「日本の近代化と健康転換」（日本学術振興会　科学研究費研究　2007-2009）
Working Paper 003

The Politics of Disease:
The Beriberi Debate and medicine in modern Japan

Alexander Bay (Chapman University)

The Politics of Disease:
The Beriberi Debate and medicine in modern Japan

Alexander Bay

In 1918, the executive members of the Internal Medicine Association of Japan, all Tokyo Imperial University professors, came under fire when Tokyo faculty Tazawa Ryoji was accused of producing ideologically stilted data. When working in the laboratory of Professor Hayashi Haruo, in order to curry favor, he argued that rice bran extracts had no effect on those suffering from beriberi (vitamin B1 deficiency disease), but when he swiiched labs and was working under Irisawa Tatsuyoshi, he suddenly declared that rice bran extracts were effective. The medical press reported that, "there are countless people who question the consistency of Tazawa." Because of popular criticism, the Tokyo Imperial University faction "tried to hide Tazawa and his shame in their sleeves."[1]

The question of the effectiveness of rice bran extracts began in the 1910s, but the larger debate over the role of diet and disease causation dated back to the 1880s. On one side of the debate were the diet theorists who based their argument on clinical and empirical studies, and on the other side stood Army Medical Bureau physicians and internal medicine doctors from Tokyo Imperial University who believed the disease was caused by a yet to be discovered bacillus.

Scientific evidence based on medical statistics, amassed during Japan's wars of imperial expansion into Asia, supported the theory that beriberi stemmed from a certain diet deficiency. The Tokyo Imperial University professors denied the link between disease and diet, even more; they began deploying what agnotologists call constructed ignorance, similar to what historians explore as "uncertainty" within the modern relationship between environment and disease, in order to counter the growing strength of the diet theory.[2]

Tokyo Imperial University doctors deployed and analyzed data in a way that emphasized the uncertainty surrounding the relationship between diet and disease. With reputation as Japan's medical elite at stake, they continued to propagate ignorance in hopes that a causal bacillus would be found and their contagionist approach vindicated.

[1] "Kangaku tóbatsu no hóka óni hyóru," *Nihon no ikai* 238 (1918): 4.
[2] Proctor, Robert and Londa Schiebinger. ed. *Agnotology: Cultural Manufacture of Ignorance* (Stanford: Stanford University Press, forthcoming). Gregg Mitman; Michelle Murphy; Christopher Sellers, "Introduction: A Cloud over History," *Osiris* 2nd series, 19 Landscapes of Exposure: Knowledge and Illness in Modern Environments (2004): 1-17.

As research, based on clinical data as well as human-based experiments tied white rice diets to disease etiology and rice bran extracts, referred to as vitamin treatments from the mid-1910s, to disease prevention, Tokyo's position became harder and harder to defend. In order to protect their privileged position at the top of the medical establishment, what critiques referred to as an "occupation," younger members of the Tokyo faction, like Irisawa and Tazawa, began to take over the Internal Medicine Association.[3] They could not endorse the diet theory and the use of rice bran abstracts, to do so would have admitted that the Tokyo faction had been erroneous in their approach to this disease and their resistance to the diet theory had been wrongheaded since the 1880s. Instead, they began re-colonizing medical associations by slowly confirming, through their own research, that indeed beriberi and diet were causally connect and that initial evidence suggested that rice bran extracts had some effect on disease progression.

This attempt at re-colonizing the medical world was quite transparent. In order to counter the slow recognition by the Tokyo faction, researchers at other institutes, such as Keió University, began experimenting on themselves and proved that beriberi stemmed from a diet deficient in what was being called the beriberi vitamin, and that foods rich in this "B" vitamin, including rice bran extracts, cured this disease. Researchers also began tying environmental factors such as living conditions and diet within factories and dormitories, hotbeds of beriberi, to disease etiology, strengthening the diet deficiency thesis. In short, doctors combined clinical, experimental, and epidemiological data to expose and crush the culturally constructed ignorance and uncertainty surrounding beriberi and diet that had been propagated by Tokyo professors since the 1880s. By the time that the Internal Medicine Department at Tokyo Imperial University appointed a diet-theorist to the faculty in 1925, the vitamin revolution was over and the science of vitamins was being promoted in both the medical and popular presses.

Beriberi, or kakke, formed a major public health problem that cut across all social boundaries. Even the Meiji Emperor suffered from it. In 1878, when the emperor fell ill, his advisers suggested building a detached palace at an elevated location where he could convalesce. Instead, the Emperor ordered the construction of a

[3] "Kangaku tóbatsu no hóka óni hyóru," 4.

research clinic, housing both Chinese and western medical practitioners, where a treatment for the masses could be developed. [4]

By July 1878, the emperor's vision, the Beriberi Hospital or Kakkebyóin, was up and running, employing two Chinese medicine (kanpó) doctors and two western medicine doctors.[5] Kanpó practitioners treated beriberi using herbal drugs combined with dietary restrictions, such as eliminating white rice and in its place prescribing barley and red beans (azuki).[6] This form of treatment dated back to the Sui (581-618) and T'ang (618-907) dynasties.[7] Western doctors treated the disease with diuretics and hearty diets consisting of meat, eggs, and lots of milk.[8]

It is interesting to note that both kanpó and western medical discourse stressed the role of environment in disease etiology. Kanpó doctors stated that beriberi was a disease of damp, low-lying areas where the causal poison infiltrated the sufferers through their legs.[9] In the premodern capital of Edo, beriberi was known as Edo wazurai, the affliction of Edo. In 1699, Katsuki Gyúzan (1656-1740) noted that this affliction was widespread among both the warrior and the commoner classes.

> Now, when officials or merchants go to the Kanto region, they lose their spirit, their legs and knees get heavy, their faces puff up, and they lose their appetites. In the vernacular this is called Edo wazurai. Because either the water or soil doesn't agree with them, on the way back home, after they go over the Hakone pass, their symptoms naturally disappear. Those samurai from the west who are stationed at their lord's mansion in Edo all fall victim…Those who don't get well should quickly return to their provincial homes, for if they pass over Hakone, they will be cured.[10]

---

[4] Kunaichó, *Meiji Tennóki* 4 (Tokyo: Yoshikawa Kóbunkan, 1970), 196. *Meiji Tennóki*, 4, 399-400. Also quoted in Yamashita, Yamashita Seizó, *Meijiki ni okeru kakke no rekishi* (Tokyo: Tokyo Daigaku shuppankai, 1988), 99-100. Donald Keene quotes a portion of this passage, but translates *mugi* as wheat, not barley. Donald Keene, *Emperor of Japan: Meiji and his World, 1852-1912* (NY: Columbia University Press, 2002), 290-91.

[5] "Kakke ha Nihon tokuyú no byó, so ryóhó wo kenkyú shi, kanjya wo sukú no ga *Kakkebyóin* no mokuteki," *Yomiuri shinbun* (7/12/1878): 1-2.

[6] Nagayo Sensai, ed., *Kakkebyóin dai'ichi hókoku: 1878* (Tokyo: Naimushó, 1879), 13-22, 72-73.

[7] *Kanpó* treatments for *kakke* focused on a dietary regime, such as forbidden and therapeutic foods. These types of pre- and proscriptions circulated within China since the Sui (581-618) and T'ang (618-907) dynasties. Yamashita Seizó, *Kakke no rekishi: bitamin hakken izen* (Tokyo: Tokyo daigaku shuppankai, 1983), 264-70.

[8] *Kakkebyóin dai'ichi hókoku*, 30-31.

[9] Yamawaki Tōmon, *Tōmon zuihitsu*, *Kyōrin sōsho III*, ed. Fujikawa Yū (Tokyo: Tohōdō shoten, 1924), 34.

[10] Katsuki Gyūzan, *Gyūzan kattō* in *Kinsei kanpō igakusho shūsei* 161, ed. Ōtsuka Keisetsu and Yakazu Dōmei (Tokyo: Meichō shuppan, 1981), 348-49. Originally published in 1779.

Before the institutionalization of bacteriology as the central pillar of scientific medicine, western doctors used what public health historian George Rosen called "contained contagionism" to explain etiology. Disease had a single cause, yet environmental and social conditions had to be right, or insalubrious, for an outbreak to occur.[11] For example, William Anderson, a British doctor living in Yokohama, wrote that filth led to any number of epidemics, including cholera and beriberi.

> Bad drainage is a conspicuous evil of every town in which Kak'ké is prevalent and especially in the low densely populated quarters. Refuse matter is conveyed away by means of open or imperfectly covered gutters, mere ditches without proper walls, which run along narrow streets immediately in front of the houses…Then the sluggish or stagnant contents, foul and putrefying, poison the air by evaporation, and spread by soakage into the adjacent soil, loading it with organic matter, contaminating the surface water and that conveyed in permeable pipes, and converting the wells into receptacles for diluted sewage.[12]

Because beriberi became epidemic only in the summer, and then only in urban environments, the Western medicine community in Japan speculated that this disease was contagious. However, when Tokyo Imperial University doctors were writing the analysis reports for the Beriberi Hospital, they showed a large interest in how the environment and Japanese customs, both diet and housing, factored into the cause of this disease. In the 1879 report, they wrote,

> First, [we want to know] the relation of the fluctuations of ground water in the various districts of Tokyo and the rates of disease outbreaks. Second, what are the relations of the customs and habits of eating and drinking throughout the country and the rates of disease outbreak and death…Beriberi is a disease particular to Japan. There are no outbreaks in Europe or America. India is not the same. Nevertheless, there are no cases of beriberi among the foreigners living in Japan…We can think of no other explanatory factors for this than the differences in food, clothing and personal hygiene. India and

[11] George Rosen, *A History of Public Health: Expanded Edition* (Baltimore: John Hopkins University Press, 1993), 264.
[12] Willam Anderson, "Kak'ké," *Journal of the Asiatic Society of Japan* 6 (Oct. 1877 – June 1878): 172. According to Charles Rosenburg, doctors and hygienists believed that epidemics stemmed from "poor sanitation and a consequent accumulation of rotting filth that in its decomposition produced a disease-inducing atmospheric miasma." Charles E. Rosenburg, *Explaining Epidemics and other Studies in the History of Medicine* (Cambridge: Cambridge University Press, 1992), 296.

