

STATUS

of

Tuberculosis

CONFERENCE REPORT

The present status of tuberculosis, responsible for 100 million days of illness annually in the United States, was discussed at the 1959 meetings of the National Tuberculosis Association, the American Trudeau Society, and the National Conference of Tuberculosis Workers. Approximately 3,000 physicians, scientists, public health officials, nurses, and executives and volunteers of State and local tuberculosis associations attended the May 24-29 meetings in Chicago.

Airborne Transmission

Airborne droplet nuclei were the source of infection for 71 guinea pigs breathing air exhausted from a tuberculosis ward, and 21 of these infections were traced to specific patients, reported researchers in a cooperative study by the Johns Hopkins University School of Hygiene and Public Health, the Veterans Administration, and the Maryland Tuberculosis Association.

At the VA Hospital in Baltimore, Md., a colony of approximately 160 guinea pigs breathed air exhausted from a 6-bed ward over the 24-month study period. When bacilli from 22 infected animals, cultured for drug susceptibilities, were compared with cultures of bacilli from the patients' sputums, it was apparent that two patients had produced 19 of the 22 infections. The one drug-susceptible organism probably came from a patient receiving initial treatment.

The researchers suggested that highly positive sputum and absence of effective therapy are important in determining a patient's infectivity as well as a natural mechanism for atomizing the infectious material and the continued viability and infectivity of the organism after becoming airborne. They felt that the study not only strengthened the case for airborne transmission but indicated an experimental tool for the study of the infectivity of human tuberculosis.

The investigators were Dr. R. L. Riley, C. C.

Mills, Dr. W. Nyka, N. Weinstock, Dr. P. B. Storey, Dr. L. U. Sultan, Dr. M. C. Riley, and W. F. Wells, of the Johns Hopkins University School of Hygiene and Public Health and the Veterans Administration Hospital, Baltimore.

Disinfecting the upper air of rooms with ultraviolet light appeared to block transmission of the influenza virus, according to Dr. Ross L. McLean, now at Emory University School of Medicine, Atlanta, Ga.

At the Veterans Administration Hospital in Livermore, Calif., one unit with complete facilities for the care of patients was irradiated. Serologic samples were obtained from all hospital patients and personnel in July 1957, November 1957, and March 1958. Practically none of the patients or personnel had been vaccinated against influenza. Staff members were exposed to the respiratory infections prevalent in the community.

Between July 28, 1957, and March 15, 1958, only 4 (2 percent) of 209 patients in irradiated rooms were infected; 75 (19 percent) of 396 patients in nonirradiated rooms were infected; and 92 (18 percent) of 511 hospital personnel were infected.

The differences in the prevalence of infection, as determined serologically, strongly suggest that an important mechanism of transmission of epidemic influenza was significantly blocked, McLean stated.

Since the ultraviolet radiation was designed to disinfect chiefly the truly airborne particles, these findings suggest that an airborne mechanism is the principal mode of transmission of epidemic influenza.

Race and Environment

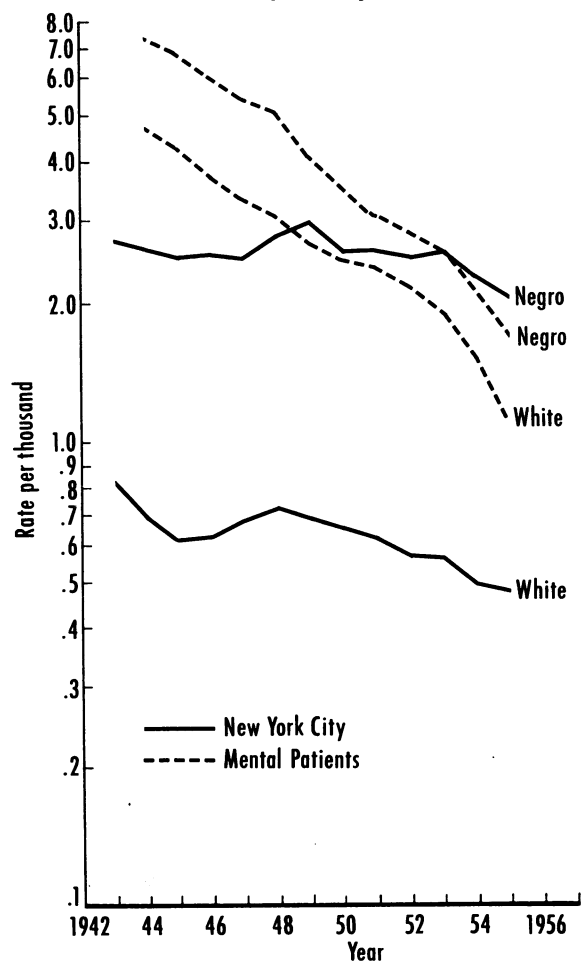
In a similar environment the response to tuberculosis of the Negro and white is similar, and racial factors probably play a minor role in producing differences in tuberculosis morbidity and mortality, concluded Dr. Julius Katz and Solomon Kunofsky, division of tuberculosis control, New York State Department of Health, Albany.

