1

Introduction

Tropical medicine is unique among medical specialties in being defined by reference to the part of the world where it is practiced and where its diseases are endemic.[1] This occurred because the discipline arose as part of Western imperialism when explorers, military personnel, colonial administrators, businessmen, and finally settlers came face to face with a new set of diseases – tropical diseases, for which they had no answer and which were, at times, particularly virulent. To combat these problems, schools of tropical medicine were launched where physicians and parasitologists learned what was known about the tropical pathogens, their life cycles, the diseases they cause, and how to cure and prevent them.

There is, however, more to tropical medicine and its history than the discovery of pathogens, the unraveling of life cycles, and attempts to eradicate them. These and other medical and scientific events were and are influenced by political and social events beyond the narrowly defined sphere of medicine and parasitology. Founded as one aspect of European and American imperialism (defined simply as the domination of one society over another), imperial policies and attitudes largely determined the nature of tropical medicine.[2]

Until very recently, however, this sociopolitical component to tropical medicine has been largely ignored by those writing about its history. These narrative histories described when, where, and by whom significant discoveries were made. Some of these, such as Harold Scott's two-volume *A History of Tropical Medicine*, have become classics. Published in 1939, it dealt with the work that had been done up to that time on virtually every important tropical disease.[3] Although there are a few introductory chapters on the army, the navy, and the colonies, the main text gives an account of scientific discoveries made on each of many specific tropical diseases (although not bilharzia). The implication from the story that Scott and others tell is one of triumph over disease; the picture they portray is of "diseased natives" made well by white man's medicine. Others who served in the colonies, put on the defensive by a

tide of anti-imperialist sentiments, were only too willing to advance this story of victory over disease, and the triumphs of tropical medicine have almost become the last justification for imperialism.[4] Most people would, I suspect, agree with the two historians who wrote: "Whatever political disadvantages colonialism might possess, from the biological standpoint its record is one of the greatest success stories of modern history."[5]

In more recent years a few historians have been more analytical and critical in their studies.[6] Indeed one of the earliest of such studies goes so far as to challenge what everyone seems to have accepted as a truth of empire. "With the apparent partial exception of West Africa," the authors wrote in contrast to what most believed hitherto, "the unhealthiest period in all African history was undoubtedly between 1890 and 1930," and "colonial rule . . . has largely created the continent's present disease environment." Thus, as these same authors assert, the story of tropical medicine becomes not simply the triumph of enlightened medicine over the useless and often harmful practices of "ignorant savages," but an attempt to control diseases that they themselves helped to create. Goodyear, for example, has argued that epidemics of yellow fever in the Americas can be linked to the sugar industry.[7] But despite this historical activity, R. MacLeod is probably correct when he notes: "There is as yet little coherent perspective on the relations between medicine and empire."[8] Certainly nobody has been able to do for the late nineteenth and early twentieth centuries what Philip Curtin has done for the earlier years in his now classic *The Image of Africa*.[9]

But to write a comprehensive modern history of tropical medicine that covers both the imperial and the medical aspects of all tropical diseases has become, I think, an impossibility. The range of diseases is so large, the information sitting in various archives and libraries on such diseases as malaria and trypanosomiasis so vast, and the machinations of the imperial powers so complex, that no scientist or historian (who tends to specialize as much as does the scientist) could ever do the subject justice.

What I have attempted here is only "a" history of tropical medicine. To do so, I have restricted myself in various ways. Only two empires are discussed, the British and the American, and I deal only with some of the countries that were either part of these empires or heavily influenced by them. The time frame is restricted also. It begins in 1898, when the British Colonial Office set in motion a series of events that led to the founding of the Liverpool and London schools of tropical medicine, and when the American Army was decimated by tropical diseases in taking over Cuba, Puerto Rico, and the Philippines following its rather shallow victory in the Spanish-American War. I end less precisely in the 1970s. By then the British Empire had collapsed, the International Health Division of the Rockefeller Foundation had more or less retired from the scene, and the WHO was in full flower, lavishly housed

in its modern quarters overlooking Geneva. More importantly, the book ends, as I shall suggest, when tropical medicine seems to have entered a new post-imperial stage of its history.

It would be wrong to repeat the errors of the past, however, by dealing with only one dimension of the issue. To talk only of empire and the socioeconomic background while, at the same time, ignoring the technical and scientific aspects of disease and disease control would be as unbalanced as those early histories that spoke only of scientific triumphs. But again necessity demands that one restrict the number of diseases with which to deal. I have chosen one disease, bilharzia or, as it is commonly called today, schistosomiasis.

