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4 May 1979

USSR

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY

BIOMEDICAL AND BEHAVIORAL SCIENCES

(FOUO 14/79)

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TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY

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INDUSTRIAL MICROBIOLOGY

UDC 634.0.863.676.16.022.082.631

FUTURE ROLE OF MICROBIOLOGY INDUSTRY IN NATIONAL ECONOMY

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYLSHLENNOST' in Russian No 7, 1978 pp 1-2

[Article: "To Increase the Effectiveness of Agricultural Production"]

[Text] Comrade L.I. Brezhnev's report on the July (1978) Plenum of the CC CPSU and the Plenum's decree "On Further Development of USSR Agriculture" made a profound impression on the workers of our country. This historic document has been completely approved by the Soviet people, who have directed their efforts toward solution of the most urgent problems of agricultural production, elimination of weak points, and more effective use of means to ensure progress in this extremely important sector of the economy. In accordance with the party's agrarian policy, capital investment in agricultural production is constantly increasing. While in the 7th Five-Year Plan, the proportion of the total volume of capital investments was 20 percent, during the 8th Five-Year Plan it was 23 percent; in the 7th, 26 percent, and in the 10th it is more than 27 percent.

During the last ten years much has been done to create a modern industrial base for agriculture. "Previously we had no such specialized, independent major fields as water conservation, land reclamation, engineering for agriculture and fodder production, agricultural construction, mixed feed production, and the microbiological industry," said L.I. Brezhnev in his report. "Now we do!" The report further said that the experience of years past indicates that the capacity of the industrial fields supplying agriculture must be increased more vigorously.

This goal is being met by the decree of the CC CPSU andthe USSR Council of Ministers "On Further Development of Fodder Supplements, Crop-Protective Agents and Other Products of the Microbiological Industry in 1975-1978," which was approved by the July Plenum of the CC CPSU. This document states that the realization of the resolutions adopted by the party and the government on the creation and accelerated development of the microbiological industry has made it possible to increase significantly the production of fodder yeast, nonmedical antibiotics, enzyme preparations and vitamins and to organize the industrial production of fodder concentrations of lysine, premixes and microbiological crop-protective agents.

The decree further states that use of the products of the microbiological industry is highly influential in improving the effectiveness of agricultural production, particularly in stock breeding.

This high evaluation of the role of the microbiolgical industry is inspiring its workers to new achievements of labor and overfulfillment of production plants, first and foremost those for fodder yeast.

As a result of protein scarcity, enormous overexpenditure of fodder is going on. In order to eliminate this deficiency, along with expanding plantings of leguminous and oil-producing crops, alfalfa, clover, rape and soy, it is necessary to take all possible measures to increase the industrial production of protein substances. Use of fodder yeast as a supplement in rations for animals and birds, for example, not only economizes on the usual fodder, but also sybstantially increases the quantity of meat, milk and eggs obtained.

The CC CPSU and the USSR Council of Ministers has given the Main Administration for the Microbiological Industry the responsibility for implementing new production capacities in 1981-1985 of 1,210,000 tons of fodder yeast. This goal must be fulfilled not only by constructing new, but also by expanding and reconstructing existing, enterprises. In addition, in order to satisfy the needs of agriculture, it is necessary to increase on a significant scale the production of amino acid premixes, enzyme preparations, fodder antibiotocs and vitamins, microbiological crop-protective agents, and bacterial fertilizers. Thus, in 1981-1985, new production capacities of 21,000 tons of lysine, 144,000 tons of premixes, and 7,300 tons of microbiological crop-protective agents are to be implemented.

The necessary raw material resources have been allotted for realizing the wide program of developing the production of microbiological products. In 1985, for example, different ministries and departments will provide the microbiological industry with 9,199,000 solid cubic meters of technological raw materials, including 3,258,000 cubic meters of chips, 5,941,000 cubic meters of sawdust, 1,765,000 tons of corn cobs, 668,000 tons of rice husks, 759,000 tons of sunflower husks, and 1,730,000 tons of cotton pods.

In the eleventh five-year plan, R 2.9 billion are earmarked for the development of the microbiological industry. Goals for constructing and implementing new capacities and organizing serial production of technological equipment have been set by the construction and industrial ministries. The decree of the CC CPSU and the USSR Council of Ministers states that the materials, resources and equipment for the creation of enterprises and units of the microbiological industry must be received first and foremost by the contract construction organizations.

Considerable funds will be invested in the reconstruction of existing hydrolysis industry enterprises with the aim of increasing their output of products for agriculture. New production capacities for fodder yeast must be created in the Arkhangel'skiy, Bobruiskiy, Biryusinskiy, Ziminskiy, Ivdel'skiy, Onezhskiy, Tavdinskiy and Tulinskiy hydrolysis and the Kanskiy, Krasnoyarskiy and Kirovskiy chemical plants. The Khakasskiy and Khorskiy hydrolysis plants will become major suppliers of premixes. New high-power enterprises will be built in Tomskiy Oblast and Krasnoyarskiy Kray--the Tomsko-Asinovskiy and Makalakovo-Yeniseyskiy hydrolysis yeast factories, each of which will give agriculture 80,000 tons of protein-vitamin fodder yeast annually.

In reconstructing existing hydrolysis plants and building new ones, application must be found for the latest achievements of science and technology, so that the new capacities are really new, meeting the needs of the times, and highly effective from the point of view of economics and the quality of products manufactured by them. This obligates the scientific research and designing organizations to examine their proposals and decisions once again and, with great creative enthusiasm and a feeling of great responsibility, to work on implementing the goals of the party and the government.

The indicated decree of the CC CPSU and the USSR Council of Ministers entrusts the Main Administration of the Microbiological Industry of the USSR Council of Ministers with developing, with the participation of the USSR Academy of Sciences and interested industries and departments, and with approving before 1 October 1978 in agreement with the USSR State Committee on Science and Technology and the USSR Gosplan, measures to ensure in 1978-1985:

further development and increase in the effectiveness of scientific research, experimental-industrial, and design work in the field of manufacturing products of microbiological synthesis;

significant increase in technico-economic indexes of microbiological production;

attainment in the shortest time possible of a high level of production for lysine, nonmedical antibiotics, microbiological crop-protective agents, enzyme preparations and bacterial fertilizer;

increase in the quality of products turned out;

development of highly productive and stable industrial strains of microorganisms;

more complete use of wastes from the enterprises of the microbiological industry and development and creation of wastefree technological processes for manufacture of microbiological products;

decrease in outlays of raw materials, fuel, and electrical energy per unit of production;

development and creation of highly productive technological lines with units of high unit-capacity and equipping the enterprises of the microbiological industry with them;

decrease in outlays of stainless steel per unit of product output;

creation of technological processes of microbiological synthesis which use new types of raw materials;

the creation of qualitatively new products of microbiological synthesis necessary for agriculture;

expansion of the application and effective use of microbiological products in agriculture, light industry, the food, meat and milk, and fish industries and in other branches of the national economy.

The development, manufacture and testing of new engineering is an urgent matter. In particular, it is very important for the hydrolysis industry to receive an experimental model of a yeast-growing apparatus for processing concentrated hydrolysis media with an output of 50 tons per day from the "Dzerzhinskkhimmash" Plant in 1979, and to test it at the Volzhskiy hydrolysis yeast plant in 1980, so that the corresponding enterprise of the Ministry of Chemical and Petroleum Machine Building can organize serial production of this apparatus in 1981.

The goal of the new engineering also includes developing initial requirements, performing technical documentation, manufacturing the experimental model, testing it, and organizing serial production of continuous output reactors for enzyme hydrolysis of pulp-containing raw materials with an output of 6,000 liters per hour; purification systems for exhaust air from dispersion driers with an output of up to 300,000 cubic meters per hour, and other highly effective equipment. The Ministry of Chemical and Petroleum Machine Building, the Ministry of Machine Building for Light and Food Industry and Household Appliances and the USSR State Committee for Material and Technical Supply have been entrusted with manufacturing and supplying the Main Administration of the Microbiological Industry with a number of complex technological lines in 1981-1985, among them three lines for the hydrolysis industry with an output of 12,000 tons of furfurol and 38,000 tons of fodder yeast per year; two lines for manufacturing xylitol with an output of 10,000 tons per year and four lines for manufacturing premixes with an output of 36,000 tons per year.

The biochemists of the cellulose and paper industry are also contributing to solve the protein problem. Through maximal use of sulphite waste liquor and pre-hydrolysates, its enterprises will bring the manufacture of fodder yeast up to 215,000 tons by 1985. In order to fulfill this goal, envisaged by the indicated decree of the CC CPSU and the USSR Council of Ministers, collectives of hydrolysis factories and biochemical shops of the pulp and paper industry will have to accomplish significant work in perfecting engineering and technology and in modernizing equipment. Institutes in this field must actively participate under the direction of the Main Administration of the Microbiological Industry in the development of measures directed toward achieving in 1978-1985:

significant increase in technical and economic indices of the alcohol-yeast and hydrolysis plants existing in this branch;

increase in the quality of fodder yeast;

more complete use of wastes from biochemical plants and creation of waste-free technology;

decrease in outlays of material and fuel and energy resources;

increase in effectiveness of products of biochemical plants.

The ministry of the cellulose and paper industry has given the all-union industrial associations Soyuztsellyuloz, Soyuzbumag and Soyuzbumizdeliye (expansions unknown) the task of constructing new, and expanding and reconstructing existing enterprises. The greatest volume of work to be done is on the Ust'-Ulimskiy and Bratskiy timber industry complexes. In the former, a production capacity of 38,000 tons of yeast must be implemented in 1982, and in the latter, yeast manufacture must be brought up to 66,400 tons by 1985.

