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LIFE SCIENCES

BIOMEDICAL AND BEHAVIORAL SCIENCES

No. 26

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USSR REPORT  
LIFE SCIENCES  
BIOMEDICAL AND BEHAVIORAL SCIENCES

No. 26

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## AEROSPACE MEDICINE

### PSYCHOPHYSIOLOGICAL PILOT TRAINING

Moscow VOZDUSHNYY TRANSPORT in Russian 14 Sep 82 p 3

[Article by A. Korolev, special correspondent: "Shaping the Pilot's Personality--to Train Worthy Replacements"]

[Text] What is a "powered Hercules"? Or a "handwalker"? Or "complex platform equipment [gear]"? ... To the unlightened none of this means anything, nor does the concept of "psychophysiological town." Yet it is expressly in such towns, of which there are two at the Kirovograd Higher Flight School (one at the central base and one at the training airport), with special training equipment, that the necessary professional skills are developed in pilots.

These unique complexes did not appear suddenly or on their own at the educational establishment--time itself imperiously demanded that they be created. And, if we were to put it more precisely and broadly, our times make it imperative to radically alter the entire area of physical training of future pilots. And such change began actively last year, when, by order of the minister of civil aviation, departments of physical education at three pilot training VUZ's were converted into departments of physical and psychophysiological training of flight personnel. The first steps taken in one of them, the Kirovograd Higher Flight School, show that the decree of the CPSU Central Committee and USSR Council of Ministers, "Further Broadening of Physical Culture and Sports," is being implemented there in a business-like manner.

The news thundered on a bright day: a group of cadets was grounded.  
For what reason, why?

"For a very weighty reason," explains the head of the school, Prof A. Komarov, doctor of engineering sciences. "These cadets were unable to meet the mandatory test standards in physical training. They were worked out in the department of physical and psychophysiological training."

"What is a modern aircraft?" ponders Andrey Aleksandrovich Komarov, sharing his thoughts with us. "It is truly a unique tool of human endeavor. At the present time, the concepts of 'pilot' and 'operator of particularly complicated control systems' are identical. And now, on a par with purely technical problems of

development of aviation, the problem of reliability of the human factor has emerged, which is called 'psychophysiological barrier' in the scientific literature. With increase in speed of flight and with introducing of more and more new automated systems, flight personnel have to work under conditions of limited time, and sometimes a shortage of time, for decision making, they must experience great neuroemotional loads. Whoever has decided to devote himself to the 'winged profession' must possess an aggregate of specific physical and psychophysiological qualities. Graphically speaking, the aviator must have a high 'safety factor.'"

The staff of the department of physical and psychophysiological training of flight personnel, headed by Docent R. Makarov, candidate of pedagogic sciences, is concerned expressly with solving problems of increasing the "human safety factor" in tomorrow's flight engineers and navigator-engineers.

Robert Nikitich Makarov has a long history behind him that is related to sports, educational and scientific work. He worked for many years at the Air Force Academy imeni Yu. A. Gagarin: as instructor, teacher, senior teacher and docent. He defended his candidatorial dissertation in 1970. R. Makarov published one book after another on different aspects of physical training of pilots. He is also working on his doctoral dissertation....

Robert Nikitich did not have to spend much time thinking about the offer to head the chair at the Kirovograd Higher Flight School: the new educational establishment opened up great latitude for creativity.

When it was learned at the school that the head of the department had authored more than 200 scientific works, dozens of books, strange as it seems, some people did not form a favorable opinion of Makarov: "A theoretician has arrived.... we know what they are like...."

And Robert Nikitich was also not at all in a radiant mood after learning about the capacities of the sports-education base at the school. For example, he discovered that there was only one horizontal bar at the camp airport!

The "theoretician" began with action, creation of a base. But even if he had been a Solomon, there was little he could accomplish alone. The headquarters personnel and Party organization of the school supported all of the useful initiative of the department head. The deputy-director of the school for educational and scientific work, A. Guzenko, and deputy-director of the school for ground-based services, A. Golyak, as well as other administrators were very helpful to him.

V. Bitsyura, head of the school's athletic base, and I. Khudaynatov, a laborer, were loyal supporters of Makarov's in the area of actual construction. And, of course, the cadets themselves!

At the present time, there are three soccer fields, seven volleyball courts, two handball courts, an indoor shooting range, inflatable 900-square meter track and field area and other facilities are available to the cadets and permanent staff of the school, where general physical conditioning of flight personnel is strengthened through scheduled exercises and mass sports activities. And, on the basis of this as a firm foundation one can start special physical

training of flight personnel. It is for this purpose that the two, so-called psychophysiological towns were outfitted at the school.

In one of them, I was able to observe the classes of second-year cadets (the very ones who built this town under the guidance of cadet M. Omariyev). The cadets, who were divided into groups, exercised in turn on special equipment. R. Makarov, head of the department, explained:

"The pilot acquires resistance to accelerations, spatial orientation and vestibular stability on the 'loping' [?] ...."

"The 'batut' [?] develops emotional stability, coordination of movements, ability to make decisions within a time limit, fine muscular sensibility...."

"The 'handwalker' develops power endurance and coordination...."

"The complex psychophysiological equipment on a platform 3 meters tall helps the cadets acquire the skill to act in the presence of danger."

Not so much time has passed since the chair headed by R. Makarov was converted, but there are already grounds to discuss some of its achievements. For example, the staff of the department have prepared the main program documents and subject plans. A theoretical course on psychological aspects of flight safety, formation of pilot personality, fundamentals of organization of psychophysiological training has been created.

Scientific research is conducted in the laboratory of psychological and pedagogic studies and organization of psychophysiological pilot training under the guidance of N. Sifun, candidate of medical sciences. The staff of this laboratory, in close contact with specialists from the State Scientific Research Institute of Civil Aviation, Civil Aviation Academy, several other scientific and educational institutions, are conducting research in three main directions: upgrading professional psychological screening for flight schools, investigation of means of organizing psychophysiological pilot training and experimental studies of the means of integral evaluation of pilot readiness for performance of flight assignments.

It should be mentioned here that the work of the laboratory and department is performed in close association with medical specialists. It is not by chance that an All-Union seminar-conference was organized at this school on the subject of "Refinement of system of monitoring physical training and sports in educational establishments of the Ministry of Civil Aviation." Speaking at this seminar, V. Tokarev, head of the Medical and Sanitary Administration of the Ministry of Civil Aviation, stressed that the purpose of strict and constant medical monitoring is to enhance the effectiveness of physical training of students and cadets, to help train students and, ultimately, pilots and other aviation workers for many years of highly productive work.

In one of our conversations, R. Makarov remarked that, unfortunately, many people have an utterly barbarian attitude toward their health. They are quick to detect flaws in things, objects, technical equipment, but absolutely refuse to see the "rust" of hypodynamia--inactivity--which systematically and insidiously

undermines the human body. The head of the department quoted Tissot, the famous French physician of the 18th century: "Movement as such can replace with its effect any medicine, but no medicine on earth can replace the effect of movement."

Thus, long live movement! Morning exercise, exercises with general physical orientation, with special physical orientation, independent exercise by cadets, mass sports competitions--movement, movement, movement!

Speaking about sports, there are 16 sections at the school and Games are organized. Special attention is given to mass sports competitions involving all of the personnel.

Finally, there is another factor that has a beneficial effect on the work of the department head, R. Makarov, his industrious, innovative coworkers, M. Karpenko, A. Redozubov, N. Piven' and others; this factor refers to the personal involvement of representatives of headquarters personnel of the school in physical culture, health-improvement and mass sports activities. For example, V. Demchuk, secretary of the party committee, heads one of the "Health" sections, in which headquarters personnel and instructors exercise, V. Rudenko, head of the flight training at the school supervises the section for mountain climbing, while N. Shevchuk, the head of the school's headquarters supervises the swimming section....

As we see, in this young higher educational establishment of the civil aviation, which will graduate this fall its first pupils into the great world and great flight, a reliable "safety factor" is being actively and purposefully formed in the cadets. This serves as a good guarantee of future achievements in solving complex problems of physical and psychophysiological training of flight personnel.

10,657

CSO: 1840/450

NEW EMPHASIS ON PILOT PSYCHOLOGY IN CIVIL AVIATION

Moscow VOZDUSHNYY TRANSPORT in Russian 5 Oct 82 p 3

[Article by Correspondent L. Tsesarkin in column "The Physician in Our Crew": "Learn Self-Command"]

[Text] Discipline and a lack of self-control, a sense of responsibility for obligations and irresponsibility, a firm word and a lack of reliability. What elicits these or other human actions, what is their cause? How does the psychological climate in a group influence work results?

These questions were answered by I. Ryapolov, Chief Psychologist of the Civil Aviation Central Clinical Hospital-Polyclinic, in a conversation with our correspondent.

Discipline is a very complex and broad concept. This question is of daily concern for the leadership of workers' groups and for party, union and Komsomol organizations, and an important politico-educational work is underway in this direction. None of this is accidental, since discipline is directly associated with flight safety and regularity and with work quality.

It was said by the ancients that: "A man's character is his fate." And they were right in many respects. But very much depends upon the nurturing of character at home, in school and at a higher educational institution and, later, upon the person himself.

Civil aviation is perhaps one of the most complex branches in the national economy. Here as nowhere else disciplined and volitional people are needed. It is therefore no accident in recent years that medical psychologists conducting professional and psychological selection of entrants have been found in the admissions committees of civil-aviation flight and flight-technical schools.

By the way, the typical secondary-education school certificate serves as its own psychological document. It can say very much about a young person's character. If the certificate scores are low, this indicates that the youth

was for many years inattentive, lazy, undisciplined or simply without initiative. Of course, our educational program is made up such that any normal student can easily become well educated.

Therefore, we examine entrants with the help of various psychological tests and devices, determine the level of their attention and memory, speed of thought and emotional stability--in a word, nearly all psychophysiological characteristics of the organism. It should be stated that the examination devices and methods are continuously improved upon from year to year.

And here at last the young person has travelled the thorny path of exams and tests and with pride and joy wears the uniform of a flight-school student. It is here that the personality development of the future aviator really begins. And very much depends upon the pilot instructor. He teaches his pupils not only mastery of the secrets of a professional craft. The instructor must also be a subtle psychologist and be able to find an individual approach to each student. He nurtures in them emotional stability and teaches self-control, organization and discipline. Of course a true pilot always represents a fusion of a fine professional craft and high moral qualities.

It is of interest to note that the Branch of Aviation Medicine of the State Scientific Research Institute of Civil Aviation has analyzed the effectiveness of professional-psychological selection. And it was found that the mean estimates of student success are higher now than before introduction of selection. And, most important, expulsion has declined significantly. This indicates that from the very beginning people have been selected for the schools who are most suitable to the work in our branch not only in knowledge but also in psychophysiological makeup.

Diverse psychophysiological investigations are being conducted at Aktyubinsk Higher Flight School, and combinations of various exercises are under development. The specialist psychologist recommends to one or another student that he develop, say, reflex speed and, to another, the strengthening of attention. The former must then work on a trainer, the other must perform simulation exercises.

A scientifically based system for manning crews is now being developed with the aim of creating the optimal psychological climate. Attention is of course focused on the commander. Not only his professional but also his moral-volitional qualities are studied. Of course the ship commander always, everywhere and in everything must be the leader. The crew must perform unquestioningly the orders of the ship commander. But it is one thing if a person is the commander only by appointment. And it is entirely another if the crew truly respects its leader. Then all his dispositions will be carried out much more rapidly and precisely. This is especially important in stress situations. And such harmonious crews get tired much less during normal, daily work and have a higher work capacity.

The observations of psychologists and practitioners show even that if the very best specialists are assembled on board this in now way means that an

ideal crew will be obtained and that the specialists will perfectly execute a flight. In civil aviation, perhaps as in astronautics, a huge role is played by the psychological-compatibility principle. If the crew has been incorrectly chosen, this lowers its work ability and induces tension, fatigue and irritability. And in the final analysis all this affects the flight quality level.

Finally, a person's character can change in one or another direction. Very much here depends upon the aviator himself. Volitional qualities can and must be nurtured in oneself and strengthened. To begin if only with the most simple: always have a neat appearance, be punctual for work, keep one's word and be conscientious even in details.

Of very great significance, especially for youth during the period of character development and formation, is the example of an older comrade, that ideal to which one must strive, the person that one wants to be like.

And, finally, of no small significance is the health, mood and psychological state of aviators. In recent years, in many airports, rooms for psychological relief have been established. Presently, only for the flight controllers but in the future for pilots. Preflight and postflight rest will be promoted by music, the interior and phytoncides--volatile substances. And in this pleasant environment the psychologist will conduct psychotherapy.

A healthy, rested person makes many fewer technical and ethical errors. Whereas, but a tired person flight is an extra load, for a well-rested pilot in a cheeful and animated mood, flight is a true pleasure.

Now, the work of the branch's medical service and the efforts of medical psychologists are directed at the creation in each group, in each crew, of a healthy psychological climate. A business-like, pleasant and agreeable environment is a guarantee of successful, precise work, a guarantee of increased productivity and of enhanced flight safety and regularity.

9942

CSO: 1840/70

AGROTECHNOLOGY

UDC 632.4:633.11:582.285.2:551.52

EFFECT OF SOLAR RADIATION ON UREDOSPORE VIABILITY OF WHEAT BROWN RUST AGENT

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 16, No 3, May-Jun 82  
(manuscript submitted 27 Aug 81) pp 211-214

PAVLOVA, T. V. and SANIN, S. S.