They studied white and Negro patients in hospitals of the New York State Department of Mental Hygiene, where living conditions are identical for both races. Between 1942 and

1955, the incidence of tuberculosis among the Negro patients exceeded the rate among the whites by about 50 percent. In New York City during the same period, the rate of development of tuberculosis was four times as high among Negroes as among whites (see chart). The incidence decreased at approximately the same rate for the mental patients of both groups, so that by 1955 the age-adjusted rate among Negroes was only 8 percent higher than among whites.

Even before the development of antimicrobial therapy not only was the differential between the groups reduced by similar environmental conditions but the Negroes' survival was about equal to the whites'.

Tuberculosis case-reporting rates in New York City and tuberculosis incidence rates in New York State mental hospitals by race, 1942-56



Dr. W. A. Paddon, of the Grenfell Mission Hospital, North West River, Labrador, Canada, found no special susceptibility to tuberculosis among the Labrador Eskimos and Indians.

He attributed their high tuberculosis death rate to inadequate control measures and environmental factors such as overcrowded homes, poverty, poor hygiene, and malnutrition. He described how epidemics of other diseases propagate tuberculosis and said that the effect of exposure of a community to any infectious disease will be determined by its past experience with the disease and not by the racial composition of its population.

In northern Labrador the tuberculosis death rate was cut from 300 to 30 per 100,000 from 1947 to 1956, and the percentage of X-ray films showing active or probably active lesions dropped from 20 to less than 4 percent. People originally reluctant to undergo treatment were won over once they were shown that tuberculosis could be arrested. Those spreading the disease, or likely to do so, were identified through yearly surveys done during visits by a small hospital ship with portable X-ray equipment and on followup visits by dogsled.

Hospitalization, drugs, surgery, and programs of rehabilitation and information were the major methods of control. With modern aircraft and radio communication now available, patients can be evacuated quickly to improved hospital facilities. BCG vaccination is being tried, but Paddon noted that as a result, the tuberculin test will lose its considerable diagnostic value as well as its value in studying tuberculosis in a community.

Legal Detention

How patients detained under court order are cared for in the security division of the Ohio Tuberculosis Hospital was described by Dr. Robert H. Browning, director of the hospital, and Dr. Irving Pine, Columbus Psychiatric Institute and Hospital.

Although the Columbus hospital serves a population of 6.3 million, the 17-bed division is adequate because the existence of a detention facility has prompted patients to accept care voluntarily in their home counties. Also there is a high rate of transfers from the detention

division to open wards, and some counties refuse to use the security division.

The hospital's policy is to provide recalcitrant patients with treatment and permit them activities as similar as possible to those of other patients, the authors said. The staff is urged to adopt a calm, firm approach rather than a punitive one. Differences in privileges for those in the security division include the denial of money and street clothes, censorship of mail and packages for contraband, restricted visiting hours, and being locked in their rooms at night and during rest hours. Two employees are always on duty when the patients are not locked in.

Patients who are beyond persuasion or who continue to be abusive or threatening are left alone for 24 or 48 hours in a security room with limited equipment, and often become cooperative, according to Browning and Pine. Patients are transferred to open wards when they show understanding of their situation and behave reasonably well. A committee whose members include several disciplines meets weekly to decide on transfers and other matters.

Analysis of the 50 patients cared for by the division in its 18-month existence indicates that most of them, while generally becoming more cooperative, do not behave normally. They remain dissatisfied and have varying amounts of subsurface tension.

The psychiatric resident and the consultant psychiatrist of the hospital classified the patients not only to identify various syndromes and disorders but also to study the relation of recalcitrant status to psychiatric appraisal.

