# THE CONQUEST OF PLAGUE

*A Study of the Evolution of Epidemiology*

BY

L. FABIAN HIRST, M.D. LOND.

WITH A FOREWORD BY

LIEUT.-GENERAL SIR WILLIAM MACARTHUR

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*When we survey the history of thought, and likewise the history of practice, we find that one idea after another is tried out, its limitations defined, and its core of truth elicited. . . . The proper test is not that of finality but of progress.*

A. N. WHITEHEAD (1929), *Process and Reality*, p. 19
Cambridge University Press

# FOREWORD

BY

LIEUT.-GENERAL SIR WILLIAM MACARTHUR
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THE author of this treatise, Dr. L. Fabian Hirst, can speak with authority on the subject of plague. During a period of twenty-two years he paid special attention to the disease in various parts of the Middle and Far East, particularly in Ceylon, where he began work in the newly built microbiological laboratory of Colombo in 1912. He at once undertook the systematic bacteriological examination of the city rodents and the study of their ectoparasites, i.e. two years before the first outbreak of plague there. Previously, in 1910, while Assistant Bacteriologist at University College Hospital Medical School, he had made a study of the ectoparasites of London rats in co-operation with his brother, the late Stanley Hirst, Acarinologist to the British Museum (Natural History).

Most of his researches have been concentrated on the parasitological and preventive aspects of plague. The results have appeared in some twenty publications, including papers in scientific journals, articles in the *British Encyclopaedia of Medical Practice*, and official reports. Unfortunately much matter published in Ceylon—e.g. his Memoir, *Researches on the Parasitology of Plague*, and his official Report, *The Protection of the Interior of Ceylon from Plague*—is not readily accessible to readers in Europe.

I know that Dr. Hirst has always taken particular pains to keep in touch with other plague workers. As a delegate to scientific conferences in India, a frequent visitor to laboratories in India, Burma, and Europe, and as a member of the League of Nations Expert Commission on Plague Research he has been able to make personal contact with leading authorities in this field. A severe illness in 1934 forced him to give up systematic laboratory work; during his long convalescence and since his restoration to health he has devoted much time to examining the enormous literature on plague in the Bodleian Library, the Library of the British Museum, and elsewhere.

Dr. Hirst has chosen his thesis wisely, for a study of the epidemiology of plague exemplifies the unity of the cosmos in more striking

fashion than any other branch of biological science, since it shows how human fate is intimately bound up with that of a vast variety of small mammals and their ectoparasites, and how they in turn respond to the influence of terrestrial climatic and solar change. We have come to realize further that seemingly minor variations in the structure and habits of particular species of fleas have major effects on the march of epizootic and epidemic disease among animals and man.

# PREFACE

THIS book deals, in broad outline, with the age-long evolution of conceptions of the nature of plague. It ends with a brief account of those recent discoveries which have at last enabled man, not only to protect himself against this most ancient and most formidable of epidemic diseases, but even to cure most of the victims. It is not a history of plague epidemics nor a systematic textbook, but a study of the development of human beliefs about the origin of the malady from the era of primitive man to the present day.

Only in an historical setting can modern epidemiological ideas be understood: only when the subject is viewed from the historical standpoint can we realize the magnitude both of our debt to the pioneers of the past and of the task which still requires to be accomplished. For we are far from achieving an adequate grasp of the fundamental principles of epidemiological science. There is much that is mysterious in the mutability of microbic infections and in the appearance and disappearance of the great historic pandemics. Nevertheless, no branch of medicine has developed more rapidly in modern times from a pragmatic point of view. Our power of waging war against our microbic enemies and of safeguarding ourselves from their attacks has increased almost as rapidly as our power of destroying our human foes by lethal weapons. Nevertheless, we have yet to discover effective ways for extirpating the seeds of plague dormant from time immemorial among the wild rodents of remote regions of Asia. Since the world pandemic of our times began its spread in 1894, vast and intractable new reservoirs of campestral rodent plague have also been established in Africa and America.

