



História, Ciências, Saúde-Manguinhos

ISSN: 0104-5970

ISSN: 1678-4758

Casa de Oswaldo Cruz, Fundação Oswaldo Cruz

García, Mónica

La historiografía de la fiebre amarilla en América Latina desde 1980: los límites del presentismo *

História, Ciências, Saúde-Manguinhos, vol. 26, núm. 2, 2019, Abril-Junio, pp. 623-641

Casa de Oswaldo Cruz, Fundação Oswaldo Cruz

DOI: <https://doi.org/10.1590/S0104-59702019000200014>

Disponible en: <https://www.redalyc.org/articulo.oa?id=386160323014>

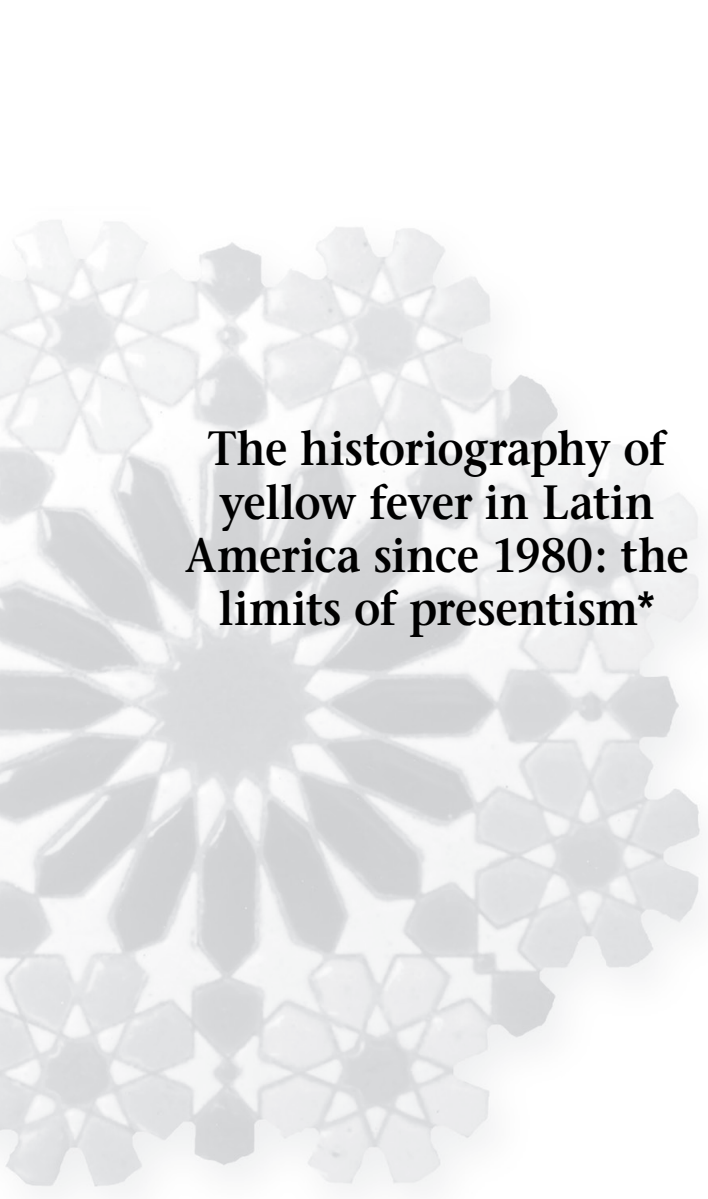
- Cómo citar el artículo
- Número completo
- Más información del artículo
- Página de la revista en redalyc.org



Sistema de Información Científica Redalyc

Red de Revistas Científicas de América Latina y el Caribe, España y Portugal

Proyecto académico sin fines de lucro, desarrollado bajo la iniciativa de acceso abierto



The historiography of yellow fever in Latin America since 1980: the limits of presentism*

GARCÍA, Mónica. The historiography of yellow fever in Latin America since 1980: the limits of presentism. *História, Ciências, Saúde – Manguinhos*, Rio de Janeiro, v.26, n.2, abr.-jun. 2019. Available at: <<http://www.scielo.br/hcsm>>.

Abstract

This article provides a historiographical analysis of yellow fever in Latin America. It shows that the dominant narratives approach the fever using the nature-culture dichotomy, either treating the fever as an historical actor or linking its history to power relations. This study explores some histories that associate the disease with the racialization of public health discourse, the relationship between centers and peripheries in the production of science, and US public health. It argues that this historiography fixes the nature of the fever according to contemporary medical knowledge (presentism), and suggests that new themes and perspectives might emerge from a dialogue with the history and sociology of science.

Keywords: yellow fever; historiography; Latin America; presentism.

Mónica García¹

¹ Professor, Programa de Historia/Escuela de Ciencias Humanas/
Universidad del Rosario.

Bogotá – Departamento Cundinamarca – Colombia

orcid.org/0000-0003-0872-2772

claudia.garcia@urosario.edu.co

Received on 28 June 2017.

Approved on 24 Oct. 2017.

Translated by Catherine Jagoe.

<http://dx.doi.org/10.1590/S0104-59702019000200014>



Yellow fever has been one of the principal areas of investigation in recent years for Latin American historians and Latin Americanists interested in the history of tropical medicine. However, many of these studies are based on implicit assumptions that have not been discussed. This historiographical revision article analyzes some of the premises behind the main historical studies, revealing that most historians have assumed that descriptions of the fever in the past refer to the same clinical and biological entity we know today, whose features have been defined by contemporary medicine. We identify the development of medical bacteriology in the late nineteenth and early twentieth century as the moment when old medical ideas were transformed and a new path opened up that led to contemporary medical notions about the fever as caused by microorganisms, a virus. Thus, we interpret past descriptions alluding to the fever as manifestations of the same acute viral illness, transmitted by specific infected mosquitoes and identifiable on the basis of clinical symptoms such as jaundice, black vomit and fever. This view, which may be labeled “presentist,” has obliged us to construct the history of this ailment based, on the one hand, on an essential distinction between nature and culture, without problematizing how both parts of this distinction co-produce each other; and on the other hand, it has caused us to overlook the contingent nature of medical knowledge. After a discussion of presentism in yellow fever historiography, this article presents some narratives that have been produced from this point of view.

Reflections on presentist historiography

Following some of the emblematic studies of yellow fever historiography in Latin America – discussed in later sections – it can be said that the history of the disease has been approached, either consciously or unconsciously, from the reliable standpoint of scientific understanding of the fever according to current medical knowledge – what we consider the “true” yellow fever. Thus, we treat yellow fever as an unchanging natural reality and we only historicize what appears obviously contingent to us: ideas, institutions, actions to combat the disease, social resistance etc. Thus, we attribute the differences between earlier descriptions of yellow fever and our yellow fever to cultural, institutional, political, or economic differences. We believe these differences depend on human action, in contrast to the fever, which we consider a natural fact. It could be argued that the historiography of yellow fever in Latin America is based on the idea of an essential distinction between nature and culture. It could also be said that we have been somewhat reluctant to reflect on the consequences of this kind of assumption for historical research.

