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East Europe Report

SCIENTIFIC AFFAIRS

(FOUO 6/80)

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CONTENTS

BULGARIA

DETERMINATION OF THE CONTOURS OF LOWER AND UPPER SECTIONS OF CONVECTIVE CLOUD HAIL NUCLEUS

Sofia KHIDROLOGIYA I METEOROLOGIYA in Russian No 1, 1980 pp 3-9

[Article by R. Petrov, S. Stoyanov and P. Boyev, submitted for publication 12 Mar 1979]

Abstract. An attempt has been made to find by calculation a relationship between the radar-locational reflectivity multiplier Z and some internal characteristics as cloud water and velocity of the updraft in a cloud, which are of considerable importance for hail processes development in the convective cloud. Two cloud areas are examined: lower (with a height of the isotherm t'_0= 0°C to t'_1= -20°C) and upper (from a height of the isotherm t'_2= -35°C to the level of convection). The evaluations are made by assuming that the first area is characterized by radar-locational reflectivity from supercooled water drops and water-covered hailstones, and the second area is characterized by radar-locational reflectivity from dry hailstones. The calculation results coincide adequately enough with the experimental data for radar-locational reflectivity from cumulonimbus clouds.

A value $\lg Z=3.2\pm0.3$ has been chosen to describe the contours of the lower and upper sections of the potential hail nuclei in the convective cloud.

[Text] According to the currently extant methods of research and operational work on hail prevention, the hail-dangerous section of the convective cloud is identified as the zone of increased reflectivity (ZIR), that is defined by the contour, from which the multiplier of radar-locational reflectivity

$$(1) \qquad Z_{\text{ZIR}}=\frac{Z_m}{10},$$

where Z_m is the maximum value of the reflectivity multiplier Z. Numerous studies on hail clouds, however, indicate that Z_m is changed from case to case in broad limits--from 10^3 to 10^7 mm^6/m^3 [1-3]. This fact demonstrates that determination of the potentially hail zone of the convective cloud based on the equality (!) is not physically entirely valid, and one should review certain concepts on the hail nuclei in cumulonimbus clouds.

In order to determine the contours of the convective cloud hail nucleus this study attempted to find by calculation a link between the radar-locational reflectivity multiplier and certain intracloud characteristics that are important for hailstone growth, for example, water content of the cloud q and velocity of updraft in the cloud w. As yet we do not have the possibility of computing the value of radar-locational reflectivity for the entire mass of the convective cloud, and in this work we will restrict ourselves to an examintion of two individual regions of the cloud: the lower and the upper. The first region is characterized by the radar-locational reflectivity from the supercooled drops and from the water-covered hailstones, while the second region is characterized by radar-locational reflectivity from dry hailstones. We will assume that the lower studied region encompasses the cloud layer from the height of the zero isotherm H_{t_0} to the height H_{t_1}, the isotherms $t'_1 = -20°$ C, without examining here the question of where and in what manner the hailstones are formed. We selected the value of the temperature boundary t'_1 based on the formed concepts that hail formation even with strong hail damage occurs as a result of freezing of an insignificant number (roughly 1-0.1 m^{-3}) of large cloud drops, that during their growth do not compete among themselves for the supercooled water [1,4,5]. One can consider that in the layer H_{t_0}-H_{t_1} this condition is fulfilled, since from certain measurement data [6] and from certain calculation results [5,7], intensive crystallization of thick convective clouds begins below the cloud temperature -25°C. We will assume in relation to the upper examined region that it is located in the crystallized section of the cloud, i.e., above the isotherm level $t'_2 = -35°C$, where hail growth can be ignored.

As is known from the many theoretical and experimental works, growth of ice crystals in a stream of supercooled aerosol occurs in two patterns: in a dry and in a wet [8,9]. In convective clouds, with other conditions equal, the growth pattern of ice particles is determined by the water content of the cloud q, while the value of the water content q_{kp} that determine mines the first pattern, is called the critical. As applied to the process of hail formation, one should note that in the dry pattern, the effectiveness of hailstone growth is low, the capture of ice particles by the growing crystal is rare, and the capture of supercooled drops results in the formation of porous ice of snow-like structure. We will ignore dry hailstone growth in this work.

In the calculations of the critical water content q_{kp} that separates the wet pattern of cloud crystal growth from the dry, we will use the formula obtained in [10] for q_{kp} that is written in the form

$$(2)\qquad q_{кр}=\frac{k_1(1-0{,}01\,t')}{\vartheta r_*^{3/4}\sqrt{\frac{P_0}{P}\left(\frac{L^*}{|t'|}-1\right)}},$$

where k_1 is the coefficient that links some of the physical characteristics for the growth of ice crystals that are included in the original heat balance equation [10], ϑ--coefficient for capture of the water drops by the growing crystal with radius r*, P--air pressure at given level, P_0--air pressure under standard conditions, L*--latent heat of ice melting, t'--air temperature in cloud. The critical water content q_{kp} computed with the help of formula (2) makes it possible to isolate the first region we examined of the cumulonimbus cloud, by comparing the values q_{kp} and the water content value q of the cloud.

By definition, the water content

$$(3)\qquad q=\frac{4}{3}\pi\varrho N\int_0^\infty \eta(r)r^3dr,$$

where ϱ--water density, N--number of water drops in a unit of air volume, $\eta(r)$--function of drop distribution according to sizes r. The type of the $\eta(r)$ function has great importance for further calculations. As shown in [11], the function

$$(4)\qquad \eta(r)=4\,\frac{r^2}{r_m^3}\exp\left(-2\,\frac{r}{r_m}\right),$$

where r_m--mode of function $\eta(r)$ approximates fairly well the typical cloud parameters and is applicable to hail. When it is used, it is necessary to know the link between the modal radius r_m and the intracloud characteristics. For the region of wet hailstone growth that we are interested in, from the contour that satisfies the condition

$$(5)\qquad q=q_{кр},$$

this link can be found after the critical water content q_{kp} is computed. Then the expression for the modal radius r_m is written in the form

$$(6)\qquad r_m=k_2\sqrt{\frac{q_{кр}}{N}},$$

where k_2 is the coefficient obtained from (3) with regard for (4).

The distribution function of hydrometeors according to dimensions (4) was used in this work and in the calculations of the radar-locational reflectivity η^* from the potentially hail nucleus in the cumulonimbus cloud. We made the estimates of reflectivity η^* in the Rayleigh approximation. As is known, for the Rayleigh scattering the radar-locational reflectivity

$$(7) \qquad \eta^* = \frac{64\pi^5}{\lambda^4} N \int_0^\infty \left|\frac{m^2-1}{m^2+1}\right|^2 \eta(r) r^6 \, dr,$$

where λ--wavelength of radar, m--complex refractive index of cloud particle substance. During radar in the microwave region(from 3 to 10 cm) in the practical calculations one can consider for water $\left|\frac{m^2-1}{m^2+2}\right|^2 = 0.93$ and for dense ice $\left|\frac{m^2-1}{m^2+2}\right|^2 = 0.20$ [1,6]. Then, with assigned wavelength λ the reflectivity

$$(7') \qquad \eta^* = 64 k_3 N \int_0^\infty \eta(r) r^6 dr,$$

or for further replacement of integration by summing

$$(7'') \qquad \eta^* = 64 k_3 N \int_0^{r'} \eta(r) r^6 \, dr,$$

where $k_3 = \frac{\pi^5}{\lambda^4}\left|\frac{m^2-1}{m^2+2}\right|^2$, while r' separates that part of the spectral distribution of cloud drops according to sizes that can be ignored due to its unimportant contribution to the water content of the convective cloud. In this study r' is accepted as equal to the maximum value of hydrometeor radius maintained at the given level by vertical currents in the cloud. We will further employ the radar-locational reflectivity multiplier

$$(8) \qquad Z = 64 N \int_0^{r'} \eta(r) r^6 \, dr,$$

that with the assigned concentration of cloud particles depends only on their distribution according to sizes.

An important factor for the hail process development is the updraft velocity in the convective clouds. Following [10], this study will consider that a critical value of vertical velocity exists in the cloud w_{kp} that is necessary for hail growth. This makes it possible to evaluate the dimensions of the hailstones r* that can be supported by the updraft, and to link the radar-locational reflectivity multiplier with the internal characteristics of the cumulonimbus cloud. The intensity of the radar-locational scattering and the attenuation of radar-locational radiation in the hail clouds, however, depends to a considerable degree on the condition of the hailstone surface. In the first region of the cloud that interests us, where the primary hailstone growth occurs in the monocrystalline pattern, and the thickness of the water film on the hailstones can reach 0.1 cm and more [12], the radar-locational reflectivity is computed on the assumption that all the hailstones scatter electromagnetic energy like equally-great aqueous spheres.

