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TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY

BIOMEDICAL AND BEHAVIORAL SCIENCES

No. 19

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INSTRUMENTS AND EQUIPMENT

DEVELOPMENT OF MEDICAL TECHNOLOGY IN CEMA COUNTRIES

Moscow TEKHNIKA I NAUKA in Russian No 9, 1977 pp 32-33

[Article by A. Bogoraz]

[**Text**] In our country the health and life of man are taken care of by the state and by society as if they were the greatest of riches. In connection with the inclusion of a clause on the right of citizens to health maintenance into the draft of the new constitution of the USSR, and furnishing this right by increasing scientific research directed toward prevention and reduction of rate of illness, great tasks arise before scientists, medical workers, and the whole scientific and medical community.

Contemporary medicine requires such a varied, complex, and perfect technology that one country, even though industrially developed, does not always manage to organize production of one or another kind of medical apparatus and instruments. Help comes from socialist economic integration and international division of labor; participation in this by Soviet scientists has also been covered by a draft of the Constitution.

What is being done now in this direction is recounted by associate of the Coordination Center for the Development of Medical Technology of the CMEA [Council for Mutual Economic Assistance] member countries, A. Bogoraz.

Recently in Kishinev, in the Yu. A. Gagarin youth center, an exhibition of modern medical technology was held by four brother countries - Bulgaria, the German Democratic Republic, Poland, and the USSR. At the end of the exhibition, all exhibits - devices and instruments - were donated to the hospitals and clinics of the Moldavian SSR.

This is but one isolated fact in a long line of important deeds accomplished in accordance with the Comprehensive Program of the Socialist Economic Integration. Particular attention in this program is attached to the development of health care, including the creation of modern techniques of diagnosis and treatment.

Now new medical apparatus is being worked out in the CMEA countries on a large scale. Over 500 scientific and industrial organizations are participating in this work - health ministries, academies of medical sciences, and about 50 different sectoral ministries and departments. The Coordinating Center - the All-Union Scientific Research and Experimental Institute of Medical Technology of the Ministry of Health of the USSR - unites the efforts of specialists in solving the most urgent problems; conducts a common technical policy; examines plans for comprehensive development of medical technology, a program of research and development, testing of devices and apparatus; and assesses the possibilities of international specialization and cooperation.

The most complex problems linked to further development of medical technology are solved at meeting at which the leading experts of the brother countries are present: scientists, directors of institutes, clinics, and design bureaus. These meetings of experts are held regularly. And this time here in Kishinev specialists gathered to discuss the problem of utilizing cryotechniques in medicine. And the exhibit of modern apparatus manufactured by the CMEA countries was set up for this very event.

The site for the international meeeting was not selected by chance. The Moldavian medical community had professional ties with their colleagues from neighboring countries. In Kishinev the Bulgarian electro-technology exporter "Electroimpeks", the Hungarian association "Medikor", and the Czechoslovakian plants, "Khirana", have already held their exhibitions. Then, following tradition, the apparatus of these firms and associations was tested in the hospitals and polyclinics of the republic, and as a rule, received high ratings from Soviet specialists.

In the very near future construction will be completed on a 1,000-bed republic hospital. Departments of the Kishinev Institute of Medicine will use it as a base of operations. A hospital for World War II veterans in Tiraspole is being constructed, as well as a number of village polyclinics, each planned for hundreds of visits every day, a republic disease-control station, and

other large-scale health-care organizations and establishments. Firms and associations of the brother countries will participate in outfitting these new buildings with modern medical equipment and instruments.

What then is the claim of the new medical technology created on an integrated basis? Above all, it is distinguished by its unified character and the possibility of flexible combination. Individual apparatus, produced in different countries, now must meet common parameters, so that in the near future it will be possible to aggregate them into electronic medical complexes.

Within the framework of the program of cooperation in medical technology,for instance, Soviet specialists have created a family of diagnostic automatic equipment intended for measuring the values of the cardio-vascular system, the characteristics of the respiratory organs, body temperature and so forth. This apparatus is built using integrated circuits. Put together, they become a portable electronic complex. At the same time, each of them can work independently of the others. In the future, some of these automatic devices will be used as the basic blocks of other autonomic medical complexes being developed in the CMEA countries. Among them are: the cardio-warning signal which automatically analyzes a cardiogram of a gravely ill person and gives an alarm signal upon dangerous deviations of heart function; and automatic units for measuring the speed of bloodflow, temperature and blood pressure.

One such device is the rheoplethysmograph. Doctors long ago noticed the significance for diagnosis of the speed of blood flow in the vessels. But how could blood flow be measured? A decade ago it was done by opening the vessels. The rheoplethysmograph spared patients from such a procedure, ensured automation of measurement, and high accuracy, and raised the level of diagnostic research in vascular diseases.

An apparatus for measuring blood pressure is just as perfect. A cuff is placed on the arm. When switched on, the apparatus automatically sucks in air. On the panel figures flicker. A stop - the upper limit of pressure. Again figures flicker. Again a stop - the lower limit. Quickly and accurately. The doctor doesn't even have to squeeze a bulb.

Of the portable devices, an electrical complex, the "Alarm-2", has also been assembled, intended for equipping cardiology clinics, intensive-care and rehabilitation facilities. These devices have already been adopted by domestic industry and are batch-produced.

Soviet anesthesiological apparatus, among the world's best examples, enjoys deserved praise from surgeons all over the world. Among them are the children's respirator"VITA-1"; the pieces of anesthesiological apparatus "RO-5", the "LADA", the"Matchta"; a device for inhalation anesthesia;and other devices equipped with unique standardized vaporizers which work efficiently with practically any liquid anesthetic substance.

The Soviet X-ray apparatus "ERGA-MT" has achieved a distinctive revolution in the technology of preparing X-ray photographs. Together with any X-ray installation, it allows pictures to be obtained on ordinary paper in two to three minutes. And soft tissues as well as bones are clearly visible.

It is impossible in a magazine article to describe in detail all developments made by the Soviet side within the framework of the cooperative program in medical technology. One can but enumerate some of them. There are: a number of pieces of physical-therapy apparatus (The "Amplipuls-41", the "Eletroson-4", the "Iskra-2"); ultrasonic apparatus("LOR-1A", "LOR-3"), applied for the treatment of hemorrhoids, tonsilitis; the electrosurgical installations ("ES-30", "ES-100), which allow the soft tissues to be cut with a minimal loss of blood; and a new suturing apparatus, which has received recognition in clinics throughout the world.

A set of domestic microinstruments for eye and ear operations, neurosurgery, and so on has received particular praise. Made of titanium alloys, they are light, durable, and corrosion-resistant. Organizing production of them is one of our most significant achievements. Using such an instrument, surgeons can perform operations about which they previously never even dreamed.

The drive to international division of labor yields a greater effect from the specialization of countries in producing certain equipment. In this regard Bulgaria's experience is indicative; Bulgaria was able to create unique devices stimulating organs and tissues,in a short time.

Developments of Hungarian designers specializing in the creation of miniature electronic apparatus are of interest. The plant association "Medikor" supplies unique portable cardioscopes in the CMEA countries. They are basically used by first-aid crews. The doctor, having placed the device on the chest of the patient, sees the electrocardiogram curve on the screen and right there, where the incident occurred, decides which measures must be taken to save the person. Recently, the "Medikor" specialists started producing another new item - diagnostic briefcases. They weigh up to 15 kg. In the case, which is intended for physiological

examination, several miniature devices are compounded which allow the doctor quickly to check hearing, take temperature, blood pressure, note breathing characteristics, run electrocardiograms and electroencephalograms. The diagnostic cases were created for other types of medical examination, too; for example, for quick determination of the chemical composition of the blood and other biological liquids under field conditions.

Poland has achieved great success in creating electronic medical devices. The foreign-trade association "Varimeks" has exported, in particular, revival cots, on which are mounted portable electronic apparatus permitting the person to be revived and his basic vital functions to be checked.

Specialists highly rate the unique complex of apparatus for psychophysiological research also manufactured in Poland. This apparatus permits the readiness of a person for machine control to be quickly and objectively evaluated, makes diagnoses in nervous and psychic illnesses, conducts experiments of physiological capability of a person,during his training for a number of occupations.

Joint developments, for instance, pharmacy furnishings designed by Soviet designers and manufactured in Bulgaria, are of distinctive quality. Specialists from the German Democratic Republic, Hungary, and Czechslovakia participated in the development of the electronic complex RFT-biomonitor". Later on, for its further refinement, Poland and the Soviet Union joined the work. This complex was awarded a gold medal at the Leipzig fair. Its unified devices allow for continuous checking of the physiological functions of a critically ill person and in crisis situations immediately sound an alarm. The complex is intended for use in village and regional hospitals and is very simple to use.

The joint work of the All-Union Research Institute for Medical Technology and the Czech association "Tesla" led to the creation of a new design of cardiostimulators insertable in the human body which are already on the foreign market. A number of organizations of the GDR and the USSR are working out a multi-channel biochemical analyzer. The organization of its batch production will allow the problem of automating biochemical analyses in large hospitals in CMEA countries to be solved. The enterprises of the Ministry of the Medical Industry of the USSR in collaboration with Hungarian specialists developed gamma-chambers for radioisotope diagnostics and fiber optics for endoscopic devices. Soviet and Czech engineers developed a unified amplifier of biosignals, on the basis of which uniform typical units of new electronic medical complexes in the CMEA countries will be developed. Soviet and Polish specialists are successfully working on polymers for medical use.

In the Moldavian republic hospital, the high-speed X-ray installation TUR-1500, manufactured in the German Democratic Republic, has been mounted and is being experimentally tested. Characteristically, one of its most complicated units - an electro-optical transformer which permits the intensity of the X-ray radiation to be significantly reduced while conserving high quality of the pictures - is being supplied by the Czech association "Khirana".

Different people work on all this medical technology, they live in different countries, and solve one or another technical problem in different ways, but they are united in their desire to preserve the greatest wealth - the health of man.

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PLANT PATHOLOGY

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DIFFERENTIATION BETWEEN STRAINS OF PUCCINIA RECONDITA ROB. EX DESM. F. SP. TRITICI USING WHEAT CULTIVARS THAT ARE DONORS OF RESISTANCE TO THIS RUST SPECIES, AND SIGNIFICANCE THEREOF TO PLANT BREEDING

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian No 5, 1977 pp 439-441

[Article by A. A. Voronkova, L. I. Sidorina and V. G. Strel'nikov, Krasnodar Scientific Research Institute of Agriculture, submitted 6 Apr 76]

[Text] Identification of strains of leaf rust on international differentiator varieties does not reflect the demands of breeding. For this reason, a search is being pursued for additional varieties capable of detecting changes that take place in virulence of populations of this pathogen. Thus, Avrora, Kavkaz, Skorospelka 35 and a few others have been approved as additional varieties in the Soviet Union, and they made it possible to determine the cause of the epiphytotic outbreak in 1973 in northern Caucasus (Voronkova, Sidorina, 1974; Rudnev et al., 1975). However, as shown by the studies of M. P. Lesovoy et al. (Shkodenko et al., 1975), the additional varieties proposed by the All-Union Academy of Agricultural Sciences imeni Lenin are also incapable of demonstrating all types of virulence of the fungus which are of practical importance.

We made an attempt to find such wheat varieties among the cultivars presently used in plant breeding as donors of resistance. For this purpose, we made a study in 1974 of 136 wheat varieties resistant in the field to 46 monopustular isolates of leaf rust representing various strains [races] and biotypes of the Krasnodar and Dagestan populations of this pathogen. It was established that cultures referable to the same strain or biotype (on the basis of differentiation thereof on international and additional varieties Avrora, Kavkaz and Skorospelka 35) have a different effect on varieties that are resistant in the field. The population from Krasnodar was found to be more homogeneous than the one from Dagestan. Many samples of wheat, that were resistant to isolates of the Krasnodar population, were found to be susceptible to some biotypes from Dagestan. Only a few of the samples were not stricken by any of the isolates obtained (Voronkova et al., 1975). This investigation made it possible to select the most valuable specimens, with regard to resistance, for differentiation, as well as varieties with different types of reactions to infection by different strains.

In 1975, infective material was collected from different varieties in three regions, Krasnodar, Dagestan and Azerbaydzhan. It was investigated using the international and additional set of varieties for the Soviet Union, as well as 11 varieties selected for this purpose which are resistant to leaf rust. It was established that isolates referable to the same strain affected the additional varieties and the wheat specimens we selected differently. At the same time, isolates referable to different strains often struck the same additional varieties that we selected. Thus, identification of strains by means of international differentiator varieties is not very effective. For this reason, in classifying biotypes, we took into consideration only the lesions induced by isolates in Avrora, Kavkaz, Skorospelka 35, as well as the 11 varieties we included additionally. However, we also retained the names of the strains. As a result, 35 biotypes were demonstrated, and they were divided into 3 groups. The first group of biotypes differed in virulence both on Avrora, Kavkaz and Skorospelka 35, and on the additional varieties we used (Table 1 [not reproduced]), and it struck only a few of these specimens. The second group consisted of biotypes that struck Avrora, Kavkaz, Skorospelka 35 and some of the resistant varieties. However, they were all avirulent for Dimitrovka 5-12 (Table 2 [not reproduced]). The third group consisted of the most virulent biotypes which struck concurrently over four of the additionally used varieties, and some of them also struck Dimitrovka 5-12. However, NC 13-19 presented resistance to all biotypes of the third group, but it was susceptible to the simpler biotypes of the first and second groups (Table 3 [not reproduced]).

Thus, our investigation revealed that there are biotypes of leaf rust in northern Caucasus and Transcaucasia, which are capable of striking many varieties of wheat that are used as donors of resistance. However, it is impossible to demonstrate them using only the established international and additional differentiator varieties used in the Soviet Union. Many of these biotypes present concurrent virulence for several of the best donors of resistance used in plant breeding. The submitted data indicate that among the varieties we studied, the best differentiators were Dimitrovka 5-12, $N11^{2}$×Comanche×$Pawnee^{3}$×Loncho, NS 13-19, Mexico 50B-21 and Purdue 5396, which enabled us to detect the main types of virulence of leaf rust encountered in northern Caucasus and Transcaucasia and presenting a potential danger to plant breeding.

Thus, differentiation between strains of leaf rust using international varieties cannot meet the demands of plant breeding; for more distinct differentiation one must use not only international and additional cultivars, but several varieties presently used as donors of resistance to leaf rust.

BIBLIOGRAPHY

1. Voronkova, A. A., and Sidorina, L. I. VESTN. SEL'SKOKHOZYAYSTVENNOY NAUKI [Herald of Agricultural Science], 1, 1974.

2. Voronkova, A. A.; Sidorina, L. I.; and Strel'nikov, V. G. VESTN. SEL'SKOKHOZYAYSTVENNOY NAUKI, 12, 1975.

3. Rudnev, Ye. D.; Krayeva, G. A.; Pribylkov, V. V.; Sanin, S. S.; and Alekseyeva, T. P. MIKOL. I FITOPATOL. [Mycology and Phytopathology], 9, 1, 1975.

4. Shkodenko, V. I.; Lesovoy, M. P.; and Panteleyev, V. K. SEL'SKOKHOZYAYSTVENNAYA BIOL. [Agricultural Biology], 9, 4, 1974.

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SEPTORIA LEAF SPOT SYMPTOMS IN WINTER WHEAT IN THE FOREST STEPPE REGION OF THE UKRAINE

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian No 5, 1977 pp 441-444

[Article by V. F. Peresympkin and S. N. Kovalenko, Ukrainian Agricultural Academy, Kiev, submitted 29 Oct 75]

[Text] The intensification of agricultural production and increase in share of grain crops used in crop rotation in the last few years have an appreciable effect on the species composition of pathogens of diseases of agricultural crops and distribution thereof.

Cultivation of winter wheat by the one-crop system, or else rapid repetition of cultivation thereof in the same crop rotation field leads to a high incidence of diseases, in particular septoria leaf spot, which is inflicting an increasing and perceptible harm to farms of the forest-steppe region in the last few years.

Septoria leaf spot has been known for a long time. The disease was first described by Desmaceres in France, in 1842. He was also the one who gave a species name to this pathogen, Septoria tritici Desm. (Demidova, 1926). The first mention of septoria leaf spot on wheat leaves in our country is referable to 1907, under the name of "white spottiness" (Yachevskiy, 1908). According to the data of A. A. Yachevskiy, significant amounts of the fungus S. tritici were found on spring wheat in Kurskaya Province, and it was the cause of premature drying of the leaves.

However, there is little information in the Soviet literature concerning the disease, and it deals mainly with the species composition of the pathogens of septoria leaf spot. Some aspects of biology of the pathogens and the harm they inflict as parasites of grain crops have also been discussed (Abramov, 1939; Marland, 1948; Brezhnev, 1955; Gorlenko, 1951).

In the last 15-20 years, the incidence and development of septoria leaf spot have been reported in several works, in Moscow (Burkhard, 1954), Novosibirskaya (Lebedeva, 1961) and Pskovskaya (Derevyankin, 1970) oblasts.

There are data on the incidence and significant involvement of wheat fields with the pathogens of septoria leaf spot in Moldavia (Popushoy, Mil'ko, 1956), the Baltic republics (Brundza, 1961; Kask, 1966), some parts of Kazakh SSR (Kalymbetov, 1966) and other regions of the Soviet Union. This disease is also known in several other countries (Kobel, 1956; Hopp, 1957; Bronnimann, 1969).

Septoria leaf spot of winter wheat has not been adequately studied for the forest-steppe region of the Ukraine. Proper diagnosis of the disease is particularly important to restrict it. This is difficult to do because leaves that have dried under the influence of the pathogen are often mistaken for leaves that have undergone normal physiological aging.

In 1972-1974, we determined that a deficient S. tritici fungus is the pathogen of septoria leaf spot of winter wheat in five forest-steppe regions of the Ukraine.

We studied the symptoms of this disease in the field and using artificial infection. Symptoms were demonstrated on the leaves, leaf sheaths, stems, internodes, nodes and glumes. We also found differences in manifestation of septoria leaf spot, depending on the variety and age of the plants.

As a result of the studies, it was established that, in the Ukrainian forest-steppe region, the disease can develop on winter wheat in the course of the entire vegetative period, starting at the phase of 2-3 leaves. Septoria leaf spot is manifested on the leaves, leaf sheaths, nodes and rarely on the stalks. Spikes were involved only in some years (mainly in Ternopol'skaya Oblast) and in negligible number. Thus, in 1973, 8% of the winter wheat spikes were stricken. In 1974, more marked development of the disease on spike glumes was observed, in 13% (11.7% mildly involved and 1.3% moderately stricken).

The first manifestation of the disease in wheat leaves begins with the formation of very small chlorotic or slightly yellowish spots of irregular shape (no more than 1 mm in diameter). Subsequently, the spots gradually grow larger and could reach 10-12 mm in diameter. They are round or oval. The spots appear in the most diverse parts of the leaf blade: on the tip, along the edges, at the base and along the central vein.

In the fall, the earliest signs of septoria leaf spot are found on the lower, older leaves of winter wheat, in the form of oval, round or irregularly shaped yellow spots that gradually turn reddish brown. At firs t the spots have vague outlines and differ little from the main green tissue of the leaf with regard to color. Gradually, the middle of these spots turns ash gray, and dark brown spots with a glossy cast--fungal pycnidia can be clearly seen with the naked eye. We found that, in the fall, pycnidia most often formed on the leaves lying on the ground, or in places where the leaves touch the soil.

Under favorable conditions for development of the disease, the amount of spots gradually increases, they merge with one another and soon cover all of the leaves of the lower level of winter wheat plants. Such leaves turn brown and die off prematurely, already in the fall.

Fusion of spots on the leaf blade occurs in both the longitudinal and transverse directions (Figure 1 [not reproduced]). Often the leaf dries not only after several spots merge, but as a result of proliferation of one or a few spots. In particular, if the leaf sheath is stricken, the entire blade dries up. But if the spot is in the central part of the blade and extends over its entire width, the upper half of the leaf dries up. This phenomenon is most often observed in the fall and early spring. We established that, when winter wheat is stricken by the pathogen of septoria leaf spot in late autumn, many spots without pycnidiae are formed on the leaves. Pycnidia develop in the spring, after the snow thaws, or even in the winter if the weather is warm and there are frequent thaws.

Observations revealed that septoria leaf spots on winter wheat seedlings are somewhat different from spots that develop on adult plants. The spots are usually wide and oval on seedling leaves, they are often located over the entire width of the blade of leaves that are not divided by veins, whereas in adult plants they are always elongated and circumscribed by the leaf veins (Figure 2 [not reproduced]).

In the summer, the light septoria leaf spots stand out against the background of the dark green surface of the wheat leaves. There is no border around the spots. We very seldom observed a dark brown margin when the spots first began to appear. The border then disappears. Quite often, the leaf tissue turns yellow around spots of an ash gray color, and this creates the impression of a border around the spot.

Septorial leaf spot also strikes organs other than the leaves in winter wheat plants. There is inadequate coverage in the literature of symptoms of this disease when the fungus invades the stalk, nodes, leaf sheaths and spike glumes [scales].

As we have already mentioned, in the forest-steppe region of the Ukraine, the pathogen strikes leaf sheaths, nodes, stalks and spike glumes.

When the leaf sheath is stricken, chlorotic spots are formed on it, and they soon become brown. At first they are small and located all over the surface. Then, as the pathogen develops in tissue, the spots grow larger. They are elongated and situated between veins. Often, as the spots become larger they involve the entire leaf sheath. Pycnidiae are formed on the brownish spots. Rarely does an ash gray color develop in the middle of the spot. The pycnidia are very small. They are situated in groups or rows.

The disease is manifested on the stalk during the period of maturation of the wheat, in the form of whitish, diffuse spots without a border, that are difficult to differentiate from the yellowish straw. The spots are located

on the stalk or internodes in the form of elongated bands. Pycnidia are rather seldom observed on the stalks, at the involved sites, and this makes is very difficult to detect the disease according to the appearance of the stalks and internodes stricken by the pathogen.

Septoria leaf spot is manifested on nodes of wheat stems in the form of small brownish spots. The spots then proliferate and involve the entire circumference of the node, or almost all of it. Gradually, the middle of the spot becomes discolored and pycnidia develop in the form of black dots. As a rule, stems with stricken nodes bend down and break rather often. Ocasionally, wrinkled indentiations are formed on the nodes, in the involved sites.

When the spike glumes are stricken by the pathogen of septoria leaf spot, which has been observed in Ternopol'skaya Oblast in some years, barely visible brown dots are formed, which rapidly grow larger and cover the entire barren glume. Occasionally the spots extend to the awn as well. Thereafter, pycnidia are formed in the brown areas of the glumes and awns.

Observations have established that development of the disease usually begins in the bottom leaves, then spreads upward over the plant, and the bottom leaves are stricken more severely than the top ones. As we have already mentioned, pycnidia of the pathogen of septoria leaf spot are formed against the ash gray background of the spot in the involved wheat plant organ. Not infrequently, pycnidia have appeared on dirty-green spots on the leaves. We observed that the leaf tissue turned yellow only 2-3 times later, at the sites of appearance of pycnidia and it subsequently became ash gray.

On the parts of the leaf stricken with the pathogen of this disease, pycnidia develop on the both the top and bottom sides of the leaf. However, more are formed on the top of the leaf. The pycnidia are arranged in rows, at first lodging under the epidermis in the stomatal changers along the veins. Most pycnidia are round, with an elongated stoma, or slightly flattened at the top. The pycnidia range from 66 to 171 μm in diameter, and the stoma is 16-35×7-17 μm in size.

Upon maturation, the pycnidia rupture the epidermis and protrude on the leaf surface with their small oval or round stoma-opening, in the form of a black tubercle. Pycnospores exit from these orifices. They are slightly bluish, filamented, straight or curved, with drops of fat, round at the ends, with septa (Figure 3 [not reproduced]). There is an average of three to five septa. Seven was the largest amount of septa that we saw on mature pycnospores gathered under natural conditions in the forest-steppe region of the Ukraine. In freshly gathered, mature pycnospores, the septa occasionally have no clearcut outline.

Thus, development of septoria leaf spot in winter wheat, in the forest-steppe region of Ukrainian SSR, can occur throughout the vegetation period.

The disease is manifested on all winter wheat plant organs that are above the ground: leaves, leaf sheaths, stems, stem nodes and spike glumes.

BIBLIOGRAPHY

1. Abramov, I. N. "Diseases of Agricultural Plants of the Far East," 1939.
2. Brezhnev, I. Ye. UCH ZAP LGU [Scientific Notes of Leningrad State University], 40, 191, 1955.
3. Brundza, K. "Parasitic Fungi of Cultivated Plants of Lithuanian SSR," Vil'nyus, 1961.
4. Burkhard, Z. I. TR. VIZR [Works of the All-Union Institute for the Protection of Plants], 5, 1954.
5. Gorlenko, M. V. "Diseases of Wheat," 1951.
6. Demidova, Z. A. MATER. PO MIKOL. I FITOPATOL. [Data on Mycology and Phytopathology], 5, 2, 1926.
7. Derevyankin, A. I. ZASHCHITA RAST. [Protection of Plants], 10, 1970.
8. Kalymbetov, B. K. IZV. AN KAZAKHSKOY SSR [News of the Kazakh Academy of Sciences], 2, 1966.
9. Kask, K. UCH. ZAP. LATVIYSKOGO GOS. UNIVERS., BOTANIKA [Scientific Notes of the Latvian State University--Botany], 2, 1966.
10. Lebedeva, L. N. SEL'SKOYE KHOZYAYSTVO SIBIRI [Agriculture of Siberia], 8, 1961.
11. Popushoy, I. S., and Mil'ko, A. I. NAUCHN. ZAP [Scientific Notes], 13, 1, 1956.
12. Marland, A. G. UCH. ZAP. TARTUSKOGO UNIVERSITETA [Scientific Notes of Tartu University], 1948.
13. Yachevskiy, A. A. "Annual of Information About Diseases and Injuries of Cultivated and Wild Useful Plants, 3d year, 1907," St. Petersburg, 1908.
14. Bronniman, A. Z., ACKER- UND PFLANZENBAU, 129, 1969.
15. HOPP, H. PHYTOPATH. ZEITSCHRIFT, 29, 1957.
16. Kobel, F. "Die Spelzenbraune des Weizens," MITT. SCHWEIZ. LANDWIRTSCH., 4, 1956.

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PLANT PATHOLOGY

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CONFERENCE ON THE PROBLEM OF PROTECTION OF FIELD CROPS FROM DISEASES IN THE NONCHERNOZEM REGION OF EUROPEAN USSR

Leningrad MIKOLOGIYA I FITOPATOLOGIYA in Russian No 5, 1977 p 457

[Article by V. I. Gordenko and N. I. Kuznetsova, Gor'kiy Base of the All-Union Institute for the Protection of Plants, submitted 7 Apr 77]

[Text] The Conference on the Problem of Protection of Field Crops From Diseases in the Nonchernozem Region of European USSR convened in Gor'kiy on 10-12 November 1976. Its participants included 107 specialists from 20 scientific, educational and production institutions. Over 40 papers and scheduled speeches were delivered.