We historians of the disease in Latin America – a field that flourished alongside the study of tropical medicine in the region in the 1990s – found in the US historiography the epistemological ground that justified the study of what we consider historicizable: the social, cultural and political dimensions of the disease. In particular, we were inspired by the definition of disease given by historian Charles Rosenberg in 1989, according to which

[d]isease is at once a biological event, a generation-specific repertoire of verbal constructs reflecting medicine’s intellectual and institutional history, an aspect of and

potential legitimation for public policy, a potentially defining element of social role, a sanction for cultural norms, and a structuring element in doctor/patient interactions. In some ways disease does not exist until we have agreed that it does – by perceiving, naming, and responding to it (Rosenberg, 1992, p.305).

This definition helped maintain the nature/culture distinction not only in histories of yellow fever but also in accounts of other diseases (Cueto, 2000, p.17, 20; Obregón, 2002, p.27; Armus, 2003, p.1; Lowy, 2001, p.19). Rosenberg's definition fixed the biological bases of the disease, reining in the socio-constructivist impulse of the 1980s, as some historians have pointed out (Wilson, 2000; Wright, Treacher, 1982). Indeed, socioconstructivism not only interpreted medicine as a social practice, but also created a space for historicizing medical knowledge and scientific facts themselves; in other words, for historicizing the nature of health, so to speak (Jordanova, 1995; Wright, Treacher, 1982). Despite this questioning of Rosenberg's definition, we historians of tropical medicine have continued to use his essentialist definition of disease, in which nature appears to be separate from culture. But we are also ignoring the discussions within the history of science and the sociology of scientific knowledge (SSK), fields that have provided important contributions to the socioconstructivist approach to disease.

In particular, the British historian Michael Worboys pointed out in 2011 that historians of medicine have been slow and reluctant to embrace the contributions of the history of science and the SSK, even though we share their disciplinary goal of deciphering how knowledge about the natural world is produced (Worboys, 2011, p.110; Warner, 1995, p.165). There are valuable studies providing complex historical, sociological and anthropological reconstructions of how science works, which have extensively shown that natural and social facts are the result of processes involving a variety of strategies and material arrangements. These works emphasize the material bases of scientific endeavors and the practices involved in co-producing the natural and social world. It has been more difficult for historians of medicine than for historians of science and sociologists of scientific knowledge to face the implications of historicizing scientific knowledge and natural facts. This difficulty may have to do with the fact that historians of medicine have been more interested in learning lessons from the past (Jackson, 2011, p.4-5) or with the fact that they are dealing with health, which is loaded with ethical commitments (Müller-Willie, 2011, p.1-2); or with the fact that their work implicitly contains suggestions for the creation of social policies on healthcare and the sociocultural dimensions of health intervention. However, it may also be possible to argue that this difficulty shows a double resistance: to abandoning the security of fixing the "nature" of the fever, according to the respected community of contemporary physicians and biomedical researchers, and also to renouncing the recognition and professional opportunities that might derive from intellectual proximity to these certifiers.

One of the historians who has taken the risk of incorporating reflections and methods from the history of science into the history of disease is Ilana Löwy. In her work on yellow fever in Brazil from 1880-1950, she presents the complexities faced by disease historians who wish to problematize the qualitative distinction between nature and culture (Löwy,

2001). Löwy acknowledges that objects like the virus causing yellow fever or what we identify as the disease itself are the result of various mediations between society and nature, the result of human activity. Diseases, she argues, are a biocultural phenomenon, “a mixture of human-made elements” (p.19); yellow fever in particular is a disease that is perceived, not only through the experience of patients but also thanks to the methods that make it visible. Therefore, the history of yellow fever is inseparable from the history of those methods. Following this line of argument, Löwy shows how, before 1930, the fever was diagnosed through clinical expertise, pathological findings in the liver, and epidemiological indicators. The 1930s were a key turning point in the history of the disease, since contemporary knowledge of the fever was made possible thanks to technologies that made the virus apprehensible (reproduction of the disease in animals, via antibodies etc.).

However, this transformation leads to a certain tension for the yellow fever historian who, like Löwy, takes the risk of including in the very definition of the disease the techniques that made its apprehension possible, and who also wishes to understand the history of the disease before contemporary knowledge about the fever stabilized. Thus, for example, Löwy (2001, p.23) says, we cannot rule out the possibility that accounts of yellow fever before 1930 might have included other pathologies different from those of the virologists, since the symptoms of “true yellow fever” – high fever, jaundice, and black vomit – are not specific to yellow fever alone. Thus, the author argues, we must establish whether we are using non-specialist definitions, definitions by physicians or laboratory analyses when stating that someone is suffering from yellow fever. In cases where we lack the technology to perform a retrospective diagnosis, or “when we encounter colonial physicians descriptions of epidemics, it is not important whether patients are suffering from leptospirosis, malaria, typhoid fever or inflammation of the liver,” since ultimately our goal is not the fever itself (Löwy, 2001, p.23). Löwy’s solution to the dilemma of how to historicize yellow fever before contemporary knowledge of it stabilized is to make explicit the criteria used to define the disease, and to ignore the impulse to identify diseases of contemporary biomedicine in epidemics in the past. It is noteworthy that Löwy highlights the mediation of technologies as the central element in establishing the very nature and definition of yellow fever. Löwy’s reflections invite us to take a more serious look at the problem of how we historians of tropical diseases theorize the relationship between the natural and cultural elements involved in health and disease, as well as the implications of this position for historical research.

Nevertheless, despite Löwy’s intriguing proposals, the historiography of yellow fever in Latin America produced during the last two decades still tends to treat the disease as natural and fixed, according to the contemporary biomedical notion, regardless of the various narratives of it that have been constructed, as we shall see in the next section.

Historiographical narratives

We historians of public health, medicine and the environment have constructed two narratives about yellow fever: the first argues that yellow fever is an actor that has shaped history, the second shows that the history of the disease is closely intertwined

with power relations. This latter narrative includes histories of the racialization of public health discourse, centers and peripheries in the production of science, and the colonialist attitude of US public health.

Disease as actor

Historians from the first group explicitly use the contemporary notion of the disease but assign various levels of agency to the fever itself – either to the virus or the mosquito – similar to the agency that historians attribute to human actors. This is the case for John Robert McNeill (2010), who explores how ecological changes involved in the development of yellow fever and malaria gave rise to empire, war and revolution in the Greater Caribbean from 1620-1914. Here the author's intent is to make nature – viruses, plasmodia, mosquitoes, monkeys, swamps – the protagonist, alongside mankind, in political history (p.2). Yellow fever and malaria are defined according to contemporary medical knowledge and considered natural actors that shaped history and vice versa. Thus, for example, McNeill argues that environmental changes resulting from the establishment of plantation economies in the colonial Caribbean from 1640 on improved growth and feeding conditions for the species of mosquitoes involved in transmitting yellow fever and malaria. Furthermore, he argues that existing viral reservoirs on the islands of Cuba, Jamaica, Hispaniola and in South and Central America were imported from Africa with the slave trade and grew because of Atlantic commerce in the seventeenth and eighteenth centuries (p.49-50).

