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GERMS OR RATIONS? BERIBERI AND THE JAPANESE LABOR EXPERIMENT IN COLONIAL FIJI AND QUEENSLAND

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In the early 1890s, the Colonial Sugar Refinery Company (CSR) introduced Japanese men to their sugar plantations in Fiji and Queensland because management believed they would prove to be superior workers to other "coloured" labor. In Fiji, an outbreak of beriberi killed many of the Japanese. The medical establishment attributed this to an infective agent, instead of diet, so there was fear the disease could spread. CSR quickly abandoned the costly "experiment" in Fiji. In Queensland, however, the company successfully controlled a beriberi outbreak by altering the rations, though for fear of contaminated food rather than for balanced diet. By 1912, political and economic factors, not disease, brought about the cessation of Japanese immigration for the sugar industry. Had the Western medical profession not been so wedded to the powerful paradigm of disease transmitted by bacterial infection and accepted the growing body of data on dietary deficiency, the Japanese "experiment" might have succeeded and, in so doing, created a very different society in modern Fiji.

In the second half of the nineteenth century, the British colonies of Fiji and Queensland shared a common problem. Both were suited to sugarcane growing but lacked tractable labor in sufficient numbers to establish the industry. Planters, sugar milling and growing companies, as well as the respective governments sought to overcome this by importing workers in the 1860s and 1870s. Though the early history of the sugar industry generally reflects poorly on the care planters gave to the health of these workers, by the 1890s there was more awareness of health considerations, if only to protect their investment and to obviate the possibility of workers' home governments and communities, supported by the humanitarian lobby, opposing the migration of labor.[1] For these reasons, planters and governments feared what they per-

ceived to be epidemic diseases, communicated by organisms in or introduced into the environment.

The Search for Plantation Labor

By 1892, sugarcane plantations were dominant components of these colonial economies. Operating in both was the powerful Australia-based Colonial Sugar Refining Company (CSR). This company utilized Melanesian indentured labor, mainly from the New Hebrides and the Solomon Islands, in Queensland and Fiji under the aegis of the respective colonial governments, though, in Fiji by the mid-1880s, Indians formed the bulk of the company's labor.[2] From the inception of the Melanesian labor trade in the 1860s, missionary and humanitarian circles as well as the British Colonial Office had been critical of the abuses attendant upon it. Indeed, this tainted record had led the first substantive governor of Fiji, Arthur Gordon, to introduce indentured laborers from British India in 1879 because the stateless Melanesian islands, excepting French New Caledonia, lay outside the control of any of the Western powers, making policing of both labor recruiters and the Melanesians difficult and often legally questionable.[3]

In Australia, the gold rushes of the 1850s–1870s and the development of the pastoral industry stimulated an influx of migrants from the British Isles, outstripping earlier convict labor, so that by the 1890s there was no longer a shortage of workers. More strident than humanitarian criticism, the growing agitation of European unionism and popular feeling against "cheap coloured labour" induced the Queensland government to plan to abandon importing Melanesians (Kanakas) in 1893.[4] In March the year before, businessman Robert Philp had suggested to the director of CSR, Edward Knox, that Japanese be tried as workers in their plantations and mills in Queensland and Fiji.[5] Although interested, Knox was cautious in regard to Queensland, saying that there was "little likelihood of our going in for them [Japanese] while we can get Kanakas as we could only stir up feelings against allowing the importation of coloured labour at all."[6]

Robert Philp, along with his friend James Burns, were the founders of Burns, Philp and Company with extensive merchant, trading, and shipping interests in Australia and the southwest Pacific. The company owned and organized recruiting ships to bring back Melanesians for the planters, including CSR. As agents, Burns Philp had much business to gain in organizing the transportation and victualing of Japanese immigrants to Queensland.[7] Knox, whose knowledge of the sugar industry spanned the tropical world, held a high opinion of Japanese as plantations workers, particularly in Hawai'i, and by late 1892 he thought it worthwhile to introduce them to Fiji too as an

"experiment," believing that they would prove more productive than the Indian "coolies" and settle as tenant families on CSR land.[8] In Queensland, the government had postponed the cessation of Melanesian recruiting in 1893 because of an economic depression. Early that year Knox acted on Philp's suggestion, introducing around sixty Japanese laborers. Knox seems to have planned to employ these men as mill workers rather than field hands, but he cautioned his manager at the Victoria mill not to be too hasty in replacing European workers in the mill to avoid antagonizing the increasingly powerful white workers.[9]

Unlike the Melanesians and the Indians, the Japanese came under "the ordinary laws . . . relating to contracts"[10] of the Masters and Servants acts without penal clauses, so neither colonial government had direct involvement as sponsor. Contractual clauses guaranteeing a return passage at the completion of their terms assuaged government worries about the workers' being left destitute or ill, though the Fijian government planned to regularize this through future legislation.[11]