> Japan are vegetarian countries; that is, meat eating is not prominent. Is beriberi prevalent because of a poor diet and crowded living quarters? If we encourage people to eat meat and stop the people from living in cramped quarters, would this be effective as a preventative measure? We hope this will be tested.[13]

This commentary reflects the general concern with environmental conditions and miasmatic emissions from the ground that were characteristic of the period before the heyday of bacteriology. While it may have been clear to those writing the analysis reports that social conditions deserved more scrutiny, the research agenda for these same doctors at Tokyo Imperial University was moving away from a focus on environment and miasma towards the isolation, in the laboratory, of a single disease causing microbe.

The leading public health officials shut down the Beriberi Hospital in 1882 and moved the beriberi project to the medical laboratory in Tokyo Imperial University's medical school.[14] As germ theories and practices were established in elite medical institutions in Japan, the idea that any breakthrough in beriberi research could only come from the lab also became entrenched. This process enabled Tokyo Imperial University doctors to establish their hold and in effect colonize the field of beriberi research.

Drawing upon the history of science, we know that research goals and agendas are formulated and carried out within communities of doctors and scientists who share an understanding of how to go about practicing science. Ludwik Fleck calls these groups "thought-collectives," and Thomas Kuhn terms their approach to science "paradigms."[15] These groups also function according to accepted scientific theories and within research parameters. Ian Hacking refers to this as a "style of reasoning."[16] Hacking notes that a style of reasoning cannot operate independently; it needs institutional authority. Similarly, Theodore Porter writes that scientific knowledge remains impotent without institutional

---

[13] Nagayo Sensei, ed., *Kakkebyóin daini hókoku: 1879* (Tokyo: Naimushó, 1881), 117-18.
[14] The official request is dated April 9, 1880, from the *Naimushó* to the *Dajókan*. Quoted in Yamashita, *Meijiki ni okeru kakke*, 120-21. This news was reported in the popular press as well. "Monbushó kanri kakkebyóin wo haishi, kakke no shinsa ha kongo Tokyo daigaku igakubu de kanshó," *Yomiuri shinbun* (5/4/1882): 1.
[15] Ludwik Fleck, *Genesis and Development of a Scientific Fact*, trans. by Fred Bradley and Thaddeus J. Trenn (Chicago: The University of Chicago Press, 1979), 93. Thomas S. Khun, *The Structure of Scientific Revolutions Third edition* (Chicago: University of Chicago Press, 1996), 175.
[16] Ian Hacking, "Statistical Language, Statistical Truth and Statistical Reason: The Self-authentification of a Style of Scientific Reasoning," *The Social Dimensions of Science*, ed. Ernan McMullin (Notre Dame; IN: University of Notre Dame Press, 1992), 132.

support.[17] Hacking argues that, "a style of reasoning [is] inseparable from the institutions that deploy it."[18] That is, once a way of thinking or a style of reasoning is institutionalized, it becomes wed to the authority of the supporting institution. Entrenched, a style of reasoning grows in certain directions, yet is closed off from other trajectories.[19]

We also know that the Western trained doctors at the Beriberi Hospital were wedded intellectually and institutionally to the idea that the laboratory should be the center for the study of beriberi. First, they were trained by Europeans in the fundamentals of experimental medicine, especially as practiced and taught in Germany.[20] Second, the connection between Tokyo Imperial University and the army was continuously reinforced because the army recruited graduates from the University Medical School. It is important to emphasize that the leading doctors associated with Tokyo Imperial University, men who also managed and operated the Beriberi Hospital formed a "thought-collective." Their shared scientific beliefs—experimental medicine was the key to disease etiology—directed how the collective understood this disease and their institutional authority ensured that the contagion-theory would be viewed as the most legitimate approach to beriberi research.[21]

In the early 1880s, navy doctor Takaki Kanehiro (1849-1920), trained in British-style social medicine, began working with medical surveys and clinical records, looking at things like housing, bedding, clothing, barrack and ship conditions, and diet in his search for the cause of the high incidence rate of beriberi in the navy. Narrowing his focus to diet, he deduced that beriberi was a protein deficiency disease.[22] He based his hypothesis on European nutritional standards that stipulated that a healthy diet needed a 1 to 15 protein to carbohydrate ratio. His data that showed that the navy's white rice rations had on average a ratio of 1 to 28. Consequently, in units

---

[17] Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995), 81-82.
[18] Hacking, "Statistical Language, Statistical Truth and Statistical Reason," 145.
[19] Hacking, "Statistical Language, Statistical Truth and Statistical Reason," 132.
[20] It is an often-cited fact that the Meiji government looked to German example for developing medical, scientific, and public health institutions. Susan L. Burns, "Constructing the National Body: Public Health and the Nation in Nineteenth-Century Japan," *Nation Work: Asian Elites and National Identities*, ed. T. Brook and A. Schmid (Ann Arbor: University of Michigan Press, 2000), 24.
[21] According to Ludwik Fleck, a "thought-collective" is a group of scientists working together on a similar problem, whose shared scientific beliefs are called a "thought-style." The thought-style itself directs how the thought-collective understands their scientific endeavors. It effects a "readiness for directed perception" within the thought-collective, and works by "constraining, inhibiting, and determining" the approach to a certain problem. The thought-style establishes the parameters for one way of thinking, and it excludes other approaches to the same problem. Fleck, *Genesis and Development of a Scientific Fact*, 93.
[22] Central Sanitary Bureau, Navy Department, *Review of the Preventative Measures Taken Against Kak'ke in the Imperial Navy* (Tokyo: Central Sanitary Bureau, Navy Department, 1892), 36-37.

where the protein content was the lowest, the numbers of beriberi sufferers were the highest, and in units where the protein content of the diet was ample, the numbers of beriberi sufferers were low.[23] He argued that the navy diet was harmful to the sailors' health and therefore reformed the diet by westernizing the rations. The sailors, however, refused to eat meat and bread.

To maintain a high protein content, he switched his approach and added barley to the rice allocation in 1884.[24] As noted, within the kanpó tradition, barley and other foods like red beans were used in tandem with herbal drugs. I argue that Takaki started out westernizing the galley, but adapted, in the end, Chinese medical practices of dietary therapy to combat beriberi in the navy.[25] As Table I also shows, beriberi sufferers dropped dramatically after the new dietary regulations were put into practice. By 1886, Takaki could claim that he had eradicated beriberi from the ranks of the navy, and by doing so, validate his discovery that a protein-deficient diet caused beriberi.

Army and Tokyo Imperial University doctors did not recognize Takaki's discovery or the effectiveness of navy dietary reform. Army Surgeon General and Director of the Army Medical Bureau Ishiguro Tadanori took the lead in criticizing Takaki's work. He believed that beriberi was a contagious disease and in no way related etiologically to dietary practices. He also believed that white rice was perfectly healthy. Finally, Ishiguro criticized Takaki's use of medical statistics, arguing that, "The theory that barley consumption reduces beriberi is based not on accumulated data on personnel and disease, but on the statistics for one year—and not even on a comparison of previous years. For this reason, I do not believe the theory (based on medical statistics) that barley either prevents against or is a cure for beriberi."[26]

Another army doctor, Mori Rintaró, schooled in Germany, also attacked Takaki's data. "Experimental induction, using microscope and microtome, is the highest art [for producing scientific knowledge],"

---

[23] Takaki Kenkan, "The Preservation of the Health in the Japanese Navy and Army," *Takaki Kenkan sensei gyósekishu*, ed. Matsuda Makoto (Tokyo: Jikeikai ika daigaku, 1993), 235-36. This article originally appeared in *British Medical Journal* 1 (1906): 1175-76.

[24] Takaki Kenkan, "The Preservation of the Health of the Japanese Navy and Army," *Takaki Kenkan sensei gyósekishú*, ed. Matsuda Makoto (Tokyo: Gikeikai ika daigaku, 1993), 235-36.

[25] In 1885, he hinted at the popular practice of using barley to treat those suffering from beriberi when he lectured to the Navy Officers' Club that, "Now, there is nothing better than barley food for preventing [Beriberi]…It is accordingly considered that the best preventative measure, at present, against [beriberi], will be to give barley." Navy Department, Central Sanitary Bureau, *Review of the Preventative Measures Taken Against Kak'ke in the Imperial Navy*, (Tokyo: Central Sanitary Bureau, Navy Department, 1892), 36-37.