Presentism in medical knowledge also allows McNeill to explain why foreigners were more susceptible to the disease than locals, and to highlight the use or political impact of that difference. Thus, immunity helped the Spanish protect their empire from British and French invaders until the late eighteenth century, but also, some Latin American independence leaders recognized the differential effects of yellow fever on the locals as opposed to foreigners, and consequently adjusted their war plans with that immunity in mind (McNeill, 2010, p.303). Lastly, McNeill also evaluates the therapeutic and preventive methods used in the Greater Caribbean in light of contemporary notions, acknowledging that they might have been useful for combatting the disease even if they were produced with other objectives in mind (p.69-72).

In a similar vein to McNeill, the historian Mariola Espinosa (2008) also confers a degree of historical agency to yellow fever. In her view, the yellow fever virus had a crucial and lasting impact on relations between Cuba and the United States in the decades surrounding Cuba's independence from the Spanish crown (1878-1939). Havana was the source of the disease that affected the southern United States, and the island became a source of concern to the US government before it declared war on Spain in 1898. Espinosa (2008, p.27-29) argues that after the economy of the Mississippi valley was seriously affected during the 1878 epidemic, the idea that the United States should acquire Cuba in order to ensure the health of the south turned into an inexorable conclusion for the Americans and Cuba was invaded in 1898 in order to end the threat of yellow fever.

Thus, the invasion of Cuba was fundamentally a war against disease. This struggle against yellow fever, which went on until 1910, was principally aimed at eliminating the source of infection for the United States rather than protecting the health of Cubans or even of the

invading force. Therefore, Cubans resisted this colonial health intervention, recognizing that keeping the island free of yellow fever mainly benefited the United States. Espinosa also describes how Cubans struggled against the US characterization of Cuba as inherently dirty and seriously affected by the disease, and sought recognition that the United States was dependent on Cuba for public health and not the reverse, as the Americans would have them believe (Espinosa, 2008).

As the detailed work of McNeill and Espinosa shows, we historians can undoubtedly deduce from past descriptions of yellow fever how the virus, the mosquito and the disease itself evolved, and how they impacted specific historic results. It is noteworthy that both historians consider the disease, the virus, and the mosquito as actors with a certain degree of agency that impacted historical results, or as actors that could be used for particular political advantages. However, this stance involves running the risk not only that we will accept anachronistic interpretations of the workings of nature as explanations of historical action – a notion of yellow fever that belongs not to the historical actors but to the historian – but that we will, as a result, take a standpoint that radically separates nature – seen as something fixed and given – and culture – human and evolving. This presentism in the history of yellow fever is also found in the second type of narrative that has dominated the historiography of yellow fever in Latin America, namely, the politics of yellow fever.

The disease and power relations

The second approach in the historiography of yellow fever is seen in studies that describe the multiple ways in which yellow fever created opportunities to differentiate between people, communities and societies – a production of differences interpreted from the point of view of medical-scientific knowledge as a form of power. The overriding themes in this approach are the inclusion of racialized notions of the disease within the discourse of public health and tropical medicine, mainly in the nineteenth century; the distinction between centers and peripheries in science; and the colonialist approach of US public health in the twentieth century.

One of the studies that directly explores the racialization of health discourse in relation to yellow fever is Sidney Chalhoub's (1993) work on yellow fever in Brazil in the late nineteenth century. One of the topics of concern to Brazilian physicians was the greater susceptibility of whites and European immigrants compared to Africans and Afro-Brazilians. Until 1870, environmentalist explanations of the fever prevailed: Brazilians believed that yellow fever was the product of poor sanitation, filthy marshes and rotting animal and vegetable matter. People exposed to these conditions – native Brazilians from the city of Rio – tended to fare better in epidemics than those who were still getting used to this environment, that is, immigrants who had recently arrived from Europe. In the 1870s, Chalhoub continues, this environmentalist language took on political and racial significance. Yellow fever had become a public health challenge in Brazil, and one of the main obstacles to the Brazilian planters' project. According to this project, European immigrants were to offset the drop in work force brought by emancipation of the slaves, which took place finally in 1888. Yellow fever, which mainly affected immigrants, was

perceived at the time as an obstacle to the transition from slavery to a free workforce. Thus, yellow fever was perceived as an obstacle to progress and civilization in Brazil. For these reasons, Chalhoub concludes that Brazilian medical thought and sanitation policy were profoundly informed by a specific racial ideology and they became active components in achieving the whitening ideal.

It is significant that Chalhoub incorporates into his account the explanations of the fever offered by nineteenth-century experts, such as, for example, the link between acclimation and resistance to the disease. This type of discourse of acclimation and racialization was also present in Colombia, as shown at the end of the article. Considering this type of explanation in historical narratives brings us closer to the experience of disease in the nineteenth century than explicitly using presentist notions, which is the prevailing tendency. In this sense Chalhoub's work is separate from McNeill and Espinosa's approach to the fever. Nevertheless, Chalhoub implicitly approaches the fever as the disease we know nowadays, maintaining in some sense the separation between natural and cultural elements. However, this does not prevent him from arguing that the disease was involved in the labor crisis in Brazil and that it contributed to shaping racial ideologies.

The second theme historians have used to describe how yellow fever was involved in the processes of creating differences among societies is that of the production of scientific knowledge on the fever. Usually in such histories there is an assumption that permeates the historiography of Latin American science, namely that the region is peripheral to the various metropolises or centers of scientific production, whether in Europe or the United States (Basalla, 1967; Lafuente, Alberto, Ortega, 1993; Peard, 2000). This focus has dominated historical work seeking to explain the controversy around the establishment of the mosquito as yellow fever vector from 1878-1900.

Historians have mostly agreed that the Cuban doctor Carlos Finlay correctly hypothesized that a mosquito transmitted yellow fever, but also that the US scientific Yellow Fever Commission that arrived in Cuba in 1900 confirmed this hypothesis by carrying out convincing experiments two decades later (Espinosa, 2008, p.3; Birn, 2006, p.49; Sutter, 2005, p.71; Alcalá, 2012, p.72). From this perspective, Finlay could not demonstrate his mosquito hypothesis because he did not know that the insect did not become infectious immediately after biting a yellow fever patient. The US commission was able to perform successful experiments once this fact was established, thus proving Finlay's hypothesis (Löwy, 2001, p.61; Espinosa, 2008, p.56, 108). In this version, Finlay's scientific failings explain why his work was not recognized for 20 years and also his secondary position in the discovery of the mosquito as the transmitter of yellow fever. The historian Nancy Stepan (1978), however, has tried to give Finlay more credit, asking not what was wrong with his science but why it took two decades for his mosquito hypothesis to be taken seriously by the scientific community; and why the US commission only took two months to confirm Finlay's hypothesis, despite the fact that they committed the same errors as Finlay (Stepan, 1978, p.407-409). Stepan explains that the delay in acceptance of Finlay's ideas was partly due to the fact that the Americans did not believe in scientific work in Latin America: it was not until insects were established as vectors for diseases like filariasis and malaria by British tropical medicine, and the US occupation of Cuba, that interests and resources

