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The making of a Pastorian empire: tuberculosis and bacteriological technopolitics in French colonialism and international science, 1890–1940[†]

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Abstract

In the early twentieth century, scientists at the Pasteur Institute and its colonial affiliates developed a historically specific form of bacteriological technoscience, which abstracted the human–microbe relationship from its environmental and social context, and created a model for public health governance that operated at the scale of the empire, rather than at the level of individual colonies or regions. Using a case study of tuberculosis management, this article argues that the success of the Pastorian model relied on its technopolitical vision of a universal model of managing human–microbe relations, while, in reality, exploiting precisely those fissures created by the uneven political and scientific landscape of the colonial and scientific world in which it operated. Pastorian bacteriology helped imperial administrators to imagine a globe-spanning, standardized empire, while restricting public health governance to technological innovations, rather than a proposal for social hygiene that would have expanded labour and associational rights for subject populations.

Keywords: bacteriology; empire; global health; technopolitics; tuberculosis

Introduction

In 1905, Albert Calmette, director of the Pasteur Institute of Lille in France, outlined a set of general principles regarding ‘the role of medical sciences for colonization’ in the *Revue Scientifique*. Rather than focusing on any specific location, he proposed a set of rules which would provide ‘results in all colonies’ where tropical diseases had hitherto prevented Frenchmen from fully exploiting resources, and had kept the *indigènes* in a state of constant precarity. As the Pasteur Institute expanded overseas, first to Saigon, in French Indochina, in 1890, and then to Madagascar, Réunion, New Caledonia, West Africa, and North Africa, these archaic conditions were bound to change. By intervening in an empire that spanned the world, but contained only individual bodies and harmful microbes, Pastorians (as the scientists called themselves) could ‘realize, however slowly, the peaceful penetration of French influence, and this penetration would replace . . . the at the very least more brutal penetration of abdomens and stomachs by destructive projectiles’.¹

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¹Albert Calmette, ‘Médecine coloniale: le rôle des sciences médicales dans la colonisation’, *Revue scientifique*, 8 April 1905, pp. 420, 418.

This article explores how Pastorians developed a new, global technoscientific framework for discussing colonial politics. This framework consisted of a novel set of public health arguments, bacteriological devices such as epidemiological studies and vaccinations, and forms of expertise. It empowered actors ranging from Vietnamese doctors to French hygienists in calling for colonial reform, but ultimately helped administrators limit the boundaries of governance in a variety of fields. By setting the colonial politics of bacteriology against a global scientific backdrop, the article reframes the relationship between social hygiene and bacteriology in the early twentieth century. Looking from a European perspective, bacteriological expertise – the laboratory identification of pathogenic microbes as part of any public health effort – was successfully integrated into the framework of social hygiene, which emphasized social reform, population management, and moral discipline.² Bacteriology was, in principle, compatible with hygienist thinking. In practice, many Pastorians were unhappy with the ways in which international bodies such as the Rockefeller Foundation or the League of Nations Health Organization (LNHO) criticized vaccination programmes. In the French empire, social hygiene programmes raised unwelcome spectres of expensive development. In what follows, I use the example of tuberculosis (TB) prevention to show how a specifically Pastorian bacteriological logic came to function as an alternative to social hygiene. Pastorians identified TB as a pan-imperial problem, and then proposed a universal, technical solution in the form of the BCG vaccine. Understanding the politics of Pastorian TB prevention requires both seeing how the empire functioned as a privileged space within a global scientific community, and also appreciating the political power of bacteriological technoscience. The former provided Pastorians with resources to respond to international criticism; the latter lent administrators a model for limiting the scope of its *mission civilisatrice*.³

Studies of colonial hygiene have largely focused on how biomedical knowledge in various empires deepened colonial power, justified the civilizing mission, and maintained colonizer–colonized divides through increasingly elaborate and involved forms of hygienic discipline: monitoring defecation habits in the American Philippines, or remaking urban space in the treaty port of Tianjin, both in the name of public health.⁴ In these cases, and many others, modernization efforts – hygienic or otherwise – created tensions precisely because states could not commit to their expansive reform plans in colonies run through intermediaries and on shoestring budgets.⁵ Such tensions certainly existed in the French empire as well. Many experts of tropical medicine

²The classic versions of this argument are found in Bruno Latour, *The Pasteurization of France*, Cambridge, MA: Harvard University Press, 1984; David Barnes, *The great stink of Paris and the nineteenth-century struggle against filth and germs*, Baltimore, MD: Johns Hopkins University Press, 2006; Andrew Cunningham and Perry Williams, eds., *The laboratory revolution in medicine*, Cambridge: Cambridge University Press, 2002. For a similar argument in the colonial context, see Mary P. Sutphen, 'Not what, but where: bubonic plague and the reception of germ theories in Hong Kong and Calcutta, 1894–1897', *Journal of the History of Medicine and Allied Sciences*, 52, 1, 1997, pp. 81–113.

³Here I am building on a number of studies of the global Pasteur network. On TB, Clifford Rosenberg has explored the privileged space of empire in international science, 'The international politics of vaccine testing in interwar Algiers', *American Historical Review*, 117, 3, 2012, pp. 671–97. The specificity of French vs British bacteriology has been explored in Pratik Chakrabarti, *Bacteriology in British India: laboratory medicine and the tropics*, Rochester, NY: Rochester University Press, 2012. The colonial network is discussed in Anne-Marie Moulin, 'Patriarchal science: the network of the overseas Pasteur institutes', in P. Petitjean, C. Jami, and A.-M. Moulin, eds., *Science and empires*, Dordrecht: Springer, 1992; and specifically in the context of Indochina in Laurence Monnais-Rousselot, *Médecine et colonisation: l'aventure indochinoise, 1860–1939*, Paris: CNRS Édition, 1999.

⁴This model, often termed 'biomedical citizenship' or 'hygienic modernity', is elaborated in Warwick Anderson, *Colonial pathologies: American tropical medicine, race, and hygiene in the Philippines*, Durham, NC: Duke University Press, 2006; David Arnold, *Colonizing the body: state medicine and epidemic disease in nineteenth-century India*, Berkeley, CA: University of California Press, 1999; Ruth Rogaski, *Hygienic modernity: meanings of health and disease in treaty-port China*, Berkeley, CA: University of California Press, 2004.

⁵Jane Burbank and Frederick Cooper, *Empires in world history: power and the politics of difference*, Princeton, NJ: Princeton University Press, 2011, pp. 327–9. See also J. P. Daughton, *An empire divided: religion, republicanism, and the making of French colonialism, 1880–1914*, Oxford: Oxford University Press, 2006; Alice Conklin, *A mission to civilize: the republican idea of empire in France and West Africa, 1895–1930*, Stanford, CA: Stanford University Press, 1997.

were committed to racialized, environmentalist, and, in this sense, social visions of hygiene, upon which such visions of modernity were built.⁶ I argue that, in contrast, the Pastorians' technoscientific tools appealed to local and imperial administrators, precisely because they *limited* the expected level of government, and provided an alternative to social hygiene in cases when it threatened to upend the colonial status quo. The 'genuine consensus' on BCG vaccination in Indochina, for example, has to be seen in this political context: as a way of containing promises of hygienic modernity in a moment when French and Vietnamese hygienists tried to expand them beyond what colonial authorities were willing to tolerate.⁷ By confining public health to the management of human–microbe interactions, Pastorian tools promised to help standardize governance, created an alternative to indigenous demands for more localized and social public health interventions, and provided administrators with a rationale to withdraw from large-scale reforms in favour of small, undemanding fixes, such as the BCG vaccine.⁸ All this still allowed French officials to claim commitment to the civilizing mission.

Conceptually, this article stresses the technopolitical nature of the Pastorian project. New technical and scientific tools – the principle of focusing on the human–microbe interface, the tuberculin skin test, the BCG vaccine – rendered the colonial world in new ways, and provided new political options for colonial administrators: alternatives to social hygiene and development programmes that nevertheless allowed French elites to claim that they were rationalizing colonial governance and addressing public health problems. Yet, simultaneously, the material logic of Pastorian technologies created new conflicts: epidemiological studies that confirmed the acute danger posed by TB unexpectedly empowered French and Vietnamese hygienists to push back against the restrictive Pastorian model. As we shall see, technical innovations, such as epidemiological studies or the BCG vaccine cannot be reduced to discourse or politics alone. The technological logic of TB prevention generated new political conflicts and obstacles that Pastorians or administrators could not anticipate – hence the term 'technopolitics'.⁹

Pastorian TB management embodied the tension between the ambition of a universal, global reach and a variegated reality, where the ability of Pastorians to ignore the environmental and social determinants of health in specific locales and capitalize on the support of particular colonial administrators became an important part of their international struggle for legitimization. Pastorian *science* promised to make the world look similar – a boon for colonial administrators. Pastorian *politics* exploited a world of empires, inequality, and varying levels of infrastructure and oversight that rarely reached beyond mainland Europe. As Albert Calmette used examples from animal testing in Guinea, human trials in Senegal, mass vaccination campaigns in Indochina, and promises of a randomized controlled trial in Algeria to defend his vaccine at the LNHO, it was infrastructural and political variability, not global uniformity, that paid him dividends.¹⁰

⁶For example, Eric Jennings, *Curing the colonizers: hydrotherapy, climatology, and French colonial spas*, Durham NC: Duke University Press, 2006.

⁷Laurence Monnais, 'Preventive medicine and "mission civilisatrice": uses of the BCG vaccine in French colonial Vietnam between the two world wars', *International Journal of Asia-Pacific Studies*, 2, 1, 2006, pp. 40–66.

