Disease, Empire and Scientific Pursuit: The historical influence of colonialism on the study and practice of tropical medicine

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While scientific discoveries may be borne out of curiosity alone, it is by no means the only motivation. This piece was written to highlight what is largely an under-discussed part of science and medicine's history, namely the large involvement by colonial empires in the field of tropical medicine. Here, the term "tropical medicine" will be defined as both the study of diseases found in the tropics and the application of such knowledge to curb disease spread. Particular attention will be given to the role of colonialism in the advancement of tropical medicine in the British Empire, and how those advances in turn supported British colonial systems. Further, the practices used by French colonial powers to manage and control disease will be described and evaluated. I believe it is necessary for students to understand how the products of academic endeavors can be co-opted to reinforce systems of power. It is also important as Singaporeans to understand the workings (even in part) of a system of governance which significantly shaped our own history, and the history of numerous other nations.

1. Colonialism and the birth of tropical medicine

It is difficult for me, having been born in 1999, to fully imagine the scope and extent of the British Empire. Even for Singaporeans who were alive when this country was a crown colony, their experience was of an Empire already in its decline[1]. The period between 1815 and 1914 represents the height of British colonialization, where the empire ruled over 412 million people, representing 23% of the global population at the time[2]. Back then, the Union Jack flew over Northern Nigeria, Southern Nigeria, the Northern territories of the Gold Coast, Lagos, Sierra Leone, Gambia, Zimbabwe, Zambia, Egypt, Sudan, Uganda, Kenya, India, Hong Kong, Myanmar and Malaya- though this is not an exhaustive list.

However, as British dominion spread, colonists that had been posted overseas were exposed to new and unfamiliar tropical diseases[3]. Such diseases significantly threatened the lives and wellbeing of

these individuals. For instance, West Africa earned the moniker "white man's grave" due to the prevalence of malaria deaths amongst the colonists who arrived there[4]. When considered at a larger scale, these tropical diseases were also a potent danger for the Empire. For example, control of all the African colonies by colonial powers, being largely Britain, Portugal, Prussia and Germany, relied upon effective occupation of those lands. This effective occupation loosely required colonial officials to complete tours of duty and to cooperate with the officials of other foreign powers without succumbing to tropical illnesses[3]. Because of this, there was great interest amongst British physicians in studying tropical diseases, and Joseph Chamberlain (then secretary of state for the colonies) strongly supported the establishment of institutions for this same purpose[5].

One such scientist was Sir Patrick Manson. While living in Amoy (now Xiamen) while it was a British-run port, Manson noticed that filarial worm larvae were present in patients with elephantiasis. Briefly, the filarial worm is a parasite found in the subtropics, and elephantiasis is a disease where the limbs of sufferers swell and harden. Manson subsequently conducted experiments on his gardener Ho Lin, who was infected with the worm. Manson allowed mosquitoes to bite Ho Lin before dissecting them. He noticed that the worm only progressed to the larval stage in humans, and that the worm was not only able to survive in the stomachs of mosquitoes but underwent further development in these insects. He hypothesized that mosquitoes might be vectors for the worm, and by extension, the elephantiasis disease. Based on this work, Manson suggested that like elephantiasis, malaria was also spread by mosquitoes. After returning to London, he shared this idea with fellow scientist Sir Ronald Ross. Ross would later travel to India, where he would study malaria using a similar experimental set-up as Manson with elephantiasis. After infecting mosquitoes by letting them feed on malaria patients, Ross dissected the insects and found the malaria parasite present in its gut. Ross was able to demonstrate that the malaria parasite underwent development inside the mosquito, and that these insects could also be vectors for malaria.

Manson was eventually appointed as medical advisor to the British Colonial Office in 1897, and he was a strong advocate for the teaching of tropical medicine so that physicians could tread colonial administrators and other colonists working throughout the empire[6]. In a 1900 report, Ross said that "in the coming century, the success of imperialism will depend largely upon success with the microscope"[7].

In terms of institutions, The London School of Tropical Medicine was founded in 1899 by Manson. The school undoubtedly advanced the study of tropical diseases. In 1900, George Carmichael Low, a

researcher from the school, spent three months residing in a wooden hut within a malaria ridden area at the mouth of the River Tiber in Italy. By remaining indoors, Low evaded the mosquitoes, and so subsequently did not develop malaria. This supported the discovery made by Ronald Ross that the *Anopheles* mosquito transmitted the disease. Low then travelled to the West Indies to study filariasis, being a parasitic disease caused by an infection of roundworms which is also spread by mosquitoes. Through his research, he was able to show the passage of the worm inside of the mosquito, and its entry into a human host through a mosquito bite. In 1903, a school commission to Uganda determined that trypanosomes, that is parasitic protozoans, were the cause of sleeping sickness. This disease has many symptoms but is so named because of the sleep disorders infected individuals develop. Other discoveries abound over what is now the school's 123 year-long history.