CSR went to considerable effort to fulfill its contractual obligations with the Japanese. The staple of the daily ration was Japanese rice (2 lb.), along with dried or salted fish (0.25 lb.) and a total of 1 lb. of foodstuffs imported from Japan, such as tea (0.25 oz.), miso (bean paste), shoyu (soy sauce made from soy beans), and preserved plums, as well as 0.5 lb. of locally obtained fresh meat or fish.[12] Aware of the hygienic habits of the Japanese, the company provided special Japanese baths, took advice from the Japanese inspectors who came with the laborers, and built accommodation as recommended by the Japanese Immigration Society. A percentage of the men's wages was regularly remitted to Japan as agreed. The company provided clothing and medicine and paid about thirty shillings a month for a term of three years, renewable for another two years with a 25 percent increase in wages.[13] Although the overall cost was 75 percent more than Indian labor,[14] Knox believed Japanese industry and intelligence would soon prove "cheaper in the long run."[15]

The first group arrived in Queensland in mid-1893 and proved sufficiently satisfactory for CSR to continue replacing those returning to Japan with new intakes until the early 1910s.[16] In Fiji, the first workers arrived on 22 April 1894 to the approbation of the *Fiji Times,* which shared Knox's opinion, describing them as "more desirable than the . . . coolies thrust upon us."[17] Knox's plan for Japanese immigrant families was frustrated, however, as only men came, problems in Hawai'i having caused the Japanese Immigration Society to cease sending women overseas for a time.

From Knox's perspective and certainly that of the Japanese, the experiment soon became a disaster in Fiji. At the end of May 1894, the first cases

of beriberi began to appear. By early February 1895, when the 223 survivors from the original 305 workers were shipped home, over 89 percent had been diagnosed with the disease and almost 21 percent had died of it. Another 38 perished on the voyage home, bringing the mortality rate to about a third of those who had landed in Fiji in April 1894.[18]

Beriberi: Effects and Cause

Beriberi has a range of symptoms, including initial lassitude, tenderness of the calf muscles, increasing loss of sensation, and bouts of shortness of breath. In adults, beriberi has two forms, dry (neuritic) and wet (edematoses). The dry form is characterized by wasting of the lower extremities, with cardiac involvement more pronounced as the edema spreads from these extremities and reaches the heart. The wet form manifests dropsical distension (edema). In both, the patient becomes polyneuritic, paralyzed and helpless with death usually from heart failure following, if appropriate treatment does not intervene. Many of the Japanese, who were mostly between 18 and 30 years old, exhibited the dry form.

Early in the twentieth century, medical and chemical research by Westerners saw the causal factor of beriberi finally being identified as a deficiency in vitamin B_1, or thiamine, in 1926.[19] Like all the B group of vitamins, thiamine cannot be stored in the body, so deprivation will manifest in symptoms within days or weeks depending on variables such as general constitution and work regime. Though widely distributed in foodstuffs, thiamine is relatively low in most. It is virtually absent in oils and fats while the content in green vegetables, fruits, and seafood is relatively low. The best source is dried brewer's yeast. Other good sources are dried baker's yeast, pork (especially liver), cereal germ, whole grains and products made from them, as well as nuts and dried legumes. Red meat has a small amount, but proportionately potatoes are between four to nine times higher in thiamine content depending on method of preparation. Potatoes generally have a higher content than both yams (*Dioscorea* species) and *kumala,* sweet potatoes *(Ipomoea batatas).* Corned beef or even tinned stewing steak has only the slightest trace because of the preserving and canning process.

In cereal grains such as rice, thiamine is not distributed evenly. It is low in the endosperm (the starchy interior), quite high in the germ or embryo (outer layer), and highest in the scutellum or bran (thin layers surrounding the endosperm and the germ). Thiamine is largely lost in milling or polishing the brown rice to produce white rice, lacking the germ removed with the bran. Yet, for many consumers, white rice is more aesthetically pleasing. Removal of the germ also improves the keeping quality because the unsatur-

ated oils in the germ of the brown rice can become rancid and is more attractive to weevils. All forms of rice lose some thiamine with long storage, with white or polished rice losing about a third after four months of storage in tropical conditions. As thiamine is water soluble, lengthy washing or cooking in more liquid than can be absorbed, as well as excessive cooking, also lead to loss of the vitamin by as much as 80 percent.[20] Thus, where polished rice dominated as a staple the likelihood of beriberi was high.

Western Medical Science: Captured by Infection

These facts, however, were totally unknown to medical science in the 1890s, although considerable study of the disease had been done. Throughout the tropical world, particularly Asia, as well as in some European countries, "epidemics" of beriberi had afflicted large numbers for centuries. It was first recorded in the Chinese Neiching, the oldest extant medical treatise, said to date from 2697 B.C. It was commonly found among occupants of ships, labor enclaves, garrisons, and other institutions such as navies, armies, and prisons but could occur elsewhere. In Japan, for example, in the last decades of the nineteenth century, beriberi *(kakke)* outbreaks occurred in most areas, more commonly in the cities, though not among the wealthy. Between 1859 and 1880, Dutch researchers in the East Indies, such as G. F. Pop, Van Kappen, Van Overbeck de Meijer, and Van Leent had deduced from observation that the disease was linked somehow to food intake. Van Leent thought that the rations of the native crew of the Dutch East India fleet were deficient in both proteins and fat. Acting on this theory, by 1880 the fleet command ordered all crew onto the European ration of less rice and more meat as well as the addition of bread, beans, peas, and potatoes, resulting in a remarkable decrease in beriberi.[21]

