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Laboratory Empires: How Diseases and Environmental History modify our perception of the History of Colonisation

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Abstract

This paper will discuss the causes, consequences and management of the sanitary aspects of colonial expansion and rule in two different parts of the former British colonial empire. It will first address the role played by tropical diseases such as yellow fever in the conquest of the regions and islands surrounding the Caribbean Sea: how did environmental conditions enable historians to write innovative narratives of past events that take into account trans-disciplinary developments in the field of Environmental History? Second, it will examine the question of whether British colonial power contributed to the spread of endemic and epidemic diseases across the African continent, with the British fight against trypanosomiasis in Eastern and Southern Africa studied as an example. In doing so, this discussion will evaluate the impact of the solutions implemented to help the development of farming industries and to further their integration in a vast global and imperial trade network.

For each of these experimental situations, the paper will try to determine the causes of these new developments and evaluate the significance of the social and environmental consequences arising from this unprecedented connection of different parts of the world and the gradual building of an imperial trade network on a global scale. It will also recall the various solutions implemented in order to solve the challenge posed by the transformation of local tropical diseases into global pandemics in the context of the expansion of a global trade and communication network.

Keywords: Colonial History – Environmental History – Colonisation – Tropical Diseases – Epidemics – Pandemics – Globalisation

Résumé

Cet article traitera des causes, des conséquences et de la gestion des aspects sanitaires de l'expansion et de la domination coloniale dans deux parties différentes de l'ancien empire colonial britannique. Une première partie traitera du rôle joué par les maladies tropicales telles que la fièvre jaune dans la conquête des régions du bassin Caraïbe et évaluera l'importance croissante de l'histoire environnementale en analysant la manière dont les conditions environnementales permettent aux historiens d'aujourd'hui d'écrire des récits innovants qui tiennent compte des apports transdisciplinaires de l'histoire environnementale. Une deuxième partie se demandera si la puissance coloniale britannique a contribué à la propagation des maladies endémiques et épidémiques à travers le continent africain à travers l'exemple de la lutte contre la maladie du sommeil en Afrique orientale et australe et évaluera l'impact des solutions mises en œuvre pour aider au développement des industries agricoles visant à l'intégration de ces dernières dans un vaste réseau commercial mondial et impérial.

Pour chacune de ces situations expérimentales, le document tentera de déterminer les causes de ces nouveaux développements et d'évaluer l'importance des conséquences sociales et environnementales découlant de cette connexion sans précédent de différentes parties du monde et de la construction progressive d'un réseau commercial impérial à l'échelle mondiale. Il rappellera également les différentes solutions mises en œuvre pour résoudre le défi posé par la transformation des maladies tropicales locales en pandémies mondiales dans le cadre de l'expansion d'un réseau mondial de commerce et de communication.

Mots-clés : Histoire coloniale – Histoire environnementale – colonisation – maladies tropicales – épidémies – pandémies – mondialisation

Introduction

Nature is not inert: with innumerable, unforeseeable and most often unintended consequences, it is not easily manageable. Understanding humans' past and present relationships to their natural environment, more specifically the impact of environmental disruption due to human activities and development, is becoming essential to efforts to protect an ever more connected, global and expanding human community facing unprecedented ecological challenges of all kinds and scales.

The latest coronavirus pandemic is a stark reminder of the long forgotten history of the vulnerability of our human condition in the face of an environment that we largely have come to consider a mere background landscape to our activities and an inexhaustible reservoir of food, materials and energy sources to fulfil all our needs. The recent crisis has also revealed how difficult it is to coexist with darker dimensions of the natural world. Large-scale disease diffusion usually needs transport networks and trade exchange. Historically, periods of widespread encounters that connected people who were previously separated, or who lived in different ecological zones with few contacts with the outside world, have always been favourable for the development of large pandemics.

In the field of colonial history, this raises many questions regarding both the impact of colonial encounters, conquests and domination not only of people, but also of diverse natural environments and ecological zones, and their forced and often sudden merging and inclusion into a vast, ever enlarging, global web of intercontinental connections. With its development of trade and transport networks, its conquests of large territories often resulting in wars and warfare, and its myriad social, political and economic disruptions, European colonial expansion from the fifteenth to the twentieth century represents a key historical moment for the analysis of human/environment interactions in general and more specifically in relation to the development and management of major pandemics on a global scale.

From this observation, arise several pressing questions: to what extent can the British Empire be considered as a transformer of the natural world of its conquered territories? What were the consequences of the development of transport and of a global trade network for the spread of pandemics on a global scale? Did the British Empire facilitate the spread of diseases not only throughout but also beyond its conquered territories? To what extent did diseases affect the conquest and development of territories? How far did the authorities in charge of administration at local and regional levels understand the deep connections between disease outbreaks, their spread, and environmental transformations? How far did contemporary ideologies regarding environmental and economic exploitation as well as the development of transports on a global scale impact the various ecosystems of the newly conquered territories? To sum up, can the British Empire be regarded as a

“lab empire”?