[26] Ishiguro Tadanori, *Kakkedan* (Tokyo: Eirandó, 1885), 43-44.

he said.[27] Statistical data did not constitute a scientific fact. There could be no causal connection between Takaki's statistics and beriberi etiology, which Mori called a "post hoc ergo propter hoc" or after-the-fact argument. [28]

To counter Takaki's theory that a white rice diet was poor in nutrition, Mori used his lab to prove the nutritional value of the traditional Japanese fare. In a series of tests, Mori fed six men a rice diet, a barley diet, and a Western diet. Using the Liebig method for calculating the energy within the food fed to the test subjects, he determined that the average calorie count for each diet.[29] Mori not only examined the energy content, he also checked the nitrogen content of the test subjects' bodily wastes. His results, reproduced in Table II, showed that the rice diet was highest in energy and it had the greatest amount of absorbable nitrogen.[30] He wrote,

> In testing the human wastes for nitrogen, it is an indication that the body is losing the nitrogen it has stored up if there is a lot of nitrogen in the waste. As for the abundance of nitrogen in the body, this is generally indicated by little [nitrogen in the waste]. [A healthy] body stores up the consumed nitrogen. In the Table, a plus sign indicated that the body was storing up new nitrogen [thus little nitrogen in bodily wastes], and seen from the point of the rations, it is [a sign of] abundance. A minus sign indicates the burning up of nitrogen previously stored by the body, and when used to analyze the rations, it reflects a scarcity [of protein].[31]

While Mori did not address the effectiveness of barley rations as a prophylaxis against beriberi, he did produce scientific data suggesting that a white rice diet was healthy. Based on this data, Mori became the representative for the ideological and institutional

---

[27] Mori Rintaró, "Igaku tókeiron daigen," *Tokyo iji shinshi* 569 (1889): 1-5; quoted above from *Ógai Zenshú* 28, 220. A microtome is a bladed instrument used to slice thin samples of tissue for examination under the microscope.
[28] Mori Rintaró, "Kakke gensho ha hatashite mugi wo motte komei ni kaetaru ni insuruka," *Ógai zenshú* 34 (Tokyo: Iwanami shoten, 1974), 166. First published in *Tokyo iji shinshi* 1221 (1901).
[29] Liebig developed a method for burning organic and inorganic compounds in a special chamber that allowed the measuring of the compound's elemental (i.e. nitrogen, carbon) make-up. Liebig's methods became standardized and "[h]is combustion apparatus became a symbol of the new era of organic chemistry." Frederic L. Holmes, "Liebig, Justus Von," *Dictionary of Scientific Biography* 8, ed. Charles Coulston Gillispie (NY: Charles Scribner's Sons, 1973): 331-32.
[30] Mori Rintaró, "Heishoku kensa seisekiryakuhó," *Ógai zenshú* 28, (Tokyo: Iwanami shoten, 1974), 136. This report was submitted on 3/31/1890.
[31] Mori, "Heishoku kensa seisekiryakuhó," 139. Interestingly, although Mori discounts Voit's theories, he is analyzing these test results according to a Voitian understanding of protein consumption in the body. Voit's work of protein led him to formulate a theory of nitrogen intake, storage, and the relative amount of energy to be gained from them. Again, intake and excretion were varied so Voit thought "the urea production as a measure not of the muscle activity at any particular time, but of the capacity for such activity over a longer time period." Frederic L. Holmes, "Voit, Carl Von," *Dictionary of Scientific Biography XIV*, ed. Charles Coulston Gillispie (NY: Charles Scribner's Sons, 1976), 64.

stance of the Army Medical Bureau. Because rice did not damage health, from the standpoint of etiology, beriberi could not be tied to the traditional Japanese diet. Instead, and in-line with Ishiguro's theory, beriberi was considered a contagious disease. In short, Mori's data acquired the authority of a fact within the army.

It is important to also note that Ishiguro and Mori reacted against any medical treatments that smacked of Chinese medicine. There can be no doubt that they saw Takaki's use of barley was borrowed from this tradition.[32] Ishiguro had worked at the Beriberi Hospital, and he maintained a personal relationship with the Chinese medicine doctor Tóta Chóan (1818-1889), so he was quite familiar with the use of barley.[33] In journal articles, Ishiguro alluded to Takaki's work as Chinese medicine, and other army surgeons as well referred to barley treatments as Chinese medicine-derived.[34] In 1895, using a pen name, Ishiguro argued that, "the army does not need Chinese medicine, statistical speculation, or 1,860 year-old theories to solve its beriberi problems; it needs scientific knowledge based on experimental medicine."[35] Despite Takaki's use of what they thought was "Oriental" and therefore backward medicine, the navy remained free from beriberi. (Table III) The same, however, cannot be said of the army, and beriberi became an added cost of Japan's growing empire.

During the 1st Sino-Japanese War, Ishiguro Tadanori, who not only oversaw hygiene but also supply and logistics, citing Mori's tests, dismissed suggestions to add barley to the white rice rations and the infantry suffered heavily from beriberi: Over 30,000 cases with close to 2000 deaths (Table IV).[36] The navy, in comparison, did not incur even one case of beriberi during the conflict. After defeating China in 1895, Japan began the occupation of Taiwan. There, the army faced a beriberi incidence rate of 90%. In 1896, the chief medical officer on Taiwan, Dr. Doki Raitoku, turned to the practice of adding barley to the rations which brought about a reduction in the incidence rate (Table V).[37]

---

[32] Yamashita, *Meijiki ni okeru kakke*, 157. Yamashita Seizó, personal letter to author.
[33] Yamashita, *Meijiki ni okeru kakke*, 153-54.
[34] Takada Kame, "Ishigami daiguni sama hoka góippó sama e ukagai sóró," *Tokyo Iji Shinshi* 921 (1895): 33; Koike Masanao, "Genkyokuchó no kakke ni kan suru kunji," *Gun'i gakkai zasshi* 162 supplement (1907): 6.
[35] Takada Kame, "Ishigami daigun'i sama hoka góippó sama e ukagai sóró," *Tokyo Iji Shinshi* 921 (1895): 34. The 1,860 year-old story may be referring to the barley remedy that is found in ancient Chinese medical texts.
[36] *Meiji 27-28 nen eki rikugun eisei jiseki*, ed. Rikugun eisei jiseki hensan i'inkai (Tokyo: Rikugunshó, 1907), 1-7; Rikugun, Imukyoku, *Medical and Surgical Statistics of the Imperial Japanese Army during the War with China (1894-1895)*, 40-41.
[37] "Taiwan rikugun eisei gaikyo," *Taiwan rikugun gun'i bu* (March), 1905 quoted in Yamashita, *Meijiki ni okeru kakke no rekishi*, 449; "Korera ha nai ga kakke ga ryúkó," *Yomiuri shinbun* (7/11/1895): 5; T.K Iku, "Taiwan no eisei nit suite," *Jiji shinpó* 4566 (1896): 10.

Ishiguro responded to Doki's order by issuing his own instruction (kunji) about these rations.

> It is difficult to determine the scientific appropriateness of the [new] diet for the Taiwan detachment. During the period that this science remains undecided, the appropriate diet for the soldiers of the empire will remain the existing diet of white rice, which has been proven through experiments at the Army Medical School to be second to none. So, until there is [another food] that is confirmed by science and experience [as superior to white rice], the main food for the Taiwan forces should not waver from white rice.[38]

Ishiguro called the barley method of prevention a biased practiced used by only a few doctors, and maintained that the scientific community has yet to recognize the science behind its use.

> For those who refer to the efficacy of barley, they do not use an established method [of proving this] because there is no clear and esteemed value or scientific belief based on comparative statistics. Those who refer to the results [based on numerical data] cannot escape from speculation.[39]

In March of 1896, Doki responded to Ishiguro by reporting on the state of hygiene in Taiwan in the newspaper Jiji shinpó. More than forty thousand, out of seventy or eighty thousand, suffered from disease. Close to fifteen thousand alone had beriberi while another fifteen thousand were hospitalized with dysentery, typhoid fever, or malaria. Doki worried that if the plague struck Taiwan, the situation would be even worse. He valued actual experience, like the data taken from the navy, over theory.[40] After quoting the entirety of Ishiguro's "instructions," Doki wrote,

> I am surprised by Ishiguro's order. The navy arrived at a preventative measure against beriberi in 1884, and has more than ten years of actual experience to back up the practice. If we compare this to the army, it is like night and day. There are comparative statistics that make this clear. Instead of acknowledging that barley rice is an appropriate [preventative] in the summer when the disease is prevalent, the army refers to

[38] Quoted in "Ishiguro Eisei Chøkan no kunji—Bøshi no giron," *Ch¥gai iji shinpø* 386 (1896): 601-03. The original "instruction" appears in Ishiguro Tadanori, "Ishiguro Eisei Chøkan no kunji," *Rikugun igakkai zasshi* 72 (1896): 238-39.
[39] "Ishiguro Eisei Chøkan no kunji—Bøshi no giron," 601.
[40] T.K. Iku, "Taiwan no eisei ni tsuite," *Jiji shinpø* 4566 (1896): 10. According to Yamashita, *Meijiki ni okeru kakke no rekishi* 409, T.K. Iku was Toki Yoritoku's pen name. It is quite possible that Toki needed to use a pen name in order to openly criticize the upper echelon of the Army Medical Bureau.