The Dutch work was not widely known. A new and extremely powerful paradigm had captured Western science in the late nineteenth century, overshadowing the significance of the Dutch dietary regime in the prevention of beriberi. As Robert Williams has pointed out, Louis Pasteur's work from 1864 gave rise to an interest in bacterial infection as the cause of disease. James Lister's use of antisepsis in surgery was one dramatic application of this and it explained Semmelweiss's previous discovery that childbed fever could be stopped by the scrubbing of the attendants' hands with chlorine to rid them of contamination from earlier autopsy operations. Pasteur's work from 1870 to 1890 on silkworm disease, anthrax in cattle, chicken cholera, and rabies in humans all pointed to an infective agent. Robert Koch then went on to isolate the respective bacilli causing a number of diseases, including tuberculosis and Asiatic cholera.

Although productive of much benefit for humanity, the concept of infection as the cause of disease proved a cul-de-sac for relief from beriberi. Medical researchers, including the great Koch himself when studying beriberi "epidemics" among Asian laborers in German New Guinea, tried vainly to find an infective organism for it. Several claimed to have found it, but one person's findings usually contradicted another's. Many researchers attributed the cause to a toxin, located in food. Treatment for the disease continued to be symptomatic and of no value, except when a diet change inadvertently increased the thiamine intake.

A prominent Japanese doctor, Takaki Kanehiro, who had studied in both Japan and England, where he became a Fellow of the Royal College of Surgeons, carried out extensive research on the Japanese navy in the 1880s and redirected attention to diet as the pivotal factor in the disease, focusing particularly on the staple, rice. Though he did not discover the vitamin connection he attributed beriberi to the nitrogen-carbon ratio in food and when he increased the ratio of proteins to carbohydrates the huge number of beriberi cases fell dramatically. As surgeon-general of the navy he brought about a changed diet that reduced the rice ration, but included meat, wheat flour, beans, shoyu, and increased vegetables. The meat, wheat flour, beans, and shoyu together provided sufficient thiamine. His findings, however, were slow to be adopted beyond the military forces. The West had only a synoptic version of his persuasive research published in the *Sei-i-kwai* medical journal in the 1880s and very few medical researchers knew of this. In 1906, however, Takaki lectured in London on beriberi and these lectures appeared in the *Lancet*, through which his work became more accessible to Western medical workers. As Williams observes, if Takaki's work had been published fully in English in the 1880s, it would probably have been far more influential in directing studies to diet rather than to an infective agent in the environment twenty years earlier than was the case.[22]

Beriberi in Fiji

The Japanese laborers in Fiji and Queensland had seen beriberi at home but, being young, healthy men, they passed quarantine and medical inspections on their arrival and soon were working hard. The bulk of their rations had been purchased in Japan, enough for six months, after which time local food could be assimilated into the diet, providing the inspectors and the employer agreed.[23] The ordinary rice for laborers in Japan at this time was usually pounded by hand to remove the husk, and so much of the tissue holding the thiamine remained.[24] The purchasing agents of Burns Philp acting on CSR's behalf, however, bought a polished white rice; their reasoning had

been, in Knox's words, "that the polished white rice was sent because it was thought that the rice ordinarily used by labourers in Japan would not keep in Fiji."[25]

This hulled and polished white rice probably originated from the mills of Saigon or Rangoon, where mechanized polishing reduced the likelihood of the rice going rancid and attracting weevils.[26] The agents also sent a sample of twenty bags of somewhat less expensive, brown but hulled rice. As the Japanese inspectors, Shoda and Hatta, commented to the manager in July 1894, "they [the laborers] have never eaten such good rice before" and even the cleaned but unpolished rice was of better quality than the usual.[27] Since the unpolished rice kept relatively well and cost £7 13s. a ton compared to £8 10s. a ton for the white rice,[28] CSR instructed Burns Philp that future orders from Japan be of "ordinary rice used by the labouring classes of Japan" for three months' rations. What had not traveled well, however, were the "condiments." It seems CSR discarded the shoyu and miso as "unfit for food" and with them a small, but useful, addition of thiamine.[29]

Given the turnaround time between Japan and Fiji, this order took three months to fill and arrived in Fiji in mid-September 1894, when seven men had already died. As the original supply was for six months, it seems almost certain that the men continued to consume that supply until mid-November at least, when Knox was discussing how the three months' supply on hand should be utilized if the Japanese were repatriated.[30] By then the disease was well entrenched. So debilitated were most of the Japanese that they may not have been able to ingest even ideal rice in the usual form. The remedies administered, such as quinine, iron, strychnine, arsenic, belladonna, digitalis, and, after meals, hydrochloric acid, cannot have stimulated or maintained appetite.[31] Today, thirteen to thirty times the normal intake of thiamine is prescribed daily for two weeks for rapid recovery, then reduced to about seven times the normal requirement for some weeks more. Thus, even if diet had been improved, such dosages were either unavailable or unprescribed under existing medical regimes; recovery would have been very slow, providing potentially fatal bacterial or viral complications such as pneumonia or dysentery did not intervene.[32]

