

The Colonizer's Cure: Quinine and the British Empire

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Human society is driven forward by innovation. Progress in science and technology can break barriers, changing lives for the better and even saving them. Quinine, a drug with the ability to cure or prevent malaria, is one such discovery: it has saved countless people from what was once thought of as the world's deadliest disease. However, as with all progress, quinine's discovery is a double-edged sword. As a result of its use, the British Empire colonized the tropical areas of Africa and India. While malaria's deadliness previously presented a barrier to colonization in the tropics, quinine protected the British and allowed them to subjugate the people of these areas. Quinine's groundbreaking discovery changed medical care forever and paved the way for the British to break the barrier of malaria in their colonization of Africa and India.

The story of quinine takes place throughout the world, and as quinine has spread and scientific knowledge has broadened, its name has changed. From quina-quina bark to cinchona, Jesuit's bark to fever tree powder, and finally quinine, advances in understanding the science behind quinine have led to different names. Quinine's story starts as the quina-quina tree, a tree native to the rainforests of the Andes mountains.

The discovery of quinine is attributed to a Quechua man in Peru. According to legend, this man was suffering from a high fever and constant shivering and was lost in the mountain jungles.¹ He soon came across a pool of water surrounded by quina-quina trees and took a drink. The pool's water had been affected by the trees, and tasted bitter. As soon as he drank, his fever was cured. He told his village of his miraculous discovery, and from that day onward, the

¹ Jane Achan et al., "Quinine, an old anti-malarial drug in a modern world: role in the treatment of malaria," in *Malaria Journal*, previously published in *Malaria Journal*, no. 10 (May 24, 2011), accessed January 27, 2020, <https://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-10-144>.

Quechua used the bark of quina-quina trees as a cure for shivers.² With this discovery, the Quechua broke the barrier of known medicine by discovering a cure for a previously incurable sickness. Although they did not know it at the time, the use of quina-quina bark by the Quechua also marks the first use of a chemical compound to treat a disease.³ Spanish conquistadors witnessed the use of quina-quina bark while in a Quechua village, and brought this miracle drug back to Spain with them.⁴ This represented another barrier being broken: the barrier between indigenous and European medical knowledge.

An alternative legend popular in Europe suggests that the quina-quina tree was first used to cure the fever of the Spanish Countess of Chinchon while in Peru. Having miraculously survived her sickness, she began using a powder made from the bark of the tree to cure the poor and sick of Lima, breaking the barrier of access separating the poor from medical care. Ever since, Europeans have called the quina-quina tree “Cinchona” in her honor. While the truthfulness of both legends is widely disputed, the point remains the same: quinine’s discovery revolutionized medical science by providing a cure for a deadly disease. ⁵

According to the European legend, the Countess and her husband soon returned home to Spain and began telling the story of the bark that had saved her life.⁶ As cinchona became more well known, Jesuit priests in Peru began to hunt for it to use both there and abroad. Priests would be sent to live in Inca communities in the hopes of gradually converting the Incas. As they journeyed between these communities and the capital city of Lima, they looked for cinchona

² Fiammetta Rocco, *Quinine: Malaria and the Quest for a Cure That Changed the World* (New York: Perennial, 2004), 57-58.

³ Achan et al., "Quinine, an old anti-malarial," in *Malaria Journal*.

⁴ Rocco, *Quinine: Malaria*, 55-56.

⁵ *Ibid*, 57.

⁶ *Ibid*, 57.

trees. Upon finding one, they stripped off the tree's bark while leaving it healthy and then dried the bark in the sun. For every tree they stripped, a priest would plant five more, resulting in a flourishing population of cinchona trees.⁷ The use of cinchona spread throughout South and Central America, with the powder being sent to Jesuit colleges in other Spanish colonies. As more cinchona was collected, a Jesuit priest named Brother Salumbrino started sending quantities of it back to Europe.⁸ Before long, all of the ships sent to Spain from Peru carried cinchona. Use of cinchona soon spread throughout Europe as well.

The cinchona powder shipped to Europe quickly became popular among the elite of society. Royals and wealthy citizens would go through expensive "cinchona therapy" to treat a variety of illnesses.⁹ Because of the difficulty of making it, the powder was extremely expensive. Dried cinchona bark had to be imported from South America at a great cost and then ground into a powder. As a result of its bitter taste, it was usually mixed with wine.¹⁰ Ironically, the few people with access to cinchona rarely needed it, while the poorer masses actually suffering from malaria could not afford treatment. This created a barrier between rich and poor, with only elites having access to sorely needed medicine.