We may recall here that the term “lab empire” may be applied to most European colonial empires arising after Columbus's landing in the New World in 1492.

This sudden connection of different parts of the world led to numerous discoveries on both sides that were to contribute in no small way to the development of what came to be termed a “scientific revolution”.

Indeed, the sheer amount, diversity and availability of new information regarding plants, animals and environments reached an unprecedented scale in the centuries that followed the “Great Discoveries”. Discoverers, explorers and settlers, as well as slaves and later indentured labourers were all faced with new and most often experimental situations in which they had to adapt to previously unaccustomed conditions. The great diversity of new circumstances, environments (which would nowadays more precisely be termed ecosystems), activities and encounters, coupled with the development and spread of the Enlightenment in Europe and this continent's ever enlarging dependencies across the Atlantic Ocean and beyond to Africa, Asia and Oceania, were to generate a new approach to knowledge that would eventually lead to the definition of modern European science.

As François Regourd interestingly points out in his contribution to the joint publication *Histoire des sciences et des savoirs*, the diffusion of this new spirit of investigation and experimentation did thrive in the societies of the Caribbean and of the New World more broadly. Transatlantic circulations quite often challenged emerging European scientific frameworks as they generated multiple unprecedented situations of contact and cross-cultural interactions. Sugar, tobacco, indigo and rice plantations witnessed major innovations, as they were places of exchange, construction, transformation and circulation of a great diversity of knowledge most often generated by African slaves who brought their knowledge with them and adapted it to the local conditions. A good example of that is the development of rice cultivation in the southern United States by African populations, a process marked by transatlantic circulations of knowledge and know-how which have recently been studied from the point of view of slave populations (Regourd, p. 339). Other examples may include medicinal plant cultivation and other farming activities, some of which merged with local Amerindian practices. We may also mention here the Creole garden, a natural way of selecting a great diversity of plants that can grow next to one another and use their diverse properties to protect each other from parasites and insects, thus creating a symbiotic environment that protects the crops. These gardens can still be seen today and form the living legacy of plantation slaves and Maroons (escaped slaves) throughout the West Indies.

This Subaltern history of experimental practices shows how the development of science in the Americas was a process of merging multiple local customs through

experimentations undertaken in the extremely fertile context of mixed societies situated at the crossroads of Asian, African, Amerindian and European worlds. The analysis of transatlantic knowledge mobility effectively challenges the existing assumption that the building of modern science was a primarily European accomplishment and even refers to a process of Americanisation of the knowledge that travelled across the Atlantic Ocean (Regourd, p. 335).

Besides, in order to centralise and enhance this accumulation of new knowledge in various research fields, scientific institutions, such as the Asiatic societies (in Bombay and Calcutta), and botanical gardens were created in the newly conquered territories all across the world. Scientific expeditions also demonstrated that the quest for scientific knowledge and experimentation had gained momentum in European and colonial societies of the time. The discovery of new “playgrounds” simply reinforced existing trends and tastes for exotic locations.

Even if it is difficult to acknowledge with certainty the extent to which the historical players (i.e. the colonial powers) were aware of the experimental nature of their rule in terms of disease control and environmental management, we may thus assert that the general context was one of experimentation in various fields such as exploration, botany, medicine, farming etc. The Enlightenment and ensuing so called “Scientific revolution” set the stage for a historical context of discovery, classification, investigation and the expansion of global trade networks. The circulation of new goods and commodities, meanwhile, called for the development of new methods of production in farming activities. Following the emergence of innovative techniques elaborated during the Industrial revolution, new products were created: for instance, seedlings of experimental cash crops such as the rubber and Cinchona (Quinine) trees were transferred from their Amazon homeland to South and Southeast Asia. Tea bushes were smuggled out of China to be replanted in the hills of India, Ceylon (Sri Lanka), Malaysia and the East-African highlands.¹ Behind the romantic façade of these cloak-and-dagger operations lay imperial goals that aimed at creating new industries and were, at least in their early stages, controlled and supervised by state and colonial scientific institutions such as the botanical gardens in Kew or those in Calcutta, Mauritius, Trinidad and elsewhere in the Empire. Indeed, in the late eighteenth and nineteenth centuries, Britain supported a diverse programme of worldwide scientific exploration. The quest for botanical knowledge, especially in terms of identifying plants of economic value, had an important influence in determining imperial expansion. The Kew botanical gardens in particular bore an imperial role at the centre of a new network of gardens in the colonies, which became centres for plant research and the assessment of profitable cash crops for cultivation and colonial development. Hence, botanical gardens played a crucial part in the economic development of the Empire and in transforming the

¹ However, more delicate plants had to await the invention of the terrarium in 1829 before they could survive long transoceanic voyages aboard sailing ships.

environment of large parts of the world:

“By the late nineteenth century, botanists had transferred almost every commercially interesting plant, whether wild or cultivated, to almost every place on earth where they could profitably be grown. This involved primarily a massive transfer from South America to South and Southeast Asia and the East Indies where conditions were favourable for labour-intensive estate agriculture.” (Headrick, 1996, p. 4).