Through ignorance CSR, as well as the laborers themselves, cut off other avenues that may have compensated in part for the thiamine-deficient rice. When, in July 1894, the laborers wanted potatoes Knox reminded their managers at Nausori and Labasa that the contract stated "vegetables *or* potatoes" (author's emphasis) daily, directing them to purchase sweet potatoes or yams, which were cheaper. As the thiamine content in potatoes is much greater than in yams and higher than in sweet potatoes, and as the ration was usually yams, this choice reduced the potential intake of the vitamin.[33]

Moreover, the ration stipulated "fresh meat or fish," but CSR, at least for the first month or two, issued beef boiled in 6-lb. tins, tinned mutton, and salted beef from Sydney—all of which would have had no measurable thiamine.[34] When, by July 1894, a contractor was supplying fresh meat, Knox ordered it reduced because the laborers themselves preferred "dried fish to fresh meat" and the company could "supply the former at about 2d a pound . . . very much cheaper than before."[35] Many of the Japanese refused to eat meat at all.[36] The dried fish, however, had only the slightest trace of thiamine. So all the potential sources of thiamine in the laborers' diet were simply nonexistent or, like shoyu and miso, too minute by themselves.

The company came tantalizingly close to finding the source of the problem. In April–May 1894, the manager at Rarawai, Ba, obtained supplies of Rangoon (or "Ballam") rice to feed the newly arrived Japanese, quite apart from the rice that came with them. Knox, acting on advice from Bowden, Burns Philp's agent in Queensland, instructed him to stop feeding them this as "they always get sick if given other than Japanese rice."[37] Yet the "Japanese rice" being rationed had the same qualities as the Rangoon rice and is likely to have originated from a similar source. Several of the men at Rarawai were "laid up" with sickness after only a week or so on the Rangoon rice, but whether this illness was early beriberi or not is uncertain. It seems that a supply of fresh meat may have alleviated the disease for a time, but by late July sickness had returned and beriberi developed.[38]

In Fiji, "[t]he first known occurrence of beriberi in its epidemic form" had a particularly tragic aspect.[39] Its severity resulted in a paper presented to the colony's Legislative Council. The first report was by Dr. Charles Hirch, the medical officer for the Rewa district, where fifty of the Japanese worked at CSR's Nausori plantations on the eastern side of Viti Levu; and the other by Dr. Noble Joynt, officer for Labasa district, where about two hundred Japanese went to Wailevu and about fifty to Ba, both on the western side of the same island. The council paper opened with a preamble by the chief medical officer, Dr. B. Glanville Corney—a comprehensive summary of the history and state of knowledge of the disease. Corney highlighted its supposed infectious nature, describing how it was "introduced" into various areas of the world including New Caledonia where immigrants from Tonkin and Annam (Vietnam) were the supposed source.

Yet Corney had one tremendous advantage over most of his medical colleagues in the West. On a visit to Fiji in 1889 by the Japanese navy's training squadron, the medical officer of the HIMJS *Hiyei,* a Dr. Sasaki, gave Corney a copy of the Annual Report of the Health of the Imperial Navy for 1887. This report contained tables and information by Takaki on his dietary innovations for the navy. Though Corney does not appear to have obtained details

of Takaki's later work between 1888 and 1891, written up in English and Japanese in *Sei-i-kwai*, until during or soon after the Fiji outbreak, he certainly knew of Takaki's emphasis on diet and also mentions the dietary focus of earlier researchers. Corney discusses in detail Takaki's later work on nitrogen-carbon ratio to 1891 in his preamble, reproducing one of the tables from *Sei-i-kwai*. He lauds the "enormous gain in human life and health, the value of the labour thus saved to the [naval] service by the improved diet" and speaks of the "phenomenal result" of the diet, not only in relation to beriberi, but also to other diseases.[40]

Corney, in spite of all this hard data from the entire population of the Japanese navy of over fifty-three hundred, remained a prisoner of the paradigm of an infective agent in the environment, even in the face of conflicting research, for he went on to state that

> we may not assume that a deficiency of nitrogen to make good the natural bodily waste is the sole or active cause of . . . Beriberi. . . . [T]he diet question is one that mainly determines the susceptibility of persons to an invasion by a specific poison. That poison, as might be expected, has been made to reveal its bacterium. . . . [Yet] Manson regards some of these discoveries rather sceptically and—himself the soundest and most eminent of English tropical pathologists—admits that he has always failed to find a distinctive micro-organism of Beriberi.