In 1820, a pair of French scientists named Pierre Pelletier and Joseph Caventou figured out how to synthesize quinine, making it available to more and more people.¹¹ This coincided with what is called the "Scramble for Africa," in which European powers raced to colonize as

⁷ Ibid, 77.

⁸ Ibid, 82-83.

⁹ James L. A Webb, *Humanity's Burden: A Global History of Malaria* (Cambridge: Cambridge University Press, 2009), 96.

¹⁰ Achan et al., "Quinine, an old anti-malarial," in *Malaria Journal*.

¹¹ Tom Cassauwers, "The Global History of Malaria, the World's First Anti-Malarial Drug," Medium, last modified December 30, 2015, accessed April 10, 2020,

<https://medium.com/@tcassauwers/the-global-history-of-the-world-s-first-anti-malaria-drug-d1e11f0ba729>.

much of Africa as possible. For a long time, the barrier of disease, most notably malaria, made Europeans hesitant to invade Africa. Many called Africa “the white man’s grave,”¹² and it was known as a death trap for soldiers. From 1819-1836, more than 48.3% of British troops sent to Sierra Leone died.¹³ A morbid rhyme sung by British sailors about the Bight, or Bay, of Benin exemplifies the European fear of Africa: “Beware, oh beware, of the Bight of Benin, / Where few come out although many go in.”¹⁴ In 1874, the British were so terrified of malaria that four different men rejected an offer to serve as governor in the colony of the Gold Coast out of fear of getting sick.¹⁵ At one point, serving in British West Africa was considered fatal to the point that some officials petitioned to abandon the colonies.¹⁶ However, quinine had the potential to change everything.

As soon as it became available to them, European explorers in Africa began taking supplies of quinine with them. Medical missionary David Livingstone, known as one of the first and most influential European explorers of Africa,¹⁷ demonstrated quinine’s necessity when he wrote, “Quinine was found invaluable in the cure of the complaint [malaria], as soon as pains in

¹² Lom Bryan-Bill Ning, "Quinine and the cinchona plant: gain or bane for Africa?," *Hektoen International: A Journal of Medical Humanities*, accessed January 27, 2020, <https://hekint.org/2019/05/22/quinine-and-the-cinchona-plant-gain-or-bane-for-africa/>.

¹³ Phillip D. Curtin, "The End of the 'White Man's Grave'? Nineteenth-Century Mortality in West Africa," *The Journal of Interdisciplinary History* 21 (Summer 1990), https://www.jstor.org/stable/204918?seq=7#metadata_info_tab_contents.

¹⁴ A. Wyatt Tilby, *Britain in the Tropics, 1527-1910*, vol. IV, *The English People Overseas* (Boston, Massachusetts: Houghton Mifflin Company, 1916), 172, accessed January 27, 2020, https://books.google.com/books?id=Gw4LAAAAYAAJ&pg=PA172&lpg=PA172&dq=beware+of+bight+of+benin+one+comes+out+for+forty+in&source=bl&ots=VHMx44KQWd&sig=ACfU3U2Ah-VbhFv3AZgH3AlmvMQFKnLWGW&hl=en&sa=X&ved=2ahUKEwixdTAA0Z_nAhXpRt8KHb9MBw0Q6AEwCHoECAoQAQ#v=onepage&q&f=false.

¹⁵ Tom Gale, *Hygeia and Empire: The Impact of Disease on the Coming of Colonial Rule in British West Africa*, vol. 11, *Transafrican Journal of History* (n.p.: Gideon Weare Publications, 1971-1995), 81, https://www.jstor.org/stable/24328534?seq=1#metadata_info_tab_contents.

¹⁶ *Ibid.*, 81.

¹⁷ Biography.com Editors, "David Livingstone Biography," *The Biography.com Website*, last modified May 14, 2019, accessed January 27, 2020, <https://www.biography.com/explorer/david-livingstone>.

the back, sore bones, headache, yawning, quick and sometimes intermittent pulse, noticeable pulsations of the jugulars, with suffused eyes, hot skin, and foul tongue, began.”¹⁸ Livingstone’s writings were influential to European doctors at the time, and quinine became one of the most popular prescriptions by military doctors in Africa.¹⁹ In 1848, the director-general of the Army Medical Department sent notices to British officials in West Africa encouraging the use of quinine, heightening its ubiquity. Quinine’s introduction and subsequent popularity among the British military marks the start of a severe drop in mortality rates, to the extent that by 1875, only 1.7% of troops died from disease.²⁰

As permanent European residence became more widespread in West Africa, quinine’s use did as well. Though expensive, quinine was considered vital to life in the tropics, as necessary as food and water. Without preventative doses of quinine, Britain would have to abandon its colonies, as malaria would have taken far too many lives to justify remaining in Africa. Quinine’s widespread use and necessity was illustrated when British military doctor Alexander Bryson wrote in 1847, “So general has the use of quinine now become, that there is hardly any part of Western Africa, where there are resident Europeans, in whose houses it is not to be found; it is in fact considered to be one of the necessaries of life, where life is of all things the most uncertain.”²¹ British life in Africa depended on quinine to the extent that without it, the empire would have collapsed.