V. F. Lisin, first deputy-chief of the Administration for Agriculture of the Or'kiy Oblispolkom delivered a speech at the plenary session. He stressed the fact that an important role is played by agricultural science in resolving the task of continued increase in agricultural production. It is imperative to strengthen the ties between science and industry, and to provide speedier solutions to pressing problems of protection of plants, which confront agriculture.

V. F. Peresypkin discussed problems of phytopathology in fulfilling the plan for development of agriculture in the Nonchernozem Region of European USSR. He dwelled on the key problems, which are related to the effects of intensification of agricultural production on the structure of agrobiocenoses, stressing that there is much work to be done in this region to improve seed-growing referable to agricultural crops, to revise seed and planting material standards.

The paper coauthored by M. K. Khokhryakov and S. M. Tupenevich demonstrated the importance of agrotechnical and organizational-management measures in the system of protecting plants from diseases, the role of varieties with complex resistance, rational precursors, optimum amount of organic and mineral fertilizers.

A. Ya. Kameraz reported on breeding potatoes for complex resistance to the most important diseases occurring in the Nonchernozem region and on the rules for potato seed growing.

V. I. Popov reported on the prospects of using fungicides for the control of diseases, with due consideration of thresholds of their deleterious effects. He observed that the rational use of fungicides should be based on profound knowledge about the biology of pathogenic organisms and thresholds of deleteriousness of the diseases that they induce.

The paper of A. Ye. Chumakov and T. I. Zakharova demonstrated the necessity for making use of forecasts of diseases of field crops in systems of protective measures and subsequent demonstration of the most dangerous diseases, in order to develop measures to control them. M. Ya. Michene shared his experience in protecting field crops from diseases in the Baltic region.

There were three working sections at this conference, dealing with grain, feed and vegetables, as well as potatoes.

In speeches made by V. I. Krivchenko, A. A. Benken, A. I. Zolotarev, V. V. Shopina, Ye. M. Sankina, V. V. Sadakov, L. R. Tyulina, A. S. Volovik, Yu. I. Shneyder, N. M. Shcherbakova, N. Yu. Pogorelova, O. P. Mazur, N. L. Polozovaya, V. V. Kotova and others, it was noted that the following present a particular hazard: root rot, smut, powdery mildew, striated spot disease of barley and oat rust, for grain crops; phytophtora fungus [blight], bacterial, viral and nematode diseases, tuber rot during storage, for potatoes; root rot, viral diseases, stem nematodes, pod spot and clover canker, for leguminous crops; cruciferous clubroot, peronosporosis of onions, viral and bacterial diseases, for vegetable crops.

The conference discussed and approved methodological instructions on evaluation of efficacy of sets of measures to protect grain, potatoes, peas and clover crops from diseases.

The adopted resolution mentioned the necessity of rational use of pesticides, on the basis of scientifically substantiated forecasts of development of diseases, with due consideration of their deleteriousness thresholds; intensification of work to develop varieties with complex resistance; revision of norms of permissible contamination and standards for seed and planting material; expansion of research on the control of soil phytopathogens, as well as introduction of sets of protective measures for the prevailing conditions of specialization and intensification of agricultural production in the Nonchernozem region of RSFSR.

10,657
CSO: 1870

PSYCHOLOGY

AMERICAN-SOVIET SCIENTISTS BEGIN DEBATE ON FREUDIAN CONCEPTS IN PSYCHOLOGY

Rather Than an Introduction

Moscow LITERATURNAYA GAZETA in Russian No 48, 30 Nov 77 p 13

[Article by A. Prangishvili, director of the Institute of Psychology imeni D. Uznadze, vice president of the Academy of Sciences of the Georgian SSR]

> [Text] "Know thyself..." it is only in our time that it has become completely possible to follow this wise council of the ancients using scientific methods. Research on human mental activity has become one of modern science's most important tasks.
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> Today, a controversy is going on about ways to develop such research and the most effective course for studying "human phenomena."

Every society develops its own concept of man and answers the questions: "What is man"?, "What is his nature"?, "What is his place in the world and society"? in its own particular way. The nature and course of psychological research depend on the answers to these questions, and in the present world it is impossible to control the processes that form the personality successfully, to regulate social relations, or to use the forces of production properly without taking the results of this research into consideration.

Naturally, the fundamental differences between socialist ideology and bourgeois ideology also caused a difference in the way psychological science developed in the socialist and capitalist countries. When the question arises of the problem of the unconscious--the relationship between man's consciousness and other forms of mental activity of which he is not conscious--this difference becomes especially acute.

In the West, the study of this problem has been influenced by Freud's psycho-analytical theory. Freud is usually credited with being the first to decisively and clearly pose the question of the important role of the

unconscious in the emergence of neuroses, in the formation of the personality, and in human behavior. This is correct. However, the degree to which Freud truly expressed the essence of this problem is important. And here a great deal seems to be unacceptable.

Freud, in fact, put the idea of the unconscious at the foundation of the theory of neuroses and their treatment that he developed. He claimed that if an intense emotion, (drive, need, motivation) cannot be satisfied, then it is displaced from the conscious, ceases to be perceived, but does not definitely disappear; in a masked form it continues to influence the person's behavior and condition, sometimes appearing in the form of illness.

Thus, a sort of double exists with the conscious--the unconscious, interferring with its work and basically being its principle rival and antagonist. Later, this scheme was expanded and turned into a complex philosophical and sociological doctrine. The most diverse social processes began to be seen through the prism of this "internal struggle," between the conscious and the unconscious, while Freud assigned the role of primary force to the latter, determining the fate of both the individual and the collective, and alloted to the conscious only the party of an illusion of controlling behavior. The biologization of man, the interpretation of sexual drive as the most important stimulus of human behavior, disbelief in the social process, excusing manifestations of violence as being somehow fundamentally unremovable from people's lives, as well as a disregard of the evidences and proofs of theoretical hypotheses that are advanced and that are generally accepted procedures in science--these are the basic attitudes that caused Soviet science to take a negative view of Freud's teaching.

It is in no way possible to conclude from this, however, that Soviet psychology rejects the very idea of the unconscious. On the contrary, in our country this idea is deeply explored on the basis of a dialectical-materialist understanding of the world. The works of the Soviet psychologist D. Uznadze have a primary place in this work. He began to create a "theory of the unperceived psychological set," according to which human actions, reactions and acts are always dependent upon the special psychological state of "readiness" for a given action. It is formed on the basis of previous experience and predetermines our behavior. Such a state--psychological set--can be entirely unperceived by the person.

Uznadze theoretically and experimentally proved that unperceived mental activity is a component element of any act of human behavior. Its role is especially great in the creative processes that are manifested in the development of science, art and language. Set theory, moreover, permits a deeper understanding of the cause of a number of illnesses.

The problem of the unconscious is one of the most important divisions of psychology. It would be difficult to list the theoretical and practical tasks associated with this problem that arise in psychology, medicine,

neuro-physiology, linguistics, theory of literature and art, pedagogics, cybernetics, and even in cosmonautics.

All of this compelled us to take the initiative in organizing the International Symposium on the Problem of Unconscious Mental Activity, to be held in Tbilisi in 1978. A two-volume collective monograph entitled THE UNCONSCIOUS: ITS NATURE AND FUNCTION AND RESEARCH METHODS, in which the works of both many Soviet scientists and foreign researchers appear, has already been prepared. In its pages there is a principal discussion, in which we attempt, naturally, to clarify our understanding on the problems discussed, based on the principles of Marxist-Leninist philosophy and the tradition of Soviet psychological science. It would seem, therefore, that such a discussion may be productive not only in the properly scientific sense, but also in the broader social and ideological sense. In this sense, the article by Nancy Rollins, who is a widely known American specialist in the area of clinical psychology and the theory of psychoanalysis, concerning a comparison of views on the problem of the unconscious in the Soviet Union and in the West, is of great interest. It is this article that is published today, with some abridgements, in the Literary Gazette (LITERATURNAYA GAZETA). A brief presentation of our position is presented in a response by Soviet scientists.

A Myth Is not a Lie

Moscow LITERATURNAYA GAZETA in Russian No 48, 30 Nov 77 p 13

[Article by Nancy Rollins, Professor, Harvard Medical School (USA)]

[Text] To look at an area of research in which one is working in a new way --this is the opportunity that was given to me thanks to studying Soviet psychology. I am convinced that expanding the dialog between American and Soviet psychologists is desirable. Visiting the Soviet Union, I learned with satisfaction that the area of unconscious mental activity is becoming, to a greater degree, a subject of research of our Soviet colleagues. My attitude toward the Soviet approach to studying the unconscious is presented in the present article.

There are three trends in Soviet scientific criticism of psychoanalysis.

Philosophical objections belong to the first trend. These objections concern such fundamental problems as the causal conditions of mental activity, the nature of self-awareness, and that which lies outside the boundaries of consciousness. In my opinion there are serious arguments in this case. Disputes on the level of psychological science belong to the second category. I do not find criticism here to be very valid. The third category of arguments concern the connection between scientific theory and the social historical process. I think that it is precisely in this area that the most significant differences between Soviet and Western thought are to be observed.

Dispute over philosophical problems can, in my opinion, begin with the fact that the resolute adherence of Soviet scientists to objectivity in scientific research limits the possibility of understanding. Psychoanalytical concepts are rejected by them because of the fact that they are intuitive and cannot be experimentally proven. Avoidance of intuition and of "thinking by analogy" is viewed as an ideal that must be pursued. However, if such an ideal is not attained by psychoanalytical theory, must this be considered a failing? Strict adherence to the principle of objectivity, a characteristic of the Pavlovian epoch, led to concentration solely on the study of higher nervous activity. In the Uznadze school this was reflected in an extreme attraction to experiments associated solely with perceptual illusions. In both cases this was a sacrifice. The whole individual, in all his richness and variety, was lost. In eliminating the "mystical gap between body and soul," contemporary neurophysiology, cybernetics, and set theory have not been any more successful than psychoanalysis.

Soviet researchers attempt to exclude intuition from scientific analysis. They, therefore, consider that the "physiological" views of Freud (metaphyschology) are only a myth. Freud's sphere of the unconscious is imagined to be the sphere of the manifestation of a special personality, of some sort of "barbarian," threatening to fill human social consciousness with primitive, amoral impulses of brutality and sexuality. I agree in principle that science must avoid thinking by analogy and mythological constructs. But any new scientific concept, replacing an old one, is a myth. In this sense, the myth is not a lie, it is only a temporary working model of reality. Therefore, why not recognize our need for myths in the form of scientific models?

Freud's mistake, as Soviet scientists express it, consists of the fact that he ignored the relationship of consciousness to the brain. Freud in fact underestimated the physiological aspect of the problem. As a result, a psychology was produced that was devoid of a material basis. This is in fact the dualism that led to Soviet scientists' calling it the fallacy of idealism. I find this argument of theirs impossible to refute.

Soviet concepts demand a unity of the organism and the environment; in this unity the emphasis is placed on the social causality of consciousness, character formation and behavior. The Freudian accent on biological instincts of sexuality, self-preservation and death are unacceptable from the point of view of Soviet scientists. They consider that Freud diminished the role of social factors. However, in this case the broad psychoanalytical literature concerning the influence of social relations in early childhood, especially relations between mother and child, is ignored.

Criticism from the psychological position primarily concerns that which Soviet scientists call Freud's "hegemony" of the unconscious, that is, the assertion that thought and behavior are determined to a significant degree by motives which are clearly not perceived. Thus, Soviet scientists reject the idea of "displacement." To agree with Freud that if a thought is intolerable to the conscious then it is "displaced" to the realm of the unconscious, means to apply spacial characteristics to the system of the

conscious and the unconscious. But I have observed that the Soviet theory of psychological defense also cannot adequately explain how a person copes with thoughts and feelings that threaten his spiritual tranquillity and health.

Criticising psychoanalysis, Soviet scientists condemn Freud's views on the development of civilization. Freud's ideas are considered not only gloomy but also amoral, approaching an apology for violence. But is it possible to reject a scientific theory because it calls up associations that are disagreeable from the point of view of moral standards?

Soviet scientists, polemicizing with West European psychoanalysts on this point, assert that it is necessary to evaluate a scientific theory from the point of view of the role it plays in the historical process, from the point of view of whether it is progressive or reactionary. This type of analysis, in their opinion, requires an understanding of how a given theory of influences social consciousness. I am, in principle, in agreement with this. But it is incorrect to reject a theory just because someone perceives a threat in it. Science has achieved a great deal by studying phenomena that did not agree with views of matters that were habitual for us.

It is remarkable that the psychological theories of Freud and Uznadze are based to a certain degree on a common foundation. They both recognize the necessity of studying the processes that lay outside of the boundaries of consciousness and are in principle in agreement with the fact that the unconscious has an influence on mental activity. Both attempted to create a universal system of psychological science. Both considered the unconscious to be a primitive form of the psyche. Both assumed that rational thought frees a person from the tyranny of the unconscious.

"The voice of the conscious is weak," Freud said, but he assumed that if one were to make the unconscious conscious, then thinking could lead a person to a rational solution. We all believe that the hope of mankind is in the reinforcement of conscious thinking and in its maximum development. Freud put this hope, therefore, in psychoanalytical therapy; it is possible that Uznadze, too, would have stressed education as the chief way of developing the conscious principle.

I would like it if many of the ideas in Soviet science could become more widely known in the United States. One of these important ideas is the definition of unperceived mental activity as the involuntary processing of information and control of human biological and mental activity on this basis for adaptation to conditions of life. It also seems interesting to me that Soviet psychologists place the accent on "cooperative" relations between the conscious and the unconscious. This is especially useful for Western psychology, which ordinarily has a tendency to emphasize the more antagonistic character of these relations, especially in psychopathology.

The greatest originality of the Soviet view, in my opinion, is the idea that conscious and unconscious mental activity are qualitatively different. Western psychology and psychiatry must take this idea seriously, particularly the fact that the conscious and unconscious are connected by psychological set.

The development of a positive theory of consciousness is also an important contribution of Soviet psychology.

Finally, the Soviet experimental approach to the unconscious, especially experiments using subconscious stimulation, is fruitful. Soviet psychologists are not rejecting, however, such methods of studying the unconscious as, for example, research on dreams, the study of artistic creativity, and children's free play.

Demands of life have increased in the modern epoch. Highly industrialized society more and more demands a high level of moral social consciousness of people. If the blind forces of reproduction and unregulated industrial production continue their present course, then the human species is doomed to extinction. As Engels said, "only the conscious organization of social production with planned production and planned distribution can raise people above the simple animals. Historical development makes such an organization more necessary with each day, and with each day, more possible. A new era will begin with it, a new historical epoch in which people themselves, and together with them all branches of their activity, in particular natural science, will become so successful that it will eclipse everything done previously.

In reality--reason or extinction. It is not surprising that the unconscious is frightened. And not only because of the instance of sexuality. Blind forces outside the society, the effects of which a person is unable to realize and which determine his behavior apart from his conscious intentions, are frightening. I share with my Soviet colleagues a belief in the decisive importance of the consciousness as a mechanism that goes into action when problems cannot be solved automatically and unconsciously.

Understanding--The Search for the Truth

Moscow LITERATURNAYA GAZETA in Russian No 48, 30 Nov 77 p 13

[Article by F. Bassin, Professor, Doctor of Medical Sciences and A. Sheroziya, Professor, Doctor of Philosophical Sciences]

[Text] Professor Rollins' article is certainly very interesting. It reflects a gradual process of penetration of the ideas of Soviet psychology into Western science, a process that has been hindered for decades not so much by the barriers of language as by the differences in ideological attitudes and in some instances even by open prejudice.

Rollins has, to a great degree, maintained objectivity, and in any case, has tried to comprehend the achievements of Soviet psychology. She expresses a number of correct and interesting observations.

Moreover, Rollins' article demonstrates how difficult the course is for a researcher trying to understand the essence of a world view that has evolved in an intellectual and ideological atmosphere that is alien to the researcher, how inaccurately sometimes the fundamental idea of our scientific concepts is perceived abroad. A calm dialog is necessary to eliminate this misunderstanding.

First of all, let us briefly describe our attitude to Freud's psychoanalytical theory. We reject it, first of all, because the majority of the conclusions of psychoanalysis cannot be considered scientifically well founded. Secondly, because it creates a distorted image of man, because it simplistically interprets the laws to which man's mind is subordinate and distorts the principles determining its formation. And thirdly, because it completely incorrectly characterizes the laws according to which society develops. At the same time, we would be guilty of a one-sided appraisal if we did not recognize the fact that Freud recognized and described aspects of human spiritual life that are impossible to ignore--in particular, that which concerns the relationship between conscious and unconscious mental processes. Such a complex interweaving of negative and positive features of psychoanalysis makes it evaluation difficult. For example, I. P. Pavlov, while rejecting the theory of psychoanalysis as a whole, nevertheless recognized in it such elements that warranted serious attention. Yes, in fact the demand for objectivity in scientific knowledge is absolute and does not permit exceptions. But this, of course, does not mean the denial of intuition as an irrefutable element of the creative process, as its most important component part. It is not a bad thing if a scientists, speculating, depends upon intuition--this has frequently led to the most important triumphs of science. It is bad when, expressing one or another opinion, a scientists bases his point of view only on a reference to intuition. Freud, for example, advanced as one of the most important concepts the idea of the "death instinct," as if the active striving for self-annihilation were inherent in every living organism. Is it possible to consider this idea fundamentally scientific? No. But not because Freud arrived at it intuitively, but because he was unable to find a scientific foundation for this concept after it had been formulated, other than analogy. And such an argument is not acceptable in science.

Rollins does not dispute the fact that much of Freud's theory remains unproven and is essentially a myth. In her opinion, there is a justification for this: a change of hypotheses is always occurring and "in this sense a myth is not a lie; it is only a temporary working model of reality."

A change of "models of reality" in science in fact occurs. But is it that an old model, yielding its place to a new model, becomes a myth because of

this? Is it, for example, that classical mechanics became a "myth" after the appearance of quantum mechanics? Or Euclidean geometry after the appearance of Lobachevskiy's geometry? No, each of these theories remained concepts that are true in certain conditions and not true in others. And this is true of the evolution of all fundamentally scientific concepts that they, in dying out, always leave behind them something that is permanent (a non-myth) and something that is removed from it forever as well (myth).

Rollins also reproaches us for the fact that having concentrated only on the study of higher nervous activity, we have "lost the whole person," with all the variety of characteristics of his personality and social tendencies. Here she makes a fundamental error.

Our adherence to the principle of objectivity, the principle of a dialectical-materialist understanding of science, excludes any attempt to "reduce" the complex to the more simple in a simplistic, reductionist, way, or to ignore the qualitative peculiarity of the complex. Rollins would easily be convinced of this if she were familiar with the materials of a discussion that developed in 1976-1977 in our leading publications Problems of Psychology (NOPROSY PSIKHOLOGII) and Journal of Higher Nervous Activity (ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI). Besides this, a tendency to simplification is frequently characteristic of psychoanalytic theory. For instance, in its interpretation of such concepts as "psychological defense" and "displacement."

We in no way deny the reality of psychological defense--of mental processes that man uses in an attempt to soften, weaken the pain of mental trauma or inability to attain something desired. It is well known that a powerful but unsatisfied drive is sometimes "displaced" from the consciousness. Having ceased to be perceived, however, in some form it continues to exist, sometimes exerting a profound influence on our organism, behavior, and our attitude to the world. However, Freud understood the "displacement" mechanism in a rudimentary way, as well as other modes of "defense" that he described--sublimation (switching to other, ordinarily more creative activity), "transference" to another person of the personal guilt that one is offended by, etc. He in particular assumed that such processes are always unperceived and seldom observed. Freud lost sight of the fact that these processes are broadly dispersed and may be both unperceived as well as recognized completely. For example, an emotionally traumatized person develops a new understanding of the traumatic experience, develops a new "feeling" for it, and that which previously seemed to be a catastrophe impresses him as being of little significance (an insult ceases to be perceived as such if the person offended, having changed his psychological attitudes, arrives at the notion that the guilty party is a person who is unworthy, disordered, etc.)

Nobody demands the rejection of the concept of "displacement" or the concept of "psychological defense." It is all in what light is thrown on these concepts. And this concerns many other things that psychoanalysis

contends about the nature of man. Take even the celebrated question of the role of the sexual drive. It is absurd to deny its importance. However, when the significance of a basic drive that subordinates other motives to itself is given to this drive, then a deformed, mutilated, and consequently a mythical vision of man results.

One of the most important reasons for our negative attitude to "classical" psychoanalysis is the fact that Freud ignored the influence of the social environment on man. The fact that such an influence exists was, of course, very well understood by Freud. Rollins could even significantly strengthen her argument by presenting the words of Freud himself, with which he began his book GROUP PSYCHOLOGY AND THE ANALYSIS OF THE HUMAN EGO: "in the mental life of man 'the other' always exists. It is, of course, an image, object, helpmate or antagonist, and, therefore, the psychology of the individual from the very beginning always simultaneously is also social psychology in this expanded, but completely scientifically based, sense." Is it possible to imagine that someone could in general deny the reality of social influence? The question includes what role is assigned to these influences, what place these influences occupy from the point of view of psychoanalysis in the process of human mental development, the establishment of his personality, the whole system of his attitude to the world, the formation of his values and motives.

It is sufficient, however, to pose the question in such a way that the root and unavoidable methodological vice of orthodox Freudism--the biologization of human nature--is immediately delineated. For Freud never conceived of social influence, affecting man, in the role of the major factor in establishing his personality and fate. This defect emerges especially distinctly when Freud began to interpret social reality and laws datermining the historical development of society. An understanding of the fundamental principles in effect here--the role of production forces and production relations, the class struggle with its influence on ideology--completely escaped his attention. Attempts to substitute these real moving forces of the historical process with the idea of the "struggle of the conscious with the unconscious" can be perceived by Soviet science only as a parody of social psychology.

If the prime mover of the historical process is the activity of the unconscious under the poor control of the conscious then, obviously, an understanding of people is possible only by turning to the biology of man, to the ineradicable and innate drives sleeping in his soul, and the idea of social progress, the improvement of forms of the social order, would have to be declared an unattainable dream. The social conclusions of psychoanalysis is predetermined by erroneous concepts of human nature. We reject Freudism not because it is reactionary and a "threat," but primarily because in many respects it is not an objective reflection of reality. An inference of its reactionary nature is only a supplementary judgment, a judgment of its social role, that we, of course, reserve the right to make. And it is in no way taken away by that which is of value, for which divisions of theoretical medicine and psychology are indebted to Freud.

We will not pause on the positive appraisals of the achievements of Soviet psychology that are very agreeable to us. It is important to preserve the clarity of positions and mark those areas in which productive, cooperative work with foreign psychologists and a fruitful scientific dialog are possible. Rollins feels that today there exists a certain closeness between Western psychological concepts and ours, particularly between theories developed by Freud and Uznadze. Of course, it is possible to detect a certain similarity between a number of the concrete scientific problems they pose. But this similarity is caused simply because of the fact that both psychoanalysis and Uznadze's theory are concerned with the participation--sometimes very important--of the unconscious in the structure of mental processes. Does it follow from this, however, that this general trait means they are conceptually close? The positions of psychoanalysis and the position of the Uznadze school are divergent in principle, especially when one is speaking of the relationship between the unconscious and the conscious, of the "hegemony" of one of these principles over the other.

From our point of view, the abstract posing of the question of the hegemony of one of the forms of mental activity over the other is empty. Both the conscious and the unconscious are real sides of the mind. Each of these sides of human mental life has its own specific functions. If one poses the question, for instance, of just which--the conscious or the unconscious--plays the leading role in regulating monotonic mental activity or in provoking neurotic and psychosomatic illnesses, that obviously will of necessity point to the unconscious. If an analogous question is posed with regard to human social activity, then it is just as obvious that here the conscious must be pointed to as having "hegemony." In both psychological and physiological research the role of the perceived and unperceived, their "priority," may be very different. The human mind always remains somewhat of a whole in which the separation of the "driving" and "driven" has a relative, conditional and changable character.

There are, as is obvious from what has been said, many disagreements between Rollins' positions and our own. But does this mean that there are no problems upon which we can work in agreement? We are convinced that the opposite is true.

The treatment of illnesses, professional work in its infinitely various forms, training, formation of the personality, socialization between people at every step pose questions compelling us to turn to the theory of unperceived mental processes. Moreover, this problem is one of the most complex and still little studied divisions of contemporary psychology. It is clear from this that serious attention must be paid to this research.

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PUBLIC HEALTH

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ACHIEVEMENTS IN SOVIET MEDICAL SCIENCE

Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSR in Russian No 11, 1977 pp 7-23

[Article by V. D. Timakov (deceased) and A. M. Chernukh (Moscow)]

[Text] At the very earliest stages of its existence, the young Soviet state made a revolutionary change in all aspects of life in our country, including the public health system, the objective of which became to care for the broad proletariat and peasant masses. Public health care began to be considered as one of the tasks and obligations of the socialist nation of paramount importance.

In spite of the extremely difficult conditions prevailing in the early years of Soviet power, the Party, Soviet government and V. I. Lenin himself devoted much attention to the development of public health and medical science. A network of medical scientific research institutes was organized in our country after the Great October Socialist Revolution. Their activities were directed toward prevention and reduction of morbidity, extension of life expectancy and strengthening the health of the people.

One of the most important tasks for medicine, in the early years of Soviet power, was to control infectious diseases, develop and implement measures to prevent them. Already in 1918-1920, such scientific research institutions as the Moscow Institute of Infectious Diseases imeni I. I. Mechnikov, Saratov Institute of Microbiology and Epidemiology for the control of plague, the Central Smallpox Institute, etc., had begun to appear. The medical scientists were of great help to the People's Commissariat of Health of RSFSR and its Scientific Medical Council in their endeavors to eradicate the epidemics that had stricken the young Soviet republic.

Concurrently with institutions specializing in epidemiology and microbiology, others dealing with other directions of medical science began to be founded. The following were established: Chemical and Pharmaceutical Institute, Moscow Oblast Institute of Sanitation and Hygiene, Institute of Tuberculosis, Institute of Biological Chemistry. The following were opened in the 1920's: institutes of physiology of nutrition, Biomedical Institute of Glavnauka [Main Administration of Scientific Institutions, Museums, Science and Art

Establishments], Physiological Institute of Glavnauka and several other scientific research institutions. Serious attention began to be devoted to problems of occupational pathology. The Institute for the Study of Occupational Diseases and a clinic in the same specialty were founded. In 1932, the All-Union Institute of Experimental Medicine began to function; there much work was done on problems dealing with physiology and pathology of the central nervous system and sense organs, neural trophics and neurohumoral regulation, chemistry of immunity, infections and invasions, and a number of other pressing problems of medicine. The network of medical scientific research institutions broadened constantly. By 1941, there were more than 200 scientific research institutes in the USSR.