converged, making it possible for the Americans to take Finlay's ideas seriously (Stepan, 1978, p.407-409). Lastly, the historian François Delaporte has argued that Finlay's idea of the mosquito as key to yellow fever transmission was not original. He believes Finlay took from British tropical medicine – even if Finlay himself was not aware of it – the notion that insects are the agents for disease transmission, and that what explains the success of the US Yellow Fever Commission was Ronald Ross's hypothesis that the mosquito serves as an intermediate host. Ross was key in taking into account the incubation period for a microorganism within an insect's body, in order to make a successful experimental case. The 20-year limbo for Finlay's hypothesis, Delaporte (1991, p.8) believes, was not due to intentional or unintentional denial on the part of the Americans but was simply the time it took to reveal the mechanism for malaria infection.¹

As this case shows, probing into scientific controversy based on a center-periphery, presentist model for understanding disease implies a kind of commitment by historians in terms of what is considered true science and also what are assumed to be true scientific facts – nature. Perhaps we historians should cease our anachronistic judgements of past scientific work and stop fixing the very nature of disease. We should historicize science, explore the implications of that historicization for our notions of the “natural” when performing historical research, and revise our research questions bearing in the mind the notions held by the actors under investigation, which they used to transform their reality. The last section of this historical revision article lists some of the matters debated in the SSK, in order to suggest topics that might help us in that task. The fact is that histories that treat the discovery of the mosquito as the agent transmitting yellow fever, even if they are presentist, have helped us to understand the politics of the insect. Historians have explored how, once *Aedes aegypti* was identified as the yellow fever vector, this fact became relevant to the US project of economic and cultural expansion in Latin America, which was tainted with colonialism. Eradicating the insect from maritime settlements became the heart of US campaigns against yellow fever in Latin America in the first half of the twentieth century, thus driving the expansion of the US economy and American intervention in the region.

The politics of *Aedes aegypti* is illustrated in the work of one of the influential actors in Latin American public health in the first half of the twentieth century, the Rockefeller Foundation (RF). Historians have described the role of this US philanthropical organization in promoting public health from 1910 through the 1940s, in line with the RF's goal of “boosting developing economies, promoting international goodwill, improving productivity, and preparing the state and professionals for modern development” (Birn, 2006, p.25). However, historians have also denounced the RF's narrow-minded, colonialist attitude in its public health projects in Latin America. They have pointed out that the RF worked to advance the US expansionist project: it contributed, for example, to sanitizing Panama in 1914 for the opening of the Canal, in order to avoid re-infestation of the United States by commercial traffic (Cueto, 1994, p.XII); its campaigns were aimed at combatting anti-American sentiment in post-revolutionary Mexico (Solórzano, 1994); and it used human subjects in experiments for developing treatments against hookworm disease (Palmer, 2010). There are also descriptions of the way the RF operated under the

assumption that Latin American societies were uncivilized (Birn, 2006, p.25; Mejía, 2004, p.120), and the way it ignored social and health problems of greater significance and concern (Quevedo et al., 2008; Mejía, 2004; Espinosa, 2008). In Mexico, for example, Birn (2006) shows that the RF's campaigns helped stabilize and legitimize Mexico as a state and create the bases for future institutional developments in post-revolutionary Mexico, while other historians have emphasized that it was not the RF's yellow fever campaigns but those run by the dictatorship of Porfirio Díaz from 1903-1911 that laid the groundwork for the modern Mexican public health system (Carrillo, 2008). Fears of separatist movements and Bolshevism also drove the Mexican government to support the RF's campaign (Solórzano, 1994). In Peru, on the other hand, the RF's participation against yellow fever in 1921 was driven not only by the government of Augusto B. Leguía (1919-1931), which wanted to raise productivity and eliminate the negative effects of quarantines, port closures and the epidemics themselves, but also by the wish to spread an ideal inspired by the living standards and achievements in health seen in US urbanization (Cueto, 1992). In Brazil the RF began work in 1923 in the north-eastern part of the country, where yellow fever was threatening migration and trade. The campaign's implementation has been described as a mixture of persuasion and coercion (Löwy, 2001, p.139). As Löwy (2001, p.144-145) and Magalhães (2016, p.82-83) show, Brazilian doctors questioned the RF's declaration in 1929 that yellow fever was close to being eradicated, describing an increase in cases of the disease in the country's interior, in the north and in Minas Gerais. Colombian doctors also described cases of yellow fever in the interior of the country in 1929 and even earlier; this was eventually known as sylvatic yellow fever (Quevedo et al., 2008, 2018). The unexpected re-emergence of yellow fever in Rio de Janeiro towards the end of 1928 and the outbreaks in Colombia finally convinced the members of the RF that woodlands and jungles were and had been a source of yellow fever for decades, which led to a massive campaign against the disease that lasted for two decades, at least in Brazil. The RF controlled epidemiological research through viscerotomies (analyses of the liver of people who had died of yellow fever), systematic elimination of *Aedes aegypti* and, from 1937 on, the production and distribution of the vaccine developed in the RF laboratories (Benchimol, 2001). It should be mentioned that the last great yellow fever epidemic was in Rio in 1928-1929 and that sporadic cases after that have been controlled with anti-mosquito measures and vaccination (WHO, 1986; Löwy, 2001, p.165).

Yellow fever without presentism

The two historiographical approaches to the fever analyzed so far show us, on the one hand, the disease as an agent of historical change, and on the other the ways in which the study or control of yellow fever allowed the development of specific forms of power. The fact that these analyses were performed using presentist notions does not in the least detract from their richness and quality or the contributions they make to our understanding of the history of the disease. What is being suggested here is that this historiography might also benefit from reflecting on the implications of presentism for historical research, and that analyses from the history of science and the SSK could be of

enormous help to us. One of the problems of ignoring the contingent nature of scientific knowledge, and thus of the things it designates, is that the separation between nature and culture is maintained. Therefore, we have come up with historical explanations based on contemporary scientific and medical notions, ignoring in some cases the world view and concerns of the people and communities that we historians study.