The July Plenum of the CC CPSU has initiated a new stage in the struggle for further development of agriculture. The decree of the Plenum was officially discussed in well-attended meetings of worker collectives, who not only warmly approved the party's agrarian policy but also contributed concrete proposals on its practical realization and on transforming agriculture into a well-developed sector of the economy. Workers of the microbiological and cellulose and paper industries are making a worthy contribution to the resolution of this national goal.

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INDUSTRIAL MICROBIOLOGY

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TESTING NEW CHEMICAL ANTIFOAMS IN FODDER YEAST PRODUCTION

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian
No 7, 1978, pp 16-18

[Article by A.K. Edomina of the All-Union Scientific and Research Institute of the Hydrolysis Industry; A.A. Misyukov, S.F. Borisevich of the Leningrad Hydrolysis Plant]

[Text] Growing fodder-protein yeast on hydrolytic media in air lift apparatus is accompanied by foam formation, which, as is known, is a positive event. In the stage of yeast separation, however, the foam must be extinguished. There are several methods for extinguishing it, the most widely used being the mechanical and chemical methods.

While in mechanical foam extinction, the foam bubbles are destroyed by means of mechanical devices (beaters, paddles, etc.), the chemical method of foam reduction is more complex, depending on many factors.

According to the data (1), two variants of the action of chemical antifoams are possible. The first is when a drop of antifoam penetrates the film between two bubbles and spreads as a thick double film; the tension created during the spreading mechanically destroys the film. The second variant is when a drop of antifoam penetrates into liquid foam but spreads to a limited extent, forming a mixed monolayer with the frothing agent. If this monolayer has poor coherence, the foam will be destroyed.

Common to both methods is the fact that the antifoam penetrates the film between two bubbles. This capacity of the substance may be expressed as the coefficient of penetration E. As soon as the drop penetrates the film, its capacity for spread is determined by the coefficient of spread S. E and S can be expressed as surface tension and tension on the surface of the partition between the antifoam and the frothing agent:

$$E = \gamma F + \gamma FA - \gamma A; \quad (1)$$
$$S = \gamma F - \gamma FA - \gamma A, \quad (2)$$

where γF = the surface tension of the frothing agent;
γA = the surface tension of the antifoam;
γFA = surface tension of the partition between the antifoam and the frothing agent.

As can be seen from Formula 1, in order for the penetration coefficient E to be positive, it is necessary to have an antifoam with low surface tension. And in order for the spread coefficient S to have a positive value, substances also having hydrophilic properties are necessary.

It should be kept in mind that the outlay of chemical antifoam in hydrolytic yeast production depends not only on the physico-chemical characteristics of the antifoam, but also on the method of addition, the physico-chemical characteristics of the frothing medium, the strain of yeast, the physiological condition of the cells, etc. These indices are different in every plant, therefore the outlay of antifoam per ton of yeast is not uniform in the hydrolysis enterprises.

For comparison, Table 1 presents data on outlays of chemical antifoam in 1974 for each plant in the hydrolysis industry. The data presented in Table 1 show that the outlay of chemical antifoam fluctuates from 5-38 kg per alcohol plant and from 14 to 77 kg per nonalcohol plant. This causes differing expenditures per ton of yeast of R 5-35.

Because of curtailment of supply stocks of cod liver oil for the needs of the hydrolysis industry, the authors of the present article conducted a study on selecting and finding new types of chemical antifoams which can be used for production of fodder yeast.

In order to investigate the antifoam properties of a number of new chemical substances, water emulsions of them in different concentrations of the basic substance--5-10-15-20%--were prepared in the laboratory in a mixer. The time of emulsification was 5 min, the frequency of mixer rotation was 5000 rev/min. The emulsion obtained reduced yeast foam taken from the first section of the production floatators of the Leningrad Hydrolysis Plant. After the foam was reduced, the volume of the yeast suspension and the amount of yeast in it were determined.

Qualitative indicators--dispersion and stability--were chosen in order to evaluate the emulsion obtained. Dispersion was determined visually, and stability was expressed by the relation:

$$C = \frac{(a_1 - a_2)}{a_1} 100\%,$$

where C = the stability of the emulsion, %;
a_1 = the amount of chemical antifoam used in preparation of the emulsion, ml;
a_2 = the quantity of exfoliated antifoam after settling for 1 day or longer, ml.

The results of the laboratory experiments are presented in Table 2.

As can be seen from Table 2, of the nearly 40 different chemical substances tested, the most effective were technical oleic acid, fatty acids of tall oils, soap stocks from vegetable oils, synthetic fatty acids and alcohols. They reduce foam with sufficient speed--in 30 to 80 s--with a relatively small outlay of 12-20 g of antifoam per kg of absolute dry yeast. The stability of the emulsion which was determined by methodology described in the literature (2), is as high as 75-98%.

It should be noted that all these substances have compatively low surface tension, a long hydrocarbon radical chain, and a hydrophilic group. Consequently, the conclusions (1) are, to an extent, valid for selection of antifoams for hydrolytic media.

The substances which showed high foam-reducing properties in laboratory investigations were tested under industrial conditions in the Leningrad plant which processes spent beer with yeast. Water emulsions of these substances were prepared in a plant unit with aid of a vortical pump. The conditions under which the emulsion was prepared and the results of industrial testing are presented in Table 3.

Testing demonstrated that the most effective antifoams were soap stocks from vegetable oils and fatty acids of tall oils. These substances are inexpensive (R 300-600/ton) and they give a stable water emulsion under industrial conditions.

Although synthetic fatty acids and alcohols have foam-reducing properties, they have an unpleasant, asphyxiating odor; therefore with the existing technology it is impossible to use them for fodder yeast culture.

Organic silicon compounds proved to be ineffective as chemical antifoams in continuous process cultures.

Conclusions

1. Studies on the selection of new types of chemical antifoams for hydrolytic yeast production were conducted. Approximately 40 types of sybstances of different origins were tested.

2. The most promising were soap stocks from vegetable oils, fatty acids of tall oils GOST 14845-69, types A, B, or V, and technical oleic acids obtained from hide fat.

3. It appears that in selecting chemical antifoams for growing fodder protein yeast, it is necessary to focus on substances having sufficiently long hydrocarbon chains and having hydrophilic and hydrophobic groups.

Table 1

Plant	Antifoam	Outlay of antifoam per ton of yeast (Kg	Price (R/ton)	Outlays per ton of yeast (R)
ALCOHOL PLANTS				
Biryusinskiy	Whale oil	12.4	971	12.09
Bobryuskiy	Soap stock	37.9	334	12.27
Volgogradskiy	Fish oil	19.6	896	17.58
Gubakhinskiy	" "	6.2	1083	6.67
Ziminskiy	" "	12.0	899	10.65
Ivdel'skiy	" "	11.0	885	9.53
Kanskiy	" "	4.9	931	4.62
Karsnoyarskiy	" "	10.6	930	9.88
Leningradskiy	Soap stock	13.2	300	5.02
Lobvinskiy	Technical oil	11.4	844	9.66
Onezhskiy	Fish oil	10.4	819	8.49
Saratovskiy	" "	12.7	782	9.91
Tavdinskiy	" "	10.4	846	8.80
Tulunskiy	Whale oil	18.1	926	16.72
Khakasskiy	" "	25.1	895	22.43
Korskiy	" "	18.1	878	15.89
Segezhskiy	Fish oil, soap stock	20.8	682	14.23
OTHER PLANTS				
Andizhanskiy	Fish oil	31.5	438	13.87
Astrakhaskiy	" "	24.2	735	17.79
Bel'tskiy	Soap stock	23.1	329	7.59
Benderskiy	" "	27.9	370	10.32
Volzhskiy	Whale oil	14.5	1401	20.28
Georgievskiy	Oleic acid, fish oil	13.9	872	12.15
Zaporozhskiy	Soap stock, fish oil	21.9	819	17.99
Kedaynskiy	Fish oil	27.1	713	19.34
Kirovskiy	" "	32.4	835	27.10
Krasnodarskiy	Whale oil	19.1	863	16.54
Kropotskinskiy	Soap stock	37	354	13.10
Lesozavodskiy		30	922	27.68
Rechitskiy	Oleic acid and soap stock	17.2	765	13.16
Ferganskiy	Fish oil, soap stock, KAV-1	46.2	142	6.56
Chimkentskiy	Fish oil	20.4	934	19.06
Yangiyul'skiy	" "	19.9	900	17.93
Appolonskiy	Whale oil technical oil	77.2	449	34.67
Nikolayevskiy	Soap stock, Fish oil	23.2	435	10.07
Syktyvkarskiy	Fish oil	31.4	838	26.28

Table 2.