This is an age of specialization, of ever more detailed analysis of natural phenomena. Considered as a whole, the present work is an attempt at synthesis. I am only too conscious of the rashness of a medical microbiologist who dares to trespass across the boundaries of so many specialized fields, including anthropology, astrology, philosophy, religion, meteorology, and the whole history of medicine. By so venturing I am inviting a barrage of criticism from those cognoscenti who may happen to dip into the pages of this wide-ranging treatise. I shall be happy if my modest effort serves to

stimulate thought. I cannot forbear to record my conviction that the modern process of scientific analysis may be positively harmful, both to the cause of truth and the welfare of humanity, if it is pursued to the neglect of synthesis in the light of reason and philosophy. We need to adopt a more holistic attitude to nature.

At least three volumes would be needed to deal at all comprehensively with the theme so briefly considered in this book. I originally planned a two-volume work; but the times are not propitious for the publication of massive and ambitious tomes. Accordingly my considerable mass of notes has been compressed into one volume. Much that some readers might think significant has, perforce, been omitted. It is believed, however, that enough references have been given to enable most gaps to be filled.

I hope that this volume will be useful to young investigators of the present and the future as a general introduction to the study of the most dreaded of all the major epidemic diseases. They will find ample scope for further advance and a full range of fascinating problems to tackle. I hope also that the book will interest public health officers, students of tropical medicine, lay administrators concerned with promoting the health of nations, and even members of the general public interested to see what light modern ecological research can throw on problems that have perplexed humanity through the ages. With that end in view I have tried to express myself in plain terms, relegating to the appendixes much technical matter of particular interest to specialists, and reducing statistical analysis of the data to a minimum.

Part I of the book deals with traditional conceptions of the nature of the disease. It has been greatly shortened, a chapter on medical astrology being reduced to a few pages.

Part II summarizes the work of modern research workers on the nature of plague, special attention being paid to the discoveries of the great pioneers, such as Yersin and Simond.

Part III contains a fairly full discussion of the effect of the local and geographical distribution of the chief species of rat fleas upon the spread of bubonic plague. I fear that the great practical importance of this factor is insufficiently realized by many authorities. The whole ecology of the insect must be taken into account, not merely the relative plague-transmitting power of the several species of fleas found in areas exposed to plague infection.

Part IV contains a very brief discussion of national and inter-

national plague-preventive measures. I stress the importance of the flea as an independent vehicle for the transport of infection from place to place by land or sea. The recent discovery of really effective pulicides and raticides, new antibiotics, such as streptomycin, and the sulpha drugs, has facilitated anti-plague campaigns to such an extent that it is not too optimistic to speak of the conquest of the disease. Further advances in our knowledge of the prophylaxis and treatment of plague are constantly being reported. Readers are referred to the various scientific bulletins, especially those issued by the World Health Organization, for the latest information.

I have chiefly relied on Georg Sticker's two volumes on *Pest* which form part of his *Abhandlungen aus der Seuchengeschichte und Seuchenlehre*, 1908 and 1910, Giessen, for the dates and various points in the history of plague epidemics. Charles Creighton's *History of Epidemics in Britain*, vols. 1 and 2, is my main authority for British plagues, supplemented by numerous tracts consulted in the Bodleian and British Museum Libraries and by papers published by Sir William MacArthur, who has made such a profound study of this subject. For accounts of medieval plagues I have relied on Sudhoff's *Archiv*, on papers by Charles and Dorothea Singer, and on translations into German by Dinānah and Müller of the chief Arabian plague tracts. Lynn Thorndike's great *History of Magic and Experimental Science* is replete with astrological lore, but I have refrained from quoting it. The sections of the book dealing with plague epidemics during the seventeenth and later centuries are almost entirely based on original sources.