⁸In the French colonies, BCG was a low-cost effort since it was generally produced and distributed gratis by the Pasteur Institute as part of their funding agreement with various colonial governments. Colonial officials consistently emphasized the cost-effectiveness of BCG compared to infrastructure construction (for instance dispensaries and sanatoria). For a discussion of costs in Indochina, see Motais, Guérin, and Mesnard in Vietnamese National Archives II, Ho Chi Minh City (henceforth VNA-II), GouCoch, 7193, G. Striedter, Inspecteur des Affaires Politiques et Administratives to the Governor of the Colony, 10 August 1932.

⁹The term is developed in Gabrielle Hecht, *The radiance of France: nuclear power and national identity after World War II*, Cambridge, MA: MIT Press, 1998, pp. 15–16. See also Timothy Mitchell, *Rule of experts: Egypt, techno-politics, modernity*, Berkeley, CA: University of California Press, 2002.

¹⁰Increasingly scholars are looking at the struggles and limits of international organizations seeking to hold empires accountable. In international diplomacy, see Susan Pedersen, *The guardians: the League of Nations and the crisis of empire*, Oxford: Oxford University Press, 2015; in medicine, see Jessica Lynne Pearson, *The colonial politics of global health*, Cambridge, MA: Harvard University Press, 2018.

This article builds on extensive scholarship both on ‘magic bullet’ enthusiasm and on the role that social hygiene played in European colonies. Before the First World War, many experts placed their faith in the Haffkine lymph in solving the *fin-de-siècle* plague pandemic; after the Second World War, others hoped that the ‘miracle drug’ Lomidine would cleanse Africa of sleeping sickness.¹¹ Social hygiene found new clout in the late interwar years, particularly among subaltern colonial populations and within organizations like the League of Nations. Whether at international meetings such as the 1937 Bandoeng Conference, or locally, on Indochinese plantations, experts discussed malaria, malnutrition, and the disastrous state of rural hygiene, with a focus on the social determinants of disease.¹² In other instances, colonial officials, too, took a more environmentalist view of public health problems – the British Africa survey of the 1930s being one example, French policies on malaria prophylaxis in Indochina another.¹³ Indeed, the Pasteur Institute and French administrators across the empire worked with social hygiene initiatives on numerous occasions. Running an empire was, after all, a task that required accommodating many different interests. Yet when social hygiene began to imply uncomfortable political changes, officials quickly leaned on Pastorian technologies to limit such projects; and Pastorians, particularly after the First World War, grew fonder of technical solutions. Understanding the politics of a technology-focused approach to TB, however, entails analysing its appeal to Pastorians, who thought globally, policy-makers, who thought imperially, and colonial officials and subjects, who thought locally.

The article proceeds in three parts. The first section analyses how Pastorian TB epidemiologies reframed TB as a pan-imperial problem caused by European contact, rather than a regional problem caused by local environmental or racial susceptibility. The second section shows how Pastorians, under criticism from international scientific bodies, and administrators seeking to concretize their promises to reform the empire, formed a potent alliance. The final section demonstrates how BCG vaccination became a rhetorical weapon against indigenous and French champions of social medicine, labour rights, and rights of free association in colonial Indochina. After the Second World War, the spread of antibiotics (streptomycin) and the political shift towards ‘developmentalist colonialism’ dramatically changed the dynamics of both colonial and medical power. Yet the Pastorians’ enthusiasm for limited, yet global, interventions in the interwar years remains relevant in the light of present-day discussions around ‘global health’, which are characterized by a similar faith in technical interventions and a global scope, and which, indeed, often refer back specifically to the ‘success’ of early Pastorians.¹⁴ For officials in those years, however, success primarily meant limiting engagement, and avoiding more capacious reforms.

The making of imperial tuberculosis

In the *fin de siècle*, TB became the central public health concern of metropolitan France, while colonial administrators effectively ignored the disease. Although long-term trends showed a slow but clear decline in TB mortality rates (from 3.89 per 10,000 in 1887 to 2.91 in 1914, across twenty-six cities), in 1898, the Academy of Medicine, government commissions, and various popular movements raised the issue as a central problem of French society – the war on tuberculosis

¹¹Guillaume Lachénal, *The Lomidine files: the untold story of a medical disaster in colonial Africa*, Baltimore, MD: Johns Hopkins University Press, 2017; Latour, *Pasteurization of France*, pp. 94–100.

¹²Annick Guénel, ‘The conference on rural hygiene in Bandung of 1937: towards a new vision of health care?’, in Laurence Monnais and Harold Cook, eds., *Global movements, local concerns: medicine and health in Southeast Asia*, Singapore: NUS Press, 2012, pp. 62–80. For a contrasting view, see Socrates Litsios, ‘Revisiting Bandoeng’, *Social Medicine*, 8, 3, 2014, pp. 113–28. For malaria, see Michitake Aso, ‘Forests without birds: science, environment, and health in French colonial Vietnam’, PhD thesis, University of Wisconsin-Madison, 2011.

¹³Helen Tilley, *Africa as a living laboratory: empire, development, and the problem of scientific knowledge*, Chicago, IL: Chicago University Press, 2011.

¹⁴Guillaume Lachénal, ‘The Dubai stage of public health’, *Revue Tiers Monde*, 215, 2013, pp. 53–71.

(*la lutte contre la tuberculose*).¹⁵ David Barnes has argued that TB became a way for the French bourgeoisie to express fears over national decline, the threat posed by unhygienic working classes, the shifting of moral norms, and the rise of vices such as alcoholism and syphilis. Defeating TB would mean defending prosperity, national security, and bourgeois morality.¹⁶ The country's obsession with TB waxed and waned. It reached a peak in the early 1900s, subsided, and surfaced again during the First World War, propelled by high TB rates among the enlisted, as well as by the American Rockefeller Foundation's mission to France. By the 1920s, France had established organizations such as the Comité National de Défense contre la Tuberculose (Committee for National Defence against Tuberculosis; CNDT), educational programmes, dispensaries, and sanatoria, all committed to improving social hygiene and preventing TB.¹⁷

In the French colonies, however, TB remained largely absent from the official mind. Epidemiological studies of TB were rare in the decades before the First World War. Discussions were often limited to general studies of 'diseases in warm climates', often in doctoral dissertations of aspiring tropical physicians, or in publications by doctors working in hospitals in Dakar or Saigon, based on individual case studies observed in their clinical practice.¹⁸ In annual medical reports to the governments of French West Africa (l'Afrique Occidentale Française; AOF) and Indochina, TB rarely occupied more than a paragraph. In the AOF, TB was simply reported as being 'frequent and widespread' in all regions of the colony – but not destructive enough to warrant administrative action.¹⁹ In Indochina, administrators often categorized TB as a 'sporadic disease', the least important of three categories, which also included 'epidemic' (smallpox) and 'endemic' (malaria).²⁰ Remarkably, unlike experts in the US and South Africa, for example, most French scientists before the 1900s not only rejected 'virgin soil' theories, which emphasized European contact as the source of TB infections, but believed that the tropical environment could, in some cases, even protect against TB.²¹

In one of the first pan-imperial surveys of the problem, published in 1905, the director-general of the Colonial Health Service, Alexandre Kermorgant, observed that, as in the metropole, TB in the colonies appeared to multiply with 'agglomeration' (population density) and with 'civilization', by which he meant urbanization and European contact.²² Yet he categorically rejected the idea of TB's European origins, emphasizing that TB had been in the French colonies 'since time

¹⁵David Barnes, 'The rise or fall of tuberculosis in belle-epoque France: a reply to Allan Mitchell', *Social History of Medicine*, 5, 2, 1992, p. 282.

¹⁶David Barnes, *The making of a social disease: tuberculosis in nineteenth-century France*, Berkeley, CA: University of California Press, 1995. For the connection between social, moral, and political anxieties and TB, see also Isabelle Grellet and Caroline Kruse, *Histoires de la tuberculose: les fièvres de l'âme, 1800–1940*, Paris: Ramsay, 1983; Dominique Dessertine and Olivier Faure, *Combattre la tuberculose*, Lyon: Presse Universitaire de Lyon, 1988.

¹⁷Vincent Viet, *La santé en guerre, 1914–1918: une politique pionnière en univers incertain*, Paris: Presses de Sciences Po, 2015; Dessertine and Faure, *Combattre la tuberculose*, pp. 36–43. For a contemporary source, see Rockefeller Archive Center (henceforth RAC), Sleepy Hollow, NY, RG 1.1, Series 500 T, box 28, folder 266; Charles Nordmann, 'La croisade des Américains contre la tuberculose', *Revue des Deux Mondes*, 15 September 1919, p. 458.

¹⁸Marcel Léger discusses these dissertations in his overview of tuberculosis studies in West Africa, 'La tuberculose au Sénégal, étude historique', *Bulletin du Comité d'Études Historiques et Scientifiques de l'Afrique Occidentale Française*, 1922, pp. 534–6.

¹⁹*Rapport d'ensemble annuel: Gouvernement-Général de l'Afrique Occidentale Française*, Paris: Émile Larose, 1909, p. 14; *Rapport d'ensemble annuel: Gouvernement-Général de l'Afrique Occidentale Française*, Paris: Émile Larose, 1910, p. 42; *Rapport d'ensemble annuel: Gouvernement-Général de l'Afrique Occidentale Française*, Paris: Émile Larose, 1911, p. 212.

²⁰For example, *Indochine: situation générale de la colonie pendant l'année 1912*, Hanoi: Imprimerie d'Extrême-Orient, 1913, pp. 8–10, 18–19, 47–9, 70; *Rapports au conseil supérieur, session ordinaire de 1910*, Hanoi: Imprimerie d'Extrême-Orient, 1913, p. 162.

²¹Randall Packard, *White plague, black labor: tuberculosis and the political economy of health and disease in South Africa*, Berkeley, CA: University of California Press, 1989, pp. 22–32, 194–210. For a history of the virgin soil theory, see David S. Jones, 'Virgin soils revisited', *William and Mary Quarterly*, 60, 4, 2003, pp. 703–42.