Antifoam	Price R/ton	Composition of emulsion (%) Anti-foam	Water	Stability of Emulsion %	Duration of foam Extinction	Outlay of antifoam g/kg yeast	Outlays on Antifoam per ton abs. dry yeast (R)
ORGANIC SILICON COMPOUNDS							
ELP-4 Emulsion	5000	0.4	99.6	--	120	6	30
" "	5000	1.0	99.0	--	150	8	40
PMS-174A	5600	1.0	99.0	0	150	12	67
" "	5600	5.0	95.0	--	160	20	112
PMS-200A	9350	0.5	99.5	0	200	10	93
" "	9350	1.0	99.0	--	190	8	85
" "	9350	5.0	95.0	--	200	8	85
" "	9350	100	--	--	--	74	690
SYNTHETIC FATTY ACIDS (SFA) AND ALCOHOL (SFAl)							
SFA fractions S_5-S_6	360	5	95	--	80	25	9
" " "	360	10	90	--	90	28	10
SFA fractions S_7-S_9	470	10	90	85	80	20	9.4
SFA fractions S_{10}-S_{16}	600	5	95	80	--	15	3.00
SFA fractions S_{12}-S_{16}	--	55	95	75	80	14	--
Distilled SFA fractions S_{14}-S_{16}	700	5	95	74	80	14	9.8
SFA fractuibs 17-20	600	5	95	76	80	16	--
Oxyethylated fatty acids	--	5	95	--	Does Not Extinguish		--
Recovered hydrocarbons	--	5	95	--	" " "		--
Propanol B-400	1000	10	95	--	--	16	16
(Progalit) AVG-6	--	10	90	--	--	12	6
Product of hydrogenation of alcohol S_{10}-S_{18}	1000	10	90	75	30	10	10
(myla kubovykh kislot	--	10	90	--	65	20	--
Primary alcohol	1000	10	90	--	60	20	20
SFA of primary fractions S_7-S_{12}	1000	10	90	--	60	20	20

Table 2, continued

Antifoam	Price R/ton	Composition of emulsion (%) Anti-foam	Water	Stability of Emulsion %	Duration of foam Extinction	Outlay of antifoam g/kg yeast	Outlays on Antifoam per ton abs. dry yeast (R)
SUBSTANCES OBTAINED FROM VEGETABLE AND FOOD MATERIALS							
Ethyl hydrolized alcohol	--	100	--	--	Does Not Extinguish		--
" " "	--	10	90	--	" " "		--
Ether-aldehyde fraction	--	100	--	--	" " "		--
Levulinic acid	--	100	--	--	" " "		--
Soap stock residue	--	10	90	--	" " "		--
Residue of technical oil	--	10	90	--	" " "		--
Lower layer of spent lye from soap boiling	--	10	90	--			--
Oleic acid (technical)	10000	10	90	980	30	12	12
Distilled talls oils	420	10	90	Many resinous acids	30	24	10
Fatty acids of tall oils	600	10	90	98.0	30	16	9.6
Fish oil	800	10	90	98.0	30	11	8.8
Oleic acid	1000	10	90	99.0	30	8	8
Soapstocks of vegetable oils	300	10	90	95.0	30	10	2.5-3.0
SUBSTANCES OF DIFFERENT ORIGINS							
Isobutyl alcohol	--	10	90	Stratified	Does Not Extinguish		--
(vtoramilovyy spirt)	--	10	90	"	" " "		--
n-butyl alcohol	--	10	90	"	" " "		--
fusel oils	--	10	90	--	--	48	--
propyl alcohol	--	10	90	Stratified	Does Not Ext.	--	--
glycerine	--	10	90	--	" " "	--	--
butyl ethers				--	--	117	--
transformer oil	--	--	--	--	Does Not Ext.	--	--
OP-7	--	10	90	--	" " "	--	--

Table 3.

Antifoam	Anti-foam	Water	KOH or NaOH	Duration of Emulsification (min)	Temperature of Water (degrees C)	Characteristics of Emulsion (Visual)	Outlays of antifoam per ton of yeast (kg)
SYNTHETIC FATTY ACIDS AND ALCOHOL (SFA and SFAl)							
SFA fractions S_5-S_6	10	90	15	15	60	Milky color, stable	30
SFA fractions S_7-S_9	10	90	--	15	60	" " "	32
SFA of primary fraction S_7-S_{12}	10	90	--	15	60	" " "	12
Product of hydrogenation of alcohol S_{10}-S_{18}	10	90	--	15	60	" " "	12
SUBSTANCES OBTAINED FROM VEGETABLE MATERIALS							
Soap stocks of vegetable oils	10	90	--	10	40	Milky color, stable	16
Acids of tall oils GOST 14845-69, types A, B, and C	10	90	0.5	15	70	" " "	25
Fish Oil (control)	10	90	--	15	70	--	25

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INDUSTRIAL MICROBIOLOGY

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INDUSTRIAL TESTING OF A METHOD FOR OBTAINING SOLUTIONS OF NUTRIENT SALTS USING RECIRCULATION OF YEAST MASHES

Moscow GIDROLYZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian No 7, 1978 pp 29-30

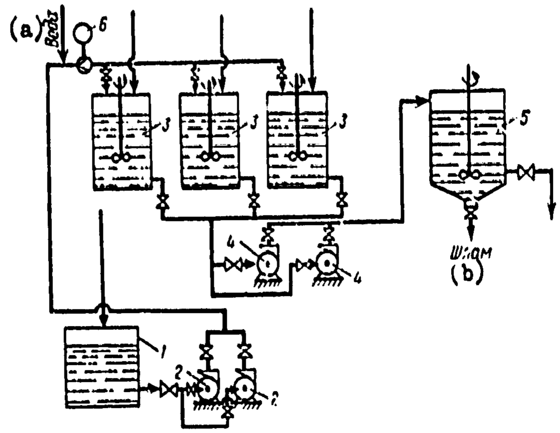
[Article by K. Kundev. A. Tatarski, and I. Stepanov, Bulgaria]

[Text] Nutrient salt solutions for yeast production are usually prepared by dissolving dry salts in water. In accordance with planning decisions, such a method was also used in the hydrolysis yeast plant in the town of Razlog. As a result of dissolving salts in industrial water, the mean concentration of phosphorus counted per P_2O_5 in the solutions was only 1.5 percent.

In order to demonstrate the possibility of increasing the phosphorus concentration of solutions in our plant, starting in 1965, the process of dissolving nutrient salts--superphosphate and potassium chloride--in recirculated yeast mashes using the approach of experimental planning was investigated. The positive results of the investigations impelled us to conduct industrial tests of the method; the summarized results are presented in the present article.

The industrial tests were conducted in the Razlog hydrolysis yeast plant in accordance with a detailed technological diagram which is presented in the figure. In order to conduct the tests, from the total number of observations 301 were selected at an interval of $86.4 \cdot 10^3$S, representing the mean arithmetic values of the results obtained at an inteval of $86.4 \cdot 10^3$S. The total duration of testing was $2.58 \cdot 10^6$S. Analyses were done using the standard methodology. The volume of yeast mash was determined by means of a float gage and by computation. The results were statistically analyzed using Student's t-test.

The characteristics of the nutrient salts and the yeast mash during the test period are presented in Tables 1 and 2, respectively.



Technological diagram for obtaining nutrient salt solutions using recirculated yeast mashes.
1= container for yeast mash; 2,4- centrifugal pumps; 3= apparatus for producing salt solutions; 5= dispensing containers for solutions; 6= device for measuring outlay of yeast mash. Key: (a)= water (b)= sludge.

Table 1

Indices	Mean Value	Reliable interval at level of significance = 0.05 for: Individual Observations	Mean Value
Phosphorus content of superphosphate counted per P_2O_5, %	46.05	±1.85	±0.10
Potassium content of potassium chloride counted per K_2O, %	61.50	±1.37	±0.07

Table 2

Indices	Mean Value	Reliable interval at level of signifidance = 0.05 for: Individual Observations	Mean Value
Temperature, K	304.15	±1.00	±0.050
Content, kg/m^3:			
of PB	1.20	±0.02	±0.001
of nitrogen	0.45	±0.03	±0.002
of KCI	0.040	±0.002	±0.0001
Quantity of P_2O_5,%	0.023	±0.002	±0.0001
Active Acidity (pH)	4.10	±0.10	±0.005

The operating conditions of the industrial apparatus for preparing nutrient salt solutions and the characteristics of the solutions obtained using yeast mash are presented in Tables 3 and 4. The data in Table 4 show that during the test period the mean concentration of phosphorus counted per P_2O_5 was 1.8 percent. Its increase to 21.33 percent in comparison with the existing method is caused by the increased temperature of the process (30.15 K), the active acidity (pH=4.1) of the yeast mash and the optimal conditions for obtaining nutrient salt solutions. In the solutions obtained, the average content (kg/m^3) of nitrogen was 9.43; of PB, 1.10; of potassium chloride, 10.39. The comparatively large reliable interval for individual observation of the phosphorus concentration (counted per P_2O_5) is caused by the variability of its superphosphate content and disturbance of the technological conditions.

Table 3

Indices	Mean Value	Reliable interval at level of significance = 0.05 for: Individual Observations	Mean Value
Volume of yeast mash in apparatus, m^3	30.50	± 0.50	± 0.03
Quantity of superphosphate in yeast mash, kg/m^3	41.97	± 0.69	± 0.04
Quantity of potassium chloride in yeast mash, kg/m^3	10.49	± 0.24	± 0.01
Duration of Load (S):			
yeast mash	$5.98 \cdot 10^3$	$\pm 1.8 \cdot 10^3$	± 103
nutrient salts	$4.3 \cdot 10^3$	$\pm 1.2 \cdot 10^3$	± 69
Duration of mixing in apparatus (S):	$14.4 \cdot 10^3$	$\pm 1.68 \cdot 10^3$	± 97

Table 4

Indices	Mean Value	Reliable interval at level of significance = 0.05 for: Individual Observations	Mean Value
Concentration, kb/m^3:			
nitrogen	0.43	± 0.02	± 0.001
KCI	10.39	± 0.21	± 0.01
PB	1.10	± 0.05	± 0.03
Phosphorus content counted per P_2O_5	1.82	± 0.12	± 0.007
Active acidity (pH)	4.10	± 0.10	± 0.005
Temperature, K	302.15	± 1.00	± 0.05
Phosphorus content counted per P_2O_5 in sludge	2.34	± 0.02	± 0.001

As a result of introducing a method for obtaining nutrient salt solutions by recirculating yeast mashes, it was determined that the effectiveness of fodder yeast production increases therewith. Thus, in manufacturing 11,500 tons of yeast, 332,900 tons of superphosphates (with a 44% P_2O_5 content), 98,416 tons of amoniac water (25% NH_3), 2.09 tons of potassium chloride (62% K_2O), 600 tons of steam and significant amounts of electric energy and capital expenditures were saved. In addition, BPK_5 contamination of sewage decreased. The economic effect obtained in this case was 8,000 Levs.