> Dr. Mori's medical school experiments from many years ago. Even if this data has value as science, to the contrary, many years of army medical experiences make clear that barley rice is a preventative against the symptoms of beriberi…The responsibility of breaking down the stubbornness of the Army Hygiene Bureau authorities falls on the shoulders of those in Taiwan. They should by all means take care of their own hygiene and by their own choice employ barley as a preventative against this disease.[41]

Doki hoped that the importance of dietary reform for the occupation of Taiwan would displace the Bureau's hegemony, opening up new ways to think about beriberi prevention. He also thought that experiences with empire would reconstitute Japanese medical practice. This was not the case in the 1890s, and his critique of Ishiguro was not without consequences. Because he was critical of Ishiguro's resistance to the use of barley as a preventative and because of his outspokenness, Doki's tenure as Chief Medical Officer was erased from the official history of the army's medical corps in Taiwan.[42]

Despite the example of Taiwan, the Army Medical Bureau did not change its policy on military diet, and again, it refused to send barley to the front during the war with Russia in 1904.[43] Subsequently, there were approximately 250,000 cases of beriberi with over 27,000 deaths.[44] Even when confronted with this crisis, the Army Medical Bureau did not rethink its stance on beriberi prevention and adopt the use of barley-rice. Instead, the Minister of War Terauchi Masatake (1852-1919), who had been treated for beriberi by a Chinese medicine doctor as a young man and eaten barley thereafter, sidestepped the Bureau, and ordered barley sent to the front.[45] In

---

[41] T.K. Iku, "Taiwan no eisei ni tsuite," 10.

[42] 11 June 1895, Mori arrived in Taipei and on August 8th, he became the Taiwan Sótokufu Rikugunkyoku Gun'i buchó. He left Taiwan on September 22nd and was back in Tokyo by October 4th. From September 1896 to January 1896, Ishizaka Tadahiro was the chief of military medicine on Taiwan. He was replaced by Toki, but Toki's name does not appear in the official record. Yamashita, *Meijiki ni okeru kakke no rekishi*, 477-78, note 61.

[43] While there was much support for barley-rations within the army medical corps, the Army Medical Bureau postponed the addition of barley because, they said, it would have complicated the main diet of white rice and caused difficulties in supply. *Gun'i no mitaru Nichiro sensó*, ed. Nishimura Fumio (Tokyo: Sen'i'ishi kankókai, 1934), 161.

[44] "Nichiro sen'eki to kakke," *Ikai jiho* 747 (10/10/1908): 1293.

[45] Aikokusei, "Kakkebyó yobó sódan II," *Ikai jihó* 742 (9/5/1908): 1154, Seaman, *The Real Triumph of Japan*, 242. In March, the army high command issued the following order concerning field rations:
"March 10, 1905 #2000, Instructions for barley rice rations for the army in the field.
For those attached to the army in the field, because it has been recognized that it is necessary to eat barley-rice as a means of beriberi prevention, when the situation allows, endeavor to make the main diet 4 *gó* or polished rice and 2 *gó* of split barley." This order was not limited only to the campaign forces, but soon was applied to the home front as well. "March 29, 1905# 2649, Instructions for barley rations within Japan. It has already been instructed that the army in the field should endeavor to eat barley rice as a form of beriberi prevention when the situation allows. For the

the army at least, the beriberi epidemic made the relationship between foodstuffs and this disease very clear. Army doctor Fujii Yoshikazu called this relationship "an undisputable fact," based on data (reproduced in Table VI) that correlated the move towards diet-based prevention with falling incidence rates.[46]

Because over 250,000 men were hospitalized with this disease during the Russo-Japanese War, beriberi came to be seen as a "national enemy" within medical discourse and in 1908 public health officials established a national research council—The Special Beriberi Research Council (Rinji kakkebyó chósakai)—employing an elite corps of internalists, physiologists, and bacteriologists.[47] While public health officials working within the national assembly, such as Yamane Masatsugu (1855-1925), pushed the funding for this council through the lower house, it was the Tokyo and army faction that took over the organization and operation of the Beriberi Research Council (or BRC). The council was chaired by army Surgeon General Mori Rintaró and divided into five research groups: Bacteriology, medical chemistry, physiology and autopsy, clinical, and history and statistics. There was none dedicated to studying the impact of diet on beriberi, meaning that the BRC had little interest in exploring why barley-rice rations protected soldiers or sailors from beriberi. [48]

In late 1908, the BRC sent Shibayama Gorósaku from the Institute for the Study of Contagious Diseases, professor of medicine at Tokyo University Miyamoto Hajime, and army doctor Tsuzuki Jinnosuke to Batavia, where they visited Dutch East Indies hospitals, carrying out clinical studies and autopsies. After returning to Japan, their official report concluded that beriberi stemmed, either in a causal or contributing fashion, from etwas—German for "something."[49] This was quite a revelation. According to medical historian Yamashita Seizó, it is unclear why the team decided to utilize a German term; nevertheless, they employed it in such a fashion to mask whether they were talking about a bacillus, toxin, or deficiency.[50] I argue that they used the term "something" because they did not find a causal

---

units within Japan, and with this purpose, endeavor to make the main diet a 7 to 3, rice to barley mixture." Quoted in Rikugun gun'idan, ed., *Rikugun eisei seidoshi* (Tokyo: Hideyósha dai'ichi kójó, 1913), *Rikugun eisei seidoshi*, 1334.

[46] Fujii, Yoshikazu "Meiji sanju shichi, hachi nen sen'eki ni okeru kakke ni tsuite," *Rinji kakkebyo chosakai* (1911): 42-43, 44.

[47] "Rinji Kakkebyó Chósakai saisoku," presented to the Imperial Diet (8/29/1908) quoted in *Nihon kagaku gijitsushi taikei 24:1 Igaku*, ed. Nihon kagakushi gakkai (Tokyo: Dai'ichi hókishuppan kabushiki gaisha, 1965), 129.

[48] Itakura Kiyonobu, *Mohó no jidai II* (Tokyo: Kasetsusha, 1988), 238.

[49] Shibayama Gorósaku, Miyamoto Hajime, Tsuzuki Jinnosuke, "Batavia fukin 'Beriberi' byó chósa fukumeisho," *Gun'idan zasshi* 3: Supplement, quoted in Yamashita, *Kakke no rekishi: Bitamin no hakken*, 270-71.

[50] Yamashita, *Kakke no rekishi: Bitamin no hakken*, 270-71.

bacillus and did not want to attribute the cause of the disease to white rice. That is, rather than recognize the relation between diet and beriberi; the BRC doctors instead purposefully propagated "uncertainty" surrounding the role

From the early 20th-century, Western colonial doctors in Southeast Asia began focusing on the relationship between diet and beriberi. These doctors drew upon the work of Dutch doctor Christiaan Eijkman (1858-1930), who had in 1895 discovered by accident that chickens fed day old white rice contracted white rice disease or polyneuritis but birds eating unpolished rice did not.[51] At the 1913 Far Eastern Association of Tropical Medicine conference, abundant experimental data taken from bird and human tests during the 1910s convinced western colonial doctors not only that polyneuritis and beriberi were the same disease but also that a white rice diet deficient in a particular element caused beriberi and that brown rice or more specifically rice bran prevented the disease.[52] Tokyo Imperial University professors and doctors staffing the BRC, highly invested in a line of research based on a bacteriological approach and very concerned with their individual names as well as the larger reputation of the national research council on which they sat, continued to discount the diet-theory and stubbornly defended the position that a microscopic agent was the cause of this disease.

For example, at the Far Eastern Association of Tropical Medicine meeting held in Manila in 1910, BRC member Shibayama Gosakuró defended a bacteriological approach to the disease. He believed that diet was a predisposing cause, not the actual cause. Since beriberi was wide spread in Asia, but absent in the west, Shibayama argued that, "It is not unreasonable to assume that the microorganisms of beriberi are only present in the Orient and, given a predisposing cause, are capable to causing the disease, whereas in the West beriberi does not appear, owing to the absence of the infecting organism, although the same favorable predisposing cause may be present."[53] This must have been an uncomfortable assertion to make. The majority of the doctors at this conference believed that beriberi was not a contagious disease and that their research proved diet was the main factor in disease causation.

---

[51] Carpenter, 39-44.
[52] Henry Fraser and A.T. Stanton, "The Etiology of Beriberi," *The Philippine Journal of Science B: Medical Sciences* 5 (1910): 58-59. Originally read at the first biennial meeting of the Far Eastern Association of Tropical Medicine on 3/10/1910 in Manila.
[53] Shibayama Gorosaku, "Some Observations Concerning Beriberi," *The Philippine Journal of Science B: Medical Sciences* 5 (1910): 125.

During the discussion portion of the meeting, Shibayama further emphasized the weakness that he saw in the diet deficiency theory. "I would also, in this place, wish especially to emphasize the fact that the polyneuritis of fowls is not identical with beriberi," he argued, "and that the interpreted experimental results obtained with these birds can not directly be interpreted in the same sense with human beings."[54] Despite the fact that several doctors presented data indicating that in human experiments, brown rice protected work-crews, prisoners, and asylum inmates from the effects of beriberi, Shibayama said that polyneuritis in birds could not be associated with beriberi in humans, so there was no evidence that proved the effectiveness of brown rice on beriberi patients. The conference proceedings, published in The Philippine Journal of Science, did not record a reply to Shibayama's statement. The other doctors may have simply not taken his comment serious enough to warrant a response. Nevertheless, Shibayama's comment revealed the scientific outlook and the values of the BRC.