The largest group of patients, 16, were alcoholics, and 7 were in an acute alcoholic episode at the time of admission. All had a personality disorder in addition to alcoholism. Many became almost model patients because the hospital filled their dependency needs.

Twelve eluded strict psychiatric classification and were described as marginal personalities. They had borderline or low intelligence quotients, seemed inadequate and immature, and had made marginal social adjustments in their jobs and families. It seemed likely they resisted hospitalization because they felt they could not adjust in the hospital.

Seven had personality disorders. Their re-

sistance to the hospital seemed to be based on a conflict produced by the family or the social milieu so that they had to refuse the need for hospitalization or risk being uprooted from a tenuous position.

The remaining patients fell into these categories: organic brain syndrome, 2; psychosis with organic brain syndrome, 2; chronic paranoid schizophrenia, 3; mentally deficient, 1; and miscellaneous unclassifiable personal problems, 7.

Casefinding

Active primary tuberculosis was found in 158 children whose disease would have been missed without the thorough checking of the family contact investigation service of the Houston Children's Tuberculosis Clinic, stated Dr. Katharine H. K. Hsu, Baylor University College of Medicine, Houston, Tex. The 158 children included 29 with positive cultures for *Mycobacterium tuberculosis*, 66 with X-ray evidence of tuberculosis, 32 whose tuberculin reactions were converted to positive within 1 to 5 months, and 31 (under 36 months of age) with infections considered active because of a positive tuberculin reaction. None showed any signs of ill health which would have prompted parents to seek medical examinations for these children.

These cases were found in 1957-58 on examination of 825 children contacts of 129 family groups. Contact investigation began when a child in the family was diagnosed as having active primary tuberculosis. The immediate family as well as close contact families were examined. Adults were screened with 70-mm. microfilms. Among 582 adults screened, 26 cases of active pulmonary tuberculosis were found. Children were tuberculin tested. All positive tuberculin reactors were given thorough clinical and bacteriological examinations. Negative reactors were given periodic tests to detect conversion of tuberculin reaction.

Intensifying contact investigation and giving proper attention to childhood tuberculosis will enhance greatly tuberculosis control, Dr. Hsu said. This can be done successfully with an organized effort of local health agencies and proper education of patients' families.

The family contact investigation service, which operates in cooperation with existing public health facilities in Houston and Harris County, was established with grants from national, State, and local tuberculosis associations. Its annual operating expenses amount to \$8,650.

If tuberculin tests are substituted for X-rays of pregnant patients, significant nontuberculous disease in nonreactors may be missed, affirmed Dr. Dorothea D. Glass, Woman's Medical College of Pennsylvania, Philadelphia. To determine whether the tuberculin tests were an adequate replacement for photofluorograms, both diagnostic aids were employed with obstetrical patients at two Philadelphia hospitals.

In a 6-month period at Woman's College Hospital, no significant lesions were found among tuberculin reactors or nonreactors, although 20 percent of the 308 women participating reacted to first strength PPD and 13 percent to both first and intermediate strength doses. One patient failed to report for her X-ray, and 13 percent failed to complete tuberculin tests.

The absence of lesions in this group was attributed to the relatively high socioeconomic level of the clinic patients. Therefore, the study was extended to 630 patients of Blockley Division of Philadelphia General Hospital. They were primarily women on public assistance, among whom, it was felt, would be a higher percentage of tuberculin reactors and some clinical tuberculosis. The age and race composition of both hospital populations was similar; 90 percent were Negroes between 15 and 35 years of age.

These women were tested on admission, most often immediately postpartum. Of the 432 women whose tests were read, 23 percent reacted to first-strength PPD. Thirty-one percent were discharged before the test could be read; the average hospital stay is 2 or 3 days, despite the hospital policy of a 5-day postpartum stay. Only one patient at Woman's College Hospital did not have an X-ray taken; 19 percent of the Blockley patients had no chest X-rays during their hospital stay.

X-ray findings were significant for two asymptomatic nonreactors; one had sarcoidosis, the other a congenital heart lesion. No previously unsuspected active tuberculosis was found.

Before relinquishing the gains available through routine X-rays of pregnant women, consideration should be given to the probability that the return rate for reading tuberculin tests may be as low as 50 percent, and significant previously unsuspected nontuberculous disease may be missed if only reactors receive X-rays, maintained Dr. Glass.