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My thanks are due to a host of plague workers in all parts of the world who have sent me copies of their reports. Several of my most valued correspondents, including W. Glen Liston, G. F. Petrie, F. W. Cragg, L. Otten of Java, and Alexander Mitchell of South Africa, have passed away. Drs. C. R. Eskey of the United States Public Health Service, Dr. Wu Lien-Teh of China, and Dr. S. Nikanorov, Director of the Saratov Microbiological Institute of the U.S.S.R., are among the many experts who have visited my laboratory and subsequently sent me copies of their publications. I thank Dr. Karl Meyer and his colleagues of the University of California for particulars of recent research work.

I am indebted to Dr. W. P. Jacocks of the Rockefeller Foundation for taking me to Travancore State and the Cumbum Valley of Madras to show me the important research work in progress there in 1934, to the Colombo Municipal Council for giving me so many opportunities to visit laboratories in India and Burma and for research work not only in Colombo but in other parts of Ceylon, to Professor Karl Jordan and the staffs of the Rothschild Museum, Tring, and the London School of Tropical Medicine for entomological assistance, to the Colonial Insecticide Research Officers for information, and to Dr. Vyes Biraud for World Health Organization publications on plague.

I thank Dr. G. Girard for the portraits of Simond and Yersin he gave me when I visited him at the Pasteur Institute, Paris, Dr. M. T. Morgan for permission to reproduce his engraving illustrating the plague of Marseilles, and Mr. B. H. Glass of the Oxford School of Pathology for the microphotographs of fleas and of the plague bacilli in a smear of rat tissue kindly prepared by Dr. J. C. Cruickshank, Bacteriologist to the London School of Tropical Medicine and Hygiene. My thanks are also due to Messrs. Cassell & Co. Ltd., the Cambridge University Press, the Trustees of the British Museum, the Librarian of Magdalene College, Cambridge, and the Editors of the *Indian Journal of Medical Research* and the *Ceylon Journal of Science* for permission to reproduce the illustrations listed on pages xv–xvi.

# LIST OF ILLUSTRATIONS

## TEXT-FIGURES

## PLATES



## MAPS

# CONTENTS

## PART I

## TRADITIONAL CONCEPTIONS OF THE NATURE OF PLAGUE



## PART II

## MODERN CONCEPTIONS OF THE NATURE OF PLAGUE

## PART III
## THE SPREAD OF PLAGUE IN TIME AND SPACE



## PART IV
## THE CONQUEST OF PLAGUE

# PART I

# TRADITIONAL CONCEPTIONS OF THE NATURE OF PLAGUE

## I

## PLAGUE AND SUPERNATURAL BELIEF

### *Plague, Primitive Animism, and the Occult*

PRIMITIVE man lived in psychic union with his fellows and with everything in nature. For him the whole universe was animated, including the shining stars, the whispering woods, the bubbling streams, and even mother earth herself. Neglected ancestral shades, or offended spirits animating some venerated object, were responsible for all afflictions, including pestilence. Yet the multitudinous demons that man feared so much were not omnipotent. They could be exorcised by the proper incantations, or their powers neutralized by magic. The tribal sorcerer was the physician.

Throughout human history, demons have been accused of generating plagues and many attempts have been made to drive them away by magical procedures. In ancient Babylonia, some 3,000 years before our era, Namtar, demon of plague and other epidemics, periodically emerged from hell.[1] It was he who accompanied the goddess Ishtar in her descent to the infernal regions and he who roamed the night afflicting man. There is a legend that an Irish pestilence of 1084 was caused by battalions of demons darting swords of fire from their throats and each as high as the clouds of heaven.[2] During plague-time in Egypt evil spirits were said to prick people with a magic lance poisoned by Lucifer.[3] Procopius,[4] in his account of the Byzantine epidemic of A.D. 542, makes much of the appearance of spectres in human shape to many who fell ill of plague. Unceasing expiation, prayers to the most holy names, failed to avert the fate of those who saw the apparition. Some shut themselves up in houses, hoping to bar the way to the plague demons; others saw the fatal vision in a dream and heard a voice pronouncing their doom. Procopius was a