

4 'Beating About the Bush' Manufacturing Quinine in a Colonial Factory

... Quinine is an article of which a great value travels within a small weight...¹

Quinine has attracted the attention of a range of scholars pursuing the histories of medicine, warfare, environment and empire. It has been pointed out that the chemical isolation of quinine in the Parisian laboratories in the 1820s led to its subsequent recognition in the European markets as the most valuable extract of cinchona barks.² The beginning of commercial manufacture of quinine by private firms in Europe was followed by the establishment of cinchona plantations in the 1860s by the colonial governments in Dutch Java, British India, Ceylon and Jamaica, and French Algeria. Many historians have justifiably situated quinine as an essential component in imperial economic botany.³ While they have located quinine as a bridge between imperial commerce and ideology, Daniel Headrick has characterised it as one of the 'tools of empire', which ensured the military expansion of European imperial rule in the nineteenth century.⁴

Such sustained interest in the history of quinine is understandable. Quinine was arguably the drug circulating most extensively in the

¹ C. B. Clarke to the Secretary, Government of Bengal, No. 202, 1 July 1870 Rungbee Home, Public, 17 December 1870, 123–125 A (NAI).

² J. L. A. Webb Jr., *Humanity's Burden: A Global History of Malaria* (Cambridge: Cambridge University Press, 2008), 92–126; M. Honigsbaum, *The Fever Trail: The Hunt for the Cure for Malaria* (London: Macmillan, 2001), 6–7; F. Rocco, *Quinine: Malaria and the Quest for a Cure that Changed the World* (London: HarperCollins, 2003).

³ K. Philip, *Civilising Natures: Race, Resources and Modernity in South Asia* (Hyderabad: Orient Longman, 2004), 238–272; L. H. Brockway, *Science and Colonial Expansion: The Role of the British Royal Botanic Gardens* (New Haven: Yale University Press, 2002); A. Mukherjee, 'The Peruvian Bark Revisited: A Critique of British Cinchona Policy in Colonial India', *Bengal Past and Present*, 117 (1998), 81–102; R. Drayton, *Nature's Government: Science, Imperial Britain, and the 'Improvement' of the World* (New Haven: Yale University Press, 2000).

⁴ D. R. Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (Oxford: Oxford University Press, 1981).

second half of the century, within the distant corners of the British Empire and beyond. Talk about quinine figured in a variety of sites: business letters,⁵ advertisements,⁶ published governmental reports,⁷ transit insurance documents,⁸ medical and pharmaceutical journals.⁹ Such discussions involved various distant places which had been identified as malarial in myriad colonial correspondences. Quinine was considered a necessary constituent of a traveller's kit. It was recommended, for instance, while journeying through the rivers in the West Africa, the Black Sea and 'all hot, moist and unhealthy districts of South America.'¹⁰ Quinine was prescribed 'wherever malaria was generated'.¹¹ Dispersed localities in the interiors of Ceylon, West Indies, Hong Kong, British India, Malta and North America were regularly supplied with quinine. Quinine could be served in the form of wine,¹² biscuits,¹³ tea,¹⁴ or administered as pills,¹⁵ tonics,¹⁶ and hypodermic subcutaneous injections.¹⁷ Quinine was believed to cure or act as a prophylactic for an elaborate range of malarious diseases including malarial fever. Quinine was also prescribed as a cardiac sedative in arresting internal haemorrhage,¹⁸ as a solution for curing diphtheritic ophthalmia,¹⁹ as a

⁵ J. Low to A. Low, 2 June 1828, Calcutta. File ACC 1037/853/2D (LMA.); Anonymous, 'Note about Import of Quinine', 20 December 1848, New York, ACC/1037/659, 1–7 (LMA).

⁶ Anonymous, 'On Quinine Wine', *The Chemist and Druggist: A Monthly Trade Circular* (15 September, 1859), 4. B/WHF/243 (LMA).

⁷ The Committee appointed to examine the properties of the cinchona alkaloids other than quinine to Secretary, Government of India, Home department. 29 October 1868. ACC/1037/699/3 (LMA).

⁸ See for instance, Howard to The London and Oriental Steam Transit Insurance Office, London. ACC/1037/690 (LMA).

⁹ G. Barnard, 'Was it Malarial Fever or Sun Stroke Cured by Quinine?', *IMG*, 5 (1870), 50.

¹⁰ Anonymous, 'On Quinine Wine'. ¹¹ *Ibid.*

¹² *Ibid.*; A. Bryson (ed.), 'Practice of Giving Quinine or Quinine Wine on Distant Expeditions on the West Coast of Africa', *Statistical Report of Health Navy 1857* (London: House of Commons, 1859), 82–85.

¹³ W. Purvis, *Specification of William Purvis: Medicinal Biscuit* (London: Great Seal Printing Office, 1871) (WL).

¹⁴ I. Smith and Company to Howard, 8 November 1860, Birmingham. ACC/1037/649/135 (LMA).

¹⁵ Home, Medical, March 1879, 58–60 A (NAI).

¹⁶ L. J. Jordan, *Specification of Lewis Jacob Jordan: Tonic* (London: Great Seal Printing Office, 1861) (WL).

¹⁷ W. J. Moore, 'On the Treatment of Malarious Fever by the Sub-Cutaneous Injection of Quinine', *Lancet*, 82, 2083 (1 August 1863), 126.

¹⁸ C. Salvatore, 'The Action of Quinine as a Cardiac Sedative in Arresting Internal Haemorrhage', *Medical Records*, 9 (1874), 285–287.

¹⁹ J. Tweedy, 'On the Treatment of Diphtheritic Ophthalmia by Local Application of Solution of Quinine', *Lancet*, 115, 2943 (24 January 1880), 125–126.

gargle in sore throat,²⁰ aphrodisiac,²¹ anti-pyretic,²² to relieve 'alarming head symptoms after violent exercise in hot weather,'²³ dental pain²⁴ and suppuration.²⁵

I have indicated how quinine acted as a pharmacological agent in quick-fix diagnostic tests. As a diagnostic category, malaria was associated with a plethora of maladies. Malaria was defined in different ways. Quinine was often administered to retrospectively determine whether an ailing body had been exposed to malaria.

Yet, quinine itself did not figure as a definite, homogenous, inflexible and rigid category. Rather than internalising the imperial projections of quinine as a generally stable and consensual category, I aim to pierce through this veneer of stability and consensus, and to explore the ways in which quinine was 'black-boxed' as a preordained, commonsensical, scientifically endorsed, homogenous entity. Empire produced and maintained the image of pure quinine in British India through a set of mundane processes, strategies and assemblages.²⁶ Particularly, attempts to manufacture cheapest possible pure quinine in government factories in British India between late 1860s and 1889 is in need of detailed analysis.

I have already noted that the first bag of cinchona seeds to be sown in the government plantations reached British India from South America in 1860. By the mid-1860s, government factories at Rungbee (which expanded in the early 1880s to nearby Mungpoo) in British Sikkim and at Ootacamund in the Nilgiris had been set up in the vicinities of experimental cinchona plantations. It is noteworthy that Rungbee and Mungpoo occupied contiguous sites and particularly from the early 1880s they were referred to almost interchangeably in the official sources. The Bengal government claimed to have invented the process of manufacturing cheapest possible pure quinine in a factory owned by it in Mungpoo

²⁰ D. J. Brackenridge, 'On the Use of Quinine as a Gargle in Diptheritic Scarlatinal and other Forms of Sore Throat', *Practitioner*, 15, 86 (August 1875), 110–114.

²¹ Jordan, *Specification*.

²² C. Allbutt, 'On the Antipyretic Action of Quinine', *Practitioner*, 12, 67 (January 1874), 29–37.

²³ R. L. Bowles, 'Alarming Head Symptoms after Violent Exercise in Hot Weather Relieved by Quinine', *BMJ*, 1, 34 (1857), 711.

²⁴ M. A. F. Mannons, *Specification of Marc Antoine Francois Mannons: Elixir* (London: Great Seal Patent Office 1862) (WL).

²⁵ D. Morton, 'Quinine and Suppuration', *Practitioner*, 13, 77 (November 1874), 348–351.

²⁶ For repair and maintenance, see B. Latour, 'Whose Cosmos, Which Cosmopolitics? Comments on the Peace Terms of Ulrich Beck', *Common Knowledge* 10, 3 (2004), 459; E. C. Spary, 'Of Nutmegs and Botanists: The Colonial Cultivation of Botanical Identity', in L. Schiebinger and C. Swan (eds.), *Colonial Botany: Science, Commerce and Politics in the Early Modern World* (Philadelphia: University of Pennsylvania Press, 2005), 187–203.

in British Sikkim in 1889. A micro-history of attempts to manufacture 'cheapest possible pure-quinine' in the British Indian government factories would reveal how pure quinine was constructed and sustained as a credible scientific fact. This reveals the history of how it was possible for the factory at Mungpoo to manufacture cheapest possible pure quinine in 1889. In other words, under what circumstances could such claims made by the cinchona factory at Mungpoo in British Sikkim appear credible and sustainable in the late 1880s?

This question, in turn, is closely connected to these following set of questions: What could be the range of attributes associated with the word quinine in factories in British India in the nineteenth century? Who could be trusted with the manufacture of pure quinine? What was referred to by purity in quinine? Who had the power to define and judge pure quinine? Who or what were considered as legitimate custodians of pure quinine? What role did ideas about race and place play in all this? Answers to these questions will be revealed when the intricate networks of correspondence between travelling geographer-botanists, European drug manufacturing families, the office of the Secretary of State for India, British Indian chemical examiners, Dutch experts on cinchona plants in Java, private investors in cinchona trade and managers of government plantations in Jamaica, Ceylon, Java, Nilgiris and British Sikkim are examined. This would expose shifting configurations of authority in the overlapping imperial worlds of medical knowledge, colonial governance and pharmaceutical business. Authority over pure quinine in these decades was not monopolised by any specific institutional edifice, but fluctuated asymmetrically amongst intricately entangled actors. Here I map the imbrications of commerce, science and politics to analyse how contending claims to authority over quinine were asserted and resisted: paving the way for the emergence of newer nodes of expertise and tutelage.

The history of quinine manufacture also reasserts scholarly insights about the relevance of substitutes in the colonial medical marketplace in British India.²⁷ Not only was pure quinine defined in relation to its substitutes, the prestige of the producers of pure quinine was delimited and contested by those who claimed to manufacture its substitutes. Mapping the political economy of substitutes is necessary to understand the shifting epistemologies of pure quinine.

Finally, the history of quinine manufacture opens up the opportunity to examine the material configurations of pure quinine in

²⁷ P. Chakrabarti, 'Empire and Alternatives: Swietenia Febrifuga and Cinchona Substitutes', *Medical History*, 54 (2010), 75–94.

nineteenth-century British India: its colour, taste, smell and appearance. The imperial assemblage which constructed pure quinine constituted not only of pharmaceuticals, botanists, geographers, chemical examiners, planters, bureaucrats, workmen, but also material ingredients like alcohol, colouring substances, cinchona barks, alkalis, oil, paraffine and protective devises like carmine, sealing wax, officially endorsed bottles and glass cases with patent locks. Even when these indispensable materials (that is, ingredients and protective mechanisms) converged, products manufactured in each factory were not necessarily ascribed the identity of quinine. Products were recognised as 'pure quinine', or retained as 'substitutes', or discarded as 'wastes'. These varying labels were contingent upon the shifting locations of their manufacturers in the hierarchies of imperial commerce and politics. The material, the social and the scientific were not self-sufficient, autonomous domains, but were instead intimately symbiotic.²⁸

At the same time, quinine tells us a lot about Empire. Despite being a product of Empire, pure quinine as a commodity-in-the-making in turn reinforced Empire. Quinine exposes various expanses, depths, tensions, prejudices as well as human and material constituents of Empire.

An Exclusive Drug

In December 1875, a report drafted by the Government of Bombay alarmed the office of the Secretary of State for India in London. It said that quinine was being sold in the bazaars of Poona and Bombay 'in the original bottles, full as issued from the medical stores, with the government mark on the sealing wax'. The Secretary of State for India promptly responded. He requested the Governor General to enquire whether government quinine was similarly in circulation in bazaars in other parts of British India as well. He specifically solicited information about 'Calcutta or other bazaars in the Bengal Presidency'.²⁹ Earlier in September, certain measures were proposed to 'prevent robbery' of quinine from the medical stores and depots owned by the British Indian government. Messrs Howard and Sons of London were by then the most celebrated family of British druggists. They suggested, for instance, that quinine

²⁸ On the theme of co-constitution, see F. Trentmann, 'Materiality in the Future of History: Things, Practices and Politics', *The Journal of British Studies*, 48, 2 (April 2009), 297, 300; A. Pickering, 'The Mangle of Practice: Agency and Emergence in the Sociology of Science', *American Journal of Sociology*, 99, 3 (November, 1993), 559, 567, 576.

²⁹ Secretary of State for India to the Governor General, No. 305, 9 December 1875, India Office London. Home, Medical, May 1876, 45–48 A (NAI).

requisitioned for British India could be coloured in England by 'some harmless substance'. Dyed quinine, it was believed, would be an indicator of pure quinine imported from England and endorsed by the British Indian Government.³⁰ It was argued that once coloured, it would be convenient to distinguish pure quinine from objects of fraud; quinine that had 'legitimately found its way into the Indian market' from objects of 'theft, robbery'. Such deliberate convergence of the identity, colour and purity of quinine indicated a recurrent pattern. The Surgeon General of the Bombay Presidency appeared convinced by the suggestion from the Howards. He found it 'necessary to *arrange* with Messrs Howard and Sons' to tint quinine exported to British India with 1 per cent carmine.³¹ It was suspected that this *arrangement* could be an excuse for ensuring the effective monopoly of the supply of quinine to Messrs Howard and Sons. On behalf of the Medical Board, Bombay Presidency, Dr J. L. Paul emphatically denied such allegations. The denial, however, was not justified by sufficient explanations.³²

In the perception of most government officials in British India, production and circulation of pure quinine appeared restricted along certain predictable, legitimate and exclusive routes. The scientific laboratory was believed to represent one such sacrosanct site.³³ However, the translation of laboratory knowledge into commercial manufacture of pure quinine was considered rare and difficult. C. B. Clarke, the Officiating Superintendent of the Botanical Gardens, Calcutta and In-charge of Cinchona cultivations in Bengal wrote in December 1870: 'Now, any good text book of chemistry will give, not only a laboratory process to produce sulphate quinine, but will also give an account of the process pursued by manufactures. The real secret is to *perform* this process with reasonable economy . . .'.³⁴

The products manufactured by very few firms were recognised as pure quinine by the British Indian government in the 1870s. Those firms were mostly based in Europe, particularly, England, France and Germany.³⁵ The London-based pharmaceutical family associated with Thomas Whiffen claimed to manufacture and sell commercial sulphates

³⁰ Secretary of State for India, 'Paragraph 16 of Military Letter', No. 227, 22 August 1876. General, Medical, October 1877, File 294, Prog. 83–85 B (WBSA).

³¹ J. L. Paul to the Director General of Stores, 23 September 1875. Home, Medical, May 1876, 45–48 A (NAD).

³² Ibid. Dated London, 28 September 1875.

³³ Anderson to Secretary, Government of Bengal, No. 49, 7 August 1863. Home, Public, 19 August 1863, 85–87 A (NAI).

³⁴ Clarke to Secretary, Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

³⁵ G. E. Shaw, *Quinine Manufacture in India, Seventeenth Streatfield Lecture* (London: Institute of Chemistry of Great Britain and Ireland, 1934).

of quinine since the 1850s.³⁶ In the 1870s and 1880s, the Whiffens began to feature regularly in the official correspondences of the British Indian governments. But, as I have noted in Chapter 1, the Howards of Tottenham represented the most influential pharmaceutical interest in quinine in the nineteenth century.³⁷ By the 1870s, the Howards had been investing in the manufacture of pure quinine over three generations. The successes of the Howards were based on their ability to coordinate amongst extensive networks of collaborators. Collaborators ranged from traveller-botanists specialising in the cinchonas and 'cinchona forests' of South America,³⁸ senior officials at the Kew gardens³⁹ and the British government in India. Even before his two books on the cinchonas were published, J. E. Howard was recognised as an expert on the different varieties of the plant.⁴⁰ He had been functioning as an advisor to the government of India in questions involving the cinchonas since the early 1860s.⁴¹

By the late 1860s, following the footsteps of the Howards, two government factories were set up in British India near cinchona plantations at Ootacamund in the Nilgiris and at Rungbee in Sikkim. It may be recalled that the declared purpose of introducing cinchonas in British India was humanitarian. The advertised intention was to manufacture and circulate the cheapest possible pure quinine in British India. The possibility of commercial profit was, nonetheless, mentioned as a 'secondary consideration'. Till the late 1880s, however, the products of these government-owned factories were denied the status of quinine. In this situation, the Howards were certainly amongst the most substantial suppliers of pure quinine to the governmental medical stores and depots in British India. They had considerable business investments in British India, and were considered as well amongst the leading intellectual authorities on quinine in the British Empire. They were frequently requested to judge the claims of the managers of the quinine factories owned by the British Indian governments. The Howards, then, enjoyed a unique position. They were conferred with the authority to examine products

³⁶ 'Process for Manufacturing Sulphate of Quinine', 1840. B/WHF/145 (LMA).

³⁷ For detailed information on the background of the Howards, please see Chapter 1.

³⁸ For correspondences between Clements Markham and the Howards see, ACC/1037/693/1-3 (LMA). See the introduction of the two books on cinchona written by J. E. Howard. Howard, *The Quinology of the East Indian Plantations* (London: L. Reeve, 1869) and Howard, *Illustrations of the Nueva Quinologia of Pavon* (London: L. Reeve, 1862).

³⁹ Two of J. E. Howard's books were dedicated to the Hookers, father and son.

⁴⁰ He had become a member of the Linnean society in 1857. See, J. H. Kirkwood et al. (ed.), *John Eliot Howard, A Budget of Papers on his Life and Work* (Oxford: Crewdsdon Howard Lloyd, 1995), 2.

⁴¹ *Ibid.*, 7.

manufactured by their prospective competitors.⁴² Later in this chapter, I shall follow the story of how the Howards performed this twin role as judge and competitor simultaneously.