Obviously, the advancement of scientific knowledge is a worthwhile and valuable pursuit. However, these discoveries were made while the British Empire was at its height. After considering the perspectives held by Ross and Manson, and of the British government, some pertinent questions remain. Chiefly, did these discoveries reinforce existing colonial power structures by only benefitting the colonists? Or were benefits shared between colonizer and colonized alike? Further, how did these discoveries shape other ideas of Empire outside of tropical medicine?

2. The benefactors of tropical medicine

Some scholars have claimed that the applications of these discoveries existed primarily to “"to make the tropics fit for the white man to inhabit”[8], which supports the idea that the colonists largely benefitted. This matches with evidence that medical services in colonies were intended for colonial officials and soldiers first, then to the local elite, and then to individuals whose disease might threaten colonial enterprises[5]. The last of these is especially interesting, as it suggests that treatment of the local population, excluding the wealthy, was done out of a sense of pragmatism. While such distribution of services may have been the case generally, this doesn't mean to say that colonized people didn't benefit from the actual research that was being carried out in tropical disease. For instance, take the case of Hong Kong and its treatment of malaria.

By 1900, the mechanism of malaria transmission by the *Anopheles* mosquito had been fully elucidated by European physicians. Prior to this discovery, it was known that general improvements in sanitation and drainage could reduce incidences of the disease, however Britain was unwilling to pay for these

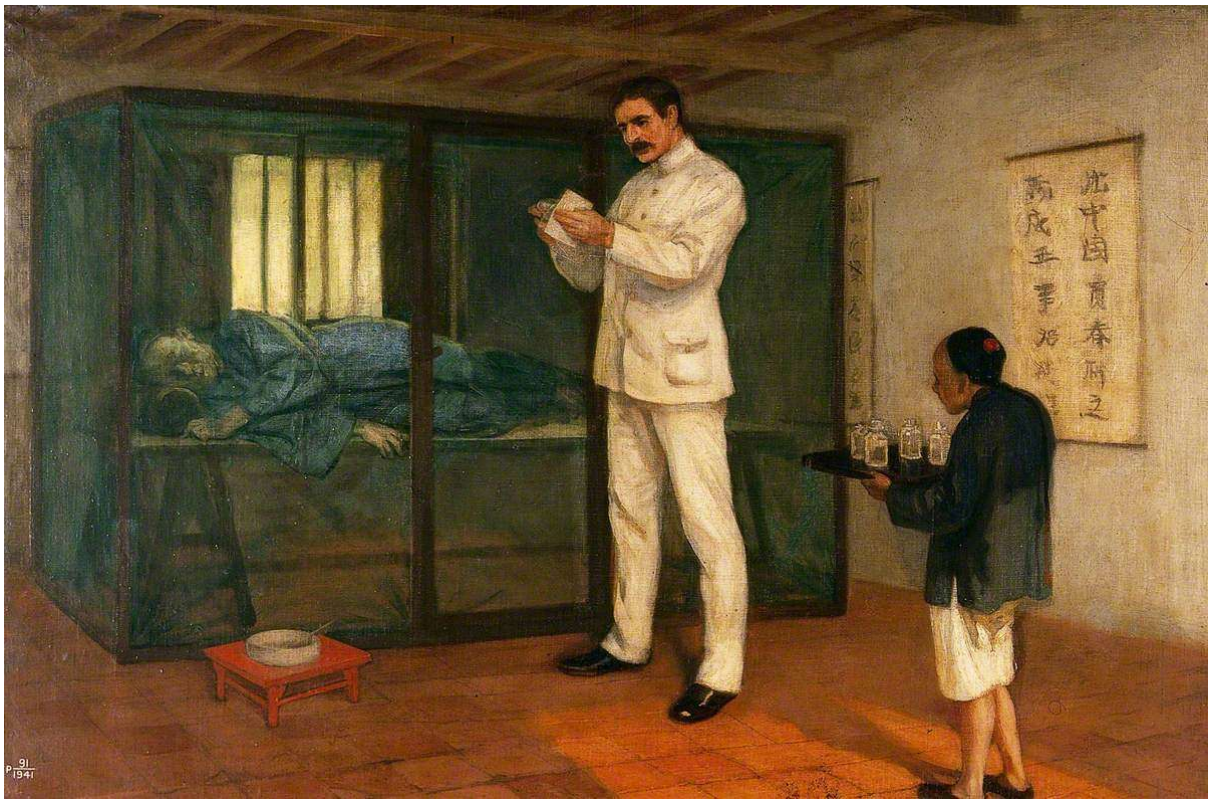
costly changes to infrastructure in Hong Kong. Knowledge that the mosquito was a vector for malaria transmission allowed the British government to approach the problem in a more cost-efficient manner. The government launched an anti-malaria program to control the breeding of mosquitoes and to destroy the vector. Sanitary inspectors were hired to find larval breeding sites and standing water was treated with kerosene[9]. Further, pamphlets were distributed in both Chinese and English on the importance of mosquito control and destruction, and quinine was administered to schoolchildren in selected districts[10]. As a result, over the 14 years between 1900 to 1914, on average, malaria deaths fell from 447 to 378, and by 1928, it accounted for less than 2% of deaths each year[10–12]. However, it has been established that implementation of these programs was in-part motivated by the fear that the economic well-being of the colony would be jeopardized by a mosquito-transmitted disease epidemic[10]. So again, a sense of care out of pragmatism is observed.