Among other things, the SSK invites us to be impartial with regard to truth or falsehood, success or failure in arguments about knowledge, and to be symmetrical in causal explanations of why a particular form of knowledge is judged true or false (Bloor, 1991, p.7). The premise here is that explanations of scientists' cognitive decisions reside not in natural reality nor in the logical structures of individual cognition, but in the contingent nature of scientific work (Barnes, Bloor, Henry, 1996, p.54-56; Barnes, 1981, p.309). This means that the content of knowledge is not only predetermined by the forms and structures of natural reality; that applying concepts to the natural world is ultimately a case of inductive judgments, not deductive logic; and that the meanings and uses of those concepts are capable of changing over time. On the other hand, as the vast historiography of science has shown over the last three decades, the contingency of science and its objects of investigation is related to various factors. First, there are certain worldviews within which what is seen as scientific work and valid knowledge is agreed upon by groups that support those worldviews – Fleck (1986) called these “knowledge styles”. More radically, Fleck suggested that “only that which is true to culture is true to nature” (p.86). Second, there are literary technologies, such as public demonstrations, debates in the press, journals and scientific conferences, books, peer evaluation, narrative styles etc. that make it possible for scientists to gain the support of experts and non-experts and, as a result, legitimacy as the group spokesperson for nature (Shapin, 1984; Secord, 2001). Third, that the practices through which scientists translate their objects of investigation into inscriptions that are portable and easily circulated – tables, numbers, curves etc. – are the basis for scientific facts and scientists' claims of universality (Latour, 1979, 1987, 1988). Fourth, that not only theoretical, explicit knowledge but also practical, tacit knowledge is fundamental in experiments and in specific scientific traditions (Collins, 2010). And, finally, that science is constructed and circulates in networks of people and objects, of which scientists are merely one component (Latour, 1979).

As shown in the second part of this text, in the historiography of yellow fever in Latin America it is difficult to find histories that are sensitive to these contributions. It is possible that new topics might emerge if disease histories were rethought in light of the SSK and the history of science. This will now be illustrated by the cases of nosologies of fevers in medicine, the climatic and geographical determination of disease, and the debates around yellow fever in mainland Latin American countries, particularly Colombia.

The first fact that should be stressed is that medical understanding of yellow fever – and other fevers – prior to the consolidation of contemporary biomedical knowledge did not coincide with this form of knowledge. Presentism partly explains why despite the fact that most nineteenth-century medical literature concentrated on fevers, historians have shown little interest in studying them, as William Bynum complained in 1981 (Bynum, 1981, p.145). Unquestionably, fevers, along with inflammation, poisoning, hemorrhage and

diseases of specific organs, constituted an important group within the five categories used to classify all pathologies. This classification of disease shows the tension present throughout the nineteenth century between eighteenth-century nosology and the anatomic pathology developed in the early nineteenth century. Thus, fevers, if not associated with inflammation or an organic origin, were described as “essential fevers,” fevers whose morphological basis would hopefully be established in the future. In the absence of an organic lesion that might explain “essential fevers,” physicians used a fever classification system based on symptoms, following the logic of illustrated botany, which classified plants into genera, species and varieties. The criterion for organizing them in this way was the variations of the fever over time and associated symptoms such as headache, hemorrhage, diarrhea, and skin rashes. For example, in the third edition of the French pathology textbook used in Europe and Latin America, the *Traité élémentaire et pratique de pathologie interne* by Augustin Grisolles (1848), fevers were divided into five genera: continuous, eruptive, intermittent, and hectic fevers – depending on the intervals at which the fever occurred and on the associated symptoms. In the continuous group Grisolles located yellow fever or typhus of America, typhoid fever, typhus of Europe, Eastern typhus or plague, bilious fever of hot countries – which was supposed to be the most common fever in the United States – and inflammatory fevers. He characterized yellow fever by jaundice and black vomit and classified it as typical of hot countries of the Americas, some parts of Africa and southern Europe. Foreigners were considered more susceptible to contracting the fever than locals. This frame of thought, which strikes us as both familiar and strange if we think of yellow fever in terms of twentieth-century medicine, made it possible to accept situations in which doctors could also see the transformation of a pernicious intermittent fever into a remittent fever and then into a continuous fever with yellow fever symptoms.

In Colombia, on the other hand, mid-nineteenth-century doctors grouped fevers into two genera: continuous and periodic fevers. In contrast to Grisolles, whose textbook they knew, Colombian doctors grouped eruptive and continuous fevers together, but they also identified the yellow fever variety as belonging to the periodic – pernicious – fever group and not to the continuous fevers, as Grisolles believed. The Colombians grouped the yellow fever variety with the periodic fevers, probably as a way of emphasizing the miasmatic origin of these fevers, which the doctors associated with agricultural production in hot countries. This association allowed them to claim the local origin of fevers of the yellow variety and to reject any idea of yellow fever being imported. Colombian doctors followed the French anti-contagionist, Nicolas Chervin, in this stance. Chervin had studied the epidemics in the Caribbean and the United States from 1820-1822 and the Gibraltar epidemic of 1828, and he defended the miasmatic and local origin of fever. Colombians found Chervin’s argument persuasive, since it allowed them to highlight their scientific expertise when compared to Europeans. Contrary to what a historian might conclude based on the center-periphery model in the production of scientific knowledge, according to which Colombia would be on the periphery of European knowledge, and contrary to presentist notions of disease, if we pay attention to what the Colombian doctors were arguing, we can clearly see that, with regard to the pathologies that nineteenth-century doctors considered locally produced, such as periodic fevers, they claimed that they were in a better position to know

the true nature of these fevers than their European colleagues, since they were in direct contact with these diseases (García, 2007).

Presentist teleological assumptions about medical knowledge have prevented historians from recognizing as legitimate the question of how the continuous or discontinuous fevers of the nineteenth century became what are known nowadays as specific fevers (typhoid, typhus fever, malaria or yellow fever). Leonard Wilson (1978) and Dale C. Smith (1980, 1982) have shown how the continuous fevers, typhoid and typhus, were defined by mid-nineteenth-century anatomic pathology in Europe and America, but few historians have been interested in how periodic fevers evolved, in medical theory, into yellow fever and malaria. The attention of historians to epidemics in Europe until 1857 and America up until 1879 has focused on the contagionist/non-contagionist debate and on policies surrounding the epidemics, always from a presentist perspective (Coleman, 1987; Humphreys, 1992).

Colombia is a case in point. The transformation of periodic fevers into yellow fever and malaria took more than two decades, from the moment the first account of the fevers was published in 1859 until yellow fever was defined as a distinct disease around 1887. Until 1886, the idea that the boundaries between continuous and discontinuous or periodic fevers were blurred, and the miasmatic theory according to which periodic fevers were locally produced by putrefying organic matter, formed a framework for understanding these diseases that suited doctors' arguments in favor of building a national medicine. These doctors claimed that studying local pathologies, such as the periodic fevers of hot climates, was the way to create a national medicine on the basis of a body of doctrine of their own, which they argued could take advantage of their privileged situation, since they were located where the fevers themselves were produced – in a hot climate (García, 2007). These arguments changed by 1887, when the practice of preventive inoculation of microorganisms against yellow fever in Mexico, Brazil and Colombia (Benchimol, 1999; García, 2012a; Lozano, 2008; Warner, 1985) triggered a debate among Colombian doctors that culminated with the acceptance of yellow fever as a specific disease caused by a germ yet to be established (García, 2012a). The rhetoric of building a national medicine was replaced in the late 1880s by one that expressed the physicians' wish to become part of a "universal science" thanks to the new medical bacteriology, in a process that involved a transformation in the ways of knowing and the objectivity seen as legitimate among Colombian scientific and medical elites (García, Pohl-Valero, 2016).