Conclusions

1. Industrial tests of a method for obtaining solutions of the nutrient salts superphosphate and potassium chloride using yeast mashes did not present any difficulty.

2. It was demonstrated that yeast mash accelerates the process of salt solution. The concentration of phosphorus counted per R_2O_5 in the solution increases by 21.33 percent in comparison with the existing method.

3. As the result of applying the method, savings are achieved in superphosphate, amoniac water, potassium chloride, steam, electric energy and capital expenditures; BPK_5 contamination of sewage decreases.

4. The method developed can be used in modernizing and reconstructing existing enterprises and in planning new plants for producing fodder yeast from hydrolysates of forestry and agricultural wastes.

9380
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INSTRUMENTS AND EQUIPMENT

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MODERN METHODS FOR CREATING ULTRACLEAN PREMISES

Moscow KHIMIKO-FARMATSEVTICHESKIY ZHURNAL in Russian No 2, 1979 pp 89-95

[Article by G.-P. Khortig, Babcock-BShKh Company, Federal Republic of Germany]

[Text] Increasing importance is being attributed to creating aseptic or ultraclean working conditions in the most diverse areas of scientific research and industry. In the pharmaceutical industry, with the development of new injectables that cannot be subsequently sterilized, the production of such products under ultraclean conditions acquires special importance. The goal of working under absolutely sterile conditions, free of all foreign particles, is an ideal that can only be more or less approached in practice.

A distinction is often made between pollution by dust particles and microorganisms. Of course, these are two very different types of pollution; however, experience in working in the field of methods for ultraclean premises shows that both these forms of pollution should be taken into consideration simultaneously, since there is no method as yet for removing, for example, only biologically active particles from air, whereas the existing modern methods of filtering air permit trapping both types of pollutants simultaneously (by means of modern instruments, the concentration of all particles in air in a suspended state is measured within 1 min and, at the same time, determination is made of their distribution according to size).

The main objective of modern engineering for the creation of ultraclean premises is to trap, along with all suspended particles in air, the elements of microbial contamination. Thus far, it has not been possible to determine precisely the proportion between biologically active particles and inert ones that are transported in air. Very approximately, the ratio can be considered to constitute 1:1000.

Figure 1 illustrates the usually encountered concentrations of particles in air. The y-axis shows the number of particles that are larger than the size of the arbitrary unit. Let us consider, for example, particles that are 0.5 μm in size; we see that there are 100,000 to 1,000,000 such particles per liter air in a large city; premises with higher air purity requirements, equipped with an ordinary ventilation system, contain about 1000 such particles per liter air, while those equipped with a system operating on the principle of laminar flow of air have up to one such particle per liter air. This figures demonstrate convincingly that the use of modern methods for creating ultraclean premises air purity can be improved by 1000 times.

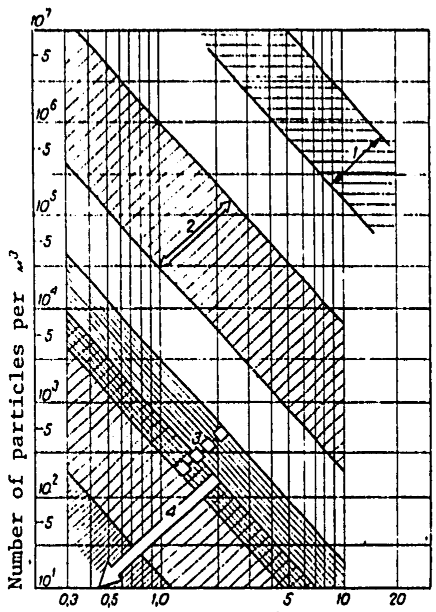

Figure 1.
Number of particles per m^3 air with the use of different purification systems
1) large city and industrial region
2) clean premises with ordinary ventilation
3) laminar flow throughout
4) laminar flow in a localized area

In order to answer the question of why the air purity indices are so low in premises with ordinary ventilation we should consider the sources of air pollution. Man himself is the primary source of air pollution indoors. Table 1 lists the indices of particles emitted by man into the environment as related to the nature of his movements. The scale covers indices of 100,000 to 30,000,000 particles per minute. Let us consider what happens to air in a room equipped with ordinary ventilation when there are 1 to 10,000,000 particles (Figure 2). Purified air enters the room at a high speed through hoods or grating [louvers] that are located in the ceiling in most cases. Because of this and jet pumping, a highly turbulent flow is generated in the room, which blows through all zones and corners, after which the air is removed from the room through outlets located near the floor. Usually air is exchanged 10 to 20 times per hour. Let us estimate the number of suspended particles in the room. Let us assume that the area of the room is 10 m^2, its height is 3 m, air is exchanged 10 times an hour and that a man is working in the room who emits about $5 \cdot 10^6$ particles over 0.5 μm in size per min, or 300×10^6/h. The volume of air removed from the room constituting 10×30, i.e., 300 m^3/h, even on the assumption that the delivered air contains 0 particles, we shall find that the concentration of particles in room air would constitute 1000 particles per liter air or, when scaled arbitrarily to microbial contamination, 1 microorganism per liter air.

Table 1. Number of particles emitted by a working man as related to the type of movements he makes

Type of movement	Particles emitted per min: measured according to Austin	Particles emitted per min: measured according to Hechst (particle size 0.3 μm)	Remarks
Standing or seated without moving	1×10^5	--	The number of particles varies widely depending on fabric of which clothing is made
Seated, making slight movements with the hand or top of body	1×10^6	0.5×10^5 to 1.5×10^6	
Slow walking	5×10^6	--	
Rapid walking	1×10^7	--	
Abrupt, uneven movements	3×10^7	2×10^7	

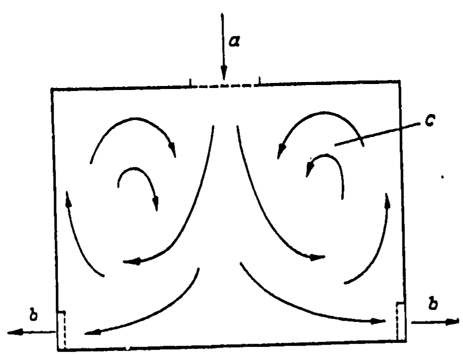

Figure 2.
Diagram of air flow in an ordinary room
a) air input
b) air output
c) zone of turbulence

This estimate clearly shows that the usual systems of air purification have very limited effectiveness. The chief flaw of such systems is that the air in the room is constantly mixed with freshly supplied air, and instead of removal of particles and microorganisms there is merely dilution thereof in the fresh incoming air. Consequently, usual air purification systems serve only as a barrier to exogenous pollution, but they do not prevent pollution arising in the room in the course of human activity.

Before we discuss more refined methods of room air purification, we should summarize the most typical cases of pollution. This can be done by defining the direction of movement of pollutants (Figure 3). The work zone or product itself are arbitrarily depicted in this figure in the form of a table (1), while the worker in the environment is rendered as a human figure. In case a(2), the possibility of contamination of the product (or work zone) from the environment should be ruled out. The arrow points to the direction of movement of pollutants that have to be averted. In other words, we are dealing here with a case of protection of the work zone that has high air purity requirements from external pollution. There are also the opposite situations, for example, in manufacturing drugs for intake by mouth, when it is not the product that has to be protected from the environment, but the environment from the product. In (3), the arrow points to movement of pollutants in the opposite direction for such a case.

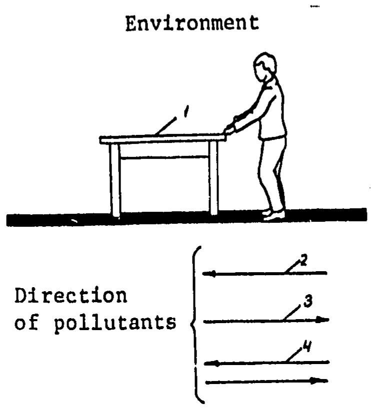

Figure 3.
Sketch of possible directions of pollutants when working in the pharmaceutical industry

1) work place
2) case a
3) case b
4) case c

In addition, it is necessary quite often, particularly when conducting pharmacological or microbiological tests, to prevent pollution in both directions, case c (4).

These three cases (a, b and c) cover virtually all situations that are encountered. Let us use d to designate all special cases that are not covered by a, b and c. The same situations as in cases a, b and c apply to cases d, but when there are additional special conditions; for example, the use of protective gases or extreme temperatures.

Let us discuss each specific case, the methods available for each of them and the results that can be achieved.

As we have already stated, we must concentrate on processes of movement of air flows. The main flaw of existing traditional systems is that the incoming fresh air is mixed with the air circulating in the room.

In order to control the movement of suspended particles in air, the air flow itself must be controlled. Instead of a turbulent, constantly mixing flow of ai., we have to create precisely directed, uniform movement of the air flow, free of turbulence, as much as possible. In this case, the room is transformed into a distinctive flow-through channel.

Such uniform, slow, vortex-free flows of air resemble laminar, i.e., jet flow, in hydrodynamic processes. Hence the name of "laminar course," or "laminar flow." At present we already know that we are not dealing with true laminar flow in the strict sense, but only with the initial elements of this process with high value of Reynolds' number. More precisely, the flow is not vortex-free but with minimal turbulence, i.e., we observe on the sides of the flow slow and very mild displacement (mixing) of air particles. Figure 4 illustrates this phenomenon clearly; it was submitted to comprehensive investigation when defining its patterns.

