

MEDICAL ASPECTS OF DR LIVINGSTONE'S ZAMBESI EXPEDITION, 1858-1864

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Between 1853 and 1856, Dr David Livingstone (1813-1873) made the first of his major African journeys, from the West Coast (in modern day Angola) to the East (Mozambique).¹ During this transcontinental journey he became increasingly aware of the African slave trade, and he became convinced that the Portuguese, nominally the colonial masters of much of this territory, colluded in the traffic in human lives.² Livingstone determined that the solution to the problem of slavery would be to introduce British civilization, commerce and Christianity into the interior of Africa. On furlough between 1856 and 1858, he canvassed support for this idea, gaining the sponsorship of the British government for an expedition to the Zambesi river. At a meeting in the Senate House of the University of Cambridge on 4 December 1857, Livingstone called on the young men of the University to assist in completing his work in Africa,³ a consequence of which was the foundation of a University Mission to Central Africa and, subsequently, the sending of Christian missionaries to Africa. Livingstone and the Expedition party embarked on the *SS Pearl* at Liverpool in

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1 David Livingstone, *Missionary Travels and Researches in South Africa; Including a Sketch of Sixteen Years' Residence in the Interior of Africa, etc.* (London: John Murray, 1857); *Livingstone's African Journal 1853-1856*, ed. by I. Schapera (London: Chatto & Windus, 1963). For a summary of Livingstone's journeys abridged from his own writings, see *Livingstone's Travels*, ed. by J.I. Macnair (London: J.M. Dent, 1954). For biographies of Livingstone encompassing his travels, see R. Coupland, *Livingstone's Last Journey* (London: Collins, 1945); M. Gelfand, *Livingstone the Doctor: His Life and Travels. A Study in Medical History* (Oxford: Basil Blackwell, 1957); T. Jeal, *Livingstone* (London: Heinemann, 1973); O. Ransford, *David Livingstone: The Dark Interior* (London: John Murray, 1978).

2 M.D.D. Newitt, 'The Portuguese on the Zambezi: an historical interpretation of the Prazo system', *Journal of African History*, 10 (1969), 67-85.

3 *Dr Livingstone's Cambridge Lectures together with a Prefatory Letter by the Rev. Professor Sedgwick*, ed. by W. Monk, 2nd edn (Cambridge: Deighton Bell, 1860).

March 1858, beginning a journey which was to last for almost six years.⁴

Health problems dogged members of both the Expedition and the subsequent Mission, principally the ‘African fever’, a condition which had claimed the lives of many Europeans on previous expeditions in tropical Africa. Difficult and dangerous as it is to extrapolate from nineteenth-century disease categories to our own, this was most probably due to malaria; the Expedition took place in areas now known to be high risk for malaria. Livingstone’s favoured remedy for attacks of African fever, developed during his previous travels, was a combination of quinine and purgatives. To four grains of quinine were added resin of jalap eight grains, calomel eight grains, and rhubarb four grains, the whole mixed well together, made into pills with spirit of cardamoms and given when required in a dose of ten to twenty grains. Following the discharge of bile, quinine was given until the ears were ringing (‘cinchonism’). This mixture apparently relieved headaches and pain within four to six hours, and Livingstone reported it to be ‘successful in every case’. Amongst the members of the Expedition it became known colloquially as the ‘Zambesi rouser’. However, Livingstone found no prophylactic role for quinine: ‘It is decidedly curative but questionably prophylactic, if we deduct the effect on the imagination.’ For Livingstone the best preventative against fever was ‘plenty of exercise and abundance of good food’.⁵

Further medical observations from the Zambesi expedition were later reported in the British medical press by Dr Charles James Meller. He joined Livingstone in February 1861, almost three years after the Expedition had first reached Africa. He published two papers, the first in the *British Medical Journal* in October 1862. Meller characterised African fever as ‘asthenic and remittent’, whereas Livingstone’s previous report described the fever to be ‘sthenic and intermittent’, thus implying that the course of fever was more

4 David Livingstone and Charles Livingstone, *Narrative of an Expedition to the Zambesi and its Tributaries: and the Discovery of the Lakes Shirwa and Nyassa 1858-1864* (London: John Murray, 1865); *The Zambezi Expedition of David Livingstone 1858-1863*, ed. by J.P.R. Wallis (London: Chatto & Windus, 1956); *David Livingstone and the Rovuma*, ed. by G. Shepperson (Edinburgh: Edinburgh University Press, 1965); G. Martelli, *Livingstone’s River: A History of the Zambezi Expedition 1858-1864* (London: Chatto & Windus, 1970).