Soviet medical science developed successfully in the preventive direction, basing itself on the physiological teaching of I. M. Sechenov, N. Ye. Vvedenskiy and I. P. Pavlov. At the very first stages of its development, Soviet medical science followed a plan. Under Soviet conditions, it was possible to avoid the former impulsive [unplanned] nature of research, and it became possible to tie it in with the needs of public health practice. Research in the field of medicine was transformed into a state affair, that was supported in every way by state and Party bodies. The system of planning biomedical research guided it toward solving the most important major problems; it made it possible to coordinate research in the entire country, to properly place scientific personnel and to implement the principles of complex scientific activities. All this was largely instrumental in speeding up, improving the quality and effectiveness of research work.

Quite a few advances were made in Soviet medical science already in the first decades of Soviet power. The work of I. P. Pavlov and his disciples made an enormous contribution to the store of knowledge about the human body. Many theoretical theses expounded by the school of this great physiologists are still part of the treasury of science. Among the major achievements of those days, we can mention development of the corneal transplant operation, scientific substantiation of feasibility of transfusion of cadaver, placental and "waste" blood, investigation of the stimulating effect of blood transfusions, which aided in broad adoption of this method in medical practice; successful development of methods of local anesthesia, not only in surgery, but other branches of clinical medicine; effective solution to the pressing problem of primary wound treatment, disinfection of infected wounds, which played an enormous role during World War II, and many other valuable scientific results.

On 30 June 1944, the Council of USSR People's Commissars adopted a decision concerning the organization of the USSR Academy of Medical Sciences. This was a unique event in the history of the world. A nation that was waging a difficult and bloody war, experiencing colossal difficulties, was founding a new academy. The constituent session of USSR AMS [Academy of Medical Sciences] convened on 20 December 1944, and N. N. Burdenko was elected its first president. The USSR AMS was charged with the task of scientific development of problems of theory and practice of medicine, formulating the main tasks in the field of medical science for medical scientific research

institutions, implementing scientific testing of the most important discoveries and proposals, and training highly qualified cadres of scientific workers.

A new stage began in the development of Soviet medical science. There was intensive development of research in the field of control of cardiovascular disease. Studies were pursued on the origin, prevention, treatment of essential hypertension and atherosclerosis; surgery of the heart and great vessels was practiced more and more widely. Research in the field of oncology was pursued in an unprecedented scope. New institutes and laboratories were opened, a network of oncological dispensaries was established. Some problems of carcinogenesis were solved; new methods were developed for chemotherapy, surgical, radiation and combined treatment of malignant disease.

The next stage, which began in the 1960's, was characterized by the fact that emphasis was laid on development of basic research, which began to concentrate on physiological and pathological processes occurring on the molecular and cellular levels. Using refined equipment, it was possible to disclose more and more the essence of processes and phenomena occurring in the healthy and sick organism. Basic research in medicine began to be conducted on a qualitatively new level. This new quality was determined by the fact that, in biomedical research, comprehensive use was made of the advances in mathematics, physics, chemistry, control science, cybernetics, as well as of high-precision and high resolution equipment. With each year, more and more specialists in other branches of science (engineers, designers, mathematicians, etc.) became involved in the research of medical scientists. For this reason, new data were obtained- which paved the way for qualitatively new stages of development of theoretical and practical medicine.

The Siberian Branch of the USSR AMS was founded in Novosibirsk in 1970. The Institute of Clinical and Experimental Medicine, Institute of Physiology and a laboratory in Noril'sk are functioning as part of this branch. It was decided to organize the Institute of Medical Problems of the North in Krasnoyarsk and Institute of Complex Problems of Hygiene and Occupational Diseases in Novokuznetsk, under the Siberian Branch of USSR AMS. The medical scientists of the Siberian Branch of USSR AMS, in collaboration with scientists of the Siberian Department of the USSR AS [Academy of Sciences], are conducting research in the field of physiology and pathology of human adaptation to the various climate and geographic regions of Siberia, the Far East, Extreme North and along the route of the Baykal-Amur Highway.

The significant increase in life expectancy of Soviet people, virtually total eradication of such previously widespread diseases as smallpox, plague, cholera and poliomyelitis are exceptionally impressive results of the work of research and practical medical institutions in the years of Soviet power. There was a significant decline in incidence of malaria, intestinal and childhood infections. Surgery and other clinical disciplines made enormous achievements. At the same time, it is quite obvious that continued progress of medicine is impossible without the trail-blazing development of basic scientific directions. As stressed by L. I. Brezhnev in his report to the 25th CPSU Congress, "The brimming stream of scientific technological progress will run dry, if it is not constantly nourished by basic research."

Such problems as the treatment of cardiovascular, oncological, viral, neuropsychiatric and hereditary diseases can be solved only by means of extensive, in-depth biomedical research. In this regard, the current status of molecular biology and its importance to medicine are an illustration.

The intensified attention given to development of molecular biology led to identification of the most important physicochemical bases of vital functions of cells and a search for common principles, upon which all of the most important processes of vital functions are essentially based. The general aspects of mechanisms of synthesis of DNA, RNA, simple and some complex proteins, coenzymes, cofactors and other compounds, of which the cell is made and which are necessary to its existence, are already known. In-depth research is being conducted on the molecular bases of a number of hereditary diseases, as well as primary defects in molecular organization of chromatin and repairability thereof. Medical scientists also made a large contribution to our knowledge of processes of formation and function of intracellular structures: ribosomes, membranes, mitochondria, etc., as well as the assembly of viral particles and adsorption thereof on the cell. In the course of biomedical research on the molecular level, Soviet scientists obtained some important data referable to one of the most burning issues of modern medicine, oncology. Investigation of the molecular and biological bases of carcinogenesis was conducted in the most diverse aspects: virology, genetics, immunology of cancer, metabolism in the cancerous cell. RNA-containing oncogenic viruses have been isolated from transferable human cells; the extracellular precursors of some of them have been isolated and identified.

Soviet scientists were the first to demonstrate experimentally that oncogenic viruses have a system of active inclusion of their genome in the genetic system of the cell, and the key enzyme of this system is the protein T-antigen coded by the virus, which is capable of inducing a break in DNA. These data are very important to the disclosure of the mechanisms of development of cancer of viral origin. Identification of some molecular mechanisms of cell degeneration under the influence of various factors made it possible to develop new immunological diagnostic methods. This direction has earned universal recognition. Development of the basic directions also helped create basically new drugs. In particular, as a result of identifying the molecular mechanisms of immunological phenomena, it was possible to develop a method of obtaining a strain that produces bacterial asparaginase, and this permits having an adequate amount of this agent for the treatment of a number of diseases, including oncological ones.

Research in the field of general pathology and pathological physiology is very important to continued development of the basic directions. The work of Soviet scientists, which aided in further development of the conception of general principles of function and structure under pathological conditions, was particularly important to comprehension of pathological processes.

The teaching on the functional element of organs and tissues, recently formulated on the basis of advances in the study of microcirculation in the healthy and sick organism, is gaining broad recognition. On the other hand, continued intensive work on problems of membranology, the main investigation

of which is directed toward functions of biological membranes under pathological conditions, is of substantial importance to the comprehensive study of mechanisms of pathological processes. The cancer cell is the object of this research; studies are being pursued of changes in cell membranes in the presence of ischemia, under the influence of ultraviolet and ionizing radiation, dietary infractions, etc.

On the basis of the requirements of modern public health care, the historical 25th CPSU Congress put some important tasks to medical science: to intensify research in the field of molecular biology and immunological bases of vital functions of the human body in order to expedite the solution of biomedical problems pertaining to the control of cardiovascular, oncological, endocrine, viral, occupational and nervous system diseases; to continue research on the problems of improving and ameliorating working conditions, as well as rational nutrition. The program approved by the Party for future research in the field of medicine is profoundly scientific; it is based on the continuity of all our prior endeavors, and it is always consistent with the general objective of Soviet public health care, which consists of maximum preservation of public health under modern conditions.

Soviet medical scientists are contributing their labor to the cause of development of Soviet science, and they are applying all their efforts to this end. It can be stated with confidence that our country now occupies the first, leading positions in the world with regard to several of the basic problems of medical science.

The research that has been done in the field of cardiovascular disease established several facts of substantial importance to clinical practice. In the basic, theoretical aspect, the scientists concentrated on processes occurring in the healthy and sick heart. As a result of the studies of metabolic processes, it was possible to demonstrate the routes of generation and transmission of energy in the myocardium, to establish the correlation between efficiency of myocardial function and concentration of a specific enzyme, to develop slowly dissolving preparations of enzymes immobilized on polymer vehicles. In addition, determination has been made of the distinctions of disturbances in energy, protein and ion metabolism in the presence of myocardial infarction, chronic coronary insufficiency, cardiac fibrillation and cardiac insufficiency. We must mention the contribution of Soviet scientists to the study of the role of nervous mechanisms in regulation of circulation under normal and pathological conditions. Work that established the substantial role of limbic structures of the brain and hypothalamus in the origin of experimental atherosclerosis and emotiogenic hypertensive states is of great theoretical importance. As a result of comprehensive investigation of the hemodynamic distinctions, pressor and depressor mechanisms in patients with essential hypertension, the role of several elements was defined in the pathogenesis, in the course of development and occurrence of disease, and this made it possible to expound a teaching on essential hypertension, with substantiation of the concept of periods of development thereof. All this is important, because it permits development of differentiated approaches to the treatment of patients with hypertension, depending on the stage thereof and distinctive features in its course.

Some encouraging results were also obtained in the study of the complex problem of atherosclerosis. An important fact was established: in the presence of this disease, there are disturbances, not only of lipid but other types of metabolism, due to impaired hormonal regulation, impaired function of enzymatic systems of the organism, as well as inhibition of redox processes. Some rather typical changes were demonstrated in metabolism of proteins, lipoproteins, mucopolysaccharides, and this could probably be used as tests for early detection of atherosclerosis, choice of most adequate therapy and monitoring of its efficacy. Some important data were also obtained on the pathogenetic significance of impairment of enzymatic processes in the vascular wall and changes in blood coagulation and anticoagulation systems. It was shown that significant and prolonged emotional tension of a negative nature leads to an increase in blood lipid levels, elevation of arterial pressure, increased permeability of the vascular wall and a tendency toward thrombus formation, as a result of which conditions for development of atherosclerosis are created. In recent years, the role of autoimmune complexes in development of atherosclerosis was discovered, and this made it possible to initiate experiments dealing with development of immunological tolerance of hypercholesterolemia, which are important to practical medicine. Soviet scientists formulated the autoimmune theory of pathogenesis of atherosclerosis. The study of the incidence of atherosclerosis in various geographic regions of the USSR revealed differences attributable to ethnic and ecological factors which disclosed, in particular, an opportunity to search for the ways and means of treating the impaired elements of lipid metabolism.

Subsequent investigation of myocardial infarction resulted in formulation of the concept of metabolic and electrical instability of the myocardium at the early stages of the disease, and the mechanism of development of circulatory insufficiency at its acute stage was identified. Investigations of the system that regulates contraction and relaxation of the myocardium were important. There are a number of data that warrant the belief that impaired regulation of flow of calcium in the myocardium leads to pathological changes in the myocardium, to the extent of total arrest. As a result of research pursued in this direction, an original technique was developed for demonstration of the system of the myocardial calcium pump. Epidemiological research was of great significance to the study of cardiovascular pathology. Not only did it demonstrate the incidence of cardiovascular diseases in various regions and among various population groups in our country, it also showed the significance of factors inducing these diseases. Studies conducted in this direction, on the "myocardial infarction register" program made it possible to investigate the morbidity rate, structure of mortality, time of onset of fatal outcome of myocardial infarction and acute coronary insufficiency, incidence of sudden death, as well as to evaluate the quality of medical care rendered to such patients.

As for refinement of diagnostics of cardiovascular diseases, significant strides have been made in the past 10 years. This was aided both by experimental and clinical development of new diagnostic methods and adoption thereof in public health practice. The use of new techniques, such as coronarography, radiositope scanning and artificial stimulation of the atria,

improved significantly the diagnostics of cardiac ischemia, with more frequent detection of discrete coronary insufficiency. In addition, it was shown that echocardiography and ultrasonic scanning of the heart could be used to diagnose valvular lesions, early stages of cardiac insufficiency, as well as to evaluate the efficacy of treatment of patients with cardiac glycosides, stimulants and β-adrenergic receptor blocking agents. As for detection of myocardial infarction, a set of diagnostic techniques was proposed that made it possible to make the diagnosis, within the first few hours of this disease, in 95% of the cases. Introduction of new methods of differential diagnostics of various forms of arterial hypertension using contrast media in the kidneys and their vessels, morphological examination of renal biopsy material, hormonal and immunological examinations made it possible to differentiate between various types of symptomatic hypertension due to renal or renal vascular pathology, or adrenal disease. There were extensive studies on the use of electronic, electron computer technology and mathematical methods in cardiology. Several diagnostic instruments, data, analysis and monitoring systems, equipment for remote telephonic and radioelectronic cardiological diagnostics, electronic equipment for direct transmission of electrocardiographic information about patients to an electronic computer were developed.

There is considerable progress in the treatment of cardiovascular disease. Thus, development and use of modern methods of differentiated therapy for patients with arterial hypertension made it possible to lower arterial pressure in most of them, as a result of which progression of the disease is arrested, and such complications as cardiac and renal insufficiency develop less often. The principles have been developed for differentiated treatment of patients with chronic cardiac ischemia, depending on the distinctions in the clinical course of the disease, as well as degree of involvement of coronary arteries. The death rate due to cardiogenic shock and severe rhythm disorders has dropped as a result of broad use of modern methods of anesthetization in the presence of myocardial infarction, electrical defibrillation and transvenous stimulation of the heart. In particular, the use of transvenous endocardial temporary electric stimulation of the heart lowered the mortality among patients with myocardial infarction and complete transverse block by 15-20%. As a result of studies of the rate of assimilation and elimination of various glucosides, new principles were expounded on the treatment of patients with cardiac insufficiency using these agents. The method of electric pulse therapy developed by Soviet scientists has found applications in the treatment of cardiac fibrillation, particularly ventricular fibrillation, which is one of the main causes of cardiac arrest. As a result of research conducted to refine methods of electropulse therapy of disturbances referable to cardiac rhythm, some new biocontrolled stimulators, paired pulse stimulator, miniature defibrillator and monitoring equipment were developed. Work has been completed on a new power source for the cardiostimulator, based on radioactive plutonium, which provides for uninterrupted operation of the device for 10 years.

The conditions have been developed for performing complicated surgery on the heart and vessels, thanks to refinement of methods of diagnosing cardiovascular

diseases, advances in anesthesiology, resuscitation techniques and transfusiology. In particular, new techniques have been proposed for surgical management of complex and combined congenital heart disease, as well as a method of combined use of extracorporeal circulation and hyperbaric oxygenation, which increases the safety of surgical intervention in cases of complex heart defects; a method has been proposed of combining extracorporeal circulation with deep hypothermia, which broadens the indications for open heart surgery on infants. Operations involving the use of Soviet mitral and arterial valve prostheses have been found to be highly effective. In addition, new Soviet equipment for extracorporeal circulation has been developed and refined; a system of measures has been proposed for the prevention of acute cardiac insufficiency during surgical intervention on the heart and in the postoperative period; a system has been developed for stage-by-stage medical rehabilitation of patients who have undergone surgery for cardiovascular disease. In the last few years, complex reconstructive operations have been proposed for the aorta, renal and vertebral arteries, vessels of the neck, face and limbs. Aorto-coronary shunts are being performed to improve blood supply to the myocardium.

There was successful development of the scientific principles involved in rehabilitation of patients with myocardial infarction, and this reduced the term of disability after acute myocardial infarction, with about 80% of the patients returning to work within a year after the infarction; it also allowed most of the patients to retain their fitness for work for the next 2-3 years.

The following were the main directions of research dealing with malignant neoplasms: determination of the causes and mechanisms of onset of tumors, searching for methods of diagnosis, therapy and prevention thereof. Some important scientific results have been obtained toward solving these problems. The viral-genetic theory of onset of cancer has been formulated, and it has gained universal recognition. Some important data have been obtained from experiments on primates conducted to study the role of viruses in onset of tumors. Thus, administration to monkeys of blood from humans suffering from leukemia led to development of a leukemia-like disease. The oncornavirus then isolated from the monkeys, its characteristics and the possibility of horizontal and vertical transmission of the disease confirm the viral nature of leukemia in man. Proof of the possible role of viruses in onset of tumors is also related to the discovery of the phenomenon of pathogenicity of tumorigenic viruses of one class of animals for another class of animals.

Research of the school of Soviet scientists on carcinogenic agents in the human body and man's environment is widely known. Our science is to be credited with the discovery of endogenous carcinogens. The studies of Soviet scientists showed that carcinogens can be destroyed by some strains of soil bacteria; they are capable of passing through the maternal placenta, increasing the possibility of tumor in the offspring. Intracellular systems, which are involved in activation and inactivation of carcinogenic agents, are important to the mechanism of carcinogenesis. On this basis, it was

demonstrated that "biochemical" prevention of the process of carcinogenesis is possible in principle, by using chemicals that block the bond between the carcinogen and nucleic acids. On the other hand, of great importance to demonstration of molecular processes of carcinogenesis occurring under the influence of a carcinogen on the cell are the completed studies dealing with isolation in pure form of the individual protein that binds carcinogens, isolation of antibodies to this protein and knowledge about its distribution in tumor and normal cells.

Much has been done in the area of diagnostics, particularly early detection, of malignant tumors. Equipment and diagnostic methods are being refined: lymphography, angiography, tomography, mammography with thermography, laparoscopy, roentgenocinmetaography, double and triple contrasting, etc. Soviet scientists have developed basically new methods of immunological diagnostics of primary carcinoma of the liver and teratoblastoma of the testis, which are based on demonstration of embryospecific serum α-fetoprotein. This original direction was first created by Soviet scientists. At the present time, the search for new, specific antigens for tumor diagnostics is being continued.

In the field of clinical oncology, attention was concentrated mainly on development of new systems and refinement of existing ones for the combined therapy of neoplastic pathology. Much was done to develop oncology by clinicians in different fields, particularly surgeons, who were always very close to oncology. Combined methods of treating chorionepithelioma, generalized melanoma, carcinoma of the endometrium, lumphogranulomatosis and Wilms' tumor in children have now been adopted in clinical practice. A clinical cure is being obtained in virtually all patients with chorionepithelioma of the uterus with the use of chemotherapeutic agents, including the domestic antibiotics, rubomycin, chrysomallin and aurantine, among those whose treatment was begun before appearance of metastases and in about 50% of those with metastases. There have been cases of treated women who became pregnant ending in normal delivery. The use of combined chemotherapy of generalized melanoma resulted in an immediate response in 40% of the patients, with complete disappearance of tumors within 3 years in 10% of the cases. Surgical management combined with antineoplastic agents has resulted in a persistent response in children with Wilms' tumor, even in the presence of distant metastases. At the early stages of this disease, surgery, postoperative radiation and preventive chemotherapy result in a clinical cure in 60% of the patients.

Immunological methods of treating oncological patients have been developed in the last few years: immunotherapy of malignant neoplasms and immunoprophylaxis of recurrence and metastases. A new and original method of immunotherapy has been developed for acute leukemia in children, using live, frozen allogenic leukemia cells. The use of this method prolonged the life of sick children to over 6 years, which is considerably longer than all the data in the worldwide literature concerning the duration of remissions in children when other methods of therapy are used. In the last 2 decades, there has been intensive development of Soviet chemotherapy. About 4000 compounds with suspected antineoplastic action have been synthesized or isolated from natural sources; more than 20 antineoplastic agents have been

handed over to practical public health, including olivomycin, rubomycin, carminomycin, fluorafur, diiodobenzotepa, nitrosomethylurea and others. New methods of radiation therapy of malignant tumors have been significantly refined and developed. For example, high-energy proton beams are being used in the treatment of cancer of some localizations; studies are in progress on the possibility of using laser beams, neutrons and ultrasound in experimental and clinical oncology.

The applications of electronic computer technicology are being broadened in diagnostics of malignant tumors, individual prognoses, choice of individualized programs for radiation, etc. In the last few years there has been extensive research on epidemiology of cancer, with the involvement of many scientists working in different parts of our country. The link between leukemia of man and animals is being investigated in collaboration with veterinary specialists. Much attention was devoted to the scientific aspects of enhancing the efficacy of various forms of mass scale preventive examinations, to upgrade control of cancer.

Intensive development of the above-mentioned research in oncology improved methods of early detection of tumors and made it possible to develop new and refine existing ... [word omitted], and to organize the cancer control service. As a result, the mortality indices referable to cancer among males have become stabilized in our country, whereas in females there is a definite tendency toward decline thereof.

Major scientific achievements can be reported in development of basic problems of endocrinology, related primarily to isolation of hormones in pure form, identification of their chemistry, investigation of their biosynthesis, mechanisms of biological action and metabolism in the organism. This research provided a firm scientific foundation for and advanced significantly the study of physiology and pathology of endocrine glands, interaction and correlation between them, patterns of implementation of regulatory functions of the endocrine system, mechanisms of formation of endocrine pathology and pathogenesis of endocrine diseases. Soviet endocrinologists have made significant strides both in the field of developing basic directions and solving many practical problems.

For example, some new mechanisms of hypothalamic regulation of endocrine functions have been demonstrated. It was established that there are two centers in the hypothalamus, cyclic and tonic, which regulate the reproductive cycle. Areas have been discovered in the hypothalamus, where the releasing factor is produced, and it stimulates secretion of adrenocorticotropic hormone; it was shown that production thereof is inhibited by overlying parts of the brain.

On the basis of investigation of biosynthesis of adrenocortical hormones and determination of the nature and pathogenetic role of disturbances in steroidogenesis, there has been establishment of the distinctive features of disturbances referable to hormone biosynthesis in the presence of hyperplasia of the adrenal cortex, corticosteroma, aldosteroma and Itsenko-Cushing

disease. In addition, some of the mechanisms were demonstrated with reference to disturbances of hormone biosynthesis in the presence of thyroid pathology and diabetes mellitus; the complete chemistry has been identified for several peptide-protein hormones, including bovine prolactin. Of great importance are studies that resulted in complete laboratory synthesis of insulin identical with human insulin, and this was applied in the direction of refining methods of chemical synthesis thereof. Original methods were used to synthesize some of the hypothalamic releasing factors and modified analogues thereof. For the first time, tetradecapeptide, corresponding to fragment 31-44 of human growth hormone, was isolated and then synthesized. It has lipid-mobilizing activity that is many times higher than the analogous activity of the native hormone. An original system was developed for complete chemical synthesis of D-11-deoxyprostaglandin E_1, which can serve as the basis for synthesis of additionally modified prostaglandins. Thymosine has been isolated from the thymus. It was shown experimentally that it affects the delayed type of allergy and some indices of humoral immunity. A drug form of thyrotropic hormone releasing factor has been developed: rifathyroin. A preparation of human somatotropin is now being manufactured; it is a specific agent for the treatment of hypophyseal dwarfism; an original steroid agent, silabolin, has been synthesized which is superior in anabolic activity than analogous foreign agents. Several other original agents have been developed as well. The advances in development of basic problems raised the level of clinical endocrinology.

In the field of virology, special attention was also given to basic research. An extensive set of work was done for the study of synthesis of virus-specific macromolecules in reproduction of RNA-containing viruses. Along with data concerning the mechanism of replication of viral nucleic acids, some important results were obtained from the study of virus-specific transcription, i.e., synthesis of virus-specific messenger RNA. The main characteristics of the nucleocapsid contained in the transcriptive complex have been described. There has been recognition of the conception of function of nucleocapsids in the transcriptive complex, which was developed in our country. Several studies were conducted in the past few years on the molecular structure of viral particles, on models of phages and viruses of plants. Some original data were obtained from studies of viral interference. Some basically important results were obtained from studies of molecular mechanisms of chronic viral infections. Continued development of research in molecular virology is the basis for finding new and effective agents for chemotherapy and chemoprophylaxis of viral infections. Soviet virologists have made a large contribution to the study of oncogenic viruses and viral etiology of malignant neoplasms and blood disease. The addition to virology of the powerful armamentarium of modern virological, biochemical, molecular biological methods has made it possible to obtain original data on isolation and identification of oncornaviruses, the possible etiological agents of human cancer and leukemia.

Significant advances have been made in the study of immunity to viruses. Of particular interest are studies dealing with the role of nonspecific immunity factors in viral infections and investigation of cellular immunity. Original data were obtained on incorporation of antigenic components of the host in

various viruses. Research is being developed on the distinctions of immunity in the presence of chronic and latent infections. Studies dealing with the most important problem of influenza were directed toward development of pressing problems of ecology thereof, molecular biology of influenza viruses, immunology, epidemiology, prevention and treatment of this disease, as well as development of new diagnostic, therapeutic and preventive agents. The teaching on variability of influenza viruses and development of live influenza vaccines constituted the most important contribution of Soviet virologists to development of this problem. Investigation of variability of influenza viruses and fluctuations in immunity to them among the public served as the foundation for scientific forecasts pertaining to influenza, and this too was done for the first time in the USSR. This research served as the basis for international collaboration in the study of influenza, which is implemented in accordance with the WHO program. The problem of preventive inoculation against influenza is still being worked on intensively in various directions; in particular, a cultural influenza vaccine has been developed for intake by mouth. In the last few years, rementadin was developed, studied and adopted in public health practice; this agent depresses the early stages of viral synthesis. At the present time, human leukocytic interferon is being used for the prevention of influenza. There has been considerable development of research on ecology of influenza viruses.

Work has continued in the last few years with regard to the study of etiology, prevention, diagnostics and treatment of viral hepatitis. Among the positive results, we should include establishment of the possibility of using modern molecular biological methods for demonstration of the pathogen of hepatitis. A (infectious hepatitis) and B (serum hepatitis) viruses have been identified, and it was shown that it is possible, in principle, to produce immunity with these inactivated viruses. Laboratory, clinical and epidemiological criteria have been developed for differential diagnostics of infectious and serum hepatitis. The correct solution to key problems of epidemiology of infectious and serum hepatitis made it possible to provide an exact evaluation of Australian HB antigen and to define its place and significance in future investigations of various forms of hepatitis. Thus, even now, there is a real possibility of controlling the incidence of infectious and serum hepatitis.

