

Presidential Address

THE PROSPECT BEFORE US

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Our economic and social philosophies have not in the past encompassed a global scope of life, and certainly we have been even less aware and concerned about the health problems entailed. The present conflict, however, has changed the prospect before us. Maintaining the health of the large numbers of men involved in military campaigns has always been a major problem, and the problem has assumed even greater proportions in the present war because of the widely separated and distant fields of operation. It has, therefore, become necessary to educate and to prepare our troops for diverse conditions. Shortly before we became involved in the war, a young man in my general zoology class questioned the practicality of including lectures on parasitism and tropical diseases for students who would perhaps never go beyond the border of the United States and who would always eat government-inspected meat. I could only reply that time would prove the value of knowledge. Recently this young man wrote to me from the Pacific area to express his gratitude for my lectures on tropical diseases. Our civilian population is slowly becoming aware of the grave health problem confronting our troops and which may be thrust upon us upon their return.

Even now our army hospitals are caring for men who have returned to this country acutely afflicted with tropical diseases. If we ever approach the proposed figure of eleven million men in the armed services, and if the same proportions continue to be sent into the tropics as now, we can appreciate the probable consequences. We are but sixty hours by air from the remotest part of the world. The air transportation routes, with the exception of those to the British Isles, traverse the areas where tropical diseases abound. The prospect of improving the health conditions

surrounding our airports in the tropics during a period of active combat appears to be remote. We are faced not only with the possibility of the transporting to our shores of the diseases in infected persons, but also we are confronted with the possibility of the introduction of new insect vectors into certain areas of the country.

Today we face our tasks with a greater confidence and assurance of success than would have been possible had it not been for the contributions of the great minds who pioneered in the study of tropical diseases. In 1893 Smith and Kilbourne proved that Texas fever of cattle was transmitted by ticks. This was the first demonstration of the role of insects in the transmission of protozoan diseases. Five years later, Sir Ronald Ross, an English army officer working in India, demonstrated the transmission of malaria by the mosquito. Dr. Carlos Finlay, as early as 1881, advanced the theory that yellow fever was transmitted by the mosquito, and experimental proof was given in 1900 by the Drs. Reed, Carroll, Agramonte and Lazear. These pioneers and many others have, through their courage, self-sacrifice and scientific accuracy given us a certain amount of insight into our present problems and have pointed the way to practical solutions.

The diseases with which we are coping today, such as malaria, amebiasis and filariasis, present many problems which are not encountered in the bacterial realm. One writer has summarized these in the following statement: "Many of these parasitic diseases are characterized by a relatively long incubation period, by pronounced chronicity, by lack of permanent immunity and by difficulties in diagnosis; there are no successful means of immunizing an individual against them, and for many we have no satisfactory treatment. These facts all add to the probability that the parasitic diseases will be the ones most likely to be brought back by returning troops and the ones which may well prove to be of considerable concern from a public health standpoint."

Malaria fever ranks first in morbidity and mortality among the global diseases. It is endemic in all tropical and sub-tropical theatres of war. Exact figures on the incidence of the disease are not generally available, but it is estimated that there are between eight and ten million cases with three million deaths annually from the disease in India. At the fall of Bataan it was estimated that eighty-five percent of every regiment had acute malaria. More than fifty percent of our men have contracted malaria during their relatively short exposure in the islands of the southwest Pacific. Even in our own country, where conditions are more favorable for controlling the disease, we have experienced a considerable loss of life. The incidence of the disease has been on a decline in the southern United States during the past years, but it is to be anticipated that as our troops are sent to heavily infected areas in the world, an increase of the disease will result among them. These infected men will return to their homes and create a problem in care and will serve as a reservoir for dissemination to our civilian population.

Three species of protozoan parasites belonging to the genus *Plasmodium* are involved. Of these, *Plasmodium falciparum* is the most virulent and the most frequently fatal. The mosquito, *Anopheles quadrimaculatus*, is largely responsible for the transmission of the malarial plasmodia; it is reported to occur in the United States as far north as the Canadian border. We usually associate malaria with our southern states, but one case was reported in Minnesota in 1930 and an outbreak was reported in Ohio in 1934. These cases are suggestive of the possibilities of an epidemic in our climate. There is also the possibility of the introduction of new vectors through our rapidly expanding air transportation system.

Malaria does not generally confer immunity for any considerable length of time and there is no vaccine available. It is possible for an individual to have three malarial infections in the same year or subsequent attacks produced by strains of the same species. Whatever tolerance a popula-

tion may develop against a certain strain as a result of repeated infections does not appear to confer immunity against attacks produced by strains from different areas. It should also be noted that malaria is often chronic and relapses are a common feature, especially when an infected individual returns to a cooler climate. Thus the disease may persist in the body without clinical symptoms for several years after a patient has left a malarious area. This appears to be due to the fact that asexual reproduction can go on in certain fixed tissue or in endothelial cells where the organisms are shielded from the host's defense mechanism. In this way, large reservoirs of carriers may be established which periodically may become infectious for mosquitoes.