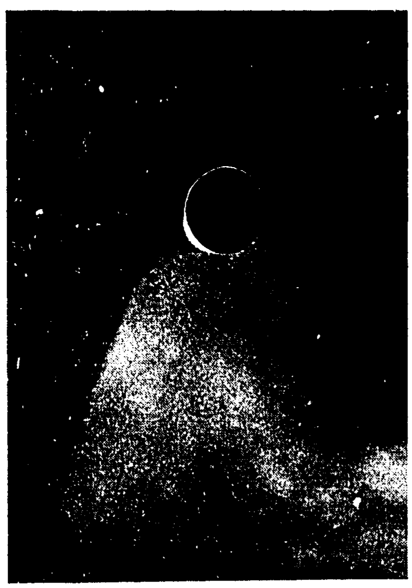

Figure 4. Transport of substance in flow section behind obstacle

On the basis of these data, we can calculate the required size of a device and define the zones that must be protected from pollution (Figure 5). Figure 5 is a sketch of a dispensing machine that operates in a vertical flow of air. It is shown that the farther it is from the work zone, the larger the area of flow around must be.

Moreover, experience has shown that the smaller the work zone, the better the results of purification. This phenomenon can be easily explained, since the smaller the channel through which flow passes, the easier it is for air to bypass the obstacle. Consider a production line in a pharmaceutical enterprise. The highest purity requirements apply to a relatively circumscribed work zone. On this basis, one can conclude that the most refined purification of air should be provided primarily in these zones, and this can be accomplished with zonal devices.

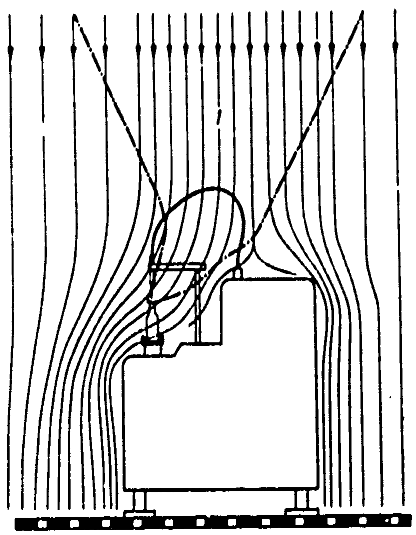

Figure 5.
Determination of required area around dispensing machine to be submitted to vertical flow of air
1) clean air region

Thus, the problems referable to case a can be solved by creating special "laminar flow" equipment in the form of work tables or booths. The problems referable to case b are resolved by using so-called "reverse laminar flow." Unlike case a, a direct flow of air with minimal turbulence is obtained by means of an exhaust or suction (Figure 6). The exhaust channel is illutrated on the right in Figure 6 and a perforated wall to produce a uniform, direct flow, on the left. Such units are used, for example, to process products that do not require sterile conditions, but from which the personnel and environment must be protected. For case c, i.e., when pollution must be prevented in both directions, special booths with closed circulation have proved themselves in practice. Figure 7 is a sketch of such a booth. Laminar flow generated in the distributor chamber (1) with filter (2) passes through the work zone (4) and returns to the distributer chamber, passing through receiving chamber (7) and prepurification filter (8). Zone (5) is contaminated with product pollutants, while environmental pollutants pass into zone (6). The different units must be assembled in such a manner that the work zone would not be next to zone (6) and zone (5) would be far from opening (10). With such arrangement of units, the conditions for case c are met, which require prevention of pollution in both directions at the same time.

A machine for filling and sealing vials (Figure 8) is shown as an illustration of effectiveness of an air purification system operating on the principle of laminar flow. In Figure 8, the machine is rendered as a flat drawing; empty vials are fed to it by a rotating disk feeder on the left, and it concurrently serves as a buffer; in the middle is the filling and sealing unit and on the right, the ready vials are put out. At the bottom, are the results of measuring the concentration of particles in the air in the immediate vicinity of the machine. At first, the machine was equipped with an ordinary ventilation exhaust, then it was remodeled and equipped with a system of air purification operating on the principle of laminar flow. The figures in parentheses were obtained with ordinary purification devices and those without parentheses, after convert' g the machine to the new system. The parameters obtained after converting the machine to the new purification system were more than 1000 times better, and this is indicative of its great effectiveness.

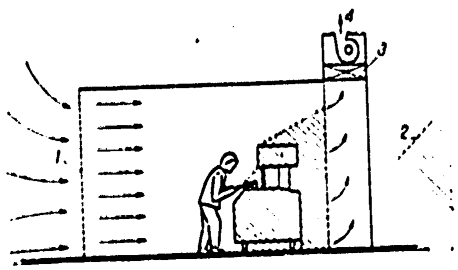

Figure 6.
Sketch of set-up for protecting the environment and worker from the product

1) distributor wall for input flow of air
2) polluted region
3) air prefilter
4) air exhaust

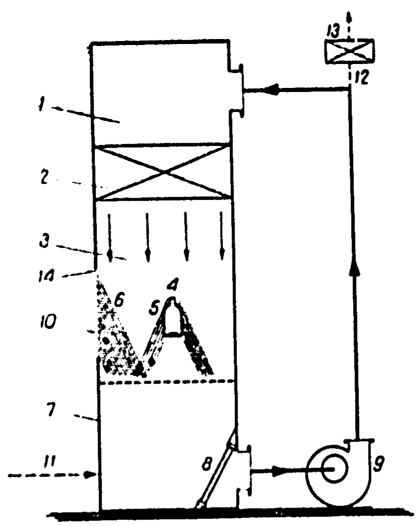

Figure 7.
Principle involved in setting up ultra-clean work zone with open inflow [suction] surface

1) pressure chamber
2) sterile filter
3) laminar flow
4) product
5) pollutant particles of product
6) pollutant particles of environment
7) receiving chamber
8) prefilter
9) ventilator
10) closet opening
11) fresh air inflow
12) exhaust
13) air filter on exhaust
14) first point of contact of laminar flow with environment

In conclusion, let us return to the question of classifying premises with increased air purity requirements. The concentration of foreign particles and microorganism in room air is only one of the factors of probability of pollution. The time factor and size of exposed area are equally important. To determine the general probability of pollution, one must use an index that is the product of all factors together for each stage i of the production process. This derivative index B for a specific stage i of the production process is expressed as $B_i = P_i \cdot \tau_i \cdot F/V$, where P_i is the concentration of particles, τ_i is exposure time and F/V is the ratio of open area to useful volume.

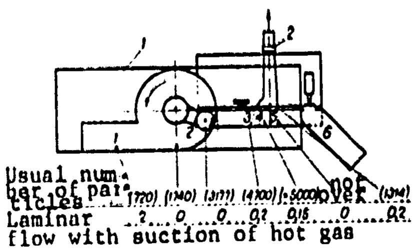

Figure 8.
Advantages of laminar flow as compared to usual arrangement

1) laminar flow at 0.35 m/s
2) exhaust of hot air

Table 2. Amount of particles and degree of air pollution in the work zone at different stages and for the entire production of a drug in the case of usual set-up of the production process (A) and with the use of laminar air flow (B)

Stage of production	Time product spends at stage, min	Number of particles over 0.5 μm in size per ℓ work zone air	Probability of air pollution in work zone at stage (β_i)	Probability of air pollution in work zone of entire production (H)
A. Usual set-up of production process				
Transport and intermediate storage	6	3,000	900)	
Sterilization	50	10,000	25,000)	
Transport	2	3,000	300)	34,000
Intermediate storage	20	1,000	1,000)	
Filling	2	50,000	5,000)	
Sealing	0.5	100,000	2,500)	
B. With the use of laminar air flow				
Transport and intermediate storage	6	1	0.3)	
Sterilization	30	1	1.5)	
Transport	2	2	0.2)	
Intermediate storage	20	1	1.0)	3.25
Filling	2	2	0.2)	
Sealing	0.5	2	0.05)	

Having thus obtained the derivative index for each stage of the production process, we can readily determine which zone or which place is subject to the greatest danger of pollution and where special precautionary steps should be taken. For the entire production process as a whole, the index of probability of pollution H is derived as the sum of indices for each stage of the production process, i.e.,

$$H = \sum_{i=1}^{i=n} B_i.$$

Table 2 lists the stages of the process of prodcution of a drug at a pharmaceutical enterprise. The first column lists the different stages of the process, the second, the time the product spends at each stage; the third, the concentration of particles in the air of each work zone and the fourth, the indices of probability of pollution at each stage. At the top are indices obtained when the equipment was protected by ordinary ventilation devices and at the bottom, indices obtained after conversion to a purification system operating on the laminar flow principle.

As can be seen from the listed indices, the probability of pollution is not the same at each separate stage of the production process; for example, in the work zone where the vials are sealed, the danger of pollution is relatively minor, in spite of the high concentration of particles, due to the brief time the product spends in this zone.

If we compare the top and bottom indices, we shall see that the bottom ones are more than 10,000 times better!

Table 2 shows that the problem of preventing contamination can be resolved by means of methods for providing ultraclean premises, based on the principle of laminar flow of air.