Although conceding that the Fiji Japanese workers' ration "was inferior in nitrogenous material to the proportion insisted on by Takaki," Corney describes "residence . . . in an infected place" as an essential factor in producing beriberi. To counteract this, he advised sufferers be removed to a place free of the infection, in a "cool and dry climate," and one free from malaria, which somehow also predisposed people to beriberi. Though Fiji was free of malaria many Indians were thought to have brought it with them and it might reassert itself. As well, strict hygiene, such as the boiling of soiled clothing, had to be observed, and accommodation had to be spacious, well-ventilated, and drained. Around living areas, the soil (and night soil) had to be treated with corrosive sublimate. Corney also recommended the Takaki diet as well as the treatments with drugs believed to relieve symptoms.[41] One of the doctors involved, Joynt, after discussing the drug "tonics" and regimes for his Labasa patients, commented that he believed "[g]ood nourishing nitrogenous food . . . to be as efficacious as any drug treatment."[42]

In time, much of Corney's recommendation was carried out. By November, Knox had obtained "a treatise on the disease" along with corrosive sub-

limate, as well as twenty bags of whole wheat, and dispatched these to Fiji.[43] Although the government was not obliged by law to supply free medical care to CSR, alarm over the outbreak convinced it "to assist the company in its present difficulties" with medical attention on payment of a fee. In October, the doctors had advised returning the men to a cold climate. Meanwhile, the government agreed to allow the sick to be moved to isolation on the quarantine island of Nukulau. Concerned the disease would spread, government doctors recommended elaborate hygiene measures to prevent the "microbe disease" from infecting the Nukulau compound.[44] In the Fijian language newspaper, *Na Mata,* the government's commissioner for native affairs even warned Fijians of the dangers of contracting beriberi from clothes sold by the Japanese.[45]

Earlier, Knox had considered the possibility of bringing in a Japanese doctor, but, as the steamer turnaround time was so great, he decided to return the men to their homeland once the difficulties of transportation during the Sino-Japanese war had lessened. Meanwhile, CSR's Fiji manager sought in vain for "a suitable man" to care for the Japanese in Nukulau. The government could not provide a doctor there, so the company abandoned the plan to move the sick to Nukulau, continuing to have the government doctors care for them at the plantation hospitals of Nausori and Labasa.[46] Burns Philp could not arrange a steamer to Japan earlier than 4 February 1895.[47] Thereafter, the company was not concerned with the fate of the 223 survivors sent home, but the government regretfully noted the deaths on board ship.[48]

The Japanese in Queensland

In Queensland, the Japanese laborers had a happier medical history. The first group arrived in June 1893 with six months' stores, but the rice had not kept well, which suggests it was not white polished rice. Whatever the reason, the company found alternative rations. Knox's experience with Rangoon rice at Ba, Fiji, caused him to advise the Victoria mill's manager not to use it and to get the rice from Japan.[49] After the Fiji experiment had failed, Knox, always with an eye to economy, had ordered the remaining rations sent across to Victoria mill in July 1895, by which time they were over seven months old. These rations were probably only the Japanese condiments, of little use in Fiji among the Indians, because a shipment of rice arrived for Victoria the same month via Burns Philp.

Beriberi, however, appeared among the Japanese at the Victoria mill in April 1896, one man dying. The records are silent as to their specific diet at the time, but Knox's reaction was swift and very different from the Fiji epi-

sode. He ordered the immediate and permanent reduction of the rice ration, the stoppage of the condiments and dried fish, and replacement with fresh meat, flour, and potatoes. Within a month, the disease had abated.[50]

Where had Knox obtained his information? One of CSR's chemists had just returned from the Hawaiian Islands and informed him that there the disease "had almost entirely been stamped out by adopting the above measures." Some in the Hawaiian medical establishment had stumbled on a cure —but their reasoning was not based necessarily on deficiency or an infectious bacterium. Some believed that the "half-decayed dried fish and condiments" produced the disease[51]—a variant on the toxin theory, sometimes attributed to a poison in the rice.[52] Fortunately for the Japanese who came to work on the Hawaiian plantations from 1885, the contract conditions not only allowed them to purchase their own food, but also to cultivate a half-acre to grow food. From 1886 until the turn of the century, they had their own doctors from Japan, men more likely to be familiar with Takaki's emerging research. It seems when Japanese and other immigrant Asian labor such as the Chinese and Filipinos economized—mainly in order to remit money home—that their frugal diet induced beriberi. Once these immigrants adopted the local diet, and this included rice, beriberi became rare, though it continued to appear in newcomers—so plantation managers often issued rations rather than money for food to make sure the laborers were adequately nourished.[53]

In Queensland, there were no more cases of beriberi among the Japanese, so Knox's regime had succeeded. In Fiji, the medical officers could congratulate themselves on preventing the spread of the "infection" by their measures.[54] It seems the odd case of disease thought to be beriberi had appeared among the Indians before 1894 and perhaps after, but never in such numbers as with the Japanese.[55] This was due, of course, to diet and not an infective agent. Most of the Indians in Fiji were from flour-producing areas of the United Provinces and the Punjab. They consumed "sharps," largely unrefined flour, which is quite thiamine rich, and did not have rice as their staple, though the Madrasi minority did. Once these people had the smallest plot of land they grew their own food, including rice and pulses, and thus were able to eat an adequate amount of thiamine.[56] No confirmed cases of beriberi had been reported among the Melanesians, including the Fijians, before the epidemic,[57] though it is possible that any deaths from beriberi may have been attributed to other diseases. The Fijian diet of root vegetables, including the staple *dalo (Colocasia esculenta)*—higher in thiamine than potatoes and yams—as well as various nuts, coconuts, and occasional shellfish and pork, provided an adequate amount of the vitamin.[58]