From 1910, Tsuzuki Jinnosuke (1868-1933), who had traveled to Batavia as a member of the BRC, abandoned the contagionist approach and refocused his efforts on nutritional studies. In his private Beriberi Research Institute, he developed a rice bran extract, what he called Anchiberiberin, which he used in animal and human experiments. Several other doctors active in the Far Eastern Association of Tropical Medicine were also experimenting with extracts around 1910.[55]

Tsuzuki's first high profile experiment was carried out at the Tokyo Electric Bureau in 1912. He was given a test group of sixty employees who were eating white rice. He took the fifteen who had never contracted beriberi and designated them the Prevention Group. This group received thirty tablets of his Anchiberiberin a day. Ten were chosen as a Control Group, and received no drugs. Thirty-five employees were currently suffering from beriberi and they became the Treatment Group. They also received thirty tablets a day. All fifteen in the Prevention Group stayed healthy. Six within the Control Group developed beriberi. All thirty-five of the Treatment Group recovered and symptoms were eliminated within four weeks. His data suggested

[54] "Discussions on the Papers by Doctors De Hann, Frase, Highet, Aron, Shibayama, and Kilborne," *The Philippine Journal of Science B: Medical Sciences* 5 (1910): 137-144. Originally discussed at the first biennial meeting of the Far Eastern Association of Tropical Medicine on 3/10/1910 in Manila.
[55] Tsuzuki Jinnosuke, "Kakke nuka ryóhó," *Tokyo iji shinshi* 1715 (1911): 985.

that Anchiberiberin worked both as a preventative and as a treatment.[56]

Tóyama Shunkichi (1856-1928), a contemporary of Tsuzuki, experimented with the use of rice bran too. He began experimenting with rice bran using chickens, pigeons, quail, sparrows and finches in 1910 and his results suggested that beriberi was a "proportional nutritional disability" disease stemming from the deficiency of a certain compound. "Beriberi stems from the continued intake, over a period of time, of a diet such as white rice that lacks the nutritional element within bran."[57]

Tóyama promoted prevention through a four-point program: First, cultivate more minor grains; second, eat more of these whole grains and bread; third, do not eat highly polished rice; fourth, decrease the amount of rice eaten and conversely increase portions of supplementary foodstuffs. How did he conceptualize the realization of this program? Scholars and educators had to teach nutritional science to the masses, he said. The elite class had to lead by example, and if they practiced minor grain dietary regimes, the lower classes would follow.[58]

In a series of 1918 Yomiuri shinbun articles entitled "Nihonjin to beishoku" (The Japanese and white rice consumption), Tōyama told how the Japanese had traditionally eaten brown rice.

> The oldest people on the earth attached to rice eating are the Japanese…However, this rice has not always been white rice like we eat today, but brown rice…Only high-ranking people within the elite class ate white rice [during the Edo period]. While culture advanced rapidly during the Genroku era [1688-1703], everyone outside of Edo, Kyoto or Osaka was eating unpolished brown rice.[59]

Tōyama's main point was that epidemic beriberi was a product of modern Japanese society. As rice polishing technology advanced, so did the prevalence of beriberi.[60] Enrolling history as a legitimizing device, he argued that eating brown rice or barley was not only a

[56] Tsuzuki Jinnosuke, "Anchiberiberin wo motte seshi kakke no yobó oyobi chiryó shaken: Anchiberiberin chúsha ryóhó," *Tokyo iji shinshi* 1753 (1912): 259-62.
[57] Tóyama Shunkichi, "Kakkebyó gen'in no kenkyú," *Rinji kakkebyó chósakai* (August, 1911): 87-88.
[58] Tóyama Shunkichi, *Kakke yobø to chiryóhó* Saishin eisei søsho series 10 (Tokyo: Kobundø, 1913), 5-6,14-15.
[59] Tōyama Shunkichi, "Nihonjin to beishoku I," *Yomiuri shinbun* (3/6/1918): 4.
[60] Tōyama Shunkichi, "Nihonjin to beishoku II," *Yomiuri shinbun* (3/8/1918): 4.

part of Japanese history and heritage; but was also naturally effective in preventing beriberi.[61]

Professors of Tokyo Imperial University did not take the work of the diet theorists seriously and often referred to such work using derogatory terms. When über-contagionist Aoyama Tanemichi heard about Tsuzuki's research, he is purported to have said, "Oh, rice bran's now a medicine for beriberi? Well, I wonder if horse piss would work too?"[62] Aoyama, director of beriberi research at Tokyo Imperial University, used his institutional authority to discredit any science that did not agree with his medical opinions: He dismissed even data produced by his students that supported the diet deficiency theory as "coincidental."[63]

Historians of the pharmaceutical industry also point out Tsuzuki's educational background influenced the reception of his new drug. As a graduate of the Aichi Medical School, he lacked the credentials of someone from a prestigious institute such as Tokyo Imperial University. When Tsuzuki presented an exhibit in the science section showing the statistical data from his Anchiberiberin treatments at the 1915 Tokyo Fair. The Tokyo Imperial University Medical Department in the adjoining booth posted a large sign that read, "Rice bran cures white rice disease in animals but has no effect on beriberi in humans."[64]

The medical elite did much to block or even negate the work of the diet deficiency theorists. At the annual Medical Association of Japan (Dainippon igakkai) in 1914, Hayashi Haruo, professor of medicine at Tokyo Imperial University and BRC member, explored the nascent vitamin theory. He based his talk on the work of his student Tazawa Ryóji (1883-1967).[65] Hayashi reported that in clinical trails, rice bran extract did not halt disease progression. During treatment, symptoms continued to worsen to the point that Tazawa stopped the trial and returned to the usual treatments of stimulants and diuretics. "Based on what many professors and their assistants have said today," Hayashi argued, "we have clear proof that rice bran extract has no effect."[66] At the end of his talk, interestingly, Hayashi returned to the contagion theory.

---

[61] Professor Suzuki Umetarō (1874-1943) also produced a rice bran extract called *Orizanin*, but because Suzuki was a professor of agricultural chemistry and not a medical doctor, his work is not addressed here.
[62] *Nihon no shinyakushi*, ed. Nihon shinyakushi kankókai (Tokyo: Yakugyó jihósha, 1969), 232.
[63] Tazawa Ryōji, "Irisawa-sensei to kakkebyō," *Irisawa Tatsuyoshi* (Tokyo: Tsutatomo insatsu kabushikigaisha, 1965), 4-5.
[64] *Nihon no shinyakushi*, 232.
[65] Hayashi Haruo, "Kakke no kenkyú ni tsuite," *Nisshin igaku* 3:8 (1914): 1275.
[66] Hayashi Haruo, "Kakke no kenkyú ni tsuite," 1282.

> I do not believe that beriberi and food are causally related. But, we would not oppose the theory that an inappropriate diet lacking vitamin rich foods predisposes one to contract beriberi. Also, living in an insalubrious environment also predisposes everyone to catch this disease. A poor diet is one of the contributing factors to beriberi. In the navy, they basically eliminated it by reforming the diet. While dietary reform may be one factor in the disease's prevention, I believe that the improvement of general hygiene also played a large role in this process.[67]

Ómori Kenta, professor at Keió University Medical School, commented that Hayashi's presentation basically put a stop to understanding beriberi as a vitamin deficiency disease.[68]

The anthropological notion of medical pluralism can help us understand the adherence to the contagionist approach. Medical anthropology analyzes the practice of medicine or medical system choice not solely in terms of efficacy, which anthropologists argue matters little, but instead in terms of "political, economic, and social considerations."[69] Like sociologists of science, medical anthropologists argue that the practice and patronage of medicine is value-laden. People articulate values, such as modern and scientific, or traditional and holistic through the patronage of different medical systems.[70] Patients and doctors, those involved in medical discussion, use medicine, a primary resource, to acquire secondary resources of political, economic or social significance. Medical anthropologist Crandon-Malamud argues that,

> The point is that physicians…shift their medical beliefs because they can use them as primary resources through which they can get access to secondary ones…evaluation of medical efficacy takes place within the context of interests in such secondary resources. The choices between alternative medical resources and shifts in medical ideologies are made at least as

[67] Hayashi Haruo, "Kakke no kenkyú ni tsuite," 1284.
[68] Ómori Kenta, "Kindai no kakke genin kenkyu no ayumi," *Bitamin kenkyu goju nen* quoted in Itakura, *Kakke no rekishi*: *shiryó to bunken nenbyó*, 111.
[69] Libbet Crandon-Malamud, *From the Fat of Our Souls: Social Change, Political Process, and Medical Pluralism is Bolivia* (Berkeley: University of California Press, 1991), 3. Crandon-Malamud examines practitioners of indigenous medical systems in the Bolivian Andes, and how they attempt to parlay the legitimacy of their medicine system into political power. She defines political power as "the ability to modify the behavior of others and enforce, through either social or supernatural sanction, a monopoly of opinion." 9.
[70] Crandon-Malamud, *From the Fat of Our Souls*, 207.

much for social and political reasons as they are for advances in technological knowledge.[71]

In short, we know that asking questions of efficacy such as "why did they support a theory that did not cure beriberi?" are not fruitful. Efficacy is subjective and contextual. Instead, we should look for the secondary resources to be gained from choosing a particular theory. That is, we need to examine the stakes and the spoils. The stakes were high for the anti-vitamin doctors. If the vitamin theory were proven a fact, an entire generation of work done at Tokyo, starting in the 1880s after the closure of the Kakkebyóin, dedicated to discovering the microscopic agent that caused beriberi, would have been discredited. Not only would have Tokyo Imperial University professors been proven dead wrong but also the diet deficiency theory and the dietary treatments of Chinese medicine doctors would have been vindicated, trumping the research of these professors.