Certain calculation results in relation to the first region we examined with w_{kp} changing according to [6] from 10 to 12 m/s, are presented in table 1. The estimates were made with three critical values for the vertical velocity of the hailstone radii corresponding to this range r*= 0.15 cm, 0.20 cm and 0.25 cm; for three levels determined by the air temperature in the cloud t'= -5°C, -10°C and -15°C, and respectively with the average air pressure values for these levels P=600 mbar, 500 mbar and 450 mbar characteristic for our summer conditions. For the concentration of cloud drops the value N=10^5 m^{-3} was selected [1], and the values of coefficients ϑ=0.8; k_1=1.12.10^{-5}; k_2=0.32; k_3=2.71 (λ=3.2 cm). The table shows the results of calculations of critical water content q_{kp}, modal radius r_m, and the multiplier of radar-locational reflectivity Z, lgZ. Judging from the computations, the approach we selected gives a correct idea about the hail-danger of the lower section of the cumulonimbus cloud; the computed values lgZ correspond to the values lgZ obtained experimentally. Thus, for example, the minimum value of this radar-locational parameter of hail clouds, obtained based on observations and measurements by the radar with λ=3.2 cm is lgZ=3.4 [13,14], which agrees quite satisfactorily with the estimates made in the given work.

The second region of the convective cloud that we examined, as was noted, is located above the isotherm t_2'= -35°C, where the vertical currents support only ice particles. The next task of this study is to compute the radar-locational reflectivity from this region. For this we will use formula (7") in which the coefficient k_3 is computed already with the assigned value of the complex ice refractive index, and the distribution of hailstones according to sizes is again described by formula (4). The link between the modal radius r_m and other characteristics in the hailstone spectrum now can be obtained by assigning the maximum value for the radius r' of the hailstones supported by the updraft in the cloud. Then it is possible to use the link between r' and the average cubic radius of the hailstones r_3 [12]

$$r' = k_4 r_3, \tag{9}$$

on whose basis from the known correlation

$$r_3 = \left(\int_0^\infty \eta(r)\, r^3\, dr \right)^{1/3}, \tag{10}$$

with regard for (4), we obtain the sought for link

$$r_m = k_5 r_3. \tag{11}$$

Certain results of the calculations in relation to the second region we examined are presented in table 2. The estimates were made with three maximum radii of hailstones r'=0.20 cm, 0.25 cm and 0.30 cm corresponding to the classification of the WMO commission to study clouds and hydrometeors, and for 5 concentrations of hailstones N=5,10, 15, 20 and 25 m^{-3},

Table 1. Computation of Characteristics of Lower Section of Cumulonimbus Cloud

r^* μm	1500			2000			2500		
t' °C	—5	—10	—15	—5	—10	—15	—5	—10	—15
$q_{нр}$ g/m³	2,84	5,39	7,26	2,29	4,35	5,85	1,94	3,68	4,95
r_m μm	96	120	132	90	111	123	85	105	116
Z mm⁶/m³	$1{,}48 \cdot 10^3$	$5.75 \cdot 10^3$	$1{,}02 \cdot 10^4$	10^3	$3.55 \cdot 10^3$	$6{,}76 \cdot 10^3$	$7{,}08 \cdot 10^2$	$2{,}57 \cdot 10^3$	$4{,}68 \cdot 10^3$
lg Z	3,17	3,76	4,01	3,00	3,55	3,83	2,85	3,41	3,67

Table 2. Computed Characteristics of Upper Section of Cumulonimbus Cloud

r' μm	2000					2500					3000				
$\bar{r}$ μm	948					1185					1421				
r_m μm	484					605					725				
N m⁻³	5	10	15	20	25	5	10	15	20	25	5	10	15	20	25
$Z \cdot 10^{-3}$ mm⁶/m³	1,23	2,45	3,71	4,90	6,16	4,68	9,60	14,13	19,05	23,44	14,13	28,18	42,66	56,23	70,73
lg Z	2,09	2,39	2,57	2,69	2,79	2,67	2,98	3,15	3,28	3,37	3,15	3,45	3,63	3,75	3,85

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corresponding to these maximum hailstone dimensions [12], and the values of the coefficients k_3=0.58; k_4=2.11 [12]; k_5=0.51. The calculations indicate that the computed values lgZ, in the same way as for the first examined region, agree quite satisfactorily with the experimental data for the radar-locational reflectivity from the cumulonimbus clouds [13,14].

Based on the results of the computations presented in tables 1 and 2, we select the value lgZ=3.2±0.3 to describe the contours of the lower and upper sections of the convective cloud hail nucleus. The next goal of our study is to compute the contour of the hail nucleus for the entire mass of the convective cloud, and compare the calculated contours with the contours of such nuclei in the clouds of varying degree of hail danger that were measured measured with the help of radar stations.

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CZECHOSLOVAKIA

HEALTH PROGRAM PROSPECTS FOR SEVENTH FIVE-YEAR PLAN IN CSR

Prague CASOPIS LEKARU CESKYCH in Czech Apr 80 No 4 pp 104-110

[Article by Docent Jaroslav Jirous, M.D., candidate for doctor of science, first deputy minister of health of the CSR: "Achievements in General Public Health Programs and Prospects for the Seventh Five-Year Plan"]

[Text] General public health programs embody one of the main missions of the health policy of a socialist state--development and intensification of the preventive character of the health care provided for the nation.

They were formulated on the basis of analysis of the main trends of morbidity, disability and mortality of the population and focused on the most serious health and social economic problems of our present society.

Their goal is to progressively provide outpatient care for the entire population. This concept is in accord with the principles defined by the 25th CPSU Congress and the conclusions adopted at the 18th conference of the ministers of health of the socialist countries.

It is my duty to report on achievements in the four fundamental, general public health programs which were specified by the 15th CPCZ Congress and fall into the sphere of preventive care, namely:

care of women and youth;

the fight against vascular and cardiac diseases (cardiovascular program);

the fight against cancer (oncologic program);

care of the aged and chronically ill.

The program of care for the younger generation has its basis in one of the fundamental principles of socialist public health care; in the Sixth Five-Year Plan it was mainly directed at improving the general health status of the population, mostly by intensification of the currently provided care for mother and child.

In the field of gynecology the program called for:

--completion of the district system of gynecologic service; in particular, realization of the planned ratio of gynecologists in the district service with a simultaneous increase of the corresponding number of gynecologic nurses;

--increasing of the number of beds in gynecologic departments by 423;

--completion of the network of specifically alloted beds for women with complicated pregnancies in gynecologic departments covering larger areas (population of about 250,000, i.e., especially in hospitals with type III policlinics and selected hospitals with type II policlinics), where such special care will be concentrated, and equipping them with modern technologic means.

Compared to the end of 1975, the number of physician slots in gynecologic outpatient care rose from 649.71 to 722.51 in relation to the population; i.e., from 0.64 to 0.70 physicians per 10,000 people, with district service showing the increase from 0.50 to 0.54. In this period, however, the number of gynecologic nurses in the outpatient service rose by only 27 positions and the ratio of the nurses per physician thus became more unfavorable.

The higher number of physician positions was reflected in expanded care for pregnant women, especially those with complicated pregnancy. The number of women treated for threatened pregnancy rose from 27.8 percent in 1976, the starting year of such records, to 28.7 percent of all pregnant women. The percentage of pregnant women prepared for deliveries by psychological instruction courses rose from 27.3 to 28.9. The percentage of women of childbearing age (14 to 44) using some kind of contraceptives also increased from 18.5 to 20.9, and the choice of hormonal contraceptives was likewise expanded and updated. During the transient decline in the years 1973-1976 the number of requested abortions showed a slight increase and amounted to 46.7 per 100 live births. The highest share of the requests was from women having two children.

The number of beds was increased by 124; i.e., by the end of 1978 the gynecologic departments of hospitals had a total of 11,277 beds. Lagging investment buildup was the main reason for the slower meeting of the plan.

The gynecologic departments of hospitals with type III and selected hospitals with type II policlinics are setting aside sections for the hospitalization of women with threatened pregnancies. Specialists for threatened and pathologic pregnancies have been assigned so far to 10 departments of gynecology and obstetrics, mostly in hospitals with type III policlinics. Equipment of these sections with the necessary medical technologic means has been limited to only a few places, because for the most part it must be imported from the capitalistic countries. Preconception care was

strengthened by treatment of infertility and sterility,, but the shortage of staff and beds did not allow substantial improvement in prevention of fertility disorders.

The achievements can be documented statistically: the rate of stillbirths, which is one of the lowest in the world, was 6.1 per 1,000 in 1976; perinatal mortality dropped to 17.3 per 1,000 and maternal mortality in 1978 was .09 per 1,000.