Knox continued the Japanese "experiment" in Queensland until 1912. In

1901, the former Australian colonies had joined in a federation. For the new state of Queensland, the price was the phasing out of "coloured" labor demanded by the federal government's "White Australia" policy. The Melanesians were deported. This loss was not as economically painful to the industry as its critics predicted, mainly because the plantation system had been replaced in 1893 by small, often family-based farms feeding in to centralized mills. Most of these were under the aegis of the Queensland state government, some under that of big companies, such as CSR.[59] Knox's colleague, Robert Philp, twice became Queensland premier and indicated in 1900 that his government was not averse to the number of Japanese remaining the same following federation. They were (and remained) the backbone of the pearl shell industry in the remote but strategically important Torres Strait—because few white men would do the dangerous work at the pay offered. As long as the total number employed in Queensland—about thirty-two hundred in 1898—remained stable, the nascent federal government turned a blind eye in order to support the pearl shell industry. So CSR managed to keep their eighty to a hundred Japanese workers on at their mills, replacing them with equal numbers when individual contracts expired. Knox was very pleased with their work as mill workers and solved the problem of their employment in the slack season, when the mills were not crushing cane, by employing them as contract timber getters and cutters.[60] Although the Japanese were highly efficient and Knox preferred them to white men, they were not "cheap" labor as the whites-only labor unions claimed.[61] They were earning between thirty and thirty-four shillings a week exclusive of overtime in 1909—wages equal to and sometimes better than those of white men.[62] In 1911, a leading labor union, the Amalgamated Workers' Association, took industrial action to demand a uniform eight-hour workday and minimum pay of thirty shillings a week. CSR charged its striking white workers under the Masters and Servants acts, but the courts ruled these acts did not apply to white workers. Because of the threat of industrial action and "as the wages of the coloured labor have now reached a high standard," CSR found the Japanese experiment less attractive. By 1912, the company ceased placing the remaining Japanese under indenture and, for the sugar industry, the immigration from Japan ended.[63]

Consequences

In Fiji, without competition from a white laboring class, much of the sugar economy continued to depend on Asians. Almost half of Fiji's population today is descended from indentured Indians. Had Knox's "experiment" had a positive outcome, as both CSR and other planters hoped, they may have

come to prefer the Japanese whom they believed to be cleaner, "ingenious, industrious and peaceable," and better workers than those from India.[64] As the pioneer historian of the Indians in Fiji, Kenneth Gillion has commented, "Fiji might have had a society as diverse as that of Hawaii" if not for the beriberi epidemic.[65]

Yet it was not the disease as such that determined this outcome, but Western colonial medical beliefs about its causation. Even CSR director Edward Knox, the epitome of the logical capitalist who had applied a practical solution to the Queensland outbreak in 1895, somewhat paradoxically continued to believe the disease stemmed from an infection, demanding two years later that the Japanese be medically examined before departure for Queensland "so as to avoid any risk of introducing Beri Beri."[66] He was following standard Western medical orthodoxy, rather than the demonstrable results of his diet regime for the Japanese in Queensland. Knox did not repeat the migration experiment in Fiji—it had cost CSR about £4,000 as well as considerable time and effort. It had cost a third of the Japanese their lives, an outcome that appealed neither to the colonial government nor to other planters who feared the spread of the disease among what they perceived to be the vulnerable Indian and Melanesian workforce.[67]

History, perforce, focuses more with what happened, not with what might have happened; but, in the case of beriberi, the potent medical paradigm of attribution of a disease to an infective agent in the environment, rather than to a simple dietary deficiency, certainly had a profound influence in shaping the composition of Fiji's society.

NOTES

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1. See generally Clive Moore, Jacqueline Leckie, and Doug Munro, eds., *Labour in the South Pacific* (Townsville, 1990), passim.

2. Margaret Willson, Clive Moore, and Doug Munro, "Asian Workers in the Pacific," in Moore, Leckie, and Munro, *Labour in the South Pacific,* 100.

3. Kenneth Gillion, *Fiji's Indian Migrants* (Melbourne, 1962), 1–18.

4. Ross Fitzgerald, *A History of Queensland from the Dreaming to 1915* (St. Lucia and Brisbane, 1982), 252; Kay Saunders, "The Workers' Paradox: Indentured Labour in the Queensland Sugar Industry to 1920," in *Indentured Labour in the British Empire, 1834–1920,* ed. Kay Saunders (London and Canberra, 1984), 213–259.

5. Noel Butlin Archives of Business and Labour, Australian National University, Canberra, Australia: Colonial Sugar Refinery Company archives (hereafter CSR), Letters outward from Head Office to Victoria (hereafter Victoria), 142/1551, Knox to Farquaher, 9 Mar. 1892; 142/1552, Roth to Manager, 26 July 1893.

6. CSR, Victoria, 142/1551, Knox to Farquahar, 23 Nov. 1892.

7. Fitzgerald, *A History,* 255–256; CSR, Victoria, 142/1552, Roth to Manager, 9 Aug. 1893; CSR, Letters outward from Head Office to Nausori (hereafter Nausori), 142/2208, Knox(?) to Manager, 24 Jan. 1894; National Archives of Fiji, Suva: Colonial Secretary's Office (hereafter CSO), 3694/93, Gemmell-Smith to Colonial Secy., 29 Dec. 1893.