Thus, the attempts of certain specific agents towards manufacturing quinine were recognised by the British Indian government as legitimate. Such agents were conferred different degrees of authority in judging, identifying and defining quinine. Similarly, governmental efforts to circulate and distribute pure quinine were confined to an exclusive network of institutions, individuals and positions. On receiving indents ratified by the office of the Secretary of State for India, a limited group of manufacturers (most notably the Howards) supplied quinine to the medical stores in different British Indian Presidencies. Under the careful vigil of the provincial medical boards or the medical department, pure quinine was distributed amongst the military hospitals and the civil dispensaries. The acts of distribution in the *mofussil* or the interiors were conducted through official agents: medical officers at the *sudder* and subdivisional stations,⁴³ police stations⁴⁴ and patrol boats.⁴⁵ In the military-medical stores, quinine was considered amongst the valuables and preserved with extra protection. 'Strong case required for storing quinines and valuables for military stores... glass cases to be made extra strong with patent locks for the special storage of quinine and other valuables at the military stores'.⁴⁶

The circulation of quinine from the medical stores was strictly monitored. In the wake of proposals that quinine supplied for India should be coloured with some 'harmless substance', the Secretary of State for India wrote in August 1876: 'Of course the adoption of this step should not in any way relax the vigilance of those in charge of medical stores to guard against the pilfering of valuable drugs by subordinates or others'.⁴⁷

However, the government did not necessarily ban drugs that circulated as quinine, beyond this insular network of exclusive institutions and personnel. Such forms of quinine were not always attributed to belong to the clandestine market. However, the legitimacies of private druggists dealing in quinine were often called into question by the state. They were often blamed for selling adulterated or fraudulent versions of quinine. The most landmark judgment against 'acts of fraudulent' business

⁴² C. R. Markham to J. E. Howard, 17 October 1873, India Office. Home, Medical, May 1874, 54–62 B (NAD).

⁴³ Home, Public. April 1872. 508 A (NAI).

⁴⁴ General, Medical, July 1876, File 290, Prog. 92–93 B (WBSA). ⁴⁵ Ibid.

⁴⁶ IOR/L/SUR/2/7/f.193, September 1868 (BL).

⁴⁷ 'Paragraph 16 of military letter' General, Medical, October 1877, File. 294, Prog. 83–85 B (WBSA).

in quinine in the 1870s and 1880s came from outside the British Empire. In 1887, Alexander Boehringer and Christian Boehringer, Directors of Milan Quinine Works, Fabbrica Lombarda de Prodotti Chimici, were sentenced to fifteen and ten years in prison, respectively.⁴⁸ It is difficult to locate such harsh measures in British India in the 1870s and 1880s. Nonetheless, private druggists were often accused of selling impure quinine. Such accusations were followed up variously by investigations, punitive measures and even justifications.⁴⁹ Allegations against private dealers in quinine, however, could take other forms. Private druggists were often believed to sell pure quinine. These druggists could, in such cases, be suspected of having benefitted from daring acts of stealing and robbing pure quinine from carefully guarded government medical stores.⁵⁰

Such suspicions were premised on the understanding that pure quinine was a precious commodity. In the perceptions of the British Indian governments, the manufacture of pure quinine was rare and difficult. The chemistry textbooks outlined the laboratory methods of procuring pure quinine. However, the commercially viable process of manufacturing quinine was considered a 'zealously guarded secret'.⁵¹ Such impressions were conveyed by C. B. Clarke, the Officiating Superintendent of the Botanical Gardens and in-charge of cinchona cultivation in Bengal to the Secretary to the Government of Bengal in July 1870.⁵² It was believed that this secret was confined to an exclusive network, which constituted a handful of institutions and individuals based in Europe and Dutch Java. The Dutch expert on cinchonas Dr J. E. de Vrij, for instance, claimed to have been aware of a process of manufacture, which he was 'unhappily... not at liberty to divulge'.⁵³ The British Indian governments claimed to be in immediate correspondence with such experts.

Small wonder, then, that the indiscriminate circulation of pure quinine, beyond the earmarked routes made the governments in British India suspicious. Acts of 'robbery' from the medical stores of the government, it was argued, resulted in the selling of bottled quinine in the

⁴⁸ Newspaper clipping from page 335 of *The Chemist and Druggist*, 17 September 1887, preserved in ACC/1037/711/4/3 (LMA) mentions this.

⁴⁹ Anonymous, 'Adulterated Sulphate of Quinine', *IMG*, 7 (1 August 1872), 187–188 and 7 (2 September 1872), 211–212; 7 (1 October 1872), 239.

⁵⁰ Secretary of State for India to the Governor General. Home, Medical, May 1876. 45–48 A (NAI).

⁵¹ Shaw, *Quinine Manufacture in India*.

⁵² Clarke to Secretary, Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

⁵³ J. E. de Vrij, to the Under Secretary of State for India, 21 October 1881, Hague. Home, Medical, 1882 November, 67B (NAI).

bazaars of Bombay and Poona in September 1875. Such lines of reasoning, in turn, revealed certain prejudices of senior officials in the colonial medical bureaucracy. It was suggested, it may be recalled, that quinine ordered from England into British India should henceforth be coloured with 1 per cent carmine. It would introduce, it was hoped, 'a further protection to the Government property'. However, Dr J. D. Paul on behalf of the Medical board, Bombay Presidency, advocated the following words of caution:

I should question the advisability of colouring the stocks already in the stores and depots in India, as the persons who would carry out the process of imparting a colour to quinine in the different medical stores in India are amongst those *generally implicated of robberies* of the drug; and it seems to me undesirable that they, of all persons, should be made acquainted with the means of colouring the drug by the very mode that will be applied by the manufacturer for future supplies [Emphasis mine].⁵⁴

Further Paul noted that quinine was stolen in small quantities by native hospital assistants who sold it to the customers. 'The government drug is employed to cure disease, but it *enriches the Native doctor*, which was not intended. . .'.⁵⁵ Other suspects included patients and their representatives who were selling those drugs, it was alleged, at a much higher price in the bazaars. As a preventive measure, the Surgeon General of Bombay Presidency suggested that the supply of medicines from dispensaries be restricted to genuine patients who could collect them in person.⁵⁶

Foolproof protection of quinine from acts of adulteration and robbery was acknowledged as difficult. It was predicted, however, that this could be achieved with the introduction of 'mixed cinchona alkaloids' in the drug market of British India: ' . . . When the mixed cinchona alkaloids come into general use, dispensaries will practically *have a quinine* which can be distinguished as a government preparation, for in appearance it differs essentially from any other form of cinchona manufacture' [Emphasis mine].⁵⁷

The description of mixed cinchona alkaloids as 'a quinine' is revealing. It indicates that in official correspondences, quinine did not necessarily mean the name of a single, inflexible drug. Quinine was a label that could be attached to drugs. Till the late 1880s, manufacture of quinine remained the unattained goal of the British Indian government factories. In government correspondences, quinine most frequently figured as a point of reference; it was a pharmaceutical designation. More tangibly

⁵⁴ Paul to the Director General of Stores. Home, Medical, May 1876, 45–48 A (NAI).

⁵⁵ Ibid.

⁵⁶ Ibid. 'Note from the Military Department', No. 594, 13 March 1876. ⁵⁷ Ibid.

circulating drugs in British India often derived their names, identities and legitimacies in relation to quinine. Officials in the government factories struggled to unravel the 'secret' behind commercial manufacture of pure quinine. Meanwhile, various products of the government factories began circulating as inferior, incomplete versions of quinine (e.g., cheaper quinine,⁵⁸ amorphous quinine,⁵⁹ and rough hospital quinine).⁶⁰

Moreover, quinine also appeared as a relational category. The identities of drugs labelled as quinine could be volatile. Such identities could be asserted and erased; labels could be ascribed to drugs and later withdrawn. For instance, F. Odevaine, a Surgeon Major in the medical bureaucracy, spoke of 'one advantage of the mixed cinchona alkaloids': '... Its solution is perfectly clear, and in dispensary practices the patients, concluding that they are getting pure quinine, will, with greater confidence, have recourse to those institutions'.⁶¹

Similarly, there are evidences to suggest that the tag of quinine could be deliberately withdrawn from drugs. In March 1882, Chetan Shah, Officiating Civil Surgeon at Jhang, narrated this revealing story.

I particularly observed a lady relation of mine who could never take quinine under its proper name without suffering from severe vomiting and intense depression... Once, one of my dispensers administered to her pills made of quinine under the name of 'sat gilo', which she believed was cooling in its effects as well as a cure for fever. On this occasion she had none of the symptoms that she used to ascribe to Quinine. Since then it became a custom in the family to administer quinine to this lady – whenever occasion required it – under the guise of 'sat gilo', and then the terrible symptoms of the fancied quininism never returned. Occasionally, when by mistake quinine was given to her as Quinine, the old symptoms appeared with the usual severity.⁶²

These examples constitute different physicians' narratives about their encounters with patients. In such narrations, the patients hardly figure as obedient recipients of prescriptions from doctors. They are represented as active agents who could make choices between restricted options. Nonetheless, on each occasion, the identity of quinine appears to have been defined and negotiated by the imposing authority of manipulative physicians.

⁵⁸ Clarke to Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

⁵⁹ Clarke to the Secretary, Government of Bengal, No. 223, 24 October 1870 Rungbee. Home, Public, 24 December 1870, 128–132 A (NAI).

⁶⁰ Clarke, to the Secretary, Government of Bengal, No. 165, 10 February 1870 Botanic Gardens. Home, Public, 12 March 1870, 157 A (NAI).

⁶¹ J. F. Beatson to the Officiating Secretary, Government of India, No. 548, 15 May 1879 Fort William. Home, Medical, 1879 October, 64–80 A (NAI).

⁶² C. Shah, 'Uncomfortable Effects of Quinine', *IMG*, 17 (1 March 1882), 75.

Quinine in nineteenth-century British India thus did not only refer to an exclusive drug – legitimised and identified by a range of protective mechanisms – but was also indicative of a flexible label which could be attached to or withdrawn from various drugs. Identities and definitions of quinine in British India in the second half of the century were shaped by contending assertions of authority. This trend was certainly not confined to narratives of interactions between cunning physicians and their vulnerable patients. Identities of pure quinine produced in British Indian factories, as I will elaborate in the following sections, were established or repudiated by biased judgments from individuals or institutions in command of particular situations. The history of manufacturing quinine in these government factories exposes the shifting equations of authority amongst contending actors within British India and beyond.

'The Authority to Judge'

Cinchona plants and seeds extracted from forests in South America started arriving in British India in the late 1850s. Within a decade, attempts to produce cheapest possible pure quinine began in factories set up in the immediate vicinities of government cinchona plantations in the Nilgiris and British Sikkim. Meanwhile, various pharmaceutical firms, phytochemists, botanists in Germany, France, Italy, England, North America and Dutch colonial officials had credibly asserted themselves as experts in the manufacture of pure quinine. Quinine factories in British India began by soliciting ratification from some of these established authorities. Seeking recognition for such projects in British India as viable and legitimate appeared as the necessary first step.

It has been indicated already that in the 1860s and 1870s the office of the Secretary of State for India repeatedly approached Howard and Sons for such endorsements, reinforcing the claims of the Howards as the most predominant authorities on quinine.⁶³ The Howards manipulated this position of superiority variously. They could exercise the prerogative of refusing to judge, and they often delegated such authority to agents of their choice. For instance, John Eliot Howard wrote in April 1868 to the Undersecretary of State for India refusing to analyse extracts of cinchona barks from Darjeeling: 'It would require more time and labour than I am prepared to give to the subject'. Instead, the Howards submitted those samples to the inspection of drug brokers Messrs Phillips and Jenkins.⁶⁴

⁶³ Secretary of State for India to the Government of India, No. 34, 27 April 1871 India Office. Home, Public, 3 June 1871, 69–70 A (NAI).

⁶⁴ General, General, January 1868, Prog. 70 B. (WBSA).

It would be fair to add, however, that in the 1860s the Howards derived much of their authority in relation to such projects initiated by the British Indian governments by offering precise judgments.

Drugs manufactured commercially in the government factories in British India in the 1860s and much of the 1870s were consistently denied the status of pure quinine by the Howards. In October 1866, Mr John Broughton had been appointed as the Quinologist to the Madras government. In successive reports, the Howards suggested that Mr Broughton's efforts could, at best, be considered to yield amorphous versions of quinine. The Howards deemed the barks of certain varieties of cinchona trees grown in the Nilgiris rich in quinine content, and therefore valuable. They considered the investment of those barks towards the preparation of 'half manufactured products' in the Madras Presidency redundant. Instead, they recommended that these barks be shipped to England for sale in the London market. Quite predictably, such judgments would enable the Howards to conveniently access the barks from Madras in London as sources of cheap raw material.

Experience has hitherto shown, . . . that the collectors and importers in the end reap *more profit* from sending in to the European market the *raw material* than the *half-manufactured product*. The latter would command no price worth mentioning as a febrifuge per se. It would simply come into competition with the refuse product of the bark operation.⁶⁵

In the early 1870s, it was reported that 'amorphous quinine' was being manufactured at a 'very serious loss to the public revenue . . . its commercial value is less than one-half the value of the raw material and manufacturing charges'.⁶⁶ The 'local manufacture of amorphous quinine' in the Madras Presidency was discontinued thereafter. Broughton resigned his appointment. The post of the Government Quinologist in Madras Presidency had not been filled up for more than a decade. The entire crop of bark from the Madras Government plantations had since the mid-1870s been sent to England for auction in the London market.⁶⁷

Unlike their counterparts in the Nilgiris, cinchona barks grown in British Sikkim featured in reports from the Howards as 'quite unsaleable', and never shipped to London. The Howards suggested that certain varieties of cinchona barks suffered from 'extreme poverty in alkaloids'.⁶⁸ In April 1871, commenting on 'preparations from cinchona barks, manufactured at the Sikkim plantation', J. E. Howard suggested

⁶⁵ A note from Howard dated 15 June 1864. Home, Medical, 9–11 A, January 1884. (NAI).

⁶⁶ Ibid. ⁶⁷ Ibid. ⁶⁸ Ibid.

that 'the preparation contains a very large percentage of copper, and that it is consequently inadmissible as a medicine'.⁶⁹

The particular variety of cinchona plants that was believed to thrive most extensively in British Sikkim was recognised as *cinchona succirubra*. The bark of the *succirubra* species of the cinchonas was considered particularly weak in quinine content whereas *cinchona officinalis* and *calisaya* were amongst the varieties regarded as rich in quinine. However, it was reported that such quinine-rich varieties were not suited to the climate and landscape of British Sikkim.⁷⁰ By contrast, cinchonas growing in the Nilgiris were reported as relatively rich in quinine. This explains why the Howards preferred such barks being shipped to England for sale in the London market. The Howards appeared keen to resist the misuse of those valuable barks in the manufacture of incomplete versions of quinine in Madras. The Howards' activities suggested that government factories in Ootacamund in the Nilgiris or Rungbee in British Sikkim were inadequately equipped to produce pure quinine. Such impressions appeared firmly entrenched in cumulative reports from the Howards by the 1870s. However, acts of defining and identifying pure quinine in British India were not solely restricted to unilateral judgments from the Howards. As it unfolded, the story accommodated many diverse voices. Some of those set limits to the authority asserted by the Howards.

Contesting 'Pure Quinine'

Official correspondences in British India in the 1860s and 1870s rarely commented on the physical appearance of pure quinine. Sporadically surviving sources describe it as a 'white crystalline substance'.⁷¹ In the laboratory, quinine was believed to crystallise into comparatively 'short crystals', in the shape of 'beautiful, long needles'.⁷² By the 1870s, officials in British India appeared aware of the method 'in general use' of manufacturing crystallised sulphates of quinine.⁷³

⁶⁹ Secretary of State for India to the Government of India. Home, Public, 3 June 1871, 69–70 A (NAD).

⁷⁰ *Ibid.*

⁷¹ H. A. Cockerell, to Secretary, Government of India, Home, Revenue, and Agricultural departments, 22 August 1879, Darjeeling. Home, Medical, October 1879, 64–80 A (NAD).

⁷² Clarke to the Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

⁷³ Clarke, to the Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAD).

Replication of closely similar methods at government factories in Rungbee and Ootacamund, however, produced different results. Efforts of Thomas Anderson, Superintendent of the Botanical Gardens, Calcutta, and in charge of cinchona cultivation in Bengal, failed to yield desired versions of white pure quinine. Instead, he ended up preparing two substances from the cinchona barks grown in Darjeeling. Those substances contained 'alkaloids mixed with some extraneous matter'. He called one of those quinium. It was described as a 'brown viscid substance'. The other figured as a grey powder that consisted of alkaloids in an 'impure and non-crystalline condition'. From bark grown in the Nilgiris, Broughton, the Government Quinologist, prepared a 'closely resembling yellowish grey powder'.⁷⁴ However, neither Broughton nor Anderson considered their inability to manufacture pure quinine in the form of a 'white crystalline substance', a failure.

On the contrary, it was claimed that the preparation of these different substances was deliberate. They were projected as attempts at 'experimenting' with alternative methods of manufacturing pure quinine. The 'usual, alcoholic process', it was suggested, was unsuitable to the conditions at the factories in Ootacamund or Rungbee. Instead, Broughton claimed to have been 'engaged in devising a new, unusual process'. Anderson's successor in the Botanic Gardens in Calcutta, C. B. Clarke, endorsed such attempts: '... The impression which I have gained from my protracted experiments is that the successful manufacture of quinine is not any particular secret or the adoption of any particular route...'.⁷⁵

While the received methods of preparing pure quinine were being regarded with suspicion, the figure of pure quinine itself was subjected to considerable scrutiny. The laboratory definition of pure quinine was increasingly seen as ever changing. Since the early nineteenth century, it may be recalled, the chemical constitution of cinchona barks had been characterised by the presence of different alkaloids. The healing qualities associated with these barks were believed to result from such alkaloids, particularly quinine. Pure quinine was understood as a residual category which could be derived by chemically isolating the other alkaloids inherent in the cinchona barks. The definition of pure quinine, then, was intimately tied to the identities of 'other alkaloids' present in the cinchona barks. Pure quinine could be defined by what remained after the elimination of 'other alkaloids' from the extracts of the cinchona barks. Cinchonine was the only alkaloid other than quinine that Pelletier and

⁷⁴ T. Anderson, to the Secretary, Government of Bengal, 14 January 1869. Ibid.

