

Pathogenesis of Poliomyelitis

Reappraisal in the Light of New Data

Albert B. Sabin

The questions of special current interest in the pathogenesis of poliomyelitis are concerned with (i) the origin of virus in the alimentary tract, (ii) the source and significance of viremia, (iii) the mode of invasion of the central nervous system, and (iv) the factors which determine invasion and variations in the extent of involvement of the central nervous system. Concepts of the pathogenesis of poliomyelitis have varied and changed over the years with each new advance in our knowledge of the nature and behavior of the causative agent. Soon after the discovery of the virus, poliomyelitis was compared to meningococcic meningitis—the virus was pictured as propagating in the nasopharynx and occasionally invading the central nervous system across the hematoencephalic barrier. When experimental work indicated that polio as well as certain other neurotropic viruses had the capacity of spreading along insulated neural pathways, poliomyelitis was pictured as an infection in which the virus multiplied in the nose and spread to the central nervous system along the olfactory pathway. The experiments with the old MV strain of polio virus, which we now recognize as a strict neurotropic variant selected by repeated intracerebral passages in monkeys, and on which this concept was chiefly based, are as valid today as they ever were, but the inferences with respect to the natural disease became untenable when olfactory blockade in human beings failed to prevent poliomyelitis (1) and when the ol-

factory pathways were not found to be involved in the human disease (2, 3). In 1944, after a study of the localization of virus in human beings and in cynomolgus monkeys infected by the oral route with recently isolated virus, I proposed the following course of events as a working hypothesis of the pathogenesis of poliomyelitis: the virus entered by way of the mouth, localized, and multiplied in various levels of the alimentary tract with incidental invasion of the lymph nodes, blood, and viscera and with occasional invasion of the central nervous system along neural pathways connected with the peripheral sites of viral multiplication (4).

When it was subsequently found that virus was readily detected in the blood of monkeys, chimpanzees, and human beings in the early stages of infection (5) and that amounts of antibody, which were incapable of protecting monkeys from paralytic infection via the olfactory neural pathways, were protective in monkeys that received virus by the oral or intramuscular routes (6), Bodian interpreted the available data as indicating that the virus in the blood passed into the central nervous system across certain limited (presumably modified) vascular zones, but because of the character of the distribution of lesions in the central nervous system, he still found it necessary to assume that from the point of penetration further spread within the central nervous system occurred along specific neural pathways. When Bodian found virus in pieces of intestine containing Peyer's patches but not in adjacent pieces of ileum, he proposed that polio virus multiplies initially only in the tonsils and Peyer's patches. From these lymphatic collections, the virus was pictured as

moving outward onto the surface of the alimentary tract and inward into the blood, which distributed it to other susceptible "target organs" such as lymphatic structures, "brown fat," and the central nervous system (7).

This interpretation of the existing data has come to be regarded as the theoretical basis for explaining the ability of relatively small amounts of antibody, either passively introduced or actively induced by killed virus vaccine, to prevent invasion of the central nervous system and the resulting paralysis. If this view is correct, the effect of the presence of antibody prior to infection should be all or none with regard to involvement of the central nervous system—that is to say that, if invasion is not prevented, there should be no modifying effect on the extent of involvement leading to nonparalytic or milder paralytic forms of the disease. The observations of Francis and his associates (8), however, suggested that the incidence of nonparalytic infections of the central nervous system due to polio virus was not strikingly affected during the 1954 field trials of the Salk vaccine, and there were also indications that in general the paralytic disease was milder when it was not prevented in vaccinated individuals. Hammon and his associates (9) had previously also suggested a modifying effect of antibody when paralysis was not prevented during the field trial of gamma globulin.