Co-authors were Dr. Fruma W. Ginsburgh, Dr. Katharine R. Boucot, Marie Capitanio, and Leonora Gray, Woman's Medical College of Pennsylvania, and Bernard Broad, Temple University School of Medicine, Philadelphia.

BCG Vaccination

A 20-year study showed a statistically significant difference in the number of cases of tuberculosis among infants who received BCG vaccinations and control subjects, reported Dr. Sol R. Rosenthal, director, tuberculosis prevention research, Chicago Municipal Tuberculosis Sanitarium; medical director, Research Foundation, Cook County Hospital; and director of the Institution for Tuberculosis Research, University of Illinois, Chicago.

Among the 1,665 control subjects there were 57 cases; among the 1,716 infants vaccinated, 16 cases ($\chi^2=24.62$; $P<0.001$). The study included 3,381 infants born at Cook County Hospital, Chicago, from 1937 to 1948. All were from nontuberculous households in areas with high tuberculosis incidence.

The followup items, continued until 1957, included birth weight, sex, race, area of birth, extent of contact with tuberculosis, examinations in the clinic, X-rays, tuberculin tests, and tuberculin conversion rates. A total of 80 items were card cataloged, tabulated, and submitted for statistical analysis.

The overall comparability of the vaccinated and the control subjects appears adequate in most respects, and statistically significant differences have been identified for consideration and assessment for medical importance, stated the statistical analyst, Dr. H. C. Batson, professor of biostatistics, public health department, University of Illinois.

Other co-authors were Dr. Erhard Loewinsohn, Dr. Mary L. Graham, and Margaret G. Thorne of Chicago Municipal Tuberculosis

Sanitarium, and Dorothy Liveright and Violet Johnson, Institution for Tuberculosis Research, University of Illinois, Chicago.

Reinfection

Age, sex, and lack of exposure to a fresh source were factors indicating an endogenous origin for reinfection in a study of 113 patients with chronic pulmonary tuberculosis by Bellevue Medical Center researchers. The patients, all with previous primary infections diagnosed during the pediatric age range, were seen at the chest clinic of the children's medical service of Bellevue between 1930 and 1956.

Risk of developing chronic pulmonary tuberculosis is greatest in adolescence and in children who had primary tuberculosis after 6 years of age. The rate for girls was higher than that for boys. Chronic pulmonary tuberculosis was first diagnosed within 2 years of menarche for 40 percent of the girls.

Histories of 71 patients indicated exposure to a case of tuberculosis at the time the primary infection was diagnosed; only 7 histories indicated renewed exposure when the chronic pulmonary disease was diagnosed. In the majority of cases, no anatomic relationship between the site of the primary and the chronic pulmonary tuberculosis could be established. The chronic disease was discovered through routine X-ray of two-thirds of the patients.

Following is the present status of the 113 patients:

	<i>Male</i>	<i>Female</i>
Followed to 25 years of age.....	20	34
Followed to 21-24 years of age.....	6	6
Still under 21 years of age.....	2	6
Tuberculosis deaths.....	8	24
Nontuberculosis deaths.....	1	1
Lost to followup.....	0	5
	—	—
Total	37	76

The death rate from chronic pulmonary tuberculosis was 21.6 percent for the boys and 31.6 percent for the girls. Of the 32 deaths, 22 occurred in patients who were first diagnosed with minimal disease. None received specific therapy during the primary phase. Only 20 patients received antimicrobial therapy for chronic pulmonary tuberculosis, and in only

three instances was treatment given within a year after the diagnosis was established.

The findings indicate the importance of keeping children with primary tuberculosis under long-term observation to gain information about the pattern of later development of chronic pulmonary tuberculosis, stated investigators Dr. Edith M. Lincoln, adjunct professor of pediatrics; Dr. Lilian A. Gilbert, associate clinical professor of pediatrics; and Dr. Soledad M. Morales, instructor in pediatrics. All are with the New York University, Bellevue Medical Center, New York City.

No relapses after 5 years occurred among 83 percent of 669 patients with negative sputums at least 6 months prior to discharge, reported Dr. Thomas F. Sheehy, medical director, Firland Sanatorium, Seattle, Wash. Relapses occurred in 11.2 percent of the original sample, 9.6 percent in the first year. There were 42 deaths from nontuberculous causes and 3 deaths from tuberculosis in patients whose disease had relapsed.