⁷⁵ Clarke to the Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAD).

Caventeau claimed to have detected in the cinchona barks in 1820. Ever since, the presence of several 'other alkaloids' had been claimed by the phytochemists. These implied corresponding changes in the laboratory definitions of pure quinine. Pelletier suggested the presence of a third alkaloid (i.e., Aricine) in 1829. In the mid-nineteenth century, Pasteur added to the list two more alkaloids, quinidine and cinchonidine. By the 1880s, phytochemists A. C. Oudemans and O. Hesse claimed to have discovered three 'new alkaloids' – quinamine, conquinamine and cinchonamine. In the laboratory sense, therefore, pure quinine could hardly be considered as an unchanging reality since the 1820s. Phytochemical understandings of pure quinine kept altering with the discovery of each 'new alkaloid'.⁷⁶

The Howards often judged efforts pursued in the factories in British India towards manufacturing pure quinine. These provided them with numerous occasions to assert their superiority over the officials located in such factories. Since the late 1860s, officials at the receiving end of dismissive judgments from the Howards often questioned the sanctity of the category of pure quinine itself. In such official statements purity of quinine figured as a subject of sarcasm, ridicule or shocking revelation. Pure quinine was most recurrently alleged as 'deeply adulterated with cinchonidine'. Officials found it difficult to distinguish between pure quinine and some of the 'other alkaloids'. C. B. Clarke wrote thus in February 1870:

... Cinchonidine is about one-third the value of quinine, and the crystals of Cinchonidine are exceedingly like those of quinine. There is really very little quinine in general use that is not at present deeply adulterated with Cinchonidine, and I doubt whether any amount of chemical knowledge will enable the medical officer to detect the percentage of Cinchonidine present, unless he were provided with quite a different laboratory apparatus from that generally at his command.⁷⁷

In a similar correspondence drafted a few months later, Clarke doubted the received understandings concerning the physical appearance of pure quinine: 'I may remark in passing that quinine itself crystallizes in comparatively short crystals, and that the beautiful, long needles which are regarded as almost a test of quinine are generally Cinchonidine'.⁷⁸ Such

⁷⁶ 'Enclosure no. 6: Report on the Bengal Cinchona febrifuge, called for by the Secretary of State for India, in Letters dated 6 April and 6 September 1878, and 11 January 1879'. Home, Medical, November 1882, 67 B (NAI).

⁷⁷ Clarke to the Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAI).

⁷⁸ Clarke to the Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

impressions seem to have had extensive currency. In September 1878, G. Smith the then Surgeon General of the Indian Medical Department, Madras Presidency, suggested that 'impure quinine of the shops' constituted a combination of sulphates of quinine and cinchonidine.⁷⁹

Suggestions that impure quinine was circulating extensively in the shops did not necessarily indicate a scandalous fraud in British India in the 1870s. Rather certain influential officials employed in the cinchona factories had begun questioning the integrity of the phytochemical category of pure quinine itself. These officials tended to suspect the distinctness of quinine as an alkaloid, suggesting that specific alkaloids supposedly inherent in the cinchona barks were not exceptional, distinguishable and autonomous entities. The identities of such alkaloids were often fluid, overlapping and seldom mutually exclusive. In 1871, Broughton showed how, once exposed to certain conditions, alkaloids changed identities. He suggested that quinine and cinchonidine shared 'chemical similarity',⁸⁰ 'a natural connection.'⁸¹ He argued that quinine could convert into cinchonidine and vice versa when exposed to sunshine and heat. He claimed that this hypothesis was not 'contradicted by a single fact' and was 'in harmony with observations made with very diverse species of cinchona'. These alkaloids, Broughton asserted, were 'especially sensitive to light'. Whiteness, according to Broughton, had been an indicator of the purity of alkaloids, but whiteness faded, Broughton believed, on exposure to Indian sunshine: 'The purest and whitest alkaloids I have been able to prepare become coloured brown when exposed to the Indian sunshine . . .'.⁸²

The authority of the Howards was based on their claim as experts in the manufacture of pure quinine. By contrast, British Indian officials like Broughton and Clarke tended to question the chemical viability of pure quinine itself. Circulation of impure quinine, then, could not necessarily be attributed to inefficient manufacturers or clandestine traders. The purity of alkaloids, these officials suggested, was often compromised by 'idiosyncrasies'⁸³ inherent in the 'living cinchona plants'. Purity of alkaloids could wane, it was argued, once exposed to adverse colonial conditions. Thus, quinine could lose its purity prior to moments of manufacture and circulation. Corruption of quinine was often seen to be beyond

⁷⁹ G. Smith to Acting Chief Secretary, Government of Madras, No. 527, 25 September 1878, Fort St George. Home, Medical, March 1879, 55–57 A (NAI).

⁸⁰ J. Broughton, 'Chemical and Physiological Experiments on Living Cinchonaey', *Philosophical Transactions of the Royal Society of London*, 161 (1871), 8.

⁸¹ *Ibid.*, 1. ⁸² *Ibid.*, 8.

⁸³ G. E. Shaw, *Quinine Manufacture in India* (London: Institute of Chemistry of Great Britain and Ireland, 1935), 3.

the control of commercial manufacturers. Clarke argued that this made the manufacture of pure quinine often 'speculative and uncertain', and that this was why John Eliot Howard, in his books, had never elaborated on the process of manufacturing quinine with clarity and precision.⁸⁴ The volatile identities of 'pure alkaloids', in turn, reshaped understandings of 'adulterated versions of pure quinine'. In October 1872, the Officiating Commissioner of Police, Calcutta, S. Wauchope, refused to consider the circulation of cinchonidine or cinchonine under the name of pure quinine, a particularly unacceptable act.⁸⁵

Even in distant contexts, chemical definitions of pure quinine acquired similar flexible forms. French botanist Gustave Planchon defined 'raw quinine' in 1866 as an 'admixture of quinine, chinchonine, unctuous matter, and colouring parts . . .'.⁸⁶ Having questioned the viability of the category pure quinine, successive Superintendents of the Botanic Gardens in Calcutta began advocating deliberate manufacture of 'impure forms of quinine'. Thus in February 1870, Clarke wrote thus: 'Dr T. Anderson now advocates the manufacture of a rough hospital quinine at Rungbee, by which he means the production of the precipitated alkaloids in a more or less *impure* form'.⁸⁷

An Economy of 'Substitutes'

Managers of the cinchona factories in British India set limits to the authority of the Howards in certain other ways. A four-member committee, including John Broughton, was appointed in March 1866 to examine the relative therapeutic value of cinchona alkaloids other than quinine. The committee reported to the Secretary to the Government of India, Home Department on October 1868 that there was no longer doubt that alkaloids 'other than quinine' were capable of being generally used with best results in India: 'Compared with quinine . . . [they] have been found, by more than one observer, to supplement this sovereign remedy in some of its points of deficiency'.⁸⁸

⁸⁴ Clarke to the Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

⁸⁵ S. Wauchope, to the Officiating Secretary, Government of Bengal, Judicial Department, No.1238, 16 October 1872 Calcutta. General, Medical, October 1872, Prog. 6–8 (WBSA).

⁸⁶ G. Planchon, *Peruvian Barks* (Bangalore: Mysore Government Press, 1867), 34.

⁸⁷ Clarke to the Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAD).

⁸⁸ The Committee appointed to examine the properties of the cinchona alkaloids other than quinine to the Secretary, Government of India, Home, 29 October 1868. Howard

Amongst these different alkaloids, only quinine had hitherto been accepted into the British pharmacopeia, and the committee suggested that this position was untenable.⁸⁹ Recognitions of the medical values of alkaloids other than quinine were reflected elsewhere. Commercial manufacture of pure quinine ceased to be the sole declared goal of the cinchona plantations. Nor is it entirely coincidental that the Annual Report of the cinchona plantations at Darjeeling removed the word 'Quiniferous' from its title since October 1866.⁹⁰

In January 1870, the office of the Secretary of State for India forwarded copies of the Medical Committee report to the Howards. This implied a break with the prevailing equations of authority. In relation to the cinchona factories in British India, this, for the first time, placed the Howards at the receiving end of instruction. The Howards were informed that the value of febrifuge other than quinine, should be generally known both in England and in India, and that the Duke of Argyll 'will not have any objection to you making any use you may seem fit of the information contained in the report'.⁹¹ Already in 1869 official correspondences in British India began recognising the cinchona alkaloids other than quinine as not only effective, but also desirable. It was suggested that the extensive circulation of such 'cheaper' alkaloids would be compatible with the declared ethical intentions of the government, since they would represent considerable saving.⁹²

Official opinion in British India as well as Burma encouraged a variety of medical preparations, often different combinations of cinchona alkaloids, other than quinine. The Secretary to the Chief Commissioner of British Burma wrote in October 1870: 'General Fytche understands that the plant can be prepared in a rough way and used as a febrifuge by those growing it, without having to send it away for chemical manipulation and conversion into the form in which it is generally used'.⁹³ Such 'rough preparations' enjoyed considerable legitimacy in British India. Managers of cinchona plantations and factories tended to invest such preparations with respectability and pedigree. Clarke suggested that such 'rough',

Private Papers. ACC/1037/699/3 (LMA); See also, Home, Public, 26 February 1866, 58A (NAD).

⁸⁹ J. A. Gammie, 'Manufacture of Quinine in India', *Bulletin of Miscellaneous Information* (Royal Gardens: Kew), 18 (1888), 139–144.

⁹⁰ T. Anderson, 'Report on the Cultivation of Cinchona at Darjeeling from 1 April 1865 to 31 March 1866', Home, Public, October 1866, 21–22 (NAI).

⁹¹ Secretary of State for India to Howard, dated January 1870, India Office. Howard Private Papers. ACC 1037/699/1 (LMA).

⁹² Home, Public, 17 April 1869, 31 B (NAD).

⁹³ A. Fraser to Secretary, Government of India, PWD, No. 612–15F, 10 October 1870. Home, Public, 17 December 1870, 43–44 A (NAD).

'amorphous' preparations of alkaloids conformed to the 'original recommendations' of Pelletier, 'the great medical authority on quinine'.⁹⁴ Pelletier had preferred these alkaloids to quinine, argued Clarke. Posterity chose to ignore such insight, reasoned Clarke, as 'making the amorphous alkaloid contained some details which the manufacturers found especially troublesome to work in practice'.⁹⁵

The 1870s and the early 1880s witnessed a plethora of such preparations in British India. These bore a variety of names and claims. In November 1876, Rai Bahadur Kanai Lall Dey, the Deputy Surgeon General of Bengal hinted at the various 'colloquial names' of cinchona-related drugs in use in Bengal: cinchona khar, cinchona yaraghana, cinchona alkaloids, Indian cinchona alkaloid, Indian febrifuge cinchona alkaloid, desaja cinchona khar and bharatta yaraghana cinchona khar.⁹⁶ The celebrated Dutch expert on the cinchonas and their alkaloids Dr J. E. de Vrij argued that quinetum, cinchona febrifuge, quinium, quinine brute and rough quinine indicated different names for almost identical preparations.⁹⁷ John Eliot Howard, in contrast, emphasised difference. He suggested that four different varieties of drugs were circulating in the name of quinetum.

Quinetum No. 1 is that prepared in British India, and sold by the Government there at Rs. 20 per English pound. It is of a fine white colour, and has a peculiar sweet smell. It is packed in tin boxes holding half an English pound, which are provided with direction for use in English and Hindustani. No. 2 was prepared at Wettevreden. It has the same appearance and smell as the Bengal, but is a little darker coloured. No. 3 is a sample of the first quinetum prepared by Broughton in Madras, and called amorphous quinine. It is a yellow stuff, sticky like resin, and looking like rhubarb powder, on the whole a very impure preparation. No. 4 is quinetum of the manufacturer Whiffen, in London. This had a grey-brown tint, smell or meth.⁹⁸

Comments from J. E. de Vrij and Howard can hardly be read as disinterested assessments. These experts had begun investing in such preparations themselves. Their products were locked in relations of comparison and competition with preparations they were judging. Physical appearance and chemical compositions were not the only indices for

⁹⁴ Clarke to the Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

⁹⁵ Ibid.

⁹⁶ K. L. Dey to Superintendent, Campbell Medical School, No. 76, 30 November 1876 Calcutta. General, Medical, December 1876, File 365, Prog. 25–27 A (WBSA).

⁹⁷ de Vrij to the Under Secretary of State for India. Home, Medical, November 1882, 67 B (NAI).

⁹⁸ J. E. Howard to the Under Secretary of State for India, 21 June 1881, Lord's Meade, Tottenham, Ibid.

comparison. Given the ethical pretensions of the British Indian government, inexpensiveness emerged as a measure of the worth of a product.⁹⁹

By the late 1860s, quinine was no longer considered the only efficacious alkaloid inherent in the cinchona barks. Quinine was shown to share its curative properties with 'other alkaloids' believed to be present in the cinchona barks and these extended also to the 'waste products' derived from the cinchona factories in British India. Clarke wrote in December 1870: 'The waste in practice is not so great as appears, because the uncrystallizable alkaloid is not thrown away, but forms the basis of many well known medicines, and is also purchased as an amorphous powder . . .'.¹⁰⁰

Judging the Howards

Contesting the indispensability of quinine implied setting limits to the authority of those groups of men who claimed expertise in the manufacture of pure quinine. Ironically, however, such experts located in The Hague or London, found in these statements promising business prospects. In successive letters written from Hague to Clements Robert Markham in April 1871, de Vrij pointed out the therapeutic virtues of one of the 'waste products of the Cinchona plants'. Referring to 'experience and information' from hospitals and dispensaries in Java, Sumatra, Samarang, Dr de Vrij suggested that quinovin could be considered as an 'excellent cure' for dysentery, diarrhoea, cholera and ague.¹⁰¹

By October 1873, the Howards had themselves begun advertising the virtues of the cheaper alkaloids.¹⁰² They began by offering 'the refuse of the quinine factory' under the name of quinoidine at about five shillings per pound.¹⁰³ However, in these years, the most emphatic claims of the Howards were for cinchonidine. J. E. Howard suggested that he found cinchonidine 'in most cases not inferior to quinine', and went on to claim that on certain occasions he considered the 'therapeutic action of cinchonidine preferable to that of quinine'.¹⁰⁴ Howard retold the story

⁹⁹ A Note from Surgeon General, Indian Medical Department, No. 1418, 17 February 1876. Home, Medical, March 1876, 53–57 B (NAI).

¹⁰⁰ Clarke to Secretary, Government of Bengal. Home, Public, 17 December 1870, 123–125 A (NAI).

¹⁰¹ J. E. de Vrij to C. R. Markham, 17 April 1871, Hague. Home, Public, 1 July 1871, 34–35 A (NAI).

¹⁰² J. E. Howard to C. R. Markham, 21 October 1873, Tottenham. Home, Medical, May 1874, 54–62 B (NAI).

¹⁰³ C. H. Wood, to C. J. Lyall, 13 July 1874, Rungbee. Home, Medical, August 1874, 44–49 A (NAI).

¹⁰⁴ Howard to Markham. Home, Medical, May 1874, 54–62 B (NAI).

of the recovery of the Countess of Cinchon in the seventeenth century. The Countess had apparently recuperated from a fatal ailment after consuming extracts of cinchona bark. Howard retrospectively attributed her recovery to the richness of cinchonidine in that particular variety of cinchona bark.¹⁰⁵ Howard suggested that an extensive supply of cinchonidine to British India would be absolutely necessary in the wake of the Burdwan fever.¹⁰⁶ In February 1874, Howard proposed to furnish 3000 pounds of cinchonidine in six months at 45 shillings per pound.¹⁰⁷ The Howards seem to have had the backing of the office of the Secretary of State for India at this stage. A note from the latter preceded the proposal. 'I hope your Government will take the suggestions contained in Mr Howard's letter into consideration . . .'.¹⁰⁸

The newly appointed Quinologist in Bengal, Mr C. H. Wood, responded to the Howards' proposals with considerable scepticism. He suggested that the Howards were desperately trying to foist accumulated cinchonidine on the Government of India: 'by hook or by crook', a position that A. O. Hume, on behalf of the India Office, endorsed. 'Howard has enormous stock in hand and wants to get rid of it', it was noted, with the cynical aside that a large sale to the Indian government could enhance the legitimacy of the same product in Europe.¹⁰⁹

Wood's response was suggestive. I have already shown that the Howards were often requested to judge the identities and qualities of drugs manufactured in the factories at Rungbee and Ootacamund since the mid-1860s. Wood's response suggested, yet again, that the authority asserted by the Howards had limits. While the Howards continued to judge the efforts of the Government Quinologists employed in Madras and Bengal Presidencies, the Quinologists had themselves by the mid-1870s begun scrutinising and even contesting assertive judgments from the Howards. From 1875, such reciprocal judgments were often witnessed between Wood and the Howards. Wood continued to hold the position of Quinologist of Bengal until he resigned in April 1879, but from the mid-1870s, the office of the Quinologist of Bengal acquired more relevance than ever before.

Several reports on the value of cinchonas grown in the emerging plantations in British India were presented after 1860. These reports, it may be recalled, revealed considerable regional variation. The cinchonas

¹⁰⁵ *Ibid.* ¹⁰⁶ *Ibid.*

¹⁰⁷ Secretary of State for India to Government of India, No. 33, 4 June 1874, India Office. Home, Medical, August 1874, 44–49 A (NAI).

¹⁰⁸ Secretary of State for India to Governor General of India in Council, 16 December 1873 India Office. Home, Medical, May 1874, 54–62 B (NAI).

¹⁰⁹ Note from A. O. Hume. *Ibid.*

thriving in plantations on the Nilgiris were identified as predominantly belonging to the *officinalis* and *succirubra* varieties. The barks of the *officinalis* plants were considered rich in quinine. In contrast, it was suggested that *succirubra* represented the most extensively proliferating species of cinchonas in British Sikkim, but their barks were considered poor in quinine. J. E. Howard kept denying the products manufactured in the factories at Rungbee in British Sikkim and Ootacamund in the Nilgiris the status of quinine. Following his recommendations, efforts at manufacturing quinine at Ootacamund were finally discontinued in March 1875. The entire crop of cinchona barks grown in the Nilgiris had been thereafter regularly sent to England as sources of cheap raw materials. As a result Broughton resigned as Government Quinologist in the Madras Presidency, and this post remained vacant ever since.