¹⁸ Christopher Lawrence, "Fever in the Tropics," ed. Adrian S. Wisnicki and Megan Ward, Livingstone Online: illuminating imperial exploration, last modified 2010, accessed January 28, 2020, <https://www.livingstoneonline.org/life-and-times/fever-in-the-tropics>.

¹⁹ Webb, *Humanity's Burden*, 107.

²⁰ Curtin, "The End of the 'White'"

²¹ Alexander Bryson, M.D., *Report on the Climate and Principle Diseases of the African Station* (London, United Kingdom: William Clowes and Sons, 1847), 244, accessed January 27, 2020, https://books.google.com/books?id=9sUNAAAAQAAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false.

From its first use in Africa by early explorers to its use by colonists once colonial rule was established, quinine enabled the expansion of British power in Africa until that power reached its colonial height. While quinine undoubtedly saved the lives of many British colonists, its legacy in Africa is deeply conflicted. Because of quinine, the British were able to steal the land of African nations, brutally killing resistance fighters.²² Quinine allowed the British and other European nations to conquer much of Africa and leave behind a devastating path of war, slavery, and exploitation. Malaria, while deadly, acted as a barrier and protected Africans from colonization.

Quinine's use by colonizers occurred in India as well. The British Crown assumed full control of India in 1858, beginning a period of time known as the British Raj.²³ The Raj, which means "reign" in Hindi, lasted from 1858 to 1947. During this time, quinine was essential to British control. Without it, the barrier of malaria would have prevented the British from living in India and continuing their reign. By 1921, there were 156,000 British colonists living in India, mostly in capacities as lawyers and clerks.²⁴ Quinine powder was used as a daily preventative dose against malaria, amounting to a total of 700 pounds of quinine per year.²⁵ Quinine's bitter taste meant that it was hard to enforce usage, so officials began encouraging colonists to mix it with soda and sugar, creating "tonic water."²⁶ This tonic water was sometimes mixed with gin, giving rise to today's gin and tonic cocktail. The importance of quinine to British rule was

²² Ning, "Quinine and the cinchona," *Hektoen International: A Journal of Medical Humanities*.

²³ Vern Cleary, "The British Raj Begins (1858)," *Modern World History*, accessed January 28, 2020, http://webs.bcp.org/sites/vcleary/ModernWorldHistoryTextbook/Imperialism/section_4/britishraj.html.

²⁴ Ibid.

²⁵ Kal Raustiala, "The Imperial Cocktail: How the gin and tonic became the British Empire's secret weapon," *Slate*, last modified August 28, 2013, accessed January 28, 2020, <https://slate.com/technology/2013/08/gin-and-tonic-kept-the-british-empire-healthy-the-drinks-quinine-powder-was-vital-for-stopping-the-spread-of-malaria.html>.

²⁶ Ibid.

illustrated when Winston Churchill, prime minister of the United Kingdom from 1940-1945 and 1951-1955, said, “The gin and tonic has saved more Englishmen’s lives, and minds, than all the doctors in the Empire.”²⁷

Despite the cruelty and humiliation that comes with colonization, many British at the time thought it was ultimately beneficial to the people who were colonized. By imposing European ideals of civilization upon their colonies, the British thought they were doing a service. Part of this process included selling or distributing medicine to native Indians in the hopes of gradually ridding the colony of sickness. Cinchona trees were grown in a plantation in the foothills of the Nilgiri mountains, and their bark was sent to quinine factories in Bengal and Madras.²⁸ Local workers were hired to build the plantation and factories, and many died in the process, a tragic reminder that the cruelty of colonization was involved with every chapter of quinine’s story.²⁹ The produced quinine was then sold through local post offices to both native Indians and British citizens,³⁰ in packets of five to seven granules priced at one pice per packet.³¹ In some cities, such as Bengal, quinine was simply handed out to members of the lower class, as the government began “the scheme for the supply of quinine to the poorer classes in Bengal... the Governor in Council thinks that a similar attempt to popularize the use of quinine should be

²⁷ David Randall, "Cocktail born in the days of the Raj is 150 years old," *The Independent*, last modified November 9, 2008, accessed January 28, 2020, <https://www.independent.co.uk/life-style/food-and-drink/news/a-tonic-for-the-troops-the-spirit-of-the-gt-endures-1003460.html>.