As the Colombian case shows, the decision not to assume what yellow fever means and to be impartial and symmetrical in the ways we approach the fever historically, allows us to see that for nineteenth-century medicine, yellow fever was a variety in the family of fevers that could evolve into another continuous or periodic fever – depending on the medical community. This would then explain how doctors grouped cases of fevers in any one of the genera, species and varieties in the families of fevers, and why they decided which fever was imported and which originated locally. Also, it shows that the historian must seek the explanation for these decisions by doctors not in the disease itself as we know it today, but in the historical contingency of knowledge and the things it designates. From that perspective, one can argue that yellow fever, as we know it today, did not exist in the

nineteenth century or – so as not to appear too relativist – that at least yellow fever was not a specific disease in that century. Of course, from the presentist point of view one can argue the opposite, if we take jaundice and black vomit as the true, clinical markers of the fever (Stepan, 2001, p.162-163). Clearly, these two symptoms were characteristic of this variety of fevers according to nineteenth-century medicine and part of the criteria that separated it from other fevers, but yellow fever was certainly not confined to that definition only. If we pay attention to the frameworks and worldviews in which the “variety” of yellow fever was understood in the nineteenth century – which implies not only abandoning presentism in the way we make history but also abandoning the idea of “nature” that we believe constitutes disease – it becomes clear that climate and geography were considered a fundamental part of the identity of fevers in their various forms.

The arguments about the local origin of diseases were associated – at least in Colombia – with ideas about climatic determination of disease and the effects of climate on people, ideas that revived Hippocratic notions about the role of climate on the body and temperaments and on the production of disease.² Colombian doctors connected Hippocratism, medical geography, the geography of plants and pre-Darwinist transformist ideas about the species in order to explain the distribution of diseases and also to explain people’s susceptibility to certain illnesses, following a racialized argument to explain such differences (García, 2012b). With regard to this last aspect, the nineteenth-century Colombian medical elite followed the idea inherited from the colonial period of the inferiority of the natives and those of African descent in considering the so-called “blacks” more resistant to the diseases of hot climates in low-lying areas, among them periodic fevers, thanks to centuries of acclimation. For people at that time, the natives of the Andean mountains and those of Spanish descent were better adapted to European climates and highlands and were therefore more susceptible to the diseases typical of the lowlands. This susceptibility to periodic fevers on the part of highlands dwellers was seen, in this version, as responsible for the fever epidemics in the tobacco-producing areas on the banks of the Magdalena river in the 1850s. Furthermore, following the social divisions between the old colonial castes, namely whites, blacks and natives – the so-called races of the new republics (1810) – nineteenth-century doctors extended this determinism to explain the division of labor: individuals from the white race were supposedly more suited to intellectual work, while those of African descent were more fit for hard manual labor, under the scorching sun of the lowlands (García, 2012b).

Given the pre-eminence of the climatological and geographic notions the Europeans and Latin American elites used to understand the differences between the old and the new world after Spanish rule in Latin America came to an end (Cañizares, 1998; Stepan, 2001), it is worth examining whether nineteenth-century Latin American medical communities also used geographical determinism to understand not just fevers but disease in general. It is not gratuitous to point out that this universe of geographic determinism, the epistemological ground in the nineteenth century for understanding nature, the body, disease, and even the historical destiny of Latin American societies, has escaped notice by most historians of yellow fever in Latin America, since their work is based on the contemporary notion of the disease.

Some might argue that when knowledge about the fever that took place stabilized around 1930, historians of yellow fever in the twentieth century did not need to pay attention to earlier versions of the fevers, since from that point on the fever described by twentieth-century doctors is the same as our own. This is like claiming that the climatological, geographically determinist and racialized notions of the disease that were constructed from the colonial era on – versions of which affected the view of fevers in the nineteenth century – disappeared thanks to medical bacteriology or tropical medicine around 1900. This is a hypothesis that must be explored historically, since medical geography did not totally disappear in the twentieth century, and also because the new science of eugenics, which began impacting Latin American countries in the 1920s and 1930s, provided new content for racialized, environmental arguments about disease. In Colombia, for example, the defenders of tropical medicine in the first half of the twentieth century, apparently imbued with soft eugenic arguments – that is, the idea that cultural and social transformation could improve the race without necessarily controlling reproduction or racial mixing, as in hard eugenics – believed that campaigns against diseases like hookworm, malaria and yellow fever would serve to fortify future generations of the “races” and promote colonization of the interior of the country (García, 2017a, p.70-73).

On the other hand, if we continue to historicize yellow fever using the center-periphery, presentist model of the history of science, we would have to accept that Fred Soper, working for the RF, established the rural yellow fever cycle for the first time in 1935 – in other words, that yellow fever was not confined to maritime settlements. Thus, we would have to ignore the fact that before the RF carried out research in Latin America and Africa, Latin American doctors had been debating the possibility that periodic fever of the yellow variety or twentieth-century yellow fever was occurring in mainland countries. Indeed, Jaime Benchimol (1999, p.15) has suggested that the yellow fever epidemics that took place in the Brazilian interior in the nineteenth century helped hygienists, clinicians and bacteriologists defend the idea that the fever was a disease specific to intertropical regions. Unfortunately, it seems that no historians have yet looked into this issue in depth in the nineteenth century. Magalhães (2016, p.182-183) stresses how twentieth-century Brazilian physicians critiqued the idea that the fever only occurred in urban maritime centers, an idea which had inspired eradication campaigns up to that point. In Colombia, debates about periodic fevers in the country’s interior – including the yellow fever variety – intensified in the 1880s and 1890s when epidemics of periodic fevers occurred along rivers and also along the routes to high country. Doctors struggled to identify the nature of these fevers, which led to doubt as to whether they were the yellow fever variety or not (García, 2012a). But also, even after the existence of yellow fever as a specific entity had been established, and after its mosquito transmission was accepted around 1900, twentieth-century Colombian doctors diagnosed sylvatic yellow fever in 1907 in cities near forests, far from maritime centers. This work was ignored by the civil servants on the RF from 1916 to the 1930s and by historians until recently (Quevedo et al., 2008, 2018).

In conclusion, it can be said that the presentism of historians of yellow fever in Latin America largely explains why they have ignored issues and problems that may have been pressing ones for the societies upon which those histories are constructed. Indeed, there

are more histories about the discovery of the mosquito; the debates over the bacteriological cause of yellow fever; the prophylactic inoculations it inspired in the 1880s; and the national and RF campaigns against the disease from 1910-1940, than on the political nature of the nosology of fevers; the debates among Latin American physicians about the yellow variety in the countries' interiors; the circulation of people, knowledge and objects in the region's interior (such as the preventive inoculations between Mexico and Colombia); the climatic and geographical identity of the fever; or the possible expression of eugenic discourses in tropical medicine in the first half of the twentieth century.