The only criteria for selection were sputum negativity for 6 months and live discharge. Status was determined as of December 31 of each year. Relapse was defined as the occurrence of positive bacteriology on a single or repeated occasion either by smear, culture, or X-ray worsening not explainable by some other acute identifiable cause.

Sheehy found that relapse occurs more commonly in middle-aged males with far advanced, cavitory disease with a secondary diagnosis of alcoholism who leave the hospital against advice. It is least common among young females with noncavitory disease who have undergone resection. Apparently, longer periods of chemotherapy prior to discharge and prior to final determination of status exert a favorable prognostic outlook.

New Techniques

Promising new techniques, a diagnostic blood test for tuberculosis and two rapid, simple methods of detecting viable tubercle bacilli in sputum, were described by several investigators.

Dr. Robert C. Parlett and Dr. Guy P. Youmans, Northwestern University School of Med-

icine, developed a serum gel diffusion test. An agar suspension of tubercle antigen at the bottom of the test tube with a covering layer of pure agar receives the patient's serum. Acid-fast antibodies diffuse toward the center of the tube, forming a precipitation ring when fixed by the test antigen.

In serums from 465 nontuberculous persons, 97.9 percent possessed no antibody to mycobacterial antigens by this test, and only 2.1 percent of the reactions were false positives. Gel diffusion tests were positive in 84.2 percent of serum specimens from 380 patients with far advanced active pulmonary tuberculosis, in 73.5 percent of 245 patients with moderately advanced active pulmonary tuberculosis, and in 57.8 percent of 128 patients with minimally active disease. The department of microbiology of the medical school and 20 hospitals and sanatoriums cooperated in extensive double blind field trials to determine the sensitivity, reliability, and limitations of the diagnostic test.

Reporting on the use of the test at the Suburban Cook County Tuberculosis Hospital-Sanitarium, Hinsdale, Ill., Dr. William Lester stated that serums from 188 of 193 patients with bacteriologically confirmed disease were positive. He also said that all test results were positive in specimens from 28 patients with photochromogenic infections and in 78 percent of the specimens from patients with scotochromogenic cultures.

A mouse test to detect tubercle bacilli in sputum and gastric lavage specimens failed only once in 362 clinical trials and is much faster and more sensitive than conventional procedures, according to Dr. David Gale, Elizabeth A. Lockhart, and Alexander Jack, Veterans Administration Hospital, Albuquerque, N. Mex.

In the test they devised, a portion of the concentrate from the specimens was injected intraperitoneally into four mice, together with hog gastric mucin. The animals were sacrificed at 5, 10, 15, and 20 days; gross pathological changes were noted; and impression smears of splenic tissue were studied microscopically for acidfast bacilli, with each slide taking 10 minutes.

The study group consisted of 188 tuberculous patients in various stages of the disease, 55 pa-

tients admitted to medical wards, and 119 outpatients. Specimens from 74 patients were positive by both mouse test and by culture. All these patients were positive by mouse test in 15 days, compared with 52 days required by the conventional technique; 97 percent were positive in 10 days, and 85 percent in 5 days.

The mouse test also detected acidfast organisms in specimens from 64 patients whose cultures were negative. Half of these patients had positive cultures at some time during the previous year.

A new 5-day slide culture technique tested on 100 sputum samples had a 98-percent success rate compared with a rate of 69 percent when the conventional method was used, reported a team of Massachusetts investigators. For the test the researchers developed a new mucolytic and proteolytic enzyme which liquefies sputum more efficiently and is less toxic to acidfast organisms. They eliminated centrifugation and collected the acidfast micro-organisms on glass coverslips treated with silicone, a substance to which the acidfast micro-organisms have an affinity. After a 5-day incubation period the coverslip samples are treated with a modified Hanks' differentiating acidfast stain, permitting superior microcolonial differentiation of acidfast micro-organisms even under low magnification. The developers of the test are James B. Gray, State Public Health Department Laboratory, Boston; Dr. Sanford Chodosh, Lung Station (Tufts), Boston City Hospital; and Edith Reinisch, Westfield State Sanatorium, Westfield, Mass.

Other Lung Diseases

Despite thorough safety precautions, laboratory personnel working with the causative agents of psittacosis and Q fever sometimes become infected, stated a Johns Hopkins University School of Medicine researcher, Dr. Allan H. Levy.

He reported on 12 cases of psittacosis and 27 cases of Q fever which occurred sporadically in the microbiological laboratories at Fort Detrick, Md. Eleven of the twelve patients with psittacosis had worked directly with the virus, but only two had been aware of a laboratory accident.