8. CSO 3167/93, Minute, 23 Sept., 4 Oct. 1892 and encls.; CSR, Victoria, 142/1552, Roth to Manager, 26 July, Nov. 1893; Nausori, 142/2208, Knox to Manager, 24 Jan., 14 June, 19 July 1894; CSR, Letters outward to Labasa (hereafter Labasa), 142/2053, Knox to Manager, 20 July 1894; CSR, Letters outwards to Rarawai (hereafter Rarawai), 142/2611, 13 Sept. 1893, 17 Aug. 1894. Re settlement, see Michael Moynagh, *Brown or White: A History of the Fiji Sugar Industry 1873–1973* (Canberra, 1981), 81, 85–89.

9. Fitzgerald, *A History,* 151, 321; CSR, Letters outward, General, 142/1051, Dixon to Manager, Victoria mill, 8 Feb. 1893; Victoria, 142/1551, Knox to Farquaher, 9 Mar. 1893; 142/1552, Roth to Manager, 9 Aug., 7 Sept., 13 Dec. 1893; 142/1558, Knox to Manager, 11 June 1903.

10. CSO 3167/93, Minute, 4 Oct. 1892.

11. CSO 3694/93, Minute, 9 Jan. 1894; CSO 54/94, Minute, 3, 5 Jan. 1894; CSO 483/93, Minute, 26 Jan. 1894.

12. Epidemic of Beriberi, Council Paper No. 1 of 1896, Legislative Council of Fiji, 40; CSO 54/94, Gemmell-Smith to Act. CS, 30 Dec. 1893, encl.

13. CSR, Letters outwards, General, 142/1051, Dixon to Manager, Victoria, 8 Feb. 1893; Victoria, 142/1551, Knox to Farquaher, 9 Mar. 1893; 142/1552, Roth to Manager, 19 Oct., 28 Dec. 1893; 142/1555, Knox to Manager, 22 Apr. 1897; Rarawai, 142/2611, Knox to Manager, 17 Aug. 1894; Epidemic of Beriberi, 17, 27, 36. There were minor variations in the respective contracts for Fiji and Queensland, with the men in Queensland being paid slightly more.

14. CSR, Labasa, 142/2053, Knox to Manager, 27 June 1894.

15. CSR, Rarawai, 142/2611, Knox to Manager, 13 Sept. 1893.

16. CSR, Victoria, 142/1552–142/1555; 142/1557–142/1566.

17. *Fiji Times,* 28 Apr. 1894.

18. Epidemic of Beriberi, 13, 17, 27; Indian Immigration Report, Council Paper No. 24 of 1895, Legislative Council of Fiji; CSR, Nausori, 142/2208, Knox to Manager, 18 Apr., 18 May 1894. One source claims the number of arrivals to have been 310, one of whom died of drowning, with nine others unaccounted for in the medical report that gives statistics for 300 only. It may be that the two accompanying inspectors were not included in the total. (CSO 2858/94, ? to Magistrate, 25 July 1894.) Kenneth Gillion states that 87 of 305 died from beriberi and other diseases in Fiji. (Gillion, *Fiji's Indian Migrants,* 79n.)

19. Robert R. Williams, *Toward the Conquest of Beriberi* (Cambridge, Mass., 1961), passim.

20. Lawrence J. Machlin, ed., *Handbook of Vitamins,* 2d ed. rev. and exp. (New York, 1991), 251–267; Heimo Scherz and Friedrich Senser, comps., *Food Composition and Nutrition Tables* (Stuttgart, London, and Tokyo, 1994), xviii; B. Holland et al., eds., *The Composition of Foods* (London, 1995), 139, 171, 179, 227, 267, 271; Marcus Krupp, Milton J. Chatton, and Lawrence M. Tierney Jr., *Common Medical Diagnosis and Treatment 1986* (Los Altos, Calif., 1986), 802–815; Winifred R. Vinacke, "The Effects of Storage, Washing and Cooking on the Thiamine Content of Rice," *Journal of Home Economics,* Oct. 1951, 641. The recommended adult intake is around 1.4 milligrams daily. Composition for some food is as follows: Per 100 grams, boiled brown rice has 0.14 milligrams, white rice 0.01, sharps (or chapatti) flour 0.36, unsalted boiled potato 0.18 or if baked in flesh and skin 0.37, unsalted boiled yam 0.14, salted boiled sweet potato 0.07, and for a cup of coconut, 0.05. (Scherz and Senser, *Food Composition,* 27, 31, 227, 267, 271, 227.)

21. Williams, *Toward,* 1–35. The Japanese army and later the navy under Surgeon-General Y. Saneyoshi included barley in the ration and further reduced the rice. (Ibid., 22–23.)