Bilharzia is a disease caused by the eggs of small, threadlike parasitic worms that live inside the blood vessels of the gut, liver, and bladder. Today these parasites are said to infect over 200 million people in 74 tropical countries of Africa, the Middle East, Asia, Latin America, and a few Caribbean islands, and in 1976 was listed as one of the six diseases of most concern to the WHO.[10] There are many reasons for this choice, not least of which being my own long-standing interest in these parasitic worms. More significantly, however, focusing on bilharzia enabled me to examine some of the basic assumptions about tropical medicine that Westerners have long accepted. Because bilharzia is mainly a disease of rural poverty that has rarely threatened the health of white officials or colonizers to any great extent, the question of motivation and priorities can be addressed more fruitfully for bilharzia than for diseases like malaria, which have threatened the health of white and native inhabitants alike. Furthermore, bilharzia is one of the most obvious examples of a disease whose prevalence has increased over the years because of human activities; it is not a disease that has quietly succumbed to the technology of Western medicine.

In addition, the disease does not occur in India. My task was greatly simplified by being able to ignore India and the British India Office, thereby focusing exclusively on the Colonial Office, which never had charge of that most prized possession of Great Britain.

Thus, I have attempted to use bilharzia as a "case study" by which to examine the much broader issue of tropical medicine in the British and American empires from 1898 to the 1970s.

IMPERIAL MEDICINE

My basic theme is that tropical medicine from 1898 to the 1970s was fundamentally imperialistic in its basic assumptions, its methods, its goals, and its priorities; it was the age of imperial tropical medicine. Few, I suspect, will disagree with this interpretation of events before World War II, for quite

clearly in those years tropical medicine was an important part of empire building and empire maintenance. As stated consistently at that time, the basic goal of tropical medicine was to render the tropical world fit for white habitation and white investment. Its practitioners were members of colonial services, armies of occupation, and mining and fruit companies. What, if anything, should be done about the health of the native inhabitants was determined by the policies of these Western agencies without reference to the needs of the indigenous communities. Not surprisingly their health needs became a priority only when their diseases were felt to threaten the health or profits of the white man, or when imperial policies demanded that the health needs of the indigenous populations be addressed. In addition, because Christian duty and the white man's burden always included medical and sanitary work, medical missionaries were also an important part of the picture although one that I shall ignore. It was an age of imperial medicine in that the imperial agencies defined what the major medical problems were, what were the causes of these problems, and what needed to be done to overcome them. This was an age of imperial medicine also in that the imperial agencies imposed their solutions on the population without involving them in any way.

I shall argue, however, that tropical medicine after World War II was also imperialistic in the sense that health policies continued to be imposed by outside agencies, whether they were the declining imperial powers or the increasingly influential professional classes and international organizations. Tropical medicine, as before, continued to be imported, technical, and scientific; and even when, as in the 1940s, a more socially oriented approach briefly appeared, it was only because Western medicine was at that time flirting with so-called social medicine. There was, however, in this postwar era a rising concern with what were perceived to be the health problems of the tropical or Third World communities, but both the nature of these problems and the solutions to them continued to be imposed and Western. Even if control slowly passed into the hands of Third World personnel, no fundamental changes took place, for they had been trained in Western ideas and shared the professional goals and beliefs of their Western colleagues.

I believe that a fundamental shift away from this imperial-styled medicine began to take place only in the 1980s. In 1979, the WHO finally endorsed the idea that all people have the right to participate in their own health care planning and implementation, to dictate priorities, and to utilize methods that they can use and afford. Community participation has become the new creed, and minimally trained health workers are becoming the major agents of this new primary health care delivery system.

The policies and attitudes of imperial medicine and the new primary health care approach, which succeeded it, are reflected in the story of bilharzia.

What follows is my attempt to superimpose the story of this one disease against the broad backcloth of imperial tropical medicine.

BILHARZIA: WHAT IT IS

Unfortunately the disease is generally known today by two names, bilharzia or schistosomiasis. The reason for this is to be found in the past. Theodor Bilharz, the discoverer of the parasitic worm responsible for the disease, placed the worm in the genus *Distoma*, a broad genus that was soon abandoned as more types of parasitic worms were discovered. Numerous generic names were thereafter invented to house Bilharz's worm, including *Schistosoma* Weinland, 1858 (the name that must stand today according to the rules of zoological nomenclature). However, in the past, in an understandable desire to honor the name of Bilharz, the disease was often called bilharziasis or bilharziosis. But in 1949, members of the WHO Study Group on Bilharziasis in Africa, ignorant of the tight rules of zoological nomenclature, recommended that the name *Bilharzia* be used for the worm genus and bilharziasis for the disease. A recommendation to this effect was made to the International Commission of Zoological Nomenclature which naturally ruled, in 1954, that the generic name *Schistosoma* must be retained, but that the disease could nevertheless be called bilharziasis.