All the above-mentioned colonial situations clearly demonstrate that the British were, to a certain extent, well aware of the experimental character of their rule in relation to the development of trade and the management of their Empire as a vast laboratory through multiple experiments having major impacts on the people and the environments that they controlled.

In an attempt to tackle this multi-faceted issue, this paper will focus on two of these experimental situations that arose from the conquest and ensuing colonisation by Britain of new foreign overseas territories, in this case mostly those located in the Tropical belt.

The first experimental situation analysed here will be that of British versus Hispanic colonial wars in the New World of the Americas, with a focus on why this may be regarded as a form of “bacteriological warfare”. As the British claimed their share of the New World, they found themselves in unprecedented situations and therefore had to adapt to a new range of unforeseen events. Some of these were the unexpected consequences of the development of the Atlantic slave trade and plantation system. For reasons that would long remain unknown, the firmly entrenched Spanish proved more resilient to the tropical diseases that, conversely, decimated newly arrived British troops. As will be discussed here, the British gradually learnt that they should avoid the hurricane season; the slaves and the Spanish, however, soon realised that they should take advantage of their relative immunity to tropical diseases when they came face to face with fresh troops recently arrived from Britain.

The second part of this paper will deal with the development of overseas farming activities. It will discuss whether the development of colonial cash crops and the expansion of a global farming trade network contributed to the spread of diseases and the transformation of the natural environment in Africa. We will draw this point out through the analysis of the British strategy in dealing with the resurgence of trypanosomiasis in Eastern and Southern Africa from the end of the nineteenth century to the first half of the twentieth century. This will lead us to assess a great variety of situations that will build a nuanced picture of the remarkable diversity of colonial situations, problematics, responses and solutions implemented in various environments across the African continent.

First experiments in “bacteriological warfare”

Why did the Caribbean islands and Southern and Central American provinces prove so difficult for the British to colonise? Why did so many of these islands and areas remain Spanish in spite of the major defeat of the Armada against the English in 1588 and the shift in the balance of naval power in favour of England?

To answer these questions, we will capitalise on the links being forged between Colonial History and Environmental History, a process that is currently shedding new light on our traditional understanding of past colonial events. This evolution has helped historians to redefine their perception of the past and frame new theories about historical events using concepts and practices that can be combined in order to produce new interpretations of the past. These new ways of combining events can help produce a global picture of history thanks to narratives that take into account innovation and developments in various research fields including in sciences such as Biology and Climate science.

The pioneering works of A.W. Crosby and J.R. Mc Neill in particular contributed to the development of a new historiography through the study of humans’ relationship to the environment, and the innovative field of environmental history resulted from their studies. Focusing on a few of the numerous disease outbreaks that contributed to framing the history of European colonisation, we will highlight the notable contribution of J.R. Mc Neill’s analysis of the development of yellow fever in the Caribbean area and how different European colonial powers tried to cope with such situations.

Alfred Worcester Crosby, meanwhile, is commonly regarded by historians as one of the founding fathers of Environmental History thanks to his pioneering work entitled *The Columbian Exchange*, a term he coined in 1972. In this book, the historian tells the story of Columbus’s landing in 1492 through the lens of the ramifications it had on the New World, particularly in relation to the ecological and biological consequences of the exchange of living organisms between the two worlds. In the 1970’s, his approach to history through biology was innovative, and the book is now considered as a founding text in the field of environmental history.

The Old World was mostly impacted by the many new crops such as maize, potatoes, Cassava and tobacco, among others, that made their way across the Atlantic Ocean to Europe and Africa. The New World, however, was heavily affected by the numerous infectious diseases brought by Old World invaders, especially smallpox and malaria. These diseases had not previously existed in the Americas and thus took a heavy toll on the local populations, thereby facilitating their conquest by the newcomers. By contrast, parts of the Old World which included the Eurasian

and African continents had shared diseases for millennia, effectively permitting the development of a sort of collective immunity that prevented large parts of the population from being seriously affected, at least on a scale large enough to inflict serious demographic damage.