22. Williams, *Toward,* 18–26; Epidemic of Beriberi.

23. Epidemic of Beriberi, 40.

24. Williams, *Toward,* 13.

25. CSR, Nausori, 142/2208, Knox to Manager, 5 July 1894.

26. Williams, *Toward,* 13, 27.

27. CSR, Letters outward, General, 142/489, Roth to Burns Philp, 26 July 1894.

28. CSR, Nausori, 142/2208, Knox to Manager, 15 June 1894.

29. CSR, Nausori, 142/2208, Knox to Manager, 4 July 1894; Letters outward, General, 142/489, Roth to Burns Philp, 26 July 1894.

30. CSR, Nausori, 142/2208, Knox to Manager, 14 Sept. 1894; Labasa, 142/2053, Knox to Manager, 19 Nov. 1894.

31. Epidemic of Beriberi, 21, 34.

32. Krupp, Chatton, and Tierney, *Common Medical Diagnosis*, 815.

33. CSR, Nausori, 142/2208, Knox to Manager, 19 July, 16 Aug. 1894; Labasa, 142/2053, Knox to Manager, 20 July 1894.

34. CSR, Nausori, 142/2208, Knox to Manager, 4 Apr. 1894.

35. CSR, Rarawai, 142/2611, Knox to Manager, 20 July, 17 Sept. 1894.

36. Epidemic of Beriberi, 36.

37. CSR, Rarawai, 142/2611, Knox to Manager, 31 May 1894.

38. CSR, Rarawai, 142/2611, Knox to Manager, 31 May, 15 June, 20, 26 July, 10, 17 Aug. 1894; Victoria, 142/1553, Knox to Manager, 5 Sept. 1894.

39. Epidemic of Beriberi, 1.

40. Ibid., 6.

41. Ibid., 7–9.

42. Ibid., 34.

43. CSR, Labasa, 142/2053, Knox to Manager, 19 Nov. 1894.

44. CSO 4609/94, Minute, JS to Chief Medical Officer, 14 Dec. 1894 and encls.

45. CSO 4609/94, Hirsch to Chief Medical Officer, 23 Dec. 1894; Pound to Colonial Secy., 29 Dec. 1895; Minute, 1 Jan. 1895.

46. CSR, Fiji, Staff movements, Manager to General Manager, 26 Dec. 1894.

47. CSR, Nausori, 142/2208, Knox to Manager, 15 Oct. 1894; 142/2209, Knox to Manager, 16 Nov., 12 Dec. 1894; CSO 4609/94, Minute, JS, 14 Dec. 1894.

48. Epidemic of Beriberi, 27.

49. CSR, Victoria, 142/1552, Knox to Manager, 28 June, 9 Aug. 1893, 18 Jan. 1894; 142/1553, Knox to Manager, 5 Sept. 1894.

50. CSR, Victoria, 142/1554, Knox to Manager, 22, 27, 29 Apr., 27 May 1896; 142/1555, Knox to Manager, 28 Sept. 1897.

51. CSR, Victoria, 142/1554, Knox to Manager, 27, 29 Apr. 1896.

52. Board of Health Report, Hawaii, 1890, cited in Edward D. Beechert, *Working in Hawaii: A Labor History* (Honolulu, 1985), 104–105; Charles B. Cooper, "Beriberi and Some Clinical Aspects from Personal Observation," *Hawaiian Medical Association: Transactions of the Annual Meeting,* 1905, 107, 112; Williams, *Toward,* 13–15.

53. Report of the Board of Immigration, Hawaii, Honolulu, 1886, 227, 257–258; Rodman Miller, "Plantation Doctor," *Hawaiian Medical Journal* 54 (1995), 788–792; Karol Haraguchi, comp. and ann., ed. Linda K. Menton, *Rice in Hawaii: A Guide to Historical Sources* (Honolulu, 1987), xv; Beechert, *Working,* 68.

54. Epidemic of Beriberi, 12.

55. Ibid., 11.

56. Moynagh, *Brown or White,* 85–91; Gillion, *Fiji's Indian Migrants,* passim.

57. Epidemic of Beriberi, 7, 11; *Fiji Times,* 2 Mar. 1943.

58. Scherz and Senser, *Food Composition,* 649.

59. Fitzgerald, *A History,* 186–187; Saunders, "The Workers' Paradox," 214–238.

60. Fitzgerald, *A History,* 188, 255–256, 314; Jeremy Beckett, *Torres Strait Islanders: Custom and Colonialism* (Cambridge, 1987), 37; CSR, Victoria, 142/1558–142/1565.

61. Fitzgerald, *A History,* 329–300; Saunders, "The Workers' Paradox," 238.

62. CSR, Victoria, 142/1563, Knox to Manager, 10 June 1909; see also 142/1564, 31 Mar. 1910; and Saunders, "The Workers' Paradox," 238.

63. CSR, Victoria, 142/1565, Knox to Manager, 3 July 1911; 142/1566, Knox to Manager, 12 Dec. 1912.

64. *Fiji Times,* 28 Apr. 1894.

65. Gillion, *Fiji's Indian Migrants,* 79.

66. CSR, Victoria, 142/1555, Knox to Manager, 7 Jan. 1897.

67. CSR, Labasa, 142/2053, Knox to Manager, 6 Nov. 1894; Epidemic of Beriberi, 7, 12.