In the field of child care we adopted measures for improved general health status of the population by providing differentiated care for the newborn, especially those with a low birth weight and congenital abnormalities. For this purpose we are gradually building intensive-care units for the newborn with pathologic states and supplementing the number of beds for the underweight newborn, and modern equipment and necessary staff are being provided for the existing sections. These steps in the field of care for the newborn contributed to the decline of infant mortality from 19.4 per 1,000 in 1975 to 16.9 per 1,000 in 1978, with the mortality of the newborn showing in this period a drop from 14.8 to 12.6 per 1,000.

In the field of care for older children, the quality of so-called complex care was also raised: systematic preventive care for children up to the age of 15 and for children of all ages with abnormal physical and mental development has been improved and expanded. Children with chronic diseases are under the care of outpatient clinics; and children with abnormalities are receiving special attention. The network of specialized pediatric centers, especially cardiologic, cardiosurgical and other, is being gradually enlarged. Medical genetics, which will be on the agenda at the session of the Collegium of the Minister of Health in February, also play an important role in the improvement of the general health status of the population. In the course of this five-year plan we have already begun to establish appropriate centers and provide personnel and materiel resources.

Meeting the plan for nursery spaces is also an important component of this program; in the course of the Sixth Five-Year Plan the net of nurseries was enlarged by 151 centers with a capacity of 7,666 places and by 322 mininurseries with a capacity of 1,578 places. By the end of the Sixth Five-Year Plan (the end of 1980) we assume that 61,662 places will be available in the nurseries and that the plan will thus be exceeded by 2,230 places, which would allow for placement of about 14.4 percent of children of nursery age. Such an increase in nursery openings is still insufficient to meet the demand, however. At the end of 1978, there were 20,667 unprocessed requests for placement of children under the age of 3 in these centers.

As far as care for mother and child in local health districts is concerned, it is realistic to assume that the number of gynecologists assigned to local and plant facilities will meet the plan. As far as district pediatricians are concerned, however, 166 physician positions still need to be filled before the end of 1980 to meet the plan. In view of the expected number of graduates of the School of Pediatrics, one may expect that the

planned complement will be realized at the beginning of the next five-year plan, unless we resort to assignments of the graduates of the Schools of General Medicine to pediatric specialties.

Realization of the cardiovascular program called for:

1. Introduction of proven methods of care in all regions of the CSR in accordance with results achieved in the model districts; increase of health awareness of the population and achievement of better familiarity of the population with administration of first aid in sudden-onset forms of heart disease, such as acute cardiac infarction, for example.

We introduced unified procedures in all regions of the CSR for diagnosis, treatment (including medical first aid) and rehabilitation of patients with conditions following acute myocardial inarct. In particular, we succeeded in shortening the time between the occurrence of the cardiac infarction and hospital admission of the patient. On the average, 50 percent of patients are admitted to the hospital within 3 hours, compared to 10 hours formerly. Heightened health awareness of the population, including better knowledge of administration of first aid in sudden forms of heart disease, has contributed to this improvement.

2. Completion of special facilities in accordance with the concept of the internal medicine branch--intensive-care units (and coronary units) provided with monitoring and operative equipment--as a part of the network of specialized centers capable of insuring immediate qualified and effective medical emergency treatment for patients with acute heart disorder; and in this connection insuring the development of quick treatment consistent with the principles of the organization of the emergency service.

The number of beds in intensive-care units, including coronary, was increased. By the end of 1978, there were 629 beds in internal medicine intensive-care units and 152 beds in coronary units, but their disposition is not equitable. More than 80 percent of the patients with acute myocardial infarcts are treated during the first phase in the intensive-care centers. The hospital mortality for persons with acute cardiac infarct is 18 percent. Compared to the period preceding the cardiovascular program, this represents a 50-percent reduction of hospital deaths. The number of districts in which quick emergency service was established also increased.

As a result of concentrated care, the average time of hospitalization of patients with uncomplicated courses of cardiac infarct was shortened by 14 days, i.e., to 3 weeks compared to the previous 5 to 6 weeks.

The effect of the consistently administered concentrated care, including rehabilitation, also has a positive economic value. From the group of patients of the productive age with complicated heart attacks, 70 percent returned to the work force, 54 percent of them to their original employment. The recuperative treatment of these patients in specially designated spas plays an important role here.

3. A gradual increase of the present number of physicians specializing in cardiology (training of 30 new specialists).

So far we have only 19 physicians who have passed the qualification tests and acquired additional specialization in the field of cardiology, but several other doctors are currently training in this specialty. Educational programs (topical courses) have been set up by the Institute for Continuing Education of Physicians and Pharmacists in Prague and at the regional level, and professional lectures are used to raise the level of competence of the physicians and other health personnel involved in diagnosis, treatment and evaluation of patients with heart diseases.

4. The direction of medical research toward improved diagnosis, treatment and evaluation of severe cardiac and vascular diseases and the accelerated application of new scientific knowledge in the medical practice.

The complex research project P 17 specified tasks whose goal was to acquire new knowledge concerning the causes and factors leading to the development of severe cardiac and vascular diseases and influencing their course, and to evolve new, more effective methods of prevention, treatment and evaluation of patients with cardiovascular diseases and their complications.

Through the progressive establishment of a network of specialized centers for cardiac surgery in Prague, Hradec Kralove and Brno we also provided effective treatment for congenital and acquired heart defects.

In four model districts which are identical with the districts of the ongoing oncologic program, we have been checking the methods of medical examinations for timely and systematic identification of patients with essential hypertension with the aim of preventing and delaying the occurrence of cerebral complications.

The work of the hygienic service and research in the field of primary prevention was directed particularly at the development of procedures for the study of the influence of individual factors of the home and work environments on the development of cardiac and vascular diseases. Investigation of the influence of these factors on ischemic heart diseases among professionals was started in selected research institutions. Furthermore, there is an ongoing study of the influence of individual factors of the home and especially work environments on the development of these diseases among workers in heavy industry.

Realization of the oncologic program has called for:

1. The necessary review and evaluation of the present results of the screening carried out in the model districts.

The first stage of a 3-year model, the testing of preventive oncologic examinations which were integrated with preventive examinations in the

framework of the cardiovascular program, was completed in the four selected districts of the CSR by 31 December 1978. In these 3 years, 149,227 individuals were examined in the model regions; the findings revealed 231 malig malignant tumors, 2,828 preblastomas, 7,354 hypertensions and 2,748 diabetics. The referral of the preblastoma cases to outpatient care means a true reduction of the risk of tumors in the given localizations. The present findings have shown that preventive cancer examinations are advisable even in the younger age groups, i.e., starting with the 30-year-old, especially so for women. Experience from the experimental districts has revealed that 4 to 5 percent of all malignant tumors found were diagnosed at a clinical stage at which the prognosis was relatively favorable with a properly selected treatment and that a higher number of cases were discovered at a treatable stage (1.5 years earlier, on the average, than if the patient consulted the physician without this examination).

The current state of cancer research does not offer a basis for an essential change of therapy prior to the year 2000 and we must, therefore, continue to develop and perfect the methodology of screening. Review of the screening program has also confirmed some problems, especially in the summoning of the younger people for examinations, because a younger person who feels well sees no reason why he should be examined. Health education must assume a greater role in the organization and issuing of invitations for such examinations. We must also expand the spectrum ofneeded cytostatics and health techniques, especially for endoscopic diagnosis and radiation therapy.

2. Gradual development of the specialty of clinical oncology and related legal regulations, and especially strengthened staffing of the centers of clinical oncology in the hospitals with type II and III policlinics.

Advisory boards for clinical oncology were established in the regional institutes of public health, and centers of clinical oncology were set up in all hospitals with type II and III policlinics. The level of personnel assignments to these centers has generally been met but not the required specialized qualifications of the workers. Specialists for chemotherapy of malignant tumors were nominated for all hospitals with type III and some hospitals with type II policlinics; and stocks of controlled cytostatics were organized for all regions. Specialists for clinical oncology are gradually being nominated at specialized departments of the hospitals with type III and some hospitals with type II policlinics and these should successfully provide the foundation for interdisciplinary team cooperation.

3. Creating conditions for systematic education of health personnel at all levels of clinical oncology with special emphasis on first-line workers.

On the basis of experience with the training of physicians in the Soviet Union, in 1977 the Minister of Health of the CSR established the chair of clinical oncology in the Institute for Continuing Education of Physicians and Pharmacists in Prague. Every year since 1977, the training programs of

the Institute for Continuing Education of Mid-Level Health Personnel have provided special courses, training positions and discussion seminars for nurses of the centers of clinical oncology in hospitals with type III policlinics and selected hospitals with type II policlinics.

4. Developing the most important diagnostic procedures for early stages of malignant tumors, cytological, biochemical, immunochemical and endoscopic, for example, which in the course of the Seventh Five-Year Plan would allow substance and capacity coverage of the examination needs in screening actions and in clinical practice; reinforce at the same time other examination procedures to support clinical diagnosis, i.e., X-ray, isotope and biopsy diagnoses.