5 D. Livingstone, ‘On fever in the Zambesi’, *Lancet*, 2(1861), 184-86; see also *Zambesi Expedition of David Livingstone*, pp. 393, 52. In the subsequently published Livingstone and Livingstone, *Narrative of an Expedition to the Zambesi*, p. 73n, a slightly different recipe is given: six to eight grains of resin of jalap, same of rhubarb, three grains each of calomel and quinine made up into four pills with tincture of cardamoms. Moreover, Livingstone has two stabs at the recipe in his 1861 letter to the *Lancet*. Vegetable laxatives were a favoured remedy for many maladies around this time; for example, both jalap and rhubarb feature in the Vegetable Universal pills produced by the noted irregular James Morison, which were claimed to cure all diseases: Roy Porter, *Quacks: Fakers and Charlatans in English medicine* (Stroud: Tempus, 2000), p. 201.

chronic, if less severe acutely. However, Meller did endorse the regime of quinine and purgatives (the 'Livingstone specific'), but he quotes four grains of quinine, ten grains of rhubarb, eight grains of resin of jalap, and four grains of calomel, with quinine then given two to three hourly in a dose of five to ten grains until deafness was produced, the greater the deafness the speedier the restoration of the patient. This difference in regime does suggest a lack of uniformity in prescribing practice. Meller stated that with this treatment headaches associated with the fever might persist for three to seven days, hence he was less optimistic about its efficacy than Livingstone. It seems likely that Livingstone underplayed the medical hazards of Africa, not wishing to discourage immigration and colonisation. Meller agreed with Livingstone that quinine had no role as a prophylactic.⁶

Meller thought that African fever resulted from exposure to miasmata arising from decomposing vegetable matter. The miasmatic theory of malaria transmission was a common belief in the mid-nineteenth century. It was almost four years later that the mosquito vector transmission of malaria was demonstrated by Ronald Ross, shortly before his appointment to the Liverpool School of Tropical Medicine.⁷

Meller's second paper based on observations made on the Zambesi expedition was published in *The Lancet* in October 1864, with Meller titled 'surgeon-naturalist in medical charge'. There are a number of case reports, including details of Meller's own febrile illness which necessitated his return to the Cape for recuperation, from April to October 1862 (it seems likely his first paper was written and sent during this period). The case of Richard Wilson, a stoker on the Expedition, is presented: during a severe attack of fever his urine was noted to darken progressively, from deep green to brown to almost black, after which he became jaundiced, dull and listless. Subsequent readers have identified this account as almost certainly of blackwater fever, a complication of falciparum malaria due to break down of red blood cells within the circulation (intravascular haemolysis), sometimes precipitated by quinine, although Wilson had not received any medication. This report has subsequently been acknowledged as one of the earliest descriptions of blackwater fever in Africa, although it is not mentioned in the extensive monograph on the subject published in 1937 by Professor J.W.W. Stephens, who was for many years at

6 C.J. Meller, 'Fever of the South-East coast of Africa', *British Medical Journal*, 2 (1862), 437-40.

7 R. Ross, 'On some peculiar pigmented cells found in two mosquitoes fed on malarial blood', *British Medical Journal*, 2(1897), 1786-88; G.C. Cook, 'Ronald Ross (1857-1932): 100 years since the demonstration of mosquito transmission of Plasmodium spp. – on 20 August 1897', *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 91(1997), 487-88; G.C. Cook and A.J. Webb, 'Perceptions of malaria transmission before Ross' discovery in 1897', *Postgraduate Medical Journal*, 76(2000), 738-40.

the Liverpool School of Tropical Medicine.⁸

It was well known that Europeans in Africa were more susceptible to fever than the indigenous peoples. Travelling with Livingstone's party were a number of Johanna men, natives of the Comorro Islands off the coast of East Africa, 'hybrids of Arab and Negro' as Meller described them. The *Lancet* paper reports a quantitative analysis of fever incidence amongst the Europeans and the Johanna men, performed by Meller during April 1863. He found that the Europeans spent twenty per cent of their time on the sick list and were four times more likely to be struck by fever than the Johanna men. Natives of the river (Zambesimen) 'had almost perfect immunity'. For this work, Meller has been credited with having performed 'the first disease survey in Central Africa, on malaria'.⁹