This made C. H. Wood the only Government Quinologist employed in British India in the later 1870s. Government efforts towards manufacturing quinine, however inchoate, were now solely confined to the factory at Rungbee in British Sikkim. This coincided with the ascription of new meanings to the *succirubra* species of the cinchonas. With the therapeutic virtues of alkaloids other than quinine being variously asserted, *succirubra* began to acquire the reputation of a valuable species. In December 1873, the Secretary of State for India suggested that the extensive use of the febrifuge in the form of cinchonidine would have the advantage of extending the cultivation and increasing the value of *succirubra*, 'the species which, while producing that particular alkaloid in very considerable quantities also grows more readily and over a wide range than any other in the hill districts of the (Bengal) presidency'.¹¹⁰

The barks of the *succirubra* species of the cinchonas, it was suggested by officials in British Sikkim, were enormously rich in alkaloids other than quinine. Figure 4.1 and Figure 4.2 suggest that photographs were circulated within official circles to bolster the claim that the cinchona plantations in British Sikkim were abundant in *succirubra* plants. Such impressions conferred considerable prestige on these cinchona plantations. C. H. Wood and his colleagues appeared to assert intimate knowledge on these plantations, claiming expertise on the extraction of alkaloids inherent in the *succirubra* barks. The Howards had, by then, found new enticing business prospects in 'other alkaloids' besides quinine.

In relation to these newly found interests of the Howards, then, Wood and his colleagues in British India were placed in a position of comparative advantage and authority. In a revealing reversal of roles, for instance, samples of quinoidine and 'amorphous quinine' prepared

¹¹⁰ Markham to Howard. Home, Medical, May 1874, 54–62 B (NAI).



Figure 4.1 © British Library Board. Photograph of 'A cinchona tree (*succirubra*) at the Government Plantation at Rungbee.' Photographer: Robert Phillips; Photo contains the note: 'View of three European men sitting beneath cinchona trees. 1870s.' (India Office Select Material, British Library. Shelfmark: Photo 637/(28).

by Messrs Howard and Sons and Dr de Vrij, respectively, were sent out between November and December 1875 to British India for trial. Reports on the efficacies of these preparations were presented by a range of medical bureaucrats, including H. Cayley (Surgeon Superintendent, Mayo Native Hospital), Norman Chevers (Principal, Medical College Calcutta), Robert Bird (Civil Surgeon, Howrah General Hospital) and S. C. Mackenzie (Second Resident Surgeon, Presidency General Hospital). The preparations manufactured by the Howards and de Vrij were found to produce 'troublesome nausea, frequent vomiting, vertigo and anorexia', and were denied the status of efficacious drugs.¹¹¹ This represented a trend that would often be repeated.¹¹²

It appears from the foregoing narrative that officials located in the government cinchona factories in British India were hardly passive recipients of dismissive judgments. Between the late 1860s and mid-1870s, they had recurrently questioned the basic foundation of the claims to

¹¹¹ Note from Surgeon General, Indian Medical Department. Home, Medical, March 1876, 53–57 B (NAI).

¹¹² Home, Medical, July 1882, 44–46 A (NAI).



Figure 4.2 © British Library Board. Photograph carrying the following note: 'Chinchona succirubra. Portion of Plantation No. 5 at Rungbee near Darjeeling showing the tallest plant of *C. succirubra* age 2 years and 9 months. The head gardener in the picture is 5 feet 9 inches in height.' Photographer: Sir Benjamin Simpson; July 1867. (India Office Select Materials, British Library. Shelfmark: Photo 1000/40 (4200).

authority asserted by de Vrij or the Howards. This was achieved, as I have suggested, in two different ways. At one level, the viability of pure quinine as a phytochemical category was subjected to vigorous scrutiny. At another, the indispensability of quinine as a febrifuge was questioned. It was recognised that other alkaloids besides quinine inherent in the cinchona barks were considerably endowed with curative properties. Such recognitions led to newer and disparate claims to knowledge on the cinchonas. Most regularly, these claims were manifested in correspondences drafted by various British Indian officials: the Quinologist of Bengal and his subordinates in the factory at Rungbee, Superintendents of Botanic Gardens, medical bureaucrats and physicians located in dispensaries, military and civil hospitals.¹¹³ Pharmaceutical business and medical relief in British India, since the early 1860s, involved a shared set of individuals, institutions and interests. In these overlapping worlds,

¹¹³ Ibid.

the 'authority to judge' did not signify an inflexible, unchanging status. It referred to relations that could vary with shifts in contexts. The 'authority to judge' has to be understood with reference to these shifting terms of hierarchical relation between concerned parties; and not as a universally agreed upon designation. Besides, 'the authority to judge' could have its limits. The judge in a particular situation could be on the receiving end of judgment in another. From the previously mentioned context, it is clear that the Howards and the Quinologist in Bengal judged the products manufactured by one another. Thus, 'authority to judge' should be understood as shifting, relational and even reciprocal positions.

The Return of Quinine

Excessive emphasis on the medical virtues of alkaloids other than quinine did not necessarily erase the relevance of quinine. The difficulties and often the impossibility of manufacturing pure quinine in British India were mentioned in official correspondence. However, quinine remained relevant as an agreed point of reference. A wide range of preparations supposedly manufactured from alkaloids other than quinine, from the late 1860s, were often collectively referred to as substitutes of quinine.¹¹⁴ Whether quinine could be identified as a tangible drug remained a matter of dispute. Nonetheless, quinine frequently figured as an index, a yardstick for comparison. The virtues of newly prepared drugs manufactured from 'other alkaloids' inherent in cinchona barks were asserted by claiming their similarities with quinine. Similarly, the credibility of some preparations was contested by indicating their differences from quinine. For instance, Robert Bird, Civil Surgeon, Howrah General Hospital, labelled a drug prepared by de Vrij as an amorphous version of quinine. He found it more 'akin to quinidine in its power. It creates irritability of the stomach and brings on vertigo and anorexia'.¹¹⁵ Thus, quinine was invoked to assert or deny the relative worth of different products prepared from the cinchonas.

Seventeen medical officers located in British India were requested to test the value of two such preparations manufactured in England, namely cinchonine alkaloids and quinetum tartrates. They responded in a variety of ways. Most responses were articulated in reference to quinine.¹¹⁶ Relations between 'other minor alkaloids' and quinine were

¹¹⁴ Home, Public, 17 April 1869, 31 B (NAI).

¹¹⁵ R. Bird, to the Deputy Surgeon General, Presidency Circle, Calcutta. No 131, 14 December 1875 Howrah. Home, Medical, March 1876, 53–57 B (NAI).

¹¹⁶ Home, Medical, July 1882, 44–46 A (NAI).

often expressed in quantifiable terms. C. B. Clarke, the Superintendent of Botanic Gardens, Calcutta, wrote thus: 'Roughly it may be said that two grains of cinchonidine are equal in all respects to one grain of quinine... cinchonidine is about one-third the value of quinine...'.¹¹⁷ These correspondents very rarely spoke of the attributes of quinine itself. Quinine seldom appeared to figure as a commodity on its own. Quinine and its substitutes were mentioned in relation to each other. The credibility of these substitutes was claimed with reference to quinine. Such claims, in turn, hinted at the qualities of quinine. Writing in defence of one such substitute, mixed triple sulphate, Surgeon Major R. W. Cunningham, XV Sikh's regiment, Sealkot suggested: 'The taste is less intensely bitter than quinine...'.¹¹⁸ Explaining why the mixed triple sulphate could emerge as a more satisfactory substitute for quinine, a memorandum suggested that the triple sulphate 'is a white crystalline substance, closely resembling pure quinine in appearance'.¹¹⁹ Thus, descriptions of the substitutes not only hinted at the curative properties of quinine, they indicated the taste and the colour of pure quinine as well. Even texts emphasising the 'desirability' of the substitutes retained the manufacture of pure quinine as the ultimate aim of introducing cinchona into British India.¹²⁰ Small wonder, then, that the managers of the cinchona factory at Mungpoo would gradually invest their newfound prestige in claiming expertise on manufacturing quinine. Already in 1872, the caption of an anonymous sketch published in *The Graphic* (see Figure 4.3) contained the claim that all the various activities undertaken in the cinchona plantations in the region were connected to the ultimate goal of 'the production of quinine in India'.

In March 1888, James Alexander Gammie, then Resident Manager of the government cinchona cultivation at Darjeeling, filed an application for patent. It involved a process of extracting quinine, pure and cheap, which he claimed to have invented.¹²¹ George King, the Superintendent of the Royal Botanic Gardens in Calcutta and the cinchona cultivation of Bengal, endorsed Gammie's claim. King suggested that the process could enable the extraction of the whole quinine inherent in cinchona barks. Such quinine, he claimed, would be 'undistinguishable, either chemically or physically, from the best brands of European

¹¹⁷ Clarke, to the Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAI).

¹¹⁸ Beatson, to the Officiating Secretary, the Government of India. Home, Medical, October 1879, 64–80 A (NAI).

¹¹⁹ G. King and C. H. Wood, 'Memorandum on the Desirability of Manufacturing Pure Alkaloids from *Succirubra* Bark', *Ibid.*

¹²⁰ *Ibid.* ¹²¹ Home, Patents, June 1888, 166–169 A (NAI).

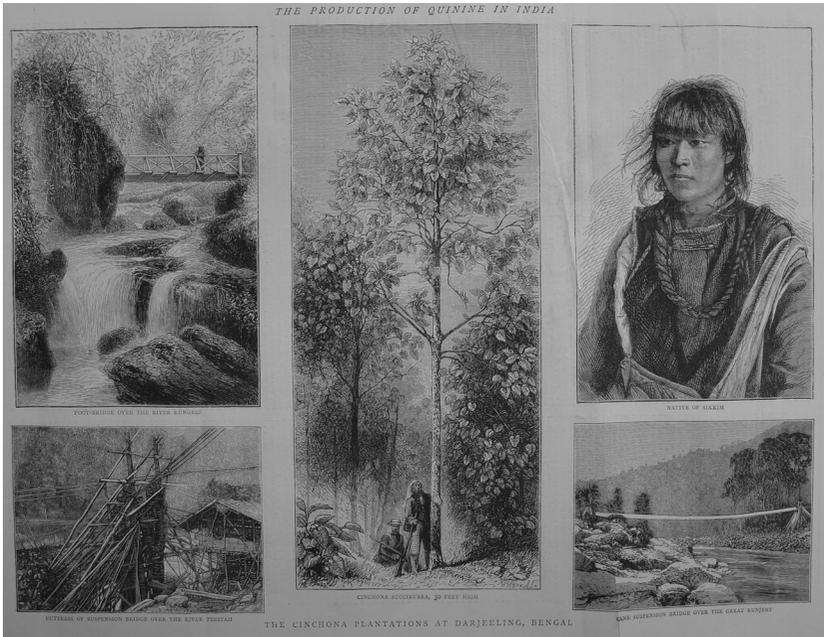


Figure 4.3 Artist unknown. 'The production of quinine in India, the cinchona plantations at Darjeeling Bengal; Cinchona succirubra 30 feet high'. *The Graphic* (October 26, 1872), 385, Author's collection.

quinine'.¹²² In recognition of this, Gammie and C. H. Wood, the ex-Government Quinologist in Bengal, received monetary awards from Viscount Cross, the then Secretary of State for India, in October 1889.¹²³ It might be tempting to place such detail as a happy ending to a teleological success story: 'The efforts of the Governments of Great Britain and Holland, to secure for their tropical subjects a cheap remedy for the commonest of all tropical diseases, have thus culminated in a more triumphant success than was ever anticipated.'¹²⁴ The official history of this accomplishment acquired the form of an uncomplicated linear narrative. King narrated the careers of J. Broughton, C. H. Wood and J. A. Gammie in British India, as part of a single, continuous story. The story constituted a journey from confusion in the art of chemical manufacture

¹²² G. King to the Secretary, Government of Bengal, Financial Department, No. 28 Q, 18 February 1888, Calcutta. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1-13 (WBSA).

¹²³ Home, Medical, December 1889, 12 A (NAI).

¹²⁴ Rev-Agriculture, Agriculture, November 1891, 29 B (NAI).

of quinine to perfection. King suggested that products like 'amorphous quinine, 'cinchona febrifuge', and 'Gammie's quinine' were indicative of cumulative progress in the method of extracting quinine from cinchonas grown in British India.¹²⁵

Instead, it is possible to read these as labels attached onto medical products. Such labels signified the hierarchical location of their manufacturers in relation to contending actors. The history of the manufacture of quinine in British India in the latter half of the nineteenth century was largely shaped by the ability of the manufacturers to sustain credible claims. It was no less informed by the abilities of others in contesting them. It was claimed, for instance, that samples of pure quinine were being manufactured 'in a remote place like Mungpoo'¹²⁶ from the early 1880s. Such claims had been faintly voiced earlier in British India. However, in the 1880s, these carried weight as never before, and indicated that Gammie, King and their colleagues in the government cinchona plantations and factory in British Sikkim had by then emerged as a collective force to reckon with. This converged with a situation when the superiorities of the Howards, the Whiffens and the office of Secretary of State for India were variously questioned in matters related to quinine. This, in turn, initiated a decade when quinine itself underwent considerable devaluation. The following sections explore such a conjuncture to explain how a convincing process of manufacturing cheap and pure quinine was 'invented' at Mungpoo in the late 1880s.

Cinchona Febrifuge: The 'Impure' as 'Desirable'

I have mentioned that C. H. Wood, the Government Quinologist in Bengal, began attempts to produce cheaper substitutes of quinine in the factory at Rungbee (Mungpoo) from his appointment in 1873. He worked very closely with George King, the then Superintendent of the Botanic Gardens, Calcutta, who was entrusted with the additional responsibility of the Superintendent of the Cinchona plantations in Bengal soon after Wood's resignation in 1879. King discharged these twin functions for more than a decade. In June 1875, Wood claimed to manufacture a 'mixture in the precipitated form of all the alkaloids present in the succirubra bark in the following combination: quinine (15.5 per cent), cinchonidine (29 per cent), cinchonine (33.5 per cent), amorphous

¹²⁵ King to Secretary, Government of Bengal. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1–13 (WBSA).

¹²⁶ Ibid.

alkaloid (17 per cent), colouring matter (5 per cent)'.¹²⁷ Over the next three years, the preparation came to be widely circulated in Bengal.

In May–June 1878, elaborate correspondence ensued between Sir Richard Temple, the then Lieutenant Governor, J. F. Beatson, the Surgeon General, Indian Medical Department and senior medical bureaucrats including J. M. Cunningham regarding an official name for this 'substance' manufactured by Wood. Probable names discussed included quinetum, cinchona febrifuge, Darjeeling quinine and cinchona mixed alkaloids.¹²⁸ Such detailed discussions indicate that the 'substance' attributed to Wood had by then attracted considerable attention and interest amongst high-ranking officials in the bureaucracy. It was predictably suggested that the official name should not sound like a quack remedy. At the same time, it was proposed that the name should emphasise its differences from quinine. The medical bureaucrats wished to underscore its autonomous identity. 'Any pseudo-scientific name for it should be avoided... an appearance of scientific structure would lead many persons to regard it as denoting a compound of quinine, or some definite chemical body. The 'febrifuge' in reality is neither of these...'.¹²⁹ Despite significant reservations, the name cinchona febrifuge was adopted. The decision appears to have been motivated by the concern of appealing to the people and 'to the natives' and reveals an official ambition extensively to circulate and distribute the medicines manufactured in Rungbee under this specific name. Officials considered the term quinetum as 'a purely fanciful name, which would be unintelligible to the natives of the country'. Besides, as the preparation was already known as cinchona febrifuge in various parts of Bengal, it was felt that any change of name would affect 'public' trust in the drug.¹³⁰

Since its introduction into the market in March 1875, the drug circulating as cinchona febrifuge had been variously compared with quinine. Cinchona febrifuge derived considerable legitimacy through numerous such acts of comparison. It gradually emerged as a respectable substitute for quinine: '... Somewhat less powerful than *pure quinine*... The taste appears to be nearly that of quinine... it is a very good *substitute* for quinine... [emphasis mine]'.¹³¹ A collage of reports compiled by J. F. Beatson, Surgeon General, Indian Medical Department in October 1879 suggests extensive use of cinchona febrifuge in all native

¹²⁷ R. Cockburn, to A. P. Howell, No. 307, 5 June 1875, Fort William. Home, Medical, August 1875, 49–58 A (NAI).

¹²⁸ Beatson, to The Officiating Secretary, Government of India. Home, Medical, September 1878, 126–128 A (NAI).

¹²⁹ Ibid. ¹³⁰ Ibid.

¹³¹ Cockburn to Howell. Home, Medical, August 1875, 49–58 A (NAI).

hospitals, military and civil.¹³² Official physicians associated with the military regiments tended to prefer cinchona febrifuge to quinine. Reports submitted by Surgeon Major W. E. Allen of the Bhopal battalion, Surgeon General R. W. Cunningham of XV Sikhs, Sealkot and Surgeon Major F. Odevaine, for instance, revealed a bias in favour of cinchona febrifuge. Odevaine claimed to have treated 600 cases of malarious fever in a regimental hospital exclusively with the drug; 593 were discharged 'cured', while the rest survived. Beatson, was doubtful if quinine would achieve better results: 'When nausea, headache, etc are attributed to the "cinchona" febrifuge by the opponents to its use, it is left to be inferred that quinine is free from all such noxious qualities; but what practical physician is not aware how often it is contra-indicated . . . ?'¹³³

Cinchona febrifuge was also projected as cheaper and more affordable, and its use instead of quinine was upheld as an effective cost-cutting measure. In view of the ever-mounting price of quinine in the late 1870s, more extensive circulation of cinchona febrifuge was proposed as an economical and benevolent step. In October 1879, cinchona febrifuge was available for Rs. 16 per pound from the government stores. In comparison, the prevalent price of quinine in the Calcutta market was shown as Rs. 25 an ounce. Consequently, it was argued: 'If introduced instead of quinine a greater saving will be effected than if all the other drugs put together were purchased at half price . . .'.¹³⁴ The introduction of cinchona febrifuge into all the native hospitals of Bengal to an amount of 75 per cent in lieu of quinine, it was hoped, would effect a considerable saving.