[Abstract] Exposure of uredospores of wheat brown rust to direct and diffuse sunlight showed that infectivity and viability were variably affected. Whereas the effects of diffuse sunlight were insignificant, direct sunlight reduced germination by 18% after 10 h, by 58% after 2 days, and by 79% after 3 days of exposure. The corresponding reductions in infectivity after 1, 2, and 3 days of direct sunlight were 36.0%, 72.7%, and 90%. Dark reactivation (in terms of viability) was evident after 3 days of direct sunlight, but not after 4 days. Figures 3; references 15: 7 Russian, 8 Western.  
[420-12172]

UDC 632.4:633.11:582.285.2

DIAGNOSIS OF LATENT BROWN RUST OF SPRING WHEAT BY FLUORESCENCE MICROSCOPY

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian Vol 16, No 3, May-Jun 82  
(manuscript submitted 24 Nov 81) pp 266-272

SHCHEKOCHIKHINA, R. I., GAPONOVA, A. G. and NAUMOVA, I. P., All-Union  
Institute of Plant Protection, Leningrad

[Abstract] Fluorescence microscopy was used to evaluate the lesions produced in resistant (Verld-Sidz 1877 [sic]) and susceptible Saratov 36 spring wheat infected with brown rust spores (*Erysiphe graminis* f. sp. *hordei*, race 77). Characteristic lesions (green fluorescence vs. normal bright red fluorescence of unaffected portions of the leaf) were seen on the resistant variety in the absence of visually apparent pustules, whereas in the susceptible variety the microscopic lesions had progressed to gross pustules within two weeks. Evidently, infection of the resistant varieties follows a latent course without frank manifestations of brown rust, but can, in the face of high morbidity, adversely affect the yield grain of the resistant plants. Figures 5; references 26: 18 Russian, 8 Western.  
[420-12172]

BIOCHEMISTRY

UDC 576.852.1.095.5

INTERSPECIES RECOMBINATION IN STREPTOMYCES GRISEUS, STREPTOMYCES OLIVACEOUS AND STREPTOMYCES COELICOLOR

Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 44, No 1, Jan-Feb 82  
(manuscript received 20 Jul 81) pp 3-7

SHEVCHENKO, A. A., MAKARCHUK, L. M., SHUMANN, G., FLEK, V. and MATSELYUKH, B. P., Institute of Microbiology and Virology, UkSSR Academy of Sciences; Institute of Microbiology and Experimental Therapy, German Democratic Republic Academy of Sciences

[Abstract] The goal of the study was to get genetically marked strains of *S. griseus* B6 (I) and *S. griseus* IMET 3933 (II) and then to cross them with *S. coelicolor* and *S. olivaceus*. Single, double and triple auxotrophic mutants of both *S. griseus* strains were obtained by UV irradiation or by treatment with nitrosoguanidine; most of them proved to be unstable, however. Interspecies crossing of *S. coelicolor* A3 with I and II was affected by the presence of plasmid SCPI: with it the crossing of II with *S. olivaceus* containing the plasmid pSOL gave a fertile product. The interspecies hybrids obtained exhibited a limited set of recombinant genotypes most of which were represented with prototrophs. Antibacterial spectra, resistance to antibiotics and fertility of the hybrids obtained showed that hybridization of these streptomyces species could be used in selection studies with strains producing leucomycin and streptomycin. References 7: 3 Russian, 4 Western. [34-7813]

## ISOELECTRIC FOCUSING OF PROTEOLYTIC ENZYME COMPLEX FROM SUBMERGED CULTURE OF BACILLUS MESENTERICUS

Kiev MIKROBIOLOGICHESKIY ZHURNAL in Russian Vol 44, No 2, Mar-Apr 82  
(manuscript received 9 Jan 81) pp 22-27

BONDARCHUK, A. A., KOLTUKOVA, N. V., ZAKHAROVA, I. Ya. and VASKIVNYUK, V. T.,  
Institute of Microbiology and Virology, UkSSR Academy of Sciences

[Abstract] A proteolytic complex of *Bac. mesentericus* enzymes was isolated from submerged culture and its properties were investigated. This preparation catalyzed hydrolysis of a number of proteins of animal origin, indicating a complex composition. By means of isoelectrofocusing on a borate-polyol system in a wide range of pH values, finally two fractions were isolated with marked activity towards casein and elastin. They exhibited isoelectric points 9.6 and 9.2 respectively. To determine more precisely these enzymes, they were treated with EDTA, an inhibitor of metal proteases, and with phenylmethylsulfonyl fluoride (PMSF) - an inhibitor of serine proteases. The data obtained showed that the enzyme with pI of 9.6 included serine proteases and the one with pI 9.2 - the metal-dependent serine proteases. Presence of two groups of enzymes in the complex indicated existence of two structural genes in the genome of *Bac. mesentericus*. Multiplicity of various protease forms within each group is probably due to posttranslational modification. Figures 6; references: 7 (Russian, one by a western author).  
[29-7813]

UDC 615.2.015.44+612.014.46

## INTERACTION OF XENOBIOTICS AND CELL ORGANELLES

Moscow FARMAKOLOGIYA I TOKSIKOLOGIYA in Russian No 4, Jul-Aug 82  
(manuscript received 27 Jul 81) pp 88-92

MURAV'YEV, R. A., Laboratory of Cellular Biology, Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Cytologic phenomena in the inactivation of xenobiotics in biological systems are reviewed from the phylogenetic aspect; they point to the existence of definite cell organelles (chloragosomes in annelids, cytosomes in mollusks, melanosomes in higher organisms, etc.) involved in such functions. These organelles are characterized by the presence of concentric lamellae, frequent presence of pigment, close relationship to the endoplasmic reticulum, existence of various oxidative enzymes in the organelles, and a response to the xenobiotics consisting of their segregation from the cytoplasm and elimination from the cell. The number of such organelles is correlated with tissue involvement in the metabolism of xenobiotics; it is postulated that an inadequate response to the xenobiotics may be a factor in carcinogenesis. References 41; 5 Russian, 36 Western.  
[59-12172]

DETERMINATION OF HISTOTOXICITY OF MEDICAL POLYMERS BY TISSUE CULTURE

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 9, Sep 82  
(manuscript received 30 Mar 82) pp 54-58

GALATENKO, N. A., YATSENKO, V. P., PKHAKADZE, G. A. and LIPATOVA, T. E.,  
Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] Comparative studies were conducted on the determination of the histotoxicity of several medical polymers by methods involving implantation into various organs and subcutaneous implants, and by evaluating the effects of medium 199-polymer extracts on the growth of subcutaneous tissue explants in tissue culture. Numerical evaluation of the degree of degeneration in tissue culture, and comparison with histopathological changes at the implant sites yielded in general good correlation between the two approaches in the outbred-rat system employed. The findings indicated that polymer A-10 (polyurethane + hexamethylenediisocyanate (HMC)/ethyleneglycol) can be regarded as nontoxic, A-23 (polyurethane + HMC/diethyleneglycol) as possessing low toxicity, PM 1/42 (polyvinylchloride) as moderately toxic, and K-1 (polyurethane + teturam) as highly toxic. Figures 3; references 7 (Russian).  
[71-12172]

## BIOPHYSICS

UDC 547.963.3;612.014+541.14:541.147

### POSSIBLE APPROACHES AND SCHEMES FOR AFFINITY SENSITIZED PHOTOMODIFICATION OF BIOMACROMOLECULES IN VIVO

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 6, Oct 82  
(manuscript received 4 Apr 82) pp 1486-1490

BARASHEV, P. P., DEMIDOV, V. V., TAL'ROZE, V. L., Corresponding Member, USSR Academy of Sciences, and TROFIMOV, V. I., Institute of Chemical Physics, USSR Academy of Sciences, Moscow; Scientific Research Institute for the Biological Testing of Chemical Compounds, Staraya Kupavna, Moscow Oblast

[Abstract] Theoretical foundations for the labeling of DNA with chromophores and subsequent exposure to UV light for the induction of point mutation in vivo are discussed. The key factor for inducing a desired modification rests on the affinity of the chromophore group for a specific base and induction of chemical modification in the sensitized base by UV light of the appropriate wavelength. A similar approach may be utilized in the case of other macromolecules, such as nucleoproteins, ribosomes, etc. References 15: 12 Russian, 3 Western.

[63-12172]

### NUMERICAL STUDY OF STOCHASTIC BEHAVIOR OF SIMPLE BIOLOGICAL SYSTEM

Moscow BIOFIZIKA in Russian Vol 27, No 5, Sep-Oct 82  
(manuscript received 30 Oct 81) pp 890-894

ALEKSEYEV, V. V. and KORNILOVSKIY, A. N., Physics Faculty, Moscow State University imeni M. V. Lomonosov

[Abstract] Autostochastic fluctuations in metabolic processes were investigated by a system of differential equations which modeled the metabolic dynamics. The presence in the phase space of a fluctuating point of an extraneous attractant led to the conclusion that stochastic behavior is a normal phenomenon in biological physics. The dimensions of the attractant determine the sensitivity threshold of the system in terms of each of the dynamic variables. Figures 5; references 9: 4 Russian, 5 Western.

[60-12172]

OPTIMAL TACTICS OF ANTIBACTERIAL THERAPY FOR TRIGGER MODEL OF INFECTIOUS PROCESS

Moscow BIOFIZIKA in Russian Vol 27, No 5, Sep-Oct 82  
(manuscript received 8 Dec 81) pp 900-904

KHOLODENKO, B. N., GEVIKSMAN, Kh. V. and KHOLODOV, L. Ye., Scientific Research Institute for the Biological Testing of Chemical Compounds, Kupavna, Moscow Oblast'

[Abstract] Mathematical consideration is given to the design of optimum chemotherapeutic regimens for the management of bacterial infections in relation to the concentration of the pathogenic microorganisms vis-a-vis the immune state of the host and the antagonistic activity of saprophytes. Using Pontryagin's maximum principle for evaluation of maximum antibacterial activity in relation to the blood concentration of the drug and pathogen concentration showed that when the rate of death of the pathogens in relation to drug concentration rises, the optimum therapeutic concentration of the drug is equal to the maximum tolerable level. However, if the plot of the toxic effect vs. drug concentration decreases, the optimum therapeutic approach consists of establishing a drug concentration maximum early in therapy, followed by a plateau phase, and subsequently a phase in which the blood concentration of the drug shows a gradual fall. Figures 2; references 8: 5 Russian, 3 Western.  
[60-12172]

## BIOTECHNOLOGY

### FUTURE FOR BIOTECHNOLOGY

Yerevan KOMMUNIST in Russian 22 Jul 82 p 2

[Article by M. Amirkhanyan, chief of the Amino Acids Section, Armenian Branch of the "IREA" [expansion unknown] All-Union Scientific Research Institute]

[Text] With the development of industrial and agricultural production, an adverse effect on nature is also growing. The process of waste formation is taking place at all levels of the technological process.

An especially large amount of substances harmful to nature is thrown out by enterprises of the chemical, cellulose-and-paper and petroleum-refining industries, ferrous and nonferrous metallurgy, construction materials production facilities and so forth.

Today, there are three main avenues in the organization of nature conservation, namely dealing with pollution of water, air and soil by means of rendering waste harmless at the enterprises, the creation of closed technological systems, as for example, a circulating water-supply system, and the development of qualitatively new, waste-free technology.

Under conditions of a planned economy, waste-free production has been recognized as the main form for eliminating any harmful effect on the natural environment. It can be achieved in several ways. First, there is the comprehensive processing of raw materials in which waste is completely processed and becomes a technologic raw material which is a secondary material resource; this leads to its complete utilization.

A second way is to develop technological processes in which the yield of the final product is 95 percent or more. These kinds of technological processes insure savings on raw materials and reduce material inputs in production and the volume of wastes formed.

Both the comprehensive processing of raw materials and the development of technological processes giving high yields for the end product are low-waste technological processes and they require extra energy consumption. In order to avoid this consumption, when developing waste-free technology it is necessary to switch to biotechnological processes in which the transformation of organic compounds is done with the aid of enzymes. Here, the conversion of some substances into other substances is 100 percent, without the formation of by-products.

In our republic, environmental protection is of special significance. While it has a total area of only 29,800,000 square kilometers of territory and only insignificant water reserves providing a per capita supply 5.5 times less than the average for the Soviet Union, Armenia is saturated with developed chemical and mining industries which produce a large amount of effluent. And new production capacities with more production facilities and increases in the volumes of effluent are being created.

Effluent pollution of river water leads to changes in fluvial flora and fauna. Changes have been established in the physicochemical and organoleptic properties of a number of agricultural crops in Armenia that are grown using contaminated water.

The still generally accepted opinion that waste is an inevitable result of industrial production is not only incorrect but also harmful. It is rather the opposite that is true: the large volume of effluent and other wastes is the result of imperfect technology and imperfect technological systems.

The CPSU Central Committee and USSR Council of Ministers have adopted a decree on the further development of biotechnology and the application of its achievements in medicine, agriculture and industry. On the basis of these most important decisions, the USSR State Committee for Science and Technology, the USSR Gosplan and the USSR Academy of Sciences have adopted goal-oriented scientific-technical programs on biotechnology.

On the basis of biotechnology, the Armenian Branch of the "IREA" All-Union Scientific Research Institute and a branch of the All-Union Scientific Research Institute of Genetics have jointly developed a number of low-waste and waste-free processes, in particular, methods for obtaining optically active amino acids and their derivatives, and enzyme preparations which are of great significance in agriculture, the food, medical and chemical industries, microbiology, medicine and science. This work was part of the goal-oriented comprehensive program confirmed by the USSR State Committee for Science and Technology, the USSR Gosplan and the USSR Academy of Sciences.

Biotechnological processes where the end product is obtained with the aid of biological catalysts--enzymes--have low material and energy intensiveness and require only soft conditions for the reaction, namely an aqueous medium and a temperature of 30-40°C. They replicate biochemical processes that exist in nature and they are waste-free.

At the Armenian Branch of the "IREA" All-Union Scientific Research Institute, using raw material treated by microorganisms, new methods have been developed for obtaining three enzyme preparations, namely aminoacylase, used to obtain optically active amino acids, proteinase for hydrolysis of proteins, and amylase, for obtaining glucose from starch.

The aminoacylase obtained makes it possible to replace an expensive raw material in short supply--porcine kidney--used for this purpose. The new method is being introduced at the Abovyan plant for biochemical preparations and at the Rasskazovo biochemical plant in Tambov Oblast. It makes it possible

to save hundreds of tons of porcine kidneys for other needs, insures a good economic effect and provides an opportunity for organizing ton-batch production of active amino acids in the USSR.

The two other enzyme preparations, both separately and combined, have been used to obtain alcohol from potatoes. According to the preliminary figures, when this development has been introduced it will be possible to achieve an annual savings of more than R1 million. These enzyme preparations can also be used in the production of beer in order to improve taste qualities and increase shelf life; in wine making to eliminate sedimentation of a protein nature and improve nutritional properties and taste; in bakery to improve the nutritional properties and taste of bakery products; and as an effective fodder additive for agricultural animals and fish, where it improves the nutritional value of the fodder while reducing consumption 5-16 percent. According to preliminary calculations R1 spent obtaining the enzyme preparations makes it possible to save R3.5. An extra 30-35 kilograms of mutton can be obtained with the use of a single kilogram of the enzymes.

Amino acids obtained on the basis of biotechnology are used for intravenous nutrition therapy and to produce antineoplastic drugs, effective antibiotics, growth peptide hormones, and vitamins; in the fur industry to improve pelt quality; in fodder production; and to increase lactation and in other spheres of intensive livestock farming; and also to obtain artificial skins, silk and wool that are as good as the real thing.

The waste-free methods we have developed for obtaining optically active amino acids will be introduced at the Abovyan plant for biochemical preparations, which is part of the "Lizin" production association, during the period through 1985. A new, universal waste-free production line to make them has now been set up at this plant.

This year, five designated biochemical preparations will be assimilated on test installations at the plant; according to preliminary calculations this will produce a savings of more than R30,000.