Following Crosby’s pioneering work, many historians have subsequently focused on such transdisciplinary approaches and the cross fertilisation of ideas brought to the field of Colonial Studies by Environmental History. Thus, the study of specific examples taken from Britain’s environmental interactions during the imperial conquest, expansion, development and management of its overseas territories’ resources in connection with disease outbreaks provided new insights into the history of the British Empire in particular and the phenomenon of European colonisation in the Modern Age more broadly. One of the most famous among these later historians was J. R. McNeill² who had already warned that environmental change was likely to threaten world order in the coming decades and that such developments were far from new, given an impressive list of historical precedents:

Lately serious scientists, serious journalists, and even serious historians have warned us that environmental change threatens world order. New and deadly infections from tropical Africa, biodiversity loss around the globe, uneven population growth, intercontinental migrations and a host of other developments spell danger for unprepared people and institutions, and for peace and diplomacy. This may be so, but even if so, it is not new. It sounds a lot like the seventeenth century in the American tropics. (McNeill, 1999, p. 175).

McNeill therefore believes that the conditions of expeditionary warfare brought “an influx of inexperienced immune systems” from Europe, which provided optimal conditions for the spread of the disease. The populations that were most vulnerable to the disease were young adult white males who had grown up outside of yellow fever zones and whose ancestors had never been in contact with the disease. Overall, yellow fever seemed to favour local populations over invaders, and Africans, women and children over young adult European men.

Thus, in *La prochaine peste, une histoire globale des maladies infectieuses*, Serge Morand (2016, p. 106) recalls that the first yellow fever epidemic in the New World broke out in the Yucatan peninsula as well as in the Caribbean in 1647 and 1648 following the arrival of 700,000 African slaves. By 1761, the disease had become endemic in Havana, where five million Africans had been deported to work on the plantations. Therefore, almost from its first outbreak in the region through Napoleon’s Caribbean and American wars and until the American Civil War, yellow fever was to plague all military interventions in the region, taking a toll mostly on foreign armies

² His father, James McNeill, who was another famous environmental historian, had previously entitled his major work *Plagues and peoples* in 1976, dealing with similar environmental history issues.

of French and British descent.

Only a few years after the outbreak of the first Caribbean epidemic in 1647, the one-week conquest of Jamaica by the English troops in May 1655 ended in the death of forty-seven percent of the invading soldiers by November of the same year, with half of the remainder falling ill. After 1655, and throughout the 1680's, in the context of the struggles between England and France, expeditions to the West Indies became frequent: "after the successes, victors usually evacuated quickly, suffering from epidemics, and at the next peace treaty conquered ports were restored to their previous masters." (McNeill, 1999, p. 179). The War of the Spanish Succession was a Spanish success in the American tropics because out of a total of nineteen cruises or expeditions sent by either France or Britain, between fourteen and eighteen were decimated by tropical diseases. Even the exception of Havana did not last. Shortly after its conquest in a nine-week battle by the British in 1762, forty-one percent of the initial 14,000 soldiers fell ill, mostly from yellow fever. By contrast, only seven to eight percent had died in combat or from other causes. The conclusion of this tragic episode was the restitution of Havana at the Peace of Paris in 1763. The War of the American Revolution and the Napoleonic Wars included numerous similar episodes (McNeill, p. 180).

As these situations became clearer and scientific knowledge developed, things began to improve as strategists on all sides gradually began to take the various conditions affecting the spread of diseases in the American and Caribbean regions into account when planning their military expeditions. Local defenders who were fairly immune to the regional diseases knew that, when under siege, they only had to hold out for a few weeks to be assured of victory while their enemies were hit by epidemics. They were aware that their chances increased if the siege took place during the rainier parts of the year, when mosquitoes were more numerous.

On the other side of the ocean, meanwhile, European strategists planned to avoid the hurricane season as they seem to have known, at least from the 1690's, that their chances of success were slimmer if they failed to get the troops to the scene before the beginning of the monsoon season. The geopolitical significance of tropical diseases reached a turning point at the end of the eighteenth century when the deported African slaves came to realise that their relative immunity to tropical diseases was an invaluable asset that could very well help them gain their freedom: Once people of West African descent began to make war on their own behalf in the American tropics, their relative immunity to yellow fever (and to falciparum malaria), if shrewdly exploited, magnified their power. That power soon shook the foundation of imperial order in the American tropics. (McNeill, p. 181).

Recalling the War for the independence of Haiti in the 1790s, Serge Morand (2016, p. 108-109) argues that the British and the French suffered major losses due to dis-

eases in spite of the capture of the rebel leader, François-Dominique Toussaint Louverture. After a few initial military successes, British troops from Jamaica were decimated by the yellow fever virus and suffered over 7,000 losses. When, in 1802, Napoleon sent around 23,000 troops to reclaim Haiti, they captured Toussaint Louverture but two thirds of the troops were lost to yellow fever in the months that followed this short-lived victory. There is little doubt that Toussaint Louverture and his lieutenant and successor Jean-Jacques Dessalines knew how to make good use of this "biological warfare", as Dessalines said to his troops (quoted in James, p. 299 and p. 314): "the French will not be able to remain long in San Domingo. They will do well at first, but soon they will fall ill and die like flies. (...) The rainy season will rid us of our foes."

