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IN MEMORIAM



Carroll Edwards Palmer
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Carroll Edwards Palmer, dean of the world's tuberculosis epidemiologists, died suddenly on January 8, 1972. At the time of his death, he was back in Minnesota, his native state. Here, after a career marked with distinction in three major fields, he was becoming deeply involved in medical education and health services research.

He was born in Fairmont, Minnesota and completed his formal education in that

state, receiving a B.S. degree from Hamline University in 1925, and his M.A. in 1927, M.D. in 1928, and Ph.D. in 1929 from the University of Minnesota. From 1930 to 1936, he taught biostatistics at Johns Hopkins School of Hygiene and Public Health. He then went to the U.S. Public Health Service, where he spent the major portion of his career. He served first as Director of Research for the Child Hygiene Bureau;

from 1942 until his retirement in 1967, he directed the tuberculosis research program of the Service. For the next four years, he was Professor of Biostatistics at the University of California School of Public Health in Berkeley. After a second retirement, he joined the staff of the Department of Medical Statistics of the Mayo Clinic in the fall of 1971.

Carroll Palmer's pre-eminence came in part from his philosophy of public health research. He believed that effective research in this area requires integration of diverse disciplines; large numbers of subjects studied under a wide range of environmental conditions; application of statistical and epidemiological principles to the design, analysis and interpretation of studies; and redirection of emphasis and approach as the balance between agent, host and environment changes. His unswerving belief in the necessity for this approach to public health research was strengthened by his years with Lowell J. Reed and Wade Hampton Frost at Johns Hopkins. During this first phase of his career, his principal research effort was the establishment of growth patterns during childhood and the degree of variation that might be expected. Students in the public schools of Hagerstown, Maryland provided a large and broadly representative study population. Not only did the results create reliable standards for childhood growth, but these studies also involved two types of interaction between health and major social events, namely the effect of the economic depression of the 1930's on growth, and the relationship of health in childhood to future fitness for military service.

Hagerstown thus became the first of many "facilities" for Carroll Palmer's research. In his lexicon, a facility designated the kind of setting in which it is feasible to conduct effective public health research. The Hagerstown school population also furnished subjects for the pioneering studies on dental caries conducted with Dr. Henry Klein in the late 1930's and early 1940's. The DMF (decayed, missing, filled) index developed by this team has been used since

that time as the major measure of dental caries experience.

Because practical public health application was always his frame of reference, Carroll Palmer insisted at the outset that research efforts must be closely allied with operating disease control programs. He and those working with him developed many research facilities for this purpose—student nurses; Muscogee County Tuberculosis Study; Navy recruits; the International Tuberculosis Campaign; cooperating groups of hospitals and health departments; the Danish Tuberculosis Index; a large guinea pig laboratory in Chamblee, Georgia; Bethel (Alaska) Prophylaxis Study; Pamlico County, North Carolina; and many other communities.

His tuberculosis research encompassed three broad fields; diagnosis, treatment, and prevention. His interests in diagnostic procedures and their significance hark back again to his Hagerstown association, for it was there that the discrepancies between tuberculin sensitivity and pulmonary calcification, discovered by several other investigators, were confirmed. During the discussion of these findings, Carroll Palmer realized that the apparent dilemma could be resolved if tuberculin sensitivity and pulmonary calcifications could each be caused by something other than *Mycobacterium tuberculosis*. His subsequent large-scale epidemiologic studies clearly showed that pulmonary calcifications were commonly caused by histoplasmosis, a usually benign fungus infection, prevalent in some geographic areas and absent in others.

His studies on tuberculin sensitivity were worldwide in scope because of his appointment from 1949 to 1955 as Director of the Tuberculosis Research Office of the World Health Organization. Again using large numbers of subjects living in different areas and under diverse circumstances, testing with standard tuberculins in a standardized fashion, and subjecting the findings to statistical analyses, he delineated the range of tuberculin sensitivity resulting from infections with *M. tuberculosis* and demon-

strated that most weak tuberculin sensitivity must result from something else, most likely infections with atypical mycobacteria. These atypical mycobacterial infections were found to be endemic in many parts of the world, and were demonstrated to have the capability of acting as a natural vaccination against tuberculosis.

In the field of therapy, Carroll Palmer's role was limited but critically important. His insistence, in the face of considerable opposition, that the initial studies of streptomycin sponsored by the Tuberculosis Study Section of the National Institutes of Health include a controlled trial went far toward insuring that the assessment of its therapeutic value would be scientifically sound. In this way, a firm basis was established for subsequent trials of new chemotherapeutic regimens, each controlled by concurrent comparisons with the regimen found most effective by the preceding trial.

His studies on prevention involved both BCG vaccination and isoniazid prophylaxis. Research on vaccination planned and conducted under his direction involved studies on the vaccine itself, its mode of administration, and on its immediate and long range effects as an immunizing agent. By including observations on both reactors and nonreactors to tuberculin in the large controlled trials of BCG vaccination, he found that BCG could have, at best, only a limited value for tuberculosis control in countries where the risk of new infection is low. This finding enabled tuberculosis control workers to concentrate their efforts on more effective control measures.

The finding from the controlled trials of BCG vaccination and community-based studies that most tuberculosis in this country came from persons infected with tubercle bacilli some time in the past suggested to him that their treatment with isoniazid might make a major contribution to tuberculosis control. As in several other aspects of his research, this possibility was carefully tested on large numbers of guinea pigs with strict attention to scientific prin-

ciples of random allocation and "blind" observations to avoid bias. Success in the laboratory led to large and equally strictly controlled trials in humans living under widely different circumstances and conditions of exposure. Their success, in turn, has shown how the tuberculosis problem in this country could be virtually eliminated.

Following his retirement from the U.S. Public Health Service in 1967, Carroll Palmer maintained his close association with tuberculosis research but became increasingly involved in the problems of teaching public health and medical students. As he often put it, "I try to put some 'bio' in biostatistics." He did not like lecture-style classroom teaching, finding small discussion groups were much more to his taste. His collaborators benefited most from his teaching. At the completion of a project there was always a soul-searching session on "How would you do it next time?"

Among the honors that came his way, he was most pleased by honorary degrees from the University of Oslo, Norway and from his alma mater, Hamline University. He became, in 1957, the second American to receive the Weber-Parkes prize for excellence in tuberculosis from the Royal College of Physicians in England. In 1964, he received the Trudeau Medal from the National Tuberculosis Association, being the first epidemiologist to be so honored.

Neither his honors nor the obvious respect with which he was regarded all over the world distorted his sense of values. The potential usefulness of the research was what really counted, and all his staff knew they were there to get the work done in the best and most expeditious way possible. Red tape was kept to a minimum; officiousness was not tolerated. But the obvious sense of purpose and accomplishment was tempered with friendliness and inspiration, a combination that typified Carroll Palmer's successful approach to large-scale epidemiologic research.

G.W.C.