The introduction of waste-free and low-waste processes is one of the most important routes toward the goal set by the 26th CPSU Congress slogan "Economics Should Be Economical,"

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## METHOD FOR SUCCESSIVE CLONING OF LINKED FRAGMENTS OF BACILLUS CHROMOSOME

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 264, No 2, May 82  
(manuscript received 11 Jan 82) pp 482-484

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[Abstract] To construct a *Bac. subtilis* strain containing a plasmid with the entire riboflavin operon, a cloning method was developed for sequential cloning of genetically-linked regions of bacilli chromosomes in form of a series of hybrid plasmids with partially overlapping DNA fragments. The recipient strain *Bac. subtilis* rec E4 rib G850 pJJ108 was transformed with the plasmid pJJ105 which included the gene of rib G and contained homologous regions with pJJ108 in the range of the riboflavin operon fragments limited by restriction fragments PstI-SalGI as well as by DNAPBR322. The plasmid pJJ105 was obtained by transformation of *E. coli* cells 100r<sub>R</sub> m<sub>R</sub><sup>+</sup> of plasmid DNAPLP95 treated by restrictase SalGI and by polynucleotidyligase. Thus this plasmid, incapable of being replicated in the bacilli cells, could be "saved" through its insertion into the "helper" plasmid pJJ108 along the homologous fragments of the riboflavin operon in the range PstI-SalGI region and DNA pBR322. This method of cloning made it possible to collect in vivo assembly of individual bacilli regions and to form an ordered bank of genes in form of hybrid plasmids with partially-overlapping, linked genome fragments. Figures 2; references 9: 2 Russian, 7 Western.  
[31-7813]

ECOLOGY

UDC 591.112.1:591.323.4

RADIOTELEMETRIC STUDY OF MUSKRAT ACTIVITY IN TERMS OF CHANGES IN HEART RATE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 2, Sep 82  
(manuscript received 5 Jun 82 pp 492-496)

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[Abstract] Radiotelemetry was employed to assess muskrat (*Ondatra zibethica*) activity in free-living and caged situations on the basis of changes in the heart rate. The results showed that in active muskrats the heart rate ranged from 229 to 308 beats/min, while at rest a range of 194-248 beats/min was recorded. Furthermore, definite circadian variations were apparent in the heart rate that were unrelated to season, sex, and the aqueous environment of the free-living muskrats but were related to diurnal activity; motor activity on land was accompanied by high-amplitude fluctuations in the heart rate, pronounced bradycardia accompanied diving and orienting activity (a ten-fold decrease in the heart rate), and changes in the heart rate paralleled various external stimuli to which the muskrats were exposed. Figures 3; references 14: 5 Russian, 9 Western.  
[19-12172]

## GENETICS

FOURTH CONGRESS OF ALL-UNION SOCIETY OF GENETICISTS AND SELECTION WORKERS  
IMENI N.I. VAVILOV

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 9, Sep 82 pp 135-136

[Report by V. Dishler]

[Text]. The All-Union Society of Geneticists and Selection Workers imeni N.I. Vavilov [VOGiS] has about 10,000 individual members and 211 institutional members. This large army of scientific workers is solving the central problems of contemporary general, agricultural and medical biology and it stands at the vanguard in resolving the urgent problems of scientific and technical progress in agriculture. The achievements of genetics form the basis of modern evolutionary theory, and 50 percent of the world growth in agricultural output is taking place solely through the breeding and introduction of new varieties of agricultural crops; and hereditary diseases now stand in third place among all diseases in man [sentence as published: probable line drop in original].

The significance of genetics and selection in solving the most urgent national economic problems was particularly underlined at the 4th VOGiS Congress which took place 1 through 5 February 1982 in Kishinev, and which was attended by more than 1,500 scientists from the USSR.

The role of genetics and selection work in the intensification and stabilization of agricultural production in our country was one of the main themes in a number of reports at the plenary sessions of this forum, presented by USSR Academy of Sciences academician D.K. Belyayev, president of the Moldavian SSR Academy of Sciences A.A. Zhuchenko, VASKHNIL vice president and director of the USSR Academy of Sciences Institute of General Genetics A.A. Sozinov, VASKHNIL academician L.K. Ernst, USSR deputy minister of agriculture V.S. Shevelyukha, and chief [nachal'nik] of the State Committee for Plant Variety Testing M.A. Fedin. Those presenting the reports stressed the need for breeding new, high-yield varieties of agricultural crops and breeds of animals adapted for different conditions through the use of the entire arsenal of traditional and modern methods of genetics and selection: intraspecific and broader hybridization, experimental mutagenesis, methods for obtaining heterosis hybrids, tissue culture, transplantation of fertilized eggs, and chromosome and genetic engineering.

Achievements in the field of the genetics and selection of microorganisms are also of great national economic significance. Selected microbial lines are now being used in the production of proteins, antibiotics, amino acids, vitamins, enzymes, yeasts, methane and other substances essential in medicine and veterinary prophylactic practice, to enrich food and fodder products and for other purposes. Forms of microorganisms are being created to utilize domestic and industrial waste and purify effluent and water reservoirs by removing oil, along with strains that are used to protect plants against pests and diseases and in the technological process in the petroleum and metallurgical industries. Selection work has been initiated on nitrogen-fixing bacteria, which is opening up the prospect of reducing the need to produce and use expensive nitrogen fertilizers that are harmful to the biosphere. A review of results and prospects in the field of the genetics and selection of microorganisms was presented at the plenary session in the report of professor S.I. Alikhanyan.

Molecular genetics and its application--genetic engineering--is now playing a vanguard role in genetic and selection research. Achievements in this field of science are opening up fantastic prospects for revealing the deepest secrets of life and for creating forms of living substances unknown in nature but useful for man, primarily microorganisms. Studies on gene function and regulation and an understanding of the laws and mechanisms involved in the formation of hybrid DNA molecules have already provided an opportunity to create remote hybrids of microorganisms suitable for the industrial production of insulin, interferon, growth hormone and other very valuable drugs. The reports of academician of the USSR Academy of Sciences A.A. Bayev, Academician of the Ukrainian SSR Academy of Sciences S.M. Gershenzon, and Professor S.G. Inge-Vechtomov dealt with problems of molecular genetics and genetic engineering.

Three years ago, the All-Union Society for Medical Genetics was set up on the basis of the VOGiS Human Genetics and Medical Genetics Section. The new society is an institutional member of VOGiS, and at the 4th VOGiS Congress, medical genetics and human genetics were covered quite broadly. This is quite natural since the laws of heredity for traits, including various hereditary diseases, in all living organisms, including man, are the same, and the methods used to study these patterns are similar. But since it is impossible to use human subjects for the main method in genetics--hybridologic analysis--in human genetics and medical genetics the methods of cytogenetics, population and mathematical genetics, genealogy, and hybridization of somatic cells are moved to the fore. The most urgent problem in insuring the health of future generations in man is to halt biospheric pollution with mutagenic, toxic and radioactive substances which cause damage to the heredity of organisms. The medical and social aspects of human genetics were set forth in a report presented by academician of the USSR Academy of Medical Sciences N.P. Bochkov.

In addition to the plenary sessions, there were also 44 symposia at the congress. The 39 subjects at the symposium meetings covered all present-day problems of genetics and selection: the organization of the genetic apparatus in the cell and the regulation of gene function, evolutionary and population genetics, selection work on animals, plants and microorganisms, environmental protection--preserving the gene pool and controlling pollution--

mathematical genetics, the theory of selection, gene and chromosome engineering, medical genetics and human genetics. Reports were presented on all the subjects covered by the symposia and discussed in workshops.

Some 15 members of the Latvian VOGiS participated in the work of the congress. Our republic society was represented in the symposium report "Population Genetics and Large-Scale Animal Breeding" (A.A. Tsalitis) and five workshops.

The accountability report of the VOGiS president, N.P. Bochkov, was discussed at a delegate meeting and a new presidium, central council and auditing commission were elected for the society. Corresponding Member of the USSR Academy of Sciences A.V. Strunnikov was elected for a 5-year term as VOGiS president.

In a letter to the CPSU Central Committee the congress participants thanked the party and government for their daily concern about the development of genetic and selection research and expressed their readiness to apply all their efforts to fulfill the plans for the 11th Five-Year Plan.

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MAPPING OF BOS TAURUS LDH, G6PD, AND PRO GENES BY SOMATIC CELL HYBRIDIZATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 4, Oct 82  
(manuscript received 13 May 82) pp 1012-1013

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[Abstract] Calf lymphocytes were hybridized with CHO-K1 ovarian fibroblast line derived from the Chinese hamster to map the location of the lactate dehydrogenase (LDH), glucose-6-phosphate dehydrogenase (G6PD), and Pro<sup>+</sup> genes on Bos taurus chromosomes. Analysis of the resultant 28 clones led to the identification of Pro<sup>+</sup> genes on chromosomes 7 and 20, and of genes coding for the synthesis of LDH subunits A and B, on chromosomes 6 and 21. Confirmation was also obtained for the presence of the G6PD gene on the X-chromosome. References 8: 1 Russian, 7 Western.  
[18-12172]

UDC 576.312.6

RAPID ENTRY OF LYMPHOCYTES INTO S PHASE IN HETEROKARYONS IRRESPECTIVE OF CELL CULTURE PROLIFERATIVE ACTIVITY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 2, Sep 82  
(manuscript received 9 Apr 82) pp 478-481

MAZUR, N. Ya., KUSHCH, A. A. and ZELENIN, A. V., Institute of Molecular Biology, USSR Academy of Sciences, Moscow

[Abstract] Cell fusion studies were conducted to determine the influence of the proliferative activity of L-cells and 3T3 cells on the entry of lymph node lymphocyte nuclei of outbred mice into the S phase. Evaluation of both the T and B lymphocytes demonstrated that rapid commencement of DNA synthesis by the lymphocyte nuclei in the heterokaryons was independent of the manner of cell fusion (with Sendai virus or with polyethylene glycol), that the T and B lymphocytes were equally efficient in entering the S phase within a

heterokaryon, and that rapid commencement of DNA synthesis was independent of the proliferative activity of the L- or 3T3-cells. Furthermore, the lymphocytes had no inhibitory effects on DNA synthesis by L-cell nuclei irrespective of the number of lymphocyte nuclei in the heterokaryons. These findings show that the subpopulation of lymphocytes predisposed to rapid DNA synthesis can be activated by cytoplasmic factors present in both proliferating and resting cultured cells used for fusion. References 11: 6 Russian, 5 Western.  
[19-12172]

## MEDICINE

### SPELEOTHERAPY

Moscow TRUD in Russian 14 Sep 82 p 3

[Article by G. Klyucherov, TRUD correspondent, Transcarpathian Oblast:  
"Mines as Healers--Medicine and Life"]

[Text] I put on a hard hat, took a portable gas mask and flashlight. In other words, I have followed all the rules for miners and then only headed toward the cage [elevator]. The 300-meter descent under ground takes 2-3 min. The gate opens and out of the profound darkness I pass immediately into a softly lit tunnel. This is not a mine or a pit, but the 250-bed Republic Allergological Hospital, which is located in the village of Solotvino in Transcarpathian Oblast.

"Here, microclimate is the therapeutic agent," I am told by Ya. Chonka, deputy chief physician of the hospital, who accompanies me through the underground health facility ["palace"]. "It's [the microclimate's] ingredients are: high levels of table salt particles, completely sterile air, constant temperature in the winter and summer."

The design of this unique health facility was not conceived by an architect or an engineer, but by the director of the Uzhgorod branch of the Odessa Institute of Resort Therapy, Prof M. D. Tortokhin, doctor of medical sciences. The Council of Ministers of the Ukrainian SSR bestowed the State Prize for this to Mikhail Dmitriyevich. This scientist is our country's founder of a new direction in the treatment of respiratory organs and allergies--speleotherapy. He was the first, along with his coworkers, to initiate extensive clinical and scientific studies. As a result, therapeutic complexes were created, in which many diseases related to respiratory organs are cured.

We are walking along the main underground tunnel. It is no smaller than a station of the Moscow subway. The walls, ceiling vaults and floor are all made of light gray salt stone.

There are four side tunnels giving off the main tunnel, each of which is 100 m long and about 6 m high. Special recesses were carved in them that are the size of a small room, where patients are placed.

As I walk, the salt creaks under the feet like snow. I try to breathe deeper in order to detect any special quality to the air of the sanatorium, but

it seems to be the same as on the surface. And how do the patients feel? I interview several of them right in the "salt" wards.

A. A. Sirant (from Stavropol Kray): "I have been suffering from bronchial asthma for 17 years. There was no improvement in any of the places I was treated. My condition led to group 2 disability. But here, it is as if I have been reborn."

The attending physician of Serezha Samoylov, 8 years old (from Kursk), reports: "The diagnosis before therapy was a pre-asthmatic condition and chronic bronchitis. He had a terrible cough, but now Serezha is entirely healthy."

R. P. Tsukanov (from Uzhgorod): "You are looking at a normal, cheerful [hale] person. Yet only recently, I suffered from such dyspnea and cardiac insufficiency that it was a problem to climb to the second floor. They put me back on my feet here."

I asked M. D. Tortokhin, director of the Uzhgorod Branch of the Odessa Institute of Resort Therapy to tell me about the underground therapy.

"Medical scientists have long since been interested in the microclimate of salt mines," said Mikhail Dmitriyevich, "it was known that people who work in such mines are resistant to influenza and colds, do not contract bronchitis and other bronchopulmonary disorders. For this reason, we decided to make a comprehensive study of the effect of a sodium chloride environment on the human body and, first of all on those suffering from bronchial asthma."

"As we know, infection is not the only cause of this condition. It can also be of noninfectious origin. Ordinary odors, completely harmless chemicals, etc., can cause spasms in susceptible people. The difficulty of this disease is that changes occur not only in the respiratory organs, but on the level of biochemical and intracellular processes. Deviations appear in the function of the nervous and cardiovascular systems. In brief, the disease strikes at the whole body. Drugs yield brief effects. Hormones were unable to solve the problem, nor has asthma vaccine justified itself."

"We started to work with speleotherapy about 15 years ago. An experimental clinic was organized for this purpose. An entire set of modern laboratories was also established at the branch."

Observations have shown that the principle, "the longer, the better," does not always by far have a beneficial effect on health. Therapeutic methods were developed. For example, the elderly and children are taken underground only in the daytime and for a short time. There are also patients who spend the entire night there. Of course, there is medical personnel underground, as well as medical equipment, and comfortable conditions for rest have been provided.

It was determined that pre-asthmatic patients, when this disease is at the first or second stage, are cured the best. But, not infrequently, it is also possible to help patients in whom asthma has already acquired a serious form. Speleotherapy is particularly helpful to children. While considerable improvement is observed after a course of therapy is observed in up to 90% of the adults who are treated there, this is true for 95% of the children.

Why is the air in the salt mines therapeutic? It was learned that it contains no pathogenic microorganisms and allergens. Oxygen content is over 20%. The main thing is that there is a large amount of sodium chloride aerosol in the air. It penetrates into all of the ramifications of the bronchial system and liquifies decomposition products accumulated in the bronchi. So-called self-purification of the body occurs.