This ruling makes little sense, and I have not followed it. Bilharziasis should be used to designate the disease only if the generic name of the worm were *Bilharzia*, just as trypanosomiasis is used to denote the disease caused by protozoans of the genus *Trypanosoma*. Thus, because the generic name *Schistosoma* must be retained, the disease can be called "schistosomiasis" as is commonly done today, but there is no justification for the term "bilharziasis."

On the other hand, just as malaria, and not "plasmodiasis," is used to denote the disease caused by organisms of the genus *Plasmodium*, the word "bilharzia" can be used for the disease caused by worms of the genus *Schistosoma*. Many still know the disease as bilharzia, and so I shall, with no apologies to anyone, use this word throughout the book. I prefer short historical names over unpleasant tongue-twisters (particularly because the ugly derivative "schisto" is now widely used).

Bilharzia, known also by many local names such as "red-water fever," "snail fever," "big-belly," and "Katayama disease," is caused by eggs of blood vessel-inhabiting worms of the class Trematoda and genus *Schistosoma*. These eggs induce an immunological response after they become trapped in the body organs, especially the liver, gut wall, and urinogenital tract. It is these immunological responses that constitute the disease.[11]

Bilharzia is, in reality, not a single disease but a complex of diseases induced by the eggs of five principal schistosome species, three of which – *Schistosoma*

haematobium, S. mansoni, and *S. japonicum* – are particularly important. *Schistosoma haematobium* inhabits the veins of the bladder area, and the eggs that are not trapped in the body are discharged in the urine. The other two species inhabit the mesenteric veins of the gut, and their eggs are discharged in the feces. In every case, the worms may also be found in the liver and portal blood system.

Distribution and prevalence

The diseases caused by these three species have a worldwide tropical distribution but are mercifully absent from the Indian subcontinent. *Schistosoma haematobium* is highly endemic in the Nile Delta and Valley, and has an irregular distribution in the Middle East countries and North Africa. It occurs in most West and Central African countries, along the coastal countries of East Africa from Somalia to Natal, and in the islands off the east coast (Figure 1.1a). *Schistosoma mansoni* is also highly endemic in the Nile Delta and now seems to be spreading into the Nile Valley (Figure 1.1b). In sub-Sahara Africa its distribution is similar to, although more irregular than, that of *S. haematobium*, but unlike *S. haematobium*, *S. mansoni* occurs also in South America (Brazil, Surinam, and Venezuela), and in some islands in the Caribbean (Dominican Republic, Puerto Rico, St. Lucia, and others [see Figure 1.1c]). Oriental bilharzia, caused by *S. japonicum*, is endemic to the Yangtze Valley and many coastal provinces of mainland China. It occurs also in Central Sulawesi, and the Philippines (see Figure 1.1d). There are also a series of smaller foci in Thailand and Japan, and an *S. japonicum*-like form has been identified in Malaysia (Figure 1.1d). The other two species, *S. intercalatum* and *S. mekongi*, have a much more restricted distribution. The former occurs in Cameroun, Gabon, and Zaire; the latter in the Mekong River valley of Laos and Kampuchea.

Over 200 million people in 74 countries are said to be infected with the worms, although the data on which such figures are based are rather unreliable. There is little doubt, however, that in villages of the Nile Delta, and in other areas where there is constant contact of the human host with water, the prevalence can be almost as high as 100 percent.

Pathology

Most people who carry the parasite suffer only minor although unpleasant symptoms: blood in the urine, occasional diarrhea, and cramps. But as the trapped eggs increasingly induce inflammatory reactions in various body organs, the classic symptoms of chronic bilharzia can appear. The morbidity, or severity, of these reactions is very variable and generally related to the "worm load" – that is, the number of worms being carried in the body. There