²⁸ Cassauwers, "The Global," *Medium*.

²⁹ *Ibid*.

³⁰ Coleman Macualey, Esq. to The Offg. Secretary to the Government of India, "Regarding proposals to hire a Government Quinologist and establish a factory for quinine production at Mungpoo," May 27, 1881, accessed January 28, 2020, http://access.bl.uk/item/viewer/ark:/81055/vdc_100079564116.0x000001#?c=0&m=0&s=0&cv=1&xywh=-1856%2C260%2C4733%2C2749.

³¹ Muhammad Umair Mushtaq, "Public Health in British India: A Brief Account of the History of Medical Services and Disease Prevention in Colonial India," *Indian Journal of Community Medicine*, January 2009, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2763662/>.

made in this presidency.”³² Quinine had become so widely used that by 1881, when this report was written, it was mass produced to the extent that the government could afford to hand it out. By handing out quinine, the British broke yet another barrier: the barrier that had previously separated India’s poor from the care they needed.

2020 marks 200 years since quinine was first synthesized. In the years since, medicine has relied heavily on chemical compounds. These drugs, used to diagnose, prevent or cure a disorder, are the basis of today’s medical system. Today, there are over 20,000 approved drugs, all taking the same approach to healing that quinine did.³³ Quinine broke the barrier of established ways of thinking by proving that medicine can be approached scientifically instead of spiritually. This way of thinking empowered people to take matters into their own hands and realize that problems can be solved by ingenuity rather than by miracles.

While it was vital to many in the 18th and early 19th centuries, quinine was not without its issues. Quinine’s potential side effects include nausea, temporary deafness and loss of memory, which, when added to its bitter taste, made many people reluctant to take it.³⁴ In addition, quinine only kills malarial parasites in red blood cells. This means that when quinine treatment is stopped, malarial parasites from other cells in the body can reinvade the red blood cells and cause a relapse.³⁵ Today, quinine has been succeeded by more advanced synthetic

³² The Right Honorable the Earl of Kimberley, K.G., Her Majesty's Secretary of State for India to His Excellency the Most Honorable the Governor General of India in Council, "India Proceedings," October 19, 1893, accessed January 28, 2020,

http://access.bl.uk/item/viewer/ark:/81055/vdc_100087850533.0x000001#?c=0&m=0&s=0&cv=0&xywh=-2855%2C-1%2C9191%2C5338.

³³ Fact Sheet: FDA at a Glance," U.S. Food and Drug Administration, last modified October 18, 2019, accessed February 3, 2020, <https://www.fda.gov/about-fda/fda-basics/fact-sheet-fda-glance>.

³⁴ Gale, *Hygeia and Empire*.

³⁵ The Editors of Encyclopaedia Britannica, "Quinine," *Encyclopaedia Britannica Online*, <https://www.britannica.com/science/quinine>.

derivatives, such as primaquine, chloroquine and hydroxychloroquine.³⁶ Hydroxychloroquine has also been used to fight a variety of diseases, such as lupus, arthritis,³⁷ and, in the midst of the COVID-19 pandemic, as a possible treatment for the novel coronavirus.³⁸

Though the drug itself has largely been replaced, quinine's legacy is irreplaceable.³⁹ The history of quinine has been entwined with imperialism since the beginning. Were it not for Spanish imperialism in Peru, quinine's use would have never expanded beyond a small Quechua village. Later, quinine enabled colonization in Africa and India. It is impossible to talk about quinine without mentioning the history of imperialism to which it is so central. By breaking the barrier of malaria, quinine provided the British with both a cure and a weapon, and by 1913, that weapon had been used to subjugate more than 412 million people.⁴⁰ Mahatma Gandhi, a barrier-breaking advocate for Indian independence, reflected on Britain's weaponization of quinine and other medical advancements from the perspective of the colonized when he wrote, "The English have certainly effectively used the medical profession for holding us. English physicians are known to have used their profession with several Asiatic potentates for political gain".⁴¹

³⁶ Ibid.

³⁷ "Hydroxychloroquine: Benefits, Side Effects, and Dosing," Lupus Foundation of America, accessed April 11, 2020, <https://www.lupus.org/resources/drug-spotlight-on-hydroxychloroquine>.

³⁸ Paige Williams, "Trump's Dangerous Messaging about a Possible Coronavirus Treatment," *The New Yorker*, last modified March 27, 2020, accessed April 10, 2020, <https://www.newyorker.com/news/news-desk/donald-trumps-dangerous-messaging-about-a-possible-coronavirus-treatment>.