10,657
CSO: 1870

PUBLIC HEALTH

UDC: 612.453.44

FUNCTIONAL STATE OF THE ADRENOHYPOPHYSEAL SYSTEM DURING EXPOSURE TO LASERS 2. EFFECT OF EXPOSURE OF RATS TO PULSED LASERS ON CROTICOSTEROID CONTENT OF BLOOD

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, Seriya 16 Biologiya, in Russian No 1, 1979 pp 35-40

[Article by M. M. Nikitina and A. I. Maslakov, Laboratory of Endocrinology and Laboratory of Space Biology, submitted 21 Apr 77]

[Text] Studies of the functional state of the adrenohypophyseal system as related to exposure of the body to different factors make it possible to assess the activity of nonspecific defense and adaptation reactions under different conditions. We previously demonstrated that exposure to continuous helium-neon lasers with beam output of 4, 25 and 40 mW induces a relatively brief stressor effect in rats only when the eyes are exposed to the beam (Nikitina, Maslakov, 1977).

It is interesting to test the effect of exposing rats to pulsed lasers on blood corticosteroid content.

Material and Methods

We used a neodymium laser at a wavelength of 1.06 μm and ruby laser at a wavelength of 0.69 μm in our experiments.

The animals (male rats) were rigidly immobilized during the experiment. To test the reaction to lasers, the rats were divided into groups, the blood being taken (decapitation) at different postexposure times: 5, 15, 30, 60, 120 min, 24 and 48 h. Concurrently with experimental, irradiated animals, we also examined control rats, which were also immobilized and shielded from the beam. We tested the effects of a beam directed to different parts of the body: eyes, parietal region of the skull, region of the gonads and adrenals.

In the experiments involving exposure of the eyes to pulsed neodymium lasers, we used beams varying in energy density (from 6 to 1000 J/cm^2), the area of the light spot constituting 0.03-0.07 cm^2. In those involving exposure of the skull, regions of the gonads and adrenals, we first shaved off the fur in the regions to be exposed. We repeated the same procedure on the control animals.

The parietal region of the skull was exposed to a neodymium laser beam with energy densities of 10 and 600 J/cm^2, aimed at the hypothalamic region. The gonads were exposed to a neodymium laser beam at energy densities of 1000 and 1500 J/cm^2, the area of the light spot constituting about 0.008 cm^2. For exposure of the adrenal region, the beam was aimed at the angle formed by the last rib and long muscle of the back. In these experiments we used neodymium lasers (beam energy density 38 J/cm^2, at the rate of 5 pulses, and 300 J/cm^2, 1 pulse per adrenal) and ruby lasers (energy density 25 J/cm^2, 3 pulses to the region of each adrenal). In these experiments, the area of the light spot was 0.2-0.5 cm^2.

To examine the functional state of the adrenals, we assayed blood plasma corticosteroid content in experimental and control animals by the method of competitive protein-binding analysis using ^{3}H-cortisol-1,2 and rat serum transcortin as binding protein (Volchek, 1973).

We first tested the characteristics of different types of stress on the basis of glucocoritoid content of experimental animals' blood (Volchek et al., 1976; Mukhammedov, Nikitina et al., 1976).

The experimental results were submitted to statistical processing (Bayley, 1962).

Results and Discussion

Effect of beam aimed at the eyes: No deviations from normal, in either behavior or condition of the eyes, was observed with the use of a beam with energy density of 6 and 30 J/cm^2(1-3 pulses). With the use of a 200 J/cm^2 beam, we demonstrated a deleterious effect on eye tissues. The animal twitched and squeaked when the laser unit was turned on. One could detect almost immediately the formation of a white spot deep in the eye. Single exposure to a beam of pulsed neodymium laser did not induce significant changes in corticosteroid content for 2 days (as compared to the control) (Figure 1).

A deep white spot appeared in the rat eye after exposure to neodymium lasers at energy density of 266 and 1000 J/cm^2(once a day for 3 days), as was found after single exposure. Some animals presented bleeding from the eye and impairment of its fibrous tunic after the first exposure to a 1000 J/cm^2 beam. With repeated exposure, the leukoma grew larger in size; the eyelids stuck together in some rats. On the 4th experimental day (24 h after the 3d exposure), most rats presented hyperemia on the internal side of the leukoma, which was a sign of development of an inflammatory process. Nevertheless, the irradiated animals appeared normal throughout the experiment, and their behavior differed little from that of control rats.

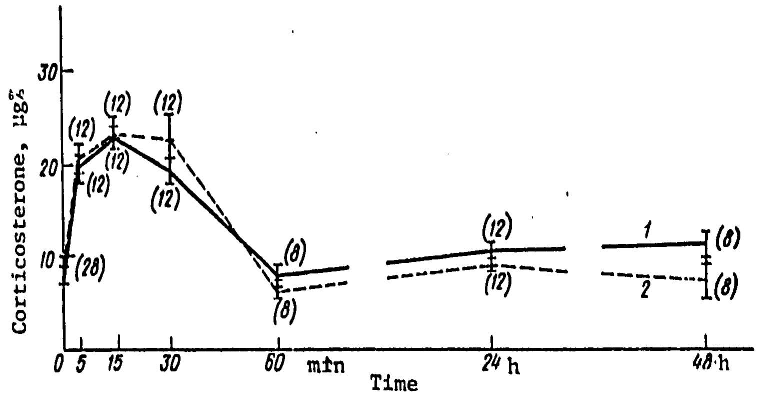

Figure 1. Effect of single exposure of rats to 200 J/cm^2 neodymium laser (1 pulse per eye) on blood corticosteroid content (averaged results of 3 experiments). Number of animals is given in parentheses.

1) control 2) experiment

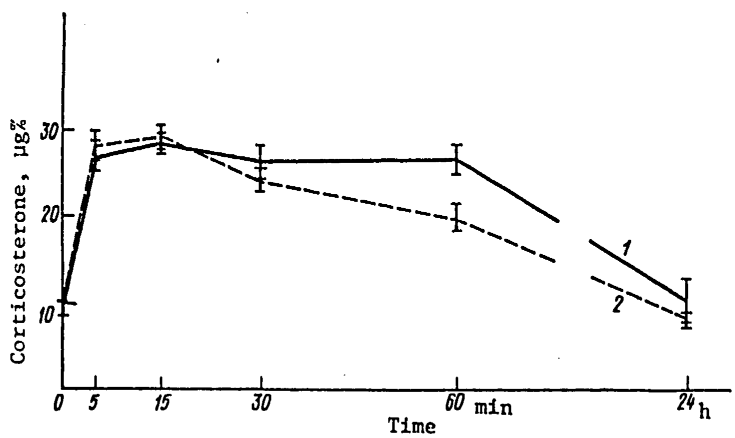

Figure 2. Effect of 3-fold (3 days) exposure of rats to pulsed neodymium laser with beam energy density of 1000 J/cm^2 (1 pulse per day per eye) on blood corticosteorid content. Designations are the same as in Figure 1. Each point corresponds to the results obtained on four animals.

We failed to demonstrate appreciable differences between irradiated and control rats with respect to blood corticosteroid content (Figure 2).

Thus, under the conditions we used, single and multiple exposure of the rat eyes to pulsed neodymium lasers did not have a significant stressor effect, as compared to the stress of rigid immobilization.

A comparison of the results of these experiments to information obtained previously warrants the belief that the factor of duration of exposure is more important to development of stress than the factor of intensity of radiation. Moreover, the obtained results suggest that the nociceptive reactions of the rats are attenuated.

Effect of beam aimed at the skull: Since the hypothalamus is the highest element in regulation of the hypothalamus-hypophysis-adrenals system, it was interesting to examine the effects of a laser beam aimed at the parietal region of the skull and focused on the region of this gland. Macroscopic examination of tissues in the exposed region (beam energy density 600 J/cm^2) revealed a skin burn and minor necrosis in cranial muscles. Bones, meninges and the brain failed to present visible changes. Apparently, the external tissues (skin, muscles) absorb a significant part of the radiant energy. There were no substantial deviations in corticosteroid content in experimental animals throughout the experiment (as compared to the control) (Figure 3).

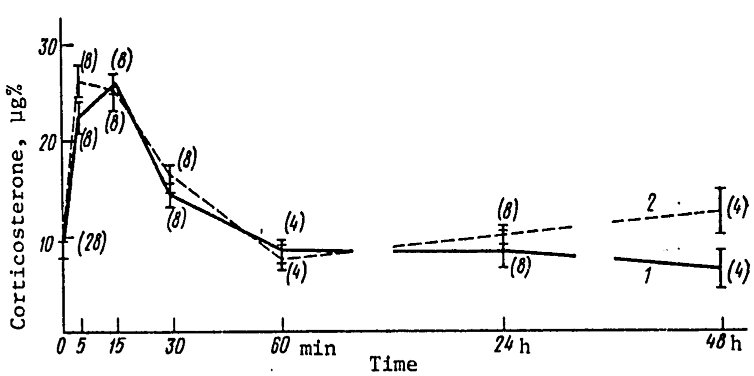

Figure 3. Effect of single exposure of rats to neodymium laser with beam energy density of 600 J/cm^2 (1 pulse to parietal region of the skull) on blood corticosteorid content (averaged results of two experiments). Designations are the same as in Figure 1.

Thus, single exposure of the rat's parietal region to a neodymium laser beam, under the conditions we used, had no significant stressor effect, as compared to rigid immobilization.

Effect of beam aimed at the gonadal region: We selected this organ for investigation in view of the fact that, in the first place, it is not within the body; in the second place, there is a close relationship between the function of the hypophyseogonadal and hypophyseo-adrenal systems and, in the third place, this organ and adjacent tissues have high sensitivity to pain. It was also interesting to compare the effect of exposing rats to neodymium lasers aimed at the testicular region and the mechanical effect of pricking the skin of the scrotum with a needle on blood corticosteroid content.