This is, so to speak, the first phase of recovery. Oxygen-enriched blood regains its biochemical properties. Ultimately, constitutional resistance increases and the body starts to function in a normal, physiological way.

The range of application of this new therapeutic method is broadening. Scientists have established that speleotherapy is instrumental in faster healing of burns, it helps treat skin diseases, circulatory disorders....

Unfortunately, the capacity of the allergological hospital is very limited. A total of 250 beds cannot by any means take care of all those who wish to be treated at Solotvino. Scientists are searching for new ways of using this unique method in clinical practice. At the present time, researchers are testing the effect of the microclimate of karst caves on man. Perhaps, this work will be a new step in the development of speleotherapy.

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## PROBLEM OF RAISING BODY'S RESISTANCE TO EFFECT OF ENVIRONMENTAL CHEMICAL POLLUTANTS

Moscow GIGIYENA I SANITARIYA in Russian No 12, Dec 81 (manuscript received 29 Jan 81) pp 8-10

[Article by Yu. I. Prokopenko, Institute of General and Communal Hygiene imeni A. N. Sysin, USSR Academy of Medical Sciences, Moscow]

[Text] Soviet hygienic science believes that the basis of prevention is creation of optimum environmental conditions for man, and in particular, strict control of toxic substances contained in the environment. However, it is still not always possible to completely shield man from their unfavorable influence. Acting upon the body for a long period of time, in these cases toxic substances may elicit various unfavorable effects manifested primarily as development of adaptive reactions, as amplification of compensatory processes in a number of organs and systems and as reduction of the body's resistance to negative effects. We may assume on the basis of modern ideas about the pathogenesis of disease that the end result of such interaction between environmental factors and the human body depends to a great extent on the state of the body's protective systems, which predetermine the body's resistance and which, in the final analysis, are responsible for lifting the body out of a premorbid state [5,7]. In this connection it would seem justified and necessary to supplement the commonly accepted prevention methods with investigation of ways of raising the body's resistance to chemical pollutants in the environment, seeking agents which would raise resistance and decoding the mechanisms of their actions. A fundamental possibility for raising the body's resistance to unfavorable effects entailing activation of its defensive-adaptive mechanisms has been demonstrated by a number of researchers (1,4 etc.). However, there is little published information on the possible ways of raising the activity of defensive-adaptive mechanisms in relation to the action of chemical compounds contained in the environment.

Solution of these problems has the most important theoretical and practical significance, and it must proceed with emphasis on the use of natural factors, ones which are vitally necessary to normal body function and which have an adaptogenic action. Among such natural factors, long-wave ultraviolet radiation (UVR) from the sun and from artificial sources ( $\lambda=280-400$  nm) is the best studied and tested.

The results of research on UV radiation in experimental and natural conditions indicate that it has a favorable action on the body, manifested as a rise in the activity of the sympathoadrenal system and in nonspecific immunological reactivity, as normalization of phosphorus-calcium metabolism etc. When applied in UV-deficient conditions (in the country's northern regions and in buildings without windows and skylights), UV radiation does have a high preventive impact, leading in the final analysis to a decrease in the overall morbidity of the population.

These properties of UVR permitted us to formulate a working hypothesis which has served as the basis of experimental research conducted by our institute in the last 10 years and aimed at finding ways to enhance the body's possibilities for adaptation to the action of environmental chemical pollutants, at studying the mechanisms of defensive-adaptive reactions and at evaluating them quantitatively. In this connection we made it our objective to develop an experimental system for seeking and evaluating resources by which to raise the body's resistance to chemical pollutants in the environment. The experimental basis for developing this system was represented by research on the effects of the combined action of UVR and a number of chemical compounds having variable biological action most typical of environmental chemical pollutants--general toxic, carcinogenic, embryotoxic and allergenic. Artificial sources of long-wave UVR ( $\lambda=280-320$  nm)--erythematous LE-30 lamps in particular--were used in the experiment. The UVR doses were calculated with a consideration for absorption of UVR by the hair of laboratory animals. The erythema dose was 120 w/min per  $m^2$  for rats and 60 w/min per  $m^2$  for mice. The UV flux was measured with a UFI-65 instrument. Visible changes on the exposed skin surface of animals served as control of the erythematous effect. We used the following as model chemical compounds eliciting the indicated unfavorable effects: aniline, chlorophos, nitrates, tetraethyl lead (TEL), benz(a)pyrene (BP), nitrosodimethylamine (NDMA), dinitrochlorobenzene (DNCB), paraphenylenediamine (PPDA), formaldehyde and cyclophosphamide. It would be important to note that besides directly investigating the effects of combined action, we also studied the influence of UVR on the course of the pathological process itself (be it carcinogenic, mutagenic or allergenic), as reproduced in an experiment in the form of experimental models known and tested in pathophysiology. The carcinogenic process was modeled by inoculated tumors, genetic disorders were modeled by spontaneous mutations reproducible through inbreeding, and the allergic process was modeled by anaphylactic shock. These experimental models permitted us to arrive at an opinion as to the nature and possible mechanisms of influence of UVR upon pathogenesis, and as to the state of defensive-adaptive mechanisms, and to compare the obtained data with those characterizing the effect created by the combined action of UVR and chemicals. During our research on the influence of UVR on specific and general toxic effects of chemical compounds, we resolved questions associated with the possible mechanisms behind the adaptogenic action of UVR. In particular, we determined changes in the red blood system and in the tissue respiration system closely associated with the former, in the microsome oxidation system and in the concentration of salivary proteins, glucuronic acids and lysosomal enzymes. Moreover we studied the state of nonspecific immunological reactivity and antitumor resistance, we determined the growth indicators of induced tumors, and we applied allergological and genetic tests.

The research established the fundamental possibility of raising body resistance to environmental chemical pollutants having both general toxic and specific action (carcinogenic, mutagenic, embryotoxic, allergenic).

The adaptogenic effect of UVR was manifested as a decrease in volume of inoculated tumors (Jensen's and No 45 sarcomas), as a decrease in the number of skin tumors induced by BP, including a more-pronounced decrease in the frequency of malignant tumors, as elongation of the latent time of their formation and as reduction of the number of hepatic tumors induced by NDMA. In this case we noted that the activity of the hepatic microsomal apparatus was greater in response to the isolated action of the carcinogens: The concentration of cytochrome p-450 in the microsomal fraction of the liver was higher, and the activity of hydrolytic enzymes of the endoplasmic reticulum and of glucose-6-phosphatase and acetyesterase in the liver and blood serum was greater. We also established higher indicators for the activity of enzymes involved in tissue respiration. In particular, the decrease in the anode fractions of one of the most important enzymes of glycolysis--cytoplasmic lactate dehydrogenase, which occurred simultaneously with a decrease in the activity of the cathode fractions, was less pronounced than in response to isolated action. Moreover higher activity indicators were established for the enzyme succinate dehydrogenase in blood lymphocytes, and the ratio of this enzyme to  $\alpha$ -glycerophosphate dehydrogenase was higher. The adaptogenic effect also manifested itself as less-pronounced changes in functional state of lysosomes, which were tested in relation to the activity of a lysosome labeling enzyme-- $\beta$ -galactosidase.

The revealed changes occurring in response to the combined effect of UVR and chemical carcinogens are opposite in orientation to changes which are observed with tumor development and which probably lie at the basis of tumor pathogenesis [2,3,6,8-10].

No information has yet been published on the possibility of raising body resistance to chemical compounds eliciting genetic disorders. But the mechanisms we established for the adaptogenic action of UVR in relation to chemical carcinogens permitted us to suggest the hypothesis that these same mechanisms may lie at the basis of the increase in adaptive possibilities of the body in regard to genetic disorders elicited by chemical compounds as well. Research conducted with models of genetic disorders reproducible in inbreeding of four generations of animals (mice of the Bal'b line) showed that UV irradiation at a suberythematous dose decreases the number of still-born animals noticeably (by a factor of four) and hastens postnatal development. To answer the question as to the possible mechanisms behind the established adaptogenic effect, we studied the combined action of UVR and formaldehyde, which has an embryotoxic action, and cyclophosphamide, which produces a mutagenic effect. We found that a suberythematous dose of UVR noticeably reduces the embryotoxic action of formaldehyde when the latter is introduced at 10 to 100 times the maximum permissible dose. However, the mutagenic effect of cyclophosphamide, as determined from the number of chromosomal aberrations, does not change significantly in animals exposed to UVR. The obtained data once again demonstrate that systems responsible for microsome oxidation and stability of biological membranes may participate in the mechanisms of the adaptogenic action of UVR, inasmuch as the embryotoxic effect of chemical compounds depends to a great extent on the functional state of these systems.

We also established in our experiment that the activity of defensive-adaptive mechanisms can be raised in the presence of allergic developments. An increase in such activity was manifested as a decline in the degree of anaphylactic shock in a body sensitized with equine serum and PPDA, as absence of a positive allergic skin reaction when sensitized with DNCB and as a rise in the hexanal-metabolizing activity of the liver. The concentration of N-acetylneuraminic acid in the skin and blood serum and of hexosglycoproteins in blood serum was the same as in intact (unsensitized) animals.

In order to obtain a quantitative characteristic of the effects of combining the action of UVR and chemical substances--environmental pollutants--we conducted experiments of varying duration (acute, subacute and chronic) in which chemical substances were employed within a varying range of doses: from threshold (the maximum permissible dose, and 10 and 100 times the maximum permissible dose) to lethal (one-tenth to one-fiftieth of the LD<sub>50</sub>). The research established general laws for the influence of different doses of UVR (0.25, 0.5, 0.75, 1.5, 3 and 6 times the erythema dose) on the dynamics and degree of toxic action of chemical compounds. Thus depending on dose, UVR changes the degree of toxic action of chemical compounds: The effect of the combined action of suberythematous doses (one-half to three-fourths of the erythema dose) is characterized by antagonism--that is, by an increase in the body's resistance to the chemical substances, while the effect of their combined action at three to six times the erythema dose has a potentiating action--that is, it raises the organism's sensitivity to the chemical substances. The dependence we established between the dose and the effect of the combined action of UVR and chemical substances is parabolic (Figure 1), and it is described mathematically by the following formula:

$$Y = a + bx + cx^2 + \frac{d}{x + 0,01}$$

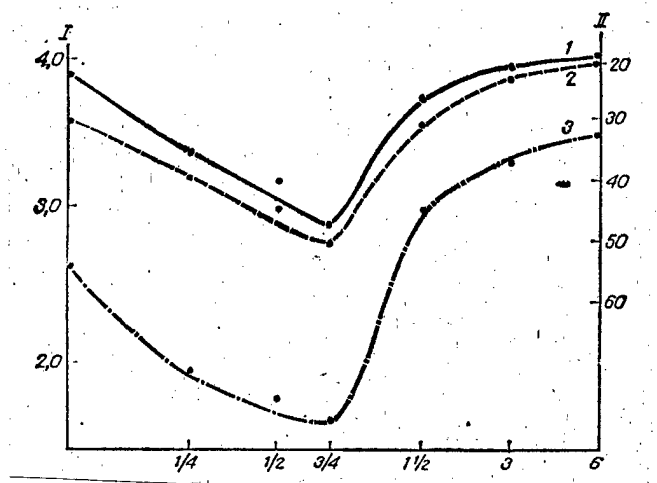


Figure 1. Dependence Between Dose and Effect of Combined Action of UVR and One-Tenth of the LD<sub>50</sub> of Chemical Substances: Abscissa--erythema doses; ordinate: I--quantity of methemoglobin (gm-%), II--quantity of cholinesterase (relative units); 1--aniline; 2--chlorophos; 3--nitrates

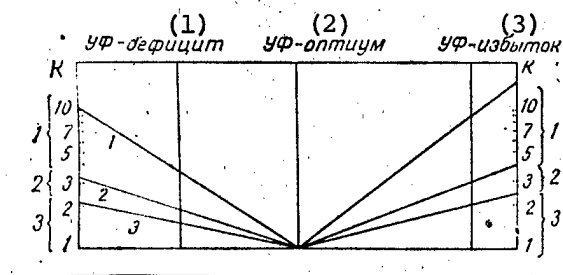


Figure 2. Nomograms of Safety Margin  $K$  in Relation to Maximum Permissible Doses of Chemical Substances in the Presence of Different Levels of Natural UV Irradiation of the Population: 1-3 --Classes of danger

Key:

1. UV deficit
2. Optimum UV
3. Excess UV

The coefficients of combined action obtained experimentally on the basis of the dose-time dependence permitted us to determine the values and plot the nomograms of safety margins in relation to the maximum permissible doses of chemical substances, differentiated in relation to territories typified by different levels of natural UVR (Figure 2).

We also discovered a law governing change in the adaptogenic action of UVR depending on the dose of the chemical substance. For example as the dose of the chemical substance is increased from the threshold level to sublethal, the adaptogenic effect (evaluated as the ratio of iso-effective doses of chemical substances applied singly and in combination with UVR) decreases from 10 to 2. Also important is the fact that the degree of adaptogenic action of UVR does not change as the time of exposure is increased, from 2 to 7 months for example. The reason for this is that a suberythematous dose of UVR hastens development of adaptation to chemical substances, and these adaptive processes come to their conclusion sooner than in response to the isolated action of a chemical substance.

Thus the experimental research results indicate a fundamental possibility for raising the resistance of the body to chemical pollutants in the environment, and they provide some ideas on the mechanisms behind growth in resistance and size of the adaptogenic effect. The results can thus serve as scientific grounds for subjecting the population to UV irradiation with the purpose of preventing the unfavorable action of environmental chemical pollutants and developing a system for experimentally evaluating the adaptogenic properties of natural environmental factors in relation to the unfavorable action of chemical pollutants.

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UDC 616.211/.232-057-084

UPPER RESPIRATORY DISEASES AMONG TRANSPORT FLEET SAILORS AND THEIR  
PROPHYLAXIS UNDER CONDITIONS OF EXTENDED SEA DUTY

Kiev ZHURNAL USHNYKH, NOSOVYKH I GORLOVYKH BOLEZNEY in Russian No 1,  
Jan-Feb 82 (manuscript received 17 Jul 81) pp 35-39

AKULININ, A. I., DRAGOMIRETSKIY, V. D., SHAFRAN, L. M. and DYUMIN, O. V.,  
Chair of Otorhinolaryngology, Odessa Medical Institute imeni N. I. Pirogov  
and Laboratory of Hygiene and Toxicology, Branch of the Scientific Research  
Institute of Hygiene and Sea Transport, USSR Ministry of Health

[Abstract] Sailors of the Black Sea and Latvian steamship lines, carriers of dry cargo and gas, were examined between trips and at the sea. The control group consisted of marine academy cadets. The frequency and type of various diseases of the upper respiratory tract were investigated in reference to different climatic and environmental factors. Significant differences were noted, especially in the zones of sharp climatic changes, where a rapid readjustment of the entire organism was experienced by the subjects. A prophylactic measure was proposed consisting of lavage of the nasal mucous membrane with a 2:1 mixture of sea to fresh water followed by nasal drops of olive or peach oil. Vitamin supplement to general diet was also advocated, References 13 (Russian).