There has been considerable development of research dealing with ecology, molecular biology of arboviruses, as well as development of diagnostic, therapeutic and preventive agents. A conception has been expounded on the distinctions of circulation of various ecological groups of arboviruses in different geographic zones of the world. On this basis and with the use of mathematical methods, a forecast was made concerning endemic sites of arboviruses in the USSR. As a result of checking the forecast in various parts of our country, 30 arboviruses were isolated in 5 years, and 13 of them are new to science and are now included in the International Catalogue. The biophysical, morphological and antigenic characteristics of the isolated viruses have been investigated. Work dealing with the detection of arboviruses in the USSR revealed that there are some persistent endemic sites, that are linked to birds, in the northern part of the temperate zone, sub-Arctic region, as well as the desert region of Central Asia and Transcaucasia.

Studies conducted in the past few years of tick-borne and Japanese encephalitis yielded data of theoretical and practical importance. By virtue of complex development of the problem, the biological properties of viruses have been investigated, vectors have been identified; warm-blooded hosts and routes of circulation of the virus in wild nature, as well as routes of human infection have been studied; a set of ways and means of preventing these serious diseases has been developed, and it includes preventive vaccination, eradication of carriers and protection from attacks by them. Research on viral hemorrhagic fevers has also been greatly developed.

One of the major achievements of medical science was the development and mass production of polio vaccines. Soviet virologists, in close collaboration with American researchers, developed and systematically introduced to practice killed and live poliomyelitis vaccines. As a result of mass immunization with live polio vaccine, which was organized all over our country, a 120-fold reduction in morbidity was obtained within a few years.

More recently, even greater attention was devoted to protecting children from viral infections, particularly such a widespread disease as measles. Complex investigation of etiology, pathogenesis, specific prophylaxis and therapy of rubeola resulted in development of a highly immunogenic cultural measles vaccine that creates reliable immunity in inoculated children.

Investigation of the medical aspects of man's environment is of enormous importance to the life of modern society. Basic research in this field established the theoretical bases of interaction between the organism and various environmental factors. Thus, determination was made of the quantitative correlation between time of appearance of general toxic and certain specific effects, on the one hand, and concentration and mode of exposure to chemical compounds, on the other; on this basis, some new parameters were proposed for evaluation of their hazard and classification of the latter; there was development of the bases for differentiated evaluation of extent of pollution of the air environment as related to the class of hazard of the substance, duration of exposure and extent to which it exceeds the set standards. Correlations were established between physicochemical properties of substances, their structure and biological effect, and this made it possible to propose mathematical methods of setting tentative safe levels of deleterious agents in atmospheric air and water in reservoirs. The degree of toxicity and hazard of chemical pollutants of water have been classified. This classification makes it possible to objectively determine the urgency and priority of studying the biological effects of specific chemical compounds. A method of extrapolation from animals to man of the results of experimental investigation of general toxic and gonadotoxic effects of chemical pollutants of water was developed on the basis of basic research. The proposed method increases the reliability of the standards set by USSR legislation pertaining to water and sanitation. There was development of methodology for setting hygienic standards for chemicals in the soil. The criteria have been defined for deleteriousness of chemical pollutants in the soil, with due consideration of their stability, solubility and migration in subterranean water, atmospheric air, plants, and their capacity to affect microbiocenosis of the soil.

The hygienic principles of functional zoning of the major industrial regions of our country have been worked out. There has been substantiation of differentiated requirements, with regard to urban planning and construction in the different climate zones of the USSR. Studies have been made of the mechanisms and patterns of biological effects of such physical factors of the indoor environment and urban areas, such as temperature, humidity, mobility, electrical status of the air environment, electromagnetic fields, noise, vibration, ultraviolet, visible and infrared radiation, and this permitted scientific substantiation of hygienic standards thereof. The study of the laws of formation of the indoor environment laid the hygienic foundation for controlling the environment within buildings.

Investigation of the patterns of distribution of pollutants in the environment served as the basis for developing the relevant formulas for dissipation of different types of waste from industrial enterprises and vehicles and this, combined with hygienic standards, permits obtaining an effective solution to problems of preventive sanitary inspection. In addition to development of the theoretical bases of environmental hygiene, there have been extensive experimental and field studies of an applied nature. The main branches of industry, agriculture and transport, as sources of environmental pollution, their influence of living conditions and physical condition of the public have been submitted to extensive investigation. A hygienic evaluation has been made of various plans for populated regions, housing, civilian and hospital construction, modern sanitary and illumination engineering equipment, new methods of obtaining drinking water by treating highly mineralized water and desalinization of sea water, as well as artificial replenishment of water level using surface run-off; new methods of treating and decontaminating drinking and sewage water, new reagents and polymers used in the water-supply system, civilian construction, in the manufacture of clothing and shoes, as well as household chemicals.

The entire set of numerous and diverse investigations made it possible to work out the hygienic bases for implementation of the system of state measures to protect the environment. About 1000 various standards, GOST and SNiP [construction norms and specifications] have been developed and approved. There has been development and refinement of methods of identifying and quantitatively assaying chemical, physical and biological environmental factors, which make it possible to organize inspection of the status of the environment.

Protection of the health of working people and the struggle to prolong the period of active longevity of the builders of the new communist society became the most important national affair from the very first days of existence of our state. Development of theory of setting hygienic standards for deleterious factors of the industrial environment became the main direction. The accumulated data made it possible to define the principles and work out methodological approaches to hygienic standard-setting. Investigation of the patterns of development of a pathological process under the influence of various industrial factors, stages of genuine physiological adaptation and compensation for the pathological process resulted in

substantiation of a number of methods for differentiating between them, and this is important to consider in setting hygienic standards. The mode of exposure to deleterious factors has been shown to play a role; in particular, this applies to the adverse effect on some groups of the intermittent exposure to chemicals, radio-frequency electromagnetic fields, microclimate, noise and other factors. The need to take into consideration the long-term sequelae of exposure of the human body to various factors of the industrial environment has been substantiated.

Research directed toward solving problems related to development of the chemical industry and extensive use of chemistry in the national economy began to occupy a large place. There was development of principles and methods of toxicometry and approaches to substantiation of maximum permissible concentrations of chemicals in the air of work zones. There was formulation of the main principles involved in establishing the thresholds of deleterious effects and maximum permissible concentrations of substances with blastomogenic properties. There was substantiation of hygienic standards with respect to permissible levels of 900 chemicals and dust in the air of work zones. Research was developed that dealt with the combined effect of industrial factors.

Investigation of the health status of individuals exposed to physical factors at work, such as noise and vibration, electromagnetic waves, heat, cold, etc., takes up a prominent place in this research. The energetic theory of effect of vibration on the organism was expounded, criteria were substantiated for hygienic standards thereof. Maximum permissible levels have been set for ultrahigh-, superhigh- and high-frequency radiations; protective gear [or devices] has been developed and adopted for workers exposed to radiowaves.

Sociohygienic research has been deployed. Studies are being pursued of the effects of working conditions on the health of women and their specific functions, so that even now hygienic principles have been worked out to regulate their work in the chemical and certain other branches of industry; a list of industries has been compiled, where women are not allowed to work. In the area of occupational diseases, one of the main directions was the study of pathogenesis, development of methods of early detection and treatment of occupational diseases, as well as research for scientific substantiation of problems pertaining to expert evaluation of fitness for work. The main form of introduction of the results of research in the field of industrial hygiene and occupational pathology to public health practice and the national economy was the preparation of standard-related and methodological documents, as well as hygienic, therapeutic and preventive recommendations. Thus, in the period of the 9th Five-Year Plan alone, institutions dealing with the problem of "Scientific bases of industrial hygiene and occupational pathology" prepared 58 sanitary rules, including "Labor safety systems," 25 GOST [State standards], 120 methodology documents dealing with diagnostics and treatment of occupational diseases and organization of medical care of workers, 233 maximum permissible concentrations, 184 methods of assaying chemicals in the air of industrial buildings and biological media, 307 applications for discoveries and author certificates, and 378

rationalization proposals. Most of the standards apply to more than one industry and are intended for extensive use in the national economy. The studies aided in significant amelioration of working conditions and lowering the incidence of occupational diseases. In the years of the 9th Five-Year Plan alone, there was a 24% decline in occupational morbidity.

The conception of a balanced diet is one of the fundamental results of development of the science of nutrition; according to it, normal vital functions of man are possible, not only if the body is supplied with an adequate amount of energy and protein, but if certain proportions are maintained of essential nutritional factors, each of which plays a specific role in metabolism. This served as the basis for working out an average formula for balanced nutrition and the document, "Recommended levels of physiological requirements in nutrients and energy," has been officially approved by the USSR Ministry of Health. The tables of chemical composition of domestic foodstuffs, which are published repeatedly, aid in proper adoption of scientifically substanitated nutritional norms and estimation of protein, fat, carbohydrate and other nutrient requirements. Hygiene of nutrition has made rather significant strides in the last few decades. The results of scientific research in the field of preventive nutrition, pursued at a number of scientific institutions of our country, served as the basis for the "Recommendations in the field of preventive nutrition of industrial workers of the USSR," which are now in force. They list diets for miners, employees in the chemical industry, construction workers on the Baykal-Amur Highway, some categories of agricultural workers and vocational and technical school students.

Extensive research has been done in vitaminology. It dealt with diverse issues pertaining to vitamin requirements as related to age and job distinctions, relationship to other nutritional factors. Expeditions to various parts of our country were of practical importance. In particular, the high endemic incidence of pellagra in the lowland regions of western Georgia was eradicated as a result of determination of its causes and implementation of preventive measures. For the first time, standards were set for the daily vitamin requirements of man, mandatory vitamin C supplements have been adopted in children's therapeutic and preventive institutions, hospitals for adults and maternity homes; there are plans for extensive addition of vitamins to mass consumption foodstuffs; standards have been developed and approved for adding vitamins in foods.

Advances in hygiene of nutrition were also made with regard to the study of alimentary mycotoxicosis. Experimental investigations established the role of microscopic fungi in onset of alimentary toxic aleukia; studies were pursued to determine the etiology and epidemiology of osteoarthritis deformans endemica, which was widespread in Transbaykal'ye. In the last few years, in view of investigation of a large group of microscopic fungi that form toxic metabolites, methods were developed for demonstration of some of them, and this made it possible to check the mycotoxin content of foodstuffs. Nor can we fail to mention the achievements of Soviet hygienists and microbiologists in the study of etiology, pathogenesis and epidemiology of alimentary

toxicosis and infections, as a result of which scientifically substantiated measures were developed for the control of botulism, salmonellosis and staphylococcal toxicosis. It should be considered important that, in our country, there has been virtually complete elimination of botulism caused by products that are manufactured by state food industry enterprises. In view of the broad use of chemistry in the national economy, much attention was devoted to studies related to protection of foodstuffs against the increasing danger of contamination by numerous chemicals that are used in agriculture and industry. Intensive research in this area made it possible to provide multifaceted descriptions of the toxic effects of a number of pesticides, antibiotics, growth stimulators, polymers, as well as substances that are being proposed as additives in the food industry and to set the maximum permissible concentrations of each of them in the products. The results of these studies and the steps taken by agencies of the sanitary and epidemiological service have guarded the public from many inadequately substantiated proposals. In the years of Soviet power, sanitary legislation has been essentially worked out in our country, and there is a code of sanitary laws in the field of hygiene of nutrition, and this aided in raising the sanitary standards of all foodstuffs in our country.

In view of the continuing acceleration of scientific and technological progress and increased mental and physical activity of man, it has become much more vital to investigate and treat diseases of the nervous system. The main theoretical questions, development of which has a strong influence on development of neurology, are the study of localizations of functions in the brain and continued shaping of the conception of their systematic organization, questions of compensation and mobilization of physiological defenses, the role of emotional stress. In this aspect, of particular importance is the research pursued by Soviet scientists involving the use of implanted electrodes in deep structures of the brain for therapeutic purposes. Of definite interest are the studies dealing with unconscious mental activity which, in contrast to Freudian interpretations, provide materialistic bases for comprehension thereof.

Vascular pathology of the nervous system is a problem of utmost importance in clinical neurology; this is attributable to its very high incidence and severe course. Much attention has been devoted to collateral cerebral circulation. A series of many clinical investigations established that the sequelae of occlusion of cerebral vessels are determined primarily by the capabilities of collateral circulation. Refinement of modern methods of examining cerebral circulation under clinical conditions has resulted in definition of conceptions about pathology of cerebral hemodynamics and its link with changes in metabolism of the brain, and this broadened the diagnostic capabilities. Experimental work dealing with modeling of diverse pathological states played a rather sizable role in this regard.

Research that established the role of great arteries of the head in impairment of cerebral circulation was of particular importance to continued progress in the treatment of cerebrovascular disease; it has become possible to surgically restore circulation in atherosclerotically constricted vessels

and obviate the danger of embolization of atherosclerotic plaques. At the present time, such operations are performed in many surgical clinics. Among other achievements in the study of vascular pathology of the nervous system, we should mention the development of a classification of vascular lesions to the nervous system, which made it possible to organize mass epidemiological screening in accordance with a unified program. Moreover, using computers, a method of prognostication of outcome of cerebrovascular accidents was devised, which makes it easier to choose between surgical and conservative management. Among the achievements of Soviet neuropathology, we should also list development of new and refinement of existing methods of diagnosing and treating cerebrovascular pathology. This resulted in lowering of mortality, particularly that referable to ischemic insultus.

Another extremely important problem of neuropathology is that of diseases of the peripheral nervous system, among which radiculitis has acquired the most significance: lumbosacral and cervicobrachial radiculitis present a serious economic problem, in addition to a medical one. It was demonstrated that not only diverse pathology of the spine, often requiring orthopedic care, but infections, intoxication and cooling often play the role of an etiological factor in radiculitis, rather than only a provoking factor. To develop this thesis, scientific systems were devised for the control of occupational hazards in different industries.

The remarkable achievements made in the last decades in the field of biological sciences raised to a better level research in the field of hereditary diseases of the nervous system. Thanks to discovery of the pathogenesis of some of these diseases some serious strides were made in treatment thereof, even though they inevitably led to severe disability or death in the recent past. Hepatocerebral dystrophy, or Wilson-Konovalov disease, is an example. The studies of Soviet and foreign scientists resulted in development of a system for the successful treatment of this disease, which was formerly hopeless. New therapeutic agents were also used with a good response in the treatment of such previously considered incurable diseases of the nervous system as Hallervorden-Spatz disease, torsion dystonia and a few others.

Neurosis is an extremely important problem of modern society. In spite of the obvious achievements of a social nature, unfortunately it is still rather widespread. At present, neuropathologists are equipped with a wide assortment of sedatives and tranquilizers, which are particularly effective when combined with physiotherapy and proper psychotherapy, for the treatment of neurosis. In addition, Soviet neuropathologists and psychiatrists have developed a number of psychotherapeutic techniques and systems.

In the years of Soviet power, considerable strides have been made in the development of the main branches of scientific psychiatry: general psychopathology and symptomatology of endogenous and exogenous psychosis, child and gerontological psychiatry and borderline psychiatry. As a result of the significant advances in diagnostics, patients are treated and socially rehabilitated. In the field of general psychopathology, there was the most

productive development of the conception of levels of mental disorders as a generalization and continued development of the teaching on psychopathological syndromes. The research on schizophrenia pursued in the last decade has resulted in a classification, which enables the physician to prognosticate the subsequent course of this illness and its social consequences with much greater degree of probability than before at the early stages of manifestation. Alcoholic psychosis has been submitted to in-depth investigation in the last few years. Advances have been made in the study of epilepsy and schizophrenia of childhood, and new forms of neurological care have appeared. Biological psychopharmacology is a new direction that is being developed by Soviet researchers. The results obtained in this field warrant consideration of pharmacokinetic and pharmacogenetic research in psychiatry as the most promising directions of modern psychopharmacology.

While Soviet medical science devotes its attention mainly to development of basic theoretical directions, it is not diminishing its concern with other extremely important branches of medicine. Soviet medicine has always attributed much importance to continued scientific research on mother and child care. Among the most important achievements, we must mention the identification of some regulatory mechanisms of contractile activity of the uterus, which was a mandatory prerequisite for prevention of premature and over-term deliveries, occurrences of various anomalies of labor, decrease in number of surgical interventions, hemorrhages and prevention of adverse outcomes for the mother and infant. Soviet obstetricians are using prostaglandins for stimulation of labor. A major achievement of recent times is the development and use in the USSR of the electroanalgesia method, and this will reduce to a minimum the use of drugs in obstetrics and gynecology in the presence of many pathological states. Soviet surgeons have made enormous achievements that are universally recognized. At the present time, surgery can be performed on any human organ. There is a very large center for hyperbaric oxygenation in the USSR, and it is working intensively, from profoundly scientific positions, on the problem of organ and tissue transplantation.

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ACHIEVEMENTS AND PROSPECTS OF DEVELOPMENT OF RESEARCH IN THE FIELD OF PHARMACOLOGY

Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 11, 1977 pp 47-53

[Article by V. V. Zakusov (Moscow)]

[Text] The present stage of development of Soviet pharmacology began after the Great October Socialist Revolution, which opened up a new era in the history of our nation. There was not a single specialized institution of pharmacology in prerevolutionary Russia; scientific research in pharmacology was pursued only in pharmacological departments of medical faculties, of which there were no more than 20 in 1917; the chemical and pharmaceutical industry was on a very low level and most drugs were imported.

At the present time, there are more than 12 major scientific research institutes specializing in pharmacology, with over 90 departments of pharmacology in our country's VUZ, and a strong chemical and pharmaceutical industry, which meets almost entirely the nation's drug requirements. The pharmacological agents produced in the USSR are exported to many countries of the world, and licenses for some of them are being obtained by the United States, FRG, Japan, Sweden and other economically developed countries.

Throughout its history, mankind has been interested in drugs. Interest in them has increased even more at the present time in view of the progress in pharmacology. It would be inconceivable to treat any disease without the use of pharmacological agents. General and local anesthetics, analgesics, neuroleptics, tranquilizers, ganglion-blocking agents and muscle relaxants were largely instrumental in development of surgery. Thanks to the new psychotropic agents it became possible to treat mental illness. At the present time, it is possible to control virtually all physiological functions and even mental activity and emotions with pharmacological agents.

N. P. Kravkov initiated many directions of modern pharmacology, and he is the recognized classic of Soviet science. His research on the relationship between the action of pharmacological agents and their chemical structure, teaching on phases of action, dose-effect function, effects of pharmacological agents on enzyme activity, and his work on pharmacology of the endocrine glands acquired particular importance.

The advances made in gaining knowledge of the chemistry and mechanisms of action of pharmacological agents opened up new prospects for the creation of effective products. It became possible to selectively synthesize pharmacological agents, i.e., to obtain chemical compounds with specified properties. The study of chemistry of pharmacological agents by means of x-ray analysis, ultraviolet, infrared, nuclear magnetic and mass spectroscopy, gas and liquid chromatography yielded precise information on their stereochemistry, and the structure of some of them was defined in three dimensions; the distribution of electric charges in their molecules and location of electron orbits were established. Such information was largely instrumental in synthesis of new drugs. It was possible to determine the significance of different radicals to pharmacological activity on the basis of chemical analysis of the structure of different classes of compounds. As a result, by adding certain radicals to the compound molecule, it is possible to develop agents with the desired properties.

Progress in synthetic chemistry made it possible to solve the problem of reproducing natural substances and their synthetic analogues as drugs. For example, some hormones were obtained synthetically, in particular estrogens and later on analogues thereof. Interestingly enough, the synthetic analogues of estrogenic hormones are many times more active than the native ones. Many of the active elements of drugs of plant origin have been obtained by synthesis (for example, alkaloids of rauwolfia, opium and cinchona bark).

Discovery of the mechanism of action of pharmacological agents also aided in developing effective products. New conceptions emerged concerning the primary pharmacological reaction as a result of studying the effects of pharmacological agents on the molecular level, i.e., investigation of their interaction with cellular receptors. Even I. P. Pavlov had mentioned the importance of this question, indicating the need to study the action of pharmacological agents, as he said, on peripheral endings of centripetal nerves. More recently the protein (polypeptide) nature of macromolecules of cellular receptors was established. Specific types of receptors have been found, for example, muscarine, opiate, 5-hydroxytryptamine. It was shown that pharmacological substances can enter into chemical reactions with them, forming covalent, ion, hydrogen and hydrophobic bonds. This is associated with conformational changes in the biopolymer molecules of receptors, as a result of which there is a physiological response. As a rule, the receptors are situated on cell membranes.

Estimates made even several decades ago by Clark offer some quantitative idea about interaction between pharmacological agents and cellular receptors. He found that, with an effective concentration of strophanthin in the medium, 1 g of frog myocardium fixes about 2 μg strophanthin. If we consider that the molecular weight of strophanthin is 760 and there are 6.02×10^{23} molecules per mole, 2 μg strophanthin contains 2×10^{15} molecules; 1 g frog myocardium contains 3×10^{8} cells; consequently, each cell fixes about 10^{7} molecules of strophanthin. One molecule of strophanthin covers about 5×10^{7} nm^2, while the surface of a frog heart cell has an area of about 2×10^{9} nm^2. Hence, the strophanthin molecules cover only 3% of the total

surface of the cell. Later on, Waser demonstrated, using the autoradiographic method, that a total block of myoneural transmission occurs when less than 1% of the postsynaptic surface is occupied by curare. Thus, a maximum pharmacological response is obtained when only part of the cellular receptors interacts with the agent. In addition, it was established that there is no linear correlation between number of receptors involved and magnitude of the response, and pharmacological agents that involve a different number of receptors may elicit the same effect. These facts led to conceptions of affinity of pharmacological agents for cellular receptors and efficacy of pharmacological agents. The latter is also referred to as intrinsic activity, at the suggestion of Ariens.

Some important information was obtained from studies of the mechanisms of action of pharmacological agents on the cellular level. In particular, it was found that many pharmacological agents influence the functions of cell membranes. Having a complex protein and lipoid structure the implement selective access of various substances, including pharmacological ones, into the cell and, consequently, distribution thereof in the organism. Various substances can penetrate through membranes passively, by means of diffusion through channels (pores) and actively in the case of dynamic equilibrium, due to the energy of adenosine triphosphate (ATP) and other macroergic compounds. Pharmacological agents can influence both the permeability of membranes and their transport function. For example, the effect of some diuretics depends on their influence on ion transport through renal membranes.

Investigation of the mechanism of action of pharmacological agents in the physicochemical aspect led to disclosure of the mechanism of action of many such agents. For example, surface activity, solubility in lipids or hydrophobic properties of narcotics [anesthetics] determine the mechanism of their action to a significant extent. Narcotics of the aliphatic class are a good illustration of the foregoing. The observed phenomena served as the basis for anesthesia theories. Some valuable theoretical information, particularly concerning mechanism of action, as well as in connection with synthesis of new and more refined agents for local anesthesia, was obtained as a result of investigation of physicochemical properties of local anesthetics (lipophilic features, coefficient of distribution in the solid and liquid phases of a nerve, capacity for absorption in a nerve, surface activity on the boundary of air, benzene and benzene solutions of nervous tissue lipoproteins, effects on monomolecular layers of lipids of fatty acids and lipids extracted from nerves of tissue).

Thermodynamic activity (principle of Ferguson), i.e., the parameter expressing active concentration of a pharmacological agent as a fraction of its concentration in the medium saturated with it (liquid or gaseous), is also often used to interpret the mechanism of their action.

The effects of many pharmacological agents are based on a biochemical principle and are implemented by means of inhibition or activation of enzymes. Physostigmine and proserine are examples of this nature; they depress the activity of cholinesterase, an enzyme that inactivates acetylcholine, which is the

mediator of cholinergic synpases; other examples are diacarb (acetazolamide) and dichlothiazide, which depress the activity of carboanhydrase, the enzyme that catalyzes the following reaction:

$$CO_2 + H_2O \rightleftarrows H_2CO_3 \rightleftarrows H^+ + HCO_3$$

and is involved in regulation of diuresis; iproniazid and nialamid, which lower the activity of monoaminoxidase, an enzyme that retards inactivation of biogenous monoamines, including epinephrine and norepinephrine, which are mediators of adrenergic synapses. There may be competitive inhibition of enzymes, for example, in the case of physostigmine--cholinesterase, or noncompetitive, as in the case of dimercaprol--heavy metals. It has been established that antipsychotic agents (neuroleptics) have an activating effect on one of the enzymes of catecholamine synthesis, tyrosine hydroxylase, eliminating substrate inhibition of the enzyme, while cocaine increases the affinity of this enzyme to the cofactor, which is associated with an increase in rate of conversion of tyrosine into dihydroxyphenylalanine.

The advances in theoretical pharmacology were largely instrumental in the creation of new drugs. For example, the discovery of the chemical component of transmission of neural excitation led to the use of mediators and their antagonists as drugs. Such agents as carbacholine, adrenalin, noradrenalin and dioxyphenylalanine are well-known. This paved the way for successful treatment of diseases related to impairment of neural trophics, for example, peptic ulcers.

After it was established that gamma-aminobutyric acid (GABA) is contained in the central nervous system and has the function in some structures of a presynaptic inhibitory mediator, analogues and derivatives thereof, including sodium salt of gamma-hydroxybutyric acid, found applications in clinical practice as sedatives and for the enhancement of anesthetics and analgesics. In addition, GABA is involved in metabolic processes related to conversion of alpha-ketoglutaric acid into succinic acid; the so-called GABA shunt refers to the chain of biochemical reactions implementing this conversion, which also corresponds to a portion of the tricarboxylic cycle.

After it had been proven that serotonin (5-hydroxytryptamine) is involved in regulation of physiological functions and its significance was established in the development of certain pathological states, the search for its antagonists began. So-called antiserotonin agents were found among various classes of chemical compounds. They include alkaloids of ergot and derivatives thereof, morphine and some indole compounds (typindol). The most effective antiserotonin agents were obtained synthetically. Continued development of these ideas led to the use of metabolites and their antagonists, i.e., antimetabolites, as drugs. Dihydroxyphenlalanine (dopa), an intermediate compound in the biosynthesis of norepinephrine, as well as the precursor of dihydroxyphenylethylamine (dopamine), is an example of a metabolite used in therapy. Many researchers have proven that dopamine performs the role of mediator in some structures of the brain and especially in the caudate nuclei. If there is a deficiency thereof in these structures, motor disorders (parkinsonism) develop which

respond to dopa therapy. Methyl dihydroxyphenylalanine (methyl-dopa) is an example of an antimetabolite that is used as a drug. As we know, biosynthesis of the adrenergic mediator norepinephrine proceeds as follows in the organism: phenylalanine--tyrosine--dopa--dopamine--norepinephrine. If dopa (norepinephrine precursor) is replaced by methyl-dopa, alphamethylnorepinephrine (pseudomediator) is formed and comes in contact with adrenoreceptors; but its activity is many times lower than that of norepinephrine (genuine mediator). For this reason there is attenuation of sympathetic influences on effector organs. The corresponding agents have found application in clinical practice under the names of aldomet and dopegyt.