³⁹ Achan et al., "Quinine, an old anti-malarial," in *Malaria Journal*.

⁴⁰ John Misachi, "What Does The Sun Never Sets On The British Empire Mean?," *World Atlas*, last modified May 20, 2018, accessed January 29, 2020, <https://www.worldatlas.com/articles/what-does-the-sun-never-sets-on-the-british-empire-mean.html>.

⁴¹ M.K. Gandhi, *Hind Swaraj or Indian Home Rule* (Ahmedabad, India: Navajivan Publishing House, 1909), 52, accessed April 10, 2020, https://www.mkgandhi.org/ebks/hind_swaraj.pdf.

During the course of its history, quinine has acted as both barrier and trailblazer. As a barrier, it has enhanced the separation between rich and poor in Europe by providing a cure to the wealthy and not the poor. However, as a trailblazer, it has broken far more barriers than it has created. It has broken the barrier between indigenous and European medical knowledge, and as the first use of chemistry against disease, it has created a pathway for the advancements in medical science that have followed. It broke the barrier of access and provided the lower classes of India with medical care that was previously unavailable to them. However, quinine's biggest impact was its enabling of colonization in Africa and India. Colonization completely transformed these areas, and the consequences of British rule are still felt today. While deadly, malaria's status as a barrier protected the people of India and Africa from colonization, leaving scholars to wonder if this barrier should have been broken at all.⁴²

⁴²Ning, "Quinine and the cinchona," *Hektoen International: A Journal of Medical Humanities*.

Annotated Bibliography

Primary Sources

Bryson, Alexander, M.D. *Report on the Climate and Principle Diseases of the African Station*. London, United Kingdom: William Cloves and Sons, 1847. Accessed January 27, 2020. https://books.google.com/books?id=9sUNAAAAQAAJ&printsec=frontcover&source=gb_s_ge_summary_r&cad=0#v=onepage&q&f=false.

This book by British military doctor Alexander Bryson was one of my most valuable sources when it came to quinine in Africa. Bryson chronicles his experiences with medicine in Africa in this book, and his passages about quinine showed me just how important quinine was. I used a quote from this source in my paper to illustrate the importance of quinine to permanent European settlement in Africa.

Gandhi, M.K. *Hind Swaraj or Indian Home Rule*. Ahmedabad, India: Navajivan Publishing House, 1909. Accessed April 10, 2020. https://www.mkgandhi.org/ebks/hind_swaraj.pdf.

This primary source is a book written by Mahatma Gandhi advocating for Indian independence. I quoted a passage describing Britain's weaponization of medicine in my paper. This source was extremely valuable to me because it looked at colonial medicine from a different perspective: that of the colonized. I found it hard to find sources from both sides, as it is usually only the story of the people in power that is recorded.

Grady, Denise, Katie Thomas, and Patrick J. Lyons. "7 Answers to Questions about the Malaria Drug Trump Keeps Pushing." *The New York Times*. Last modified April 9, 2020. Accessed April 10, 2020. <https://www.nytimes.com/article/coronavirus-hydroxychloroquine-malaria.html>.

This online article discussed the use of hydroxychloroquine as a potential treatment for COVID-19. It was startling for me to classify this as a primary source, as I had never thought of the media we see daily as a primary source. I was fascinated by looking at the connection between history and current events.

Her Majesty's Secretary of State for India. Letter to His Excellency the Right Honorable the Governor in Council Madras, "Proposals for the establishment of a Quinine Manufactory on the Nilgiris," February 14, 1884. Accessed January 28, 2020. http://access.bl.uk/item/viewer/ark:/81055/vdc_100079564473.0x000001#?c=0&m=0&s=0&cv=0&xywh=-3106%2C0%2C9408%2C5463.

This government memo sent between departments of the British India Office discusses plans to build a quinine factory in the Nilgiris district. Through this primary source, I learned more about how quinine was procured for the British in India. Understanding the process of quinine production helped me better understand the quinine distribution program.

———. Letter to His Excellency the Right Honorable the Governor in Council Madras, "Proposal to establish a manufactory in the Nilgiris for the preparation of quinine by private enterprise," August 28, 1884. Accessed January 28, 2020.
http://access.bl.uk/item/viewer/ark:/81055/vdc_100079564527.0x000001#?c=0&m=0&s=0&cv=0&xywh=-978%2C1577%2C5154%2C2549.

This memo is another primary source that showed me more about the quinine program. In this memo, plans for allowing private companies to produce quinine in India are mentioned. By looking at the mentions of quinine in government documents, I slowly pieced together a picture of quinine in India.