[30-7813]

CRYOPRESERVATION OF ERYTHROCYTE CONCENTRATE AT  $-196^{\circ}\text{C}$ 

Moscow PROBLEMY GEMATOLOGII I PERELIVANIYA KROVI in Russian Vol 27, No 6, Jun 82 (manuscript received 2 Oct 81) pp 16-18

VINOGRAD-FINKEL', F. R., professor, FEDOROVA, L. I., doctor of medical sciences, SEMENOVA, N. V., AZOVSKAYA, S. A., VINOGRADOV, V. L., BATASHEVA, T. V., SHITIKOVA, M. G. and IVANOVA, A. N., Central Scientific Research Institute of Hematology and Blood Transfusion, USSR Ministry of Health, Moscow

[Abstract] An improved method for cryopreservation of erythrocytes has been reported. The method utilizes higher concentration of erythrocytes in a glycerine-mannite solution, doubling the content of erythrocytes and increasing glycerine concentration to 40 vol-%. Erythrocytes frozen under these conditions were stored for a year and then tested. It was shown that they retained size and shape very well. The thawed mixture contained a low level of free hemoglobin and exhibited good metabolic stability. The cell membranes of these erythrocytes retained their ability to regulate ion transport. In general they exhibited normal viability and biological activity. Patients receiving such cryopreserved erythrocytes tolerated them well and manifested their therapeutic value. References 2 (Russian).  
[46-7813]

UDC 615.385.25.036.8:612.111.7.015.2:[547,963,32+577.175.859

CONTENT OF CYCLIC 3,5-ADENOSINEMONOPHOSPHATE AND PROSTAGLANDIN  $\text{E}_2$  IN PLATELETS AND THEIR HEMOSTATIC PROPERTIES DURING BLOOD PRESERVATION AT  $4^{\circ}\text{C}$ 

Moscow PROBLEMY GEMATOLOGII I PERELIVANIYA KROVI in Russian Vol 27, No 6, Jun 82 (manuscript received 15 Jun 81) pp 21-23

SUSHKEVICH, G. N., CHEBOTAREVSKAYA, L. V. and SYATKOVSKIY, V. A., Scientific Research Institute of Medical Radiology, USSR Academy of Medical Sciences, Obninsk and Belorussian Institute of Blood Transfusion, Minsk

[Abstract] The adhesive and aggregational properties of platelets, during preservation of blood, were studied along with their content of cyclic adenosine-3,5-monophosphate (3,5-cAMP) and prostaglandin  $\text{E}_2$  ( $\text{PGE}_2$ ). It was shown that the number of platelets gradually dropped down to 40% of the starting level. The adhesive-aggregational activity was also lowered significantly; aggregation induced with adrenalin or ADP decreased by about 60% and that induced with thrombin dropped to one seventh of the original level. The synthesis of 3,5-cAMP increased gradually with storage.  $\text{PGE}_2$  also increased initially reaching a peak on the fourth day, then dropping to the starting level. An assumption was stated that the increased synthesis of 3,5-cAMP could play a role in the lowering of the aggregational activity of platelets. References 14: 8 Russian, 6 Western.  
[46-7813]

SYSTEMIC HEMODYNAMICS AND MICROCIRCULATION DURING TREATMENT OF BURN SHOCK WITH BLOOD SUBSTITUTES

Moscow PROBLEMY GEMATOLOGII I PERELIVANIYA KROVI in Russian Vol 27, No 6, Jun 82 (manuscript received 4 Nov 81) pp 26-30

KOCHETYGOV, N. I., professor, and KULIKOV, A. M., Leningrad Scientific Research Institute of Hematology and Blood Transfusion

[Abstract] The effect of polyglukin (PG), polydes (PD) and decalcinated gelatinol (DG) on systemic hemodynamics and microcirculation in burn shock was studied on rabbits. Recovery of systemic hemodynamics was achieved optimally with infusion of PG, somewhat less effectively with PD and minimally with DG. This difference could be related to their volemic properties which parallel the observed effect. All of these agents lowered dynamic density of blood and range of viscosity; immediately upon their infusion the rheologic property of blood was improved. Overall, these agents were found to be effective blood substitutes in treating burn shock. PG increased primarily the heart output, but showed a weaker effect on microcirculation. DG improved significantly blood circulation with little effect on systemic hemodynamics. PD showed properties of intermediate nature. References 9: 8 Russian, 1 Western.  
[46-7813]

IDENTIFICATION OF UBIQUINONES IN CERTAIN INDUSTRIAL MICROORGANISMS

Moscow PRIKLADNAYA BIOKIMIYA I MIKROBIOLOGIYA in Russian Vol 17, No 5, Sep-Oct 81 (manuscript received 30 Mar 81) pp 720-723

KOGAN, L. M., OBOL'NIKOVA, Ye. A., ZAMUREYENKO, V. A., USTINNIKOV, B. A., MUZYCHENKO, L. A., LEVONCHUK, I. G., MINTS, Ye. S. and SAMOKHVALOV, G. I., All-Union Scientific Research Vitamin Institute, Moscow

[Abstract] Conditions are described for cultivation of industrial microorganisms and subsequent isolation of ubiquinone (CoQ<sub>n</sub>)-containing fractions. Preparation of the CoQ<sub>n</sub> fraction consisted of boiling the harvested biomass with KOH, pyrogallol, and EtOH under an argon atmosphere, followed by dilution with water and hexane extraction, concentration, storage at -20°C for 16 h, and filtration. Preparative TLC on silica gel was employed for preparation of the CoQ<sub>n</sub>-containing fraction, while combination of TLC and mass spectrometry was used for the identification of the individual congeners. The results showed that CoQ<sub>9</sub>, CoQ<sub>8</sub> and CoQ<sub>7</sub> are present in *Candida utilis* and *C. arborea*, CoQ<sub>9</sub> and CoQ<sub>8</sub> in *Aspergillus niger* and CoQ<sub>9</sub> only in *Asp. awamori*, CoQ<sub>8</sub> in *Endomycopsis bispora*, and CoQ<sub>9</sub> and CoQ<sub>10</sub> in *Micrococcus glutaminis*.  
References 15: 1 Russian, 14 Western.  
[32-12172]

## MICROBIOLOGY

### CHEMOTHERAPY OF VIRAL DISEASES

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Riga SOVETSKAYA LATVIYA in Russian 8 Sep 82 p 3

[Article filed by LATINFORM: "Chemicals Against Viruses"]

[Text] The advances made by modern science laid the foundation for development of effective chemotherapeutic agents to treat viral diseases. Theoretical and experimental research in this direction is acquiring increasing importance to clinical medicine. This was the topic of the Fifth International Symposium of Socialist Nations, which dealt with the problem of "Antiviral Agents," that is holding its concluding meeting today. Scientists from Bulgaria, Hungary, GDR, Poland, the Soviet Union, Czechoslovakia and Yugoslavia participated in the symposium.

R. A. Kukayn, academician of the Latvian Academy of Sciences, chairman of the organizing committee [of the symposium] told us: "Since viruses are very variable, vaccines against them are not always effective. For this reason, much is expected today of chemotherapeutic agents. But studies thereof involve some rather difficult problems, the solution of which has been undertaken by science only in the last decades. Viruses, unlike bacteria, develop only in living cells, and any exogenous intervention should preclude injury thereof. In this case, as they say, one has to be precisely on target. Significant progress in such branches of science as virology, molecular biology and genetics has provided the necessary conditions for realization of new ideas."

Perhaps the most promising task is to find drugs that would prevent penetration of pathogens through cell membranes without detriment to the body. However, there is also another possibility. It was found that certain compounds are capable of arresting viral reproduction, even within cells. Remantidin, which was developed at the Institute of Organic Synthesis, Latvian Academy of Sciences, has this property. Incidentally, thus far this is the only agent in the world for such purposes, which is being delivered to the pharmacy network and already in wise use for the prevention and treatment of influenza. This Soviet drug lowers morbidity to one-fifth the former incidence.

The staffs of several dozen scientific institutions and VUZ's in the USSR are studying antiviral agents. At the present time, the intensive search is continuing for new agents to control the tiniest invisible organisms that strike man, animals and plants. Scientists of friendly socialist nations have joined forces in this area. They are working in accordance with an extensive

coordinated program. More than 70 papers were delivered at this international symposium. Discussion thereof made it possible to summarize the achievements and coordinate future research.

10,657  
CSO: 1840/445

## L-ASPARAGINASE FROM ERWINIA CAROTOVORA 268

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 6, Jun 82 (manuscript received 10 Dec 81) pp 110-111

[Article by R.K. Ozolin', Institute of Microbiology imeni Avgust Kirkhenshteyn, Latvian SSR Academy of Sciences]

[Text] Latvian scientists have achieved great successes in developing the theoretical bases for the formation of biologically active substances by microorganisms and in developing technology for obtaining preparations for the needs of the national economy and medicine. The antineoplastic drugs developed at the Latvian SSR Academy of Sciences Institute of Organic Synthesis include L-asparaginase from *Escherichia coli* [1]. Asparaginase was the first enzyme used in antitumor therapy and is now considered to be among the 10 most effective antileukemic drugs in use worldwide [2].

The CPSU Central Committee and USSR Council of Ministers decree on the further development of physical and chemical biology and biotechnology should promote a further deepening of theoretical research and increase the scales of production and extend the range of preparations for medicine, agriculture and industry.

The use of microbial enzymes in medicine has certain advantages, namely the availability of the enzyme source, cheapness of production, possibilities for standardization, the high level of specific activity, the required spectrum of action and so forth, and also certain disadvantages, namely the heterologous nature of the enzyme protein for man, allergic reactions and others [3]. Limiting the negative qualities of enzyme drugs can be achieved in various ways, namely by the use of chemically modified enzymes, and also by the use of immobilized forms and of enzymes obtained from taxonomically distinct microorganisms.

The use of *E. coli* as a source for the enzyme L-asparaginase has made this microorganism very popular as a subject of biochemical and genetic studies in the laboratories of the world, even though this microorganism does not possess high asparaginase activity. The controlled search for active producers of asparaginase among the natural microorganisms has revealed a group of bacteria in which asparaginase activity is very high while the enzyme protein possesses a number of chemical and immunologic features that are different from proteins

from other origins. We refer to the phytopathogenic bacteria of the genus *Erwinia*. In collaboration with the Ukrainian SSR Academy of Sciences Institute of Microbiology and Virology imeni D.K. Zabolotnyy, at the Institute of Microbiology imeni Avgust Kirkhenshteyn a producer of L-asparaginase, *Erwinia carotovora* 268 with a high asparaginase activity, has been obtained [4]. The selection work constantly being conducted has led to a significant increase in the initial activity of the culture [5].

A series of studies has been conducted to elucidate the nutrient requirements of the producer and the features of nitrogen and carbon metabolism, and this has made it possible to clarify the biochemical regulatory mechanisms determining the "hypersynthesis" of asparaginase, and also to specify the conditions required for culturing the producer to obtain a biomass with high asparaginase activity [6,7]. The nutrient requirements established for the producer make it possible to use a broad selection of organic compounds as the main carbon source in order to obtain a producer biomass. The formation of asparaginase is stimulated by sugars (xylose, galactose), organic acids (Kreb's cycle acids) and amino acids (glutamate). The possibility was also demonstrated of using pentose-containing hydrolysates from various waste in agricultural production (corn stems, cotton bolls, wood pulp and so forth). Use of such hydrolysates with a 1-percent pentose (xylose) content gives an asparaginase yield better than 70 I.U./milliliter of the medium [8]. With a pentose the dominant factor in the hydrolysates, the presence of glucose, which usually causes catabolic regression of asparaginase synthesis, does not lower enzyme yield because of the requirement for this sugar during the initial period of culture growth. Studies have also been conducted on the features of transport of pentoses that stimulate the formation of asparaginase and on conjugation in the transport process with further metabolism of the sugar, and asparaginase activity.

The result of studies on the regulatory mechanisms involved in the formation of asparaginase was the establishment of a metabolic link between the level of asparaginase activity and C<sub>4</sub> compound metabolism in general. A positive correlation was found between the level of asparaginase activity and the level of Kreb's cycle acid activity and the aspartase pathway for the assimilation of ammonium ions. In turn, the latter are determined by the carbon source used.

A determination was made of a number of the physicochemical properties of L-asparaginase from *Erwinia carotovora* 268 that confirm the difference in asparaginase from *Erwinia carotovora* and *E. coli* [9]. The staff of the All-Union Scientific Research Institute of Antibiotics had earlier shown the oncolytic activity of a preparation of asparaginase from *Erwinia carotovora* 268 [10] and the immunologic differences between asparaginase obtained from *Erwinia carotovora* and *E. coli* [11], militating in favor of asparaginases obtained from *Erwinia carotovora* 268. Similar work is being done by our institute jointly with the Latvian SSR Academy of Sciences Institute of Organic Synthesis and its medicinal preparations plant.

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UDC 576.851.11

BIOLOGICAL CHARACTERISTICS OF METHANE-FORMING BACTERIA ISOLATED FROM OIL FIELDS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 266, No 6, Oct 82  
(manuscript received 12 May 82) pp 1483-1485

BELYAYEV, S. S., OBRAZTSOVA, A. Ya., LAURINAVICHUS, K. S. and IVANOV, M. V.,  
corresponding member, USSR Academy of Sciences, Institute of Microbial  
Biochemistry and Physiology, USSR Academy of Sciences, Pushchino, Moscow  
Oblast

[Abstract] Bacteriologic studies were conducted on the methane producers isolated from oil fields in the Tatar ASSR. Three (strains 26, 31, 51) of the isolated strains were identified as closely resembling *Methanobacterium bryantii*, although possessing a higher temperature optimum (37-45°C); another two strains (41 and 348) were identified as showing considerable similarity to *M. formicicum*. Figures 2; references 11: 2 Russian, 9 Western.  
[63-12172]

UDC 578.858

CURRENT CONCEPT OF ONCOGENE AND ITS FUNCTIONS

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 7, Jul 82  
(manuscript received 25 Jan 82) pp 89-95

KUKAYN, R. A., SVIRSKA, R. V. and MUROVSKA, M. F., Institute of  
Microbiology imeni Avgust Kirkhenshteyn

[Abstract] Aspects of the current understanding of oncogene and its functions are discussed from materials in the non-Soviet literature. Nearly 15 oncogenes of different composition have been identified in different sarcomas of fowl and mammals. Products of these genes are of two types: independent proteins and "fused" proteins. Research over the last 15 years at the Institute of Microbiology imeni Kirkhenshteyn has shown that one of the basic etiological factors in cattle leukosis is the cattle leukosis virus BLV. This suggests the possibility of the existence of a cattle sarcoma virus. Figure 1; references 37 (Western).  
[39-2791]

## PHYSIOLOGY

### PARAPSYCHOLOGICAL HEALING DISCUSSED

Kiev RADYANS'KA UKRAYINA in Ukrainian 19 Sep 82 p 4

[Article by Candidate of Medical Sciences O. Kozin in series "Good Health to You": "Does the Biofield Heal?"]