However, the disaster would only continue for the French, as Europeans living on the island eventually fled from the massacres perpetrated by their former slaves. They ended up in Louisiana, another French American province that stretched from New Orleans to Canada on the western frontier of the newly created United States of America, and in doing so spread yellow fever in their wake. The loss of San Domingo and the ensuing epidemics in Louisiana were undoubtedly one of the factors that led Napoleon to sell Louisiana to the young American republic, thereby enabling its westward expansion (Morand, p.109).

Eventually, the Spanish strategy of assimilation through mixed marriage seems to have proved an invaluable advantage for keeping most parts of America under Spanish rule in the centuries following the discovery of the New World. Unmarried Spanish Conquistadors quickly came to wed local women and later black women. Mixed marriages were officially authorised from 1514. This practice was widespread and occurred in all social classes, while also contributing to the creation of new social and racial hierarchies known as castes. This codified intermingling thus helped dilute antagonisms and contributed to the fragmentation of local hierarchies among the conquered populations (Kourliandsky, p. 69-70). However, another fundamental advantage of these marriages was soon to become obvious, as the immunity conferred to their offspring was to prove one of the most decisive key factors in the continuation of Spanish rule in the tropical areas of the New World. Moreover, the economic development generated by the plantation system, which also proved a favourable environment for mosquitoes and viruses, combined with the movements of various populations from Europe and Africa in the seventeenth century, converged to create the conditions for a long-lasting Spanish Empire in the American tropics:

A grass from New Guinea (sugarcane), a mosquito and a virus from Africa after the mid-seventeenth century wrought an ecological transformation that stabilised the geopolitics of the Caribbean basin. They kept the Spanish Empire intact after 1655, and prevented first France and then Britain from acquiring a choke hold on

Spanish silver and a near monopoly position on American sugar(...). [Besides] After the 1770s, differential disease immunity assisted insurgent populations of the American tropics (and sub-tropics) as they sought to end European empires in the New World. (McNeill, 1999, p. 182).

The development of sugar plantations brought about an ecological revolution in the Caribbean islands as millions of acres of forest were hacked down and burned off to make way for ever-enlarging sugarcane fields. This destruction of indigenous ecosystems upset the natural balance and accelerated soil erosion and a loss of biodiversity, thus generating new environmental conditions that favoured the mosquito vector of yellow fever. Fewer birds meant fewer predators, making plantations excellent incubators for mosquitoes.

In the seventeenth and eighteenth century, sugar was refined on the spot with widespread use of clay pots to process it and drain out molasses. Crystallised sugar was then poured in the pots to let the molasses drain out. These clay pots were empty most of the year apart from a few months after the harvest, and some of them were left broken in the fields. When the rain came, it is easy to imagine how these containers filled with water became breeding grounds for mosquitoes, thus contributing to the spread of mosquito-borne diseases on the plantations and in surrounding towns and ports.

Moreover, the great number of slaves working on the plantations with regular new arrivals from Africa brought fresh supplies of blood to feed the mosquitoes. In some cases, the newcomers came infected with yellow fever. An estimated twelve million Africans were forcibly embarked, but because of the high mortality aboard, only about ten million slaves were disembarked at different ports in Brazil (45%), the British, French, Dutch, and Danish Caribbean (37%), Spanish America (11 %) and North America (4%).³

These terrible figures enable McNeill (p. 178) to point out that “more mosquitoes, more human bloodstreams, and more ships from Africa favoured the establishment of yellow fever in the neotropics.” Thus, the first clear epidemic of yellow fever was to hit Barbados, the biggest sugar island at the time, in 1647 before spreading to Guadeloupe, St. Kitts, Cuba, the Yucatan and the east coast of Central America in the following years, killing perhaps twenty to thirty per cent of the local populations.

As McNeill (p.177) summarises, “after 1640, sugar and geopolitics set the table very nicely for the yellow fever virus”.

³ Figures from the EHNE Digital Encyclopaedia of European History/Sorbonne Université:
<https://ehne.fr/en/encyclopedia/themes/europe-europeans-and-world/europe-and-atlantic-slave-trade/atlantic-slave-trade>

Experiments in farming activities, the development of colonial cash crops in Africa and the fight against trypanosomiasis

Did British colonial powers contribute to the development and spread of endemic and epidemic diseases on the African continent?