Kimberley, Earl of., Her Majesty's Secretary of State for India. Letter to His Excellency the Most Honorable the Governor General of India in Council, "India Proceedings," October 19, 1893. Accessed January 28, 2020.
http://access.bl.uk/item/viewer/ark:/81055/vdc_100087850533.0x000001#?c=0&m=0&s=0&cv=0&xywh=-2855%2C-1%2C9191%2C5338.

This memo is a long recording of the discussion topics of the British India office, with only a few mentions of quinine. That being said, the quinine-related paragraphs were very valuable to me, as they discussed the quinine distribution program for the poor of Bengal. I used a quote from this source in my paper.

Macaulay, Coleman, Esq. Letter to The Offg. Secretary to the Government of India, "Regarding proposals to hire a Government Quinologist and establish a factory for quinine production at Mungpoo," May 27, 1881. Accessed January 28, 2020.
http://access.bl.uk/item/viewer/ark:/81055/vdc_100079564116.0x000001#?c=0&m=0&s=0&cv=1&xywh=-1856%2C260%2C4733%2C2749.

This government memo is another primary source discussing the quinine program. This memo proposes hiring a government Quinologist, a scientist who specializes in growing quinine for medical use. I paraphrased part of this memo in my paper to describe the post office distribution program.

Tilby, A. Wyatt. *Britain in the Tropics, 1527-1910*. Vol. IV of *The English People Overseas*. Boston, Massachusetts: Houghton Mifflin Company, 1916. Accessed January 27, 2020.
https://books.google.com/books?id=Gw4LAAAAYAAJ&pg=PA172&lpg=PA172&dq=beware+of+bight+of+benin+one+comes+out+for+forty+in&source=bl&ots=VHMx44KQWd&sig=ACfU3U2Ah-VbhFv3AZgH3AlmvMQFKnLWGw&hl=en&sa=X&ved=2ahUKEwixdTA0Z_nAhXpRt8KHb9MBw0Q6AEwCHoECAoQAQ#v=onepage&q&f=false

This primary source describes the history of British colonization in Africa, as well as the situation at the time it was written. The writer talks about Britain's fear of African diseases, the most notable of which was malaria. I used a quote that illustrates Britain's fear of Africa from this source.

Williams, Paige. "Trump's Dangerous Messaging about a Possible Coronavirus Treatment." *The New Yorker*. Last modified March 27, 2020. Accessed April 10, 2020.
<https://www.newyorker.com/news/news-desk/donald-trumps-dangerous-messaging-about-a-possible-coronavirus-treatment>.

This article gave me more information regarding hydroxychloroquine and COVID-19. I was fascinated by my topic's continued relevance in today's world.

Secondary Sources

Achan, Jane, Ambrose O. Talisuna, Annette Erhart, Adoke Yeka, James K. Tibenderana, Frederik N. Baliraine, Phillip J. Rosenthal, and Umberto D'Alessandro. "Quinine, an old anti-malarial drug in a modern world: role in the treatment of malaria." In *Malaria Journal*. Previously published in *Malaria Journal*, no. 10 (May 24, 2011). Accessed January 27, 2020.
<https://malariajournal.biomedcentral.com/articles/10.1186/1475-2875-10-144>.

This journal article talks about quinine in a very different way from the majority of my sources, looking at it from a scientific perspective. Through this, I learned more about the mystery surrounding quinine's discovery, and about the more modern treatments for malaria that have replaced it. Although quinine was incredibly important in the past, the difficulty of producing it and its relative inefficiency compared to modern cures renders it obsolete.

Biography.com Editors. "David Livingstone Biography." The Biography.com Website. Last modified May 14, 2019. Accessed January 27, 2020.
<https://www.biography.com/explorer/david-livingstone>.

This biography describes the life of David Livingstone, a medical missionary who was one of the first people to bring European-style medical care to Africa. Livingstone was instrumental in the introduction of quinine to the British military, and understanding his life story let me write more accurately about quinine's early use in Africa.

Cassauwers, Tom. "The Global History of Malaria, the World's First Anti-Malarial Drug." Medium. Last modified December 30, 2015. Accessed April 10, 2020.
<https://medium.com/@tcassauwers/the-global-history-of-the-world-s-first-anti-malaria-drug-d1e11f0ba729>.

This online article gave me information regarding the synthesis of quinine. I also used this source to learn more about the details of Britain's Indian quinine distribution program, such as where cinchona was grown and how quinine was sold.

Cleary, Vern. "The British Raj Begins (1858)." *Modern World History*. Accessed January 28, 2020.
http://webs.bcp.org/sites/vcleary/ModernWorldHistoryTextbook/Imperialism/section_4/britishraj.html.