²²Alexandre Kermorgant, *La tuberculose dans les colonies françaises et plus particulièrement chez les indigènes*, Paris: Imprimerie Nationale, 1906, pp. 6–8.

immemorial'.²³ Hospitals in Hanoi admitted patients from distant provinces of Annam, Cochinchina, and Tonkin, where they could not have had extensive contact with Europeans. Records of TB cases dated back to missionary reports from the 1860s, when colonization had only just begun. References to local names provided further evidence of the disease's ancient provenance in both Indochina and West Africa. Experts reported that TB had traditional indigenous names: it was called 'Lo Beng' in Cambodia, 'Binh ho Lao' in Annam, for example.²⁴

Rather than blaming the corruptive effects of social and moral ills, doctors in the colonies focused on environmental and racial determinants, which gave tropical TB a different character from its metropolitan equivalent. Some doctors argued that blacks and 'orientals' carried 'a sort of natural immunity against tuberculosis'.²⁵ In Indochina, Alphonse Voillot believed that the 'yellow races' suffered less from the disease 'in spite of their ancient contact with Europeans'.²⁶ Doctors noted that, even in high-affliction regions of Indochina, TB among 'orientals' was milder, with 'a slow evolution', 'dry', without coughing or sputum, and that symptoms were more likely to include 'diarrhoea and intestinal problems'.²⁷ Other experts, however, speculated that Africans were more, rather than less, susceptible to TB.²⁸ Either way, tropical doctors agreed that race played a central role in TB susceptibility.

Still others emphasized environmental determinants: in their view, cleaner air and a warm, dry tropical climate could lower affliction rates. Algeria, in particular, was known for its healthy air, with some doctors calling the country's climate the *patibulum vitae*, the life-giving cross.²⁹ Some doctors even suggested that malaria acclimatized Africans' organs against certain forms of morbidity, including TB. 'Tuberculosis and the malarial miasma are like two pans of a scale, if one rises then the other must lower', wrote Dr Boudin in 1857.³⁰ These views persisted into the early twentieth century, reappearing in reports at the 1904 tuberculosis conference speculating that malaria might be responsible for the low rates of TB among Malagasies and Somalis.³¹ Over time, however, doctors who showed that malaria could, in fact, accelerate and worsen TB, contested these environmentalist claims.³²

Colonial doctors concluded that, if colonial TB was indeed a perennial problem determined by environmental and racial factors, then 'all prophylactic measures would prove illusory'.³³ Administrative action remained rare in both the AOF and Indochina. In 1900 and 1904, the Ministry of the Colonies mandated that hospitals and sanitary services across the colonies must take precautions against contagion: military establishments were required to regularly disinfect the premises and aerate buildings, while hospitals were required to isolate consumptives from

²³*Ibid.*

²⁴Hénaff, 'La tuberculose chez les indigènes de Cochinchine', *Annales d'Hygiène et de Médecine Coloniales*, 6, 1903, p. 50; Angier, 'La tuberculose au Cambodge', *Annales d'hygiène et de médecine coloniales*, 6, 1903, p. 65.

²⁵J. P. F. Thévenot, *Traité des maladies des Européens dans les pays chauds et spécialement au Sénégal*, Paris: J.-B. Baillière, 1840, p. 252. For claims to a consensus, see Louis-Joseph Janvier, *Phtisie pulmonaire: causes, traitement préventif*, Paris: Impr. A Parent, 1884, pp. 24–6. According to Leger, 'La tuberculose au Sénégal', pp. 534–6, this consensus began to fracture in the late 1880s.

²⁶Alphonse Voillot, *Contribution à l'étude de la tuberculose aux colonies*, Paris: Thèses médicales, 1898, p. 21. See also Dr Crespín, 'Paludisme et tuberculose', *Congrès international de la tuberculose tenu à Paris du 2 au 7 octobre 1905*, Paris: Masson et Cie, 1906, p. 540.

²⁷E. Jeanselme, 'La tuberculose dans la presqu'île Indo-Chinoise et dans le Yunnan', in *ibid.*, pp. 546–7.

²⁸J. Crambs, 'Contribution à la géographie médicale du Soudan occidental (région aurifère entre le haut Sénégal et le haut Niger)', Bordeaux: Thèse de doctorat, 1887; Voillot, *Contribution à l'étude de la tuberculose*, p. 45.

²⁹Dr Feuillet cited in Dr Gillot, 'Progression de la tuberculose en Algérie', in *Congrès international de la tuberculose*, p. 549.

³⁰J. C. M. Boudin, *Traité de géographie et de statistique médicales et des maladies endémiques*, London: J.B. Baillière et fils, 1857, p. 96.

³¹Crespín, 'Paludisme et tuberculose', p. 541.

³²Georges Darenberg, *La phtisie pulmonaire*, vol. 2, Paris: J. Rueff, 1892, p. 115; H. Hérard, V. Cornil, and V. Hanot, *La phtisie pulmonaire*, 2nd edn, Paris: Felix Alsan, 1888, pp. 364–5.

³³Kermorgant, *La tuberculose*, pp. 23–4.

other patients. Yet, even here, local officials acknowledged that budgetary resources were insufficient for complying with all the demands, and implored that, at minimum, doctors should change shirts and wash their hands after seeing patients with TB.³⁴ In the pre-war years, neither medical nor administrative elites made the case to take TB in the colonies seriously. In the early 1900s, in part thanks to the efforts of the Pastorian Albert Calmette, this view began to change.

Calmette became involved in the anti-TB movement in the late 1890s, when working at the Pasteur Institute in Lille, an industrial town, where TB was a particularly acute problem, and where he ‘could observe, every day, the inutility or insufficiency of the poorly coordinated efforts of public welfare institutions and of private charity’.³⁵ Unlike other social hygienists, Calmette focused exclusively on contagion. He elaborated on this principle in several high-profile studies, most notably in a 713-page *magnum opus* titled *The role of microbial infection in human and animal tuberculosis*. After spending several hundred pages on the morphology, cultivation, life cycle, chemical composition, and infection mechanisms of the tubercle microbe, he proceeded to demolish the ecological public health approach of the day. Listing popular arguments that grounded TB infections in ‘ignorance’, ‘alcoholism’, ‘misery’, and ‘insufficient nutrition’, Calmette concluded that

It would be best to not repeat too often these aphorisms intended for the public, since it would detract our attention from the central goal which we need and wish to follow, that is to reduce or render docile the sources of infection. . . . Alcoholism, misery, lack of nutrition, unsanitary housing cannot cause tuberculosis *if the microbe itself is not present*. These are only – and this is already too strong a claim – factors of organic decay which, after the infection has already manifested itself, can paralyse or hinder the organism’s natural defensive weapons.³⁶

Calmette believed that the broad social campaign against TB was misguided, focusing too much on the environmental conditions of potential victims and not enough on eradicating the microbe itself. Instead, he argued that ‘it is hard to imagine the limitation and then extinction [of the tubercle microbe] otherwise than by the *vaccination* of all men and susceptible animals’.³⁷

Calmette had many allies in the colonies, where his own career had begun, and where he had mentored a generation of young Pastorians. From 1912 onwards, his methodological conviction of the primacy of contagion, and a new technological tool at his disposal – the tuberculin skin test – enabled him to reorient the scholarly consensus on the importance of TB in the colonies. A series of epidemiological studies, which used the resources of the expansive Pastorian network and took the entire empire as the scale of analysis, constructed TB as an acute, pan-imperial problem, with roots in the colonizing process itself. In what follows, I argue that Calmette-era epidemiologies worked as epidemiological devices, which constructed an imperial geography of TB, undermined the fatalist implications of previous studies, and made an argument for Pastorian medical intervention.³⁸ We will see that Calmette’s data was limited by similar factors to those of previous

³⁴Circular of the Minister of the Colonies to the Governors-General of the AOF, Indochina, and Madagascar and to the Commissaire Général of the Congo, *Bulletin Administratif du Gouvernement Général de l’Afrique Occidentale Française*, 2 March 1900; Circular of the Minister of the Colonies to the Governors-General of the AOF, Indochina, and Madagascar and to the Commissaire Général of the Congo, *Bulletin Administratif du Gouvernement Général de l’Afrique Occidentale Française*, 19 February 1904.

³⁵Archives de l’Institut Pasteur, Paris (henceforth AIP), CAL.A1, Albert Calmette, autobiography, p. 17.

³⁶Albert Calmette, *Infection bacillaire et la tuberculose chez l’homme et chez les animaux*, Paris: Masson et Cie, 1920, p. 600, emphasis in original.

³⁷*Ibid.*, p. 604, emphasis in original.