Investigation of the mechanisms of action of pharmacological agents on the system level constitutes the chief aspect of modern pharmacology. The synaptic theory of action of neurotropic agents aided in the emergence of new conceptions of their influence on integrative activity of the nervous system. The study of the effects of pharmacological agents on behavior, learning, memory, conditioned reflexes, emotions and motivation, based on Pavlov's teaching on higher nervous activity, with the use of modern electrophysiological methods, electron computer technology, mathematics and cybernetics, aided significantly in predicting the distinctions of their effects in clinical practice.

As we know, the final stage of a study of pharmacological agents is to examine their effects under clinical conditions, on healthy and sick people. For this reason, the clinical direction of modern pharmacology has acquired much importance.

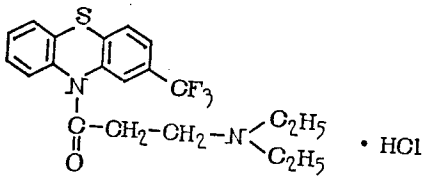
As we have already stated, investigation of the correlation between effects of pharmacological agents and their chemical structure is the main direction of the search for new drugs at this time; however, there may be instances when substances with different chemical structure could have a comparable physiological effect; for example, aliphatic hydrocarbons--ethyl alcohol or diethyl ether, predion (viadril) which is a steroid compound, and magnesium ions.

We submit below some examples of specific synthesis of drugs.

In the course of investigation of the correlation between pharmacological properties of phenothiazine derivatives and their chemistry, not only were active neuroleptics obtained, but it was found that some of them have antidepressive (thymoleptic) properties, others have anti-angina properties and others yet, anti-arrhythmia properties (restoration of proper rhythm of cardiac contractions).

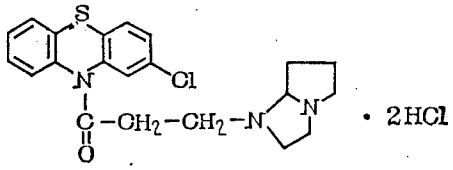
It was established that when the dialkylaminoalkyl radical at N10 is replaced by a dialkylaminoacyl one, the obtained compound loses its neuroleptic, as well as adrenolytic properties and acquires features inherent in antidepressants with a tricyclic structure, in particular adrenosensitizing properties. This circumstance served as grounds for looking for antidepressants in the class of 10-aminoacyl derivatives of phenothiazine.

A pharmacological evaluation, using many tests for demonstration of antidepressant effects (influence on motor activity, conditioned reflexes, potentiating of effect of phenamine, antagonism to reserpine), revealed that the most active antidepressant, as compared to known agents with this type of tricyclic structure, imipramine and amitriptyline, was 10-(beta-diethylaminopropionyl)-2-trifluoromethylphenothiazine, which was named fluoracizine:



Like imipramine and amitryptyline, fluoracisine enhances and prolongs the action of phenamine; it removes catalepsy induced by neuroleptics and potentiates the hypnotic effect of barbiturates. Clinical studies of fluoracizine resulted in a good rating, and this agent was recommended for broad use in practice.

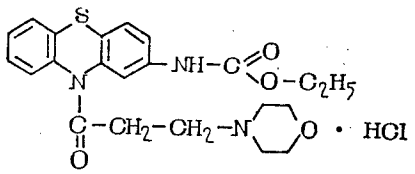
Compunds with marked anti-angina properties can be obtained by adding diazabicyclic radicals at N10 of the lateral chain of phenothiazines. A pharmacological study of agents of this class revealed that 10-{beta[1,4-diazabicyclo(4, 3, 0) nonanyl]-4-propionyl}-2-chlorophenothiazine dihydrochloride, named nonachazine (azachlazine) was the most active:



Experimental studies revealed that nonachlazine is a new type of anti-angina agent. It has a distinct beneficial effect on delivery of blood to the heart: it increases the volumetric rate of coronary blood flow, diminishes oxygen utilization by the heart, reduces its function, intensifies contractions and improves metabolism in the heart. The mechanism of beneficial effect of nonchlazine on blood supply to and activity of the heart is complex, and it is related to many factors. It was found that nonachlazine increases the norepinephrine content of the myocardium and has a stimulating effect on beta-adrenostructures. It activates adenylcyclase, aiding in accumulation of cyclic AMP in the myocardium, and this is associated with a beneficial inotropic effect. There are reasons to believe that the efficacy of nonachlazine on cardiac ischemia is related to its capacity to activate adrenergic mechanisms of regulation of glycogenolysis, transferring metabolism in the heart to the anaerobic route of releasing energy.

A clinical study of nonachlazine conducted on a large group of patients suffering from various forms of cardiac ischemia and angina pectoris showed it to have a high degree of therapeutic efficacy. Objective methods, using placebo and the double blind method proved that nonachlazine lowers the incidence of or arrests attacks of angina pectoris, making it possible to reduce nitroglycerin intake (occasionally none at all) and increases tolerance of physical loads. In patients with cardiac ischemia, nonachlazine increases stroke output and output fraction. In most cases, nonachlazine is superior to other anti-anginal agents (intensain, cordaron, corontin, inderal, isoptin).

Phenothiazine derivatives contained in the side chain of the N10 morpholine cycle were found to be highly active anti-arrhythmia agents. One of them, 10-(beta-morpholyl-propionyl)-phenothiazine carbamic-2-acid ethyl ester hydrochloride, named ethmozine, has already found clinical applications:



Ethmozine is considerably superior to novocainamide with respect to antiarrhythmia activity. It is effective in the presence of extrasystole, sinus tachycardia, paroxysmal supraventricular and ventricular tachycardia. It is not very effective in the case of auricular flutter and fibrillation.

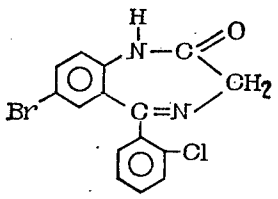
In view of the great practical importance of tranquilizers in current therapy, the laboratory of psychopharmacology at the Institute of Pharmacology, USSR AMS, in collaboration with the department of organic synthesis at Odessa University, undertook studies of the link between chemical structure and various forms of activity of benzodiazepine tranquilizers as the most promising agents in this category.

Experiments on animals revealed that substitutes in the 1,3 and 7 position of the benzodiazepine cycle are of greatest importance to the activity of benzodiazepine derivatives. Substitutes in the 7 position of the benzodiazepine cycle have the most distinct influence on the activity of compounds, with regard to tranquilizing, sedative, hypnotic, myorelaxant and anticonvulsive effects. Addition of electron-acceptor radicals (NO_2, Cl, Br) in this position enhances the activity of the compounds. Conversely, addition of electron-donor radicals, for example, CH_3, attenuates significantly the sedative, muscle relaxant and anticonvulsive effects, as compared to the analogue without substitution in this position. Agents with various substitutes in the 7 position can be listed in the following order of diminishing activity: NO_2, Br, Cl, H, CH_3. With addition of the CH_3 radical in position 1 of benzodiazepine, the activity of the compound increases. Consequently, addition of an electron-donor substitute in position 1 of

benzodiazepine may have an indirect effect on shifting electron density in its molecule, enhancing the electron-acceptor properties of radicals in the 7 position. Substitutes in position 1 have an appreciable effect on manifestation of tranquilizing properties of benzodiazepines. The activity of such compounds gradually diminishes with addition in this position of a methyl, acetyl and, particularly, ethyldioxane radical. A study of the role of substitutes in position 3 of the benzodiazepine cycle failed to demonstrate distinct patterns in the change in activity of compounds, with regard to the different types of action.

A comparison of experimental and clinical data on the activity of tranquilizers revealed that there was the most distinct correlation between general tranquilizing effects in humans and attenuation of external inhibition in animals.

As a result of studies conducted in this direction, a new active tranquilizer was found, which was named fenazepam: (7-bromo-5-(*o*-chlorphenyl)1,2-dihydro-3H-1, 4-benzodiazepine-2 one:



Experimental studies of fenazepam with the use of adequate methods led to the conclusion that it is an active tranquilizer, superior to known products of this nature with regard to the main types of action (chlordiazepoxide, diazepam, oxazepam, nitrazepam). Observations pursued in neurological and general medical clinics corroborated the experimental data completely, and fenazepam has been recommended for extensive use in practice.

The interests of practicing medicine resulted in the appearance of new directions in pharmacology. Thus, space, geriatric, pediatric pharmacology and pharmacogenetics were conceived. The clinical direction must be considered particularly timely, and it has acquired exceptional importance in the study of pharmacological agents.

It is to be expected that the rate of appearance of pharmacological agents will slow down in the immediate future. This will occur, in the first place, because each new agent must have major advantages over those already known and, in the second place, there has been significant increase in requirements with respect to investigation of toxicity, side-effects and remote consequences of an agent, to assure its total safety in clinical practice.

It is not difficult to foresee the brilliant future of pharmacology, as we review its past and see its rapid progress at the present time.

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ACHIEVEMENTS AND PROSPECTS OF RESEARCH IN ENVIRONMENTAL HYGIENE

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[Article by G. I. Sidorenko (Moscow)]

[Text] The wise policy of the CPSU and Soviet government in the area of environmental protection makes it possible for all branches of the economy to develop rapidly under the conditions prevailing in a socialist society, with neutralization of the deleterious effects on public health and nature of the side-effects of man's endeavors. Planning and control of the quality of the environment are being implemented on the basis of state regulation of the use of natural resources, setting rules and standards for the protection thereof.

Hygienic science, whose main task is to investigate the interaction between man and all the diversity of environmental factors, with substantiation of optimum parameters of the environment to assure normal vital functions of the human body and population as a whole, plays an important role in implementing the policy of the Communist Party and Soviet government in the area of environmental protection. The medical aspect is the main one in the problem of environmental protection, since safeguarding the health of the people, providing beneficial working, living and recreational conditions for the Soviet people are still the main concern of the Soviet government. At the present stage, public health should be the main system-forming factor in state handling of ecological problems, since the level of physical production ultimately depends on the health status of the people and preservation of manpower resources.

Even at the inception of the socialist state in 1919, the program of the Russian Communist Party (of Bolsheviks) included a section dealing with "safeguarding public health," stating that the immediate objective of the Party in this area is ... "to ameliorate populated areas (protection of soil, water, air), development of sanitary legislation." That same year, the government adopted a decree directed toward the protection of surface and subterranean sources of water from pollution by sewage on a national scale. The "Sanitary standards for designing industrial enterprises" of 1935 already submitted a scientifically substantiated sanitary classification of industrial enterprises as sources of pollution of the atmospheric air and

the sizes of sanitary protection belts in accordance with this classification. After the Great Patriotic War, work was continued to develop a system of state legislation on environmental protection. In 1949, a decree on protection of atmospheric air in our country was adopted. Of extremely great importance were laws pertaining to protection of natural resources, adopted by all of the Union republics in 1957-1968. In our country, problems of environmental protection were further developed in several state decrees: "Fundamentals of land-related legislation in the USSR and Union republics" (1968), "Fundamentals of water-related legislation in the USSR and Union republics" (1970) and others. The decree adopted by the Central Committee CPSU and USSR Council of Ministers "On intensification of environmental protection and improved utilization of natural resources" was important to the cause of environmental protection (1972); it defined the legal bases of environmental protection in the USSR, laying the responsibility for environmental protection and implementation of ameliorative measures on the relevant industrial ministries and agencies of the USSR and Union republics.

In the "Main directions of development of the national economy of the USSR in 1976-1980," adopted by the 25th CPSU Congress, among the most important directions of scientific research in the natural and engineering sciences, emphasis was laid on the need for comprehensive development of the fundamentals of rational use and protection of soil, minerals, plant and animal kingdoms, air and water basins, i.e., protection of the environment as a whole.

The fact that the CPSU and Soviet government devote enormous attention to questions of environmental protection is also confirmed by the inclusion of a special item in the new Constitution of the USSR, according to which one of the most important functions of the Soviet government is to protect the environment in the interests of the health and welfare of all Soviet people, and thus far this is the first and only such precedent in the world. Various standards and rules should be considered the most important elements in solving these problems; they are set down in the form of state legislation and are called upon to control the efficacy of environment-protecting, preventive and ameliorative measures. Thus, hygienic standards became the main criteria in our country in planning ameliorative measures on a national scale. No other country in the world has such extensive and refined state sanitary legislation as ours at the present time.

The scope of development of hygienic standards for the quality of the environment can be illustrated, for example, by the following figures: At the present time, in the USSR there has been scientific substantiation of hygienic standards for water in reservoirs with regard to more than 500 chemicals, over 160 chemicals in atmospheric air, over 800 in the air of work zones and more than 100 in foodstuffs; work has begun on setting the maximum permissible concentrations (MPC) for toxic substances in the soil; GOST [state standards] have been prepared for the quality of drinking water and choice of sources of municipal supply of drinking water; standards have been substantiated for minimum and optimum levels of total mineralization and calcium content of desalinated water; standards have been substantiated for the microclimate of residential and public buildings and medical institutions in

various geographic and climate regions; permissible levels have been set for urban and industrial noise, electromagnetic fields of different radio-frequencies; numerous recommendations and rules have been worked out for the prevention of the deleterious effect on the body of chemical, physical and biological environmental factors.

The great importance of hygienic standards and rules to practical implementation of measures to prevent undesirable changes in the environment and safeguard public health makes it necessary to provide profound and comprehensive substantiation thereof, since it would be detrimental to public health if they are not strict enough and, in the case of excessive stringency, there would be a sharp increase in expenses for the construction of treatment plants. It is known that with 90-95% efficacy of waste treatment, the cost of the treatment plants constitutes up to 20-30% of the cost of an industrial enterprise. This cost grows rapidly if an attempt is made to increase the efficacy additionally, by even 1% or fractions of a percentage point. For this reason, hygiene as a science that develops criteria for the quality of the environment should base itself on in-depth basic research, the importance of which was stressed in the report of L. I. Brezhnev, general secretary of the Central Committee CPSU, to the 25th CPSU Congress.

The principles and fundamentals of setting hygienic standards for deleterious environmental factors were successfully developed and introduced by such prominent Soviet hygienists as A. N. Sysin, A. A. Letavet, A. N. Marzeyev, V. A. Ryazanov, A. A. Minkh, S. N. Cherkinskiy, A. A. Pokrovskiy, L. I. Medved' and others.

There was particularly broad development of methodological investigations in hygiene in the last few years and this permitted considerable acceleration of substantiation of standards, on the one hand, and more scientifically substantiated, on the other. Hygiene was able not only to evaluate, but predict sanitary situations, not only to investigate morbidity due to the effects of deleterious environmental factors, but to forecast it.

A method of extrapolation of the results of studying the general toxic effects of chemical pollutants of water from animals to man was developed on the basis of comprehensive analysis and generalization of numerous experimental data; this increased the reliability and scientific substantiation of hygienic standards (G. N. Krasovskiy). This method is based on the established general biological rule, according to which the logarithms of indices of toxic agents and biological parameters of mammals are linearly correlated with the logarithms of body weight (allometric ratios). This pattern was found to be valid for the main physiological and biochemical constants of mammals, including man (pulse and respiration rate, intake of food, water, air, weight of viscera, activity of microsomal enzymes of the liver, levels of methionine, glutathion and glucose, cholinesterase activity, etc.). G. N. Krasovskiy et al. also established that the mean life expectancy of mammals (with the exception of man) is linearly related to their body weight. Mathematical analysis of this function, as well as of the constants established by Rubner, revealed that the mean life expectancy of any animal corresponds (is equivalent) to only 15-17 years in man. All years in excess

of this figure in human life expectancy are the result of the influence of social factors, the social living conditions of man, a social animal, in the accurate description of Karl Marx. In the light of these data, the question of extrapolating experimental data from animals to man is being considered in a new light. The demonstrated nonequivalence of life expectancies of man and animals is also important to development of general theory of modeling pathological processes.

The established nonproportionality of human and animal life expectancies should also apparently be taken into consideration in experimental studies of the long-term sequelae of exposure to chemical pollutants in the environment (particularly the carcinogenic and aging effects). Of course, continued refinement of methodology of extrapolation of experimental data from animals to man is the way to augment our knowledge about the correlation between toxicity and hazard of substances and their physicochemical properties, kinetics of intake, distribution and elimination from the organism, and mechanisms of development of intoxication. Of great theoretical and practical importance are the results of many years of research, which demonstrated that, in the case of continuous inhalation of substances, the concentration--time function, with regard to onset of both general toxic and allergenic and gonadotoxic effects, is in the nature of a hyperbole which could be approximated by straight lines with various angles of inclination on a graph in a logarithmic scale. Analytically, this function can be expressed by an exponential equation, $y = ax^b$. The established function was tested on a number of agents (over 20) with different toxic dynamic properties. For the first time in hygienic science, a system of toxicometric parameters of atmospheric pollutants was worked out on the basis of this function, and there was development of methods of assaying and predicting them, as well as a classification of chemical compounds according to the degree of their hazard; on the basis of the latter, nomograms were prepared for evaluation of the extent of actual pollution of atmospheric air (G. I. Sidorenko, M. A. Pinigin).

At the present time, some advances have been made in determining the correlation between chemical structure of different classes of compounds and their toxic properties. This is a rather important direction of research, since there is an enormous gap, which is constantly increasing, between the number of hygienic standards that are set annually and the number of chemicals introduced in industry. The demonstration of objective correlations between the physicochemical constants of substances, their biological activity and indices of toxicity and hazard made it possible to develop mathematical models (N. G. Andreyeshcheva). For example, a correlation has been established between indices of medial lethal doses and median lethal concentrations of the same substances. This correlation can be described by the equation, $\log LD_{50} = 0.5\ Cl_{50} + 2.55$. Such mathematical models are used to predict safe levels of chemical pollution of reservoirs and atmospheric air. Consideration of the patterns of development of the toxicodynamic process, investigated in short-term experiments on the basis of the dose--time--effect function, can also serve this purpose. The practical use of the set patterns makes it possible to accelerate by 10 or more times substantiation of permissible

levels of toxic substances in the environment. Thus, hygienic science is able to meet the demands of life promptly (G. I. Sidorenko, M. A. Pinigin and others).

There has been substantiation of the feasibility and development of methods of predicting the biological effects of atmospheric air pollutants (under diverse inhalation conditions) and those in reservoirs, on the basis of short-term experiments; basically new systems of express experiments have been proposed. The basic system and methods have been worked out for quantitative evaluation of the combined and complex effects of chemicals, as well as classification of chemical compounds (M. A. Pinigin and others).

The advances in Soviet biochemistry, with reference to research on the functions of biological membranes of subcellular structure in detoxification processes and structural organization of the cell have found practical applications in hygienic research. Thus, in the last few years, a comparative study was made of the functional state of various subcellular structures (lysosomes, microsomes, mitochondria and cytoplasmic membranes) under the influence of diverse environmental factors. The findings made with the use of biochemical and electron microscopic techniques defined the mechanisms of action of some heavy metals and organochlorine compounds. Evidently, some of the metabolic mechanisms of toxic effects are referable to impairment of cellular architectonics and solubilization of membrane-bound enzymes, particularly those of lysosomal origin, i.e., liberation of enzymes from the bond with membranes and passage thereof into the cystoplasmic space, which could be due to injury to the membranes.

For the last few years, hygienists in close collaboration with the most diversified biomedical specialists have been pursuing broader and broader studies and demonstrating more and more often the long-term effects of exposure to many chemicals (embryotoxic, gonadotoxic, allergenic, mutagenic, etc.). With the development of research dealing with the effects of different environmental factors, taking into consideration primarily overt pathological changes, there was development of integral approaches to the study of the health status of the public and determination of changes inherent in prepathological states of the organism. Problems of compensatory and adaptive mechanisms under the influence of deleterious chemical, physical and biological factors of the environment are closely linked with the study of prepathology. One of the important issues in the study of compensatory and adaptive mechanisms is to develop methods of quantitative evaluation of the extent of compensation, which could serve as an index of the degree of hazard of some environmental factors or other even before a disease develops. Quite apparently, such a quantitative evaluation could be the starting point in forecasting morbidity among the public related to deleterious environmental factors.

Several major studies of theoretical and practical importance have been completed in the past few years. The role of sulfur dioxide and phenol, as factors that stimulate pulmonary carcinogenesis, has been established under laboratory and field conditions (epidemiological studies). A study has been

made of the mutagenic, gonadotoxic, embryotoxic and allergenic effects of low doses of a number of chemicals. New methods have been developed to evaluate the reflex effect of chemical atmospheric pollutants on bioelectrical activity of the brain (method of evoked potentials, rhythm change reaction) and behavioral reactions. Several comprehensive studies have been completed regarding evaluation of the effects of the waste from the main branches of industry on the condition of the atmosphere, living conditions and public health. In particular, studies have been made of major industrial enterprises referable to the oil refining, petrochemical, ferrous and nonferrous metallurgical and construction industries. Studies were also made of the effect of transport (motor vehicle, aircraft and maritime) on the environment, living conditions and health. Hygienic recommendations have been prepared on urban construction, engineering and technological measures. Among the field studies, of particular interest is the comprehensive work done in the area of circulation of carcinogens in the environment and conditions under which they penetrate into the organism. Studies have been pursued in three cities on the levels of carcinogens in air, soil, drinking water and vegetables, which made it possible to calculate the actual intake doses.

Comprehensive research to develop new GOST for quality of drinking water and choice of sources for municipal and drinking water should also be included among the most important achievements. The first edited copy has been prepared of a new GOST dealing with the choice of water sources for municipal and human consumption. New "Rules for the protection of surface waters from pollutation by sewage" have been prepared and approved; they strengthened significantly the hygienic positions in sanitary protection of reservoirs. Several major studies have been completed on hygienic evaluation of desalinization methods of obtaining drinking water. The standards of minimum and optimum levels of general mineralization and calcium content of desalinated drinking water have been substantiated. An evaluation has been made and recommendations prepared with regard to increasing the efficacy of various methods (distillation, electrodialysis, reverse osmosis, ion exchange) of desalinization of subterranean, sea and mine salt water; some of them have been approved by the USSR Ministry of Health, and some are used to refine installations (G. I. Sidorenko, A. I. Bokina, Yu. A. Rakhmanin). Sanitary rules have been worked out for the inspection of installation and operation of water intake systems with a system of artificial replenishment of subterranean water; there has been substantiation of material dealing with prediction of quality thereof. Extensive field studies of the sanitary condition of reservoirs and analysis of the prospects for development of the national economy made it possible to prepare the hygienic substantiations for the General Plan for comprehensive use and protection of water resources of the USSR up to the year 2000 for the nation as a whole and the Union republics, as well as for local systems of using specific water basins. In particular, recommendations have been prepared for the protection of the basins of the Volga and Ural rivers, protection and combined [comprehensive, complex] use of the fourth section of the Karakumy Canal, Ust'-Ilimskiy, Saratov, Dnepropetrovsk, Krasnodar and other reservoirs.

The "Methodological instructions on preparation and scientific substantiation of MPC of toxic agents in reservoir water," approved by the USSR Ministry of Health,which are based on the results of the theoretical research described in the beginning of this article, as well as the experimental studies for substantiation of MPC, played a large role in increasing the reliability of hygienic standards. Recommendations have been offered for the protection of reservoirs by sewage from the oil refining, petrochemical, aniline dye, paper and pulp, coal-tar chemical, ferrous metallurgy, nonferrous and rare metal processing industries. Work has begun to provide scientific substantiation for measures pertaining to sanitary protection of coastal sea waters. New, interagency "Rules for sanitary protection of coastal waters" have been prepared and approved.

There was continuation of work dealing with evaluation of the barrier role of existing and new treatment plants, development of measures to increase their reliability with regard to purification and decontamination of drinking and sewage water.

For the first time, there was substantiation of the principles of hygienic standard-setting for chemical pollutants of soil; "Temporary methodological instructions on setting MPC for chemicals in the soil" have been prepared. The first hygienic standards for 7 chemicals have already been approved by the USSR Ministry of Health. Studies have been made of the effects on soil, vegetation and ground water of waste and exhausts from a number of industrial enterprises and sludge tanks [reservoirs]; recommendations have been prepared for sanitary inspection of operation of sludge tanks of nonferrous metallurgy enterprises, sanitary inspection of operation of biological ponds, irrigated agricultural fields and a number of others.

On the basis of analysis of development of the national economy and summarization of the results of scientific research dealing with this problem, forecasts were developed on migration, urban construction, sanitary status of atmospheric air, wager resources of our country and soil for the immediate and more distant future, as well as forecasts of scientific research in the field of environmental hygiene. The results of this work are submitted in a collective monograph published in late 1975; they were also submitted to the State Committee for Science and Technology of the USSR Council of Ministers, and they were made part of the draft of the scientific and technological forecast on environmental protection; they are also used in preparing recommendations on transformation of the urban environment of 26 of our country's largest cities (G. I. Sidorenko and others).

"Methodological instructions on organization of state sanitary inspection of development and implemention of regional planning" have been worked out and approved by the USSR Ministry of Health; they are being used for hygienic substantiation of general and regional planning of reclaimed and reconstructed regions in our country, in particular, the region of the Baykal-Amur Highway. "Methodological instructions on organization of state sanitary supervision of development of general urban plans" have been prepared; there are also recommendations on planning and conveniences in residential regions and microregions, with due consideration of climate and

sociodemographic conditions, the present status and prospects of urban development. Comprehensive studies have been completed on hygienic substantiation of conditions under which underground space can be used in cities. An evaluation has been made of the existing systems of short and long vacations [rest]; studies are in progress of the relationship between size of recreational facilities and sanitary condition of the environment; sociological studies are being pursued in order to determine the public requirements in various forms of recreation, in order to substantiate differentiated specifications for organization of a network of recreational facilities, with due consideration of age-sex and occupational structure of the population and environmental-climatic conditions.

In view of the changes in building technology of the past 10-15 years, appearance of new construction and finishing materials, sanitary engineering installations and illumination installations, new standards have been substantiated for the microclimate of residential and public buildings and medical institutions in various environmental and climatic regions, with due consideration of the age structure of the public, and for hospitals dealing with various forms of pathology (Yu. D. Gubernskiy). In particular, it has been proven that the temperature should be 2-3° higher in residential buildings, in view of the change in fencing and lighter weight of indoor clothing, the lower (by 1-2°) temperatures in public buildings (particular, VUZ) to retain optimum efficiency of mental labor, 1.5-2-fold increase in level of illumination of rooms, with due consideration of the age-related distinctions of individuals over 40 years of age, the number of which continues to increase among the employed population. A new section of SNiP [construction standards and regulations] has been prepared, dealing with artificial lighting of therapeutic and preventive medical institutions; special fluorescent lamps have been developed for medical diagnostic laboratories (N. M. Dantsig and others); an exhaustive evaluation has been made of various sanitary engineering systems used in residential construction; on the basis of extensive sociological studies, optimum dimensions of future living space (14.5-14.7 m^2) have been substantiated. Recommendations have been prepared for upgrading the plans for residential buildings and medical institutions in various climate regions. The vast majority of standard-related recommendations were approved by the State Committee for Civilian Construction for inclusion in the new SNiP (Ye. I. Korenevskaya, Yu. D. Gubernskiy, E. B. Borovik).