Meller's papers seem at first sight to be pioneering contributions in the field of 'tropical medicine'. However, with the advent of further information, this analysis may be carried further. When Livingstone first conceived the Zambesi expedition, he was keen to have the services of a botanist to study the indigenous flora in the hope that plants suitable for commercial development might be discovered. On the recommendation of Sir William Hooker, Director of Kew Gardens, London, Livingstone appointed Dr John Kirk, a medical graduate of Edinburgh University and a keen botanist with overseas experience of collecting plants, to the post of 'Economic Botanist and Medical Officer' to the Expedition. It was Kirk who, at Livingstone's behest, equipped the Expedition with the necessary medical supplies, obtained from Apothecaries Hall, London, in February 1858, and Kirk who travelled to Liverpool in early March 1858 to embark on the *SS Pearl*. He had signed up for three years, but in the event served for almost the whole duration of the Zambesi expedition, much of time as *de facto* second-in-command to Livingstone. Kirk and Livingstone, trekking alone, became the first Europeans to reach Lake Nyassa (Lake Malawi) in September 1859. Livingstone wrote in his *Narrative* that Kirk:

Collected above 4000 species of plants, specimens of most of the valuable woods, of the different native manufactures, of the articles of food, and of the different kinds of cotton from every spot we visited, and a great variety of birds

8 C.J. Meller, 'On the fever of the East Central Africa. Encountered by Livingstone's Zambesi expedition', *Lancet*, 2(1864), 459-61, 520-22; G.C. Cook, 'Doctor David Livingstone FRS (1813-1873): "the fever" and other medical problems of mid-nineteenth century Africa', *Journal of Medical Biography*, 2 (1994), 33-43 (p. 35). J.W.W. Stephens, *Blackwater Fever: A Historical Survey and Summary of Observations Made Over A Century* (London: University Press of Liverpool/Hodder & Stoughton, 1937); P.J. Miller, "Malaria, Liverpool." *An Illustrated History of the Liverpool School of Tropical Medicine 1898-1998* (Liverpool: Liverpool School of Tropical Medicine, 1998).

9 M.S. King and E. King, *The Story of Medicine and Disease in Malawi. The 130 Years Since Livingstone* (Blantyre: Montfort Press, [n.d., published after 1992]), p. 12.

and insects; besides making meteorological observations, and affording, as our instructions required, medical assistance to the natives in every case where he could be of any use.¹⁰

Kirk kept a daily journal of his work and experiences throughout his time in Africa. Livingstone hoped Kirk would use this as the basis for his own account of the Expedition, focusing on botanical and medical issues not covered in his own *Narrative*. However, this did not come about, and it was not until 1965, one hundred years later, that Kirk's journals entered the public domain.¹¹ Its account of the expedition is often harrowing: it describes the hard labour of hauling the paddle steamer over shallows where its draught was too deep for the river, of cutting wood for its voracious and inefficient boiler; the mischievous behaviour of certain members of the Expedition; problems with the indigenous population; the ill-health and death of friends; the failure to realise the stated aims of the Expedition.

The journal bears out Livingstone's statement in his *Lancet* paper of 1861 that, for the treatment of African fever, 'Dr Kirk [...] entertain[s] the same opinion of the value of our pills as I do'. Initially Kirk envisaged diarrhoea as a mechanism for getting rid of malaria, but after a couple of years in Africa he was advocating quinine and magnesia or even quinine alone for slight febrile attacks, and reserving 'active purgatives' for more severe attacks. Kirk also observed the inefficacy of unbleached quinine, which was impure, as opposed to pure quinine, in the treatment of fever.¹²

Expedition policy regarding quinine prophylaxis is clarified by Kirk's journal. On the outward journey, Kirk records: 'Today we began the quinine (2 grains in half glassful of wine) to each man. We shall continue this daily.' However, two months later, once in Africa: 'Quinine again recommended. It has been intermitted for about 12 days.' Arrival at a marshy location again prompted the precautionary use of quinine. With this piecemeal approach to prophylaxis it is perhaps not surprising that it proved ineffective. Moreover, the dosages of quinine used were too low by modern standards.¹³

10 *The Zambesi Doctors: David Livingstone's Letters to John Kirk, 1858-1872*, ed. by R. Foskett (Edinburgh: Edinburgh University Press, 1964); R. Coupland, *Kirk on the Zambesi: A Chapter of African History* (Oxford: Clarendon Press, 1928); Livingstone and Livingstone, p. 10.