The rat squeaked at the time of exposure to the laser beam. Small areas of necrosis appeared on the external and internal sides of the skin. Effusion of blood in the external tunic of the testes was observed in some animals in the experiment with a 1500 J/cm² beam. Visually, no changes in tissue of the gonad proper were demonstrable in any of the experiments.

We used a preparation needle, about 1 mm in diameter, to puncture the rats. The anterior surface of the scrotum was pulled away so that the needle would not touch the testes. The prick was administered as briefly as possible, to correspond to the duration of the laser pulse used.

Table 1. Effect of exposure of rat gonad region to neodymium laser (1500 J/cm²; 3 pulses) and prick (3 times) in the scrotal skin on blood corticosteroid content (averaged results of 4 experiments)

Group	Time after, min	Number of rats	Corticosterone, μg%	Reliability between groups
Laser 1	5	16	32,31±1,34	$p>0,05$
Prick 2		4	32,31±1,22	
Control 3		16	30,03±1,55	
Laser 4	15	16	32,96±1,45	$p>0,05$
Prick 5		8	27,62±2,78	
Control 6		16	30,96±0,95	
Laser 7	30	16	25,28±1,52	7—8 $p<0,002$
Prick 8		8	18,50±1,23	7—9 $p<0,001$
Control 9		16	15,82±1,45	8—9 $p>0,05$
Laser 10	60	8	8,68±0,96	$p>0,05$
Control 11		8	6,75±0,83	
Laser 12	24 h	8	9,14±2,10	$p>0,05$
Control 13		8	4,43±0,82	

A comparison of blood corticosteroid content in experimental and control rats revealed a reliable difference only 30 min after exposure to a 1500 J/cm² beam with 3 pulses (Table 1). Evidently, this stress effect was due to the high sensitivity to pain of the testicular region. Probably, the nociceptive effect of laser light was stronger than that of acupuncture, since there was no appreciable difference between rats submitted to acupuncture and control animals, with respect to blood corticosteroid content.

Effect of beam aimed at the adrenal region: We previously demonstrated that exposure of the region of the adrenals, one of the main elements in the stressor mechanism, to continuous action helium-neon laser beam did not induce significant differences between experimental and control animals, with respect to blood corticosteroid content (Nikitina, Maslakov, 1977). Minor necrobiotic changes in the external surface of the skin were observed in rats exposed to pulsed lasers, at the site of exposure. The other tissues, including the adrenals, remained intact. In this series of experiments, the corticosteroid content of blood of experimental animals did not differ from that of control rats (Table 2). Evidently, the lack of a direct effect of the laser beam on the adrenals is attributable to absorption of most of the energy by the skin and muscles.

Table 2. Effect of exposing each rat adrenal to neodymium (300 J/cm^2; 1 pulse) and ruby (25 J/cm^2; 3 pulses) laser beams on blood corticosteroid content (averaged results of 4 experiments)

Laser	Group		Postexposure time, min	Corticosterone, µg%	Reliability between groups
Neodymium	exposure	1	15	14,75±0,92	1—6 $p>0,05$
		2	30	13,87±1,44	2—7 $p>0,05$
		3	60	2,50±0,78	3—8 $p>0,05$
		4	120	8,62±1,13	4—9 $p>0,05$
		5	24 h	8,38±1,42	5—10 $p>0,05$
	control	6	15	11,62±1,75	
		7	30	11,12±1,16	
		8	60	5,75±1,25	
		9	120	6,25±0,79	
		10	24 h	7,87±2,07	
Ruby	exposure	1	15	30,66±1,31	1—6 $p>0,05$
		2	30	22,16±2,15	2—7 $p>0,05$
		3	60	11,12±0,95	3—8 $p>0,05$
		4	120	12,83±1,33	4—9 $p>0,05$
		5	24 h	6,75±1,53	5—10 $p>0,05$
	control	6	15	28,00±0,68	
		7	30	23,33±3,05	
		8	60	11,75±1,40	
		9	120	12,00±1,59	
		10	24 h	6,75±1,82	

Thus, under the conditions we used, pulsed lasers, like continuous helium-neon lasers, aimed at different parts of the body did not have a significant stressor effect on rats.

The authors wish to express their deep appreciation to L. B. Rubin, doctor of biological sciences (chair of wave processes, Physics Faculty of Moscow

State University) for his assistance and consultation in conducting this study.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

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ALL-UNION SCIENTIFIC CONFERENCE ON PRESSING PROBLEMS OF PSYCHIATRY AND ADDICTIONS (PSYCHOTHERAPEUTIC ASPECTS)

Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII in Russian No 3, 1979 p 376

[Article by P. V. Voloshin and N. K. Lipgart]

[Text] This conference, which convened in Khar'kov on 18-19 May 1978, was organized by the USSR and Ukrainian ministries of Health, the All-Union and Ukrainian scientific societies of neuropathologists and psychiatrists, the Central Scientific Research Institute of Forensic Psychiatry imeni Prof V. P. Serbskiy, the Khar'kov Scientific Research Institute of Neurology and Psychiatry, as well as the Ukrainian Institute for Advanced Training of Physicians. G. V. MOROZOV, chairman of the board of the All-Union Scientific Society of Neuropathologists and Psychiatrists, delivered the opening remarks at the conference. He stressed the need to create a broad network of psychotherapeutic care, to expand the training of psychotherapists, as well as to work on theoretical problems of psychotherapy.

E. A. BABAYAN (Moscow) delivered one of the main papers at the conference, dealing with the role of psychotherapeutic care in the structure of the addiction service, with analysis and specific suggestions to augment the role of psychotherapy in the treatment of patients suffering from alcoholism on different levels of the addiction ["narcological"] service.

The papers of M. S. LEBEDINSKIY (Moscow), V. YE. ROZHNOV (Moscow), M. M. KABANOV (Leningrad) and B. D. KARVASARSKIY (Leningrad) discussed various aspects of theoretical problems of psychotherapy. Organization of psychiatric care was the topic of the papers of I. Z. VEL'VOVSKIY (Khar'kov) and N. K. LIPGART (Khar;kov). A. T. FILATOV (Khar'kov) discussed in his paper questions of correlation between psychotherapy, psychohygiene and psychoprophylaxis [preventive psychiatry].

Four section meetings dealt with psychotherapy in the treatment of somatic diseases, borderline states, alcoholism and drug addiction, as well as in psychiatric practice. Surveys prepared by meeting chairmen on the basis of published data served as the basis for discussion of relevant problems. Thus, at the meeting entitled "Psychotherapy in the Treatment of Somatic Diseases," the survey paper of V. V. KOVALEV (Moscow) summarized the data information of 22 reports, which demonstrated convincingly the need to use psychotherapy in the presence of various somatic diseases, in particular, cerebrovascular diseases, myocardial infarction, bronchial asthma, pathology of the gastrointestinal tract, endocrine diseases, etc. V. V. Kovalev dwelled in particular on a group of papers dealing with psychotherapy in balneology. At the meeting entitled "Psychotherapy of Borderline States," N. M. ASATIANI (Moscow) delivered a survey paper summarizing the data in 30 reports. He analyzed different aspects and methods of psychotherapy in cases of functional neurotic pathology and discussed interaction between psychotehrapy and psychopharmacology. I. V. STREL'CHUK (Moscow) delivered a paper summarizing the data in 13 reports at the meeting on "Psychotherapy for Alcoholism and Drug Addiction," and demonstrated the role of psychotherapy at different stages of treatment of alcoholics. The participants in the discussions stressed the special importance of group psychotherapy in the treatment of alcoholism, which is directed toward altering the personality sets of the patients. At the section meeting entitled "Psychotherapy in Psychiatric Practice," the survey paper of M. M. KABANOV (Leningrad) systematized the data from 14 reports. A special place was given to reports indicating the importance and potential of developing group forms of psychotherapy in psychiatric practice. There were animated discussions at all of the above meetings, which developed and defined a number of theses pertaining to practical and organizational problems of psychotherapeutic care.

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SCIENTIFIC AND CLINICAL ASSOCIATION OF PSYCHIATRISTS

Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII in Russian No 3, 1979 p 377

[Article by M. A. Medvedev, A. I. Potapov, Ye. D. Krasik and M. I. Petrov (Tomsk)]

[Text] There is an age-old tradition in Tomsk, a tradition that consists of close collaboration between the chair of psychiatry (headed by Prof Ye. D. Krasik) and the Oblast Psychiatric Hospital (chief physician M. I. Petrov; A. I. Potapov prior to 1975), which serves as the base of operations for the chair.

At the present time, they are functionally united for the purpose of further expansion of scientific research on pressing problems of psychiatry, upgrading the quality of differentiated psychiatric care of the inhabitants of Tomskaya Oblast and improving educational and methodological work. A special statute was prepared and approved for this scientific and clinical association. The following are considered its main objectives: 1) expansion of scientific research on the problem of epidemiology, symptomatology and rehabilitation of mental patients; 2) improvement of diagnostic work, development, trial and immediate introduction to psychiatric practice of new, scientifically substantiated clinical, paraclinical and sociopsychological methods of patient examination; 3) expansion of highly qualified consultant services for patients in hospitals and under extramural conditions; 4) systematic advancement of qualifications of physicians, interns, nurses, junior medical personnel, vocational instructors, psychologists and social workers; 5) improvement of specialized care of patients suffering from chronic alcoholism and drug addiction, as well as expansion of in-depth scientific research in this field; 6) expansion of studies, faster trial and adoption in psychiatric practice of new ways and means of early detection and dispensary care of patients; 7) preparation of new, more effective rehabilitation programs, clinical substantiation thereof, rapid trial and introduction to psychiatric practice; 8) continued improvement of management aspects of hospital and extramural care of the public, improved continuity of all stages of rehabilitation; 9) expansion of sociohygienic research on the problem of controlling drunkenness and alcoholism on the basis of business contracts with industrial enterprises, the Tomsk ASU [automatic control system] and a number of institutes; 10) improvement of educational and methodological work, differentiated according to faculties, bring instruction closer to the demands of practical public health care; 11) development of new forms of student participation in research pursued by the scientific and clinical association; 12) improvement and expansion of dissemination of medical, sanitary and hygienic information in different rayons of this oblast and at industrial enterprises of Tomsk.