Despite systematic attention, this did not materialize in the expected scope because of limited capacities for laboratory and clinical diagnostics. Some places already managed to unite the needed elements into larger entities, broadened the range and increased the number of the examination procedures in the indicated cases. During the implementation of the oncologic and cardiovascular programs, the number of procedures per 100,000 people rose considerably; for example, in the past 7 years to 164 percent in the field of roentgenology and to 194 percent in clinical biochemistry.

5. Developing therapeutic preventive care so as to eliminate, in the course of the sixth and seventh five-year plans, the differences between individual regions in overall cancer treatment and its individual components, i.e., surgical treatment, radiotherapy and chemotherapy.

In the field of therapeutic preventive care, there continues to be inadequate capacity in the surgical and radiotherapy departments, and there is no network of radiotherapy departments in the policlinics. Cancer chemotherapy has not yet been properly managed organizationally and particularly with regard to its methodology.

6. At the close of the Sixth Five-Year Plan, formulation of a proposed network of institutes of concentrated care for patients with malignant tumors, on the basis of conceptual, substantive, prospective and operational aspects, so that we can start with the buildup of the proposed network in the seventh and eighth five-year plans.

The present proposal of the prospective network of health care centers of the regional national committees to the year 2000 has considered the establishments of only two such institutes, in the southern Moravian and eastern Bohemian regions. An institution for the central Bohemian region is now also under consideration. I believe that three such institutes with a total capacity of 1,000 beds would be sufficient to meet the needs.

The program of care for the aged and chronically ill whose basic tasks in the public health field were set forth by CSR Government Resolution No 252/1972, has shown this progress during the Sixth Five-Year Plan: From the beginning

of the Sixth Five-Year Plan to 30 September 1979 the number of beds in the facilities for chronically ill rose by 753, in the units for recuperative treatment of patients by 158 and the number of nurses positions in the care for the aged and chronically ill rose by 383.38 [as published]. Regional national committees expect that by the end of the Sixth Five-Year Plan, the number of beds in facilities for the chronically ill will increase by 1,348; this will not, however, meet the goal of 1,561 beds for the Sixth Five-Year Plan, which was approved by the councils of the regional national committees. The capitol city of Prague, and the central and western Bohemian regions are mostly accountable for this deficiency.

Reorganization of underutilized health centers for the benefit of the aged and chronically ill is proceeding very slowly. In most cases this is due to both personal and group interests--very often of the directors of these health facilities.

Small, inadequate hospitals thus continue to vegetate, although the change in utilization of their beds would solve one of the burning problems of the present and future health care, i.e., institutional nursing care for the aged and chronically ill who on account of the state of their health can no longer be cared for in their homes. Hospitalization of such patients in clinical departments of university hospitals, for example, is unproductive because their diagnosis is known and because of the nature of their illness the patients do not need highly qualified diagnostic and medical attention, but need nursing and rehabilitation care. Because of the shortage of beds in facilities for the chronically ill, these patients are occupying hospital beds designed for treatment of acute states with a planned higher turnover of the bed, and they thus block a certain percentage of such beds. This also leads to unnecessary economic losses; for example, in 1978 the cost of operational expenses alone for 1 day of care and bed in the hospitals with type III policlinics was Kcs 248.00 and in university hospitals Kcs 300.00, but only Kcs 105.00 in facilities for the chronically ill.

It was expected that in the Sixth Five-Year Plan the sector of care for the aged and chronically ill would meet the allocations of nurses charged with care for these citizens in the local health districts with the average of 0.5 nurse slot per district. As of 30 September 1979 this standard was met by 60.6 percent and it is assumed that by the end of the five-year plan it might be met by about 80 percent. Work plans at some places make the attainment of 100 percent impossible, although middle-level health workers might be available there for day service.

The government of the CSR and the Public Health and Social Committee of the CSR and the Public Health and Social Committee of the Czech National Council dealt with the current state of fulfillment of the missions of these general social programs. The conclusive and indisputable achievements in mother and child care, which are related to the strong tradition of this service that has existed from the start of the socialist public health service, were evaluated. Emphasis was also placed, however, on the need for modern

equipment and the fact that this program cannot be viewed merely as a narrow medical matter.

The public health and social committee of the Czech National Council also evaluated the achievements in the cardiovascular program and the relationship of intensive care treatment to rehabilitation and convalescence treatment in the spas. At the same time emphasis was placed on the need for a greater role of health education to bring about changes of life style and thus prevent such diseases.

When evaluating the program of care for the aged, the Public Health and Social Committee of the Czech National Council has found that no leading research clinical center participates in this program, and that even such a step as the establishment of the network of nurses specializing in geriatric care faces serious difficulties because of the limited feasibility of the work plans in public health facilities.

Concerning the oncologic program, the public health and social committee of the Czech National Council called attention to the fact that without test procedures, even if imperfect, timely detection of malignancies has little success and that the results of the present treatment methods are not good enough to dispel fear of this disease among people.

Concept of Further Development of General Social Programs in the Seventh Five-Year Plan

The basic trait will remain further emphasis on the preventive character of our public health service. We shall therefore continue to insure on a priority basis the care of the younger generation, provide healthy conditions for the development of children, especially in collective facilities, and insure concern about the care of workers and their home and work environments.

In the field of gynecologic care, in the Seventh Five-Year Plan we shall continue to identify infertility and sterility and arrange more intensive care of women with risk pregnancy and women using contraceptives. The influence of the life style of girls and young women on premature births and miscarriages will be investigated. For this purpose it will be necessary to:

--fill the medical positions in the outpatient service in the discipline of gynecology and obstetrics;

--continue with the buildup of a network of specifically alloted beds for women with threatened pregnancies in hospitals with type II policlinics and assign specialists for such care;

--insure the necessary number of beds in gynecologic departments of all types of hospitals;

--supply departments for threatened pregnancies in hospitals with types III and II policlinics with modern medical technology;

--further develop specialized gynecologic services (gynecologic endocrinology, clinical oncology, prevention of female cancers, child gynecology).

Research should be directed at:

--prevention, timely diagnosis and therapy in the field of perinatal medicine, and the lowering of perinatal mortality, perinatal morbidity and genetic congenital development defects;

--prevention and treatment of female infertility and acquisition of new knowledge indispensable for control of human fertility (both in the positive and negative sense);

--testing of interruptions of early pregnancies using vacuum aspiration (mini-interruption) at selected centers and, depending on the results, eventual introduction into nationwide practice.

In the sector of child care it will be necessary to:

--supplement the intensive-care units for treatment of pathological conditions of the newborn, and increase the number of beds for newborn with low birth weights in all regions; and provide gradually modern medical technology for these two areas;

--develop a network and activity of the departments of medical genetics in hospitals with type III policlinics and eventually in selected hospitals with type II policlinics, and gradually equip these departments with needed instruments;

--in primary pediatric care, achieve a ratio of 1,100 children under the age of 15 per pediatrician slot in the district;

--strengthen with personnel the specialized services in the pediatric wards of hospitals with types III and II policlinics;

--continue the gradual establishment of highly specialized centers (e.g., nephrologic, gastroenterologic, hematologic) in pediatric departments of university hospitals and type III policlinic hospitals;

--expand pediatric psychiatric care;

--increase the number of beds in facilities for long-term psychiatric pediatric care and for mentally ill children;

--establish sanatoria for chronically ill children where they can stay for days and weeks, especially for the group of abnormal children, and achieve

this principally through reorganization of unutilized pediatric hospital wards;

--complement the network of institutes for infants;

--insure further development of nurseries so that at least an average of 17 percent of children of nursery-school age could be placed there;

--improve therapeutically preventive care for adolescents and recruits (apprentices, working youths and students).

Research should be aimed at:

in the field of care for the newborn:

--problems of adaptation of the newborn and its disorders;

--respiratory disorders of the newborn;

--problems of the newborn with low birth weight;

in the field of care for infants and preschoolage children:

--development of defense mechanisms of the infant;

--increased quality of infant and child nutrition;

--development of the nervous system of the child and its disorders;

--metabolic disorders, their diagnosis and treatment;

--prevention of recurrent chronic respiratory ailments;

--development of children at risk (early detection and rehabilitation);

in the field of care for schoolage children:

--sound physical and mental development of the child in the pedagogic process;

--reaction of children to changes in physical and mental stress;

in the field of institutional care for children:

--prevention of nosocomial illnesses;

--diagnosis, treatment and prevention of diarrheal diseases;

--development of children under various living conditions;

--child care outside the family (nurseries, mininurseries, kindergartens, infant institutions, children's homes);

in the field of care for adolescents research should be aimed at:

--diagnosis, treatment and prevention of the most frequent health problems of adolescents;

--functional diagnosis;

--evaluations concerning the possibilities of productive life of handicapped adolescents.