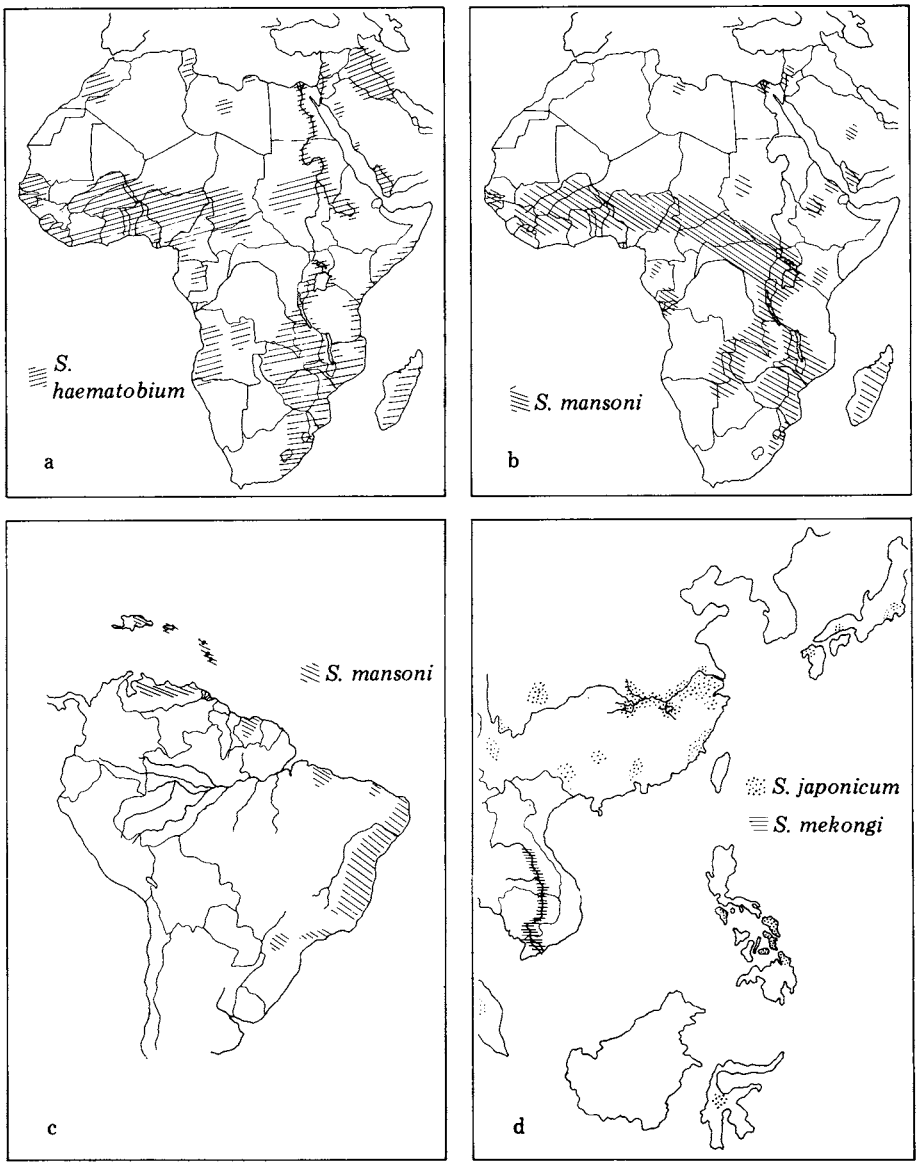

Figure 1.1. Distribution of the human schistosome species: (a) *S. haematobium* in Africa; (b) *S. mansoni* in Africa; (c) *S. mansoni* in South America; (d) *S. japonicum* and *S. mekongi* in the Orient.

are also pathological differences among each species and among strains of the same species.

In very general terms, an infection with *S. haematobium* can cause lesions to occur in the bladder and ureter around the entrapped and calcifying eggs. In addition to the discharge of blood in the urine, and painful and excessive urination, various malfunctions occur as urinary and kidney passages become blocked with these lesions. In the intestinal schistosomes, the lesions occur in the gut wall and liver. This can result in the venous drainage of the liver being blocked, which in turn can lead to a compensatory increased arterial flow to it. As a result of this, portal hypertension and the classic enlargement of the liver and spleen can occur. Eggs of all three species may also become trapped in the lungs, and in *S. japonicum*, nervous disorders or "cerebral schistosomiasis" can also occur if egg aggregates come to rest in the brain.

Life cycle

The worm eggs, whose shapes are highly diagnostic for each species, when shed in the urine or feces of the human host hatch to produce a minute, short-lived larval stage called a "miracidium" (see Figure 1.2). These miracidia bore into and invade the tissues of specific snail hosts, where they undergo asexual reproduction eventually to produce the final larval stage. This final stage, the "cercariae," are released daily in very large numbers from the snail, swim freely in the water, and then will bore directly into the skin of the human host. In the human, the parasite migrates to the liver via the heart and lungs eventually to mature in the veins of the liver, gut, or bladder. Eggs will appear in the urine or feces approximately 30–40 days after infection.

