, especially actions associated with his routine work, but he is not fully conscious of why he performs these actions. As a rule all of these states arise in response to a suddenly appearing negative emotion, or in connection with the need for swiftly switching the attention to an unexpectedly new direction while concentrating on something important. In Davidenkov's opinion (5) the principal mechanism boils down to a physiological task that is more than the given nervous system can handle. Davidenkov believed it highly probable that the association between the short-term nervous breakdown he described and a difficult situation can subsequently be reinforced as a conditioned reflex mechanism. This interesting clinical observation requires experimental testing. It may possibly be the basis for formation of a pathological temporary association involving subthreshold, unrealized stimuli.

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The pathological states described here are not essentially anything all that exceptional. Davidenkov (4) was correct in suggesting that these pathological states are nothing more than extremes of states that are more or less typical of the normal personality. More and more examples of various sorts of emergency situations or emergencies arising as a result of emotional stress experienced by the operator have been published in recent years (2). These cases demonstrate that very short disturbances in perception, lasting for just a few seconds, in which the operator ceases to realize information coming from without or realizes it poorly, and is consequently unable to evaluate it adequately and make an adequate decision, are the main cause of disturbances in the activity of an operator in a man-machine system. Despite presence of such "transitory disturbances in consciousness," the operator often continues to control his vehicle, obviously on the basis of unrealized perception of stimuli.

Despite the importance and urgency of the problem, not enough research has been conducted on the neurophysiological mechanisms behind disturbances in perception caused by negative emotions in man. This book presents the results of experimental research on this problem at the laboratory of higher nervous activity of the Institute of Forensic Psychiatry imeni V. P. Serbskiy; these results are discussed in light of today's ideas about the structural and functional nervous organization of emotional behavior. The results of psychophysiological, pharmacodynamic, and bioelectric observations permit the author to state his own opinion about the nervous mechanisms behind changes in realization of outside signals under the influence of negative emotions, about the possible functional basis for the differences in the directions these changes can take, and about the neurophysiological substrates for the action of unrealized stimuli upon the human body.

Another important aspect of the "perception and emotion" problem is research on the role of unrealized emotionally meaningful semantic stimuli in human behavior, particularly in the genesis of so-called unaccountable or unprovoked emotions. That verbal stimuli which have negative emotional meaning and which are not realized by the individual have an effect on the individual had been established experimentally back in 1949. This was confirmed in numerous laboratories, mainly abroad, and the physiological and psychological functions upon which such unrealized stimuli may act have been revealed. But almost no attempts have been made to clarify precisely which nervous mechanisms lie at the basis of such "unconscious" phenomena.

The work done at our laboratory has demonstrated that the problem of the "unconscious" or, to put it more accurately, the effect outside signals, including verbal ones, that are not realized by the individual have upon the individual at a given moment does yield to physiological interpretation. It is not our intention to suggest that this phenomenon now has a conclusive neurophysiological explanation. That is a matter for the future.

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The author's own observations and published data available today make it possible to suggest, for the reader's consideration, a physiologically grounded hypothesis in line with modern ideas about the cerebral mechanisms of animal and human behavior.

The problem of the neurophysiological basis of the "unconscious" is intimately associated with research on the influence of negative emotions on perception. It is precisely in the conditions of emotional stress or at the time of action of emotional stimuli that the threshold for realizing outside signals can rise significantly, and that the effect of unrealized stimuli manifests itself. According to the hypothesis suggested here, this happens owing to a difference in the arousal thresholds of temporary associations making up a functional system reflecting an unpleasant or threatening situation.

The successes neurophysiology has enjoyed in research on the role of the reticular and limbic systems in emotional behavior, particularly their influence on sensory functions, made it possible to suggest that reactions to unrealized emotional stimuli are the product of activation of cortical-limbic-cortical associations or arcs without the participation of higher cortical levels responsible for realization of surrounding phenomena. Pharmacodynamic analysis and comparison of cortical potentials evoked by neutral and emotional words confirmed the author's hypothesis concerning the role supplementary ascending activation originating in the limbic system plays in the nervous mechanisms responsible for threshold changes and reactions to unrealized signals.

Physiological research on human reactions to unrealized outside signals is important and necessary first of all because it provides a basis for reaching an understanding, from the positions of determinism, of the real brain mechanisms behind a large number of "unconscious" phenomena, ones which have often received a speculative and mystical interpretation, mainly from a psychoanalytical standpoint ("displacement," the role of the "superego," and so on). Second, this research shows the so-called unprovoked emotions may be elicited by quite real environmental stimuli which are not realized by the subject at the given moment owing to a number of external and internal conditions. Unaccountable emotions, which are elicited by unrealized stimuli, are a rather common phenomenon in the presence of numerous neurotic states and psychoneural diseases. An emotionally labile individual may be influenced by "such a great mass of entirely unaccountable subtle stimuli that sometimes even the patient himself is unable to understand why he had been melancholy and what unpleasantness had compelled him to estrange himself from the gay society in which he had just been enjoying himself with such carefree abandon" (3). Unaccountable emotions can also arise in practically healthy people in extreme conditions, while doing stressful work, especially that requiring rapid switching of attention, in the presence of mental fatigue, and so on. Some conditions promoting the action of unrealized outside signals upon the individual were modeled in our laboratory.

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The so-called perception time--that is, the time required for transmission of sensory information to the central nervous system and for comparison of the signal with its image stored in the memory--is extremely important to psychophysiology and engineering psychology. The author's research, based on the method of reverse masking, demonstrates that perception time depends not so much on the emotional meaningfulness of the signal as on the functional state of the subject's central nervous system (mental fatigue, the action of alcohol, posttraumatic asthenia, and so on).

Naturally, this monograph does not examine all aspects of the "perception and emotion" problem, and far from all of the questions are answered. In particular, the psychological aspect of the problem is not discussed. This book describes an attempt at physiological analysis and interpretation of problems associated with the mutual relationships existing between perception functions and negative emotions. Much attention is devoted to the physiological substrates of human reactions to unrealized outside signals. The explanation for this can be found in the fact that physiologists have done little work on the problem of the "unconscious," so important to our understanding of some aspects of human behavior, and that, as the work of our laboratory has shown, it does yield to physiological analysis and explanation from the deterministic positions of the modern teaching on the brain.

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