³⁸The term ‘epidemiological devices’ is inspired by Michel Callon’s ‘market devices’, technical instruments that intervene in the construction and reshaping of markets. Michel Callon, *Market devices*, New York: Wiley and Sons, 2007. See also Gerald Oppenheimer, ‘Causes, cases, and cohorts: the role of epidemiology in the historical construction of AIDS’, in E. Fee and D. Fox, eds., *AIDS: the making of a chronic disease*, Berkeley, CA: University of California Press, 1992, pp. 49–83.

studies (for example, a focus on select urban areas) and did not paint a dramatically different picture of TB spread, but the technical innovations he used allowed him to dismiss previous studies and impress the novelty of his conclusions on medical administrators.³⁹

Calmette first turned his attention towards the colonies in 1910, when he and Camille Guérin managed to cultivate a non-virulent strain of the tubercle bacterium, and a vaccine appeared to be within their grasp. At that point in time, the French doctors Mantoux and von Pirquet, using Robert Koch's research, had developed a new tool for diagnosing TB infection even in people who were not symptomatic. This was a major innovation in an age when even symptomatic TB was often confused with other diseases such as pneumonia or lung cancer. The test involved injecting matter extracted from dead tubercle microbes – tuberculin – and then observing the subject's reactions. A red patch developing at the site of injection within 48–72 hours indicated that the subject had TB antibodies.⁴⁰ Calmette furnished his collaborators with free tuberculin developed at the Pasteur Institute in Lille, and Pastoriens and doctors in the colonies, sensing an opportunity for furthering their careers, eagerly went along with the plan.⁴¹ The results were published in the *Annales de l'Institut Pasteur* in 1912, and became the basis for a number of future studies, cited as the beginning of a new epoch by both colonial administrators and later researchers alike.⁴²

The tuberculin skin test allowed Pastoriens both to dismiss prior studies for their lack of technical sophistication, and to emphasize the importance of fighting a disease that, on the surface, seemed less immediately dangerous than malaria or yellow fever. As Marcel Léger argued in his overview of TB studies in West Africa,

Morbidity and mortality statistics have always only very imperfectly informed us of the frequency of a bacterial infection in a given country. There are, in reality, always a number of subjects in whom the manifestations of illness are completely absent or constantly hidden, yet who are still infected by the microbe. These are the sources of contagion, far more dangerous as they are hidden and ignored.⁴³

Tuberculin tests could detect latent carriers of TB, and, equally importantly, Pastoriens considered them to be sufficiently *precise*. Calmette suggested that the 'great precision' of the tuberculin test would enable the charting of the spread of the disease and the development of a '*tuberculosis index* of a particular ethnic group, locality or even an entire country'.⁴⁴ To that end, the only studies he considered relevant were those that utilized tuberculin, such as those done in the in Kalmyk steppes in Russia, or a few studies attempted at around the same time by other Pastoriens.⁴⁵

Yet, for all the claims to technical precision, Calmette's statistics were not much more detailed than those collected by Kermorgant ten years earlier, nor did they show a fundamentally different picture of TB epidemiology. Calmette's collaborators could indeed break down the communities they studied by age (children under one year, children aged between one and fifteen, children

³⁹On the difficulties of evaluating the truth-claims of historical epidemiology, see Barnes, *Making of a social disease*, pp. 5–13.

⁴⁰Lee B. Reichman and Earl S. Hershfield, *Tuberculosis: a comprehensive international approach*, 2nd edn, New York: Marcel Dekker, 2005, pp. 29–31.

⁴¹Albert Calmette, 'Enquête sur l'épidémiologie de la tuberculose dans les colonies françaises', *Annales de l'Institut Pasteur*, 26, 1912, p. 499.

⁴²For instance, Kérandel, 'La tuberculose chez les indigènes dans les colonies françaises', in *Congrès de la santé publique et de la prévoyance sociale, Marseille, 11–17 septembre 1922*, Marseille: Commissariat général de l'exposition coloniale, 1922; Constant Mathis, *Oeuvre des Pastoriens en Afrique noire, Afrique occidentale française*, Paris: Presses Universitaires de France, 1946, p. 333.

⁴³Léger, 'La tuberculose au Sénégal', pp. 537–8.

⁴⁴Calmette, 'Enquête sur l'épidémiologie', p. 498, emphasis in original. For other instances of the rhetorical claims to precision, see Mathis, *Oeuvre des Pastoriens*, p. 333.

⁴⁵Calmette, 'Enquête sur l'épidémiologie', p. 498.

older than fifteen), and by ethnic group (white, Wolof, Maure, Bambara), rather than extrapolating from mortality rates or simply reporting the disease as ‘rare’, ‘present’, or ‘dominant’, as Kermorgant’s study had done.⁴⁶ But Calmette’s study was far from a village-by-village accounting of TB rates. His reach was limited by the extent of his network of collaborators: Pastorians based in laboratories in major cities such as Dakar or Saigon, with little access to the less-travelled areas of West Africa and Indochina. In Indochina, Calmette had data from all five colonies, but, even there, most of the tuberculin tests were performed in Hué, Saigon, and Phnom-Penh, with only a few tests done in rural regions. In the AOF, the vast majority of his data came from the colonies of Senegal and Guinea (3,000 tests). Outside colonial capitals, his research remained as impressionistic as prior studies.

Calmette still drew novel conclusions. He argued that TB was ‘extremely rare among the indigenous populations of the black race, in areas where Europeans have only recently penetrated; but the proportion of contaminated subjects grows with the intensity of commercial exchange and foreign immigration’.⁴⁷ The Pastorian further asserted that in certain areas TB infection was more likely to develop into symptomatic illness, and such illness would have graver consequences than in regions where TB was ‘more widespread and more ancient’.⁴⁸ Further, since infants in the colonies ‘never [drank]’ cow’s milk, the infection could not come from bovine TB.⁴⁹ This, Calmette concluded, meant that ‘Europeans . . . constitute[d] the primary means of infection’, and were responsible for the development of ‘serious forms’ of the disease among colonized populations.⁵⁰ Questions of nutrition, climate, racial specificity, and other environmental-biological factors, which previous researchers had used to explain the variability of TB mortality rates in the colonies, were completely irrelevant to Calmette; he focused on infection, which he asserted came from Europeans. The solution therefore had to be bacteriological, one that could halt the spread of the infection both from Europeans to colonized subjects, and from those with a latent infection to those with symptomatic illness: in short, the ‘methods of vaccination’ he was researching with Guérin.⁵¹

After 1900, experts in other colonial empires, too, began to term TB a ‘disease of civilization’, noticing its prevalence in mines that made extensive use of indigenous labour, in urban agglomerations, and in the military. The Irish pathologist Lyle Cummins, working in the Royal Army Medical Corps, studied Sudanese troops in the 1910s, and South African mine workers in the 1920s, concluding that the ‘virgin soils’ of Africa were responsible for higher mortality rates. In British India after the First World War, officials cited the study of Dr Arthur Lankester, which showed dramatic increases in TB rates in most urban areas, and in industrial areas in particular. German experts called increasing TB rates in Africa ‘the price paid for civilization’.⁵²

Many of these studies referenced Calmette’s research, but there were also significant differences. In South Africa, virgin soil theories led to fatalistic conclusions that TB could not be mitigated by active interventions, and that improvements would take decades, if not centuries. Many experts focusing on Africa and the United States remained committed to theories of racial specificity even in the 1930s, arguing that factors ‘deeply fixed in the blood of each race’ were far more important

⁴⁶Kermorgant, *La tuberculose*, pp. 9, 11–12.

⁴⁷Calmette, ‘Enquête sur l’épidémiologie’, p. 542. Calmette recapitulated this argument later in a number of popular and scientific publications. See AIP, BCG.37, Albert Calmette, ‘La lutte antituberculeuse dans les colonies françaises, principalement en Afrique Occidentale’, c.1931, pp. 2–3.

⁴⁸Calmette, ‘Enquête sur l’épidémiologie’, p. 542.

⁴⁹*Ibid.*, p. 543.

⁵⁰*Ibid.*, p. 497.

⁵¹*Ibid.*, p. 498.

⁵²Mark Harrison and Michael Worboys, ‘A disease of civilization: tuberculosis in Britain, Africa and India, 1900–39’, in L. Marks and M. Worboys, eds., *Migrants, minorities and health: historical and contemporary studies*, London: Routledge, 1997, pp. 93–124; Packard, *White plague, black labor*.

than acquired immunity and prior contact.⁵³ Neither interventionism nor fatalism necessarily followed from virgin soil theories; they were responses deriving in part from political necessity, methodological conviction, and the ability to make a case to policy-makers. In Calmette's case, his Pastorian pedigree, the ability to marshal technological innovations, and the alignment of his solutions with policy-makers' anxieties all contributed to the success of his logic.

BCG in colonial politics and global science

The French Ministry of the Colonies returned to public health problems in the interwar years, prompted by metropolitan concerns over birth rates, changing gender roles, and wartime injuries, and by the conviction that colonial subjects, particularly Africans, were untainted by civilization and therefore exceptionally virile.⁵⁴ While many commentators interpreted this latter claim as yet another sign of danger to the French race, a significant number of experts saw it instead as an opportunity to regenerate the French nation through intermarriage and settler colonialism.⁵⁵ Researchers called for a renewed focus on preventive and social hygiene, 'the improvement of both the quality and quantity of the races'.⁵⁶ Ultimately, though, colonial pronatalism was more economic and military than social or moral: 'all of our colonial problems, from the economic development of our overseas colonies . . . to the recruitment of indigenous troops depends directly on achieving high population densities in our colonies'.⁵⁷ For the Minister of the Colonies, Édouard Daladier, the population problem was primarily a labour problem.

At the same time, colonial officials were under pressure to demonstrate the humanitarian role of imperialism with new urgency. For anti-colonial activists, conditions of hygiene in particular became representative of the hypocritical promises of the civilizing mission, echoing Pastorian concerns about the European sources of TB. One African intellectual writing in *Le Cri des Nègres* argued that the trifecta of TB, alcoholism, and syphilis, the 'defects of "civilized metropolises"', had led to demographic decline in Africa, thereby proving that colonized societies under French rule were 'in a worse state than when they were left to their "barbarous instincts"'.⁵⁸ The 'archaic hygienic conditions of life that civilization has left them' led African intellectuals in Paris to conclude that 'it is a cynical lie to say that Negroes are incapable of self-governance and that they need the tutelage of European metropolises' to prevent them from falling back into barbarity'.⁵⁹

Improving hygiene therefore remained the core strategy for demonstrating imperial humanitarianism. In 1924, Daladier attempted a massive expansion of the colonial health system,

⁵³Harrison and Worboys, 'Disease of civilization', p. 107.

⁵⁴Mary Louise Roberts, *Civilization without sexes: reconstructing gender in postwar France, 1917–1927*, Chicago, IL: University of Chicago Press, 1994; Andres Horacio Reggiani, 'Procreating France: the politics of demography, 1919–1945', *French Historical Studies*, 19, 3, 1996, pp. 725–54. For claims of African virility, see Service Historique de la Défense-Toulon, Toulon (henceforth SHD-Toulon), 2013 ZK 005 223, Édouard Daladier, 'Rapport au Président de la République Française', 1 November 1924.