This association does not, therefore, cancel the tasks facing the hospital and chair; rather, it raises them to a new level, providing conditions for more immediate and effective development of neuropsychiatric care for the residents of the oblast, upgrading the quality of scientific, educational and therapeutic work, as well as personnel training. By order of the head of the Oblast Health Department and rector of the medical institute, an association council was formed to administer the scientific and practical [clinical] association. This council includes the chief physician of the hospital, his deputies, 2-3 department heads, the head of the paraclinical service, head of the chair of psychiatry of the medical institute, a docent (assistant), representatives of public organizations of the chair and hospital. The same order includes the appointment of a scientific administrator for the association. The council meets at least once every 2 months in accordance with a specially prepared plan. Its decisions are considered compulsory for all staff members of the hospital and chair. The hospital is accountable about its operation to the Oblast Health Department and association council, while the chair is accountable to the rector of the medical institute and also the association council. On the whole, the scientific and clinical association is accountable to the joint meeting of the rectorate of the medical institute and board of the Oblast Health Department. In spite of some debatable aspects of the statute concerning the scientific and clinical association, which must be resolved, even now it is apparent that organizational integration of the work of scientists and practicing physicians is quite effective. This is shown by the fact that the scientific and clinical association of Tomsk psychiatrists has become a school of advanced knowhow: a regularly operating All-Union seminar on rehabilitation of mental patients was organized on the basis of the hospital and chair.

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SYMPOSIUM ON PEDIATRIC NEUROLOGY AND PSYCHIATRY TO CONVENE IN BUDAPEST

Moscow ZHURNAL NEVROPATOLOGII I PSIKHIATRII in Russian No 3, 1979 p 377

[Announcement]

[Text] A symposium on pediatric neurology and psychiatry, which is being organized by the sections of pediatric neurology and psychiatry of relevant societies in socialist countries, will convene in Budapest on 3-6 October 1979. Correspondence pertaining to delivery of papers at this symposium should be addressed to A. Mattyus, M. D., Heim Pal Gyermek-Kozhaz, Section of Neurology, H 1089 Budapest, Ulloi ut 86, Hungary; inquiries pertaining to registration and organization of the congress should be addressed to Congress Office MOTESZ, H 1361 Budapest, POB:32, Hungary.

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PERMANENT CEMA COMMISSION ON CHEMICAL INDUSTRY ANNOUNCES PROJECTS

Moscow GIDROLIZNAYA I LESOKHIMICHESKAYA PROMYSHLENNOST' in Russian
No 7, 1978 p 30

[Article: "From the Pages of the 'Information Bulletin of the Chemical Industry'"]

[Text] Nos 2 and 3 (1978) of the information bulletin of the Permanent CEMA Commission on the Chemical Industry have come out. In them the measures taken and the achievements accomplished by CEMA-member countries in economic, scientific and technical cooperation are discussed in depth.

No 2 of the bulletin contains various materials on the questions of complex automatization of chemical plants and enterprises, mathematic modeling and optimization of chemical and technological processes and apparatus and on use of computer technology in planning and management; the progress of cooperation in the field of enterprise planning in the chemical industry is dealt with. Of interest are: an estimate of the material and thermal balances of complex chemical and technical projects (USSR), decisions for mass planning of automated control and regulation schemes (Bulgaria) and others. A wide informational list was published on scientific investigations completed in 1976-1977 on a given theme, the results of which are recommended for introduction.

Noteworthy are: works on mathematic modeling of the synthesis of complex ethers in the presence of cations (Poland), programs for calculating multicomponent rectifications (PRB), a methodology for calculating columns (USSR) and a number of other items. A list is presented of programs developed in the CEMA-member countries for calculating technological diagrams, physical and chemical properties of mixtures, reactors, and rectification, extraction and absorption columns, heat exchange apparatus and other equipment on electric computers.

Bulletin No 3 reports that the Permanent CEMA Commission on the Chemical Industry has approved materials for demonstrating the approximate requirements of the CEMA-member countries for technological lines, units, different types of machines and equipment for the chemical, petrochemical, pulp and paper and microbiological industries in 1981-1990 and has decided to present these materials in the Permanent CEMA Commission on Machine Building.

In this number of the bulletin the problem of creating a unified system of scientific and technical information in the USSR about chemistry and the chemical industry is discussed. The All-Union Institute of Scientific and Technological Information and the central branch organs of the scientific and technical information, including VNIPIEIlesprom and ONTITEI-mikrobioprom are participating in this work.

Substantial achievements in the work of the Institute of Organic Industry of the Polish People's Republic are discussed. In particular, the institute has developed technology and introduced 27 pages of (geliofory)--bleaching substances which make fabrics, paper and pigments perfectly white. They have become full-fledged substitutes for imported substances and at present are articles of export from Rumania.

In the same No 3, information on licenses offered for sale by CEMA-member countries has been published for the first time. Wood chemists should be interested in the effective formalin production technology proposed by the People's Enterprise (Loyna-verke), (GDR), which ensures outlays of methanol of no more than 0.47 tons per ton of marketable 37 percent formalin based on its content of 3.4 percent methanol as a stabilizer.

FOOTNOTE

* For the contents of Bulletin No. 1, see GIDROLIZNAYA I LESOKHIMICHESKAYA PROM-ST', 1978, No 6, p 29.

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PUBLICATIONS

UDC 628.4(031)

HANDBOOK ON SANITARY CLEANING OF CITIES AND SETTLEMENTS

Kiev SPRAVOCHNIK PO SANITARNOY OCHISTKE GORODOV I POSELKOV in Russian 1978 signed to press 10 May 78 pp 2, 3-4, 213-214

[Annotation, foreword and table of contents of book by Yu. L. Shevchenko and T. D. Dmitrenko, Izdatel'stvo "Budivel'nyk", 33,000 copies, 216 pages]

[Text] This handbook describes methods of organizing waste collection, removal, treatment and processing operations, gives the characteristics of machines and mechanisms used for transporting solid wastes and for cleaning urban areas, presents data on norms for accumulation of urban wastes and the methodology for determining these norms, examines the basic status of the organization of ordinary and prophylactic inspection of sanitary cleaning of cities and settlements, gives examples of designs for means of transportation and material and technical resources for complex mechanized removal of residential rubbish and for disposal of wastes from streets and squares.

Normative data are presented as of 15 March 1978.

The handbook is intended for engineering and technical workers of planning organizations and communal enterprises engaged in organizing sanitary cleaning of cities and settlements.

42 illustrations, 73 tables, bibliography of 36 titles.

Foreword

In "Basic Directions of the Development of the USSR National Economy in 1976-1980" adopted by the 25th CPSU Congress, considerable attention was given to environmental protection and rational use of natural resources. An important component of this problem is sanitary cleaning of cities and settlements, which ensures a favorable living environment and maintenance of the population's health.

The CPSU's consistent policy of creating healthful and comfortable living conditions in cities and settlements, protecting the environment from pollution, making rational use of resources and of efficiency and increased work quality is promoted by such basic goals of sanitary cleaning and waste disposal in cities and settlements as ensuring highly sanitary conditions in residential areas, streets, squares and areas of green plantations, complete treatment and utilization of wastes in the national economy, complex mechanization of waste collection, removal, treatment and processing and of waste disposal in urban areas, decreasing the cost of waste collection, removal, treatment and processing operations and of cleaning operations in urban areas.

The wide program of social development, the constant increase in the soviet people's standard of living, the increase in the use of products and industrial goods and the increase in the urban population all cause rapid growth in the amounts of waste and lead to an annual increase in the volume of urban sanitary cleaning work. In recent years, progress has been made in organizing the sanitary cleaning of cities and settlements: a planned, regular system of waste collection and removal has been introduced; the amount of manual labor has been sharply reduced; the material and technical base of the sanitation enterprises has increased, and a great deal of work has been done in equipping and organizing landfills for solid residential wastes. Large rubbish treatment plants have been put into operation.

Further planning and construction of plants for the biological and thermal treatment of wastes from which it would be possible to obtain and use in the national economy heat, electrical energy, compost, organic fuels, metals, etc., are urgently needed. Such plants are being built in Moscow, Vladivostok, Khar'kov, Odessa, Tol'yatti, Rovno, Zhitomir and other cities.

In order to use effectively the enormous funds allocated for developing and perfecting sanitary cleaning--a branch of municipal service which is technically and organizationally one of the most complex--it is necessary to use a scientifically-based approach in selecting types of plants, machines and mechanisms and technological schemes for sanitary cleaning and in predicting changes in the composition, properties and accumulation of wastes.

In preparing the present handbook, we used normative materials, instructions, recommendations and studies from the K. D. Pamfilov Academy of Municipal Service, literary materials and the experience of the sanitary cleaning organizations of the cities of the Ukrainian SSR. In connection with the development and division into independent branches of individual branches of municipal service (sewerage, gas-scrubbing, protection against noise and vibration, etc.), data on these subjects are not presented in this book.

The foreword and chapters 1, 3 and 4 were written by P. D. Dmitrenko, chapter 2 by P. D. Dmitrenko and Yu. L. Shevchenko, chapters 5 and 7 by Yu. L. Shevchenko.

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