Epidemiology

The disease has a very complex epidemiology, resulting in part from a very intricate relationship between the parasite and the snail intermediate host. There are not only strains of each schistosome species but also a multiplicity of snail species and varieties that vary in their susceptibility to these strains. Also the taxonomy of these snails has long been a source of almost total confusion and seems always to be in a constant state of revision.[12] I shall, however, ignore the history of these controversies.

Both *S. haematobium* and *S. mansoni* are transmitted by species of freshwater pulmonate snails (the group to which most freshwater snails belong). Those of *S. haematobium* belong to various species complexes of the genus *Bulinus*, whereas species complexes of the genus *Biomphalaria* act as the snail host for *S. mansoni*. *Schistosoma japonicum*, on the other hand, is transmitted by amphibious prosobranch snails (a group to which most marine snails belong but which has also a few genera of amphibious freshwater forms) belonging to the

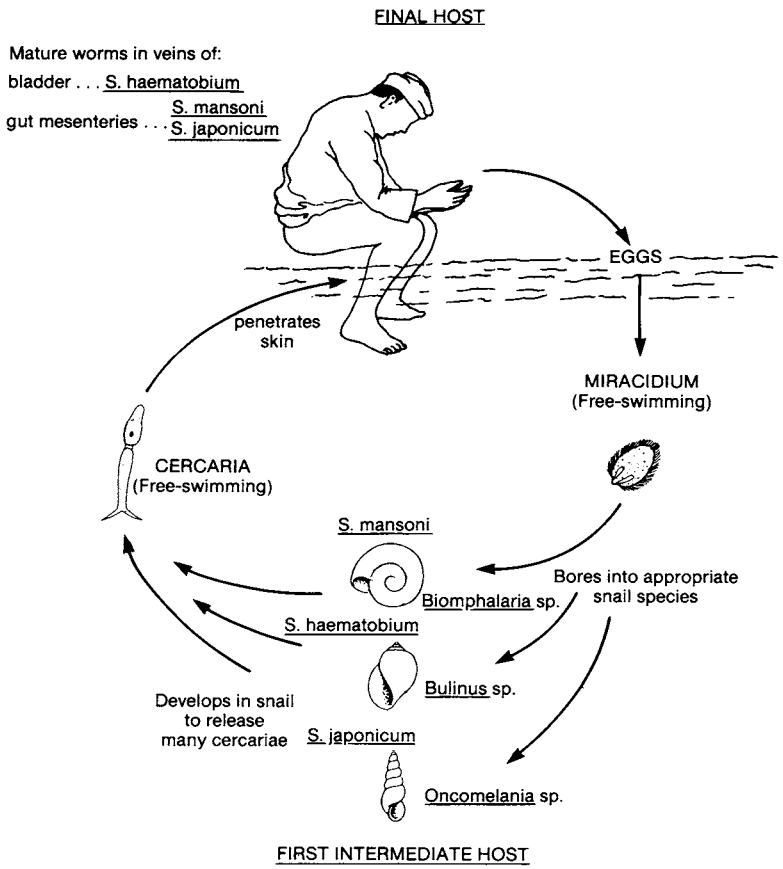

Figure 1.2. Life cycle of the human schistosome worms

species *Oncomelania hupensis* of which there are six geographical subspecies. Another prosobranch snail, *Tricula aperta*, endemic to the Mekong River, acts as the intermediate host of *S. mekongi*.

Bilharzia is a chronic disease of economic poverty of mainly rural areas, where children and adults, because of recreational, domestic, religious, and occupational reasons, come regularly into contact with freshwater contaminated with the schistosome cercariae. In cases of *S. haematobium* infection, the prevalence of the disease and the intensity of infection peak in the teenage years; this is less true for other species, however.

Reservoir hosts play an important role in Oriental bilharzia, where the parasite is naturally transmitted between humans and other vertebrates, including many domesticated animals such as cattle, pigs, and dogs. Although

animals are believed to play little if any role in the transmission of the other two schistosome species in Africa, rodents are believed to act as important reservoirs of *S. mansoni* in South America.

But very little was known about bilharzia in 1898 when our story begins. Then, Queen Victoria was on the throne, the British Empire was at its zenith, and the Americans first set about acquiring their own.