⁵⁵On imperial regeneration, see Aro Velmet, 'Beauty and big business: race and civilizational decline in French beauty pageants, 1920–37', *French History*, 28, 1, 2014, pp. 66–91; Margaret Cook Andersen, *Regeneration through empire: French pronatalists and colonial settlement in the Third Republic*, Lincoln, NE: University of Nebraska Press, 2015, pp. 25–60. On the overly virile other, see Elisa Camiscioli, *Reproducing the French race: immigration, intimacy, and embodiment in the early twentieth century*, Durham, NC: Duke University Press, 2009.

⁵⁶SHD-Toulon, 2013 ZK 005 223, 'Développement des services sanitaires et des oeuvres d'hygiène et d'assistance aux Territoires d'Outre-mer de 1925 à 1928', p. 3; 2013 ZK 005 161, 'Instructions de M. Daladier – ministre des colonies', 30 December 1924, p. 2.

⁵⁷Dr M. M. Nogue and Dr Adam, 'La mortalité infantile dans les colonies françaises', in *Congrès de la santé publique*, p. 445.

⁵⁸S. Rosso, 'Alors que l'Exposition se ferme', *Le Cri des Nègres*, November 1931.

⁵⁹Saumane, 'L'Exposition coloniale internationale', *La Race Nègre*, April 1931; S. Rosso, 'L'impérialisme aux abois', *Le Cri des Nègres*, September 1931. There is an interesting parallel here with invocations of neurasthenia as a 'disease of civilization' in colonial Vietnam. See Laurence Monnai, 'Colonised and neurasthenic: from the appropriation of a word to the reality of a malaise de civilisation in urban French Vietnam', *Health and History*, 14, 1, 2012, pp. 133–6.

refocusing it 'on demographic and social questions'.⁶⁰ The minister sought to expand the Assistance Médicale Indigène (AMI), a health service for subject populations of the AOF and Indochina, founded in 1905, which he argued had remained essentially powerless.⁶¹ Daladier's second goal was orienting colonial medical services more towards social hygiene, through popular education, training of midwives and construction of maternity wards, improvement of sanitation and potable water in the cities, and finally prevention of infectious diseases, particularly those that tended to threaten infants and expectant mothers.⁶²

Daladier's reforms, which aimed to standardize and expand preventive medicine across the colonies, created conflicting demands on colonial officials. Development budgets were meagre before the First World War, and remained so under Daladier as well. Large-scale investments to transform the colonies in France's image were not going to be forthcoming, and political transformations were going to be equally limited. Daladier's medical reforms remained similarly constrained. Imperial officials focused primarily on reorienting existing institutions and capitalizing on modest technical improvements. In 1924, the Governor-General of the AOF, Jules Carde, ordered the AMI to push staff towards indigenous maternity services, hoping that in addition to delivering babies and administering care, midwives and nurses would also impart hygienic education to new mothers – yet these reforms were limited to a tiny number of hospitals and involved no new resources.⁶³

The Pasteur Institute provided both the rationale and the technology for Daladier's reforms in such a constrained setting. Pastorians were already collaborating with colonial governments on a number of preventive endeavours: they produced smallpox and rabies vaccines, and they performed analyses of potable water in cities like Dakar or Saigon, lending force to the ministry's focus on technical improvements. TB vaccination was one such example of a relatively cheap technical fix that could be integrated into Daladier's reform plan.

Calmette's enthusiasm for the colonial mission, however, has to be seen equally in the context of widespread scepticism in the global scientific community. In 1924, Calmette and Guérin publicized their work on an experimental vaccine, the *Bacillus Calmette-Guérin* (BCG). Based on two human trials on 667 infants, Calmette and Guérin claimed that the vaccine was both safe and efficacious.⁶⁴ This, however, quickly became a controversial claim. The Pastorians' enthusiasm for a vaccine-based solution was at odds with rising confidence in social hygiene, spearheaded by the Rockefeller Foundation, international bodies such as the LNHO, and a number of high-profile statisticians in Denmark, the UK, Poland, and elsewhere.

By 1920, the Rockefeller Foundation mission to France had built up a system of charities, dispensaries, and education programmes, reinforcing principles of social hygiene in French physicians and the lay population alike.⁶⁵ Evidence from the United States suggested that social hygiene was indeed effective. Rockefeller propaganda materials cited, in particular, the rapid fall of TB mortality in New York after reforms undertaken by the newly formed city Health Board in

⁶⁰SHD-Toulon, 2013 ZK 005 223, Édouard Daladier, 'Rapport et projet de décret au président de la République par le ministre des Territoires d'Outre-mer Daladier sur le service de santé (1924)'.

⁶¹SHD-Toulon, 2013 ZK 005 223, Édouard Daladier, 'Rapport au Président de la République Française', 1 November, 1924.

⁶²SHD-Toulon, 2013 ZK 005 449, C. Chippaux, 'L'Institut de Médecine Tropicale du Service de Santé des Armées et l'oeuvre de Santé Publique des Médecins des troupes de Marine dans les pays d'Outre-Mer', 1988, p. 22; 2013 ZK 005 223, 'Développement des services sanitaires et des oeuvres d'hygiène et d'assistance aux Territoires d'Outre-mer de 1925 à 1928', 1928.

⁶³SHD-Toulon, 2013 ZK 005 161, Governor-General Jules Carde, circular to the lieutenant-governors and prefects of the AOF, 12 March 1924.

⁶⁴Albert Calmette, Camille Guérin, and Benjamin Weill-Hallé, 'Essai d'immunisation contre l'infection tuberculeuse', *Bulletin de l'Académie Nationale de Médecine*, 91, 1924, pp. 787–96; Albert Calmette and Camille Guérin, 'Vaccination des bovidés contre la tuberculose et méthode nouvelle de prophylaxie de la tuberculose bovine', *Annales de l'Institut Pasteur*, 38, 1924, pp. 371–98.

⁶⁵L. Murard and P. Zylberman, 'L'autre guerre (1914–1918): la santé publique en France sous l'oeil de l'Amérique', *Revue Historique*, 276, 1986, pp. 367–98; Dessertine and Faure, *Combattre la tuberculose*.

the early 1900s.⁶⁶ Statistics showing that mortality rates in New York in 1913 were half (1.92 per 10,000) those in Paris (3.79) migrated from Rockefeller publications to prestigious general interest journals such as *Revue des Deux Mondes*.⁶⁷ Mortality rates in France did indeed decline, though not as rapidly as in the United States, the Netherlands, or Germany. A growing number of medical experts believed that improving demographics confirmed that the ‘war on tuberculosis’ would take place principally in the domain of *social medicine*.⁶⁸ Calmette seemed to be addressing a problem that already had a reliable solution, thereby making the perceived risks of vaccination unjustifiable. As one article asserted, the ‘white plague’ would ‘not be cured by drugs, but by hygiene, a particular way of life, by following simple precautions’.⁶⁹

From the start, Calmette and Guérin saw their campaign to prove the safety and efficacy of BCG as a global task. They distributed samples of the vaccines to interested parties around the world and called upon the international scientific community to experiment with BCG and confirm their claims. Yet these calls could also backfire. In France, a small but vocal coterie of physicians and veterinarians led by Joseph Lignières challenged Calmette, and suggested that environmental factors might render BCG pathogenic, and that adverse reactions might undermine public trust in physicians.⁷⁰ More concerning were attacks by statisticians and social hygienists from the UK, Sweden, and the United States, among others, who criticized Calmette’s cavalier use of statistics, which were intended to confirm the efficacy of the vaccine but did not meet emerging norms of randomized trials. Critics such as Arvid Wallgren at the Gothenburg Children’s Hospital, or Major Greenwood at the London School of Hygiene, did not so much accuse BCG of being actively harmful, but simply noted that the lack of rigour in Calmette’s use of statistics made it impossible to prove that it was effective.⁷¹ A well-publicized incident in Lübeck in 1929–30, where 72 infants who had been vaccinated with BCG died over the course of a few months owing to contamination in the production process, further accelerated criticisms, and the Netherlands, Belgium, Poland, Switzerland, and Germany all discontinued the use of BCG for a shorter or longer period as the situation unfolded.⁷²

Calmette hoped that the LNHO, a new organization, could confirm the efficacy and safety of BCG and silence critics, but the organization’s verdict turned out to be as ambivalent as those of Calmette’s critics. The head of the agency, Ludwik Rajchman, a Polish bacteriologist and committed socialist, wanted the agency to focus on the large-scale study of complex health systems, which ‘no single administration . . . can undertake’.⁷³ This meant gathering data on global epidemiology, the effects of nutrition on health, infant mortality, and rural hygiene – all factors that were social and therefore malleable by human action.⁷⁴ It is hardly surprising, then, that TB, the quintessential social disease, generated considerable interest within the LNHO. As the LNHO investigated global TB rates as part of its epidemiological mandate, Yves M. Biraud, a representative

⁶⁶RAC, RG 3, Series 900, box 9, History Source Material vol. 8, 1900–01.

⁶⁷RAC, RG 1.1, Series 500 T, box 28, folder 266, Overview of the Rockefeller Mission to France, summary; ‘La croisade des Américains contre la tuberculose en France’, *Revue des Deux Mondes*, 15 September 1919, p. 459.

⁶⁸For example, Etienne Bernard, *Tuberculose et médecine sociale*, Paris: Masson, 1938, pp. 2–3 (statistics on 7).

⁶⁹‘La croisade des Américains’, p. 461.

⁷⁰AIP, BCG.14, J. Lignières, ‘Quelques réflexions sur les mesures d’hygiène appliquées à la prophylaxie de la tuberculose humaine et sur l’emploi du BCG’, *Académie de Médecine*, 2 October 1928, pp. 932–3.