The late 1870s witnessed a curious situation when a lesser substitute appeared to be favoured over the drug it tried to simulate. In the hierarchy of drugs, the status of cinchona febrifuge underwent substantial changes. It had begun competing with quinine in the drug market. Cinchona febrifuge seemed to displace drugs circulating as quinine from the government hospitals as the principal cure of malarial diseases. In December 1878 for example the medical officer of the 43rd Regiment Assam Light Infantry abandoned the use of quinine altogether in favour of cinchona febrifuge in both his military and civilian practice.¹³⁵

Such acts of substitution were witnessed in military hospitals for Indian troops in the British imperial army in most presidencies. In the Bengal presidency, cinchona febrifuge displaced quinine to the extent of 75 per cent. Two-thirds of the stock of quinine was replaced by

¹³² Beatson to the Officiating Secretary, the Government of India. Home, Medical, October 1879, 64–80 A (NAD).

¹³³ Ibid. ¹³⁴ Ibid. ¹³⁵ Ibid.

cinchona febrifuge in these hospitals in Bombay Presidency. By February 1879, Madras had not, however, agreed to such proposals.¹³⁶ In March 1879, W. Walker, Inspector General of the Civil Hospitals and Dispensaries, North-Western Provinces and Oudh, compared the therapeutic and economic values of the two drugs. On the basis of observations made in police and jail hospitals and dispensary practice, he suggested that cinchona febrifuge should be considered half as effective as quinine. He argued that so long the price of quinine remained more than double that of cinchona febrifuge, such acts of substitution made sense. On the basis of Walker's recommendations, the use of imported quinine and cinchona febrifuge was prescribed in the proportion of one-fourth and three fourths, respectively.¹³⁷

Cinchona febrifuge was often blamed for causing harmful side effects, including intense nausea and gastric irritation. Howard attributed these reactions to the 'noxious properties' inherent in the 17 per cent of 'amorphous alkaloid' present in the drug. At a time when cinchona febrifuge had begun commanding considerable respectability, de Vrij wrote a report emphasising the 'desirability' of retaining such 'nauseating principles' in the drug. The elimination of the 'amorphous alkaloid', he suggested, could be an expensive process, which would 'frustrate the humane purpose of the government to procure a cheap febrifuge for the numerous population of India'. de Vrij went on to argue that the elimination of the 'nauseating principle' would require the mediation of 'different liquids'. Such 'offensive impurities' would contaminate the 'nature' of the alkaloids, he feared. The nauseous side effects associated with the cinchona febrifuge had to be tolerated then as necessary and even desirable.¹³⁸

Successive Superintendents of the cinchona plantations in British Sikkim, the managers of the cinchona factory at Rungbee and their subordinates had since the late 1860s asserted themselves as experts on the alkaloid chemistry of the cinchonas. The extensive circulation of cinchona febrifuge in the late 1870s suggests that such claims acquired considerable credibility in different parts of British India. However, cinchona febrifuge had also aroused the interests and anxieties of officials, chemists and businessmen beyond the borders of mainland British India. J. E. Howard had grown intensely inquisitive about the functioning of the

¹³⁶ Government of Bengal, 'Register no. 1231, Diary no. 92 Medical', No. 937, 24 February 1879. Home, Medical, May 1879, 16–18A (NAI).

¹³⁷ W. Walker to the Secretary, Government of the North-Western Provinces and Oudh, No. 49, 3 March 1879 Lucknow. Home, Medical, May 1879, 19–21 A (NAI).

¹³⁸ 'Enclosure no 6'. Home, Medical, 1882, November, 67B.

cinchona plantations and factory in British Sikkim around 1878.¹³⁹ In August 1880, Lieutenant-Colonel T. Cadell, the Chief Commissioner of the Andaman and Nicobar Islands, ordered the issue of three grains of cinchona febrifuge daily to 1000 labouring convicts in the Northern districts of the island. In the southern districts, similar doses were to be made available to 500 labouring convicts. He argued that such distribution of febrifuge would reduce rather than enhance expenditure because those who received 'the cinchona febrifuge will not receive the much more expensive milk ration'.¹⁴⁰ Far away in Trinidad in May 1881, the Surgeon General was contemplating a substitution of quinine manufactured in England by cheaper cinchona febrifuge, for use in the island.¹⁴¹ Earlier in April, Mr Mitchell, the Emigration agent for Trinidad in Calcutta, had suggested the same. He proposed that a supply of cinchona febrifuge could be secured at cost price directly from the government factory in British Sikkim. The drug would then be recommended to the indentured immigrants in Trinidad.¹⁴² Cinchona febrifuge, thus, tended to serve the cost-effective managerial needs of the colonial medical bureaucracies. It was as well showcased as an object of 'botanical curiosity', and was solicited as an exhibit at the National Museum, Washington, in August 1881.¹⁴³

Writing in 1888, J. A. Gammie claimed that cinchona febrifuge had inspired the manufacture of similar drugs in England and Holland. Those drugs, he suggested, circulated under the name quinetum, but credit for the preparation belonged to India: 'It is a remedy for which the whole world is indebted to India.'¹⁴⁴ Such assertive claims were followed by elaborate statistical detail, conveying the enormous scale of profit enabled by the venture of manufacturing cinchona febrifuge at the factory in Rungbee. Gammie claimed that the supply of cinchona febrifuge from the factory at Mungpoo increased from 1940 pounds in 1875–1876 to 87,704 pounds in the late 1880s. The price of the commodity was shown as uniform; at 16 rupees 8 annas per pound. In the same period the average price of quinine in London appeared as 8s. 4 and ½ d. per ounce. Gammie added, 'The sterling value (calculated at this rate) of 87,704 pounds of quinine would be £587,616, while this

¹³⁹ Howard Private papers: ACC/1037/693/1–3 (LMA).

¹⁴⁰ T. Cadell to Officiating Secretary, Government of India, Home, Revenue and Agricultural Department, No. G426–448, 12 August 1880 Port Blair. Home, Port Blair, October 1880, 30–32 A (NAI).

¹⁴¹ The Surgeon General to the Colonial Secretary, 27 May 1881, Trinidad. File 929, June–July 1881, IOR/L/PJ/6/42 (BL).

¹⁴² Home, Medical, January 1882, 36 B (NAI).

¹⁴³ Home, Medical, April 1882, 20–22 A (NAI).

¹⁴⁴ Gammie, 'Manufacture of Quinine in India', 141.

quantity of febrifuge has actually been delivered to the Indian consumer for the sum of Rs. 14,47,116. The actual saving to India has, therefore, been very great, and the capital account of the plantations (about 11 lakhs of rupees) has been covered several times'.¹⁴⁵ Earlier, the Report of the Government cinchona plantation in Bengal and of the Government Quinologist for 1880–1881, had suggested that 'total savings' resulting from the substitution of cinchona febrifuge for quinine amounted to 'more than 16 Lakhs of rupees'.¹⁴⁶ In February 1888, George King similarly claimed that the saving to the government by the substitution of quinine by the febrifuge amounted to 25 lakhs of rupees, 'which is more than twice the total capital cost of the Sikkim plantation'.¹⁴⁷

By the early 1880s, the managers of the cinchona plantations and the factory in British Sikkim started asserting considerable authority in the world of pharmaceutical chemistry as producers of cinchona febrifuge. It was hardly, however, an easy process. Cinchona febrifuge came under attack from different quarters. The proposal to substitute cinchona febrifuge for quinine was firmly resisted in the Madras Presidency by G. Smith, the Surgeon General, Indian Medical Department for Madras. Reports received from subordinate officials in the Presidency failed to convince him of the relative merits of cinchona febrifuge vis-à-vis quinine.¹⁴⁸ In the late 1860s, efforts at manufacturing medical preparations from cinchona barks began at Ootacamund and British Sikkim almost simultaneously. At this time J. F. Broughton was the Government Quinologist to the Madras Presidency and Thomas Anderson followed by C. B. Clarke were Superintendents in-charge of cinchona cultivations in Bengal. Early efforts were characterised by collaborations between them. They exchanged insights and travelled into plantations managed by one another.¹⁴⁹ I have already mentioned that efforts at manufacturing drugs were discontinued at Ootacamund in 1875. This made the position of the Quinologist of Madras redundant, and Broughton resigned. The post was not filled until the mid-1880s. Meanwhile, the factory at Rungbee had begun manufacturing cinchona febrifuge amongst other substitutes of quinine. Cinchona barks grown in Madras were instead made to travel into England, where they were auctioned and made available to the highest bidder. This was how long-standing pharmaceutical interests represented by the Howards or the

¹⁴⁵ *Ibid.*, 141–142. ¹⁴⁶ Home, Medical, 15–16 A, August 1881 (NAI).

¹⁴⁷ G. King to the Secretary, Government of Bengal. Finance, Miscellaneous, August 1888, File M Q/1, Prog. 1–13 (WBSA).

¹⁴⁸ Home, Medical, March 1879, 55–57 A (NAI).

¹⁴⁹ Clarke, to the Secretary, Government of Bengal. Home, Public, 24 December 1870, 128–132 A (NAI).

Whiffens could access them as cheap raw materials for manufacturing quinine. Earlier associations between the plantations in the Nilgiris and British Sikkim gradually faded. Instead, the managers of the plantations in the Nilgiris found themselves entangled in another network of pharmaceutical business marked by long-distant circulation of cinchonas. Madras was incidentally the only Presidency that had rejected the substitution of cinchona febrifuge for quinine. This decision may not have been entirely informed by apprehensions about the many vices associated with cinchona febrifuge.

It is then hardly surprising that the fiercest and most consistent voice against cinchona febrifuge should be J. E. Howards. In February 1879, for instance, Howard refused to consider the price charged for cinchona febrifuge by the managers of the factory at Rungbee as reasonable. He maintained that the government could be supplied with the 'mixed crystallised alkaloids' at the 'same or still lower price by the European manufacturers'.¹⁵⁰ In June 1881, he bolstered his earlier judgment by the following observation: '1 pound of sulphate cinchonine would cure 89 cases, at an expense of Rs. 5, whilst 1 pound of febrifuge might cure 65 cases, at an expense of Rs. 16, while with sulphate cinchonidine 101 cases would be cured, at an expense of less than Rs. 17... So much for the supposed cheapness of the febrifuge...'.¹⁵¹ In an earlier report he had asserted that the amorphous alkaloids inherent in the cinchona febrifuge 'are capable of producing death under a fearful aggravation of symptoms'.¹⁵²

Medical bureaucrats in British India appeared to believe that cinchona febrifuge was not suitable for European soldiers. A senior member of the Indian Medical Service, Dr Ker Innes, recommended against the employment of cinchona febrifuge in the European military hospitals and in British hospitals in substitution or supersession of quinine. Reports from the members of the British Medical Department reflected similar impressions. Cinchona febrifuge was seen as a 'crude and coarse' preparation that could only cure the Indians.¹⁵³

Such impressions were usually contested by medical bureaucrats representing the Bengal Presidency. These officials were located at various levels in the hierarchy, and included, for instance, medical officers

¹⁵⁰ J. E. Howard to Under Secretary of State for India, 22 February 1879, Tottenham. Home, Medical, June 1879, 17–19 A (NAI).

¹⁵¹ J. E. Howard to the Under Secretary of State for India, 21 June 1881, Tottenham. Home, Medical, November 1882, 67B (NAI).

¹⁵² J. E. Howard to the Under Secretary of State for India, 'Enclosure no. 2'. Home, Medical, February 1879, 53–57 A (NAI).

¹⁵³ J. M. Cunningham, 'Memorandum', 14 May 1878. Home, Medical, September 1878, 126–128 A; Home, Medical, November 1880, 111–119 A (NAI).

appointed by the East India Company, Dr Pilcher, the Surgeon to the Howrah Hospital, J. M. Cunningham, senior member of the Indian Medical Service and J. Irving, Surgeon General for Bengal.¹⁵⁴ Irving suggested that 'all medicines affect Europeans and Natives alike, and that the medicines which will cure fever or dysentery, or any other disease, in a native, will have the same effect on a European, I know of no facts to the contrary...'.¹⁵⁵ In a memorandum on cinchona febrifuge, Cunningham wrote, 'Papers... relating to the trial of the drug in European military hospitals... are disappointing. With exception of Lucknow and Delhi... the reports are against the use of this substitute of quinine amongst European soldiers... I confess that I do not understand the results, as I have taken the febrifuge frequently myself, and have seen other Europeans take it, with excellent results, and not a single symptom of nausea which is so much complained of'.¹⁵⁶

Officials based in the Bengal Presidency did not always express themselves as a homogenous group in defence of cinchona febrifuge. In June 1879, cinchona febrifuge faced attack from its manufacturers themselves, when Wood once again claimed to have manufactured a much more efficacious drug at the factory in Rungbee. It came to be recognised as triple sulphate. Wood and George King recommended it as a much more effective substitute for quinine than cinchona febrifuge. While trying to highlight the relative efficiency of the triple sulphate over cinchona febrifuge, they ended up exposing some of the limitations associated with the latter: 'In every instance, the triple sulphate has been found to be quite efficacious as the febrifuge... and free from the objections that attach to the latter preparation. Some even regarding it as fully equal to quinine... in large doses the triple sulphate creates less constitutional disturbance than the cinchona febrifuge...'.¹⁵⁷ King and Wood's claims were opposed by certain sections of the medical bureaucracy within the Bengal Presidency. In May 1879, the Surgeon General of Bengal, J. F. Beatson, disagreed with King and Wood, noting 'There may perhaps be claimed for the "triple" febrifuge... a slight superiority over the cinchona febrifuge; but at what an extra expenditure – the former costs Rs. 29–9–8, the latter Rs. 16 per pound, – while the price of the former might at any time be increased'. A committee earlier appointed to examine the

¹⁵⁴ C. Macaulay to The Officiating Secretary, Government of India, Home department, No. 631, 14 February 1879, Calcutta. Home, Medical, March 1879, 58–60 A (NAI).

¹⁵⁵ J. Irving, to The Undersecretary to the Government of Bengal, Judicial, Political and Appointment Departments, No. 111. B G, 24 January 1879, Calcutta. Ibid.

¹⁵⁶ Home, Medical, November 1880, 111–119 A (NAI).

¹⁵⁷ G. King and C. H. Wood, 'Memorandum'. Home, Medical, October 1879, 64–80 A (NAI).

recommendations from King and Wood turned them down.¹⁵⁸ Wood resigned as Chemical Examiner and Quinologist to the Government of Bengal in April 1879.¹⁵⁹

Drugs circulating as cinchona febrifuge thus faced opposition from a variety of quarters. Nonetheless, by the late 1870s, managers of the cinchona plantations and the factory in British Sikkim had begun engaging in effective negotiations with contending actors. The manufacturers of the extensively circulating cinchona febrifuge appeared to have acquired a set of allies and a vocabulary for articulating further ambitions. It was often recommended by various officials based in Bengal, for instance, that the practice of exporting Nilgiri barks to London be discontinued. Instead, the feasibility of converting these barks into cinchona febrifuge at the factory in British Sikkim was considered. Between June 1879 and May 1882, this suggestion was made at least twice.¹⁶⁰ Nothing much immediately emerged out of such proposals. However, they were symbolic of the esteem which products like cinchona febrifuge had brought to the factory at Rungbee. Such esteem, in turn, empowered its managers into indulging in the act of making more ambitious claims.

James Alexander Gammie succeeded Wood as the manager of the plantation and executive in-charge at the factory at Rungbee. In May 1881, George King asserted that Gammie's experiments at 'discovering processes for manufacturing quinine at a comparatively small cost' had proven successful. King suggested that Gammie had 'succeeded in turning out a crystalline preparation... free from the amorphous alkaloid... a pleasanter medicine than cinchona febrifuge in its present form... a very pretty preparation, being nearly as white as quinine itself...'.¹⁶¹ He went on to argue the case for the drug: 'appearance is undistinguishable from, and which on analysis proves to be quite as pure as, the best English quinine...'.¹⁶² King's claims appeared credible to several government officials in British India. Colonel R. H. Beddome, Conservator of Forests, Madras, visited the Darjeeling cinchona

¹⁵⁸ Beatson, to Officiating Secretary, Government of India. *Ibid.*; C. Bernard, Officiating Secretary to the Government of India to the Secretary, Government of Bengal, No. 385, 2 July 1879, Simla. *Ibid.*

¹⁵⁹ H. A Cockerell to the Officiating Secretary, Government of India, No. 1402, 24 July 1879, Darjeeling. *Ibid.*

¹⁶⁰ Home, Medical, June 1879, 43 B; C. Macaulay to Officiating Secretary, Government of India, No. 134, 23 January 1882, Calcutta. Home, Medical, May 1882, 58–61A (NAI).

¹⁶¹ G. King, *Nineteenth Annual Report of the Government Cinchona Plantations in British Sikkim*, 28 May 1881. Home, Medical, August 1881, 15–16 A (NAI).

¹⁶² G. King to Secretary, Government of Bengal, Medical and Municipal department, No. 65 Q, 14 May 1881 Darjeeling. Home, Medical, June 1881, 47–49 A (NAI).

plantations in December 1881. He recognised Gammie's preparations as 'very pure quinine'.¹⁶³ In July 1881, Dr Macnamara, the Examiner of the Medical Stores in Calcutta, presented a comparison between 'Mr Gammie's quinine' and 'Mr Whiffen's quinine'. He argued that 'Gammie's quinine' was of 'excellent quality' and 'in purity surpassed Mr Whiffen's manufacture'.¹⁶⁴ The response received from the office of the Secretary of State for India was, however, more lukewarm. It was admitted that the sample of 'Gammie's quinine' sent to England was indeed of 'excellent quality', but warned that Gammie's process would inevitably fail to extract the whole of valuable alkaloids from the barks, and could not profitably be undertaken on a 'large commercial scale'.¹⁶⁵ Drugs manufactured on a commercial scale at Rungbee would not be recognised unanimously as quinine until the late 1880s. However, it was agreed by many that Gammie's efforts in the early 1880s had resulted in considerable experimental success. It appeared that the art of manufacturing cheap and pure quinine no longer remained an elusive mystery to the managers of the factory at Rungbee. The increasing prominence of this factory was reflected in the shifting botanical identities of plants growing in the adjacent cinchona plantations.