Stuides have been made of the combined effect of long-wave ultraviolet radiation and chemical pollutants of the environment. It was demonstrated that suberythemic doses of ultraviolet radiation enhance the adaptational and compensatory capabilities of the organism.

A cycle of studies has been completed on nonspecific prophylaxis of intramural [in hospital] infections (streptococcal and viral).

Of importance is the refinement of methodological approaches to evaluation of the biological effects of new chemicals and consumer goods, with consideration of their toxic, mutagenic, allergenic and blastomogenic effects. The

"Temporary methodological instructions on hygienic evaluation and sanitary supervision of storage and sales of household chemicals to the public" have been prepared and approved by the USSR Ministry of Health; this also applies to the "Temporary methodological instructions on evaluation of materials treated with synthetic resins and other chemical compounds." About 500 polymers (polyvinylchloride, polyamide, polyester, polyurethane, synthetic rubber and other materials) and household chemicals (anion-active, nonionogenic, cation-active) have been given a hygienic rating. In the course of the work, about 50-60% of the developed materials were rejected, mainly because of chemical instability of polymers, unsatisfactory physical properties of items made from them and carcinogenic hazard of some ingredients of household chemicals.

Studies have been made of the patterns of circulation of pathogenic bacteria and viruses and those of sanitary significance in environmental objects made it necessary to substantiate new criteria of epidemic safety of water varying in degree of pollution, and they are used in a number of documents pertaining to standards. Determination has been maid of the principal patterns of effects of chemical and physical environmental factors on vital functions of intestinal and respiratory viruses, pathogenic enterobacteria and microorganisms of sanitary significance. For the first time, studies have been made of the hygienic aspects of using bdellovibrio bacteriovirus as a biological indicator of self-purification of polluted water with regard to pathogenic bacteria and enteroviruses. For the first time, a system was substantiated for assaying enterococcus indices and tentative rating of quality of water in reservoirs. A new index has been proposed to evaluate the water in swimming pools: pathogenic staphylococci (G. A. Bagdasar'yan, Yu. G. Talayeva, L. Ye. Korsh and others).

Intensive studies are in progress of the effect of urban noise on the public, with consideration of its pulsed nature, and standards are being set for levels thereof. "Methodological instructions on supervision of implementation of sanitary standards of permissible noise level in residential and public buildings and in residential areas" have been worked out and approved by the USSR Ministry of Health; "noise maps" have been plotted for several cities of RSFSR, the Ukraine, Central Asia and the Baltic regions. Permissible levels of static electricity used in rating synthetic materials have been established. For the first time, studies have begun on the biological effects of radiofrequency electromagnetic fields in populated areas and their effects on public health, which helped work out the relevant standards and sanitary rules for locating radio-transmitting objects in cities (M. G. Shandala, Yu. D. Dumanskiy and others). The biological effects and action of accelerations and vibrations due to municipal transport are being studied for the purpose of setting standards. The present stage of development of hygienic science is characterized not only by continued logical differentiation of special branches of hygiene, municipal hygiene, industrial hygiene and occupational diseases, hygiene of nutrition, hygiene of children and adolescents, etc., but the extreme importance of integration of all hygienic knowledge, as well as biomedical knowledge about the effects on man of deleterious factors, into general hygiene or, as it would be more correct

to call it under modern conditions, environmental hygiene. We have witnessed, along with continued development of special hygienic disciplines, the inception and successful development of an integrative preventive discipline, environmental hygiene. As a result there have also been qualitative changes in the structural level of research: along with studies on the organismic, organic and cellular levels, broader use is now made of molecular and population levels. There has also been some change in degree of practical application of the results of hygienic research, not only in the recommendations of the USSR Ministry of Health, but to create USSR and GOST laws on environmental protection.

Thus, thanks to the successful development of environmental hygiene, several basic investigations were completed in the last few years, which were directed toward upgrading the scientific bases of hygienic standards for chemical compounds in atmospheric air, reservoirs, drinking water and soil, methods of investigating the combined, complex and associated effects of environmental factors with due consideration of their potential long-term effects. Special mention should be made of work dealing with refinement of methodology of evaluating the effects of environmental pollutants on human health.

Credit is given to Soviet scientists for their original scientific research on the problem of "Scientific bases of environmental hygiene," not only by specialists in countries of the socialist camp, but researchers in a number of developed capitalistic countries (United States, France, Canada and others), with whom successful scientific collaboration is being implemented, as well as by WHO. The research of Soviet hygienists has been praised highly at conferences of CEMA nation specialists, Soviet-American symposiums dealing with the achievements of this collaboration (1974, 1976), at conferences of experts of international WHO organizations, and others.

The entire experience of development of Soviet hygienic science indicates that, thanks to the wise policy of the CPSU and proper management of public health, its preventive direction gradually broadened and strengthened, as a result of which such tremendous achievements were made by medicine in the 60 years of Soviet power and, in particular, by one of its most important branches, environmental hygiene, of whose achievements we are justifiably proud.

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PRINCIPAL ACHIEVEMENTS AND PROSPECTS OF DEVELOPMENT OF SCIENTIFIC RESEARCH IN THE FIELD OF INDUSTRIAL HYGIENE AND OCCUPATIONAL PATHOLOGY

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[Article by N. F. Izmerov (Moscow)]

[Text] Safeguarding the health of the working people and the struggle for a longer active and employed longevity became the most important national affair from the earliest days of existence of our state. The first legislation pertaining to introduction of the 8-hour work day, mandatory hour off for lunch, institution of state social insurance in case of disability due to illness, invalidism or other causes, issuance of the "Statutes on labor safety techniques and practices," etc., are a vivid illustration of the concern of the Soviet state about the health of the working people of the USSR.

Immediately after the revolution, N. A. Semashko, the first people's commissar of health, made an appeal "to turn from the control of epidemics to amelioration of working and living conditions." Development of legislation dealing with labor safety and implementation of measures to provide beneficial working conditions in various industries required, even in the early years of Soviet power, broad development of scientific research in the field of industrial hygiene and occupational pathology. In view of industrialization of our country, in the course of the first few Five-Year plans it became necessary to organize a network of specialized scientific research Institutions. In 1923, the first Institute for the Study of Occupational Diseases was founded in Moscow, and it is presently known as the Scientific Research Institute of Industrial Hygiene and Occupational Diseases of the USSR AMS [Academy of Medical Sciences].

At the present time, there are 15 institutes in this field in the USSR. In addition, problems of industrial hygiene and occupational pathology are being studied on special chairs of medical institutes and institutes for advanced training of physicians, various clinical chairs, some institutes of general hygiene, as well as specialized laboratories and departments of technological institutes. In all, there are over 100 institutions working on the problem of "Scientific bases of industrial hygiene and occupational pathology."

The institutes of industrial hygiene and occupational diseases conducted preventive work to ameliorate working and living conditions on the basis of extensive sociohygienic research and dispensary care of workers. Comprehensive studies of working conditions and morbidity were pursued in enterprises of the coal, mining, chemical metallurgical, textile, tanning, machine building and other branches of industry.

In the period of the first few Five-Year plans, the institutes reorganized their work significantly in accordance with the new problems. It became necessary not only to improve working conditions at existing plants, but to participate actively in examination of plans for new construction in connection with the objectives of industrialization of the country. During the Great Patriotic War, the institutes that were transferred to the eastern part of the country did much work to render scientific and methodological assistance to the medical and sanitary sections of plants for the prevention of poisoning, diseases and trauma. Instructions and methodological recommendations were developed on labor safety and prevention of occupational diseases.

A new stage, which determined the continued theoretical development of industrial hygiene and occupational pathology, as well as development of scientific bases of sanitary industrial legislation and hygienic standard-setting, methods of preventing and treating occupational diseases, began after the USSR AMS was founded and the Moscow Institute of Industrial Hygiene and Occupational Diseases became a part of it; this institute became the official All-Union center for the planning and coordination of scientific research dealing with industrial hygiene and occupational pathology.

Scientific and technological progress in the national economy, mechanization and automation of industry, increased use of chemistry in the national economy, the use of the latest advances in physics, chemistry, electronics, etc., in industry confronted industrial hygiene with new and difficult problems of safeguarding the health of workers. Scientific and practical solution thereof required constant expansion of scientific research, upgrading the organization and methods of work. In the last few years, development of theory of setting hygienic standards for deleterious factors of the industrial environment became the main direction of scientific research in industrial hygiene. The accumulated data made it possible to define the principles and develop the methodological approaches to setting hygienic standards, thresholds of all types of effects of chemical and physical factors, the concept of criteria of deleteriousness, the greater importance of medical parameters as compared to technical achievement, etc. The study of the patterns of development of the pathological process under the influence of various industrial factors, stages of true physiological adaptation and compensation of the pathological process made it possible to substantiate a number of methods of differentiation between them, which is important to to take into consideration when setting hygienic standards. Determination has been made of the role of conditions under which deleterious factors act, in particular the adverse effect of intermittent exposure to some groups

of chemicals, radio-frequency electromagnetic fields, microclimate, noise and other factors. There was substantiation of the necessity of taking into consideration the long-term sequelae of exposure to various environmental factors: blastomogenic, embryotropic, mutagenic, etc.

Research dealing with problems related to the development of the chemical industry and use of chemistry in the national economy began to occupy a large place. There was development of the principles and methods of toxicometry and approaches to substantiation of maximum permissible concentrations (MPC) of chemicals in the air of work zones, on the basis of standard methodological approaches, with due consideration of long-term sequelae of exposure. Methods were developed for assaying various chemicals and products of oxidation products of breakdown of polymers were developed. There was substantiation of hygienic standards for permissible levels of 900 chemicals and particles in the air of work zones. Scientific research was developed with regard to the combined effect of industrial factros, including the complex effect of chemicals entering the organism from various media simultaneously.

The developed hygienic requirements and MPC played an important role in designing new plants which, in most cases, are characterized by good working conditions and are not sources of environmental pollution. However, there are still many unsolved hygienic problems in the chemical industry. Hundreds of new chemicals are being introduced in industry and they require combined and complex toxicological evaluation; there is inadequate substantiation of hygienic requirements concerning the territories of industrial enterprises, sanitary protection belts and protection of the environment from waste.

The problem of pneumoconiosis, one of the main occupational diseases, which is now in first place in the structure of occupational morbidity, has been worked on from the very inception of industrial hygiene and occupational pathology, particularly in the coal industry. The joint efforts of hygienists and technological engineers, directed toward development of dust-preventive, medical and prophylactic measures have resulted in some achievements. Adoption of a set of hygienic and dust-control measures in many industries (mining, machine-building) has already lowered dust content to permissible levels, thus preventing development of diseases. But in some industries, and first of all the coal industry, radical measures are needed to alter the technology of coal mining to provide safe conditions.

A significant part of the research in this field deals with the physical condition of those who are exposed to physical factors at work, such as noise, vibration, electromagnetic waves, ionizing radiation and deleterious microclimate. At the present time, in spite of the fact that vibration sickness is still among the leading occupational diseases, there is a tendency toward declined incidence. On the basis of fundamental theoretical research on the energetic effect of vibration on the human organism, the scientific bases have been developed for setting hygienic standards of "local vibration"; determination has been made of the specifications for mechanized hand tools; hygienic recommendations have been substantiated for working conditions referable to occupations with vibration hazard, and a

a set of therapeutic and preventive measures has been tested. There have also been some advances in the study and regulation of the noise and vibration factor. Thus, on the basis of the latest scientific achievements, there has been standardization of the classification of all types of noises that are encountered; standards have been set on limitation of the work places for power-fed machinery, technological equipment and vibrations to which an operator's hands are exposed. The hygienic studies revealed that, in a number of cases, prevention of noise and vibration related pathology in industry can be achieved by organizing a rational mode of operating vibrating equipment.

In the program for 1978-1980, the State Committee for Science and Technology puts to hygienic institutes the task of setting standards for permissible noise levels with due consideration of intensity and difficulty of labor, and vibration levels with due consideration of the main forms of labor. Such differentiation of standards will aid in prevention of fatigue and decreased efficiency. In this regard, it is necessary to develop and standardize biomedical criteria for evaluation of the effects of noise and vibration, determination of the pathogenetic mechanisms of their action and problems of adaptation of biological systems. The question of cumulative effects of noise-vibration stimuli requires special attention, not only in industry, but transport and everyday life in order to determine the permissible dose of energy of noise in the course of man's entire life.

In the early 1950's, in connection with the intensive development of radar technology and broad use of high-frequency electromagnetic radiation to heat materials, a new hygienic problem emerged, that of "Radio-frequency electromagnetic fields." In the years since that time, some advances have been made in our country on this score: a hygienic evaluation has been made of the working conditions of individuals dealing with sources of electromagnetic fields (EMF) in the radio-frequency range, in various branches of the national economy: radio, electronics, defense, light bulb and tube, machine-building industries, communications, civil aviation, sea and river fleets. There have been experimental studies, to a significant extent, of the biological effects of EMF in different frequency ranges on various systems of the organism. Studies have been made of the biological effects of microwaves combined with some physical factors of the industrial environment, as well as the combined effect of EMF in different ranges of frequency. On the basis of the set of hygienic, clinical and experimental studies, maximum permissible levels (MPL) have been set for virtually the entire radio-frequency range (from 60 to 300 kHz), which were reflected in the "Sanitary standards and rules for working with sources of high-, ultrahigh- and superhigh-frequency electromagnetic fields." The standards played an important role in development of measuring technology, development and introduction of safety devices, and this led to a radical change in working conditions for those involved with sources of radio-frequency EMF.

However, continued technological progress will lead to the use of new sources of electromagnetic radiations in various frequency ranges and various modes of exposure in various branches of industry, communications, science,

medicine and household. This enables us to predict that, in the next 10-15 years, there will be more people exposed to nonionizing radiations, and this means that the problem of "Radiofrequency EMF" will develop into a new, major hygienic problem, that of "Nonionizing radiations."

In the last two decades, the history of Soviet industrial radiation hygiene has been characterized by rapid development. This made it possible to succeed in solving problems of providing for the safe use of the latest technology, discoveries and inventions in the field of atomic science and technology. In a relatively short period of time, Soviet researchers have investigated working conditions, prepared the hygienic requirements and preventive measures referable to all of the main directions of use of radioactive substances and sources of radiation in the national economy, science and medicine, along with their successful solution to many general hygienic problems of radiation safety. Standardized sanitary legislation and an effective system of checking implementation thereof by enterprises and institutions was developed and submitted to constant revision on a strictly scientific basis. Rapid introduction of the projects to practice not only resulted in appreciable improvement of working conditions for large groups of individuals in the occupations related to radiation hazard, but in prevention of the possible adverse consequences in individuals who had previously been exposed to high levels of radiation. At the present time, in spite of the fact that there has been a sharp increase in applications of radioactive substances and sources of ionizing radiation, the levels of exposure to radiation are declining. Actually, the best working conditions have been provided in this branch of industry. However, the sharp increase in applications of radioactive substances and sources of radiation in the national economy poses new problems: continued expansion of complex research dealing with working conditions and health status of workers, with due consideration of the combined effects of both radiation and nonradiation factors.

Scientific substantiation and development of the bases of sanitary legislation to set hygienic standards is the general direction of standardization of the industrial microclimate in the USSR. In view of development of existing branches of industry and appearance of new ones, development of microclimate standards for individual branches of industry, with due consideration of specifics of labor and new types of sanitary technology is also an important direction.

Setting standards for infrared and ultraviolet radiation, ion composition of air, temperature of safety devices [guards], as well as the combined effect of various combinations of meteorological components and other physical and chemical environmental factors is still an unsolved problem in hygiene.

In view of the increasing number of workers engaged in mental labor and control, whose work involves significant nervous and emotional tension and a large volume of processed data, one of the pressing problems is to determine microclimate parameters that aid in removing fatigue and increasing the efficiency of the human body.

Continued research on the mechanisms of action of thermal factors, processes of human adaptation and acclimatization to various conditions of the industrial and geographic environment is gaining special importance; this also applies to determination of the essence of stable adaptation and the functional changes involved in achieving it (price of adaptation), conditions under which adaptational changes evolve into pathological ones and methods of differentiating between them.

In our country, special attention had always been given to improvement of working and living conditions and health care for women. This was reflected in the program of social development and raising the standard of living, which was adopted by the 25th CPSU Congress and entered in the new Constitution of the USSR. From the very first years of existence of the Soviet state, special research was begun on living conditions and health status of women working in the textile and tobacco industries, agriculture, etc. There was particular intensification of research dealing with various aspects of women's labor in the last few years, in view of the establishment of a special laboratory of industrial hygiene for women at the main institute. Studies that are being pursued in collaboration with specialists in different fields have resulted in accumulation of data on the effects of deleterious factors on the female organism and offspring, and they served as the basis for preparation of legislation (instead of that in effect since the 1930's). We refer, in the first place, to the list of industries, occupations and work under deleterious and difficult conditions, in which women are not allowed to be employed and, in the second place, the maximum permissible loads for women with regard to carrying heavy objects. At the suggestion of the State Committee for Labor and Social Problems of the USSR Council of Ministers, work has begun to prepare recommendations and standards referable to hygiene, physiology and medical and health care of women employed in various industries. The studies will be conducted in the ferrous metallurgy, machine-building, oil mining and refining, polymer, textile, light and furniture industries. Studies will be expanded on industrial hygiene for women employed in public health and the medical industry. The role of family and other social conditions in the overall number of factors affecting employed women, development of hygienic and physiological criteria to define the jobs and occupations where women should be replaced in some industries are problems that have yet to be resolved. Development of recommendations for rational employment of pregnant women and nursing mothers is a task for the future.

The shortage of manpower raises some serious problems with regard to substantiation of pension benefits and development of hygienic requirements for employing individuals of retirement age.

Automation and mechanization of industrial processes and new forms of organization of labor have resulted in a significant reduction of heavy forms of physical labor. However, new problems have cropped up, which are related to the monotony of work operations, immobility of workers, significant neuroemotional and mental tension. Industrial physiology has made great advances in the study of the distinctions of various forms of labor, substantiation of

physiologically rational work and rest schedules for many mass professions. Criteria have been developed to evaluate labor according to difficulty, tension and deleteriousness. There has been substantiation of ergonomic requirements of industrial equipment when working in the main working positions, measures to prevent fatigue in a number of occupations characterized by monotony and hypodynamia. Special attention has been given to the study of the physiological distinctions of new occupations involving primarily mental and neuro-emotional tension, long periods of concentrated attention, frequent diversion of attention, etc. It is imperative to widen and deepen significantly research in the field of industrial physiology. The theoretical bases of industrial physiology and ergonomics must be developed; there must be determination of the intimate mechanisms of development of fatigue, diminished efficiency, development of nervous and mental changes during work involving nervous and emotional tension.

The distinctive features in working conditions in modern industries raise the problem of developing criteria of occupational screening and vocational guidance in order to optimize the choice of an occupation.

In view of the fact that, at the present time, high concentrations of chemicals and high levels of physical factors are not encountered in industry, occupational pathologists and hygienists have to deal with low intensity factors.

Occupational pathology is faced with new problems. It is becoming particularly important to answer scientific questions pertaining to pathogenesis and methods of pathogenetic and etiological therapy and prevention of various occupational diseases. Processing of the data obtained from complex clinicophysiological, biochemical, morphological and experimental research pursued in various clinics of our country aided in solving these problems.

There are some advances in the study of dust-induced pathology of the respiratory organs, a problem that has retained its prime importance to this day. The accumulated data aided in defining the various forms of development, course and complications of silicosis, and its most serious variant, silicotuberculosis. There has been significant expansion of research dealing with the clinicoroentgenological characteristics of other forms of pneumoconiosis related to the effects on the organism of various types and compositions of dust. A special set of clinicophysiological criteria of early disturbances of respiratory function has been worked out for early detection of pneumoconiosis. Advances have been made in an important and insufficiently studied problem that of dust pathology, dust-related bronchitis. One of the most important tasks in the field of dust-related pathology is to develop methods of treating pneumoconiosis.

Of interest are the results of occupational neurological investigation of the symptomatology of classical forms of neurointoxications with the typical and distinctive syndrome of encephalopathy and polyneuritis. Joint studies have revealed the nature of neurodynamic changes occurring in the activity of the central nervous system, phasic nature of reactions to exposure to industrial factors, general and special patterns of development thereof, and made it possible to outline the most effective therapeutic and preventive measures.

There has been development of the data obtained from studies of quantitative, functional and morphological changes in cellular elements of blood in the presence of some occupational types of poisoning, which were pursued at the early stages of inception of occupational pathology. Patterns have been established in development of the first reactions of the blood system, as well as in-depth characteristics of clinical hematological syndromes, early detection of occupational diseases of the blood and development of methods of therapy and prevention.

Much attention was devoted to the mechanism of action of chemicals on the skin, a search for more informative methods and more effective means of protecting it (synthetic detergents, protective paste).

A wide set of current clinical and laboratory morphological studies made it possible to define the distinctions of development, course, differential diagnostics, prevention and treatment of toxic hepatitis. There has been generalization of the results of a comprehensive study of the condition of the cardiovascular system after exposure to chemical and physical factors, and in the presence of occupational pathology of the lungs. There has been a classification of syndromes of cardiovascular changes associated with exposure to industrial and occupational factors.

On the basis of systematization and generalization of accumulated data, a classification has been developed for various nosological forms of occupational pathology: pneumoconiosis, vibration sickness, fluorosis, occupational dermatosis, etc., as well as methodological recommendations that are of great interest to public health practice. Preliminary (when starting on a job) and periodic physical examinations played an important role in lowering occupational morbidity.

The strict hygienic standards and broad adoption of ameliorative recommendations, improved sociohygienic living conditions resulted in positive dynamics in the field of occupational pathology. For example, there has been virtually complete eradication of some, previously common occupational diseases (caisson disease, zinc-fume fever, overheating and convulsive disease of hot shop workers, lead colic, toxic edema of the lungs, etc.). The cases of acute poisoning have become rare. There has been a significant decline in incidence and severity of chronic poisoning. There has been a change in structure of occupational morbidity. There is a significant decrease in number of new cases of silicosis, and evolution of the silicotic process is now different. Severe cases with rapid progression of the process in the lungs and formation of massive fibrosis are things of the past. In the last few years, diffuse, so-called interstitial and stable form of silicosis, with less tendency to progress, has become prevalent, and there is a lower incidence of tuberculosis as its complication.

However, the problem of the effects on the body of noise and vibration has become one of the most important ones in modern occupational pathology. In this regard, of great theoretical and practical interest are the criteria, which have been developed for testing hearing of workers in "noisy

occupations," methods of diagnostics, age-related occupational screening criteria for applicants to work in relevant shops. These data served as the basis for methodological recommendations on diagnostics, expert determination of fitness in the presence of occupational impairment of hearing. In view of the fact that vibration sickness is now in one of the leading places in the structure of occupational morbidity, broad and comprehensive clinicophysiological studies are being pursued on the main aspects of effects on the organism of vibration and prevention of vibration pathology. In-depth research, pursued at several institutes working within the framework of the problem commission, defined the clinicophysiological and biochemical criteria of early reactions of the organism, early, reversible stages of the process with development of veteomyofascitis, vegetative polyneuritis, angiodystonic syndrome and more marked forms of vibration sickness, and long-term sequelae thereof. These data were also used as the basis for selection of the most effective therapeutic and preventive measures, as well as solution of problems referable to expert determination of fitness for work.

The lower concentrations of toxic agents in modern industrial enterprises and contact with low-intensity deleterious factors are leading to development of discrete forms of occupational pathology, which are very difficult to recognize, as well as to differentiate between occupational and general pathology, to determine the pathogenetic link between an occupational factor and the nature of the clinical syndrome. Clinical and experimental studies have revealed the special role of individual sensitivity and altered immunological reactivity in the case of a mild pathogenic factor in development of pathology. Analysis of these data expanded significantly our conceptions of the role and place of allergy in the field of occupational pathology, the provoking influence of industrial factors on the incidence and nature of course of general diseases. The solution to these problems, obtained by specific, allergological diagnostic methods is of definite theoretical and practical interest. The knowhow in clinicostatistical retrospective analysis of the course of the most common forms of occupational pathology accumulated by Soviet symptomatology of occupational diseases and expert evaluation of such pathology are quite important and promising to continued development of prognostication and methods of medical, social and vocational, as well as occupational rehabilitation of patients and those disabled as a result of occupational disease.

Scientific and technological progress creates conditions, under which neuromental and, in particular, intellectual stress are becoming one of the prime factors in human endeavor.

When the organism is exposed to low levels of deleterious factors, in the presence of neuro-emotional tension, combined with hypodynamia, there is prevalence of nonspecific reactions referable to various systems of the organism, and this presents major difficulties in determining the etiology of a disease and requires complex theoretical and methodological work. The joint participation and close relationship between scientists in different fields, in their theoretical and practical activities, are a guarantee for the successful solution to the problems confronting the area of occupational diseases.

Substantiation and preparation of sanitary legislation and instructive-methodological material to aid sanitary inspection [surveillance] agencies are the chief forms of practical use of the results of hygienic research. The highest form is the GOST [state standard] of the system of labor safety practices and procedures. The "Sanitary standards for planning and operating industrial enterprises" were prepared on the basis of the extensive data obtained from scientific research in industrial hygiene; as new data are accumulated, these standards are periodically revised. The "Sanitary rules for organizing technological processes" and hygienic specifications for industrial equipment also pertain to interspecialty documents. In the years of the 9th Five-Year Plan alone, institutions dealing with the problem of "Scientific bases of industrial hygiene and occupational pathology" prepared 58 sanitary rules, 25 GOST; they substantiated 223 maximum permissible concentration levels and developed 184 methods of assaying chemicals in the air of industrial buildings.

Adoption of scientifically substantiated hygienic standards and rational work schedules in industry aided in improving working conditions and lowering occupational morbidity). (In particular, it dropped by 24% in the years of the 9th Five-Year Plan alone.) At the present time, we actually have no cases of acute forms of poisoning or new cases of severe chronic occupational diseases. Mass screening of workers usually reveals varying degrees of functional changes. The problem of long-term sequelae of man's contact with industrial factors at minimal levels, the problem of safety of the human population as a whole, is gradually moving to the fore. Elimination of the possibility of contact with industrial factors is a radical solution to the problem of preventing long-termed sequelae of exposure to them. However, at this stage of development of science and technology, it is impossible in most cases to eliminate from industry all of the hazardous substances and technological processes and, consequently, we cannot prevent contact with such factors. In this case, limitation of exposure or "setting hygienic standards" (establishing the safe levels) is the only realistic solution. In spite of the unquestionable methodological difficulty and laboriousness of investigating the long-term sequelae of exposure to deleterious factors of the industrial environment, hygienic standards are now being set with consideration of this effect. Soviet hygienists are to be credited with being the first to substantiate the principles and methods of setting hygienic standards for factors that elicit long-term effects, including blastomogenic ones. This made it possible, for the first time in worldwide practice, to set the MPC of the widespread blastomogen, 3,4-benz(a)pyrene, in the air of work zones.