[Text] Health is a priceless gift. And it is not surprising that many sick people are willing to avail themselves of the services of some specialist in order to restore health. My neighbor has a sick child. Unfortunately, thus far all methods of treatment have failed. Once she came to me with the periodical TEKHNIKA MOLODEZHI No 3, 1980. In it was published an article by Associate Member of the USSR Academy of Sciences, Aleksandr Spirkin, "Learning to Know Psychophysical Reality."

I will not reiterate its content. I think that the article is worth reading in the original. However, I will permit myself to comment that the phenomena of telepathy, telekinesis, cutaneous vision and healing by the laying on of hands, etc., (and the article refers to this very thing) have long been known to mankind. And while it is felt that talking about them is at worst not harmful and does not obligate anyone to anything, this is decidedly not true of the question of healing.

To begin with, let's recall the era in medicine associated with soda baths, Novocaine blocks, cabbage and potato juice, tea mushrooms and many other "cure-alls." These have long been forgotten. Unfortunately, readers still often ask organs of the press to familiarize them with the action of particular remedies and their effect on the human organism. As a rule, the answers are given by qualified specialists. But often they forget that in answering such questions scientists must not express their own personal thoughts and as a rule should not share their personal experience but present the scientific point of view officially recognized today. The author of the above mentioned article writes that "some of the (extrasensitives) claimed that under certain conditions they can see an aura, i.e., shining, multicolored haloes around people, animals and plants. But if that is the case, if they see, i.e., perceive, a real object with the organs of sight, in this case an area of space, which shines with multicolored lights, then these particles of matter have to be objectively recorded and perceived by other forms of detection for example, a camera.

And if, as A. Spirkin claims "when a hand is brought close to the human body they feel a biofield at some distance from the body in the form of heat, tingling or light support of the hand's motion," then this biofield must have definite physical and electrical parameters. In other words, it has to be measured and defined in a purely physical manner. Yet we still do not have a single example where the existence of the phenomena of telepathy and telekinesis were scientifically and objectively proved and could be repeated with observance of scientifically valid control. Therefore, for the time being, all extrasensitives are conjurers: some have been exposed, and others are unexposed. Well, in general no one is against studying these phenomena. Here only what has already been proved must be asserted, and proposed hypotheses must be called hypotheses and not scientific fact. The same should be said about the merging of the biofields of psychologically united people. They are "seen" by extrasensitives but not recorded by any equipment.

The author's claim that "as a whole, the biofield is not any of the fields known to physics. This is something qualitatively new" also does not withstand criticism.

Usually everything new is accepted by the "conservatives" of science with difficulty. And not everyone is capable of immediately understanding and giving it an exhaustive explanation. However, I shall permit myself to guess that the last statement about "the biofield as a whole" was made in the response to the journalists' question "What progress has been made in the past decade in studying the physical nature of the biofield?" Ten years is a fairly long period, especially considering that Professor Wilhem Roentgen, who discovered the X-ray, which at that time received his name, gave such a complete description of it in two weeks that subsequent generations have succeeded in adding little, and Aleksandr Popov, after discovering radiocommunications, was immediately and fully able to convince mankind of the reality of his discovery.

In order not to make unsubstantiated statements and become a conjurer in reverse, I shall cite a few, also rather authoritative, thoughts. "Real, physical forces which could explain such phenomena are unknown to science. All the so-called influences of a person's willpower on other people or physical objects are connected with psychological and physical phenomena and not some suggestion not included in these two possibilities. All instances of telepathy, when tested under strict scientific conditions have also failed to confirm the presence of influential forces previously unknown to science," so believes Academician of the UkSSR Academy of Sciences P. G. Kostyuk.

And here's another thought. German Gel'mgol'ts claimed that neither the testimony of all members of the Royal Society nor his own senses could force him to believe in the transmission of thoughts from one person to another outside the recognized channels of perception. But is it possible that all doctors are simply great conservatives and unable to understand and comprehend the rapid progress of progressive science? Let's cite nonmedical authorities: "If by willpower it is possible to move a straw, our picture of the world must change." This is a thought of Michael Faraday, who, by

the way is the same scientist who created the theory of electromagnetic fields.

Another surprising thing. As can be seen from the article, A. Spirkin himself is also not a physician, and he cites the authority of other specialists who are not at all medical men. A pleasant exception is Dzhuna Davitashvili--a nurse and masseuse. Usually it is necessary to enlist physicists, mathematicians and biologists in investigation of biofield phenomena. But why the ability to heal, i.e., cure, comments a "well-known specialist in the field of radio detection and ranging." The following sentence is also very surprising sounding, "She has to her credit many cured people with different diagnoses, both unknowns and the very famous." As if the character of the person and the nature of the illness were a function of whether the patient is famous or unknown! By the way, this sentence is the basis for many legends about the recovery of certain individuals, who are called "those who believed."

Another surprising thing. We are always compelled to take the word of the sorcerer himself or someone writing about him. A correspondent who came especially to interview Dzhuna Davitashvili, tries to convince us that around her head is observed a shining which can be photographed, but for some reason he did not have a camera. He writes, however, that in Dzhuni's words, he has a strong biological field, but an attempt to lift a box by means of this power did not succeed. Isn't something being overlooked here: the analogy with the fact that Ol'zi Lepeshinskiy was unsuccessful in repeating an experiment with spontaneous generation of cells and Baxter, an experiment with the manifestation of emotions in plants? The American Yuri Geller, "a phenomenon," who breaks spoons and forks with his gaze, refuses to demonstrate his ability in the presence of professional illusionists. Or another fact: people are being treated and cured by people who, as a rule, have no medical education.

It is possible that Doctor of Biological Sciences B. F. Sergeev is indeed right. He claims that "For some reason only charlatans display an aptitude for telepathy." And here is what else he writes in his book "The Mysteries of Memory": "Clairvoyants, spiritists, telepaths, thought photographers and the like do not occupy last place among the cohorts of charlatans. Our country has no shortage of mediums. Every "self-respecting" city finds it necessary to have its own unique: Konotop--Elizaveta Balashova; Khar'kov--Lena Bliznova, Sverdlovsk--Nadya Lobanova, Baku--Tofik Dadashev, Ul'yanovsk--Vera Petrova, Nizhniy Tagil--Roza Kuleshova, Leningrad--Ninel' Kulgina, Moscow--Associate-Member of the International Parapsychology Association Ye. Naumov."

The paramedics' activity is of two kinds. Some of them only make a lot of trouble for those organizations to which they send the account of their discoveries. The USSR Academy of Medical Sciences Presidium, like many other institutions, receives such "works," in most cases very voluminous, nearly every day. In them may be found, for example, an account of methods of curing patients by the laying on of hands with transmission of vital warmth to the patient. Paramedics of this kind base the validity of their ideas and the effectiveness of the methods of treatment propounded by them

on their own experience or the experience of their closest relatives and friends.

Another type of paramedic works actively: he surrounds himself with followers, organizes his own type of sect and sometimes enlists public organizations and press representatives in his activity. While the first type confines the realization of his own ideas to the mail and the office, the second is among the propagators of ignorance and prejudice.

Not so long ago I noted how a "shaman" (as his patients called him), equipped with a science degree, treated headache, heart pain and pain from bruises, headcolds and bronchial asthma, nephritis and pulmonary inflammation and even infertility with identical electrical exposures, by means of a device he himself had invented. Unfortunately, the outcome of all these cases could only be identical--the absence of effect. Although not completely so. I was very lucky at that time...I had caught catarrh of the upper respiratory passages and at the "healer's" suggestion, I agreed to verify the effectiveness of the treatment, which, in his opinion, cures angina and catarrh in equal measure. As a result, I completely lost my voice for two weeks, because, quite naturally, the electrical stimulus, like all others, is cold, and it only aggravated my condition.

As usual, the incident with me, as with other people healed by a particular method, cannot be proof or disproof of the value of a given therapeutic method. Careful, scientifically valid clinical testing is necessary; without it no method, even the most fascinating, can be recommended for use.

I am not speaking in favor of conservatism or bald denial of the possibility of the influence of new phenomena and forms of human energies and qualities in the real world. Of course, investigation of every type of biofield must be welcomed, only it is not worthwhile to combine this with "miracle cures," and new methods of treatment must be introduced in compliance with the established procedure and law.

9380

CSO: 1840/13

## UNDERWATER PHYSIOLOGICAL EXPERIMENTS IN GELENDZHİK

Moscow TRUD in Russian 6 Aug 82 p 4

[Article by A. Isayev, Gelendzhik: "Experimentation--Attack on Depth"]

[Text] An experiment is in progress in Gelendzhik, in the Southern Department of the Institute of Oceanology imeni P. P. Shirshov, USSR Academy of Sciences, to test and refine modes for compression and decompression of people who work underwater at great depths.

O. Skalatskiy, chief of the laboratory of habitable [manned] hyperbaric systems, tells us: "This experiment is being conducted by the Institute of Oceanology together with physicians. It is not by chance that Gelendzhik was selected. Here, on the shore of the Blue Bay, a hyperbaric complex was created--an entire system of installations, in which the conditions to which man is exposed under water are simulated."

The first crew consists of four aquanauts, A. Mikhnenko, N. Gertsik, A. Vorob'yev and A. Kulikov, who spent 12 days in the pressure chamber, in the habitable compartment of the complex and "forechamber," where the pressure reaches 9 atm, which creates the effect of being at a depth of up to 80 m. "Submersions," i.e., passages into the forechamber, correspond to man's exit from the underwater habitat to work. At such a "depth," the aquanauts performed various physical exercises, including pedaling on bicycle ergometers, and sensitive instruments monitored their condition.

"How did you feel when you were 'deep' down?" I asked the commander of the first crew, A. Mikhnenko.

"Normal," he answered, smiling.

Now, to continue the experiment and checking the effect of "depth" on the human body, another crew of aquanauts--Yu. Zakharov, A. Suvorov and S. Rodchenkov--will take the night watch in the complex.

... The compressors are humming smoothly, pumping air and helium mixtures into the aquanauts house. Neatly made bunks, suspended from the wall, as well as two bicycle ergometers, on which they "log up" the specified number of kilometers, can be seen through the portholes. The muscular energy expended, the effect of exercise on the heart, lungs and other organs correspond to

changes that occur in the human body after many hours of work under water at a great depth. Physicians, under the supervision of I. Poleshchuk, candidate of medical sciences, who is responsible for the medical part of the experiment, monitor attentively the progress of the experiment around the clock. They can see the aquanauts on a television screen and continuously receive electrocardiography data and readings of other changes by means of sensitive sensors that are connected to instruments. R. Unku, the on-duty physician, showed me a cyclogram of 1 experimental day: checking respiration, the cardiovascular system and psychological tests.

In the evening I returned to the room in the complex. There was muted music; the on-duty group gathered to conduct the experiment. "The crew is drinking tea," said the on-duty physician. I looked in a porthole: the aquanauts, wearing pajamas, were sitting at a table (tea and food is passed to them through a special transfer hatch). A peaceful scene on the level of the bottom of the Azov Sea. The experiment is continuing.

10,657  
CSO: 1840/452

UDC 612.821+159.9:612.766.1

SIGNIFICANCE OF INDIVIDUAL TYPOLOGICAL PROPERTIES OF NERVOUS SYSTEM IN TRAINING TOP-RANKING ATHLETES

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 28, No 3, May-Jun 82  
(manuscript received 17 Nov 80) pp 274-278

SIROTSKIY, V. V., VORONOVSKAYA, V. I., GOVORUKHA, L. I., TROFIMCHUK, G. Ye., ZUYEV, S. N., PANCHENKO, V. M., MAYORENKO, P. P. and PIL'KEVICH, N. A.,  
Laboratory of Human Higher Nervous Activity, Institute of Physiology  
imeni A. A. Bogomolets, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Numerical values were assigned to functions reflecting higher nervous activity and short-term visual memory to assess the correlation between functional efficiency of the nervous system and athletic performance of 19-22 year old fencing masters and 13-16 year old mountain skiers. The results showed that superior athletic performance was correlated with high numerical ranking and that, generally, the numerical values of the older athletes were higher than of the younger athletes. Although assessment of the nervous system appears to be an important factor in predicting potential athletic achievement, such assessment has to be evaluated within the context of anthropometric, physical, and other factors affecting athletic performance. References 10 (Russian).  
[20-12172]

UDC 612.833.81

DEVICE FOR MEASURING AND RECORDING SENSORIMOTOR REACTIONS IN HUMANS

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 28, No 3, May-Jun 82  
(manuscript received 16 Jun 80) pp 363-365

MITRONOVA, I. A. and SIROTSKIY, V. V., Kiev Institute of Psychology

[Abstract] A schematic is presented of a device designed to measure muscle tension as a reflection of mental stress, since the latter is accompanied by involuntary contraction of the skeletal muscles and changes in their tone.