Further, to the colonists, the role of the *Anopheles* mosquito in malaria transmission merely reinforced existing colonial views about the local population. Specifically, that their way of life was unhygienic, dirty and naturally conducive to the spread of disease. This meant that despite malaria deaths decreasing with the successfully implemented control programs, there was increased interest in segregating the Chinese and European communities[13]. This segregation was supported by Joseph Chamberlain, who remarked that "people of clean habits will be safe from malaria"[14].

3. Scientific discovery and the mythology of empire

Generally, the discoveries made in this period reinforced existing colonial narratives, such as the racial and cultural dominance of the European races. The theory of evolution by natural selection as put forward by Charles Darwin in the middle of the 19th century had already contributed to the belief that European races were evolutionarily more advanced than the African races[15]. Advances in Western science may have had a similar effect, with new discoveries serving as proof that Western man had seemingly greater intellectual power than the dirty, ignorant, and superstitious colonized peoples. In accordance with this idea, it was also believed that the tropical disease of the colonies could only be understood by the absolute truth of Western medicine[16].

Evidence of these ideas have been preserved in art. Take the following painting, titled “Sir Patrick Manson (1844–1922), Experimenting with *Filaria sanguinis hominis* in Amoy, China” [17].



This piece was commissioned in 1912, and painted by Ernest Board. In the painting, Manson takes the central position, and is a tall, domineering as well as striking figure clad all in white. He stands in strong contrast to the two Asian figures in the scene. One of these figures is of course Ho Lin, the servant that Manson experimented on, who is asleep and bathed in a sickly green light. The second is a small and stooped unnamed man, who is assumedly also a servant. In terms of meaning, this painting is suggested to convey that “Manson alone as a representative of European science and medicine possesses privileged access to the workings of nature”[18].

4. Practicing tropical medicine: the colonial medical campaigns

The primary motivation for colonialization was economic, as the establishment of large overseas empires allowed for the colonizers to accumulate great wealth[19]. However, Britain and indeed other colonizers may have doubly viewed colonization as a racial or Christian duty, wherein it was their responsibility to civilize, educate or convert the "savages" that lived in the far reaches of the world[3,20]. The presence of disease amongst the local populations represented one such point of correction, though as seen in the case of Hong Kong, such prevention may also have been enacted out of a sense of economic pragmatism. Nevertheless, colonial governments did organize medical campaigns against disease. However, the approaches and long-term effects of these campaigns leaves much to be desired.

In the early 20th century, there existed no ethical standards for medical treatment or patients' rights[21]. Though this certainly was the case elsewhere in the world, the enforced power dynamics between colonizer and colonized was reflected in the distribution of medical services. This is observed in the 1921 and 1956 French colonial medical campaigns against sleeping sickness.

While not as large as the British Empire, the French colonial empire occupied a significant portion of Western Africa. The tsetse fly is only found is sub-Saharan Africa, and it is a vector for *Trypanosoma brucei*, a parasitic kinetoplastid that causes "sleeping sickness" (or African Trypanosomiasis as it is known today). After the parasite is transmitted by the fly, in the first stage of the disease, sufferers display flu-like symptoms. However, in the second stage, when the parasite begins to infect the immune system, the symptoms change to confusion, poor co-ordination and trouble sleeping. Unless treated, the disease is lethal. Because of the localisation of the tsetse fly, the disease is endemic in Africa. Over three decades, French colonial governments tried to manage the disease, and millions of people were subjected to medical examinations and injections which had serious side-affects.