The spoils were equally important. These doctors had nothing to gain by supporting the diet deficiency theory. They participated in no discoveries, so no academic glory was to be earned. Tsuzuki and Tóyama had already pioneered rice bran extraction methods and developed several different kinds of serum treatments. As doctors at the premier medical research institute in Japan, they would have been merely following the lead of other scientists. The microorganism hypothesis, on the other hand, offered the potential for the discovery of the beriberi bacillus or toxin. As long as the cause remained unclear, doctors like Aoyama and Hayashi could spread uncertainty concerning disease etiology, and continue to support the contagion theory.

Reputation vis-à-vis lower ranking doctors was not the only issue. Kitasato Shibasaburó (1853-1931), star pupil of Robert Koch, had set up an Institute for the Study of Contagious Diseases with the support of the Home Ministry. This was a deliberate alliance, because under the protection of the Home Ministry, Kitasato could keep his Institute outside of the control of the Ministry of Education and Tokyo Imperial University. Flaunting his autonomy in the face of the imperial university doctors, Kitasato was a thorn in the side of both Tokyo Imperial University and the Ministry of Education. The Ministry of Education finally absorbed the Institute for the Study of Contagious Diseases into its fold in 1914, bringing it under the

[71] Crandon-Malamud, *From the Fat of Our Souls*, 209-10.

control of Tokyo doctors. Kitasato immediately quit, set up the Kitasato Institute for the Study of Contagious Diseases, and brought the entire staff of the Institute for the Study of Contagious Diseases to his private research facilities.[72]

From 1908, members of the Institute for the Study of Contagious Diseases such as Shiga Kiyoshi served on the Beriberi Research Council alongside doctors from the imperial universities. While originally conceptualizing the disease as contagious, Shiga later switched his approach and explored the relationship between diet and disease etiology.[73] This made the rivalry even stronger.

After the 1914 Medical Association of Japan meeting, Shiga took Professor Hayashi to task for his continued support of the contagion theory. Shiga recounted how Hayashi did not believe that experimentally induced white rice disease in birds, or polyneuritis, was the same disease as beriberi in humans. Hayashi also used the case study of a merchant marine ship, that traveled on a 500-day training voyage around South America and across the Indian Ocean, to back the contagion theory. The crew consisted of officers, enlisted men and trainees. One trainee was suffering from a light case of beriberi at the beginning of the voyage. Out of 125 trainees, seventy developed beriberi. Among the twenty-seven enlisted men and twelve officers, there were no cases of the disease. The diet of the enlisted men and officers contained western food while the trainees' fare consisted of predominantly white rice.[74] Hayashi stressed that the one trainee with beriberi infected the others. Shiga did not agree. There had been numerous examples like this dating back to the early 1880s in the navy, and Takaki Kanehiro had argued that such cases proved the causal relationship between diet and beriberi. Shiga criticized Hayashi for his adherence to the contagion theory.

> Attempting to explain these cases through the contagionist approach is totally impossible. There is nothing new to be said about these cases. Why were there no cases among the officers or enlisted men if this disease is contagious…The nutrition deficiency that I advocate can explain Hayashi's causes. I am not saying that the cause of beriberi stems from the relationship of eating white rice or not eating white rice. The nutrition deficiency theory looks at the differences of labor

[72] For more on this process, see James Bartholomew, "Science, Bureaucracy, and Freedom in Meiji and Taishó Japan," *Conflict in Modern Japanese History: The Neglected Tradition* ed. T. Najita and J.V. Koschmann (Princeton University Press, 1982), 295-341.
[73] Shiga Kiyoshi. "Kakke kenkyú dai'ni: toku ni ippan eiyó to kakke shøjø no to kankei," *Saikingaku zasshi* 193 (1911): 789-806.
[74] Shiga Kiyoshi, "Hayashi Haruo-shi to kakke no gen'in nit suite," *Ikai jihó* 1034 (1914): 2.

> and lifestyle even when dealing with the same diet and argues that there are differences born from more than simply nutrition.[75]

The rivalry between the Kitasato faction and the Tokyo faction added another layer of importance to the beriberi debate. If Tokyo doctors conceded, Kitasato Institute doctors, championing the diet theory, would have prevailed. In a very real sense, reputation at the top of the Japanese medical world, and the power associated with it, was at stake.

As much as the senior medical elite within Tokyo Imperial University and the BRC wanted to deny that beriberi and diet were causally related, some researchers from these institutions began publishing data supporting the vitamin theory. Irisawa Tatsuyoshi (1865-1938) and Tazawa Ryóji published "Kakke kanja (Nuka ekisu) chiryó seiseki (dai-ichi hó)" in the 1917 BRC journal Rinji kakkebyó chósakai hókoku, arguing that rice bran extract had some effect on beriberi patients.[76]

Professors of medicine at Tokyo had been accused of carving out feudal-like enclaves of power and influence from the late 1890s.[77] Pundits within the medical community accused Tokyo professors of continuing this practice as late as 1918.

> For the most part, any scientific association with the prefix "Japan" are occupied by a Tokyo faction staffing its chair and executive officer positions. [The authority of the offices] are exhausted to the limit in pursuit of the [Tokyo faction's] willful selfishness. In all of these associations, the election of the officers and discussants are entrusted to the nomination of the chair. Also, the election of the chair, which is left to the consideration of the officers is like the godfather (oyabun) nominating his lieutenants (kobun) and the lieutenants selecting their godfather as the chair. Also, all of the official business/duties are carried out under the direction of the godfather, shouldered by the lieutenants and moreover, all the costs for these activities are covered by the membership fees. In short, it is nothing less than members being forced to pay taxes for the willful and selfish whims of the godfather

[75] Shiga Kiyoshi, "Hayashi Haruo-shi to kakke no gen'in nit suite," 2.
[76] Irisawa Tatsukichi and Tazawa Ryøji, "Kakke kanja (nuka ekisu) chiryø seiseki (dai'ichi hø)," *Rinji kakkebyø chøsakai høkoku* 146 (1917): 1-12.
[77] James Bartholomew, *The Formation of Science in Japan: Building a Research Tradition* (New Haven: Yale University Press, 1989), 191-92.

> and his lieutenants. Members cannot become the chair or the officials. They are not given the right to vote, and are only given tax-paying duties to shoulder. It is like Indians under British rule.[78]

Tokyo professors Aoyama and Irisawa were both accused of attempting to make bodies like the Internal Medicine Association their own "private possession" by forceful "occupation."[79] I tentatively call the process at work in the late 1910s as the "recolonization" of the Internal Medicine Association by the next generation of Tokyo professors like Irisawa. Because of the overwhelming evidence connecting diet to beriberi, the next generation of Tokyo doctors could no longer maintain the doubt and uncertainty propagated by the old guard since the 1880s. I am not arguing that there was a Khunian-style revolution in scientific thinking. The vitamin revolution had occurred in 1910 when doctors like Tsuzuki and Shiga produced experiment-based data attesting to the efficacy of rice bran extracts. Instead of drawing upon the work of these researchers, Tokyo doctors like Irisawa slowly re-colonized the upper echelon of the Japanese internal medicine world by gradually recognizing the relation of diet and beriberi and, based on their own work, confirming that rice bran extracts cured this disease. The medical press criticized them, quite bluntly, for not acknowledging the work of other doctors like Tsuzuki who had been studying the nascent science of vitamins from 1910.

In 1918, the editors of Japan Medical World (Nihon no ikai), criticized the Internal Medicine Conference for being close-minded to theories not originated by professors at Tokyo Imperial University Medical School. "Tsuzuki Jinnosuke submitted a paper on rice bran extract to this year's conference. Because of the fear that he would refer to Tazawa's data, the Hygiene Conference inquired whether he might retract his application, but apparently he did not respond to this request."[80] At the 5th Annual Japan Internal Medicine Conference in April 1918, eleven doctors presented papers concerning beriberi. Tsuzuki argued that his data on Anchiberiberin showed the total recovery rate had been increasing since 1911, and he stressed that Professor Tazawa and other prominent doctors should recognize that

[78] "Kakumei enjó ni oharu kaku gakkai: Kanryó! Hótó!! Gakubatsu hon'i fuka, kakumei teki kibun suisho ni ouitsusu," *Nihon no ikai* 237: (1918): 4.
[79] "Kakumei enjó ni oharu kaku gakkai: Kanryó! Hótó!! Gakubatsu hon'i fuka, kakumei teki kibun suisho ni ouitsusu," 4.
[80] "Kakumei enjó ni oharu kaku gakkai: Kanryó! Hótó!! Gakubatsu hon'i fuka, kakumei teki kibun suisho ni ouitsusu," 5.

rice bran extracts, such as Anchiberiberin, were effective against beriberi. According to the medical news, he argued,

> "There is no need to question the consistent effect of bran extract. Last year I treated 1707 patients at my research institute and produced results of its obvious effect. Can there be a more eloquent endorsement of rice bran extract than this?" Challenging the Tokyo faction's claims that bran extracts have no effect, he then said, "The era for debating the effectiveness of rice bran is already past. Can't the most stubborn 'no effect' proponents, Professors Irisawa and Tazawa recognize this?"[81]