In the sector of the cardiovascular care the Seventh Five-Year Plan will concentrate on:

--achievement of outpatient care for all persons threatened with or having hypertension in the age-risk group 40 to 60, and study of the decline of morbidity and mortality due to complications of hypertension;

--continuation of the present way of treatment of heart attack patients, especially expanding possibilities of rehabilitation to achieve a reduction of the short-term work incapacity and a decline of premature disabilities;

--furnishing centers of cardiovascular surgery so that the number of children and adults for whom surgical treatment of congenital or acquired heart defects and diseases is indicated may be raised;

--increasing the number of major vascular surgeries and start of timely surgical treatment of poststroke conditions in indicated patients;

--creation of neurosurgical centers for larger population areas.

The research should:

--continue development of methods for the study of the individual components of the home and work environments in the development of cardiovascular diseases, study their influence on the development of ischemic heart diseases in selected groups (especially professionals and workers engaged in the heavy machine industry);

--study in greater depth the risk factors of atherosclerosis, its pathogenesis and possibilities of prevention;

--investigate more intensively the diagnostic methods and treatment of embolism of large vessels to have them available within 3 years;

--continue with research on artificial hearts and aids to blood circulation.

In care for cancer patients it will be necessary to:

--heighten watchfulness for detection at all levels and in all specialties;

--search actively especially for the early stages of cancers and precancerous states in selected localizations (cervical, laryngeal, rectal and skin carcinomas) and tumors of the digestive tract;

--evaluate breast self-examination among women from the aspect of its effect on detection of the clinical stages of breast carcinoma and on the number of identified dysplasias;

--insure a sufficient number of beds in departments of surgery for surgical treatment of cancer patients; provide modern technology needed for radiation treatment and adequate choice of cytostatics, thus achieving further improvement of the short-term and long-term results of treatment, prolongation of useful life and fitness for work;

--establish centers for complex treatment of cancer patients in large population areas (several regions) to improve the quality of this care and utilize more effectively medical technology and staffs of specialists;

--Utilize positive experiences from the 3-year trial study of preventive oncologic examinations and incorporate their principles into the system of a single preventive examination; and introduce it speedily into the practice;

--direct the health education of the population toward education of a generation of nonsmokers as a preventive measure against certain environmental diseases.

Research in the field of oncology should be aimed at:

--relationship of individual factors of the home and work environments to the genetic risk, their role in primary prevention, determination of the mutagenesis of these factors, investigation and determination of the involvement of professional exposure and possible conveyance of these factors to the individual;

--determination of the characteristics signaling increased risk of a malignant transformation (cytogenetic examinations of peripheral lymphocytes, immunologic examinations, changes of the activity of enzymes in the blood);

--analyses of the influence of individual factors of the home environment on the body with the aid of epidemiologic studies utilizing short-term tests for detection of mutagenic action and thus potential carcinogenic risk;

--standardized methodology of objective evaluation of the risk level of the development of malignancies;

--effective forms of detection of malignancies in the population groups having a definite risk of development of malignant tumors.

With regard to the development of cancer, beside the genetic basis, negative factors of the external environment and the way of life which also correspond to the factors that influence the development of atherosclerosis, play their role here. The trial programs of the fight against cardiovascular diseases and cancer, and against some other socially important diseases, have been clinically conceived more or less separately and are linked together, beside these external factors acting on the organism, mostly by corresponding laboratory and clinical examinations needed for evaluation of the health of the citizen or the seriousness of his illness. Moreover, it is not desirable that a person be called by individual medical departments for uncoordinated, frequent, preventive or other examinations which repeatedly interrupt the work process.

For the Seventh Five-Year Plan therefore, we are considering integration of preventive examinations and such programs into a single program of the fight against socially important diseases, setting up a model of a single preventive examination with subsequent outpatient followups of selected groups of people, especially workers, in the risk categories; detection will be directed at selected, economically and medically most serious diseases and on those stages of such diseases which are controllable by the currently available means of medical science. We want to concentrate particularly on identification and treatment of individuals with hypertension to prevent heart attacks and apopletic strokes; on the screening of selected localizations of cancers; and on detection of diabetes and selected diseases of the respiratory, motor and digestive tracts. At the same time we shall place greater emphasis on coordination of the work of all components of therapeutic preventive care with the work of the hygienic-epidemic service.

The success of such an effective work process has naturally an essential requirement: fully equipped and properly functioning local and industrial public health districts, common examination and treatment components, specialized policlinical departments and sections of the hygienic-epidemic service, and an appropriate system of medical records and mutual exchange of information among all participants.

The realization of this program, however, still requires elaboration of a detailed implementation project dealing with the questions of management and staffing at the individual levels, questions of the supply of materials, instruments, drugs and funds, and intensification of the postgraduate training of the physicians (local, industrial and other specialists) who would be responsible for this unified preventive program.

In accordance with the recommendation of the Public Health and Social Committee of the Czech National Council we will have to insure that the

individual components of this unified public health program have their clinical and research centers which at the same time would serve as a base for postgraduate and undergraduate training. These centers should also be closely tied to international cooperation, especially with the USSR and the socialist countries.

In the field of care for the aged and chronically ill in the Seventh Five-Year Plan we shall:

--continue to increase the number of beds in the facilities for the chronically ill as charged by the Czech National Council Resolution No 252/72, particularly through a reorganization of the existing bed capacities in the regions;

--complete the staffing of local districts with visiting nurses for the aged and chronically ill (geriatric service nurses);

--increase the number of beds for recuperative treatment of patients in hospitals of all types;

--utilize the possibilities of combining the resources of the public health and social care services to build common facilities of a new type for the aged and chronically ill;

--improve technically the management of the service for the aged and chronically ill by separating it from the service for the Fighters against Fascism; and, at the regional and district levels, one physician will be assigned the responsibility for this project and at the same time for coordination and control of the public health and social services provided in the facilities of the public health administration and in the social care facilities in the area under the jurisdiction of the pertinent national committee;

--establish the specialty of geriatrics as a part of the policlinic structure in the department of internal medicine for special consultations needed by district physicians, and perhaps also for other branches, and for outpatient care of selected patients with a pathologic aging process.

Research in the field of geriatrics and gerontology should be aimed at:

--the study of the partial mechanisms of aging at the cellular and subcellular levels (genetic code);

--pharmacologic possibilities of influencing the functional and structural changes of collagen macromolecule (i.e., geriatrics proper);

--determination of the functional age, elaboration of principles and procedures;

--preventive interventions for people of the retirement age who are in the work force;

--methodology of objective testing of self-sufficiency and social dependency as a basis for planning, management and active identification of the needs in public health social service;

--research and development of aids making the life of the aged and chronically ill easier;

--determination of therapeutic measures for the most frequent disorders of the aged, including utilization of geriatric medicine.

These four general public health programs will also be interrelated with continuation of the projects of the virological program and the fight against disabilities due to accidents. All activities will be carried out in the framework of the existing regional system of our public health facilities, based on the principles of differentiated care and with effective integration of personnel and material resources, which are being provided for public health service in a rising volume by our developed socialist society.

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VIROLOGICAL PROGRAM IN CSR FOR 1981-1985

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[Article by Dana Zuskova, M.D., Chief Public Health Officer of the CSR: "Virological Program of the Fight against Viral Diseases in CSR for 1981-1985"]

[Text] The virological program was adopted and approved by the Collegium of the Ministry of Health on 14 April 1977 as a series of preventive measures for the gradual reduction of morbidity caused by viral diseases of the upper respiratory tract, influenza in particular. It was formulated in conformance with directions and goals of the main program to realize the conclusions of the 15th Congress of the CPCZ in the health field. In the period 1977-1980 it focused on viral respiratory diseases, especially influenza, because this group of diseases is an unsolved, serious worldwide problem and ranks among the most serious of all diseases, both from the economic and the health aspects. Several concrete tasks both in the field of hygienic service and therapeutic-preventive care, and medical research and production, were formulated within the framework of this program, and the chiefs of the public health departments of Regional National Committees, the director of the Institute of Hygiene and Epidemiology and the general director of the Institute of Serums and Vaccines were charged with the further elaboration of these measures and their realization. The defined tasks were fulfilled according to plan and the various results created conditions for the further development of this program in future years and a further reduction in the morbidity caused by these infections.

The problems of viral respiratory diseases are not the only difficult problems in the fight against contagious diseases. In past decades, following the incorporation of scientific achievements into medical practice, the prevention and treatment of bacterial infections reduced significantly the morbidity and mortality due to these infections (diphtheria, whooping cough, tuberculosis, tetanus, abdominal typhus and other typhoid fevers, etc.), but the fight against viral infections has not shown such marked achievements. Throughout the world there is no specific drug to combat such infections, which means that the fight against them is limited today

to prevention and prophylaxis, either specific (where a vaccine is available) or nonspecific measures against epidemics.