In the French colonies, roving military medical teams were dedicated to treating the illness. However, villagers were often forced at gunpoint to undergo a physical examination. Villagers were checked for swelling in the lymph nodes, the presence of the parasite in their blood, and had spinal taps. For those who were identified as having the disease, the medical teams tried to determine the extent of disease progression. However, these diagnostic procedures have been described as imperfect[22,23]. After diagnosis, attempts were made at curing the disease. At the time, the drug atoxyl had already been developed by Paul Ehrlich (of Salvorsan fame) and Kiyoshi Shiga. However, a serious side effect of this organo-arsenic compound was blindness. Further, the dosage required to treat the disease was close to what would have been a lethal amount for the patient, and was typically distributed to villagers

irrespective of their diagnosis[23]. The ethos of these practices has been described as "tolerate(ing) the negative effects on individual patients if it meant that other individuals were then less likely to get sleeping sickness"[24].

The consequences of these practices extended beyond the treatment of sleeping sickness. Studies of colonial medial campaigns in Africa suggest it is biologically plausible that the use of unsterile syringes and the increased blood transfusions in these campaigns helped to spread HIV infections throughout the continent in 1924 and 1955[25,26]. The consequences of colonial medical efforts are seemingly not limited to the past either. A 2021 study found that locations that were targeted more by these campaigns had reduced vaccination rates and a lower trust in medicine[24]. The memory of the campaigns against sleeping sickness is also immortalised in the culture of the Eton people in Central Cameroon, inside of a song that goes:

"The injection against sleeping sickness was too painful.... They ask me to go draw water from the well, If I drag my feet The policemen hit me on the head, The injection against sleeping sickness was too painful"[27].

5. Evaluating the practices of the 1921-1956 French colonial campaign against sleeping sickness

While there was a lack of other useful drugs that could be used in a tropical climate without severe negative side-affects, the use of atoxyl raises significant issues of care. Chiefly, if a disease is prevalent amongst a certain community, and there are currently no wholly appropriate medicines that could be used to cure said disease, should they still be administered as a treatment? If recipients for the medication were properly informed of the risks, and a more equal balance of power between medical personnel and patients existed- one where patients could refuse treatment, then it seems appropriate to try and treat people using those medications. However, the circumstances under which the French colonial campaign was conducted, specifically the coercion and mass treatment of villagers, renders this entire practice wholly inappropriate.

Secondly, the ethos of this campaign, in forgoing the negative effects on individual patients, raises that timeless ethical question, being: do the ends truly justify the means? While the validity French colonial campaign could be analysed from a number of ethical perspectives, it is also worth taking into

account the existing colonial context in which these campaigns were conducted. It should be remembered, that these campaigns were motived out of both economic pragmatism and care/correction. In which case, the positive outcomes of the campaign, that is the "ends", may itself be tainted with ideas of exploitation and racial superiority.

6. Reflections

It is disquieting as a science student to learn about the mutually reinforcing relationship between science and colonialism. Especially considering that in the present, science tends to be characterised as a force for good, with research being motivated in no small part by humanitarian aims and the "spirit of discovery". Therefore in writing this piece, in discussing the discoveries encouraged by colonialism, the science felt impure, dishonourable even. This feeling was furthered when the benefactors of advancements in tropical medicine and the reinforcement of colonial narratives was discussed. Each of these points served as proof that science research doesn't exist wholly in a vacuum, but is itself informed by and applied to larger systems of power. Is this true only of the colonial era? Certainly not. In the present, a concern with CRISPR/Cas9 gene editing is that it could further socioeconomic divisions- an example of science being used to reinforce economic systems of power. These cases all demonstrate that scientists need to be wary of the larger implications and applications of their work.

Secondly the 1921-1956 French colonial campaigns clearly demonstrates the necessity of ethical standards for medical treatment and patients' rights. It also shows that advances in disease research (here on the etiology of disease, or in pharmaceutical development) does not directly equate to positive outcomes for people being treated. The actual practices by which people are diagnosed and treated must also be considered. In the case of the French colonies, the power the colonizers had over the colonized resulted in wholly inappropriate practices. To revise a point from earlier- this demonstrates how science can be applied *inside* systems of power. In comparison with the present, these campaigns were certainly extreme. However, this knowledge is valuable in understanding current medical campaign practices. For example, the reduced freedoms of non-vaccinated individuals in Singapore arose as the government tried to balance respect for bodily autonomy with the desire to reduce the incidence of Covid-19. This intentionally stands in stark contrast to the approach of the French colonial government and its abuse of power.

In closing, and to briefly draw attention to perspectives in the present, the death of Elizabeth II in September 2022 sparked discussions on the merit and failures of colonialism by former colonies. To me, any attempt to uncover merits are ultimately futile. Firstly, because any possible merits are often overshadowed by the magnitude of abuse and exploitation of colonized peoples. Secondly, any advantage gained is tainted, if not directly shaped, by imperialistic notions. I believe examples of both these ideas were demonstrated in this piece, being an exploration of just a few case studies in tropical medicine – itself only one facet through which empires operated.

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