'A Botanical Puzzle'

Along with alterations in equations of authority in the overlapping worlds of medical relief and pharmaceutical business, the botanical perceptions about particular cinchona plantations changed. In the early 1880s, King proposed a major shift in the geography of cinchonas growing in the British Indian plantations. I have already indicated that the barks of *suc-cirubra* cinchona trees, which were believed to thrive in British Sikkim in the Bengal Presidency, were considered poor in quinine content. In contrast, cinchona plants belonging to the *officinalis* and *calisaya* varieties which abound in the Nilgiris were considered rich in quinine. Such impressions survived at least till June 1883.¹⁶⁶ This neat division was

¹⁶³ R. H. Beddome to Secretary, Government Revenue Department, 12 December 1881, Bombay. Home, Medical, February 1882, 42 B (NAI).

¹⁶⁴ 'Enclosure no. 7: Copy of a report by Dr Macnamara, dated 29 July 1881,' Home, Medical, November 1882, 67B (NAI).

¹⁶⁵ Secretary of State for India to the Governor General of India in Council, 30 March 1882 India Office London. Ibid.

¹⁶⁶ F. C. Daukes, 'Cinchona', 30 June 1883. Home, Medical, January 1884, 9–11 A (NAI).

however disputed by King on his return from an official visit to Dutch Java in November 1879.¹⁶⁷

The greater part of King's report focused on a 'variety of calisaya'¹⁶⁸ in cultivation in Dutch Java. The bark of that particular variety was considered richer in quinine than any other bark ever imported from South America. Some of the Dutch samples had apparently revealed on analysis an extraordinary 13.7 per cent of quinine. That particular variety, King informed, was called ledgeriana. Disagreeing with preceding understandings, King asserted that quinine-rich varieties of cinchonas could thrive in the plantations at British Sikkim, suggesting that plants of ledgeriana had already survived there for more than a decade. The managers of the plantation, he claimed, had been unaware of its identity. His experience in Java apparently proved that 'three of our best kinds of calisaya are precisely the same as some of the forms of ledgeriana cultivated by the Dutch...'. He was satisfied that the 'true ledger calisaya' grew in Sikkim, and advocated that its cultivation should be maximised.¹⁶⁹

King did not mention whether he had carried any sample of ledgeriana from Java for comparison with plants in British Sikkim.¹⁷⁰ He seemed to rely more on the authority of the claim itself, and showed little interest in establishing his claims. He suggested that cinchona barks that yielded the Dutch such an alarmingly high percentage of quinine were raised from a parcel of seeds purchased in 1866 by the Dutch government from an English collector named Charles Ledger. The presence and survival of such ledgeriana plants in British Sikkim, however, did not seem out of place to King. He claimed that 'a pinch of those seeds' was purchased from Ledger in the 1860s by J. W. B. Money, a private planter in British India, who exchanged those seeds for succirubra with McIvor, the head of the government cinchona plantations at Madras Presidency. McIvor, in turn, conveyed them to a colleague based in Bengal. King claimed that those seeds 'were obtained at second hand from the Nilgiris'.¹⁷¹

King appeared to project the plantations he managed as pregnant with unlimited sources of quinine. This coincided with the claim that Gammie had acquired the technical skills of manufacturing experimental samples of pure quinine. King's observations barely seemed absurd to his contemporaries. There was no official report dismissing or even

¹⁶⁷ G. King to Secretary, Government of Bengal, Revenue department, No. 96 C, 22 November 1879 Royal Botanical Gardens, Howrah. Home, Medical, January 1880, 24–26A (NAI).

¹⁶⁸ Ibid. ¹⁶⁹ Ibid.

¹⁷⁰ C. Bernard, Officiating Secretary, Government of India to the Secretary, Government of Bengal, 8 January 1880, Fort William. Ibid.

¹⁷¹ J. H. Holland, 'Ledger Bark and Red Bark', *Bulletin of Miscellaneous Information (Royal Gardens, Kew)*, 1 (1932), 1–17.

questioning his claims. This could have been evidence of the authority King had begun commanding as the Superintendent of the cinchona cultivation in Bengal since late 1870s, and as a mentor to the increasingly significant cinchona factory at Mungpoo.

This also coincided with a phase of intense impasse in the botanical classification of cinchonas grown in the British Indian plantations. Robert Cross had been an associate of C. R. Markham in the exploration of the 'cinchona forests' of South America in the late 1850s. In 1879, Cross returned to South America to collect cinchona plants under instructions from the office of the Secretary of State for India.¹⁷² On his return, Cross claimed to have discovered considerable discrepancies involving the 'true identities' and names of different varieties of cinchonas grown in the government plantations. 'The plant hitherto termed cinchona succirubra is micrantha . . . the tree known on the estates as "McIvor's hybrid" and "pubescens" is the true cinchona succirubra . . . the plant designated "magnifolia" is the pata de gallinazo of the red bark regions of South America'.¹⁷³

Cross was not alone in asserting such discrepancies. Colonel R. H. Beddome, Conservator of Forests, Madras Presidency had similar reservations.¹⁷⁴ In 1881, Beddome was deputed to visit, inspect and report on the cinchona plantations in Ceylon and British Sikkim. He reported about similar confusion in identifying and naming plants in Ceylon. 'I was much interested to find the "pata de gallinazo" described by Mr Cross, the species hitherto known here as "magnifolia" . . . The same species is in Ceylon generally known as "hybrid" though it has other names and is sometimes called "condaminea" . . .'.¹⁷⁵ Lack of clarity about the identity of each species, argued Beddome, was detrimental to commercial interests. Having encountered a plantation of 'hybrid calisaya' near Nuwara Eliya, Beddome observed: 'The trees . . . would completely puzzle any botanist . . . whether they are distinct species or all forms of one very protean species . . . analysis is all important in a plantation of this sort, if profit is to be looked to . . . as forms apparently similar in every way may in some individuals be very rich in quinine and in others have no trace of it'.¹⁷⁶

This questioning of plants and their identities provoked responses beyond India. The authorities at Kew Gardens initially tried to distance

¹⁷² Home, Medical, June 1880, 26 B (NAI).

¹⁷³ Surgeon General Bidie to the Secretary to Government, Revenue Department, Madras, No.199, 3 March 1882. Home, Medical, April 1882, 80 B (NAI).

¹⁷⁴ W. T. Thiselton Dyer to L. Mallet, 24 January 1882 Royal Gardens, Kew. Home, Medical, May 1882, 37 B (NAI).

¹⁷⁵ Home, Medical, November 1881, 41 B (NAI). ¹⁷⁶ Ibid.

themselves, but later determined to resolve the confusion. The commercial value of cinchona trade appeared too great to allow such confusion.¹⁷⁷ This initiated a series of correspondence involving senior officials at Kew including Joseph Hooker, Thiselton Dyer, and Benj H. Paul of the Analytical laboratory in London, Hartington, the Secretary of State for India, Dr Trimmen, the Director of the Botanic Gardens at Ceylon, Dr Bidie and the Superintendent, Central Government Central Museum at Madras.¹⁷⁸

In this context King made two claims: first, the cinchona plants in the plantations in British Sikkim belonged as much to the calisaya varieties as they did to the succirubra species; second, the calisaya trees in British Sikkim actually belonged to the superior ledgeriana variety. It was a situation when the accepted identities of different varieties of cinchonas were subjected to intense scrutiny and revision. This explains why King's claims were not immediately denounced as absurd.

King's claims had their effects. The landscape of British Sikkim suddenly seemed compatible with the proliferation of quinine-yielding cinchonas. In 1881, he noted how the existing succirubra trees in British Sikkim were being gradually uprooted to make room for calisaya and ledgeriana.¹⁷⁹ Colonel Beddome, touring the plantations in British Sikkim in late 1881, noted that 200 acres had been assigned to plant 'young ledgeriana'. He found 150 calisaya and ledgeriana trees in British Sikkim as against 4,320,000 succirubra trees.¹⁸⁰ In the course of the 1880s, evidence suggests a gradual decrease in the number of succirubra trees in these plantations. This converged with a sharp rise in the number of quinine-rich yellow bark trees (i.e., ledgeriana, calisaya, verde, morada).¹⁸¹ By 1885, quinine-rich yellow bark trees in these plantations numbered more than 1,200,000.¹⁸² Writing in 1888, Gammie observed: 'Calisaya and its variety ledgeriana really thrives in Sikkim . . . succirubra has been supplanted by calisaya to the extent of about a million trees'.¹⁸³ Early 1880s onwards, the landscape of British Sikkim thus seemed particularly malleable to cultivate quinine-rich cinchona plants (see Figure 4.4).

¹⁷⁷ W. T. Thiselton Dyer to L. Mallet, 13 June 1882 Royal Gardens, Kew. Home, Medical, November 1882, 67 B.

¹⁷⁸ Ibid.

¹⁷⁹ From in-charge of the Cinchona cultivation in Bengal, No. 37, 28 May 1881, Home, Medical, August 1881, 15–16 A (NAI).

¹⁸⁰ Beddome to the Secretary to the Government. Home, Medical, February 1882, 42 B (NAI).

¹⁸¹ 'Resolution', 30 May 1884 Darjeeling. Home, Medical, June 1884, 81–84 A (NAI).

¹⁸² 'Resolution', 19 June 1885 Darjeeling Home, Medical, July 1885, 40–43 A (NAI).

¹⁸³ Gammie, 'Manufacture of Quinine in India', 142.



Figure 4.4 Photograph of a 'Ridge covered with *Cinchona Ledgeriana* in Munsong, British Sikkim'. Unnamed photographer. Credit: Wellcome Library, London.

Such impressions were reflected in a variety of official correspondence. In July 1882, for instance, a collection of plants and seeds belonging to the 'china cuprea' variety of cinchona, collected from South America and considered 'good quinine yielders' was sent to British Sikkim with the understanding that it would 'grow well' there.¹⁸⁴ In September 1883, a sample packet containing cinchona calisaya seeds was sent from South America through Messrs Christy of London to British Sikkim. The seedlings were eventually planted out, and 'thrived well'. Even when they were 'too young' to be classified with 'absolute certainty', Gammie preferred to identify them as *ledgeriana*.¹⁸⁵

Since the early 1860s, quinine-yielding varieties of cinchonas were considered the exclusive privilege of a very few plantations and particular landscapes. In the 1880s, however, such trees appeared much

¹⁸⁴ E. N. Baker to Secretary, Government of India, Revenue and Agricultural Department, 7 June 1882 Darjeeling. Home, Medical, July 1882, 15–16 B (NAI).

¹⁸⁵ Acting Superintendent, Cinchona plantations, Darjeeling to the Officiating Under Secretary, Government of Bengal, Financial Department, 17 September 1883, Mungpoo. Home, Medical, April 1884, 46–47 B (NAI).

less rare than before. Newer assertions of pharmaceutical authority and shifts in the geographies of quinine-rich cinchonas happened simultaneously. Revisions in the botanical knowledge about cinchonas appeared to reflect the unprecedented prominence of British Sikkim in the world of drug manufacturers. This converged with a decade-long devaluation of quinine as a medical commodity which, in turn, was related to a temporary decay in the prestige commanded by the erstwhile experts in the manufacture of pure quinine.

An 'Experiment' in London

The year 1880 saw crucial changes in the office of the Secretary of State for India, as the Marquis of Hartington replaced Viscount Cranbrook. This office had been so long preoccupied with liaising efforts relating to the manufacture of pure quinine in British India. Correspondence between the managers of cinchona plantations and factories in British India and the European and Javanese experts on quinine were either received through this office or carried in its name. The most significant role performed by this office between the late 1860s and 1880 was mediation, in the course of which the office exercised considerable agency. Under Hartington, however, the office began intervening more directly, becoming more assertive in relation to contending actors. The tone was set by disagreement with some of the measures proposed by King. King's report on his trip to Java had concluded by proposing new sites where cinchona plantations might be contemplated, for instance, in the Andaman Islands, Khasia hills and Burma.¹⁸⁶ This was followed by extensive initiatives relating to King's proposed trip to the Andamans for supervising the selection of prospective sites.¹⁸⁷ The Secretary of State, however, considered King's proposals not 'necessary or desirable'.¹⁸⁸

In September 1880, the Secretary of State proposed an 'experiment'. The auction of cinchona barks (exported from the government plantations in the Madras Presidency to the highest bidder) in London was to be discontinued. Instead, quinine and 'other alkaloids' were to be extracted from the Madras barks in London by 'established quinine

¹⁸⁶ King to Secretary, Government of Bengal. Home, Medical, January 1880, 24–26A (NAI).

¹⁸⁷ Home, Medical, February 1880, 53–54 B (NAI).

¹⁸⁸ Secretary of State for India to Governor General of India in Council, No. 85 (Revenue), 14 October 1880 India Office. Home, Medical, December 1880, 51 A (NAI).

manufacturers', on government account, precisely for the British Indian market. The experiment was supposed to be consonant with the declared governmental goal of distributing pure quinine in British India at the cheapest possible price. The Howards and the Whiffens were asked to tender and submit detailed responses. The Howards agreed to receive all the Nilgiri bark sent to London and in return to supply the government with as much quinine and alkaloids as they might require. They suggested the following conditions: 'Government would be their own analysts, and would receive a price proportional to such analysis; . . . and Government would also be gainers by the saving in brokerage and intermediate profits . . .'.¹⁸⁹ After 1880, auction of Nilgiri barks in London was discontinued, but the Howards retained convenient access to the Nilgiri barks. The alliance with the office of the Secretary of State for India was presumably profitable: in April 1883, having extracted 803 pounds of febrifuge from a consignment of 200 bags of red cinchona bark, Messrs Howard and Sons earned £441.¹⁹⁰

In March 1882, the office of the Secretary of State reacted adversely to suggestions that the manufacture of quinine in Sikkim could be initiated on a large scale in accordance with the method proposed by Gammie. Recommendations that a large factory be set up in British Sikkim to utilise the Nilgiri barks in addition to the barks from Darjeeling were rejected on the grounds that the process was not new and had little to offer.¹⁹¹ The Secretary of State instead suggested that barks from the Darjeeling plantations could be 'more profitably worked in England for the extraction of sulphate of quinine than in India'. He asked for 600 bales of different kinds of barks from Darjeeling in London to verify his assumptions. His suggestions in turn were firmly resisted by senior bureaucrats in Bengal,¹⁹² including King, J. M. Cunningham and the Lieutenant Governor. In the early 1880s, it seemed that the managers of the cinchona factory in British Sikkim and the Office of the Secretary of State for India were competing for access to cinchona barks produced in British India.

¹⁸⁹ Secretary of State for India to Governor in Council, Fort St George, Madras, No. 39 (Revenue), 16 September 1880, London. Home, Medical, November 1880, 103–108 A (NAI).

¹⁹⁰ Secretary of State for India to Governor General of India in Council, No. 32 (Revenue), 8 May 1884 India Office. Home, Medical, June 1884, 50–54 A (NAI).

¹⁹¹ Secretary of State for India to Governor General of India in Council, 30 March 1882, India Office London. Home, Medical, November 1882, 67 B dated 30 March India Office London, 1882. See especially 'No. 1 Enclosure. Report on the manufacture of Sulphate of Quinine and other Cinchona alkaloids on Government account'.

¹⁹² Government of Bengal, 'Cinchona', No. 370, 15 February 1883. Home, Medical, April 1883, 38–40 A (NAI).

As I have indicated, the control of the Secretary of State over the barks grown in the Nilgiris was much more complete.¹⁹³ In the early 1880s, private business interests based in the Madras Presidency were keen on procuring cinchonas grown in the government plantations in Madras. By April 1882, Messrs Croysdale and Co., Messrs Parry and Co., Messrs Dymes and Co., and Messrs F Muraglia and Co. had made several applications to the Acting Commissioner of the Nilgiris to allow the auction sale of the Madras barks at Messrs Oaks and Co.'s salesrooms in Madras itself. Such sales were quite profitable, but were rarely organised. N. A. Roupell, Acting Commissioner of the Nilgiris explained the situation: 'It is the wish of the government that a local demand should be developed without interfering with the experiments now in progress in England for the manufacture of quinine and other alkaloids from the government plantation bark. It will be necessary, therefore, that the sales would be limited . . .'.¹⁹⁴

While engaging the 'established manufacturers' in extracting quinine and other forms of febrifuge in London on its behalf, the office of the Secretary of State faced certain difficulties. Most of these related to transport insurance and irregularities involving freight charged on shipment.¹⁹⁵ However, the most irreparable oversight in relation to the Secretary of State's experiment surfaced in the official registers after June 1883. It was the fear of overproduction and wastage. It was admitted on behalf of the office of the Secretary of State for India that the 'result of the manufacture in London during the last three years has been to accumulate a stock both of quinine and other alkaloids, and of febrifuge, for which there is no immediate demand in India'.¹⁹⁶ The stock, it was feared, would outlast the anticipated demand in British India for many years. This could initiate a phase of unprecedented devaluation of quinine in British India.

However, it might be naïve to consider 'demand of quinine and febrifuge in British India' as a disinterested and objective description. Knowledge of such demand or the lack of it was contingent upon projections and mediations from officials based in British India. The agency of the managers of the cinchona factory and plantations in British Sikkim, senior officials in the medical depot and medical bureaucracy

¹⁹³ For an understanding of the varied terms and modalities of correspondences between the Madras Government and the Office of the Secretary of State for India see, Home, Medical, February 1882, 65B (NAI).

¹⁹⁴ Home, Medical, May 1882, 36 B (NAI).

¹⁹⁵ Home, Medical, February 1882, 53 B; Home, Medical, October 1881, 86 B (NAI).