Lengthy and diverse investigations must be conducted to set hygienic standards. For this reason, considerable attention is being given to development of rapid methods of establishing safe levels of factors, methods of predicting deleterious effects, including consideration of long-term effects. In this respect, some encouraging results have been obtained, both experimentally and clinically. Methods have been worked out for rapid substantiation of MPC with regard to a specific (irritant, allergenic) action. Of great importance are the results of studies of the correlation between biological

effects and structure of chemicals or of ranges of physical factors. The data obtained to date make it possible to tentatively predict the effects of newly synthesized substances or new ranges of physical factors. All these are promising directions of research.

It can be stated that, at the present time, work dealing with hygienic evaluation of working conditions is being pursued in virtually all new or updated industries. The present level of industrial hygiene makes it possible to substantiate measures to assure safe and healthy conditions in most industries. However, in some cases, implementation of hygienic recommendations requires development and introduction of new industrial processes, equipment, complex automation and mechanization, continuous processes, etc. This is a task for technologists and designers. For this reason, much attention is devoted to upgrading forms that facilitate decisions and implementation of hygienic recommendations in industry. This work is done on the basis of agreements for creative collaboration with industrial enterprises, technological and planning institutes, organization of sectors and enterprises that are exemplary with regard to working conditions, creating of inter-VUZ scientific councils for joint work on technical and hygienic problems, organization of councils of directors of industrial enterprises and institutions of sanitation and hygiene, etc. The most promising form of work is to organize research in accordance with standard comprehensive programs in conjunction with industrial ministries, agencies and enterprises aimed at reaching the ultimate goal, that of ameliorating working conditions, lower the incidence of occupational diseases and, ultimately, creating optimum working conditions, from the standpoint of both productivity of labor and health status of workers.

In this era of the scientific technological revolution and transformation of science into a direct productive force, it is becoming more and more apparent that development of socialist industry cannot occur without prompt adoption of scientifically substantiated measures directed toward improvement of working conditions, safeguarding the health of the working people and increasing their efficiency. Special attention was called to this by the 25th CPSU Congress, which stressed the need to develop research dealing with the control of occupational diseases, continued improvement and amelioration of working conditions. These questions were also touched upon by L. I. Brezhnev in his reports to the October (1976) Plenum of the CPSU Central Committee and 16th Congress of Trade Unions.

Industrial hygienists and physiologists, as well as occupational pathologists, are now working to fulfill a most important national task: to render the labor of Soviet people creative, attractive and to transform it into a vital need.

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DEPENDENCE OF THE INCIDENCE OF HYPERTENSIVE CRISES ON THE TIME OF THE YEAR AND WEATHER FORMING FACTORS

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/Text/ The study of man's natural living conditions, which include heliogeophysical and climate-weather factors, occupies a prominent place among the various aspects of human ecology.

A significant number of scientific publications indicate that in a number of diseases, especially of the cardiovascular system, these effects can be important risk factors (A. N. Zhurenko, 1963; G. M. Danishevskiy, 1969; I. A. Ali-Zade, 1972; D. I. Panchenko, 1972; L. B. Dzgoyev, 1973; I. I. Nikberg et al., 1973, 1974; Leshchinskiy, 1970, 1972; West et al., 1973). However, despite this many aspects of the interaction within the "weather-climatic conditions-sick body" system have not yet been established and, as a result, there are no clear criteria for a mass prevention of weather related aggravations of diseases.

The different direction in the evaluation by various authors of the relative significance of weather factors among the many causes of aggravation of cardiovascular diseases, which leads either to a hyperbolization of their role or to a complete denial, is one of the reasons for the above. Such a contradiction in the evaluation is due to a lack of investigations aimed at revealing the relative significance of all the causes of aggravations, that is, determination of the share of every risk factor with respect to this pathology.

The object of our work was an in-depth mathematical-statistical investigation of the dependence of the course of hypertensive disease, which is the leading disease among cardiovascular pathology in its spread, disability and mortality (A. L. Myasnikov, 1965; Ye. G. Protsek, 1974), on the time of the year and basic weather forming factors. We studied the data on requests for first aid in Kiev during hypertensive crises.

In order to judge the seasonal distribution of the incidence of crises among the population of Kiev, we processed monthly statistical reports (form 2) of the city first aid station, which contained information on 187,000 calls in connection with hypertensive crises in 6 years (from 1968 through 1973). For the purpose of comparing the characteristics of the seasonal dynamics of hypertensive disease with the seasonal characteristics of other diseases, during the same period and from the same sources we studied the distribution of a total number of 3.037 million requests for first aid in the city of Kiev and 2.323 million requests connected with diseases.[1]

We evaluated the changes in all the types of requests depending on the time of the year on the basis of the indices of seasonal fluctuations (I. S. Guseva, 1973).

As can be seen from the data of table 1, a rise in the number of calls in all three groups is noted during the months of the cold period and a drop, during the month of the warm period.

Apparently, the seasonal characteristics of the course of all diseases are connected with seasonal changes in the general reactivity of the body (depending on fluctuations in ultraviolet radiation and on the characteristics of nutrition, vitamin balance and so forth), as well as with the seasonal dynamics of respiratory and "cold" diseases. The enumerated factors equally affect the course of various chronic diseases and the development of their aggravations.

However, it is evident from the data of the table that, when the seasonal rhythm of aggravations of hypertensive disease resembles that of other diseases, individual periods (January, March, May and December) are characterized by significant differences, which can be explained only by the addition of other factors to the seasonal factors, to which the body of a person suffering from hypertensive disease is especially sensitive. Weather conditions in the form of unfavorable complexes of synoptic, meteorological and helio-geophysical elements can be these factors.

To clarify this, a mathematical study of the effect of weather forming factors on the dynamics of the indices of hypertensive crises was conducted. At the same time, we proceeded from the fact that weather conditions are by no means the only cause of aggravations of hypertensive disease, but are an environmental element capable of having a negative effect on the state of health of a person suffering from hypertension only at certain moments and is a significant risk factor with respect to this disease.

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1. Calls in connection with diseases are the number of all the population's requests addressed to first aid institutions without calls in connection with injuries, alcoholic intoxications, food poisonings, childbirth, shifts of duty, transport operations and consultations and unfounded calls.

Table 1.

(1) № группы	(2) Причины вызова службы скорой медицинской помощи	(3) Месяцы: (4) январь	(5) февраль	(6) март	(7) апрель	(8) май	(9) июнь	(10) июль	(11) август	(12) сентябрь	(13) октябрь	(14) ноябрь	(15) декабрь	За весь год (16)
I	Все вызовы (17)	105,5	105,7	102,0	99,5	100,8	97,9	93,5	91,6	95,0	97,1	103,5	108,4	100,0
II	Заболевания (18)	105,8	105,2	104,4	100,7	101,6	96,4	92,4	91,2	93,2	98,3	103,5	98,5	100,0
III	Гипертонические кризы (19)	107,0	103,9	108,4	102,6	108,5	93,8	95,7	85,2	88,6	87,2	100,9	108,2	100,0

Key:

1. No of group
2. Reasons for calls for first aid service
3. Months
4. January
5. February
6. March
7. April
8. May
9. June
10. July
11. August
12. September
13. October
14. November
15. December
16. Throughout the year
17. All the calls
18. Diseases
19. Hypertensive crises

The existence and nature of the studied dependence (weather conditions-person suffering from hypertensive disease) usually are manifested on a scale of relatively short periods--a day and sometimes even hours. Therefore, we made a daily sampling and analysis of 34,078 departure cards of the registration of first aid calls connected with hypertensive crises in 1973.

The information on weather forming elements was obtained from METEOROLOGICHESKIY YEZHEMESYACHNIK of the Ukrainian Hydrometeorological Observatory, operational journals of registration of hourly measurements in the Kiev Meteorological Station and the bulletins SOLNECHNYYE DANNYYE of the Main Astronomical Observatory of the USSR Academy of Sciences and KOSMICHESKIYE DANNYYE of the Institute of Applied Geophysics of the USSR Academy of Sciences.

When studying the relationship, we used the methods of paired correlation and multiple correlation-regression analysis, in which 1 day was taken as the unit of observation. The calculation was made by the Mir-1 electronic digital computer and the Dnepr-2 electronic computer.

The coefficients of paired correlation of daily indicators obtained during this analysis are presented in table 2.

Table 2.

Метеофактор (1)	r	P
Температура воздуха (X_1) (2)	—0,393	>0,99
Перепад температуры (X_2) (3)	—0,195	>0,99
Атмосферное давление (X_3) (4)	—0,83	<0,90
Перепад атмосферного давления (X_4) (5)	+0,184	>0,99
Относительная влажность воздуха (X_5) (6)	+0,225	>0,99
Перепады относительной влажности (X_6) (7)	—0,285	>0,99
Дефицит влажности (X_7) (8)	—0,344	>0,99
Упругость водяных паров (X_8) (9)	—0,375	>0,99
Общая облачность (X_9) (10)	+0,156	>0,99
Скорость ветра (X_{10}) (11)	+0,009	<0,90
Относительное число солнечных пятен (X_{11}) (12)	—0,144	>0,95
Суммарная площадь солнечных пятен (X_{12}) (13)	—0,149	>0,95
Количество хромосферных вспышек (X_{13}) (14) (15)	—0,108	>0,90
Напряженность магнитного поля Земли — Ар-индекс (X_{14})	+0,031	<0,90

Key:

1. Meteorological factor
2. Air temperature
3. Temperature drop
4. Atmospheric pressure
5. Atmospheric pressure drop
6. Relative air humidity
7. Drops in relative humidity
8. Humidity deficit
9. Elasticity of water vapor
10. Total cloudiness
11. Wind speed
12. Relative number of sun spots
13. Total area of sun spots
14. Number of chromospheric eruptions
15. Intensity of terrestrial magnetism--R-index

It is evident from the data of this table that the overwhelming majority of the coefficients of correlation is statistically reliable ($P>0.95$). The coefficients of correlation of air temperature, humidity moisture and elasticity of water vapor with the incidence of crises point to an inverse relationship of a moderate closeness ($0.5>r>0.3$). The coefficients of the other factors point to a weak degree of correlation ($r<0.3$).

For a comparative evaluation of the effect of individual affecting elements, partial coefficients of determination were used. Judging from their absolute value, individual factors have a weak effect on the incidence of hypertensive crises, but their combined effect is considerable. On the day of observation 20.91% of the hypertensive crises were caused by the effect of the complex of investigated weather forming factors.

Having recorded the values of the affecting factors on the day of observation (0-date), we calculated the correlation regression models characterizing the dependence of the incidence of hypertensive crises on this weather complex on days different with regard to the reference day (table 3).

Table 3.

(1) Статистический показатель	(2) Дни −2	−1	0	+1	+2	+3	+4	+5
Совокупный коэффициент детерминации R (3)	0,1802	0,1984	0,2091	0,2584	0,2665	0,3281	0,2965	0,1947
Критерий достоверности F (4)	5,415	6,080	6,611	8,688	9,032	11,823	10,176	5,940
Удельный вес (%) (5)	18,02	19,84	20,91	25,84	26,65	32,81	29,65	19,47

Key:

1. Statistical indicator
2. Days
3. Combined coefficient of determination R
4. Criterion of reliability F
5. Proportion (%)

As can be seen from the value of the combined coefficients of determination, up to 32.81% of the variation in the number of aggravations of hypertensive disease (in Kiev in terms of 1973 this is equal to 11,181 cases) is due to a variation of these signs, the proportion of these factors among the causes contributing to the development of crises being different on days different with regard to the reference day. For example, 2 days (-2 date) before the registration of these affecting factors only 18.02% of the aggravations of hypertensive disease were due to their changes, 1 day (-1 date), 19.84%, on the day of observation, 20.91%, the next day (+1 date), 25.84%, after 2 days (+2 date), 26.65%, after 3 days (+3 date), 32.81%, after 4 days (+4 date),

29.65%, and after 5 days (+5), 1947%. The values of the combined coefficient of determination mentioned are reliable with a high level of probability (the actual values of dispersion ratios exceed the critical values with α=0.01, P=0.99) and the number of degrees of freedom K_1=14 (the closest to 14--1=13) and K_2=400 (the closest to 365--4=361). According to the quantile table, F--distribution $F_{0.99}$=2.12. Apparently, the increase in the combined coefficient of determination with an incidence of crises after 2 or 3 days is due to the fact that patients request first aid not at the moment their condition worsens, but during the period of a full development of the hypertensive crisis, when the patients themselves and those around them realize that the medications they have are insufficiently effective.

It follows from the data presented that under Kiev's climatic conditions the incidence of hypertensive crises has seasonal fluctuations characterized by an increase in the incidence of aggravations during the months of the cold period and a decrease in their incidence during the months of the warm period. Against this background also characteristic of other sudden diseases the incidence of crises rises in December, January, March and May and drops in August, September and October. Mathematical-statistical processing showed a representative dependence of aggravations of hypertensive disease on weather forming factors. On the whole, individual factors have a negligible effect on the incidence of crises and the combined specific effect of the entire weather complex is very great. Up to 32.81% of the hypertensive crises develop under the effect of weather conditions. Determination of unfavorable and favorable complex characteristics will make it possible to develop objective criteria for the prevention of weather related aggravations of hypertensive disease.

BIBLIOGRAPHY

1. Ali-Zade, I. A., Author's Abstract of His Candidate Dissertation, Baku, 1972.

2. Guseva, I. S., "Metodicheskiye Razrabotki po Izmereniyu Sezonnykh Kolebaniy" /Methodological Studies of the Measurement of Seasonal Fluctuations/, Moscow, 1973.

3. Danishevskiy, G. M., in the book "Mater. IV Nauchn. Konf. po Probl. 'Klimat i Serd. Sosud. Patol'" /Data of the Fourth Scientific Conference on the Problem "Climate and Cardiovascular Pathology"/, Moscow, 1969.

4. Dzgoyev, L. B., Author's Abstract of His Candidate Dissertation, Yalta, 1973.

5. Zhurenko, A. N., Author's Abstract of His Candidate Dissertation, Kiev, 1963.

6. Myasnikov, A. L., "Gipertonicheskaya Bolezn' i Ateroskleroz" /Hypertensive Disease and Atherosclerosis/, Moscow, 1965.

7. Nikberg, I. I., and Bardov, V. G., in the book "Chetvertoye Nauchnoye Soveshch. po Probl. Med. Geografii" /The Fourth Scientific Conference on the Problem of Medical Geography/, Leningrad, 1973, p 137.

8. Nikberg, I. I., and Khomenko, Yu. A., in the book "Itogi i Perspektivy Mediko-Geograficheskikh Issledovaniy" /Results of and Prospects for Medicogeographical Investigations/, Kiev, 1973, p 72.

9. Nikberg, I. I., Khomenko, Yu. A. et al., in the book "Klimat i Gorod. Mater. Konf. 'Klimat-Gorod-Chelovek'" /Climate and City. Data of the Conference "Climate-City-Man"/, Moscow, 1974, p 72.

10. Panchenko, D. I., Isakov, N. A., and Lukashevich, L. P., "Mediko-Biologicheskoye Znacheniye Biotrona i Yego Fiziko-Tekhnicheskiye Resursy" /Medicobiological Significance of Biotron and Its Physicotechnical Resources/, Kiev, 1964.

11. Panchenko, D. I., VRACH. DELO, 1972, No 1, p 1.

12. Protsek, Ye. G., Author's Abstract of His Doctoral Dissertation, Kiev, 1974.

11,439
CSO: 1870

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MAIN PROBLEMS OF INDUSTRIAL HYGIENE IN THE CHEMICAL INDUSTRY

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[Article by A. S. Arkhipov, Ye. N. Marchenko, Yu. L. Yegorov (Moscow), Central Institute for Advanced Training of Physicians; Institute of Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences; Institute of Hygiene imeni F. F. Erisman, submitted 17 Jun 77]

[Text] In 6 decades, the chemical industry developed into a major and most important branch of our national economy. The huge growth of the chemical indstry was both quantitative and qualitative. We can site an example of the growth of chemical production: While we produced 0.3 million ton mineral fertilizers in 1928, the objective in 1977 is to produce 100 million tons of such fertilizers.

According to the data of CEMA, the indices of increase in production of chemical raw material in the entire world are higher than for other types of raw material. Thus, if the 1970 indices are taken as 100%, in 1975 the growth in production of chemical raw material constituted 184% and, according to the forecasts, it will constituted 329% in 1980. Worldwide consumption of synthetic fibers increased from 4.9 million tons in 1970 to 7.9 million tons in 1975 and, according to forecasts, will reach 12.7 million tons in 1980; the consumption of synthetic rubber will also undergo a 5-8-fold increase.

The qualitative growth of chemical products was closely linked with technological progress. Processes of mechanization of manual operations, high pressure, high temperatures, new and more effective catalysts, new and more powerful technological units, continu processes, etc., were widely adopted in the technology of chemical production. Many new chemical units resulted in less contamination of the industrial environment, i.e., they were progressive not only in the technological, but hygienic respects: new types of electrolyzers, pumps, etc. (V. S. Filatov, M. I. Erman et al.). Development of a number of general and theoretical problems was of substantial significance to improvement of working conditions in chemical plants.

Development of rational types of planning of industrial buildings, which was aided by adoption of continuous technological processes, played a large role in enterprises of the chemical industry.

Planning was based on the principle of isolating the most hazardous technological units, from the standpoint of gas and dust emission, with differentiation of two zones: equipment zone (where the main technological equipment is located) and control zone (with the control consoles).

As a rule, the air environment of the control zone (control consoles) is free of chemical pollutants (organophosphorus compounds, nitro compounds of toluene, etc.) so that employees can be protected from toxic agents.

Hygiene-related studies also made it possible to recommended different degrees of isolation for industries using moderately and minimally toxic agents. The two-zone planning system made it possible to use a rational system of staggered pumping of air with delivery of clean air under pressure to the control zone, and this provided stable movement of air from the clean areas (control zone) to the more contaminated ones (equipment zone).

The main hygienic principles involved in rational planning of buildings were reflected in health law SN 245-71.

For many years, hygienists were particularly concerned with the problem of hygiene of plant areas in the chemical industry. Problems of contamination of the air reservoir of plant areas and the effects of such contamination on working conditions for individuals who work out of doors, pollution of air in the air-flow ventilation chambers were studied on objects of major chemical and petrochemical enterprises.

Studies were made of the main patterns of dissemination of emitted pollutants in different zones of the plant area as related to the height of the ducts (level of emission of pollutants), numerous sources of emission, nature of plant construction, wind roses and other factors. All these data were used extensively to substantiate the need for providing treatment installations, and work dealing with preventive and routine inspection in chemical enterprises.

In the last few years, increasing attention is being given to the arrangement of technological equipment of the chemical industry in plant areas out of doors. On the basis of a number of investigations, the main theses and principles have been development for placement of technological equipment, servicing and repair thereof in plant areas out of doors, with due consideration of hygienic requirements.

Several hygienists called attention to the problem of deposition of toxic agents on construction materials of housings of buildings of chemical enterprises. Mercury and deposition thereof on building material are an old model in this regard. It was established that many building materials (woodwork, bricks, wood, paint, lacquer, etc.) could sorb and then deposit

the most diverse chemicals (lead tetraethyl, benzene, hydrogen sulfide and many others).

Studies have been pursued of the main patterns of sorption of chemicals by building materials, depending on the concentration, exposure time and other factors. As a result of desorption processes, chemicals deposited in building materials penetrate into the air environment of work rooms, and this determines the main hazard of these processes. Investigations have identified the building materials that sorb chemicals minimally; various protective coatings, which limit sorption processes in building materials, have been studied. Various methods have been investigated with regard to degassing and cleaning work areas in the case of contamination by various chemicals, and this is of substantial importance to practice.

The problem of contamination of the integument of those working with chemicals, the cutaneous route of intake of industrial poisons in the organism is drawing the increasing attention of hygienists. This is related to the fact that, with development of chemical production, many chemicals have appeared that induce not only development of chemical dermatosis but, after being absorbed, present a great hazard of resorptive action, after they hit the integument.

It should be noted that, in view of the substantial progress made in the last few years with respect to amelioration of working conditions in the chemical industry and as a result of lowering the concentrations of chemicals in air, the cutaneous route of intake of toxic agents, as a result of contact contamination, has begun to play an increasing role in building up toxic doses of poisons in the organism.

The first research, conducted in the 1930's by N. V. Lazarev and other investigators, resulted in addition of notes concerning the hazard of intake through the skin of a number of agents to the roster of maximum permissible concentrations of toxic agents in the air of work zones. There was particularly successful development of research in this direction, after the question of a need for setting hygienic standards for pollutants of workers' integument was raised for discussion at the Third All-Russian Congress of Hygienists (A. S. Arkhipov, B. B. Bykhovskiy, Yu. L. Yegorov et al., 1969). The many years of research conducted by Yu. I. Kundiyev on the mechanisms of absorption of pesticides through the skin were largely involved in creating the prerequisities for approaches to setting the maximum permissible levels of integumental pollutants. At the present time, tentative maximum permissible levels of skin contamination have been proposed as a result of the work done at the Institute of Hygiene imeni F. F. Erisman and other hygiene-oriented institutions, for benzene, chlorobenzene, nitrobenzene, xylene, xylidine (Yu. L. Yegorov et al., 1976), trinitrotoluene (Ye. G. Dymova, 1976), nitryl of acrylic acid (L. V. Zotova, 1977).

Among the theoretical problems of modern industrial hygiene, those pertaining to dust and gas mixtures (DGM) or aerosol-gas mixtures (AGM) are attracting

attention. In many branches of the modern chemical industry (production of superphosphates, complex fertilizers, sulfuric acid, aluminum fluoride, dyes, industrial rubber, tires, etc.), we find dust along with various gaseous chemicals in the air environment of industrial buildings and in the main equipment. To date, we studied the dust factor and the chemical factor in these industries separately, and we evaluated their danger separately. Yet, in the DGM or AGM system, processes of complex interaction take place at varying intensity between the gas component and dust (sorption processes), and occasionally catalytic processes.

Biological experimentation established that the dust in a DGM (AGM) system has a high degree of biological activity, as manifested by fibrinogenic processes in the lungs and, in some cases, it could lead to signs of acute toxicity after intake in the organism.

On the basis of laboratory investigations, it was established that the effect of DGM dust on the organism is related to processes of desorption of the gas component, processes of dissolution thereof in the biological media of the respiratory tract. Then there is the effect of DGM dust in the respiratory tract, with persistent fixation of various amounts of the gas component in the dust. These processes vary in different DGM models. Thus, in the cinder--sulfur dioxide model, desorption processes are minimal and most of the toxic component is transmitted into tissues as a result of dissolution processes. There is a different pattern in the superposphate-hydrogen fluoride DGM model. Here there is prevalence of desorption processes with less marked dissolution processes.

All this raises new problems with regard to hygienic evaluation of DGM and AGM systems in the chemical industry. It should be noted that the problem of DGM and SGM is a pressing one not only for the chemical industry, but some branches of machine-building, mining, etc.

Ventilation plays more than a minor role in improving working conditions in the chemical industry. There is not a single chemical plant were some ventilation systems or other are not used to remove chemical pollutants from the air environment of the work zone. Effective ventilation systems have been developed and are used in many chemical plants. A ventilation system involving generation of air pressure ["podpor"] in the control zone and rational exhaust into the equipment zone has proven to be very effective in new plants with two-zone lay-out. Several rational systems of ventilation have been developed for chemical shops with excessive heat. Many different variants of ventilation have been developed and are in operation in the most diverse types of chemical plants. All of these ventilation systems are being constructed with consideration of a most important principle: to remove chemical pollutants emitted from equipment at the site of their production (emission). Occasionally, insufficient power, improper adjustment and lack of purification of the ventilation air delivered into the atmosphere are among the flaws of modern ventilation systems.

Much work has been done in the area of special industrial hygiene referable to some branches of the chemical industry.

In the prewar period, hygienists concentrated on such industries as the production of yellow and red phosphorus, lead tetraethyl and ethyl fluid, mineral fertilizers, etc. In the late 1920's and early 1930's, working conditions were poor in the phosphorus compound industry, an electrothermal method was adopted for production of yellow phosphorus and some of the stages of the new technology had not yet been adequately assimilated. During this period there was a rise in incidence of phosphorus poisoning, to the extent of severe forms (phosphorus necrosis of the jaw). However, through the efforts of technologists, hygienists and engineers specializing in ventilation, a broad range of measures was instituted to control gas emission in the phosphorus industry, and this improved working conditions appreciably. Phosphorus poisoning was eradicated in these industries.

Much work was done by hygienists in the prewar period to improve working conditions in the lead tetraethyl and ethyl fluid industries, which were then only beginning to be assimilated and, of course, had many flaws. Problems of sealing off the main equipment, rational planning of buildings, ventilation, degassing work rooms, special work clothing and many others were solved. In these industries, they succeeded in obtaining a stable decline of concentrations of lead tetraethyl in the air. The research of A. S. Arkhipov, A. N. Boytsov and Ye. N. Marchenko (1962) revealed that the levels of concentration of lead tetraethyl dropped systematically from 3 mg/m^3 in 1936 to 0.5 mg/m^3 in 1947, and to 0.06 mg/m^3 in 1958 in the lead tetraethyl and highly toxic ethyl fluid industries. In subsequent years, maximum permissible concentrations were obtained in the air of permanent work places.

In the group of enterprises producing mineral fertilizers, the production of superphosphate played the leading role in the prewar period. The concentration of fluoride compounds (converted to hydrogen fluoride) reached 14-76 mg/m^3, while the concentration of dust constituted 47-70 to 1180-2446 mg/m^3. In the postwar period, as a result of technological progress, working conditions in the superphosphate industry were significantly improved. Adoption of continuous processes, automation and mechanization of the main production operations, remote control of equipment operation aided in significant lowering of concentrations of fluoride compounds and dust. The concentration of the former dropped to 0.2-10 mg/m^3 and of the latter, to 3-79 mg/m^3. However, higher concentrations were observed in some sectors of this industry.

In the postwar period, hygienists studied more than 100 new branches of the chemical industry. The intensive growth of production of synthetic resin and plastics caused development of much work dealing with hygienic investigation of these industries. Studies were made of the production of simple polyesters, elastic and rigid polyurethane foam, fiber glass based on polyesteracrylic resin, urea-formaldehyde foam plastic, foam epoxy, etc. These industries are characterized by complex pollution of the air environment

(6-8-10 or more components), and more favorable data with the use of pouring methods, as compared to spraying methods. More recently, some foam plastics are being produced on a conveyer (Vilates 5), which permits mechanization of some manual operations (pouring, removal of plastic from casts, etc.). The conveyer provides for continuity of the technological process, and continuous processes play a substantial role in the chemical industry with regard to improving working conditions. Continuous technological processes in the production of synthetic alcohols, organophosphorus compounds and xylene aided in improvement of working conditions. There was an appreciable reduction in pollution of the air environment in the production of isoprene rubber when a continuous technological process was adopted in this industry.