This webpage contained details of the British Raj in India. I learned a lot about the experience of British citizens in India through this source, as well as some statistics about the number of British expats in India. I incorporated some of these details into my paper to present an accurate picture of India during the Raj.

Curtin, Phillip D. "The End of the 'White Man's Grave'? Nineteenth-Century Mortality in West Africa." *The Journal of Interdisciplinary History* 21 (Summer 1990).
https://www.jstor.org/stable/204918?seq=7#metadata_info_tab_contents.

This secondary source looked at the causes and number of deaths of European soldiers in Africa. The statistics I found in this source were invaluable for me, as they provided evidence for my thesis and illustrated the sharp decline in deaths after the use of quinine began.

The Editors of Encyclopaedia Britannica. "Quinine." *Encyclopaedia Britannica Online*.
<https://www.britannica.com/science/quinine>.

This encyclopedia entry provided a brief but informative overview of quinine. Reading this article helped me understand that quinine was replaced because it only kills malarial parasites in red blood cells, meaning that once quinine treatment is stopped, parasites from other cells can reinvade the red blood cells.

"Fact Sheet: FDA at a Glance." U.S. Food and Drug Administration. Last modified October 18, 2019. Accessed February 3, 2020.
<https://www.fda.gov/about-fda/fda-basics/fact-sheet-fda-glance>.

This website provided statistics that helped me look at quinine in the context of medicine. As the first use of chemistry to cure a disease, quinine undoubtedly broke barriers, and this web page about the current state of medicine helped me understand the consequences of this broken barrier.

G, Gabriel, Garner P, Ferroni E, Tröhler U, and Chalmers I. "Evaluating Cinchona bark and quinine for treating and preventing malaria." *Commentaries on the history of treatment evaluation*.
<https://www.jameslindlibrary.org/articles/evaluating-cinchona-bark-and-quinine-for-treating-and-preventing-malaria/>.

This secondary source gave me a deeper understanding of quinine's origin legend. In addition, I learned that quinine has gradually become replaced by more efficient cures, such as vaccines. This source was really interesting to me because it looked at quinine from a modern perspective instead of a historical one.

Gale, Tom. *Hygeia and Empire: The Impact of Disease on the Coming of Colonial Rule in British West Africa*. Vol. 11 of *Transafrican Journal of History*. N.p.: Gideon Weare Publications, 1971-1995.
https://www.jstor.org/stable/24328534?seq=1#metadata_info_tab_contents.

This book is a secondary account of how disease affected British colonization in Africa. Through this source, I learned just how much of a barrier malaria posed to the British. It also provided me with specific examples of this barrier, some of which I used in my paper.

"Hydroxychloroquine: Benefits, Side Effects, and Dosing." Lupus Foundation of America. Accessed April 11, 2020.
<https://www.lupus.org/resources/drug-spotlight-on-hydroxychloroquine>.

This website offered a brief outline of hydroxychloroquine as a treatment for lupus and gave me more information about quinine's modern derivatives. Modern sources always take a much more scientific approach to describing quinine and its derivatives, while historical ones remain vague.

Kaul, Chandrika. "From Empire to Independence: The British Raj in India 1858-1947." BBC. Last modified March 3, 2011. Accessed January 27, 2020.
http://www.bbc.co.uk/history/british/modern/independence1947_01.shtml.

This webpage provided a secondary account of the British Raj from its very beginning to its end. This source also gave me information about the pre-colonial system of rulership in India, with princes ruling provinces under the supreme rule of the Emperor. I used this information to better understand the events surrounding quinine in India.

Lawrence, Christopher. "Fever in the Tropics." Edited by Adrian S. Wisnicki and Megan Ward. Livingstone Online: illuminating imperial exploration. Last modified 2010. Accessed January 28, 2020. <https://www.livingstoneonline.org/life-and-times/fever-in-the-tropics>.

This secondary source is an account of medical missionary David Livingstone's explorations in Africa. I used a quote by Livingstone from this source in my paper's paragraph about early use of quinine in Africa. The quote describes Livingstone's reliance on quinine for treating malaria.

Luscombe, Stephen. "Africa and the British Empire." The British Empire. Accessed January 27, 2020. <https://www.britishempire.co.uk/maproom/africa.htm>.

Like my sources about Indian history, this helped me understand the context of quinine, but in Africa. Quinine had an enormous impact on Africa, and understanding the backstory helped me figure out where quinine fit in.

Misachi, John. "What Does The Sun Never Sets On The British Empire Mean?" World Atlas. Last modified May 20, 2018. Accessed January 29, 2020.
<https://www.worldatlas.com/articles/what-does-the-sun-never-sets-on-the-british-empire-mean.html>.