The illnesses were somewhat milder than naturally acquired infections. Eight patients had an abrupt onset with malaise, headache, chills, and fever; four had an insidious onset. Cough was common but often did not develop until the second week of illness. Rales were heard early in the course of illness of three patients, but did not develop until the fourth or fifth day of hospitalization in six others. X-ray findings of pulmonary infiltration were noted in the lower or middle lobes of 10 patients and the upper lobes of 2. Nine patients were treated with one of the tetracyclines, chloramphenicol, or penicillin, and all responded promptly.

Only 18 of the 27 patients with Q fever worked directly with *Coxiella burnetii*, although several others were infected while in areas adjacent to laboratories. In four, the source of infection remained obscure. None of the illnesses was severe, and only 21 of the 27 required hospitalization.

Although most patients had been vaccinated with both Q fever and psittacosis vaccines, complement-fixing antibody titers after infection were higher and persisted longer than those resulting from immunization. It was not possible to determine if the large proportion of mild illnesses was the result of prior immunization or the mode of infection or the result of effective case detection through continual surveillance of a closed population.

Co-authors were Dr. Edward W. Hook and Dr. Robert R. Wagner, Johns Hopkins University School of Medicine.

Several attitudes toward the relationship between smoking and lung cancer prevail, stated Dr. Dean F. Davies, administrator for research on lung cancer, American Cancer Society, New York City. They can be categorized on five decision levels—intuition, clinical judgment, epidemiological evidence, pathogenetic evidence, and “proof positive.” The present status of knowledge falls short of definitive proof, but the evidence is sufficiently impressive to satisfy most observers.

Although the condensates derived from tobacco smoke and atmospheric pollutants produce cancer on skins of selected strains of animals, invasive epidermoid lung cancers have not been reported following exposure to typical samples of these agents. Changes in

the epithelium of the tracheobronchial tree, including both inflammatory and proliferative reactions, following chronic exposure to cigarette smoke and simulated atmospheric pollutants have been observed.

Epidemiological data are inadequate to quantify the roles played by cigarette smoke and atmospheric pollution in the causation of lung cancer. For future research it would be desirable to continue efforts to produce epidermoid lung cancer experimentally in animals by these agents, he said. Either on human or

other animal populations it would then be desirable to study host factors, including genetic, immunological, and endocrinological influences, as well as history of previous disease, congenital conditions, and psychological factors.

The carcinogenicity of each fraction of tobacco smoke condensate should be tested for the lung as has been done for the skin. The identification of noncarcinogenic substances from both sources and a study of their contribution to proliferative changes in bronchial epithelium also require close attention.

Personnel Announcements

Dr. Morris Schaeffer, noted virologist, resigned from the Public Health Service June 30, 1959, to become director of the bureau of laboratories in the New York City Health Department. He has been chief of the Virus and Rickettsia Section, Laboratory Branch, Communicable Disease Center, Montgomery, Ala., since 1949.

Dr. Schaeffer, who has been active particularly in the fields of poliomyelitis and influenza, will also be on the staff of the New York City Public Health Research Institute and professor of medicine at the New York University-Bellevue Medical Center. Besides developing an outstanding scientific staff, he directed training courses in virology and rickettsiology which attracted large numbers of students from around the world.

Dr. Robert Dean Wright has been appointed to the new post of assistant director for medical and health activities of the Office of Vocational Rehabilitation. A commissioned officer of the Public Health Service since 1938, Dr. Wright was detailed from the position of deputy regional medical director and general

health services director at Charlottesville, Va., a post he occupied for 21½ years. At the same time he served as clinical professor of preventive medicine at the University of Virginia. Previously, he founded the University's department of preventive medicine and served 6 years as chairman of the department.

Another appointment in the Office of Vocational Rehabilitation brought Dr. Frank H. Krusen, founder and senior consultant of the Mayo Clinic's section of physical medicine, to the post of special assistant to the director for health and medical affairs. He is on leave from the Clinic.

Dr. Donald Roger Chadwick, a career medical officer of the Public Health Service, has been named secretary of the Federal Radiation Council, on detail from the position of chief of the Program Operations Branch, Division of Radiological Health, Public Health Service, which he has held since July 1, 1958. Before then, he was acting chief of the division for 4 months, having been liaison officer for radiation in the Office of the Surgeon General.