Significant progress was made in the treatment of malaria through the use of quinine. With the fall of Java to the Japanese, more than ninety percent of the world's supply of quinine was lost to the Allied Nations. Through the efforts of Dr. Parran of the United States Public Health Service, atabrine, a promising substitute for quinine, was produced. But neither atabrine nor quinine will eradicate an infection; they are most useful in controlling acute cases. There are cases in which atabrine is toxic, and our dwindling supply of quinine must be reserved for cases of this type. We can only hope that good fortune will attend our efforts in establishing plantations in Central and South America so that a supply of quinine may again become available for the treatment of the more acute cases. There is a dire need for a more adequate drug for chemoprophylaxis.

Amebiasis is another protozoan disease of importance. Amebiasis is found over the entire world, but it is most prevalent in tropical and sub-tropical areas. The epidemic of amebic dysentery in Chicago in 1933, in which about fourteen hundred cases were reported, received wide publicity and created an awareness of the existence of the disease in a temperate climate. It has become established in the United States, where it appears to be most prevalent in the southern states. Surveys indicate that it is found in

about ten percent of the individuals examined. It is, however, not as prevalent in the north. Recent examinations made by a northern transcontinental railroad company of the food handlers in its employ revealed that less than one percent of the individuals were infected.

Studies on the incidence of amebiasis made after the last war revealed that the men in the armed forces were not more heavily infected than the civilian population. A somewhat different picture may be anticipated in the present war since large numbers of our troops are concentrated in areas where *Endameba histolytica* or similar virulent strains are prevalent. *Endameba histolytica* is reported to be the most common form infecting the British troops in India, and it has created many grave problems among our troops in the Mediterranean and African areas. We may do well, therefore, to be prepared to cope with an influx of amebiasis in our population when the war is over.

Fortunately this disease does not involve intermediate reservoir hosts, and if the individuals infected can be detected and treated, the problem becomes less acute. This disease is like the majority of gastro-intestinal diseases; infected individuals may not manifest symptoms, but may be "carriers" in whose stools infectious cysts are numerous. The carrier may become the source of many infections in a community unless precautions are taken to safeguard the water and food of the population.

Regular examination of food handlers must be carried out and the individuals found to be infected should be treated until they are no longer infectious. We must continue to lay emphasis on personal cleanliness and to carry out sanitary regulations. Control measures should be invoked against flies, cockroaches, and other animals which have been found to transmit the disease. The foregoing measures can best be achieved when the public becomes conscious of the dangers which may accrue from indifference to the problem. Here education can play a vital role.

Filariasis is a third disease which may present a serious post-war problem here. The history of the hookworm dis-

ease in our southern states illustrates how devastating to human life and energy a parasitic nematode may be. There are two types of worms which are considered by most authorities to constitute a threat to our post war health.

The first of these is *Wucheria bancrofti*, which lives in the blood stream of man and results in a disease known as elephantiasis. The disease is very prevalent in the Orient and has been endemic in Charleston, S. C. and surrounding areas. Recent reports, however, indicate that it is on the wane in this area. The organism is known to be transmitted by the *Culex quinquefasciatus* mosquito, but other vectors are not improbable. We know that a number of mammals in northern Minnesota are infected with microfilarial worms, and that a mosquito is instrumental in the transmission of the organism. At present, there is no specific treatment for the filarial infection. Individuals remain chronic carriers and the mortality rate is high.

Onchocerciasis is a disease caused by the second microfilarial parasite *Onchocerca volvulus*. This disease is characterized by superficial nodular swellings or tumors usually at or near the surface of the skin. It is transmitted by several species of small black gnats of the genus *Simulium*. The disease is endemic in the Western Hemisphere, in Guatemala, and southern Mexico. It is not a problem in this country at present. Several species of black flies which may become intermediate hosts in the life cycle of the disease are known here, and it is not improbable, with increased commerce between this country and our South American neighbors, that the disease may be introduced.

The prospect before us will be to safeguard our troops on the battle fronts from the devastations of disease, to care for the men who return as victims of disease, and to exercise preventive measures in protecting our civilian population. This will require the cooperation of many scientific and civic organizations. We are fortunately not unprepared for this task. Our first line of defense is the United States Public Health Service which works in cooperation with the Military Medical Corps. Upon this organization rests the re-

sponsibility for maintaining the health of our armed forces and guarding our shores against the invasion of diseases. The medical men serving in the United States armed forces have received excellent training and invaluable experience in the diagnosis and the treatment of the global maladies. This is our second line of defense. Thirdly, comprehensive courses in tropical medicine have been introduced into our medical schools with short courses for instructors and practicing physicians. Many state health departments have engaged authorities on tropical medicine to give lectures and conduct conferences on the subject throughout the various states for the doctors on the home front. Our South Dakota health department has conducted such a series of lectures in various cities throughout our state. This constitutes a splendid fourth defense. Even though the incidence of malaria has in the past been very low in South Dakota, it does not seem impractical for us to give attention to making a survey of the species of mosquitoes found in the state. The paper which is to be presented later on this program, dealing with the problem of mosquito survey, will bring to light our fifth line of defense. Finally, since it seems inevitable that with the passing years we shall become a part of a global society, a greater educational emphasis should be placed upon world health problems. Such a program could be effectively incorporated into our general science, biology, and hygiene courses in our schools, and by popular lectures to civic clubs, radio broadcasts and newspaper and magazine articles for the general public.

Perhaps even with these measures we shall not have perpetual health or solve all the problems, but we shall be well on the road to earn the designation—wise men.