From the very beginning of the conquest of sugar islands in the Caribbean in the seventeenth century to the development of farming in Africa in the late nineteenth century, agricultural activities and extensive plant and animal transfers were vital aspects of the gradual control exercised by the British Empire over the natural environment of conquered territories. There was thus a constant tension between the desire to conserve and the drive to produce and profit.

The development of scientific discourse enabled a better understanding of colonial settings and of their fragility and exhaustibility. In most cases, the British were prone to condemn indigenous habits and practices as endangering the environment, and consequently undertook efforts to separate the local populations from their ancestral lands or regular living place. “Environmentally, the British were adept at finding out what was ‘wrong’ with indigenous practices, whilst failing to find any fault in their own.” (Jackson, 2013, p. 48). This argument proved nowhere so true as in Africa.

One of the most challenging problems that the British had to face on that continent was the prevalence of a great deal of tropical diseases. At the time, Africa was referred to as “the white man’s grave”, and very few of the Englishmen who worked in the region prior to the mid-nineteenth century returned home alive. The mosquito-borne diseases of yellow fever and malaria took their toll on the newly arrived young European administrators and prevented them from venturing further inland than the coastal settlements or trade-posts. These diseases effectively constituted “a deadly barricade just beyond the beaches” (Kiple, p. 4). Philip Curtin, who calculated death rates among British troops in various African colonies in the early nineteenth century (quoted in Beinart & Hughes, p. 29), found that, on average, about half of the troops garrisoned in Sierra Leone between 1819 and 1838 died annually.

However, things were to change gradually thanks to new scientific research and the development of plant-based tropical medicine, and these improvements led to the development of farming activities across the African continent. In *Guns, Germs and Steel: The Fates of Human Societies*, Jared Diamond recalls in a chapter entitled the ‘Lethal Gift of Livestock’ that a great number of infectious diseases known to mankind originated in the growing intermingling between men and animals following the process of animal domestication in the Neolithic period (between c. 6000 and 3000 BCE). One of these diseases was trypanosomiasis, also known as sleeping

sickness or tsetse fly disease, which has affected humans as well as animals for millennia throughout the tropical areas of the African continent.

Tsetse fly disease was an issue for many pre-colonial and early colonial travellers, hunters, and potential colonisers and administrators because it affected their movements, and early colonial governments in East Africa found that they had to address it. "In Uganda, a British protectorate from 1890, perhaps 250,000 people died from sleeping sickness between 1900 and 1908." (Beinart & Hughes, p. 189). An even larger number probably succumbed in the Congo, and that the disease was prevalent in Tanzania, Mozambique, Zambia and Malawi, although not on the same scale. British authorities had a major stake in dealing with the problem because it was prevalent in many of their colonies and subsequently steadily expanded the no-go areas for their livestock (Beinart and Hughes, p. 189).

Two books, published in the 1970s by different authors, adopted the same postulate highlighting colonial responsibility for environmental degradation leading to the spread of infectious diseases such as sleeping sickness and malaria throughout the tropical belt of the African continent. In *The Role of the Trypanosomiasis in African Ecology*, John Ford, who worked in the British colonial service, suggested that Africans had, in some contexts, reached a *modus vivendi* with the fly and achieved partial immunity through regular low-level contact. The spread of the disease in the late nineteenth century, he argued, was a consequence of colonialism and colonial methods of land management and conservation. In *Ecology Control and Economic Development in East African History*, Helge Kjekshus came to a similar conclusion by developing the idea that in pre-colonial times, people from Africa had come to establish some degree of balance with the fly thanks to dense settlement, intensive cultivation and the practice of keeping areas around settlements relatively bush-and-wildlife-free by the use of fire and clearing.

Thus, drawing on late pre-colonial travellers such as Speke and Burton, Helge Kjekshus describes a basic mastery of East Africans in Tanzania over their environment. Richard Burton, the twentieth century British traveller and explorer, found that wildlife was rare in the densely settled areas of the East African coast. Kjekshus argues that (quoted in Beinart and Hughes, p. 190) 'the dangerous combination of trypanosomes, their hosts (wildlife) and their vectors (tsetse flies)' could be kept at bay because they tended to be concentrated in woodlands and wilderness zones between the major chiefdoms, where they did not contest for space with humans.