Despite the problems cited, however, one must note that in the past years virological research throughout the world has broadened the knowledge of the origin, pathogenesis and epidemiology of a number of serious viral diseases to such an extent that practical application of the findings is now possible. Viruses causing hepatitis and methods to detect them were discovered, and this opened the way for exact diagnosis, effective prophylaxis and specific treatment of such diseases. New virological, immunochemical and other procedures considerably enhanced the possibility of defining and utilizing micromethods and automation of such tests. Vaccines for certain serious diseases (rubella, mumps) for which no specific prevention has existed, can now be produced and intensive work continues on developing other vaccines (type B viral hepatitis).

In our country, as a result of the proper channeling of work in the field of public health after 1948, and especially as a result of a proper selection of tasks in the sector of health care after the 14th and 15th CPCZ Congresses, we were able to show concrete positive achievements; in particular, morbidity of infectious infantile paralysis was reduced practically to zero, morbidity and mortality due to scarlet fever was significantly reduced and finally, conditions were created for the gradual reduction of morbidity due to other viral diseases.

The tasks of the virological program for the period of the Seventh Five-Year Plan, i.e., for the years 1981-1985, are based on the achievements made so far and on the present needs of our society and crucial public health priorities. Particularly in setting the directions of research, the long-term program of virological research respects equally the current and prospective cooperation and division of labor at the work centers within the CSSR and CEMA countries for maximum effectiveness of research and acceleration of the cycle of "research-production-application." The solution of many problems is directly related to possibilities for importing diagnostic and prophylactic preparations from abroad, which will not be possible unless the import ceilings are raised. It appears that higher ceilings will already be needed for the Seventh Five-Year Plan. To achieve the tasks stated in the program we must also insure higher deliveries to the public health facilities of technical sterilization equipment, injection syringes and needles, and other materials produced by other sectors.

At present, problems of sickness due to viral diseases of the respiratory tract remain from the point of view of health and economics in first place. As far as this group is concerned, one of every four citizens still has a respiratory infection on the average of three times a year, and preschool-age-children four to five times. Our health authorities report an annual average of about 3 million cases of respiratory tract diseases. It is evident from domestic and foreign data that respiratory infections constitute one-half to two-thirds of all illnesses, and 80 to 85 percent of them are of viral origin.

Recurrent diseases of the respiratory tract have many sequels for the child population. About four percent of all children so afflicted continue to have recurrent and often serious chronic respiratory ailments throughout their lives. Influenza and certain other viral diseases of the respiratory tract are one of the five main causes of death in our population. The annual number of deaths from these infections in the CSSR is between 8,000 and 10,000. The age groups which are most affected are the oldest (over 65) and children under one year of age. Viral infections of the respiratory tract and especially influenza are also of fundamental economic importance. They are the main cause of absenteeism at work and schools. The individual with respiratory disease is unfit for work for an average of 5 days; during influenza epidemics 7 to 10 days; and in case of complications, for as long as 21 days. The rate of viral respiratory infections in work incapacitations amounts to 25 percent on the average, but in times of epidemics it rises to 75 percent and above.

Thanks to the fulfillment of the tasks of the virological program we have succeeded in increasing the production and improving the quality of influenza vaccine, and by introducing intranasal application of this vaccine we have succeeded in increasing almost three-fold the number of persons vaccinated; through the activation and expanded activity of the district and regional anti-influenza committees we were able to mitigate the course of epidemics, and on an experimental basis we have succeeded in producing sub-units of influenza vaccine intended for the vaccination of children; and studies testing the effectiveness and possible use of other agents against viral respiratory infections (Impulsin) have continued.

Intensified surveillance of the epidemiological program has confirmed the health-related and economic seriousness of influenza. It was found, for example, that the sum of economic losses in one region in the course of one epidemic was more than Kcs 0.5 billion; at the same time it was established that the lowering of morbidity by a single percent would bring about in this region the reduction of economic losses by Kcs 5.2 million. Virological study of both influenza viruses and other viruses causing respiratory infections has been expanded. Current strains could thus be incorporated in time into the influenza vaccine, which has insured a fully effective vaccine in the given period. Thanks to the intensification of immunological studies we were able to identify in the individual periods the age groups most exposed to infections with various antigen variants of the influenza types A and B and other respiratory viruses, and thus perfect the system of predicting influenza epidemics in our population. The health service was thus prepared with medicines, sufficient beds and the organization to cope with a higher incidence of influenza cases with bacterial complications. New laboratory techniques suitable for a quicker and more exact laboratory diagnosis of infections caused by influenza and other respiratory viruses were introduced within the public health service. Standard laboratory procedures for diagnosing infections caused by influenza viruses, para-influenza viruses and RS virus were elaborated and issued, and the spectrum of viral diagnostic preparations was expanded in accordance therewith. The Central Commission for Effective Pharmacotherapy

issued a basic instruction on the prevention and treatment of acute respiratory infections of viral origin, including influenza; it also included the protocol for effective pharmacotherapy of these infections insofar as the indicated use of antibiotics is concerned.

Many important tasks nevertheless remain to be solved. We are faced with limiting factors which influence the fight against these diseases, primarily for the reason that beside the influenza viruses, more than 150 other known agents and many others, still unidentified, cause the upper respiratory ailments. The artificially induced resistance is naturally also of short duration and the influenza viruses periodically change their characteristics. The difficult and expensive process required to produce vaccines and other known means of immuno- and chemoprophylaxis is a barrier to their mass employment. Transmission of infection through the air facilitates mass spreading and this cannot be controlled by the current antiepidemic measures.

Even in the period 1981 to 1985 emphasis therefore will have to be placed on the development of preventive, therapeutic and organizational measures to limit the incidence of these infections. Hence, prevention of their occurrence and spread cannot be expected. Even with the optimum exploitation of the present system of prophylaxis and treatment, mortality and morbidity due to these infections can be reduced only gradually.

The fight against viral hepatitis is another important and highly topical problem. In the CSR, as elsewhere in the world, viral hepatitis represents a serious health and economic problem both on account of long hospitalization during the acute phase of the disease (average 35 days) and long convalescence, and on account of the incidence of frequent chronic illness as a sequel to the acute phase (average loss of working capacity of about 80 days; in 10 to 15 percent of patients the acute illness changes to the chronic associated with incapacitation lasting over one year and in some instances leads to permanent disability). The rising trend of parenteral procedures in the health facilities coupled with the current inadequate guarantees of proper sterilization and lack of single-use disposable supplies, has increased particularly the risk of the dangerous type B viral hepatitis.

Both types of viral hepatitis, type A (previously called infectious hepatitis) and type B (previously called serum hepatitis) occur in Czechoslovakia. Type A affects children predominantly, especially those of school age, while type B is more common among adults and occurs especially as a hospital infection of an occupational disease of health personnel.

The annual incidence of viral hepatitis in the CSR ranged in recent years around 10,000 cases, and type B hepatitis constituted almost one-half of this number. In 1979 however, we witnessed how the morbidity of type A hepatitis can increase during an epidemic and the consequences of such a widespread epidemic in the further spreading of this infection by contact.

Viral hepatitis, especially type B, accounts for a significant number of the occupational diseases in our country. Of 5,617 cases of occupational diseases reported in the CSSR in 1977, 716 cases, i.e. 12.7 percent, were due to viral hepatitis. Health personnel are affected with viral hepatitis three to four times as often as the general population of the same age.

Economic losses due to the incidence of viral hepatitis are considerable, ranging around Kcs 80,000 for each case. In recent years (with the exception of 1979 which was the year of the epidemic) the CSR suffered an annual loss of about Kcs 800 million of national income directly related to the incidence of viral hepatitis. Hence, if the effective steps which are the final goal of the virological program should manage to reduce the morbidity by a mere 10 percent, the economic saving would be considerable.

Epidemiological study of viral hepatitis and epidemiological practice have a long tradition in our country. In the areas of laboratory research and laboratory diagnosis, however, work fell below the world level mostly because of inadequate equipment stocks. Qualitative changes in laboratory diagnosis of viral hepatitis have recently taken place worldwide. The adoption of more sensitive micromethods has insured a high detection rate of various antigens of type B hepatitis and the pertinent antibodies. Using these methods we must accelerate the testing of blood donors (passive reverse hemaglutination) and insure the quality control of manufactured blood derivatives (mixed fraction I plasma with methods of radioimmunoassay and enzymeimmunoassay). Employment of such diagnostic means is of course directly related to increased material demands.