The device is capable of providing information on the latent time, motor time, and the degree of response in a graphic manner. Figures 2; references 8: 6 Russian, 2 Western.  
[20-12172]

UDC 612.821+615.847

SELECTIVE ELECTROSTIMULATION OF CEREBRAL HEMISPHERES AND ITS USE IN IMPROVING THERAPEUTIC EFFECTIVENESS OF ELECTROSLEEP

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 9, Sep 82  
(manuscript received 3 Jun 82) pp 102-105

SPANDEGA, I. A., Latvian Scientific Research Institute of Experimental and Clinical Medicine, Latvian SSR Ministry of Health

[Abstract] Studies were conducted on the selection of the most effective electrical modalities for the induction of electrosleep in 303 patients with regulatory disturbances of the cardiovascular, gastrointestinal, or nervous systems; the cohort consisted of 172 females and 121 males 15 to 68 years old. Impulse current (10-150 Hz, 0.5-10 mA) was applied to one or both cerebral hemispheres in several variations and evaluated by the patient as 'pleasant' or 'unpleasant'. Positive evaluations corresponded to a positive correlation coefficient of 0.735 between the alpha- and theta-rhythms ( $P < 0.0005$ ), and between alpha- and delta-waves (0.612;  $P < 0.005$ ). Negative feelings as a rule were not accompanied by statistically significant correlations between any of the EEG waves. The use of appropriately selected electrosleep-inducing conditions resulted in shortening the individual therapeutic sessions from the usual 60 min to 15-25 min, and the number of treatments from 10-15 sessions to 5-7 sessions with improved clinical results. Figures 3; references 1 (Russian).  
[27-12172]

UDC 612,821

DETERMINATION OF GALVANIC SKIN RESPONSE FOR EVALUATION OF ALCOHOL TOLERANCE IN HUMANS

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 9, Sep 82  
(manuscript received 6 May 82) pp 105-108

KHAKELE, M. Kh. and SPANDEGA, I. A., Latvian Scientific Research Institute of Experimental and Clinical Medicine, Latvian SSR Ministry of Health

[Abstract] Healthy male and female subjects 29-58 years, were tested for the effects of alcohol (0.46 g/kg) on the galvanic skin response (GSR) on the

right and left palms. The subjects were divided into two groups depending on whether the GSR was greater in the right or left hand in background determinations. Furthermore, in the latter group the GSR values were greater for both hands than in the former group and the differences between the right and left hand in this group were statistically significant, whereas in the other group they were not. Alcohol intake led to symmetrical fluctuations in the GSR in the group with higher background GSR values on the left hand, while asymmetrical fluctuations between the left and the right palm were recorded in the group with higher background GSR on the right hand. These observations indicate that the GSR is highly sensitive to the functional state of the CNS and may be used in developing methods for the early diagnosis and prevention of alcoholism. Figures 4; references 9; 8 Russian, 1 Western. [27-12172]

UDC 612.825+615.357

EFFECTS OF INTRAVENOUS INJECTION OF LYSINE-VASOPRESSIN ON CEREBROCORTICAL ELECTRICAL ACTIVITY IN CATS

Tbilisi SOOBSHCHENIYA AKADEMII NAUK GRUZINSKOY SSR in Russian Vol 106, No 1, Apr 82 (manuscript received 31 Jul 81) pp 137-140

KHANAYEVA, Z. S. and MONIAVA, E. S., Institute of Physiology imeni I. S. Beritashvili, Georgian SSR Academy of Sciences

[Abstract] Electroencephalograms (EEG) were evaluated in tubarinetreated cats following injection of lysine-vasopressin into the femoral vein. Analysis of EEG data showed that the injection was followed by immediate short-term (up to 60 sec) EEG desynchronization, subsequently followed by prolonged (30-60 min) synchronization with a spindle-like 5-12 Hz activity component. In view of the established effects of vasopressin on memory consolidation it appears that the late effects were due to central mechanisms. Figures 3; references 8 (Western). [25-12172]

## PUBLIC HEALTH

### GEORGIAN HEALTH CARE PROGRESS, PROBLEMS SKETCHED

Tbilisi KOMUNISTI in Georgian 19 Sep 82 p 1

[Editorial: "Health Care--An Urgent Concern"]

[Text] Among the most important social tasks is concern for the health of Soviet citizens, as L. I. Brezhnev stated at the 26th CPSU Congress, which mapped out a broad program of further development of health care. This statement once again shows clearly the kind of attention that is paid to citizens in our country. It is also dictated by the unceasing, constant concern manifested by the Communist Party and the Soviet government for every member of Soviet society, human beings building communism.

As a result of the social and economic measures that have been implemented, the health care organs have been able to perfect and improve the service. It should also be pointed out that the medical sector's material-technical base has been substantially strengthened, and the network of in-patient establishments has been expanded. Our republic's health care centers are daily adding new hospitals and polyclinics. A few figures will make this graphically clear. In the past decade our hospital beds have increased by a total of 12.34 million [sic], and the polyclinics can handle 13,000 per shift.

The larger medical centers in Tbilisi and other cities of the republic have acquired structures outfitted with modern medical equipment and instruments. The work has been much improved in the primary links--the polyclinics, emergency and first aid establishments, and departmental hospitals and outpatient clinics in the villages; preventive services have been enhanced, specialized medical services have been developed, and so on. This is not enough, however, because we have not yet achieved the level of medical care which the party and the government have asked health care workers to provide.

Recently the CPSU Central Committee and the USSR Council of Ministers passed the decree "Additional Measures To Improve the Health Care of the Population," which presents a profound and thorough analysis of the state of affairs and points out shortcomings along with successes.

The decree points out that the quality of medical care has been improved, but all available possibilities for further enhancing it are not being utilized; efforts to eliminate shortcomings in the organization of the work of the

hospitals, polyclinics, village outpatient clinics, emergency services, and preventive measures are not proceeding fast enough, and so on. All of these deficiencies also characterize our republic's health care services.

Some of our medical personnel still violate regulations and fail to perform their duties properly. Instances of this are not hard to find. A study of patient services in Republic Clinical Hospital for Eye Disorders revealed serious shortcomings. The wards are filthy, sanitary requirements are not complied with, too many beds have been set up, and patients are issued old linen and torn nightshirts and smocks even though there are hundreds of sets of fresh linen and unused garments in the hospital's supply rooms. These facts show clearly that the quality of patient care is far below the hospital's resources and capabilities. The hospital's administration and party organization have allowed standards and control to slacken, they have failed to organize the service personnel's work properly, leading to undesirable results.

Efforts to further improve the health care of the population, as we mentioned above, constitute one of the most important social tasks set forth at the 26th party congress. For this reason, the republic's Health Ministry, gorkoms and raykoms, and soviet organs must focus major attention on new, additional party and government measures to further develop the medical sector.

It is intolerable that there are shortcomings in the assignment of medical cadres and the provision of proper living and working conditions for them. This is especially true of the republic's highlands. Our sanitation-epidemiology service is not performing well. There are shortcomings in the construction of health care facilities and regulation of deliveries of medicines and supplies. The responsible leadership organs must take immediate steps to rectify this situation.

Special attention must be paid to the construction of new health care facilities. The lag in this sector is indicative primarily of the poor performance of the economic and party leadership of the construction organizations. The economic and party officials of the construction organizations must provide effective leadership, improve the organization of labor, complete high-quality work on time and turn the new facilities over to the clients.

Problems of labor protection for industrial and agricultural workers are far from fully resolved. It is vital, therefore, to map out ways to further develop hygiene science, strengthen the material-technical and research base, and enhance contacts between medical scientists and technical personnel; it is also essential to seek out optimal forms of further integrating hygiene science and production, taking account of the specific characteristics of our republic's industry and agriculture.

The GSSR Health Ministry, its various departments, and the scientific-research institutions must, with local party and soviet leadership, promote improved disease prevention efforts, enhance the quality of the dispensary system and medical checkups, especially for women and children, and improve medical services for preschool children. It is essential to improve the administration

of the health care system, in particular in rural areas, where it is essential to expand and strengthen the network of outpatient clinics staffed with physicians, and ensure the improvement of emergency and first aid services, the work of the sanitation-epidemiology stations, and the supplying of drugs and medicines to health care institutions and pharmacies.

Officials of local medical institutions, physicians, and medical personnel are obligated to make a profound study of this party and government decree and see that it is carried out. And higher-level official organs must systematically monitor this effort. Special attention must be focused on the proper diagnosis of diseases in medical treatment institutions and on improvement of laboratory work.

Let us hope that the republic's Health Ministry, its departments, and local party and soviet organs will work diligently to promote enhancement of the population's medical services and to carry out the aims and tasks that the party and government have mapped out for us in the new decree "Additional Measures to Improve the Health Care of the Population."

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UDC 632.4:582.282:633.16

IDENTIFICATION AND CLASSIFICATION OF POWDERY MILDEW RACES ON BARLEY

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 3, Mar 82  
(manuscript received 23 Jul 81) pp 89-98

KAVATSS, G. E. and LANKUTE, R. Kh., Institute of Biology, Latvian SSR Academy of Sciences

[Abstract] A review is presented on the identification and classification of the various races of pathogenic agent (*Erysiphe graminis*) responsible for powdery mildew on barley. A hierarchic scheme for classification is proposed based on pathogenicity for selected barley test-strains, which led to the identification of 512 races of which 116 (22.7%) have been identified experimentally. The findings indicate that formation of races is not based on a free combination of virulence genes and elimination of forms with "surplus" virulence, but involves accumulation of definite gene combinations which are encountered more frequently than some other combinations. This condition allows for the prediction of new virulent races of the powdery mildew agent that may arise. Figures 2; references 26: 2 Czech, 5 Russian, 19 Western. [36-12172]

## RADIATION BIOLOGY

### RADIATION SPECIALIST ANSWERS READERS' QUESTIONS ON RADIATION SAFETY

Moscow TRUD in Russian 26 Sep 82 p 2

[Article by correspondent I. Zagura: "Protection From Radiation: Professor P. V. Ramzayev, Director of the Leningrad Scientific Research Institute of Radiation Hygiene, Responds to Questions From TRUD Readers"]

[Text] The editor's office has recently been receiving many letters from readers wishing to know how serious a hazard of radioactive irradiation is presented by large-scale construction of atomic electric power plants and by extensive introduction of sources of ionizing radiation into different sectors of the national economy. Our correspondent I. Zagura asked Doctor of Medical Sciences P. V. Ramzayev, a USSR State Prize laureate and a well known specialist in radiation hygiene, to comment on the most typical of these letters.

[Question] The mystery of the energy of the atomic nucleus, which man is gradually beginning to master, is directly associated with the problem of radiation protection. Who in our country is studying these problems?

M. Tutin, motor vehicle repair plant  
dispatcher, Ryazan

[Answer] These problems are being dealt with by representatives of a number of specialties, but primarily by us, the radiation hygienists. There are few who are aware of the existence of our science. I think that there are even more people who know that reactors are being installed. Perhaps this is not all that bad. It means that protection is reliable, if it is not noticed. Seriously speaking, however, it would not be a bad thing for people to have some idea about our science, all the more so because there are hundreds of thousands of people in our country with occupations involving the servicing of sources of ionizing radiation. And the number of these occupations is growing.

Radiation hygiene has incorporated three scientific directions: dosimetry, radiobiology and, specifically, protection against ionizing emissions. In general the objectives of our as yet rather young science include detecting an intangible and thus especially insidious radioactivity, clarifying the

changes that occur in the living organism in response to ionizing emissions and protecting it from radiation.

[Question] I work as a fault detection specialist in ship building using gamma-ray equipment. The work is interesting, and I enjoy it. But I often hear that no matter what precautions are taken, I am still exposed to radiation. I would like to know, how dangerous is this?

M. Kravchenko

[Answer] It would probably be worth recalling that there is something called a maximum permissible dose (MPD) recognized today in Soviet and world science. For professionals it is 5 ber per year for the entire body. (ber--biological equivalent roentgen). This dose does not cause injuries to the body which could become detectable at any time during one's lifetime.

But the average annual doses of radiation experienced by most people working with sources of ionizing emissions do not exceed 0.5 ber today--a tenth of the maximum permissible dose.

If we look at ship building concretely, then we would find that since 1961-1962 the average individual annual doses received by personnel working with portable gamma-ray fault detection instruments decreased from 3-4 ber to 1.4-2 ber. In relation to permanently installed instruments, however, this value averages 0.6 ber for the RSFSR. The radiation doses received by workers at Soviet atomic electric power plants are decreasing just as persistently--by up to 0.6-1 ber per year.

Incidentally each of us also receives 0.24 ber per year in our own apartments due to emissions from construction materials, air and natural body radioactivity. This does not seem to have any effect on our lives. Materials gathered by the International Commission on Radiological Protection persuade us that in terms of the degree of risk, jobs associated with radiation have become the safest in all industrial sectors.

[Question] Several years ago an accident occurred at an American atomic electric power plant, showing that such power plants are not entirely foolproof in the sense of safety, as is often asserted. Who can guarantee that the same thing might not happen again at another of these power plants on some fine day?

M. Terent'yev, gas welder, Sverdlovsk

[Answer] Once I was in charge of a project concerned with public radiation safety near nuclear reactors. I can say quite definitely that the accident which occurred at the "Three-Mile Island-2" plant on 28 March 1979 (this is the plant the letter's author was implying) had as its consequence a danger of a sort having nothing to do with radioactivity. This accident served as a unique "trigger" for a campaign against construction of atomic power plants in a number of foreign countries. I will not venture any ideas on what role the monopolies controlling traditional sources of energy played in this campaign. But the fact itself of the referendums and parliamentary debates, occupation

of construction sites by demonstrators and the rumors of the unavoidable harmfulness of atomic power did produce a certain result. The atomic power plant construction programs of England and the FRG were abandoned, erection of atomic power plants in the USA was halted, and something coming close to armed collisions occurred at construction sites in Spain.

But in the heat of the debate for some reason everyone forgot to consider the actual radiation dose that people residing in regions near the power plant received. It was 100 milliber of external radiation. The same quantity, though considered in relation to whole-body irradiation, is the permissible weekly dose for persons working with sources of ionizing emissions.

By the nature of my occupation I am extremely cautious about radiation. But the consequences of this particular accident said something perhaps not about the danger of atomic power plants but more likely about the associated protective measures. By the way, even this incident forced scientists to reexamine the basic premises of public radiation protection in emergency situations so that such a possibility of irradiation might be excluded as well.

[Question] It is common knowledge that a sanitary-protective zone is created around every atomic power plant, but there is another "zone" that arises almost simultaneously, if not earlier, consisting of occasionally the most absurd rumors. Sometimes things go so far that people stop buying vegetables and fruits if they were grown near an atomic power plant. Could we not ask specialists to write about these power plants more frequently, so that there would be fewer idle conjectures?

L. Fomichev, UPTK brigade leader, Smolenskaya AES Construction Administration, Desnogorsk, Smolensk Oblast.

[Answer] All operating atomic power plants in our country do in fact have a sanitary-protective zone with a radius of more than 3 kilometers as a rule for the purposes of radiation safety. Such power plants are located not less than 25-40 kilometers from large cities.

The main argument for locating atomic power plants in remote places is the potential possibility of emergency situations. But research conducted by specialists of our institute categorically demonstrated that it would be much more effective to apply the existing technological possibilities for containing an accidental blow-out than it would be to place an AES in a remote location. The radiation risk to the public would be much lower in such a case.

As far as vegetables and fruits are concerned, I would personally be more interested in something else. For example, was this head of cabbage grown next to a busy freeway? I think that gasoline combustion products, which cabbage "eagerly" accumulates, are much more dangerous to health than would be its proximity to an atomic power plant of any kind. And incidentally, by improving the principles of hygienic standardization and the protective techniques and technology, we have recently made it possible to use some parts of the sanitary-protective zones around atomic power plants to grow annual agricultural crops.

[Question] It seems to me that doctors are much too willing to use radioactive isotopes to make their diagnoses. And they prescribe roentgen radiation in all sorts of cases, whether convenient or not.

L. Shvedova, roentgenological technician,  
Leningrad

[Answer] Medical irradiation does in fact involve the greatest dose. According to the statistics about 60 percent of the public is subjected to roentgenological treatments in the course of a year. Of them, half find themselves in front of the X-ray apparatus once or twice a year. However, the average level of radiation they experience does not exceed the doses they receive from natural sources, and therefore we need not be fearful of the roentgen.

Much has already been done to protect laboratory personnel from radiation exposure: from using the highly effective deactivating preparation "Zashchita" to supplying special protective equipment. In recent years not a single case of occupational illness was revealed among radiologist-physicians working in these laboratories. Nor were there practically any cases in which the maximum permissible dose was exceeded among medical roentgenologists. For the most part the dose they receive does not exceed a tenth of the maximum permissible.