However, ecological control was vulnerable to external circumstances, and this became especially apparent as East Africa became increasingly connected to the rest of the British Empire through its integration in growing trade and communication networks. One example is the series of disasters that hit East Africa between

the 1890s and the end of World War I. The causes of those events were partly environmental and partly the indirect consequences of imperialism. Environmental conditions were triggered in part by an El Nino event in 1896 that coincided with widespread famine, epidemics and conflicts. Diseases such as the rinderpest, smallpox and plague hit an epidemic scale among humans and animals, destroying up to eighty percent of the herds. Malaria spread along with maize cultivation, as mosquitoes seem to thrive on maize pollen. Furthermore, the German colonial conquest of Tanzania was followed by the brutal suppression of the Maji Maji Rebellion in 1906, which caused the death of seventy-five thousand people. The region then became one of the theatres of the First World War. The Germans used scorched earth methods of warfare and control, while armies on all sides required porters and thus used coercive labour recruitment methods. Finally, the 1918 influenza epidemics added to an already dramatic situation by killing perhaps three percent of the Tanzanian population (Beinart and Hughes, p. 190). Thus, Helge Kjekshus concludes that taken together, these processes reduced cattle numbers, halted population growth, and allowed bush and tsetse flies to spread. Moreover, as Beinart and Hughes add, rinderpest also killed trypano-tolerant stock in the 1890s, and the replacement animals were almost certainly less immune. Together with famine, out-migration and probable demographic decline, these series of events likely engaged the whole region in a 'narrative of ecological decline'. The conclusion put forth by Beinart and Hughes (p. 191) is that the breakdown of pre-colonial balance allowed wildlife, bush and flies to expand at the cost of settled areas. Regaining such territories would prove very difficult.

Nonetheless, another problem was more directly connected to colonialism: that of conservation. The example of the Maasai communities in Kenya is quite relevant here. From 1911 to 1913 in British-ruled Kenya, many Maasai were forcibly removed from their lands in the northern reserve of Laikipia and transferred to Western Narok in the south of the protectorate. Trypanosomiasis was prevalent in this area, and thus the Maasai communities experienced greater human losses. Laikipia was then converted into a game reserve for the purpose of conservation. The eviction of local populations from their ancestral lands further contributed to the spread of tsetse flies given that large areas were left to return to their initial state of wilderness. All the above examples thus seem to suggest that colonialism was either directly or indirectly responsible for the influx of trypanosomiasis between the end of the nineteenth century and the 1930s in the East African region.

While there is little doubt that trypanosomiasis was initially spread by colonial intrusion, local events that were not colonially induced also played a major part in the subsequent spread of the disease between the 1890s and the 1920s. Despite the fact that Malawi had a denser population than most of Zambia or Tanzania in the nineteenth and early twentieth century, tsetse belts also spread there. This spread

can be explained by local events, including the disruption of dispersed settlement patterns from the mid-nineteenth century.⁴ In this scenario, Beinart and Hughes argue, the spread of tsetse flies and bush began before the colonial invasion. However, there was not a single major sleeping-sickness epidemic until the colonial period.

Alongside local disruptions, the economic situation of Malawi also played a part in the spread of the disease. The early colonial state found it difficult to establish areas for European plantations. This is the reason why labour migration to neighbouring countries was encouraged by local authorities. The colony was landlocked and there was not much scope for the development of cash crops grown by Africans. Therefore, male labour was siphoned off and unavailable for agriculture and land clearance. Consequently, the situation was a favourable one for the spread of trypanosomiasis. At the same time, the colonial government decided to engage in a strategy of wildlife eradication through culling. Such policies had proved their efficiency in neighbouring Transvaal, where hunters had decimated the wildlife and the rare surviving antelopes had been killed off by rinderpest. In Malawi, however, this proved less successful because culling probably scattered animals and accelerated the advance of the fly, as smaller animals who were more difficult to shoot, such as warthogs, bush pigs and bush buck, were also major carriers, a fact unknown at the time.

It was only from the 1930s that sufficiently careful research was done to discover which animals were the key hosts. Eventually, the fending off of fly belts in Malawi happened in an unexpected way which was not connected whatsoever with colonial campaigns of eradication. In the 1920s, African peasants were encouraged by the colonial state to start growing tobacco. Consequently, male labour was absorbed back into agriculture which, in turn, contributed to the clearing of large areas of land and the felling of trees as wood was needed as fuel for the drying process. This had a decisive impact on the fly's habitat, drastically reducing it. Moreover, the expansion of markets for dried and smoked fish from the lakes also affected Malawi's woodlands.

According to Beinart and Hughes (p. 196), all these examples complicate the links between British colonialism and the spread of trypanosomiasis and alert us to regional specificity. Thus, even if incredibly huge numbers of wildlife were destroyed in Southern Africa, culling was not always effective. Furthermore, it is more likely that the rapid expansion of both population and cultivation in most African coun-

⁴ Southern Malawi was invaded by slavers, mostly Yao-speakers from the east coast and northern Malawi partly conquered by the Ngoni (an offshoot from the Zulu kingdom). [As a result] many communities took refuge in stockaded villages, on islands in the lakes and rivers, or on plateau areas. In the Tchiri highlands, formerly one of the most densely populated areas, much land was reclaimed by bush and game. In the north, the Ngoni cleared land around them of people and thus allowed tsetse to encroach. (Beinart and Hughes, p. 194).

tries after the Second World War contributed to the gradual diminishing of the disease's severity on the continent. Therefore, the effectiveness of colonial policies concerning trypanosomiasis proved to be limited. Even if culling seems to have achieved some degree of efficiency by eradicating the source of the disease, it was not a sustainable solution.