11 *The Zambesi Journal and Letters of Dr. John Kirk, 1858-63*, ed. by R. Foskett (Edinburgh: Oliver & Boyd, 1965). Very brief medical details were published in J. Kirk, 'Notes of two expeditions up the River Rovuma, East Africa', *Journal of the Royal Geographical Society*, 35(1865), 154-67 (p. 159).

12 *Zambesi Journal and Letters of Dr. Kirk*, pp. 272, 285, 323, 402-403.

13 *Ibid.*, pp. 23, 53, 145, 431, 484; *Zambesi Expedition of David Livingstone*, pp. 6, 77.

It is clear from Kirk's journal that Dr Meller's arrival in Africa in February 1861 came as a complete surprise to Kirk; evidently Livingstone had not informed him of his plans. Despite this difficult start, Kirk tried hard to get on with the newcomer but occasional comments in the journal suggest that he was not entirely enamoured of him.¹⁴

A comparison of the medical information contained in Kirk's journal and Meller's publications makes for interesting reading, since there are significant areas of overlap. As in Meller's 1864 *Lancet* paper, Kirk's journal, for February 1863, also relates the history of Wilson, the stoker with blackwater fever, and of Macleod, a blacksmith, who was similarly afflicted. In addition to the clinical features, Kirk gives an account of the findings in the urinary sediment:

When boiled, it almost solidified with a coagulum which was rendered more dense by nitric acid. Heated with nitric acid, it became bright green. Through the microscope nothing could be seen save a very few epithelium scales and mucus corpuscles, not a blood disc full or collapsed. The colour is most certainly due to bile; the mucus, a pus corpuscle, may come from anywhere [...] But whence comes the albumen in such quantities [?]

The circumstantial details provide added verisimilitude to what may be regarded as a remarkable piece of medical science, considering the prevailing working conditions.¹⁵

Kirk's journal contains the results of an epidemiological analysis of fever in Europeans and Johanna men which he undertook between April to July 1862, hence several months before Meller undertook his analysis (April 1863). Kirk notes that of twenty-three Europeans, 532 days were lost sick and off duty, whereas six Johanna men lost only twenty-nine days. Hence there was more than four times as much sickness amongst the Europeans, who spent one-fifth of their time on the sick list, four-fifths of this due to fever. These results are almost identical to those reported by Meller.¹⁶

On the basis of the existing documentary evidence I am not able to advance any explanation for the similarities in the work of Kirk and Meller. They may have seen the same patients, together or independently, but certainly the epidemiological surveys could not have been collaborative work, since for the whole of the period that Kirk was collecting data Meller was recuperating at the Cape, and Kirk doubted that he would return to the Expedition. Certainly

14 *Zambesi Journal and Letters of Dr. Kirk*, pp. 326, 433, 493.

15 *Ibid.*, pp. 502, 504. Since this account was not then in the public domain, it is understandable that these findings were not included in Stephens's 1937 monograph on blackwater fever.

16 Reported in Kirk's journal on 4th August 1862 (*ibid.*, p. 464ff).

the availability of the journal indicates that the credits given to Meller for his publications are at least equally merited by Kirk.

Why did Kirk not write up his journal for publication, as Livingstone had hoped? I suspect that, by the time he was able to leave, he was fed up: with Livingstone, the struggle of exploration, arguments with other Expedition members, the loss of friends. He needed to recuperate from his own ill health. He may have preferred to put the Zambesi behind him and look to the future, and indeed new opportunities were opening up. He returned to Africa as Vice-Consul in Zanzibar in 1866. In his journal he had written that it was a 'duty of humanity' to reduce the slave trade.¹⁷ In 1873, as Consul-General, he was able to conclude an anti-slavery treaty with the Sultan of Zanzibar, thus, in the year of Livingstone's death, partially achieving one of the aims of the Zambesi expedition.¹⁸

17 *Ibid.*, p. 265.

18 A fuller account of this research is to be found in A.J. Larner, 'Charles Meller and John Kirk: medical practitioners and practice on Livingstone's Zambesi Expedition, 1858-1864', *Journal of Medical Biography*, 10(2002), 129-34.