Historians have described how ideas about geographical influences on population, nature, bodies and diseases have shaped postcolonial worldviews (Cañizares, 1998; Stepan, 2001; Larson, 2002). There are few histories of disease in Latin America – whether presentist or not – that note the fact that neo-Hippocratism and medical geography, with their implicit climatic determinism, were alive until the early twentieth century (Stepan, 2001; Cueto, 2003; García, 2007). This dimension has escaped historians of fever in particular because of their decision to consider the nature of the fever as a fixed object according to contemporary medicine and to separate it from culture. We have not problematized the implications of taking modern science for granted, perhaps because we historians have benefited from the authority conferred on it by our society, but above all because we have ignored the contributions of the history of science and the SSK to the history of disease.

NOTES

* Some of the ideas explored here were presented in the seminar on the History of Global Health coordinated by the World Health Organization, York University and the Casa de Oswaldo Cruz/Fiocruz on December 2, 2016, and in García (2017b).

¹ Using the debate among Brazilian and Argentine physicians about prophylactic measures against yellow fever that took place in the Second Congress on Latin American Medicine in 1904, Sandra Caponi (2000) proposes that the emergence of tropical medicine and the reference to arthropods as necessary vectors for the propagation of certain infectious diseases “demand association with other types of expertise and other ways of constructing knowledge” that were unknown to microbiological research at the time: entomology, epidemiology and natural history.

² For an analysis of the persistence of ideas about the influence of climate on health and disease see the introduction to the special issue of the *Bulletin of the History of Medicine* entitled “Modern Airs, Waters, and Places” (Bashford, Tracy, 2012).

REFERENCES

- ALCALÁ, Carlos.
De miasmas a mosquitos: el pensamiento médico sobre la fiebre amarilla en Yucatán, 1890-1920, *Historia, Ciências, Saúde – Manguinhos*. v.19, n.1, p.72-75. 2012.
- ARMUS, Diego.
Between malaria and aids: history and disease in modern Latin America. Durham, NC: Duke University Press. 2003.
- BARNES, Barry.
On the conventional character of knowledge and cognition. *Philosophy of the Social Sciences*, v.11, n.3, p.303-333. 1981.
- BARNES, Barry; BLOOR, David; HENRY, John.
Scientific knowledge: a sociological analysis. London: Althlone. 1996.
- BASALLA, George.
The spread of western science. *Science*, v.156, n.3.775, p.611-22. 1967.

- BASHFORD, Alison; TRACY, Sarah. Modern airs, waters, and places. *Bulletin of the History of Medicine*, v.86, n.4, p.495-514. 2012.
- BENCHIMOL, Jaime (Coord.). *Febre amarela: a doença e a vacina, uma história inacabada*. Rio de Janeiro: Editora Fiocruz. 2001.
- BENCHIMOL, Jaime. *Dos mosquitos aos micróbios: febre amarela e a revolução pasteuriana no Brasil*. Rio de Janeiro: Ed. Fiocruz. 1999.
- BIRN, Anne-Emanuelle. *Marriage of convenience: Rockefeller international health and revolutionary Mexico*. Rochester, NY: University of Rochester Press. 2006.
- BLOOR, David. *Knowledge and social imagery*. Chicago; London: University of Chicago Press. 1991.
- BYNUM, William F. Cullen and the study of fevers in Britain, 1760-1820. *Medical History*, sup.1, p.135-147. 1981.
- CANIZARES, Jorge. Entre el ocio y la feminización tropical: ciencia, élites y estado-nación en Latinoamérica, siglo XIX. *Asclepio*, v.1, n.2, p.11-31. 1998.
- CAPONI, Sandra. El veneno y el mosquito: aspectos epistemológicos de la etiología y la profilaxis de la fiebre amarilla. *História, Ciências, Saúde – Manguinhos*, v.7, n.2, p.251-282. Disponible en: <<http://dx.doi.org/10.1590/S0104-59702000000300002>>. Acceso en: 28 abr. 2000. 2000.
- CARRILLO, Ana María. Guerra de exterminio al “Fantasma de las costas”: La primera campaña contra la fiebre amarilla en México, 1903-1911. In: Agostini, Claudia (Coord.). *Curar, sanar y educar: enfermedad y sociedad en México, siglos XIX y XX*. Ciudad de México: Unam/Instituto de Investigaciones Históricas; Puebla, Buap, Instituto de Ciencias Sociales y Humanidades “Alfonso Vélaz Pliego”, p.221-156. 2008.
- CHALHOUB, Sidney. Yellow fever and race in nineteenth century Rio de Janeiro. *Journal of Latin American Studies*, v.25, n.3, p.441-463. 1993.
- COLEMAN, William. *Yellow fever in the North: the methods of early epidemiology*. Madison: University of Wisconsin Press. 1987.
- COLLINS, Harry. *Tacit and explicit knowledge*. Chicago; London: University of Chicago Press. 2010.
- CUETO, Marcos. Nationalism, Carrión's disease and medical geography in the Peruvian Andes. *History and Philosophy of the Life Sciences*, v.25, p.319-335. 2003.
- CUETO, Marcos. *El regreso de las epidemias: salud y sociedad en el Perú del siglo XX*. Lima: Instituto de Estudios Peruanos. 2000.
- CUETO, Marcos. *Missionaries of Science: the Rockefeller Foundation in Latin America*. Bloomington/Indianapolis: Indiana University Press. 1994.
- CUETO, Marcos. Sanitation from above: yellow fever and foreign intervention in Peru, 1919-1922. *The Hispanic American Historical Review*, v.72, n.1, p.1-22. 1992.
- DELAPORTE, François. *The history of yellow fever: an essay on the birth of tropical medicine*. Cambridge, MA: MIT Press. 1991.
- ESPINOSA, Mariola. *Epidemic invasions: yellow fever and the limits of Cuban independence, 1878-1939*. Chicago; London: University of Chicago Press. 2008.
- FLECK, Ludwick. *La génesis y el desarrollo de un hecho científico: introducción a la teoría del estilo de pensamiento y del colectivo de pensamiento*. Madrid: Alianza Editorial. 1986.
- GARCÍA, Claudia Mónica. Las “fiebres del Magdalena”: medicina y sociedad en la construcción de una noción médica colombiana, 1859-1886. *História, Ciências, Saúde – Manguinhos*, v.14, n.1, p.63-89. 2007.
- GARCÍA, Mónica. Enfermedades de clima cálido y medicina tropical (1868-1959). *Colección del Sesquicentenario, Ciencias de la Vida*, v.2, t.1. Bogotá: Universidad Nacional de Colombia. p.56-87. 2017a.
- GARCÍA, Mónica. Histories and narratives of yellow fever in Latin America. In: Jackson, Mark. *Routledge history of disease*. Abingdon; New York: Routledge. 2017b.
- GARCÍA, Mónica. Producing knowledge about tropical fevers in the Andes: preventive inoculations and yellow fever in Colombia, 1880-1890. *Social History of Medicine*, v.25, n.4, p.830-847. 2012a.