¹⁹⁶ Secretary of State for India to the Governor General of India in Council, No. 68 (Revenue), 18 October 1883, India Office London. Home, Medical, January 1884, 9–11 A (NAI).

in Bengal, and their colleagues and subordinates towards circulating such perceptions can hardly be exaggerated.¹⁹⁷ In a memorandum titled 'Cinchona' submitted by the British Indian medical bureaucrat F. C. Danvers in June 1883, the accumulated excess stocks of quinine and cinchona febrifuge were reported as 3595 pounds and 7576 pounds, respectively.¹⁹⁸ As a trademark of the government, these had already been coloured with carmine before circulation in British India. These products were, therefore, considered 'unsaleable' in Europe.¹⁹⁹

The manufacture of quinine and febrifuge on government account in London from Nilgiri barks continued and inevitably augmented the accumulated stock. Worse still, the office of Secretary of State for India was anticipating fresh shipments of barks from the Nilgiris. This alleged inability to maintain parity between anticipated demand in British India and manufacture in London was admitted as a source of collective embarrassment which the Howards, the Whiffens and the office of the Secretary of State for India shared. To reduce the accumulated stock of surplus cinchona barks from Madras, the Howards were requested to accept payment for manufacturing charges entirely in bark instead of money.²⁰⁰ The remaining stock of barks consigned to the office of the Secretary of State from Madras, it was proposed, could be made available by 'the former system of sale by auction' in London. The Secretary of State for India was thus compelled to discontinue the experiment of engaging 'established manufacturers' to extract quinine and other alkaloids in London on government account from barks grown in the Nilgiris.²⁰¹ In March 1884, the Secretary of State thought it prudent to advise against any further shipment of cinchona barks from the Nilgiris to London.²⁰²

In the wake of this embarrassment, the Secretary of State for India was confronted with the challenge of distributing the accumulated stock of quinine and febrifuge in British India. It was a concern that plagued the office of the Secretary of State for India until November 1887. To get rid of the accumulated stock in London, the Secretary of State

¹⁹⁷ For instance, see A. J. Payne to the Secretary, Government of Bengal, Municipal Department, No. 2362, 9 April 1884, Calcutta. Home, Medical, June 1884, 36–43 A (NAI).

¹⁹⁸ F. C. Danvers, 'Cinchona', June 1883. *Ibid.*

¹⁹⁹ Secretary of State for India to the Governor General of India in Council. Home, Medical, January 1884, 9–11 A (NAI).

²⁰⁰ Danvers, 'Cinchona', June 1883. Home, Medical, June 1884, 36–43 A (NAI).

²⁰¹ E. N. Baker, to the Secretary, Government of India, Home department, 15 May 1884 Darjeeling, *Ibid.*

²⁰² Secretary of State for India to the Governor in Council of Fort St. George, 27 March 1884, India Office. Home, Medical, June 1884, 30–31 B (NAI).

decided to make the 'English-made febrifuge' available in 'special localities especially affected with malaria at a nominal price'. It was believed that it could reach out to the 'very poor classes who are unable to buy the Sikkim febrifuge'. The Secretary of State's proposals were driven by an aspiration to replace the Sikkim febrifuge by the 'English-made febrifuge' as the most benevolent face of medical governance in British India. It was feared by the Secretary of State that the 'English-made febrifuge' might not readily be purchased in British India even when offered at a nominal price. Alternatively, the stock of 'English-made febrifuge' could be considered for 'gratuitous distribution'.²⁰³ It was decided to distribute the 'English-made febrifuge' to 'out of the way places where the Indian febrifuge does not now reach'.²⁰⁴

The desperation with which the Secretary of State for India set out to dispose of the accumulated stock of quinine and febrifuge into dispensaries in British India was striking. It is hardly surprising that the managers of the factory and plantations in British Sikkim should use this opportunity to assert their relative superiority as manufacturers. In February 1885, King described the febrifuge manufactured in London as a lesser drug. He feared that the circulation of an inferior drug under the same name might tarnish the image of the febrifuge he was associated with. He proposed a couple of measures to enable the convenient delineation of these drugs as two different commodities. He suggested that either the London drug be purified in the Bengal factory or be coloured before issue to distinguish it from the Sikkim version. These comments suggest how British Indian bureaucrats had subjected the 'English-made febrifuge' as well as its manufacturers to vigorous condescension in the mid-1880s.²⁰⁵

In June 1884, following recommendations from the Secretary of State for India, it was decided to distribute the stock of quinine and febrifuge accumulated in London amongst the Bengal, Bombay and Madras Presidencies. A quarter of the stock was to be sent to the government of Madras. Another quarter went to the government of Bombay. The remaining half was to be sent to Calcutta for distribution in the Bengal Presidency. Subsequently, it was predicted on behalf of the government of India that the proposed transfer of accumulated stock of quinine would suffice for the requirements of the Medical Department

²⁰³ E. N. Baker to the Secretary, Government of India, Home department, 15 May 1884, Darjeeling. Home, Medical, June 1884, 36–43 A (NAI).

²⁰⁴ E. N. Baker to the Surgeon General Bengal, No. 262 T-M, 19 April 1884, Darjeeling. Ibid.

²⁰⁵ G. King to the Secretary, Government of Bengal, Financial department, No. 23 Q, 19 February 1885, Howrah. Home, Medical, May 1886, 83–86 B (NAI).

in British India for many years to come, and would make any further indents unnecessary in the foreseeable future.²⁰⁶ In the mid-1880s then the image of quinine underwent crucial changes in the pharmaceutical market of British India. It ceased to be seen as a rare and expensive drug. By the latter half of the decade, quinine revealed itself as a commodity in overabundant supply. It was going through a phase of considerable depreciation in value. These were reflected in the price charged for the commodity.

An Expensive Substitute

Official reports from Bengal claimed that the price of cinchona febrifuge manufactured in British Sikkim remained relatively stable through the course of the 1880s, in contrast to the drastic reduction in the price of quinine imported from England.²⁰⁷ The difference between the price of quinine and cinchona febrifuge appeared considerably less than before. Quinine now figured as a much more affordable commodity, and cinchona febrifuge began to be considered an expensive substitute for a relatively cheap commodity. 'At present quinine can be bought freely in Calcutta for Rs. 2–1 per ounce. There is therefore comparatively little inducement to the public to buy febrifuge at about half that price. It was quite a different matter quite a few years ago when the bazaar rate of quinine was seven or eight times higher than at present...'.²⁰⁸

In November 1888, A. P. MacDonnell, the Secretary to the Government of India, expressed concern about the 'present high price of cinchona febrifuge' manufactured in British Sikkim. He pointed out that King had promised to sell quinine at the rate of Rs.1 per ounce or Rs. 16 per pound. By contrast, the Sikkim febrifuge was being sold at Rs. 16–8 per pound, a price which, he suggested, was introduced when the price of quinine was high enough to alienate the poorer classes. He argued that decline in the price of quinine should be followed by a corresponding reduction in the price of cinchona febrifuge.²⁰⁹

In response to such criticisms, King recommended the reduction of the price of cinchona febrifuge from Rs. 16–8 per pound to Rs. 14 per pound.²¹⁰ Quinine supplied to the Bombay depot in early 1889 was

²⁰⁶ The Government of India to Secretary of State for India, No. 31, 13 June 1884, Simla. Home, Medical, June 1884, 36–43 A (NAI).

²⁰⁷ Home, Medical, September 1886, 57–59A (NAI). ²⁰⁸ Ibid.

²⁰⁹ Home, Medical, November 1888, 43–44A (NAI).

²¹⁰ G. King to the Secretary, Government of Bengal, Financial Department, No. 2 Q, 3 January 1889, Seebore. Home, Medical, March 1889, 117–118 A (NAI).

invoiced at Rs. 16–7–9. In view of such a 'phenomenally low' price for quinine, the substitution of cinchona febrifuge for quinine made little sense. The Surgeon General of Bombay suggested that the proportion of such acts of substitution should be diminished from 75 per cent to 50 per cent.²¹¹

An annual report of the government cinchona plantation and cinchona factory in Bengal, published earlier in June 1887, took note of the 'extraordinary cheapness of quinine'. This cheapness was explained in terms of a 'series of years of depression' in the cinchona planting business.²¹² The 'real cause' was thought to be 'abnormal export' of cinchona from Ceylon. The planters in Ceylon were apparently uprooting cinchona trees to make room for tea. Such trees were feared to have become 'almost universally unhealthy'. The export of cinchona plants from Ceylon in the preceding three years, it was suggested, averaged a staggering fifteen million pounds annually.²¹³ The relative decline in the price of quinine vis-à-vis cinchona febrifuge also began to be felt beyond the shores of British India. Mr Butler, the Keeper of the Medical Stores in Jamaica, for instance, mentioned in 1887 that the cost of buying one ounce of cinchona febrifuge from British Sikkim was higher than importing equal amount of quinine from London. The Medical department of Jamaica reportedly paid Rs. 2–10 1/2 per ounce for Sikkim febrifuge as opposed to Rs. 2–9 3/8 per ounce for quinine.²¹⁴ In the distant United States, the decline in the price of quinine in the ten years following 1879 was reported as 'magical'. In five years it had fallen from \$3.40 per ounce to \$1.23 and in ten years to 35 cents.²¹⁵

From 'Discovery' to 'Invention'

It was in this context of an extensive slump in the price of quinine that Gammie claimed to have discovered a process for manufacturing cheap and yet 'very best and pure' quinine at the factory in Mungpoo.²¹⁶

²¹¹ G. King to Secretary, Government of Bengal, Financial Department, No. 106 Q, 22 July 1889, Seebpore. Home, Medical, October 1889, 19–21 A (NAD).

²¹² G. King to Secretary, Government of Bengal, Financial department, No. 25, 9 June 1887, Seebpore. Home, Medical, December 1887, 63–65 A (NAI).

²¹³ C. Macaulay, 'Resolution', 22 November 1887, Calcutta. Ibid.

²¹⁴ W. Fawcett to the Secretary of State for the Colonies, No. 1837, 6 June 1887, Jamaica. Home, Medical, October 1887, 64–70 A (NAI).

²¹⁵ I. M. Tarbell, *The Tariff in Our Times* (New York: The Macmillan Company, 1911), 93, 280 quoted in F. W. Taussig, 'Public Finance, Taxation and Tariff', *The American Economic Review*, 2, 1 (March 1912), 132–134.

²¹⁶ J. A. Gammie to Secretary Government of Bengal, Financial Department, No. 43c, 2 July 1888, Mungpoo. Home, Medical, January 1889, 38–41 A (NAD).

Erstwhile contenders of such claims did not voice much dissent. The alliance between the 'established manufacturers' and the office of the Secretary of State for India had just ended in crucial miscalculations and shared embarrassment. In the latter half of the 1880s, the Howards and the Whiffens appeared to distance themselves from questions concerning quinine manufacture in British India in pursuit of other preoccupations. Thomas Whiffen acquired the business of George Atkinson and Co. in 1887 and diverted more attention towards the manufacture of antimony compounds, clove oil, mercury sublimate, almond oil, vermilion, iodine, iodides, iodoform, bromides and camphor.²¹⁷ The Howards similarly found themselves entangled into other concerns. John Eliot Howard died at the age of 75 in 1883. David Howard, a nephew of J. E. Howard, and William Dillworth Howard, J. E. Howard's son, took over. J. E. Howard's death was preceded by considerable imprecision and confusion within the family, relating to clauses in the articles involving partnership. Hierarchical distinctions involving 'partner', 'senior partner' and 'sleeping partner' were subjected to probe and revision.²¹⁸ By April 1886, the Howards were considering suggestions for investing in synthetic preparations of quinine.²¹⁹

Parallel claims for manufacturing pure quinine were, however, received from private interests based in the Madras Presidency. Government efforts at manufacturing quinine had been abandoned at Ootacamund in the mid-1870s. The post of the Quinologist to the Government of Madras remained unoccupied for more than a decade. By the mid-1880s, supplies of Nilgiri barks exceeded the demand and were declared unwanted in the London market. Firms like Messrs Arbuthnot and Co. were keen on accessing and investing in those barks for the manufacture of quinine at a private factory in the Madras Presidency. A group of 'English capitalists' hired a scientific chemist, Dr E. L. Cleaver. Experimental manufacture began under his supervision at Calicut by September 1885.²²⁰ In response, the office of the Secretary of State for India and the senior officials in the Madras Presidency were discouraging. The Secretary of State appointed D. Hooper as the Government Quinologist of Madras. Under his supervision, attempts at manufacturing quinine at a government factory in Madras were resumed. Such efforts

²¹⁷ Rupert S. Law, *The End of a Chapter: The Story of Whiffen and Sons Limited, Fine Chemical Manufacturers* (London: Fisons, 1973), 7 (WL).

²¹⁸ Howard Private Papers. ACC/1037/706/2 (LMA).

²¹⁹ Howard Private Papers. ACC/1037/707/1,3 (LMA).

²²⁰ Note no. 1016 (Revenue), 11 September 1885. Home, Medical, November 1885, 52–54 A (NAI).

promised to consume the bulk of the cinchona barks cropped in the Nilgiris. Hooper claimed to have prepared a drug 'fluid cinchona febrifuge' and in July 1886, the Deputy Surgeon General with the Madras Government, G. Bidie, offered generous comments on the preparation. He described the product as 'efficient, safe, stable and cheap'.²²¹ Samples of quinine manufactured by Dr Cleaver on behalf of Messrs Arbutnot and Co. were subjected to analysis by Dr Cornish, the Surgeon General of Madras and Hooper. Cornish found it 'so far... not very satisfactory'.²²² Hooper predicted that the commercial value would be 'greatly impaired' in the 'present dogmatic state of the market'.²²³ Private interests in the manufacture of quinine based in the Madras Presidency failed to resist the claims of Gammie.

Such undermining of private initiatives towards extracting quinine in the Madras Presidency was hardly new. Proposals for setting up a private quinine manufactory had been mooted by one Colonel Henderson, a resident of Devala in the Nilgiri district in July 1882.²²⁴ Similar proposals were repeated in a detailed letter addressed by Messrs H. Stranborough, Hinde and others to the Under Secretary of State for India in January 1884.²²⁵ These failed to receive sympathetic consideration from the Office of the Secretary of State for India. The Office denied private proprietors of a proposed local factory on the Nilgiris the right to import alcohol free of duty, or to supply them with fuel at cost price or concessions in acquiring land.²²⁶

Thus the attitude of officials associated with British Indian governments towards private interests had been various and ambiguous. At one level, pharmaceutical families like Howards or Whiffens were recognised as 'established manufacturers' of quinine. Until the mid-1880s, the Office of the Secretary of State for India looked up to them for deriving legitimacy and initiating respectable alliances. This is not to overlook the different ways officials based in British India set limits to the authority asserted by these families.

²²¹ G. Bidie to the Secretary, Government of Madras, (Revenue), No. 0-276, 16 July 1886, Ootacamund. Home, Medical, May 1887, 44-51 A (NAI).

²²² M. A. Lawson to Secretary, Government of Madras (Revenue), No. 28, 9 July 1885, Ootacamund. Home, Medical, November 1885, 52-54 A (NAI).

²²³ M. A. Lawson to the Secretary, Government Revenue Department, No. 7, 1 May 1885, Ootacamund. Home, Medical, March 1886, 8-9 B (NAI).

²²⁴ F. Henderson to the Private Secretary to the Governor of Madras, 10 June 1882, Devala. Home, Medical, November 1882, 9B (NAI).

²²⁵ Note dated 21 January 1884, 9 Mincing Lane, London. Home, Medical, May 1884, 8-11 A (NAI).

²²⁶ Secretary of State for India to the Governor in Council, Madras, No. 29 (Revenue), 28 August 1884 London. *Ibid.*

Through the course of the 1860s, the usual attitude of the government towards private planters in British India, on the other hand, was one of patronage. This gave way to frequent bouts of competition, allegation and denial.²²⁷ At the same time, the office of the Secretary of State for India, as I have just noted, was more dismissive and discouraging towards private initiatives for extracting quinine in factories based in British India. Thus, different constituents and layers within the British Indian governments had to engage with diverse sets of private interests. These engagements manifested in a variety of ways over time. Ironically, as I will point out in what follows, the managers of the factory at Mungpoo vindicated their 'discovery' by evoking the private manufacturing interests based in British India.

In July 1888, Gammie claimed credit for having discovered a 'cheap process' for the manufacture of 'pure sulphate of quinine'.²²⁸ Both Gammie and King admitted that the market price of quinine had slumped into an unprecedented low in the latter half of the 1880s. In such a situation, the discovery of a cheap process might not have been considered an extraordinary achievement. Colman Macaulay, Secretary to the Government, observed that Gammie's process would never cost more than Rs. 25 per pound. However, he added, that quinine was then obtainable in the open market at similar or lower rates anyway.²²⁹ King predicted that the product resulting from this 'new process' could be circulated at Rs. 1 per ounce. In comparison, 'Howard's quinine', he continued, was 'obtainable in the open market at the unprecedented low rate of one rupee and nine annas per ounce'.²³⁰

However, both Macaulay and King acknowledged that the decline in the market price of quinine had been caused by 'entirely exceptional circumstances' – the 'abnormal exports' of cinchona barks from plantations in British Ceylon and Dutch Java. As a result, they argued, the barks from South America had been almost driven out of the market. This converged with the excessive production of quinine in London on government account. Macaulay and King predicted that such a situation would not continue for very long. The market would revert back to

²²⁷ For instance, see G. King to Secretary, Government of Bengal, Financial Department, 30 May 1881, Howrah. Home, Medical, June 1881, 47–49 A (NAI); Secretary of State for India to the Governor General of India in Council, No. 68 (revenue), 18 October 1883, London. Municipal, Medical, File 1, Prog.1–16, April 1884 (WBSA). See especially the allegations made by J. W. B. Money on 28 June 1875.

²²⁸ Gammie, to Secretary, Government of Bengal, Financial Department. Home, Medical, January 1889, 38–41 A (NAI).

²²⁹ Gammie, 'Manufacture of Quinine in India', 142.