The example of Ngamiland, in Northern Botswana is rather informative in this respect. When British officials tried to expand the cattle economy by eradicating wildlife and tsetse flies from ranching areas, the Okavango delta impeded this process, as it has always been a reservoir for wildlife with limited human settlement and livestock. When tsetse fly management by culling failed, the local chieftaincy supported the development of the Moremi Game Reserve, which became the country's largest and most profitable national park (Beinart and Hughes, p. 197). Trypanosomiasis was regarded as a major issue on the continent, as it clearly challenged the development of all farming projects in the region, especially in white settlers' colonies. Thus, the fight against that disease absorbed the most important part of the Colonial Office budget dedicated to the fight against endemic diseases on the African continent until 1939. (Joly, p. 308).

Conclusion

To conclude this paper on the consequences and management of some sanitary aspects of British colonial expansion, we shall recall that the two examples analysed here show the complexity of the sanitary situation emerging from the confrontation and connection of different parts of the world through the conquest and ensuing colonisation of vast tracts of lands in the Tropical belt.

Through the example of the conquest of the Caribbean and American tropics, we have seen that diseases greatly impeded Britain's global expansion in the New World. Germs that had initially helped the Spanish in their conquest of Amerindian populations proved equally problematic for successive waves of colonising endeavours by France and Britain, whose strategies failed due to changing conditions arising from the spread of tropical diseases following the development and expansion of a global trade network between Eurasia, Africa and the Americas. Consequently, diseases played an important part in maintaining a status quo between diverse European ventures and contributed to the elaboration of varied strategies that were to shape imperial designs and geopolitics as well as the construction of colonial political entities.

Yellow fever played an important part in shaping the colonial history of the American and Caribbean region, from the continental rim of the Caribbean Americas to the numerous islands scattered across the Caribbean Sea. The interconnection of

environmental and social elements proved decisive in historical events that took place in the area in the centuries following colonisation and the establishment of a plantation-based economy. The diverse responses formulated by the various protagonists left a lasting impression on a region that remains one of the most diverse and creolised area to have arisen from the European colonisation of the New World. The slow but steadily increasing understanding of some of the conditions that gave rise to these tragic epidemic outbreaks ultimately slightly tipped the balance of power, even if, in most parts of the region, environmental conditions remained largely unchanged. This enabled a new European status quo that would maintain a greater diversity of European powers in the Caribbean region than in any other European colonised area elsewhere in the world.

The African example, meanwhile, enabled us to analyse the complexities of disease diffusion in a colonial context and evaluate the significance of European responsibility and (mis)management regarding the spread of tropical diseases. It is still difficult to evaluate the real impact of colonisation with respect to diseases and their spread on the African continent, but the numerous factors that come into play tend to depict a great diversity of situations. The evaluation of colonial governments' responses through the management strategies they implemented is even more challenging. The political and economic situation of the African continent at the end of the nineteenth century was extremely complex and fast changing. The ongoing battles between control and conservation (Beinart and Hughes, p. 197), and the necessity to share land and territory between men and wildlife, represented recurring issues on the continent through to the present day.

Overall, disease diffusion follows complex patterns that can have numerous causes and even more numerous and unforeseeable consequences. The period of European colonial expansion was one of great worldwide changes, and the British Empire can be seen as a great transformer of the natural world. Following the discovery of the New World by the Spanish and the Columbian Exchange, a vast global network of trade and transport came into being. The imperial structures that followed created new routes and new connections between different parts of the world, thus paving the way for global pandemics such as the nineteenth-century plague pandemic and the first cholera pandemics that made their way back to the European continent after hitting most ports and outposts of the expanding British Empire. The measures implemented were not always efficient, but the development of tropical medicine and research on medicinal plants such as the Cinchona bark would prove invaluable to the development of medical knowledge on infectious diseases. The development of Quinine is another great example of bio-piracy, as were the aforementioned tea bushes and rubber trees. However, numerous experiments were necessary to adapt the much-needed plant to other environments. All attempts made between the 1840s and 1860s in places as diverse as Algeria, Reunion Island, Jamaica or the Unit-

ed States failed. The British eventually managed to adapt the plant to the Nilgiri Hills of Southern India and to Ceylon in the 1880's. The island went on to become the first Asian producer before specialising in tea towards the end of the nineteenth century (Fredj, p. 508).

If one acknowledges that there was a lot of experimenting and unintended consequences, as many things we now take for granted were far from well-known at the time, we may regard the British Empire and other European empires as laboratory empires in the full meaning of the term.

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