⁷¹Arvid Wallgren, ‘Observations critiques sur la vaccination antituberculeuse de Calmette’, *Acta Pædiatrica*, 12, 1928, pp. 120–37; P. Greenwood, ‘Professor Calmette’s statistical study of B.C.G. vaccination’, *British Medical Journal*, 3514, 14 May 1928, p. 793.

⁷²Philippe Menut, ‘The Lübeck catastrophe and its consequences for anti-tuberculosis BCG vaccination’, in Anne-Marie Moulin and Alberto Cambrosio, eds., *Singular selves: historical issues and contemporary debates in immunology*, New York: Elsevier, 2000, p. 207.

⁷³Ludwik Rajchman cited in Martin David Dubin, ‘The League of Nations Health Organization’, in Paul Weindling, ed., *International health organisations and movements, 1918–1939*, Cambridge: Cambridge University Press, 1995, p. 67.

⁷⁴*Ibid.*, pp. 56–80.

of the LNHO, corresponded with Calmette, who had served as a member of its predecessor, the Provisional Health Committee, in 1922–23, discussing the possibilities and limitations of national statistics, and ways of standardizing data collection.⁷⁵ Under Calmette's sponsorship, the LNHO discussed BCG at a series of conferences held at the Pasteur Institute in Paris in October 1928, and in Berlin in 1929, and finally proclaimed BCG 'a harmless vaccine', 'incapable of producing virulent tuberculosis lesions', concluding that it was potentially, although not conclusively, effective.⁷⁶ Though Calmette interpreted the report as a clear endorsement of the Health Organization, it did little to close the controversy, as the LNHO report echoed concerns about the reliability of the Pastorians' statistics, and argued that only randomized controlled trials could conclusively prove that the vaccine worked.⁷⁷ The controversy caused much anxiety for Calmette: his letters to Charles Nicolle abound with assurances of the vaccine's safety, frustration over the public's lack of confidence in him, and confessions of health issues resulting from the dispute. 'This ordeal in Lübeck is making me sick', he wrote in 1930, and complained of 'suffering from cardiac troubles since this miserable affair'.⁷⁸

As early as 1924, Calmette had enrolled the Ministry of the Colonies to sponsor BCG trials. Daladier sent out circulars to governments-general in Madagascar, Indochina, and West and Equatorial Africa, ordering them to collaborate with the Pastorians.⁷⁹ The minister was convinced by the thesis of European contact, noting in his circulars both the 'particular exposure' of colonial troops to contagion during their stays in France, and the vulnerability of populations living on 'virgin soil'.⁸⁰ Second, Daladier was concerned about 'other problems of colonial demography', namely infant mortality and population density.⁸¹ At the same time, Calmette wrote to his Pastorians collaborators in Tunis, Dakar, and elsewhere, convincing them to spearhead vaccination campaigns and collect data that would help his crusade to legitimize BCG in Europe.⁸² The fact that Pasteur Institutes assumed the cost for producing vaccine made the proposition even more appealing to the ministry.

In the interwar decades, Pastorians in Algeria, Tunisia, West Africa, and Indochina produced the BCG vaccine and distributed it to local populations. Although these programmes were supposed to be trials, both Pastorians and colonial officials soon began to describe BCG as a proven and efficacious vaccine. From 1929 onwards, the Ministry of the Colonies began referring to BCG as a reliable vaccine, citing evidence from the 1924 trials, although these were still highly contested in European metropolises.⁸³ In some colonies, the experimental nature of BCG was effaced much faster. In 1925, doctors in Cholon and Phnom-Penh were already discussing the 'importance of convincing, first of all, the indigenous *milieux* of the safety of this procedure as well as its prophylactic importance'.⁸⁴ In meetings of health councils, bacteriologists did occasionally emphasize the 'uncertain efficacy' of the procedure, but ultimately concluded that it remained 'the only

⁷⁵League of Nations Archive, Geneva (henceforth LNA), R.881, Letters of Yves M. Biraud to Albert Calmette, 1924–25.

⁷⁶LNA, C.H.745, 'Report of the technical conference for the study of vaccination against tuberculosis by means of BCG, Oct 15–18, 1928', pp. 7–8.

⁷⁷AIP, BCG.9, Albert Calmette, 'La vaccination préventive de la tuberculose par le B.C.G.: objections qui ont été faites à cette méthode'; BCG.14, 'Réponse à M. S.A. Petroff par Albert Calmette', n.d. (c.1930). For critical readings of the LNHO report, see AIP, BCG.19, translation of *Breslauer Neueste Nachrichten*, 28 May 1930; BCG.17, 'Le procès de Lübeck: les débats ne sont pas encore terminés', *Le Matin*, 1 November 1931.

⁷⁸AIP, NIC.3, Albert Calmette to Charles Nicolle, 3 June 1930; BCG.16, Calmette to Prof. W. Kolle, 6 October 1931.

⁷⁹AIP, BCG.37, Minister of the Colonies Daladier, circular to the Governors-General of Madagascar, the AOF, and Indochina, 20 September 1924; Daladier's circular to the governors of Togo and Cameroun, 30 August 1929.

⁸⁰AIP, BCG.37, Daladier to Governor-General of Madagascar, 20 September 1924; Daladier's circular to the governors of Togo and Cameroun, 30 August 1929.

⁸¹AIP, BCG.37, Daladier to Governor-General of Madagascar, 20 September 1924.

⁸²AIP, NIC.3, Calmette to Charles Nicolle, 23 July 1926.

⁸³AIP, BCG.37, Daladier's circular to the governors of Togo and Cameroun, 30 August 1929.

⁸⁴AIP, BCG.37, J. Bablet, 'Les vaccinations antituberculeuse des nourrissons par ingestion de BCG en Cochinchine (1924–25)'.

applicable [method] in our arsenal, given the state of things', and the problem of efficacy quickly disappeared in official popularizations, replaced with references to 'encouraging results' in official correspondence.⁸⁵

The colonies – where Pastorians and officials worked closely together, where independent oversight was lacking, and where administrative pressure to report 'humanitarian' benefits was stronger – helped Pastorians defend BCG in Europe and in organizations such as the LNHO. As Clifford Rosenberg has documented, Algeria became the site for the first randomized control trial to meet LNHO criteria, a project that lasted until the mid 1950s.⁸⁶ Defending BCG in front of bodies ranging from the Royal Society to the LNHO, Calmette cited simian testing in Guinea, adult vaccinations in the AOF, and mass infant vaccinations in Mauritius, North Africa, Madagascar, and Indochina, alongside statistics from other European countries, as supporting evidence for the vaccine's safety and efficacy.⁸⁷

Throughout the 1920s, colonial uses of BCG provided Calmette with firepower for defence against his scientific opponents in France, the UK, the LNHO, and elsewhere. Yet, while colonial politics helped him in his scientific struggles, the science of BCG in turn shaped colonial politics beyond questions of public health. As officials and scientists began to pay attention to TB in the colonies, other actors, who did not support BCG, entered the colonial debate. We will now turn to colonial Indochina, and investigate how Vietnamese and French social hygienists used the TB threat to demand social rights, and how the BCG vaccine was used as a technopolitical weapon against such demands.

The technopolitics of BCG in colonial Indochina

The most expansive BCG campaigns took place in Indochina. With the exception of the North African colonies, Indochina had the best-developed health system in the empire, with a medical school in Hanoi, several Pasteur Institutes, and infrastructure that, while far from perfect, nevertheless allowed the AMI to access some of the more remote areas of the colony.⁸⁸ The French reported high vaccination numbers. By 1928, the Pasteur Institute was distributing more than 60,000 doses a year to maternity hospitals in twelve cities; by 1931, the number had increased to more than 100,000. From 1929 the government-general made the 'war against tuberculosis' a part of the institute's mission and a separate line item in the colonial budget.⁸⁹ Indeed, Laurence Monnais has used BCG vaccination as an example of the colony marching ahead of the metropole in providing preventive health care and responding to local needs.⁹⁰ Yet a closer look suggests that there was, in fact, much debate over the proper means of combating TB in Indochina, and that the consensus that emerged between colonial officials and Pastorians had more to do with BCG's political usefulness than its humanitarian potential.

As Calmette and others made the case that TB was an imperial problem, other actors in France and Indochina were taking an interest in the issue. In the interwar years, the CNDT attempted to expand to Indochina, organize stamp sales, fund dispensaries and sanatoria, and provide public education. Their hygienist concerns intersected with those of Vietnamese doctors and local

⁸⁵Archives Nationales d'Outre-Mer, Aix-en-Provence (henceforth ANOM), RSTNF 3865, Institut Pasteur de Hanoi, 'Instruction relative à l'emploi du vaccin du BCG dans les essais d'immunisation des nouveau-nés contre l'infection tuberculeuse', n.d.; Résident Supérieur du Tonkin, circular to local prefects and residents, 1 March 1928.

⁸⁶Rosenberg, 'International politics'.

⁸⁷LNA, C.H.745, 'Report of the technical conference for the study of vaccination against tuberculosis by means of BCG', Albert Calmette's report, pp. 24–5, 43–6, 47–63; AIP, BCG.37, 'Conférence à la Royal Society', 9 June 1932, Calmette's notes.

⁸⁸Monnais-Rousselot, *Médecine et colonisation*, pp. 269–99; Aso, 'Forests without birds', pp. 154–208.

⁸⁹AIP, IND.C1, 'Rapport au grand conseil des intérêts économiques et financiers et au conseil de gouvernement de l'Indochine sur le fonctionnement des Instituts Pasteur d'Indochine, 1928', p. 9; VNA-II, GouCoch, IIA.53/2415, Letter of the Governor-General to the Pasteur Institute of Saigon.