The planned development of laboratory research and practice will make possible the improved diagnosis of viral hepatitis, a greater scope for epidemiological studies and epidemiological practice, the evaluation of passive and later also active immunization, the identification of carriers among blood and plasma donors, as well as the control of blood derivatives that are produced. Many important tasks have already been accomplished in this area. Methodological directives were issued, which have unified and, according to the current state of scientific knowledge, have revitalized the fight against hepatitis. Steps were taken to make it possible in 1980 to start production of our hyperimmune globulin against type B hepatitis; and preparation of a new, more sensitive agent for diagnosing type B hepatitis using the method of passive reverse hemaglutination was scientifically researched. Another program was based on the supposition that the accelerated development of medical practice and laboratory research will raise the level of the fight against hepatitides and thus reduce their morbidity. It is in consonance with the program adopted in this sector by CEMA.

The important problem of possible damage to development of the fetus, if the mother contracts infections caused by rubella, herpes, megalocyte and other viruses in the course of pregnancy, has been highlighted. In the interest of protecting the health of the younger generation, we must pay

attention to viral infections from this aspect as well. First of all, we must utilize the effective specific prophylactic possibilities that already exist in the world, such as vaccination against rubella. At the same time we must increase the quality and scope of laboratory tests which make the clinical diagnosis more precise and facilitate the diagnosis of the disease. Because only vaccines imported from the capitalistic countries are now available against rubella (they are not produced in the CEMA countries and their production is not included in the Seventh Five-Year Plan), we are considering introducing this vaccination in our country in the most economical way possible. This means that only those girls who are not immune would be vaccinated. They constitute about 30 percent. To reduce expenditures for imported vaccines we must first provide the laboratories of the hygienic stations with facilities so that, using quick and accurate micromethods of automated processing, the girls of each population year could be examined. When we consider that about 30 percent of the women who are not immune and who come into contact with the rubella virus in the first trimester of pregnancy give birth to a child with a congenital development defect, the health-related importance of such vaccination is clear. Even the economic view speaks in favor of such vaccination; for example, expenditures for the institutional care of one person with a congenital development defect to the age of 40 amounts to roughly Kcs 1.2 million. If ten similar cases were prevented annually as a result of vaccination (and this is the minimum estimate of the actual effect of the rubella virus in our country), this would mean a saving of Kcs 12 million.

Another unresolved problem is that of mumps which because of its frequency (about 60,000 cases annually on the territory of the CSR) and the frequency of complications affecting the central nervous system and pancreas (about 5 to 10 percent of all cases), ranks as a serious problem. Here again we will have to intensify work concerning the preparation and testing of our vaccine which has been produced in a few experimental batches, but is not yet effective enough and is thus not suitable for wide use. At the same time we must create conditions for controls, from the laboratory side, of such vaccination in the field. This means introducing into practice sensitive methods for diagnosing the infection and the disease. Introducing such a vaccination would likewise represent a benefit both from the health and the economic standpoints. According to calculations, at thepresent time the annual incidence of mumps in the CSR represents a loss of national income of about Kcs 85 million (including losses due to the absence of mothers caring for the child). This means that expenditures for the introduction of a vaccination program, compared to the losses mentioned, clearly speak in favor of the measure.

In addition to the infections for which we are considering vaccinations, we must continue to devote great attention to the study of the incidence and resistance to infections against which we have been vaccinating for years, to maintain the attained level of resistance of the population to these infections also in the future. This applies specifically to scarlet fever and poliomyelitis where, according to the findings of the epidemiological surveys and further studies, vaccination will have to be complemented and adjusted as needed.

All this is possible only when the effectiveness of laboratory virological diagnostics and the centralization of certain examinations, especially immunological screenings are simultaneously intensified. This can be done, however, only by better outfitting these work centers with the needed instruments and diagnostic preparations, particularly in the Institute of Hygiene and Epidemiology. We will also have to continue to supplement the standard equipment of laboratories with modern instruments, by utilizing micromethods, dose dispensers, etc. To meet the tasks in the sector of immunological production, we will also have to supply gradually the facilities of economic production units of the Institute of Sera and Vaccines with the needed equipment so that such production will be modern, efficient and at the same time meet the required quality standards of the products.

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CZECHOSLOVAKIA

BRIEFS

DESULFURATION PROJECT--Czechoslovakia has considered two methods of removal of sulphur dioxide from flue gas at coal-fired power plants; the Soviet NIIOGAS magnesite method and the West German Bergbau-Forschung method. It has selected the Soviet method which is expected to be implemented on an experimental basis at one of the 200 megawatt blocks of the Tusimice II power plant by 1986. This experiment will be necessary prior to installation of desulfuration equipment at two coal-fired power stations in North Bohemia Kraj by 1990. [Prague CHEMICKE LISTY in Czech Apr 80 No 4 p 359]

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GERMAN DEMOCRATIC REPUBLIC

MORAL, ETHICAL ASPECTS OF GENETIC ENGINEERING EVALUATED

East Berlin WISSENSCHAFT UND FORTSCHRITT in German Vol 30 No 5, May 80, pp 188-191

[Article by Prof Dr Erhard Geissler, Central Institute for Molecular Biology, GDR Academy of Sciences, Berlin-Buch; Prof Dr Helga E Hoerz, Section for Marxist-Leninist Philosophy, Humboldt University, Berlin, and Prof Dr Herbert Hoerz, Central Institute for Philosophy, GDR Academy of Sciences, Berlin: "Interference with Man's Heredity?"]

[Text] The very rapid development of molecular and cell genetics, and in particular the methods used by genetic engineers, have marked the start of a new qualitative stage in the discussions concerning possible interference with man's heredity. While these questions--raised primarily by the notoriously famous 1962 Ciba symposium, "Man and His Future," where (following the rules of conferences dealing with concepts) no subject was taboo, although many were labeled as not serious in the western press--have been discussed around conference tables for almost two decades, experts have determined, among others at the Seventh Kuehlungsborn Colloquium on philosophical and ethical problems in modern biosciences,1 which took place in 1979, that systematic experiments aimed at interfering with man's heredity are now possible.

The moral and ethical evaluation of this type of research has given rise to many discussions--among others at the Fifth Congress on Philosophy of the GDR, at the end of last year. The following article presents our point of view on these questions.* It is based on the principle

* This article is based on a lecture presented at the Conference on "Social Effectiveness of Natural Sciences, Mathematics and Technological Sciences in the 19th and 20th Centuries" (Berlin, 23-25 January 1980), adapted for publication in WISSENSCHAFT UND FORTSCHRITT.

that we can comply with the requirements of humanity without designing social norms so narrow that they would hinder research beneficial to man.

With the discovery of important molecular structures and processes, biology is increasingly becoming a fundament of biotechnologies. It also involves potential dangers for man. In principle, we want to state the following:

1. In the /social/ [in italics] development of man, there are /more genetic biological possibilities/ [in italics] than have been realized until now under concrete social conditions. Against the genetic improvement of man as a social being, there is the often confirmed experience that a purposeful change in /one/ [in italics] element of a system cannot materially change this system. The relation between the law of the system and the behavior of its elements must be reckoned with, just as the existence of objective accidents which prevent us from attaining all the possible ends we had contemplated.

The social nature of man calls for social activities. These, however, also include genetic biological measures and all their consequences. Just as we influence biological mechanisms with antibiotics, hormones, vaccines, etc., just as contraception has an effect on population structure and demography, genetic measures can lead to an improvement in man's way of life.

2. Man's freedom also includes the freedom to control his own behavior to a large extent. A humane science will help man assimilate reality consciously and actively and change it, it opens up possibilities to improve man's conditions of existence. In a humane sense, however, conditions of existence are better only when they increase the freedom of the individual.

3. From a philosophical and ethical point of view, experiments involving man require the proof that they are necessary to fulfil a humane task, that the risk has been minimized, and that those involved can decide freely with full knowledge of the risk incurred. The responsibility of the scientist is to examine the possible consequences of his research, to prevent consequences harmful to man, to promote those that are useful, to make knowledgeable and humane decisions, and to evaluate and, if need be, correct his actions.

It is on the basis of these considerations that we should examine the possibility of interfering with man's genetic material.

Already a Possibility: Gene Therapy

Thanks to the very rapid development of gene technology and other molecular and cytogenetic techniques,[1] it has now become possible, among others:

- to introduce genetic information not only into bacteria, but also into isolated animal cells, with isolated DNA;

- to implant selected genes in mammal cells, using appropriate carriers, for instance viruses or plasmids,[2] and to demonstrate their biological activity there;[1]

- to eliminate a potentially lethal genetic defect which, at least now, cannot be removed in any other way,[1] by an artificial infection of human cells (for the time being in cell cultures) with a given virus.