Great advances have been made in many new industries, where modern technological equipment is used, with respect to improvement of the air environment. The concentrations of chemicals in enterprises producing organophosphorus compounds are at the level of the maximum permissible concentration or close to it. Introduction of more refined BGK-17 electrolyzers with wiring at the bottom in the production of chlorine lowered the chlorine concentration to the maximum permissible level.

Introduction of new technology (furnaces with a boiling layer) in the production of sulfuric acid resulted in a significant decline of concentration of sulfur dioxide. The use of systems of continuous "kuperatsiya" [?] using sealed equipment and aspiration from it had a beneficial effect on the air environment. The concentration of nitrogen oxides does not exceed the maximum permissible levels.

Many hygienic investigations were conducted in the viscose and chemical fiber industries. These industries are characterized by a high degree of gas emission in the process of formation of viscous fiber and processing thereof. The developed system of two-mode ventilation cannot provide the required lowering of concentrations of carbon disulfide. In this respect, there is still much work to be done by technologists, designers and hygienists.

Labor legislation limiting the time of contact of workers with toxic agents (short work day, pension benefits, longer paid vacation) is very important to the health of those working in the chemical industry.

Hygienic standards, as well as sanitary rules, which were developed on the basis of hygienic research, played a large role in improving working conditions in the chemical industry.

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METHODOLOGICAL APPROACHES TO THE STUDY OF ALLERGENIC ACTIVITY OF CONSTRUCTION MATERIAL POLYMERS

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[Article by G. P. Trubitskaya, A. N. Bokov (Rostov-na-Donu) and O. G. Alekseyeva (Moscow), Medical Institute, Institute of Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences, submitted 5 Oct 76]

[Text] We know of only one work that has a direct bearing on the problem in question, in which an effort was made to demonstrate, under close to natural conditions, the allergenic effect of a set of chemicals emitted from plastic based on resin PN-1 (I. D. Gadalina).

In view of the foregoing, we undertook a study to develop adequate methodological approaches and selection of the most informative tests, that are also the most readily available to practical physicians, for demonstration of allergenic activity of building materials made of polymers. Special attention was devoted to the instances where the overall relative index of level of chemical compounds in the air environment, in fractions of the maximum permissible concentration, is lower or equal to the former, and consequently the danger of a general toxic effect was ruled out.

In these studies we used the method developed by A. N. Bokov, intended originally for the study of general toxic effects of building polymers. This method consists, in essence, of modeling the expected conditions under which the material is to be used in special generator chambers, which permits obtaining air for further investigation with qualitative and quantitative characteristics of chemical pollution that are consistent with natural conditions under which the materials are used. The modeled factors include air temperature, frequency of air exchange, saturation of the room with polymer material and, if necessary, humidity and other conditions. The study of the general toxic effect of polymer material involves four stages in accordance with the complete methodological scheme: sanitary chemical investigation; determination of the presence, intensity and nature of odor generated by the material; clinicophysiological observations for demonstration of reflex effects on the organism; chronic toxicological experiment with

around-the-clock exposure of experimental animals in order to study the chronic resorptive effect. External air is delivered, after purification, to all experimental and control generator chambers around the clock; the temperature is set and maintained by means of heating elements, thermoregulators and magnetic switches contained in the housing of the generator chambers; the size of the specimen is determined in each instance in accordance with the expected degree of saturation when the material is in use and the size of the generator chamber. The latter is regulated in accordance with the specifics of each stage of the study (at least 100-200 l for the sanitary chemical studies and 1000-2000 l for biological studies). In the course of the biological studies, air from the generator chambers is fed into a system of special helmets (observations on humans) or exposure chambers 100 l in size (experiment on animals).

Each of the polymers was studied in two modes simultaneously: continuous around-the-clock and intermittent (24 h of exposure, 24 h off) delivery of air to animals in the 100-l chambers, from 1000-l generator chambers. Air from generator chambers into which no polymer materials were placed was delivered to control animals around the clock and to experimental animals exposed intermittently during the off periods. Around-the-clock exposure was performed in order to approximate as much as possible man's living conditions, and the 24-h breaks in the case of intermittent exposure were used for research purposes, in the hope of stimulating antibody production under conditions involving retention of the circadian cycle of metabolic processes in the organism. We used guinea pigs, mainly of a white strain, with initial weight of 250-300 g, in our experiments. Blood was taken in vivo by the method of intracardiac puncture from 5 animals at a time from each group (first stage).

We adjusted the conditions and duration of exposure, as well as optimum times for the study of the indices on four types of polymers, including two polymer items [or designs]: No 327, with fiber glass based on a combination of PN-1S (100 parts by weight) and PVKh-Ye-62 (15 parts by weight) resins with additives (aluminum powder, "giperiz," cobalt naphthenate, antimony trioxide) and No 325, fiber glass based on PN-1 resin (100 parts by weight) with additives (titanium white, "giperiz" and cobalt naphthenate) and two samples of nitrolinoleum: brand 6/P, with the use of three plasticizers (trioctyl phosphate, dibutyl phthalate, trichloroethyl phosphate) and brand 2/P, with two plasticizers (trioctyl phosphate and dibutyl phthalate).

At the first stage, there were 8 experimental and 2 control groups, with 20 guinea pigs in each, and we used the following parameters: total protein, lysozyme, complement, sialic acids, histaminopectic index (HPI) and blood serum proteinogram; the results of skin tests, as well as hematomorphological indices obtained by the conventional methods.

The mean concentrations of styrene, dibutyl phthalate and phthalic anhydride migrating from item No 327 were on the levels of 0.021, 0.057 and 0.297 mg/m^3, and these substances were emitted from design No 325 on the levels of 0.015, 0.05 and 0.397 mg/m^3, respectively (Table 1). Maleic anhydride and

formaldehyde were not demonstrated; however, in view of the sensitivity of the methods used and amount of air samples taken for analysis (90-120 l), according to theoretical estimates, the concentration of maleic anhydride could not exceed 0.00008 mg/m^3 and that of formaldehyde, no more than 0.006 mg/m^3.

Table 1. Indices of statistical reliability of changes in experimental animals, as compared to the controls

Tests	Continuous exposure								Intermittent exposure							
	item № 327				item № 325				item № 327				item № 325			
	days of exposure															
	14	21	30	60	14	21	30	60	14	21	30	60	14	21	30	60
Total protein	0	0	0	c$^-$	0	0	0	0	0	0	0	0	0	0	0	0
Albumins	0	0	0	0	0	б$^-$	б$^-$	0	0	0	б$^-$	0	0	0	0	c$^-$
α-Globulins	0	c$^+$	0	0	0	0	б$^+$	0	0	0	0	0	0	0	0	0
γ-Globulins	б$^+$	c$^+$	0	0	0	c$^+$	0	0	0	0	0	c$^+$	0	c$^+$	0	c$^+$
β-Globulins	б$^-$	0	0	0	0	0	б$^+$	0	0	0	c$^+$	0	0	0	0	0
Lysozyme	0	c$^-$	0	0	0	0	0	б$^+$	0	0	0	0	0	0	0	0
Complement titer	0	c$^+$	0	0	0	0	0	c$^-$	0	б$^-$	б$^-$	0	0	б$^+$	0	0
HPI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eosinophils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Segmented nucl.neutrophils	c$^+$	0	0	0	0	0	0	0	c$^+$	0	0	0	0	0	0	0
Monocytes	б$^-$	0	0	0	0	0	0	б$^+$	0	0	б$^-$	0	0	0	0	б$^+$
Stab nucl. neutrophils	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lymphocytes	б$^+$	0	0	0	0	0	0	0	0	c$^-$	0	0	0	0	0	0
Leukocytes with pathological fluorescence	б$^-$	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Skin tests	negative															

Key:

c$^+$ and c$^-$) reliable change in the index, with $P \leq 0.001$, in the direction of increase or decrease, respectively

б$^+$ and б$^-$) reliable change in index, with $P \leq 0.05$, in the direction of increase or decrease, respectively

0) no reliable changes

Table 1 shows that the substances emitted from item No 325 elicited a statistically reliable change in some indices no earlier than the 21st experimental day; exposure to the substances migrating from design No 327, however, led to a change in more indices and at earlier times. Analysis of the obtained data also revealed that the most significant changes in immunobiological reactivity of the organism developed with the use of the continuous mode. For this reason, in subsequent experiments, we used around-the-clock exposure for 30 days, with testing on the 14th and 30th experimental days.

We used this system to study 11 samples of various polymer compositions to demonstrate their allergenic activity: wood chip tiles (WCT) based on M-19-62

and SK-75 resins, Mytishchinskii and Sumgaitskiy polyvinylchloride linoleums, two brands of nitrolinoleum, three types of foam rubber sponge, PE-251 B brand lacquer and polymer item No 327. In these experiments, along with testing of indices of nonspecific immunity (total protein, proteinogram, complement and lysozyme of serum, hematomorphological indices), we used several methods of specific diagnostics of allergy: passive hemagglutination reaction (PHAR) as modified by O. G. Alekseyeva et al., specific agglomeration of leukocytes (SAL) according to N. Ye. Sosonkin, reaction of enhancement of leukocyte pyroninophilia (RELP), droplet tests with haptenes and the conjunctival test in the modification of G. P. Trubitskaya.

For the conjunctival test, aqueous solutions of haptene were applied: 1 drop under one upper eyelid of guinea pigs using an eyedropper with a thin, elongated tip. The second eye served as a control for the solvent (distilled water). The reaction was examined 5 min, 24, 48 and 72 h after applying the haptene. In this test, we used concentrations of haptenes that did not induce signs of conjunctivitis in intact animals: 0.01% cyclohexanone, 0.1% formaldehyde, 0.1% phthalic anhydride, 0.1% katapin [?] and 4% 1-aminoguanidine.

The following concentrations of aqueous solutions of haptenes were used to run the PHAR, RELP and SL: 0.00001% katapin, 0.005% β-naphthylamine, 0.01% 1-aminoguanidine, 0.01% maleic anhydride and 0.01% phthalic anhydride.

These studies enabled us to demonstrate overt allergenic properties in 7 out of the 11 tested polymer materials. Table 2 lists, as an illustration, the results of testing 4 materials, including item No 327 which was tested at the first stage. According to Table 2, item No 327 (the results of sanitary-chemical investigation are given above) elicited allergic reactions in most animals, and this confirms the specific nature of changes demonstrated at the first stage of the studies.

As for foam rubber sponges, the most complicated complex of substances was found in the air environment when testing the material produced by the first formula (0.002 mg/m^3 styrene, 0.0105 mg/m^3 formaldehyde, 0.001 mg/m^3 divinyl, 0.012 mg/m^3 polyethylenepolyamine and 0.065 mg/m^3 ammonia). In the course of testing foam rubber produced by the second and third variants of the formula, we demonstrated only formaldehyde and ammonia (0.011 and 0.137, 0.008 and 0.119 mg/m^3, respectively) in the air of the generator chambers. However, it should be noted that some haptenes (kapatin, neozone [phenylnaphthylamine], diphenylguanidine) contained in the formula for foam rubber sponge could not be demonstrated by the methods of sanitary chemistry that we were able to use.

As can be seen in Table 2, foam rubber sponge, referable to the first variant of the formula, presented the most marked sensitizing properties. Successive modification of the formula resulted in a significant decrease in allergenic activity of this material, particularly with the third variant of the formula.

Table 2. Sensitization indices in guinea pigs

Tests	Index	Days of exposure in tests with item No 327		foam rubber sponge: 1st formula		2d formula		3d formula	
		14	30	14	30	14	30	14	30
Droplet tests	Number of animals	5	5	5	5	5	5	5	5
	Animals with reaction	0	0	0	0	0	0	0	0
Conjunctival test	Number of animals	5	5	not tested		5	5	5	5
	Animals with reaction	5	5			0	2	0	0
	Mean rating	1—1,4	1,2—1,8			0	0,8	0	0
PHAR	Number of animals	8	10	8	9	8	7	9	8
	Anim. with antibodies	8	3—8	6	4—5	0	3	0	0
	Mean $\log_2$ of titer	0	3,0—4,0	4,0—6,0	5,0—6,0	0	4,0—5,0	0	0
SAL	Number of animals	10	10	8	8	not tested		9	8
	Animals with reaction	5—7	3	2—7	1—2			0	0
RELP	Number of animals	not tested		8	8	8	8	8	8
	Animals with reaction			8	8	8	8	8	8
	Mean rating			1,8—2,8	2,7—2,8	3,0	3,0	1,4	1,4

Note: Hyphenated numbers indicate the range of fluctuation of indices with the use of several haptenes.

It should be mentioned that a good hygienic rating had been given (A. F. Stepanenko; A. N. Bokov et al.; L. N. Kuchkina) to all of the materials listed in Table 2, as well as the wood-chip tiles based on SK-75 and the two types of nitrolinoleum, on the basis of the good results of sanitary-chemical studies, clinicophysiological observations of humans and toxic experiments on albino rats. Consequently, our methodological approach to the study of the biological effects of polymer materials used in construction permits demonstration of a sensitizing effect in the case of emission into the air of volatile ingredients in subtoxic doses; and in this regard, the conjunctival tests according to G. P. Trubitskaya with haptenes and the allergodiagnostic in vitro methods, which permit not only demonstration, but evaluation of sensitization were informative.

Conclusions

1. Methodological approaches have been developed, which permit demonstration of the sensitizing effects of volatile chemicals that migrate into the air environment from polymeric construction materials.

2. The threshold of allergenic effects of volatile ingredients of construction polymer materials is lower than the threshold of toxic effects, so that it is imperative to use methods of diagnostics of allergies in making a hygienic evaluation of such materials.

3. In the case of inhalation of complexes of chemical compounds emitted from polymer materials, skin tests are not informative and one should use the conjunctival test according to G. P. Trubitskaya and allergy-testing methods.

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THIRD ALL-UNION SYMPOSIUM ON 'EFFECTS OF VIBRATION ON THE HUMAN BODY AND PROBLEMS OF PROTECTION FROM VIBRATION'

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[Article by A. M. Volkov and A. B. Novikov (Moscow)]

[Text] The third All-Union symposium on "Effects of Vibration on the Human Body and Problems of Protection From Vibration" convened from 14 to 18 March 1977, in accordance with the plan of the USSR Academy of Science, at the Institute of Mechanical Engineering imeni Academician A. A. Blagonravov.

A total of 317 specialists participated in the symposium; they represented 62 scientific research organizations, 42 VUZ, 8 medical institutions and 14 plants from 41 cities of 10 Union republics, AUCCTU, USSR Ministry of Health and a number of ministries of machine building.

A total of 225 papers were delivered. They were discussed in five sections: effects of vibration on biomechanical characteristics of man-machine-environment systems; clinicophysiological aspects of the effects of vibration; ways and means of automating research in man-machine-environment systems; problems of measurement and setting standards of vibration to which man is exposed; development and creation of new means of protecting man from vibration.

In his greeting to the symposium participants, Academician I. I. ARTOBOLEVSKIY discussed the multifaceted nature of the problem of protecting man from vibration. The participants were also welcomed by Academician B. N. PETROV. He observed that the main task for the symposium is to assemble the basic data for application in specific research related to upgrading existing industries and new ones.

In his introductory remarks, K. V. FROLOV, corresponding member of the USSR AS [Academy of Sciences] and director of the Institute of Mechanical Engineering imeni Academician A. A. Blagonravov, reported that the problem of protecting man against the deleterious effects of vibration is still an acute one, in view of the complexity of stationary and random vibration

processes. He observed that the task for the present is not only to eliminate the deleterious effects, but to find vibration parameters that would have a beneficial effect and stimulate work.

Of greatest interest to hygienists were the papers delivered in the section dealing with clinicophysiological aspects of vibration.

V. K. TKACH, V. T. ZHEMBA and N. N. DEMCHENKO studied the cumulative effect of vibration on blood proteins and found a change in electric potential of blood serum solution on the solution-air boundary, and a change in force of surface tension. Papers were delivered on the effects of low-frequency and high-frequency vibration on adenine nucleotide levels (index of energy metabolism) and some enzymes (aldolase and creatine kinase). N. P. BARANOVA, S. N. ROMANOV, R. A. ARTSISHEVSKAYA and O. YA. ABRAMOVA reported on changes in the protein complex (enzymes) and resistance to injury under the influence of vibration, as well as decreased capacity of muscular actomyosin to discharge energy to maintain efficiency.

The paper of I. M. KHZEN dealt with the effects of vibration with a complex spectral composition on the human operator and metabolism of biologically active substances in the trophotropic class (histamine and serotonin), which undergo a change even at the early stages of exposure to vibration, diminishing regulation of the myocardium and retarding the recovery process.

The paper of A. A. OTELIN was received with great interest; it dealt with the morphological reaction of receptor systems of the skin and soft tissue elements of the skeleton to vibration. The Vater-Pacini corpuscles (VPC) are believed to be receptors of vibration, and they retain their structure for a longer time than other encapsulated receptors. The hypothesis is expounded that vascular disturbances associated with vibration sickness are due to the vascularization distinctions of VPC. Changes in VPC occur within the first few seconds of exposure to vibration and they are manifested by mitochondrial swelling, which disappears by the 15th second of exposure (S. Ye. Li, V. F. Mashanskiy, A. S. Mirkin, S. Ye. Churilina). Other cellular structures are also not indifferent to vibration. Assumptions are expounded of biomechanical resonance of elements involved in ion permeability of membranes, membranes of the endoplasm, reticulum and mitochondria.

The agenda of the symposium included papers dealing with EEG changes under the influence of vibration (A. S. MELIYA, A. V. VERZILOVA and F. L. RAZBASH). YU. S. MEDNIKOVA reported on the properties of hypothalmic neurons, which undergo little change under the influence of vibration but demonstrate impaired reactivity with functional loads (development of time-related conditioned reflexes). Some interesting data were reported on neuronal reactions in sensorimotor regions of the cortex to mechanical oscillations and electric stimulation of vestibular nuclei (G. G. GORGILADZE, YU. V. KREYDICH and A. G. POPOV), and cervical torsion nystagmus and compensatory eye movements in the presence of sinusoidal oscillations.

There were papers on the effects of random vibration on the organism (A. M. VOLKOVA, A. B. NOVIKOV), clinicohygienic prerequisites for substantiation of pathogenesis of diverse forms of vibration sickness, as well as measures pertaining to medical vocational rehabilitation (A. M. VYALOV et al.). Considerable attention was devoted to the combined effect of vibration and other factors on the organism. There was discussion of the effects of vibration and physical tension on operators (T. T. BASOVA), combined effect of vibration and noise in the ship-building industry (V. M. BARANOVA, S. A. KEYZER, N. M. KLOCHEV, YU. V. ZERTSALOV), methods of comprehensive evaluation of the functional state of an individual exposed to vibration on highways and results obtained with these methods (YE. I. SOKOLOV, R. M. BAYEVSKIY and others), criteria for evaluating the adaptation process with exposure to vibration on the job (Z. M. BUTKOVSKAYA, T. V. KALYADA and N. M. LENKEVICH). The paper of L. YA. TARTAKOVSKAYA on criteria for evaluating the combined effect of vibration and concomitant factors of the industrial environment (lead) was quite interesting. At first, vibration attenuates the toxic effect of the metal with latent occurrence of the pathological process and subsequent change to a phase of depletion of defense and adaptation mechanisms.

The report of YE. N. RODINA that vibration stimulates periodontosis and depresses karies prompted considerable interest on the part of the audience. A report on physiological substantiation of working conditions for those working on high-frequency rotating machines was delivered by A. M. MIKULINSKIY et al. K. F. FROLOV and A. S. MIRKIN raised the question of using vibration as a preventive and therapeutic factor and the boundary between positive and negative effects of vibration. In their paper, data were submitted on testing methods of vibrostimulation on 176 patients with endarteritis obliterans.

Much attention was devoted to the effect of vibration on biomechanical characteristics of the man-machine-environment system, questions of using vibration sensitivity to give "fealing" to manipulators and prostheses (N. S. GURFINKEL' et al.) and in instrument display systems (YU. A. SHNEYDER et al.).

There was discussion of dynamics of vibration-proof chairs with consideration of dynamic characteristics of man (Z. V. CHIKHLADZE, A. V. SINEV), analysis of spatial oscillations of man in the case of monaxial vibration (A. V. MAKARYCHEV, G. YA. PONOVKO), measurement of input impedance during exposure to vibration and anthropometric model for the study thereof (YU. M. VASIL'YEV et al.). V. D. ZHIVOTCHENKO, A. B. NOVIKOV, B. A. POTEMKIN and G. A. SAFARISHVILI delivered an original report on analysis of the pulse as an oscillatory process.

The ergonomic aspect of vibration in riveting work was discussed by N. P. BENEVOLENSKAYA. She reported that the morbidity indices did not drop, even with the introduction of riveting hammers that met the GOST standards.

There were interesting reports on the ways and means of automating studies in man-machine-environment systems (YA. I. AVAKYAN, K. K. GLUKHAREV, S. A. DOBRYNIN, D. YE. ROZENBERG and others).

Of extremely great importance was the work of the section dealing with "Measurement and standard-setting referable to man's exposure to vibration." YU. M. VASIL'YEV supplied useful information about permissible levels of industrial vibration in different countries. There was a heated debate concerning vibration safety and setting vibration standards for machines and mechanisms.

G. A. SUVOROV, N. N. MALINSKAYA, E. I. DENISOV and I. B. YEVDOKIMOVA dealt with problems of setting vibration standards at work places and local vibration in their papers.

The participants at the symposium listened to papers on integral evaluation of effects of vibration on man with great interest.

There is a new methodological approach to evaluation of the effects of vibration on man that merits attention; it was developed at the Institute of Mechanical Engineering imeni Academician A. A. Blagonravov, and it is based on the concept of "biological dose of vibration: (A. B. NOVIKOV and B. A. POTEMKIN).

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

HEALTH SERVICE DIAGNOSIS BY TELEPHONE

Moscow PRAVDA in Russian 15 Aug 77 p 6

[Article by N. Korshunova]

> [Text] Scientists, inventors, and engineers are constantly engaged in the search to develop means to lighten the work of doctors, mid-level and junior medical personnel. Many such novelties have been completed and are displayed for the first time for the scrutiny of specialists at the exhibition hall of the All-Union Scientific Research and Experimental Institute of Medical Technology of the Ministry of Public Health of the USSR. Together with its director, Rustam Ismailovich Utaymyshev, we went on a tour through the exhibit. There are several dozen displays.

"All this--the latest developments," said the director. "Models do not remain here on display; their renewal goes on constantly. Some are sent to the factories where they are used in serial production, others are replaced and their fate remains to be determined by the specialists. The creators of medical technology strive to decrease the size of instruments to the minimum. The doctor must obtain compact, lightweight, but at the same time accurate apparatus. Miniaturization is one of the main directions of the researchers' goals."

In one of the display windows, there is a medium size instrument entitled "Toy." It is simple in construction--The patient, unassisted, can measure his own blood pressure with a semi-automatic measuring device for arterial blood pressure. The pressure gage is attached on the cuff. The high accuracy of the resulting measurement is fixed on the scale of the graded monometer when the sound signals appear.

A series of gleaming screens were lined up, reminiscent of televisions. These are automatic interviewers. Located at the main dispensary, it is

difficult for the doctor to want a better assistant. At one session, up to 16 patients can be assisted simultaneously. Patients are lined up near the screen on which questions appear. The examinees, pressing buttons, give answers which the EVM [electronic computer] immediately processes, stores and thus assists in establishing the clinical history.

A range of the most sensitive equipment has been created to trace the heart and blood vessels and to signal undesirable changes in them, to precisely indicate the place--the localization of the infraction. This can be classified as "Diagnosis MT" [expansion unknown]."

Systems have been developed as well for the relaying of an electrocardiogram by telephone or radio. One of these, "VOLNA" [Wave], is under study in clinics in Moscow, Leningrad, and Saratov. Symptoms of the illness are communicated directly from the bed of the patient by telephone or through a radio set installed in the car to the cardiology center. The use of "VOLNA" allows the cardiologist on duty to provide a consultation and the doctor can give first aid.

Of interest is an experimental model of a membrane oxygenator, used to enrich the blood with oxygen by means of an artificial blood circulating apparatus. As a ventilator for the lungs, one can call the apparatus "Harmony MT" [expansion unknown], a machine which speeds up the uninterrupted regulation of the infusion of oxygen, air, the life saving mixture to the lungs.

For people whoever endure visits to the dentist, it would be of interest to know about the portable electric drill "Gamma 2," which has gone into serial production. Its main advantage is its compactness and speed in drilling the hard substance of teeth, while excluding pain.

Sets of instruments for ocular and microneurosurgery are exhibited. By several parameters, in particular, the decrease in working parts, the instruments are superior to all available models.

Ultrasonic, cryogenic, and laser techniques are not yet available to modern medicine. But in the laboratories of the institute, one has the opportunity to look into the future, when diagnosis by holography will assist the doctor. Experimental results obtained by laser and supersonic holography predict the possibility of penetrating the mystery of living organisms. Thus, a mechanism has been created to obtain an holographic imprint of an ocular socket and the contents of the eyeball. The work is based on the development of an apparatus which allows one to visualize a volumetrical portrayal of every internal organ by radiograph, made in various cross-sections.

The instruments of labor for doctors are being perfected and are becoming more complicated. And when you leave the exhibit, the question will come to you: whether all doctors are prepared to work with this technology?

"The use of similar novelties," says R. I. Utaymyshev, "requires, of course, special training." Therefore, this year, the All-Union Scientific Medical-Technical Society declared a review-congress of specialists, in order to master the new medical technology.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ENDOCRINOLOGY CENTER IN KIEV

Moscow RABOCHAYA GAZETA in Russian 16 Aug 77 p 3

[Article by Ratau]

[Text] The workers of the Kiev Scientific Investigatory Institute of Endocrinology and Metabolism were relocated in a new five story building, constructed in the picturesque northwestern district of the capital of the Ukraine. Within the structure of the complex there are experimental and clinical wings where a polyclinic, clinic, various investigative laboratories and sections are accommodated.

"With the opening of this complex," reported the scientific secretary of the institute, N. D. Tronko, candidate of medical science "the creation of the first large endocrinology center in the country is practically completed." It is equipped with the latest investigative, diagnostic and therapeutic equipment which significantly broadens the resources of scientists and doctors in the solution of various problems of modern medicine and questions of the future development of public health services. The tasks confronting the organization are very crucial. Included, for example, is the study of the mechanism of hormones, the search for effective drugs in the battle against serious ailments, the development of progressive methods for their diagnosis and treatment. Special attention is given, in particular, to the sufficiently widespread disease--diabetes. At the institute, an interesting and at the same time, complex study is underway directed at the development of an artificial pancreas.

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