⁹⁰Monnais-Rousselot, 'Preventive medicine'.

notables, who used the vocabulary of social hygiene to discuss controversial political issues around labour and public expression. For administrators, political radicalism posed the greatest threat to French rule during the interwar years. Intellectuals such as Nguyễn An Ninh, Trần Huy Liệu, and Bùi Quang Chiêu founded newspapers and journals such as *La Cloche Fêlée* or *Đông Pháp Thời Báo*, as well as revolutionary groups such as the Young Annamites and the Secret Society of Nguyễn An Ninh. As various incidents – the arrest of Nguyễn An Ninh, the Yên Bái rebellion, to name but two – escalated and led to mass boycotts and strikes, French officials clamped down on associational life, believing it to be a road to radicalization.⁹¹ Repression peaked in 1930–31, when French forces responded to peasant riots by machine-gunning protests from the air, burning down ‘communist’ villages, and executing those suspected of seditious activity.⁹²

Meanwhile, workplace rights rose to the top of both Vietnamese and French concerns. By 1928, the labour force on French plantations had ballooned to nearly 100,000 labourers, a small fraction of the expanding Vietnamese population, but economically significant nonetheless. Colonial health officers noted that the establishment of *hévéa* (rubber) plantations by companies like Michelin had caused unprecedented epidemics of malaria.⁹³ Responding to episodes of mass worker desertion, such as at the Mimot plantation where 300 workers left their posts in reaction to mistreatment, the French government sent out experts to study the conditions of labour and life in rubber plantations. These studies became the basis of official and popular exposés that uncovered unsanitary housing conditions, routinely violent managers, starvation, and forced hiring.

Vietnamese workers quickly learned how to take up the language of social hygiene in making claims against their employers. In the late 1920s, mandarins like Bui Bang Doan inspected plantations and chronicled instances of abuse, and Vietnamese council members criticized the French medical system for only catering to rich city-dwellers. Vietnamese doctors and activists increasingly articulated concerns over epidemic disease, labour conditions, and the inadequate medical response as specifically anti-Vietnamese in nature.⁹⁴ In 1927, the government-general set up a Department of Labour and issued a series of decrees that reformed labour law, established retirement funds, and strengthened public health provisions.⁹⁵ As usual, these laws looked better on paper than in practice. Around the country, however, more and more Vietnamese came to see health as a political issue. Through the work of indigenous midwives, the establishment of local medical schools, and public education campaigns, sanitationist ideas, particularly about the questions of infant care, spread among young Vietnamese, creating further enthusiasm for social hygiene.⁹⁶

The arrival of the CNDT in 1926 brought questions of social hygiene and TB prevention into the centre of Indochinese politics. The construction of new dispensaries and sanatoria was largely financed through the sale of stamps, as in France. As the society’s finances lagged behind its expanding reach, representatives of the CNDT wrote to officials and medical experts in Indochina, encouraging them to join the ‘defence against the social danger’ and become a part of the charitable network.⁹⁷ Indochinese administrators initially rejected the idea, since it involved creating non-governmental Franco-Vietnamese associations. The first proposal of Senator André Honnorat was returned with a note saying ‘This does not concern local affairs and deals with an issue not immediately useful to the Annamite people.’⁹⁸

⁹¹Pierre Brocheux and Daniel Héméry, *Indochina: an ambiguous colonization 1858–1954*, trans. Ly-Lan Dill Klein, Berkeley, CA: University of California Press, 2011, pp. 305–14.

⁹²*Ibid.*, p. 318.

⁹³Aso, ‘Forests without birds’, p. 199.

⁹⁴*Ibid.*, pp. 204–6.

⁹⁵*Ibid.*, p. 200; Monnais-Rousselot, ‘Preventive medicine’, p. 45.

⁹⁶Monnais-Rousselot, ‘Preventive medicine’, p. 46.

⁹⁷Vietnamese National Archives I, Hanoi (henceforth VNA-I), RST 32.090, André Honnorat, sénateur, président de la CNDT to the Résident Supérieur du Tonkin, 30 March 1926.

⁹⁸VNA-I, RST 32.090, Directeur Local de la Santé to the Résident Supérieur du Tonkin, 18 May 1926.

The reluctance of the Government-General, however, was superseded by pressure from both above and below. The CNDT's proposal aligned perfectly with the Ministry of Colonies' new emphasis on social hygiene, leading the minister to pen a strongly worded reminder to the Indochinese governor-general about the 'capital demographic importance' of the TB problem.⁹⁹ Meanwhile, CNDT propaganda began to spread in Vietnam, largely through Camille Guérin's efforts to raise awareness about the role that childhood infection played in the development of TB, and to highlight the importance of proper prophylaxis and maternal care. These publications stressed the cost of TB to 'the social capital', the importance of better living and working conditions, and the need for collective action to combat the disease – the hygienist aspects of TB prevention, largely copied directly from metropolitan French examples.¹⁰⁰ Such brochures were quickly translated into Vietnamese and distributed in schools and hospitals in Saigon, Cholon, and elsewhere.¹⁰¹ Soon, a corps of Vietnamese doctors and officials began expressing support for extending anti-TB prophylaxis, constructing dispensaries, and organizing anti-TB social movements in Indochina itself. Joining forces with French doctors and medical officers, these activists founded a number of associations dedicated to selling TB stamps and building a movement for social hygiene: by 1930, these included the Central Committee for Mutual Aid, the Anti-Tuberculosis League of Tonkin (LAT), the masonic *Fraternité Tonkinoise*, the Pierre Pasquier Dispensary, the Anti-Tuberculosis League of Cochinchina, and the League of the Friends of Annam.¹⁰²

Vietnamese doctors used even marginal cases of infection to lobby for the expansion of workers' rights and the improvement of working conditions. In 1939, Dr Hoang Mong Luong filed a report with the Resident of Annam, demanding greater attention to TB among the *giáo sư* (secondary school teachers) in a township near Huế. The number of recorded cases turned out to be very low – ten over three years among a population of 215 teachers – but, as Luong argued, the social danger posed by the disease was much greater. Infected teachers could spread TB in the classroom before developing symptoms, but, crucially, the rise in confirmed cases signified 'deplorable hygienic conditions in which our *giáo sư* live: lack of physical exercise, poor nutrition and probably overworking'.¹⁰³ To combat TB, Luong suggested a number of measures ranging from the clinical – regular check-ups and X-rays for suspected cases – to the social: limiting the number of students per teacher to fifty, reduction of working hours, raising wages to 'improve nutrition', and organizing a free 'centre of vacation for tired teachers, whether at a beach or a hill station'.¹⁰⁴ The language of social hygiene enabled Vietnamese doctors to pivot medical discussion towards the politics of labour.

In response, French officials and experts used the rhetorical force of BCG to undercut social hygiene, and to restrict the scope of TB prevention to vaccination. BCG was both cheap and did not endanger French control over questions of labour and associational life. This dynamic played out in exemplary fashion in the meetings of a 1932 committee to study the use of TB stamp sales.¹⁰⁵ Most French members in the committee suggested modest initiatives, ranging from expansion of BCG vaccination to the construction of a few new dispensaries. One member, Dr Bourgin, however, joined two Vietnamese experts, Dr Lan, and Dr Cua, in proposing a thorough overhaul of the TB prevention system. The proposal focused on three pillars:

⁹⁹VNA-I, RST 32.090, Ministry of the Colonies to the Resident Supérieur de Tonkin, 2 March 1926.

¹⁰⁰VNA-I, RST 32.090, Albert Calmette, 'L'effort national de défense contre la tuberculose'.

¹⁰¹See, for instance, the report of the translation of Guérin's brochure by Dr Nguyen Van Khai and the demand for further popularization by Mr Huy in VNA-II, GouCoch, IIB.56/094, 'Comité d'hygiène de la ville de Cholon, procès verbal du Comité d'Études pour la lutte contre la tuberculose', 13 December 1924; VNA-II, GouCoch, 7163, 'La vie saine', December 1926.

¹⁰²ANOM, RSTNF 3864, 'Organisation de la lutte contre la tuberculose au Tonkin', 8 October 1936; RSTNF 1484, C. Mandel to the Ligue des Droits de l'Homme et de Citoyen, 5 October 1936; RSTNF 660, 'Demande de capacité juridique', 1933.

¹⁰³Vietnamese National Archives IV, Dalat (henceforth VNA-IV), S.125, Report by Hoang Mong Luong, 1939, 'Dossier relatif aux autres épidémies dans les diverses provinces en Annam, années 1911–1938'.

¹⁰⁴*Ibid.*

¹⁰⁵VNA-II, GouCoch, 7193, G. Striedter, Inspecteur des Affaires Politiques et Administratives to the Gouverneur de la Colonie, 10 August 1932.

'protect – instruct – cure', again drawing from the CNDT's hygienist lexicon. Lan and Cua outlined a nine-year plan for radically expanding TB facilities, constructing new isolation wards within existing hospitals, producing popular educational and propagandistic films, building seaside resorts for Vietnamese children, buying mobile dispensary units, and, in the last stage, constructing seaside and high-altitude sanatoria for adult Vietnamese patients. This effort would have required a vast expansion of state funding for TB prevention: the estimated budget, as one councillor noted, was over 360,000 piasters, nearly ten times the money raised by the sale of stamps, creating immediate opposition among administrators.¹⁰⁶

There were other, political, reasons for the French to resist such proposals. Vietnamese hygienists' plans would have further empowered voluntary associations and Vietnamese labour. In order to secure the trust of the population, experts such as Trần Hàm Nghiệp argued that it was crucial to staff the new dispensaries with 'Annamite nurses, women of excellent general education, high technical skill and exceptional moral values'.¹⁰⁷ Others suggested training Indochinese doctors in every province and equipping them with a mobile sanitary unit, to improve anti-TB propaganda.¹⁰⁸ Finally, Bourgin and others recommended using money from the sale of stamps to construct 'larger and more hygienic housing' for the Vietnamese in cities like Saigon, Hanoi, and Huế.¹⁰⁹ While always couched in the language of social hygiene, the recommendations of Vietnamese doctors and their French allies sought to increase the power and social standing of Vietnamese professionals, address the social injustices in the domains of labour and housing, and direct more power to voluntary associations.