In theory, gene therapy for selected gene-linked diseases is possible in principle. This is true above all of diseases which--like phenylketonuria[3]--result from the simultaneous occurrence of two abnormal recessive alleles. In these cases, it is enough to introduce /one/ [in italics] normal allele, and to make sure that the information he carries is realized. We have chosen here the example of phenylketonuria on purpose, although many will argue that this disease is just one of the genetic defects which do not need therapeutic treatment because, in its case, early diagnosis and treatment of the symptoms are possible. However, this treatment does not work in all cases, or not always to the extent desired;[1] in addition, it is expensive and very inconvenient.[3]

We are of course fully aware that numerous fundamental questions and procedural details will have to be clarified before genetic therapeutic methods can be used in practice, and this is probably not for today or tomorrow. Nevertheless, attempts have already been made a few years ago to cure argininemia in man (a condition resulting from an arginase deficiency) through gene therapy. It was known that Shope's papilloma virus will code a viral arginase which, for instance, is synthetized in the organism of laboratory workers unknowingly infected by the virus, and also in cultures of virus-infected human cells. Therefore, sick children were given injections of Shope's papilloma virus--however without any therapeutic effect. Presumably, the virus preparation used contained inactive viruses. These attempts were then interrupted because the parents of the children involved objected.

Most scientists are of the opinion that such methods and, above all, the preliminary experimental work involved, are not objectionable, either from a bioscientific point of view, or for philosophical, or ethical and moral reasons--especially when what is at stake is gene therapy for diseases which cannot be controlled in other ways.

Not Unconceivable: Eugenic Gene Therapy

The gene therapy discussed is a euphenic measure; i.e., the manifestation of the symptoms is prevented, but the patient involved retains his genetic defect and transmits it to his offspring with his germ cells. Of course, the offspring will be clinically sick only if the patient's partner is a carrier of the same defective recessive allele; nevertheless, we already know over 1,000 such recessive hereditary diseases.

This is why an individual form of eugenic gene therapy--i.e. one in which no demographic genetic effect is aimed at, but which is only intended to enable carriers of harmful alleles to conceive healthy children--is indicated only in rare exceptional cases, for instance when two phenylketonuria patients wish to have a child of their own. Such a eugenic gene therapy, therefore, would answer not so much a social, than a rare individual need.

Considering the abundance of pressing bioscientific tasks, we do not think that we would be justified, at present, in undertaking investigations which would help so few people.

In our reflections, however, we are much less concerned with the feasibility of certain given operations as with their evaluation--with the question of whether research aimed at modifying man's genetic material is humane and therefore legitimate, or inhumane, and therefore taboo.

In this connection, we would like to point out that similar experiments are of great practical importance in livestock raising and animal production, and are being prepared today, if not already carried out here and there. If it works for cattle or hogs, in principle it should also work for man--at least as far as methods are concerned.

All this, of course, presupposes extensive experimenting on the subject. In addition, not only will experiments on animals be necessary, but also experiments with human germ cells--in the laboratory only, of course, and without the intention of subsequently implanting these manipulated egg cells, or their early division stages, in a female organism. In our opinion--and the majority of our knowledgeable colleagues in the GDR probably share that opinion--it should be permitted in principle, at least in the laboratory, to experiment also with human germ cells once scientific and social objectives are sufficiently documented. Eugenic therapy focussing on the individual and his offspring would be impossible from the start without such experiments.

If we can genetically reprogram human body cells (at least for medical reasons), why should we not also attempt to carry out similar laboratory experiments on human germ cells--if only to find out if genetic interventions have any chance of success?

Besides, experiments on human germ cells have been carried out in practice for years--also in our country. These are experiments, for instance, on the separation of sperm into male and female sex determining cells, the results of which are important for animal production but, in principle, can also be used for man, and are easier to perform with human than with animal sperm. To our knowledge, no ethical objections against such experiments have yet been raised.

In addition, mutagenicity studies on human germ cells are already being performed in foreign occidental countries. In the end, this is also the only way to make a realistic evaluation of the mutagenic effect of physical and chemical agents. Thus, a discussion among experts concerning the detection of potential mutagens harmful to man (which took place last year in Cold Spring Harbor) has shown that, among others, experiments are being made in which male germ cells are treated in vitro with a suspected mutagen.[6] Also, sperm from a man who had inadvertently been exposed to high mutagen doses has also been investigated. Such sperms are used to fertilize hamster egg cells. Pronuclei are formed, and we are told that the interspecific hybrids obtained even survive one or two divisions, so that two-celled and four-celled embryos are obtained. It is then possible to observe directly any existing damages to the human chromosomes.

Apart from the eugenic gene therapy discussed, there already exist today experiments which are socially quite necessary and morally and ethically unquestionable, in which human germ cells are used as a biological object. For all that, there is nothing objectionable, in our opinion, in fertilizing hamster egg cells with human sperm, i.e. in producing interspecific hybrids. The objective here is not to breed some sort of man-hamster hybrid (which, anyhow, is probably impossible), but to test the sensitivity of man's genetic material to external factors by a cleverly chosen method! In addition, we have known for a long time that, in laboratories all over the world, human body cells have been fused with those of all possible sorts of other organisms (including that of the mosquito), and the resulting hybrids used to investigate problems of gene localization, of cancer genesis, of virus therapy, etc.

For all these reasons, we believe that laboratory experiments with such biological material, including human germ cells, can serve perfectly humane objectives and should not be made taboo!

Conceivable, But Not Yet Possible: Controlled Biological Evolution of Man

If it is conceivable that, one day, man will interfere with his heredity to repair important defects, then, in this connection, we must also consider whether man could not one day use these methods to lead his own biological evolution in a given direction.

When, occasionally, people demand that we do not use human germ cells for genetic experiments because, in principle, man cannot be improved biologically or genetically,[4] what is meant by that should be stated more clearly.

But we would like to make clear from the start, first, that the problems involved here cannot find a practical solution today or tomorrow, in spite of the very rapid development of gene engineering, and that we do not have to start arguing now about whether they are morally justifiable or warrantable; because, if such experiments can actually be carried out, both humane requirements and moral standards will have to be defined more precisely. But

already today--and unfortunately sometimes openly--specters and distorted representations are depicted to arouse the fear of a misuse of genetics, which then are sometimes excessively publicized by journalists and writers who are technically poorly informed but can express themselves with power.

Second, the question is not to interfere with man's heredity to overcome problems which can and must be solved socially. And, third, we hardly need to mention, in this connection, that all inhumane and improper interference with man's heredity must be condemned just as strongly as all other crimes against man.

However, we believe that genetic engineering methods can solve any problems which cannot be solved socially. For instance, it is conceivable that we will attempt to reduce the rate of spontaneous mutations, or the rate of spontaneous cancer occurrence by interfering with human heredity. These thoughts were already expressed in 1972.[5] That at least one of these proposals is not fully unrealistic became apparent in 1979 when H. L. Robinson, at the Cold Spring Harbor Symposium, under stormy applause from the audience, presented a white Leghorn hen which had been freed from all ten known endogenous (tumor) viruses through a lengthy genetic cross-breeding program. This result shows that at least one hen can live and be raised without any cancer gene. Whether it will remain cancer-free all its life remains to be seen. And, naturally, it is still a very long way before similar experiments are made on human cell cultures, or even only on animal models somewhat more similar to man than a hen--although this is already feasible, in principle, with the methods of genetic engineering.

It should be clear, therefore, that experiments are quite conceivable, in which we would examine whether one day it might be possible to improve man's typical individuality entirely, even genetically and biologically--primarily by removing the internal causes and the conditions conducive to disease. We would like to point out here, right from the start, that ethical and moral considerations prompt us to accept as improvements only those genetic and biological modifications which increase the potential of the individual, and therefore his freedom. These could be measures which improve his resistance to diseases or his adaptability to unfavorable environmental conditions, but in no case those which would amount to breeding specialists (for instance, mathematicians, musicians, astronauts, divers, high-performance athletes) or the like--quite apart from the fact that we do not have the slightest experimental starting point for that. That means, of course, that overall social conditions all over the world will have been shaped so as to enable a full development of man's positive genetic traits.

But why should we not start experimental investigations already now, for instance in a laboratory, to determine whether the sensitivity of human cells to cancer-causing chemical or physical irritants, or to tumor viruses can be altered, whether such modifications are genetically permanent, and whether this can be reproduced on other human cells using methods of genetic engineering? For instance, it is actually possible to isolate variants of the human Hela cell line which show increased resistance.

We do not believe that the interventions in man's heredity which we have just mentioned will reduce the multiplicity of human traits which are always further enhanced by social development. On the contrary: we should not retain any harmful allele in the human genetic pool if realistic alternatives are available.

Humanity and dialectic require that we examine all possibilities which could lead to an improvement in man's assimilation of reality through genetic and biological modifications. Here too, improving our control over chance by knowing the laws is the foundation for an increased freedom. All measures which violate the integrity of the person--i.e. its potential for making free and responsible decisions (including those concerning itw own body)--are morally condemnable.

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