During the post-presentation discussion, Tazawa replied that Tsuzuki's assertions were a huge misunderstanding. He had said that there seems to be a relation between the disease of white rice eaters and beriberi, but he did not admit that they were the same. While rice bran extract was effective on white rice disease, Tazawa had not said that it was effective on beriberi. Nor did he say anything about Anchiberiberin. Tazawa even cited, reading aloud from his book, one of the world's leading white rice disease specialists, Dr. Schaudinn, who remarked that Anchiberiberin was impure and not possibly effective against beriberi. Tazawa added that if Anchiberiberin were indeed effective against beriberi, he would like to know the identity of the effective element and how it worked. Tsuzuki became angry, shot back that Schaudinn had used an expired sample of Anchiberiberin, then asserted that the element in rice bran, which he himself had extracted, was called Anchiberiberin.[82]

As noted in the introduction to this paper, the medical press was quite critical of Tazawa, who claimed that rice bran extracts had no effect on beriberi patients when he was working in the lab of Professor Hayashi but then switched his stance once he entered the lab of Professor Irisawa. The Japan Medical World editor wrote that Tazawa's waffling was "shameless."[83] Also, Tazawa's conduct during the conference also came under fire. The section of the Japan Medical World article recounting this part of the conference was entitled, "Tazawa pursued, flees: The fake scholar who could not answer in his defense."[84]At the beginning of the discussion session Tazawa had asked for some time to reiterate his main point. "But, all he

[81] "Kangaku tóbatsu no hóka óni hyóru," *Nihon no ikai* 238 (1918): 4.
[82] "Kangaku tóbatsu no hóka óni hyóru," *Nihon no ikai* 238 (1918): 4.
[83] "Kangaku tóbatsu no hóka óni hyóru," 4.
[84] "Kangaku tóbatsu no hóka óni hyóru," 4-5.

succeeded in making clear through an exceedingly detailed defense of himself was that he was 'Mr. Change my theory when I change laboratories'."[85] Indeed, the discussion became so hostile towards Tazawa that the Internal Medicine Association officials, made up of the Tokyo faction, "were greatly flustered, and in an attempt to rescue Tazawa, they stopped him from saying anything more."[86]

Because of the backlash against Irisawa and Tazawa's attempt to re-colonize the Internal Medicine Association, it appears that the Tokyo faction brought in a young researcher from Kyoto Imperial University to placate the medical community. The conference organization committee for the 1919 Internal Medicine Association meeting in Kyoto asked Shimazono Junjirø (1877-1937) to give a state of the field address on the topic of beriberi. Shimazono had graduated from Tokyo University Medical School in 1905, served in the army during the Russo-Japanese War, and then studied in Germany from 1911 to 1913. After returning from abroad, he took a position at Kyoto University Medical School in 1914. Before World War I, the Japanese medical establishment looked predominantly to Germany for its institutions, theories, methods and approaches. Ømori Kenta noted that because German scholarship was no longer available during the war, the Japanese medical community turned to the Anglophone world to keep abreast of the major developments within western medicine. British and American doctors had made significant advances in the study of beriberi, and this was important for Japan's search for the cause and cure for beriberi.[87]

At the conference, Shimazono summarized the literatures and declared that there was no evidence to support either the contagion or the toxin theories. It was indisputable that a main diet of white rice caused beriberi. He did not, however, assume that polyneuritis and beriberi were the same. Had he declared that bird beriberi, curable using rice bran extracts, and human beriberi were the same, he would have been implicitly endorsing of the extracts that Tsuzuki and Tóyama had been working on, and would have discredited the research agenda and institutional stance of Tokyo Imperial University professors, the reputation of the BRC, and it would have vindicated the work of the diet theorists, none of whom were faculty at Tokyo. Shimazono nevertheless concluded that, "Based on this opinion, we cannot deny that beriberi is caused by a deficiency in the beriberi

[85] "Kangaku tóbatsu no hóka óni hyóru," 4.
[86] "Kangaku tóbatsu no hóka óni hyóru," 4-5.
[87] Ómori, *Kakke: Nihon shokuji no kekkan ni kan suru kenkyú*, 69.

vitamin [called vitamin B]. There are cases in which giving vitamins to beriberi patients are effective, but there is no consensus yet."[88] While he did not endorse rice bran extracts such as Anchiberiberin, he did create the discursive space for such tests to be carried out and confirmed at the imperial universities. Why Shimazono was brought in to represent the Tokyo faction is a question that I have to research further. While speculative, it appears that Irisawa and Tazawa had upset enough people that they were removed from their position at the forefront of beriberi research at Tokyo Imperial University. As we will see, Shimazono quickly takes their place.

Because researchers like Shimazono at the imperial universities, unlike scientists in the west, did not accept that white rice disease in birds and beriberi in humans were the same disease, Professor Ómori Kenta began experimenting at Keió University on humans to show that the diseases were indeed the same. In April 1921, he received a Ministry of Education grant to investigate the cause of beriberi. When researchers at the Keió medical department, including Ómori, ate food containing no vitamin B they all developed beriberi. Initial symptoms of the disease developed within seven to nineteen days and full-blown beriberi emerged by the fortieth day. Ómori repeated the experiment, and he had fellow scientists carry out similar tests. The results were the same. Backed by repeated tests and peer review, Ómori asserted: "Beri-beri is caused by a lack of vitamin B in diet," at the annual medical conference at Keió University in November 1921.[89] Treatment centered on the administering of vitamin B. Taking over 200 grams of bran preparations produced immediate results.[90]

According to Ómori, the best prevention was to eat foods rich in vitamin B such as products made from soy beans such as tofu, soy milk, tofu paste, azuki, kidney beans, barley, milk, raw fish, carrots, sweet potatoes, spinach, peony flowers, Dutch hollyhock, onions, peanuts, Irish potatoes, and rice bran. These foods, he asserted,

---

[88] Shimazono Junjiró, "Kakke," *Nihon naika gakkai zasshi* 7:5 (1919): 227 quoted in Ómori, *Kakke: Nihon shokuji no kekkan ni kan suru kenkyú*, 69-71.

[89] Ómori Kenta, "Studies on the Cause and Treatment of Beri-Beri in Japan," *The Japan Medical World: A Monthly Journal of Medicine, Surgery, and the Collateral Sciences* 3:11 (1923): 233. Ómori, *Kakke*, 73. Ómori Kenta, "Jibun no shintai ni jikken shite, Kakkebyó no gen'in wo vitamin no ketsubó to jisshó suru made…II," *Yomiruri shinbun* (12/5/1921): 4, wrote, "Based on this data, beriberi stems from a deficiency in vitamin B. A decrease in supply of vitamin food quickly increases the deficiency and accelerates the advance of this disease. A supply of vitamin B cures it. Without a supply of vitamin B, the formerly healthy subjects got beriberi. That is, eating a diet that lacks vitamin B causes beriberi. In turn, this is cured using vitamin B. We can clearly say that beriberi is a vitamin B deficiency disease."

[90] Ómori, "Studies on the Cause and Treatment of Beri-Beri in Japan," 238.

were not luxurious and the common people could include them in their diets.[91]

Shimazono eventually carried out experiments on humans as well. He used the daily menu of a factory dorm (a usual hotbed for beriberi,), containing 61 grams of protein, 5 grams of fat, and 457 grams of carbohydrates, coming from the 616 grams of daily rice, to induce beriberi in human subjects. [92]

> We experimented with factory food on healthy people, put them in the hospital and observed them, most developed signs of vitamin B deficiency such as a dulling of the senses, swelling, digestive troubles, low blood pressure and an unsteady pulse. Based on this set of experiments, we confirmed that when Japanese live on a diet of white rice, they develop vitamin B deficiency. When a white rice diet lacks enough vegetable and animal products, or these are not available, the diet becomes vitamin B deficient.[93]

The final breakdown of the Tokyo Imperial University internal medicine department stance against the diet theory came in 1925. At the Tokyo Medical Association meeting, Tokyo Imperial University Medical Department, Assistant Professor Ogata Tomosaburō argued that data contradicted Ōmori's vitamin theory. It was not possible to induce paralysis, the main symptom in human beriberi, in lab animals using foods low in vitamin B. The Yomiuri reported, "With the discovery of this new fact, Ogata's research puts the Keiø theory in danger. While Tokyo University and Keiø have been battling over the implications of their respective beriberi research, in the end, the imperial university wins out over Keiø."[94]

Since Tokyo was the premier institute for producing scientific knowledge, it should be no surprise that within the popular press, the data that its scientists presented necessarily trumped data produced by institutions like Keiø. Ogata, however, only pointed out

---

[91] Ómori Kenta, "Jibun no shintai ni jikken shite, Kakkebyó no gen'in wo vitamin no ketsubó to jisshó suru made…III," *Yomiruri shinbun* (12/6/1921): 4.

[92] For beriberi in factory dorms, see Mikiso Hane, "The Textile Factory Workers," *Meiji Japan: Political, Economic, and Social History 1868-1912 Volume II The Growth of the Meiji State*, ed. Peter Kornicki (London: Routledge, 1998), 158; and E. Patricia Tsurumi, *Factory Girls: Women in the Thread Mills of Meiji Japan* (Princeton: Princeton University Press, 1990), 86. Ishigaki Ayako, in her autobiography, remembered that when she visited a textile factory in 1919, 20% of the female workers had beriberi. In the mess hall, the factory official noted that most of the women were from the country-side and ate only barley at home, but at the factory, they were able to eat white rice at every meal. This luxury meant that the workers were "better fed than they would be at home." Ishigaki Ayako, *Restless Waves*, trans. Haru Matsui (NY: Modern Age Books, 1940), 111-12. I am indebted to the Master Historian Peter Duus for bringing this passage to my attention.