In response to the political problems raised by the CNDT's social hygiene model of TB prevention, the government used research on BCG to limit the scope of medical intervention. Officials argued that the use of the 'progressive' BCG was sufficient to protect against TB, therefore obviating the need for further reforms and for the expansion of associative life. When the LAT applied to the government to approve the society's constitution, the Resident Superior ordered a *medical* expert to offer his opinion on the mission of the association. The local director of health broadly disapproved of the wide mandate of the society by leaning on Calmette's contagionist thesis. He noted that, unlike in France, where people worked in factories, working conditions in Indochina had little impact on the spread of TB. Plantations had fresh air and plenty of space, making contagion more difficult: 'Workers are less affected since they lead an active life in open air and they live in *paillottes* open to all kinds of bad weather; agricultural workers are even less affected for similar reasons.'¹¹⁰ In this rendition, the low quality of Vietnamese housing and the harsh conditions of the *indigénat* became virtues, instead of contributing factors to disease.

The real problem, the doctor argued, was infant mortality, which could be solved with BCG: 'the war against tuberculosis has its *only* weapon in the form of anti-tuberculosis vaccination with BCG; other means, without meaning to neglect them, have only a secondary importance. In fact, with the exception of vaccination, no other prophylactic measure can take hold among this care-free population completely ignorant of the laws of hygiene.'¹¹¹ Here, the doctor combined the scientific rhetoric of contagion, moralist language about the Vietnamese constitution, and a technical insistence on the reliability of BCG. He convinced the administration to curtail the permitted range of activities of the LAT, limiting its ability to purchase real estate and to publish educational material, and placing it under close police surveillance for years to come.¹¹²

¹⁰⁶*Ibid.*

¹⁰⁷VNA-II, GouCoch, 7193, L'Inspecteur Général de l'Hygiène et de la Santé Publiques to the Directeur Local de la Santé en Cochinchine, 24 October 1935.

¹⁰⁸*Ibid.*

¹⁰⁹VNA-II, GouCoch, 7193, G. Striedter, Inspecteur des Affaires Politiques et Administratives to the Gouverneur de la Colonie, 10 August 1932.

¹¹⁰ANOM, RSTNF 660, 'Rapport du Directeur Local de la Santé sur la tuberculose au Tonkin', 26 June 1928.

¹¹¹*Ibid.*, emphasis in original.

¹¹²ANOM, RSTNF 660, 'Note du 1er bureau', 24 May 1928.

Officials similarly used BCG to limit action in the committee for distributing the anti-TB stamp funds. Administrators were reminded that BCG was the colony's 'first line of defence' and provided *gratis* by the Pasteur Institute. Anti-TB stamps were to be used to further fund the TB laboratories of the Pasteur Institute. As the president of the ad hoc committee argued: 'In order not to disperse our efforts, we ought to focus them on BCG, because BCG represents the future.'¹¹³ Eventually, the ambitious proposals of Vietnamese doctors were all rejected, with a single concession to provide more public propaganda, but only if it was limited to advertising the benefits of BCG.¹¹⁴

Some Vietnamese and French doctors in Indochina remained committed to social hygiene. In Cholon, city officials showed enthusiasm for *préventoriums*, social assistance funds, and studies of schoolchildren's housing. Debates at the Far Eastern Association for Tropical Medicine, and at venues such as the Bandoeng Conference emphasized the importance of the social conditions of life; these were in turn amplified by similar calls within the International Labour Organization and the League of Nations.¹¹⁵ Yet officials in Paris, Hanoi, and elsewhere in the colonies, supported by Pastorian expertise, pushed to expand BCG and to limit other kinds of interventions – dispensaries, vacations, improved nutrition, limiting working hours, and expanded public education – even as they lacked evidence of the vaccine's actual impact. Calmette himself admitted that, in places like Indochina, the lack of *état-civil* made determining the variance of death rates between vaccinated and non-vaccinated patients effectively impossible.¹¹⁶ Official reports admitted that, while tuberculin skin tests confirmed the general presence of TB around Indochina, the statistics were not sufficient to observe changes in infection rates over time.¹¹⁷ In defending his research to an international public, Calmette used high vaccination numbers from Indochina to argue that the vaccine was trusted and safe, and animal testing in Guinea to argue for its efficacy, while his collaborators in Algiers, which did have an *état-civil*, began to prepare a trial to properly test its effectiveness.¹¹⁸

Ultimately, changes in TB morbidity could not be determined, and it is telling that officials did not try to find out. Instead, they cited the very inability to produce comparative statistics as a reason for continuing BCG vaccinations, which colonial health experts saw as 'subject to incontestable proofs'.¹¹⁹ For administrators, the political power of BCG to counter Franco-Vietnamese demands for social reform sufficed. After the Second World War, as the geographical and political contours of the French empire changed, organizations such as the World Health Organization and the United Nations put new emphasis on rural health, and as antibiotics, such as streptomycin, created new, powerful means to combat TB, the technopolitical importance of BCG disappeared.¹²⁰

Administrators elsewhere also embraced BCG as a political alternative to reform.¹²¹ Pastorians themselves observed this. In 1936, Dr Morin, the director-general of the Indochinese Pasteur Institutes noted that British and Japanese officials were taking an interest in BCG: 'because they consider it impossible to fight against tuberculosis by improving the living conditions of coolies, [the British and the Japanese] are taking an active interest in BCG vaccination'.¹²² For precisely the same reason, so did the French. Although Calmette's epidemiology had opened up a path for

¹¹³VNA-II, GouCoch, 7193, G. Striedter, Inspecteur des Affaires Politiques et Administratives to the Gouverneur de la Colonie, 10 August 1932.

¹¹⁴*Ibid.*

¹¹⁵Monnais-Rousselot, 'Preventive medicine', pp. 54–5.

¹¹⁶AIP, BCG.37, A. Calmette, 'Vaccination préventive de la tuberculose par le BCG', 1933, p. 5.

¹¹⁷AIP, BCG.37, Dr Lasnet, 'Infection tuberculeuse et vaccination BCG', 1930, pp. 8–10.

¹¹⁸For a longer discussion of the limits imposed by the colonial order on determining the health effects of BCG, see Rosenberg, 'International politics', pp. 684–6. Rosenberg misattributes the discussion of the Indochinese *état-civil* to Calmette. The author was Dr Lasnet.

¹¹⁹AIP, BCG.37, Dr Lasnet, 'Infection tuberculeuse et vaccination BCG', p. 10.

¹²⁰For the post-war health order, see Pearson, *Colonial politics of public health*.

¹²¹Randall Packard, 'The invention of the "tropical worker": medical research and the quest for Central African labor on the South African gold mines, 1903–36', *Journal of African History*, 34, 2, 1993, pp. 271–92.

¹²²AIP, BCG.22, Dr Morin, Commission de BCG à l'Institut Pasteur, 29 October 1936.

debating labour and associational politics under the rubric of social hygiene, the technopolitics of BCG vaccination blocked this avenue.

Conclusion

The appeal of Pastorian bacteriology depended on the difference between its promise of universal applicability and the reality of exploiting the frictions and inequalities in a world of empires, international scientific bodies, and activist organizations.¹²³ For policy-makers like Daladier, TB epidemiologies, which modelled a world of TB carriers, microbes, and suspect populations, opened up avenues for intervention that matched his pan-imperial ambition of solving 'population' and 'labour' problems. The Pastorians thought on a similar scale. And in their scientific struggles for legitimacy, Pastorians, too, realized that they had to think globally, that the reactions of experts in Lübeck, London, or Copenhagen could have an impact on their credibility in France or the United States. Yet the politics of these struggles depended on the fact that Saigon was *not* like Geneva, and Algiers was *not* like Paris. LNHO experts suggested that randomized control trials would be nearly impossible to conduct in New York or Paris, but they were possible in Algiers. Proponents of social hygiene and expert statisticians made Calmette's life difficult at the LNHO, but their reach did not extend to Saigon. And the consensus between Pastorians, administrators, and doctors in Indochina helped spread the BCG vaccine faster, and adapt it to local conditions.¹²⁴

The universal ambitions of Pastorians mattered to their opponents as well. Vietnamese doctors and French hygienists could find common ground because they accepted the premise of bacteriological epidemiology, but not its proposed solutions. The CNDT found a receptive audience in Indochina because people like Dr Luong or Dr Cua saw the potential of using the language of bacteriology *and* social hygiene to demand new labour rights and revitalize associational life. Adopting the biomedical vocabulary had its limits, however. Drawing on international evidence, administrators highlighted BCG's material properties – its low cost, safety, and association with Pastorian methods – to pursue local political objectives. The interplay between universal promises and transnational, variegated, lumpy spaces was always at the heart of Pastorian politics.

Although the BCG vaccine is still in use, current scholarly consensus has largely validated the opinions of social hygienists. Improvements in living standards have brought about a dramatic decline in TB rates in the Western world. In the Global South, however, health and development organizations are still likely to recommend large standardized technical programmes, often invoking the example of colonial-era vaccination campaigns and even the specific history of the Pasteur Institutes.¹²⁵ The ways in which the Pasteur Institutes have been separated from the history of colonialism in the public debate in both France and its former colonies has further cemented the humanitarian role of French bacteriology in this period. As tensions between acknowledging the social determinants of health and funding limitations, between aspirations for universally applicable solutions and local constraints continue to characterize the age of global health, the Pastorian example serves to remind us of how the universal ambition of microbiological technoscience can become a vehicle for restricting reformist ambition in a (post)colonial setting.

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¹²³See Anna Tsing's concept of friction, *Friction: an ethnography of global connection*, Princeton, NJ: Princeton University Press, 2006.

¹²⁴In addition to this article, see Monnais-Rousselot, 'Preventive medicine', for the urban impact of the vaccine.

¹²⁵Lachénal, 'Dubai stage', pp. 53–71.