²³⁰ G. King to the Secretary, Government of Bengal, Financial Department. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1–13 (WBSA).

the 'ordinary course'. The 'new process', it was argued, would enable the price to remain low despite the unpredictability of the market. The novelty in the discovery, it was claimed, lay in its ability to impose a 'permanent reduction' in the price of quinine.²³¹

Such apparent novelty inspired the government of Bengal to file an application requesting a patent for the process. It was communicated to the Bengal Government by T. T. Allen, Superintendent and Remembrancer of Legal Affairs, that such a petition could only be filed by an 'individual' in accordance with the Section 15 of Act XV, 1859. Such 'exclusive privilege' could only be granted to the 'inventor'.²³² Such legal compulsions necessitated the refashioning of the 'discovery' as an 'invention'.²³³ Gammie was chosen to file the application on behalf of the Bengal government citing himself as the 'inventor'. G. C. Paul, the Advocate General, advised the Bengal Government that once the patent had been granted it could be purchased from Gammie. The government could thereafter become the patentee by assignment and be entitled to all the rights and benefits accruing from the patent.²³⁴

Despite the application for patent, neither Gammie nor King appeared absolutely certain about the technical originality of the process. Neither the title of the 'invention' nor its description in the application mentioned the word quinine: 'A process for the extraction of the alkaloids from cinchona bark by means of alkalis and oil . . .'.²³⁵ King seemed confident that the process resembled the 'European oil processes' already in use. His detailed narrative of the history of the discovery acknowledged debt to the German quinine makers. He admitted that on his trip of Europe in 1884, he set out to 'discover' the process used in Germany.²³⁶ The *Calcutta Gazette* observed that the process was 'an adaptation of a Dutch plan of manufacture'.²³⁷ Wood himself admitted elsewhere that during his stay in Holland, King 'had acquired some valuable

²³¹ Gammie, 'Manufacture of Quinine in India', 142.

²³² T. T. Allen to Under Secretary, Government of Bengal, Finance department, No. 1489, 7 March 1888, Calcutta. Finance, Miscellaneous, File M Q/1, Pros 1–13 August 1888 (WBSA).

²³³ Government of Bengal, 'Diary no. 251', No. 1386, 27 March 1888. Home, Patents, June 1888, 166–169 A (NAI).

²³⁴ T. T. Allen to Under-Secretary, Government of Bengal, Finance, No. 395, 22 June 1888, Calcutta. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1–13 (WBSA).

²³⁵ R. L. Upton to the Under-Secretary to the Government of India, No. 2487, 24 March 1888, Calcutta. Home, Patents, June 1888, 166–169 A (NAI).

²³⁶ King to the Secretary, Government of Bengal, Financial Department. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1–13 (WBSA).

²³⁷ J. Gammie to the Secretary, Government of Bengal, Financial Department. No. 9, 1 June 1888, Mungpo. Ibid.

information regarding the paraffine oil process as used in the continental oil factories'.²³⁸

What Gammie and King considered original, unique and novel in their discovery was the declared intention. By indulging in the rhetoric of benevolence the managers of the factory at Mungpoo emphasised a place for themselves in the world of quinine manufacturers. The Bengal government rhetorically denied any desire to derive profit from the discovery.²³⁹ King suggested that quinine makers in England and Germany had so far concealed the process of making quinine as a 'trade secret'. Despite considerable increase in the consumption of quinine in the latter half of the 1880s, the manufacture of quinine was still restricted allegedly to an exclusive club of manufacturers. Only two firms in England and a few others in Germany claimed to manufacture it. This, King argued, was responsible for the high price usually commanded by quinine in the market. He justified the patent application as a means to protect private efforts in British India from the 'quinine-makers in Europe'.

King appeared to fear that the 'Mungpoo process' could be closely similar to methods pursued by European firms. Once the details of the 'Mungpoo process' reached Europe, King predicted, 'quinine-makers' could try to prevent its use by patenting an exactly similar process in British India. This could be a danger to the 'private cinchona growers' who might effectually be prohibited from using this process. This could leave the project of circulating cheap and pure quinine in British India incomplete. 'Government should patent the Mungpoo process and announce that it does so with the intention of allowing it to be freely used by any one in India'.²⁴⁰ A month later, in March 1888, Colman Macaulay, the Secretary to the Government of Bengal rephrased King's words: '... The application has been submitted on behalf of the Government of Bengal, with the view of only preventing any one concerned in the manufacture of quinine from obtaining a monopoly in India. Mr Gammie's application is merely filed as a bar to any other claim to patent the process in question...'.²⁴¹

The claim of 'inventing a new process' at the Mungpoo factory was thus founded on the promise of 'permanent reduction' in the price of quinine. The apparent insistence on a humanitarian agenda made

²³⁸ C. H. Wood, 'Memorandum on the fusel oil process of manufacturing quinine'. Rev-Agriculture, Agriculture, November 1891, 29 B (NAI).

²³⁹ Gammie, 'Manufacture of Quinine in India', 142–143.

²⁴⁰ King to Secretary, Government of Bengal, Financial Department. Finance, Miscellaneous, August 1888, File M Q/1, Pros 1–13 (WBSA).

²⁴¹ Government of Bengal, 'Diary no. 251'. Home, Patents, June 1888, 166–169 A (NAI).

the managers of the factory accountable to a range of scrutiny. Price emerged as a crucial index around which the credibility of manufacturers could be measured. 'What has been the average price of quinine for the year?'²⁴² Was Mungpoo indeed supplying quinine at the cheapest possible price? Such questions began to be asked from different quarters: the British parliament,²⁴³ contending private manufacturers,²⁴⁴ and officials based in the Madras Presidency.²⁴⁵ The question of price predictably figured while assessing the initiatives of the Madras Government towards manufacturing quinine. In response to such attempts in October 1890, one Dr Rice wrote: 'I don't understand why the manufacture of these alkaloids by Government should be so costly, it should be enquired whether the selling price of them is not kept up so as to cover losses in other branches of the department . . .'.²⁴⁶

The early 1890s witnessed the return of the Howards to prominence in British India. Henry Wellcome set up a few quinine depots in British India in the late 1890s. Manufacturers based in Dutch Java also started exploring the market in British India. They brought with them competitive conceptions of quinine and its fair price, and recurrently alleged that government quinine continued to remain more expensive than the market price. Focusing on the two decades following 1889, the next chapter will examine, amongst other questions, how the managers of the factory at Mungpoo negotiated these allegations.

Conclusion

The recognition that commercially produced drugs manufactured at the cinchona factory in British Sikkim in the late 1880s was quinine was thus an intensely political process. The discovery/invention attributed to Gammie was not an exclusively scientific event which reflected unprecedented pharmaceutical craft. It did not indicate a glorious ending to a straightforward teleological journey: from relative ignorance to more improved technology. Nor was it achieved within the walls of an insulated colonial factory. The discovery/invention of the process for manufacturing cheap and pure quinine in British Sikkim was instead founded on legal manoeuvrings, imperial rhetoric, strategic revisions in the

²⁴² Rev-Agriculture, Agriculture, December 1893, 14 C (WBSA). ²⁴³ Ibid.

²⁴⁴ Deputy-Secretary, Government of India to the Surgeon General, Government of India, No.166/7, 10 February 1888, Fort William. Finance, Miscellaneous, M 1R/27, December 1890, 3-6 B (WBSA).

²⁴⁵ A note from the Madras Government No. 706 A., dated 4 September 1890. Rev-Agriculture, Agriculture, November 1891, 29 B.

²⁴⁶ Ibid.

botanical identification of cinchonas, the increasing (political and commercial) preeminence of Mungpoo in the world of drug manufacturers, and the transitory retreat of contending actors (particularly the Howards, the Whiffens, the office of the Secretary of State for India, private manufacturing interests in Madras) at a time when the decade-long devaluation of quinine had reached its apogee.

Focusing particularly on the first half of the twentieth century, historians have justifiably argued that allegations about impurity, corruption and adulteration of quinine were made to explain the inefficacy of the drug in contemporary medical practice in British India.²⁴⁷ I have hinted that this tendency also existed in the two decades following the first establishment of quinine factories in British India in the late 1860s. However, what is especially noteworthy is that imperial officials in colonial departments, factories, laboratories and plantations across South Asia and beyond carried out the more fundamental debate about what could be considered pure quinine itself even as the drug continued to be recommended to patients as an efficacious remedy.

The mere convergence of prevalent techniques and necessary material ingredients could not inevitably guarantee a product the status of quinine in the second half of the nineteenth century. Whether manufactured in Ootacamund, Mungpoo or London such products could receive various labels, such as, 'Brown viscid quinium' or 'yellowish grey powder amorphous quinine', or white pure quinine. The various labelling of these products were contingent upon the shifting configurations of authority in the overlapping worlds of pharmaceutical business, colonial governance and scientific knowledge. Hierarchies between the expert manufacturer and the factory-in-tutelage were hardly absolute, stable and inflexible. Instead, these hierarchies indicated specific relations, which could be altered and reconfigured, between contending actors.

Thus, perceptions about who could or couldn't act as legitimate custodians of pure quinine varied along with these shifting relations of authority and subordination. In the preceding pages I have explored the myriad assertions, contestations and the emergence of newer nodes of authority to explain the shifting status of the factory at Mungpoo. Although initially ridiculed by the Howards to be producers of amateurish drugs like 'brown viscid quinium', this factory was recognised eventually in the early 1880s as manufacturers of 'a pretty preparation' which closely resembled the 'best English quinine'. Neither was the subordination of

²⁴⁷ See especially P. Barton, 'Powders, Potions and Tablets: The "Quinine fraud" in British India, 1890–1939' in J. H. Mills and P. Barton (eds.), *Drugs and Empire: Essays in Modern Imperialism and Intoxication, c. 1500–1930* (Basingstoke: Palgrave Macmillan 2007), 144–161.

the factory at Mungpoo to dismissive judgments from various European and Dutch experts of pure quinine permanent nor was the authority asserted by the Howards or Whiffen or de Vrij absolute. British Indian officials set limits to the reputation of the Howards in significant ways. Most glaringly in 1885, one might recall, George King discredited the London febrifuge manufactured by the Howards to be an inferior drug, which required further purification in the factory at Mungpoo.

Such fluctuating configurations of authority and subordination were both engendered by and reflected in the vibrant careers of drugs which were described as substitutes of pure quinine. Without addressing the history of these substitutes it is difficult to make sense of the historical commodification of pure quinine in British India. Pure quinine is an example of a commodity which was constructed in significant ways in reference to what were considered its substitutes. Producers of 'substitutes' like cinchonidine, cinchonine, quinetum, cinchona febrifuge, quinidine and mixed triple sulphate were crucial in delimiting, defining and contesting the prestige of pure quinine and its reigning experts. In the process these producers ended up asserting their own contending claims to authority over pure quinine.

For much of the period, pure quinine continued to figure widely in official correspondence as a rare, relatively inaccessible, distant drug. The imperial medical marketplace consisted of a plethora of widely circulating signifiers of pure quinine. It was suggested that pure quinine's physical characteristics, taste and therapeutic efficacies could be measured by mapping the more tangible substitutes like quinine brute, rough quinine, Darjeeling quinine and amorphous quinine. The insurmountable superiority of pure quinine, officials maintained, could be gauged comparatively from the perceived inadequacies of the substitutes: 'Cinchonidine is one-third the value of quinine'.²⁴⁸ Mixed triple sulphate 'is less intensely bitter than quinine; (it is a) white crystalline substance closely resembling quinine in appearance'.²⁴⁹ Cinchona febrifuge 'tastes nearly that of quinine . . . (is) less powerful than pure quinine . . . half as effective as quinine'.²⁵⁰

In the end, pure quinine, as a commodity-in-the-making in British India, was occasioned by Empire. This is why it tells us a lot about

²⁴⁸ Clarke to Secretary, Government of Bengal. Home, Public, 12 March 1870, 157 A (NAI).

²⁴⁹ Beatson to the Officiating Secretary, Government of India. Home, Medical, 64–80 A, 1879 October (NAI).

²⁵⁰ Cockburn to Howell, Home, Medical, August 1875, 49–58 A (NAI); Walker to the Secretary, Government of the North-Western Provinces and Oudh. Home, Medical, May 1879, 19–21 A (NAI).

Empire. The imperial assemblage that constructed pure quinine was constituted of a network of humans and nonhumans. The project of manufacturing it held together not only the contending aspirations of European pharmaceutical families, office of the Secretary of State for India, chemical examiners, peripatetic geographer-botanists, cinchona planters, managers of colonial factories, but also properties attributed to cinchona barks, alkaloids, colouring matter, alkalis, alcohol, oil, paraffine, labelled bottles, sealing wax and carmine. The history of manufacturing and maintaining pure quinine reminds us that such chains of human/nonhuman enmeshes could be amongst the indispensable constituents of Empire.

Pure quinine not only reinforced Empire as a profit-making enterprise couched by the rhetoric of benevolence, but also revealed it as a 'commodity spectacle': Administrators, planters and factory managers located in places as distant as Andaman, Ceylon, India, Java, Jamaica, Sumatra, Samaran and Trinidad were bound up by their preoccupations to produce and protect the purity of cheap quinine.²⁵¹ Apart from exposing an extensively interconnected imperial space, the history of manufacturing pure quinine reconfirms existing historiographical insights about the fault-lines and 'tensions of empire'.²⁵² The history of quinine manufacture contests the impression that Empire was characterised by unidirectional and uncomplicated flows of authority from London to the rest of the world.²⁵³ The question of pure quinine cemented alliances as well as deepened conflicts between the office of the Secretary of State, pharmaceutical business houses, and managers of colonial plantations and factories. Pure quinine thus immensely fractures the homogenous and monolithic image of Empire.

Pure quinine attracted the attention of a range of imperial workaholics across extensively dispersed geographical locations for more than three decades. Having acquired somewhat of a larger-than-life status, it nonetheless found itself embroiled in broader dehumanising processes. The production and distribution of pure quinine or its substitutes stoked various narratives of racial discrimination. Cinchona febrifuge, for example, was considered too 'crude and coarse' to suit for the delicate

²⁵¹ For commodity-spectacle, see A. McClintock, *Imperial Leather: Race, Gender and Sexuality in the Colonial Context* (New York and London: Routledge, 1995), 56.

²⁵² A. L. Stoler and F. Cooper, 'Introduction: Between Metropole and Colony: Rethinking a Research Agenda', in A. L. Stoler and F. Cooper (eds.), *Tensions of Empire: Colonial Cultures in a Bourgeois World* (Berkeley/Los Angeles/London: University of California Press, 1997), 1–46.

²⁵³ In the history of science this model has been epitomised by G. Basalla in 'The Spread of Western Science', *Science*, 156 (May 1967), 611–622.

constitutions of European soldiers serving in British India.²⁵⁴ In contrast, following a recommendation in 1880, Indian labouring convicts in the Andaman and Nicobar islands were not only forced to consume the same drug every day, but as an effective cost-cutting measure, on each such occasion they were denied their daily milk ration.²⁵⁵

The perceived material configurations of pure quinine closely indicate how scientific racism and what Anne McClintock in another context calls 'commodity racism' converged and sustained one another.²⁵⁶ Pure quinine was projected consistently in official sources as a 'white substance'²⁵⁷ which crystallised as 'beautiful, long needles', was bitter in taste and had a sweet smell. This metaphorical correlation of whiteness with purity is particularly striking considering impure quinine was frequently associated with yellow and brown. For example, 'amorphous quinine', which was produced by Broughton at Ootacamund was discarded by Howard as a 'yellow stuff, sticky like resin . . . on the whole a very impure preparation'.²⁵⁸ Similarly quinium, which was manufactured at Rungbee by Anderson in the late 1860s, was declared impure by officials on the basis of its 'brown viscid' appearance.²⁵⁹ In the process, pure quinine and its impure substitutes were anthropomorphised as they were shown to personify racial hierarchies of colour.²⁶⁰ It is further revealing to recall that yellowness, blackness and brownness figured around this time in various imperial reports as colours most closely associated with malaria.²⁶¹

Colonial bureaucrats warned that the purity of white quinine could be contaminated when exposed to Indian weather and the natives. As

²⁵⁴ Cunningham, 'Memorandum'. Home, Medical, September 1878, 126–128 A; Home, Medical, November 1880, 111–119 A (NAI).

²⁵⁵ Cadell to Officiating Secretary, Government of India, Home, Revenue and Agricultural Department. Home, Port Blair, October 1880, 30–32 A (NAI).

²⁵⁶ For commodity racism, see McClintock, *Imperial Leather*, 31–33.

²⁵⁷ Cockerell to the Secretary to the Government of India, Home, Revenue, and Agricultural departments. Home, Medical, October 1879, 64–80 A (NAI).

²⁵⁸ J. E. Howard to the Under Secretary of State for India, 21 June 1881, Tottenham. Home, Medical, November 1882, 67 B (NAI).

²⁵⁹ Anderson to the Secretary, Government of Bengal. Home, Public. 12 March 1870, 157 A (NAI).

²⁶⁰ For the links between scientific racism and whiteness see W. Anderson, *The Cultivation of Whiteness: Science, Health and Racial Destiny in Australia* (Durham: Duke University Press, 2006). For a recent commentary on the nineteenth-century racialisation of yellow see, M. Keevak, *Becoming Yellow: A Short History of Racial Thinking* (New Jersey: Princeton University Press, 2011), 70–122.

²⁶¹ J. Macculloch, *Malaria: An Essay on the Production and Propagation of this Poison* (London: Longman, Rees, Orme, Brown and Green, 1827), 429–430; G. Dodds, 'Tropical Malaria and its Sequels', *Edinburgh Medical Journal*, 23 (1887–1888), 1094; E. A. Parkes, 'Report on Hygiene for 1867', *Army Medical Department Report for the year 1866*, Volume viii, 1868, 316–317 (WL).

Broughton observed in 1871, ‘The purest and whitest alkaloids I have been able to prepare become coloured brown when exposed to the Indian sunshine...’.²⁶² It was feared that quinine became potentially impure whenever accessed by the native doctors, indigenous hospital assistants, fake patients or other handlers in the vernacular marketplace. The need to deploy a range of protective mechanisms including sealed bottles, carmine, patrol boats, police stations and glass cases with extra strong patent locks thus loomed large in the bureaucratic imagination.

This chapter has thus alerted us to details which histories dedicated exclusively to analysing either materiality or social construction of scientific facts often miss. Scientific knowledge about pure quinine, the material configurations of pure quinine and imperial politics were not only intimately entangled, but also co-constituted.

²⁶² J. Broughton, ‘Chemical and Physiological Experiments on Living Cinchonaey’, *Philosophical Transactions of the Royal Society of London*, 161 (1871), 8.