[Question] It has been said that mice leave apartments with color television sets--that they can sense the radiation.

S. Strel'chenko, nurse, Kaluga

[Answer] This is, of course, a fairy tale. Why not hypothesize that they are encouraged to leave such apartments simply because of poor television programming? By the way, there is in fact an abundance of rumors about television sets. So here is the truth. The radiation dose is so much lower than the permissible values that it simply makes no sense to talk about it. Recipes for roentgen-safe glass developed jointly with our institute have now been introduced. And it has reduced radiation from the screens of Soviet black-and-white and color television sets to the lowest limits. But that is not all. The radiation dose experienced by personnel of enterprises at which television sets with such glass are tested, adjusted and repaired are now within 0.1-0.3 ber per year.

In general the radiation hazard created in our century must in no way be belittled, but it should not be exaggerated either. What we need here is the sober viewpoint of a person well informed about all of the pluses and minuses of radioactivity. In general we are now making our first steps toward broad use of ionizing emission sources. And, if the reader would excuse me for using a possibly inappropriate term, we are still "greenhorns" in this area. Radiation hygienists know that "greenhorns"--people who have been working with ionizing emission sources from 1 to 10 years--have a tendency to exaggerate the risk of their work.

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CSO: 1840/51

UDC 616.001.28:612.12

PHYSICAL CHEMICAL PROPERTIES AND STRUCTURE OF HEMOGLOBIN IN COURSE OF ACUTE RADIATION SICKNESS

Kiev FIZIOLOGICHESKIY ZHURNAL in Russian Vol 28, No 3, May-Jun 82  
(manuscript received 25 Nov 80) pp 327-333

PANASYUK, Ye. N. and ZDRAVKO, B. Y., L'vov Medical Institute

[Abstract] Investigations were conducted on the physical chemical and structural characteristics of hemoglobin derived from irradiated guinea pigs (300 cGy, 76% mortality in 30 days). The results showed no presence of methemoglobin in aqueous solutions of hemoglobin, although the latter showed greater susceptibility to in vitro oxidation. Structural features of hemoglobin crystals did not vary from those seen with hemoglobin obtained from unirradiated guinea pigs, while differences in electrophoretic mobility on polyacrylamide gel were ascribed to the presence of a new peptide (A<sup>1</sup>) detected on fingerprinting tryptic hydrolysates of hemoglobin specimens from the irradiated animals. Peptide A<sup>1</sup> disappeared after 46 days; it has not been determined whether its formation was due to direct action of radiation on hemoglobin or on the synthetic apparatus. Figures 4; references 20; 13 Russian, 7 Western.  
[20-12172]

## PARAPSYCHOLOGY

### INCREASING INTERFERENCE OF PARAPSYCHOLOGY IN MEDICINE

Moscow MEDITSINSKAYA GAZETA in Russian 15 Oct 82 p 4

[Article by Professor I. Akulinichev, doctor of medical sciences: "Does Medicine Need Soothsayers? The Conjectures of Parapsychologists and Practical Reality"]

[Text] "For a long time much has been said concerning parapsychologists and psychics who supposedly diagnose and cure many diseases. Is this in fact true?"—O. Kazankov, physician, Krasnodar.

Medicine has been defined as a science and art in a struggle with superstition and mystification, in the conquest of religious and philosophical barriers. Biologists, physiologists and pathologists gave practical medicine the necessary knowledge and harmonious teaching of the functional integrity of the organism. Psychologists and psychiatrists have armed the practicing physician with the ability not only to recognize mental diseases but also to investigate the patient's personality, specifically impaired in each person suffering a disease.

Physicians of the older generation, in spite of all the paucity of laboratory and instrumental equipment, adequately performed their high duty. They were guided by the most simple truth: a person is ill not only in the liver, not only in the heart, but as an integral whole; a patient is credulous and does not think as does a healthy person. The physician's professionalism, raised through the centuries to the level of a high art, first of all inspired the patient's confidence in overcoming the disease and thus assured the mobilization of the body's forces. Now, however, much has changed both in medicine and in the minds of the people under the influence of the scientific-technical revolution and the abundance of information.

First of all, the present age has created in people an anxiety over the "diseases of the age," the consequences of the destruction of the biosphere. Man has submitted to himself colossal natural forces. Ionizing and other radiations and gravitational and electromagnetic fields, possessing biological activity, have drawn notice not only from physicians. Mechanics, philosophers, mathematicians and simple dilettantes, far removed from medicine, have expressed technocratic hypotheses on supernatural biopoles in man, on

supersensory channels for receiving information. Experts have recommended protective screens, antifielid generators and even fantastic methods for treating patients.

Physicians themselves have no small portion of blame for this. Stunned by the onslaught of pseudodiscoveries and quackery and overwhelmed by an abundance of analyses, graphs and report documents, they do not transcend "organic pathology" during the cursory examination of specific disease histories and do not investigate the patient's personality. A yawning gap, through which charlatans gain the patient's trust, has formed as a result of such formalization of medical activity in the interrelationships with the patient.

Now in polyclinics, at the doors of medical consulting rooms, one can sometimes hear how patients receive unique psychological treatment with conversations about the powerlessness of medicine and the omnipotence of psychics. Here there are distributed the addresses of miracle workers, supposedly been cured by a psychic's "wave tension" becomes an advocate of mysticism.

But recall something of the history of the question. For a century parapsychology both here and abroad has been considered as occultism, as an occupation of people who have lost or never had connection with progressive science. Insofar as parapsychologists have not contributed to knowledge and have only deflected intellectual energy from the solution of vital scientific problems, this intolerable phenomenon has been combated and is being combated in all highly-developed countries. Nevertheless, the attraction of parapsychology is periodically revived in the form of a counterfeit of natural science or under more modern names: bioelectronics, bioenergetics and psychotronics. But the goals and methods remain as before!

Parapsychologists do not disdain any means for gaining authority. They depict themselves as sufferers from the inertia of scientists, as implacable fighters against an imagined bureaucratism in science. They burst in the auditorium with the proclamation of sensations, usually tossed up from abroad. Here they especially insistently propogandize conjectures as to supernatural forces, supposedly capable of providing mankind unusual energy and limitless possibilities of telecommunication.

With this purpose, public meetings are arranged. For three to four hours without interruption agitation is warmed around instances of "seeing at a distance" without equipment, "mind reading at a distance," "bloodless" surgery and the "movement of objects without touching." The showing of movies and the pseudoscientific interpretation of experiments conducted then and there with accomplices produce a strong impression. Recently the author of these lines and Doctor of Biological Sciences V. G. Manusadzhan had occasion to speak with a woman who, in a burst of proclaiming her curative powers, referred to scientists who found in her a 50-fold greater "bioforce"; she asserted that during the measurement "all instruments went off scale."

What do parapsychologists propogandize most of all? The so-called "biofield," which "by a psychic is perceived as a certain elasticity or illumination above the sick organ, and during a cure is a factor in the therapeutic effect." But let us look at these phenomena with the eyes of biologists and physicians.

Here and abroad a large number of scientific works have been published whose authors have carefully investigated and have not seen the proposed "biofield" in a wide range of low, ultrasonic and radio frequencies and in all ranges of light, infrared, ultraviolet and X-ray radiation. The use of highly sensitive instrumentation did not confirm the presence in candidates of any kind of unusual energy flows or, especially, channels of communication, while the falsification and machinations of parapsychologists were definitively established in impressive experiments on telekinesis, telepathy and telestasis.

After the discussion held last year at the joint meeting of the USSR Academy of Sciences and the USSR Academy of Medical Sciences on the pseudodiscoveries of parapsychologists, their activity declined markedly.

What must we, ourselves, the physicians, not forget, what should we tell people, especially those suffering convalescence? That biomedical science even now stands at the shore of the limitless ocean of the unknown. There will be and there will always be recognized certain truely phenomenal manifestations of human nature, in particular the complex interactions between man and the environment. Science does not need soothsayers. Its basic instrument is the most elaborate laboratory-technical equipment. If it is in the hands of specialists, gifted with curiosity, self-criticism and professional responsibility, physicians can combat diseases and anticipate their eventual control.

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## PSYCHOLOGY

### REVIEW OF BOOK ON SCIENTIFIC PRINCIPLES AND MODERN MYTHS

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[Review by Candidate of Philosophical Sciences Yu. Orfeyev of book "Nauchnyye printsipy i sovremennyye mify" ["Scientific Principles and Modern Myths"] by V. P. Lebedev, Znaniye, Moscow, 1981, 64 pp]

[Text] UFOs, the Bermuda Triangle, the Loch Ness monster... The adherents of these myths sometimes act in the name of science and appear in the mass consciousness as creators of original theories. The author raises the questions: What is a scientific fact? On what facts do the adherents of pseudo-scientific myths rest? And why cannot these facts be recognized as scientific?

There is an infinite number of possibilities for discoveries of nonexistent phenomena and for obtaining incorrect data in an experiment, not to mention deliberate falsification. Even the most attentive investigator can himself make an error. The processes of perception and our sense organs often permit a glimpse of that which does not exist in reality or the discovery of objects where there are none.

V. Lebedev shows, for example, that recognition of the ability to predict accurately the future actions of a person from a photograph, the so-called proscopia or clairvoyance, leads to the recognition of an absolute determinism of human actions. From this it inevitably follows that the "absence of human free will leads to a loss of meaning of the concept of responsibility for one's own actions and to the liquidation of their legal and juridical evaluation..." But he does recognize that: "The prophesier-clairvoyants possessed a definite talent. A talent to express a vague thought in ambiguous and at the same time indefinite expressions, a talent for finding unusual metaphors and images, which in some measure links them to poets." It is perhaps no accident that M. Nostradamus (1505-1566), a famous clairvoyant, an interest in whom has not been lost even to this day, composed his predictions in poetic form.

In the contemporary literature devoted to prophesy there exists the concept of the self-organizing or self-fulfilling prophesy. The point is that if a man or group of people believe in some prophesy, they may facilitate its realization by means of their belief.

In a critical analysis of modern pseudoscientific myths it is important to draw a distinction between the mythical and scientific explanations of phenomena. But, whereas to an outsider's eyes modern physics becomes more and more "occult"--black holes, "time running backwards," elementary particles changing into one another as if werewolves--modern mysticism cloaks itself in the armor of a precise natural science. However, scientific knowledge is a sequence of theories and models, which at each step more deeply and fully reflect the world surrounding us. But a myth from its inception appears in a complete and finished form. It is not self-critical, it is dogmatic and in this is close to religion. In science the most beautiful theory can be rejected if its concepts are contradicted by new facts. Pseudoscientific myths are invulnerable to experimental falsification.

Very often the adherents of "hidden" phenomena, in reproaching official science for dogmatism and conservatism, cite the debate that broke out at the beginning of the 19th century concerning the existence of meteorites, "stones falling from the sky." The French, English and American academies of sciences refused to believe in them. The arguments of the opponents of "stones falling from the sky" came down to the fact that the absence of evidence, that is to say proof, of the presence of meteorites was "evidence of nonexistence." But as soon as a large number of meteorites fell in France in 1803 and their chemical composition was investigated most scientists changed their opinion.

But modern science cannot recognize the visitors from space, the Loch Ness monster or the abominable snowman, not due to conservatism but because the facts on which the adherents of such phenomena rest admit a different and wholly convincing interpretation.

The UFO myth, which is analyzed by the author, is interesting in that it was born under the eyes of our generation. This myth has widely captured the mass consciousness. The numbers in a single American religious sect of UFO worshippers reached about 15,000 people. The preachers of this cult tell their followers that a UFO will take them into the sky if they can overcome all their human emotions and worldly ties. Certain followers of this cult abandoned a good job, their home and even small children and prepared to leave "this planet" on a UFO in order to undergo metamorphosis and be transformed into creatures with an indestructible body. Another sect, calling itself the "Divine Light Mission", constructed as early as the 1960s a special landing pad in their astral cathedral--the Astrodome in Houston--for the expected arrival of a UFO.

K. Jung was the first 20th century thinker to investigate this strange phenomenon. He related UFOs to a rare variety of collective hallucinations, similar in their psychological nature to the visions of the crusaders (they saw the celestial Jerusalem). The vital basis of the myth, from K. Jung's point of view, is as before the expectation of universal destruction or salvation on the part of certain higher, superhuman powers. According to Jung, the visions yield to the same interpretive principles as do dreams. UFOs and similar phenomena can be explained in two ways; either a certain objectively-existing anomaly in the atmosphere or stratosphere creates the basis for mythicization, or, the anomaly acts only as a release mechanism.

This release mechanism may be a meteorite or the stages of space rockets (they sometimes break up into pieces, burning in the atmosphere). Balloons and airplanes also can be taken as UFOs if they are unusually illuminated. Finally, birds, flocks of locusts. Turbulences ("twisters") in the atmosphere...

The more the press reported on UFOs the more frequently information arrived concerning sightings of the phenomenon. One feature of study of phenomena of the UFO, Bermuda Triangle, Loch Ness monster and abominable snowman type should be noted here: the information on the basis of which science must make a decision usually comes not from research groups but from people far removed from science, accidentally observing one or another phenomenon. This information is often subject to distortion in the telling and it is subjective and contradictory. All this creates additional difficulties in the identification of phenomena of such type and a fertile environment for pseudoscientific mythicization.

V. Lebedev, in speaking of the culturological aspect of modern pseudoscientific myths, asserts that the ancient process of mythicization continues even under the conditions of the scientific-technical revolution. The author, however, accurately notes that no adherent of unusual phenomena will agree that he is a creator of myth and will assert that he investigates phenomena unknown to modern science. But, in V. Lebedev's opinion, "knowledge can be realized not only in scientific form but also in a mythological, of which there is a mass of examples: the properties of the magnet, medicinal herbs, hypnosis, chemical transformations, etc., were known in the distant past and were realized in prescientific forms of thought." The author admits that myths can perform the role of "psychological generators of creative thought," stimulating the appearance of innovative scientific ideas and even lead to a resulting practical activity, as happened, for example, with Schliemann, who found the legendary Troy.

Modern science cannot pretend to a monopoly of universal knowledge. A constructive dialogue is needed between science with its practically-tested methods and knowledge appearing in nonscientific form, which can sometimes perform a heuristic function. In fact, the UFO myth turned the attention of scientists to the importance of investigating specific phenomena in the earth's atmosphere. The myth of the Bermuda Triangle made it possible to discover in its vicinity one of the most intensive magnetic anomalies in the entire world ocean.

I cannot but agree with V. Lebedev's opinion that even an investigation of psychokinesis may reveal not, of course, a field of a special physical nature but something new in the manifestations of the human psyche. And the discussion of the scientific and methodological problems that accompanies such investigations will lead to the refinement of a number of concepts, as well as to the propagandization of truly scientific knowledge.

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