Faber (10) brought forth evidence of early invasion of the regional nerve ganglia after feeding polio virus to cynomolgus monkeys, and he has maintained that polio viruses multiply only in nerve cells in monkeys and human beings. According to this view, the ingested virus is absorbed by the nerve endings of the buccopharyngeal and lower alimentary mucosa, multiplies in the neurons of the regional ganglia, and from there moves centrifugally back into the mouth and throat and sometimes also centripetally into the central nervous system. Viremia, according to Faber, is the result of the continued absorption of this excreted virus into the lymphatics of the alimentary tract with an ultimate overflow into the blood. Having demonstrated that direct inoculation of thousands of infective doses of virus into the vertebral artery produced specific lesions in the spinal cord, Faber assumes that virus which is absorbed into the blood from the alimen-

The author is professor of research pediatrics at the University of Cincinnati College of Medicine, Cincinnati, Ohio. This article is based on a paper presented at the annual meeting of the American Association of Pathologists and Bacteriologists, 27 Apr. 1956.

Pathogenesis Of Poliomyelitis Journal

Neal Nathanson



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Viral Pathogenesis and Immunity Neal Nathanson, 2007-04-04 Based on the highly successful reference work *Viral Pathogenesis* published in 1997 this concise economical version can be used both as an introductory text or for self education by medical students and biologists alike This latest edition provides a completely revised overview of the subject with new chapters on innate immunity emerging viral diseases and antiviral therapy in a format that is easy to understand without continually referring to additional information Used by the author in his graduate classes at the University of Pennsylvania it sets forth the essential principles and discusses the details of how the immune system responds to viral invasion including the treatment and prevention of infection Illustrated by pertinent examples it is one of the only books devoted exclusively to this topic Offers almost a 20% expansion over the first edition Focuses specifically on viral pathogenesis unlike other texts where only a few chapters are devoted to the topic Neal Nathanson is one of the primary authorities in the field and has authored chapters on viral pathogenesis in two of the most well known virology and microbiology titles Field's *Virology* and Topley and Wilson's *Microbiology* Now in four color throughout *New Developments in the Bioarchaeology of Care* Lorna Tilley, Alecia A. Schrenk, 2016-08-22 *New Developments in the Bioarchaeology of Care* evaluates refines and expands existing concepts and practices in the developing field of bioarchaeological research into health related care provision in the past Evidence in human remains that indicates an individual survived with or following a serious pathology suggests this person most likely received some form of care from others This observation was first made half a century ago but it is only in the last five years that health related caregiving has been accepted as a topic for bioarchaeology research In this time interest has grown exponentially A focus on care provides a dynamic framework for examining the experiences of disease and disability in the past at the level of the individual receiving care and that of the community providing it When caregiving can be identified in the archaeological record bioarchaeologists may be able to offer unique insights into aspects of past lifeways This volume represents the work of an international diverse cross disciplinary group of contributors each bringing their own particular focus style and expertise to analyzing past health related care Nineteen chapters offer content that ranges from an introduction to the basic bioarchaeology of care approach through original case studies of care provision to new theoretical perspectives in this emerging area of scholarship This book creates a synergy that challenges our thinking about past health related care behaviors and about the implications of these behaviors for understanding the social environment in which they took place **Distribution and Treatment of Infectious Diseases: Challenges for Developed and Developing Nations** Hamdar, Hiba, 2025-07-16 In our interconnected world infectious diseases pose an ever increasing threat transforming boundaries and affecting both developed and developing nations While developed countries benefit from advanced healthcare systems the rise of antibiotic resistant infections an aging population and global travel challenges persist Simultaneously developing nations face a more significant burden due to limited healthcare infrastructure poverty