This webpage acted as a brief but comprehensive history of the British Empire. The writing contained valuable statistics about the scope of the British Empire, some of which I used in my paper. By looking at the size of the empire, I gained a deeper understanding of the extent to which quinine changed the world.

Mushtaq, Muhammad Umair. "Public Health in British India: A Brief Account of the History of Medical Services and Disease Prevention in Colonial India." *Indian Journal of Community Medicine*, January 2009.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2763662/>.

This secondary source provided me with facts about the laws and policies the British made in India regarding disease control. Through this source, I learned about the stockpiles of quinine the government kept in case of a malaria epidemic.

Ning, Lom Bryan-Bill. "Quinine and the cinchona plant: gain or bane for Africa?" *Hektoen International: A Journal of Medical Humanities*. Accessed January 27, 2020.
<https://hekint.org/2019/05/22/quinine-and-the-cinchona-plant-gain-or-bane-for-africa/>.

This webpage is the only secondary source I found that directly addresses quinine's influence on the British Empire. It discusses quinine's impact in Africa, and how this impact is both positive and negative. Although quinine cured many from deadly malaria, it also allowed for the terrible human rights abuses committed by the British and other European powers.

Polu, Sandhya L. *Infectious Disease in India, 1892-1940: Policy-Making and the Perception of Risk*. Cambridge Imperial and Post-Colonial Studies Series. London, England: Palgrave Macmillan, 2017. Accessed April 10, 2020.
https://books.google.com/books?id=hBbLaon4LpMC&pg=PT59&lpg=PT59&dq=malaria+statistics+late+1800s+india&source=bl&ots=s51_dQS4Mf&sig=ACfU3U3PsTn8cr1rlWaGZVj3E#v=onepage&q=malaria%20statistics%20late%201800s%20india&f=false.

This book gave me examples of how malaria affected daily life in India and helped me learn more about different methods of malarial control. While many people focused on quinine, government projects to drain swamps and reduce the number of mosquitoes were also effective.

Randall, David. "Cocktail born in the days of the Raj is 150 years old." *The Independent*. Last modified November 9, 2008. Accessed January 28, 2020.

<https://www.independent.co.uk/life-style/food-and-drink/news/a-tonic-for-the-troops-the-spirit-of-the-gt-endures-1003460.html>.

This article provided secondary context about quinine's use in the gin and tonic. I also used a quote from this article by Winston Churchill that illustrates the gin and tonic's use in the Empire. By mixing bitter quinine with water and gin, the flavor was disguised and the cure was more palatable.

Raustiala, Kal. "The Imperial Cocktail: How the gin and tonic became the British Empire's secret weapon." Slate. Last modified August 28, 2013. Accessed January 28, 2020.
<https://slate.com/technology/2013/08/gin-and-tonic-kept-the-british-empire-healthy-the-d-rinks-quinine-powder-was-vital-for-stopping-the-spread-of-malaria.html>.

This website was provided a secondary account of quinine's use by the Raj. I learned about the gin and tonic, a drink originally made with quinine, from this source, as well as statistics about the amount of quinine used by the Empire.

Rocco, Fiammetta. *Quinine: Malaria and the Quest for a Cure That Changed the World*. New York: Perennial, 2004.

This book was one of my most valuable secondary sources. It provided a complete account of quinine's history, from its origin story to its use up to the 20th century. I used its account of quinine's discovery in my paper, and used certain sections to give me an overall picture of quinine's use.

Roland, James. "Quinine in Tonic Water: What Is It and Is It Safe?" Edited by Natalie Butler, RD, LD. Healthline. Last modified January 3, 2018. Accessed April 10, 2020.
<https://www.healthline.com/health/quinine-in- tonic-water#side-effects-and-risks>.

This source gave me information about modern-day uses of quinine. In America, one of the most common uses of quinine is to treat nocturnal leg cramps. This source also provided information about quinine's potential side effects.

Science Museum. "Malaria: The Persistence of Disease." Brought To Life: Exploring the History of Medicine. Accessed April 10, 2020.
<http://broughttolife.sciencemuseum.org.uk/broughttolife/themes/diseases/malaria>.

This secondary source helped me learn more about quinine usage throughout history. Quinine was used in several wars and has a wide-reaching impact beyond colonization.

Webb, James L. A. *Humanity's Burden: A Global History of Malaria*. Cambridge: Cambridge University Press, 2009.

This book was one of my most valuable secondary sources. It gave me necessary information about the early use of cinchona in Europe, as well as information about quinine's use by military doctors in Africa. In addition, the footnotes of the book pointed me to one of my primary sources, a book by military doctor Alexander Bryson.