- GARCÍA, Mónica.
Clima, enfermedad y raza en la medicina colombiana del siglo XIX. In: Hochman, Gilberto; Palmer, Steven; Di Lisia, María Silvia (Ed.). *Patologías de la patria: enfermedades, enfermos y nación en América Latina*. Buenos Aires: Lugar Editorial, p.59-74. 2012b.
- GARCÍA, Mónica; POHL-VALERO, Stefan.
Styles of knowledge production in Colombia, 1850-1920. *Science in Context*, v.29, n.3, p.347-377. 2016.
- GRISOLLE, Augustin.
Traité élémentaire et pratique de pathologie interne. Paris: Victor Masson, Libraire-éditeur. 1848.
- HUMPHREYS, Margaret.
Yellow fever and the south. New Brunswick, NJ: Rutgers University Press. 1992.
- JACKSON, Mark.
Introduction. *The Oxford handbook of the history of medicine*. Oxford: Oxford University Press, p.1-17. 2011.
- JORDANOVA, Ludmila.
The social construction of medical knowledge. *Social History of Medicine*, v.8, n.3, p.361-81. 1995.
- LAFUENTE, Antonio; ALBERTO, Elena; ORTEGA, María Luisa (Ed.).
Mundialización de la ciencia y cultura nacional. Madrid: Doce Calles. 1993
- LARSON, Brooke.
Indígenas, élites y estado en la formación de las repúblicas andinas. Lima: Pontificia Universidad Católica. 2002.
- LATOUR, Bruno.
The pasteurization of France. Cambridge, MA: Harvard University Press. 1988.
- LATOUR, Bruno.
Science in action: how to follow scientists and engineers through society. Cambridge, MA: Harvard University Press. 1987.
- LATOUR, Bruno.
Laboratory life: the social construction of scientific facts. Los Angeles: Sage. 1979.
- LÖWY, Ilana.
Virus, moustiques et modernité: la fièvre jaune au Brésil entre science et politique. Paris: Éditions des Archives Contemporaines. 2001.
- LOZANO, Sonia.
Importation et destin de la première théorie des germes au Mexique: développement des premières recherches sur la fièvre jaune dans les années 1880. *História, Ciências, Saúde – Manguinhos*, v.15, n.2, p.451-471. 2008.
- MAGALHÃES, Rodrigo Cesar da Silva.
A erradicação do Aedes aegypti: febre amarela, Fred Soper e saúde pública nas Américas (1918-1968). Rio de Janeiro: Editora Fiocruz. Coleção História e Saúde. 2016.
- MCNEILL, John Robert.
Mosquito empires: ecology and war in the Greater Caribbean, 1620-1914. Cambridge: Cambridge University Press. 2010.
- MEJÍA, Paola.
De ratones, vacunas y hombres: el programa de fiebre amarilla de la Fundación Rockefeller en Colombia, 1932-1948. *Dynamis*, n.24, p.119-155. 2004.
- MÜLLER-WILLE, Staffan.
History of science and medicine. In: Jackson, Mark (Ed.). *The Oxford handbook of the history of medicine*. Oxford: Oxford University Press, p.469-483. 2011.
- OBREGÓN, Diana.
Batallas contra la lepra: Estado, medicina y ciencia en Colombia. Medellín: Eafit. 2002.
- PALMER, Steven.
Toward responsibility in international health: death following treatment in Rockefeller hookworm campaigns, 1914-1934. *Medical History*, v.54, n.2, p.149-170. 2010.
- PEARD, Julian.
Race, place, and medicine: the idea of the tropics in nineteenth-century Brazil. Durham, NC: Duke University Press. 2000.
- QUEVEDO, Emilio et al.
De los litorales a las selvas: la construcción social del concepto de fiebre amarilla selvática, 1881-1938. Bogotá: Editorial de la Universidad del Rosario. 2018.
- QUEVEDO, Emilio et al.
Knowledge and power: the asymmetry of interests of Colombian and Rockefeller doctors in the construction of the concept of “jungle yellow fever”, 1907-1938. *Canadian Bulletin of Medical History*, v.25, n.1, p.71-109. 2008.
- ROSENBERG, Charles.
Framing disease: illness, society and history. In: Rosenberg, Charles. *Explaining epidemics and other studies in the history of medicine*. Cambridge: Cambridge University Press, p.293-304. 1992.
- SECORD, James A.
Victorian sensation: the extraordinary publication, reception, and secret authorship of vestiges of the natural history of creation. Chicago; London: University of Chicago Press. 2001.

SHAPIN, Steven.

Pump and circumstance: Robert Boyle's literary technology. *Social Studies of Science*, v.14, n.4, 481-520. 1984.

SMITH, Dale C.

The rise and fall of typhomalarial fever. *Journal of the History of Medicine and Allied Science*, v.37, p.182-220, 287-321. 1982.

SMITH, Dale C.

Gerhard's distinction between typhoid and typhus and its reception in America, 1833-1860. *Bulletin of the History of Medicine*, v.54, n.3, p.368-385. 1980.

SOLÓRZANO, Armando.

The Rockefeller Foundation in Revolutionary Mexico: yellow fever in Yucatan and Veracruz. In: Cueto, Marcos (Ed.). *Missionaries of science: The Rockefeller Foundation in Latin America*. Bloomington: Indiana University Press, p.53-69. 1994.

STEPAN, Nancy Leys.

Picturing Tropical medicine. London: Reaktion Books. 2001.

STEPAN, Nancy.

The interplay between socio-economic factors and medical science: yellow fever research, Cuba and the United States. *Social Studies of Science*, v.8, n.4, p.397-423. 1978.

SUTTER, Paul.

El control de los zancudos en Panamá: los entomólogos y el cambio ambiental durante la

construcción del Canal. *Historia Crítica*, n.30, p.67-90. 2005.

WARNER, John Harley.

The history of science and the science of medicine. *Osiris*, v.2, n.10. p.164-93. 1995.

WARNER, Margaret.

Hunting the yellow fever germ: the principle and practice of etiological proof in late nineteenth-century America. *Bulletin of the History of Medicine*, v.59, p.361-382. 1985.

WHO.

The World Health Organization. Present Status of Yellow Fever: Memorandum from a PAHO Meeting. *Bulletin of the World Health Organization*, v.64, n.4, p.511-524. 1986.

WILSON, Adrian.

On the history of disease-concepts: the case of pleurisy. *History of Science*, v.38, p.271-318. 2000.

WILSON, Leonard G.

Fevers and science in early nineteenth century medicine. *Journal of the History of Medicine and Allied Sciences*, n.33, p.386-407. 1978.

WORBOYS, Michael.

Practice and the science of medicine in the nineteenth century. *Isis*, n.102, p.109-15. 2011.

WRIGHT, Peter; TREACHER, Andrew.

The problem of medical knowledge: examining the social construction of medicine. Edinburgh: Edinburgh University Press. 1982.