and the prevalence of tropical diseases The lack of access to clean water sanitation and vaccines further compounds the challenges creating a complex tapestry of infectious disease dynamics Distribution and Treatment of Infectious Diseases Challenges for Developed and Developing Nations is a comprehensive book a beacon of knowledge and a catalyst for change it brings together esteemed scholars to form a collective of effort and knowledge sharing to unravel the intricacies of infectious diseases By addressing topics ranging from the basics of infection to the specific challenges faced by developed and developing nations the book offers a comprehensive understanding of the global situation Beyond a mere analysis this book presents actionable strategies and fosters international cooperation to combat the socio economic factors misinformation and barriers to effective treatment *Interstate Medical Journal* ,1917 The Poisoned Needle Elanor McBean,Eleanor McBean,1993-04 1957 Suppressed facts about Vaccination Contents the Poisoned Needle Smallpox Declined Before Vaccination was Enforced Vaccination hit by Doctors the History of Vaccination Cancer caused by Vaccination Syphilis and Vaccination Other Diseases A Summer Plague Tony Gould,1997-09-11 Polio often called the summer plague struck hundreds of thousands of children around the world between its emergence as an epidemic disease in 1916 to its cure in the 1950s Today images of children with crutches and leg braces or encased to their necks in iron lungs may be little more than a painful memory Yet during its height the disease induced panic on a scale reminiscent of the great plagues of history This book is the most comprehensive and compelling account of the century s polio epidemics yet written Interweaving biographical political social and medical history Tony Gould a distinguished British writer and himself a polio survivor traces the rise and fall of the epidemics and describes the individuals who were influential in its treatment and conquest He tells of Franklin D Roosevelt the most celebrated polio sufferer of all who set up his own hydrotherapy center at Warm Springs in Georgia John Enders the Nobel prizewinner who made the crucial breakthrough in the laboratory FDR s lieutenant Basil O Connor whose March of Dimes became a byword for successful fund raising Sister Elizabeth Kenny the larger than life nurse from the Australian outback who challenged medical orthodoxy and invented miracle cures and finally the scientific rivals Jonas Salk and Albert Sabin caught in a dramatic race to produce a viable vaccine Gould then examines the experience of polio survivors on both sides of the Atlantic including a moving autobiographical account of his own struggle with the disease and resulting disability Although the disease has been eliminated in the West it has not disappeared paralytic polio remains a scourge in India the Far East and parts of Africa And there are new worries that fatigue and accelerated muscular weakness a post polio syndrome has come to afflict survivors three or four decades after the initial attack Gould s powerful book published forty years after the successful trial of the Salk vaccine helps us to understand the savage and continuing impact of polio **Physicians of the Mayo Clinic and Mayo Foundation ...** Mayo Clinic,1927 *Polio Wars* Naomi Rogers,2014 A study of Australian nurse Sister Elizabeth Kenny and her efforts to have her unorthodox methods of treating polio accepted as mainstream polio care in the United States during the 1940s A case study of changing

clinical care and an examination of the hidden politics of philanthropies and medical societies *Essentials of Orthopaedics & Applied Physiotherapy - E-Book* Prakash P Kotwal,2016-10-28 *Essentials of Orthopaedics Applied Physiotherapy E Book*

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British Medical Journal ,1927 **Sister Kenny** Victor Cohn,1975 Sister Kenny was first published in 1976 Minnesota Archive Editions uses digital technology to make long unavailable books once again accessible and are published unaltered from the original University of Minnesota Press editions Sister Elizabeth Kenny the Australian born nurse is remembered by thousands of grateful parents and grandparents of young polio patients as well as others who were less personally affected as the woman who successfully fought the medical profession to win acceptance of her techniques to combat the crippling effects of this disease In this biography Victor Cohn a prize winning science writer details the life of Sister Kenny and her significant role in the history of medicine It is an inspiring story and one which will be of particular interest to those of the present generation who are engaged in the movement for women s equality Sister Kenny s struggle against the bitter opposition of many doctors to her concepts for the treatment of polio dramatized the then common attitude of male chauvinism on the part of the medical profession toward nurses The biography traces Sister Kenny s life from her birth in Australia through her early nursing career in the bush to her rise to prominence in America Much of the narrative focuses on her confrontation with the medical establishment Throughout the author writes from an objective viewpoint and in conclusion he assesses Sister Kenny s accomplishments

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