[93] Shimazono Junjiró, *Kakke* (Tokyo: Kokuseidó, 1927), 18-20.

[94] "Kakkebyø no gen'in ha fumei da. Todai no Ogata hakasei ra no shinhakken, Keiø-setsu ha yaburu," *Yomiuri shinbun* (11/2/1922): 5.

what had been noted before. Clinical signs of beriberi in birds differed from those exhibited by humans. He proved neither that beriberi was not a diet deficiency disease nor that rice bran extracts were not effective against beriberi in humans. This so-called victory was short lived. By 1925, imperial university doctors like Shimazono agreed that data showed how beriberi and white rice or vitamin deficiency disease were a single affliction. No doubt because of the growing evidence deployed by Ōmori and Shimazono, Ogata joined the vitamin B deficiency theorists in 1926.[95]

1925 was a pivotal period for beriberi research. First, because similar research was taking place in several institutions and the etiology of beriberi was clear, the army convened a final BRC meeting to abolish the Committee.[96] At the last meeting in June, Shimazono led the presentations with a report on the comparison between vitamin B deficiency and beriberi. He concluded, "It is my opinion that a diet deficient in vitamin B is the basic factor in the development of beriberi, and administering vitamin B leads to recovery. Based on these two facts, we can now state that beriberi and a vitamin B deficient diet have an intimate causal relationship."[97] The BRC was active for eighteen years and had done much to further the study of beriberi. But it also hindered the efforts of researchers interested in the dietary origins of this disease. Second, Shimazono became a Tokyo faculty member in 1925 and received his PhD in medicine based on his beriberi research in 1926.[98] For the first time, a diet deficiency theorist was a professor of medicine at Tokyo Imperial University.

By the time Shimazono arrived at Tokyo, the vitamin revolution was already over. The Tokyo faction's monopoly on beriberi research had been broken. Shimazono was forced to stand alongside Ómori and others at the forefront of beriberi research. None of the rice bran extracts on the market came from Tokyo internal medicine faculty. Finally, Ómori, Tóyama and other doctors busily spread the science of vitamins throughout the medical and popular presses. Doctor Oinuma Tomoroku, for example, published a series of articles concerning the basics of vitamin deficiency. Beriberi was one of the world's "minus diseases (mainasu-byó)," he asserted. Toxins or improper storage were not the cause of beriberi, but rather the deficiency of a nutrient,

[95] "Jintai shiken de kakkebyøgen no kenky¥: Kaku ika daigaku ga kyødø shite, vitamin B no ketsubøshoku wo ataeru," *Yomiuri shinbun* (6/14/1926): 3.
[96] "Kakkebyø chøsakai i'in no køshø ha ch¥shi," *Ikai jihø* 1607 (1925): 1072.
[97] Shimazono Junjirø, "'Vitamin B' ketsubøshø to kakke to no hikaku," "Kakkechøsakai saish¥ no hokoku I," *Ikai jihø* 1608 (1925): 1100.
[98] Itakura, *Kakke no rekishi*: *shiryø to bunken nenbyø*, 128-29.

which was found in the thin bran membrane that surrounded white rice. The germ was rich is this element.[99] Eating foods containing high amounts of the beriberi vitamin prevented and cured the disease. "Grains and eggs are the foods richest in the beriberi vitamin. Milk and meat have comparatively little. Of the grains and legumes, soybeans contain the highest amount, more than azuki (red beans) or nattø (fermented beans). Soy bean flour, because it is made from soy beans, is good to sprinkle on rice and eat."[100]

In a newspaper column, Dr. Okuda Michikazu answered reader's queries about issues of health and the body. Fielding a question about the cause and treatment for beriberi, Dr. Okuda wrote that the disease was caused by a white rice diet deficient in the beriberi vitamin. "The guaranteed method for total recovery," he maintained, "is to eat food that contains plenty of the beriberi vitamin. Half-polished rice and barley-rice are rich in this vitamin, and supplementary foods like fresh cabbage, eggs, soybeans, kidney beans, milk, meat, and sweet sake also contain a lot of vitamin B. Of course, bran or medicines made out of bran that are high in this vitamin are the best."[101] He advised a reader to treat numbness in the hands and feet and heart palpitations, an obvious case of beriberi, with foods high in vitamin B such as bran, beans, cabbage, barley, tomatoes, eggs, and carrots, and he recommended medicines such as Orizanin, Ginhi ekkisu, Urihin, and Baranutorin as well."[102] Knowledge of rice bran extracts spread to the people in several ways. Articles on medicine and hygiene, like Dr. Okuda's column, suggested its use, and drug companies, like Sankyø, also ran newspaper advertisements for beriberi medicines (Table VII).

Because beriberi was a disease predicated on the national, white rice diet, Ømori argued that it was "a truly fearful disease of the people (kokuminbyó)."[103]

> White rice consumption by everyone is the sign that the country is enlightened (kaika). The advancement of civilization is not, however, restricted to the advancement of the social welfare of the people…Now, the main people who contract beriberi are the proletariat class who, although desire and lust after civilization, because of incomplete economic power, have yet to

[99] Oinuma Tomoroku, "Kakke ha sekai ni mitsu no minasubyø no hitsotsu I," *Yomiuri shinbun* (7/24/1921): 4.
[100] Oinuma Tomoroku, "Kakke ha sekai ni mitsu no minasubyø no hitsotsu III," *Yomiuri shinbun* (7/26/1921): 4.
[101] Okuda Michikazu, "Katei eisei mondai," *Yomiuri shinbun* (12/19/1921): 4.
[102] Okuda Michikazu, "Katei eisei mondai," *Yomiuri shinbun* (5/27/1926): 7.
[103] Ómori Kenta, "Jibun no shintai ni jikken shite, Kakkebyó no gen'in wo vitamin no ketsubó to jisshó suru made…I," *Yomiruri shinbun* (12/4/1921): 4, Ómori Kenta, "Jibun no shintai ni jikken shite, Kakkebyó no gen'in wo vitamin no ketsubó to jisshó suru made…III," 4.

> receive the benefits of this lifestyle… Since we cannot hope for economic increases in a single day, the only other option is to change the main staple. In other words, we must abolish white rice and adopt the consumption of half-polished[, or brown,] rice.[104]

Ómori, like Tóyama, argued that the spread of beriberi was a symptom of a specific deficiency of modernity, industrial work fueled by lots of white rice causing beriberi, and since it was not possible to improve the people's diets because of social and economic reasons, he stressed the need for the state to regulate the consumption of white rice. This view formed the basis for public health campaigns in the late 1930s when need for a national beriberi prevention plan emerged during Japan's second war with China. Because beriberi threatened the health of soldiers and factory workers, the claws and teeth of imperial expansion, the government passed the Regulation on Milling Rice law (Beikoku tøseira seigen rei) that required millers to leave 30% of the vitamin B rich germ on the grain in November 1939.[105] Beriberi incidence and death rates fell dramatically after the law passed.[106]

In conclusion, the shift from looking at various environmental factors to focusing on experimental medicine in the lab, to a final combination of the two reflects several trends in the history of medicine in Japan. First, doctors like Tsuzuki and Ómori combined clinical and lab-base data to combat the intellectual firewall set up against the diet theory. When Takaki Kanehiro used medical statistics to prove the relationship between beriberi and diet, army doctors said that statistics do not count as definitive scientific evidence. When researchers proved, in the lab, that white rice caused beriberi in birds, and that brown rice or rice bran cured it, imperial university doctors said that bird beriberi and human beriberi were not the same disease. Finally, when Ómori and others showed that vitamin deficient diets caused beriberi in themselves, imperial university doctors could not muster a rebuttal and were forced to join the rest of the global medical community in agreeing that a diet

[104] Ómori, *Kakke*, 4.
[105] "Tsukiake horyú kyuwari yonbu beikoku tsukiryó seigenrei: kakugi kettei, iyoiyo 12 gatsu, suitachi jisshi," *Yomiuri shinbun* (11/22/1939): 1. The terms used to describe polishing, *bu* or %, refers to how much the kernel is polished. 10 bu is white rice fully polished. 7 bu retains some of the germ, in other words, the remaining 3 bu is the germ. Kimura Katsuichi, owner of Kiben shoten rice shop, 102 Ichikawa, Ichikawa-chó, Hachinohe-shi, Aomori-ken, Japan, 5/17/2006 interview.
[106] Yamashita, *Kakke no rekishi: Bitamin no hakken*, (Kyoto: Shinbunkaku shuppan, 1995), 393.

lacking vitamin B, such as those fed to factory workers, caused this disease. So, Ómori and others needed to combine laboratory data and epidemiology, experimental physiology and medicinal statistics, in order to undermine and tear down the institutional logic of beriberi research at Tokyo Imperial University that dated back to the 1880s and the Kakkebyóin. Second, in the 1910s, after the heyday of bacteriology, and after the realization that germ theories and practices had limited therapeutic value, doctors began stressing the importance of salubrious environments, both at work and home, and hearty diets in preventing disease.[107] When these couldn't be realized due to economic reasons, doctors encouraged the state to step in and change the people's dietary culture through public health laws.

Beriberi research continued to play a role in the rebuilding of Japan after the Pacific War. The government made the people's nutrition a priority and supported the reconstruction of the pharmaceutical industry. Synthetic vitamin B had been manufactured in Japan since 1942, and this technology formed the basis for post-war drug production. By 1950, companies like Takeda Seihin advertised energy pills like Metaporin for fatigue and beriberi.[108] Vitamins were seen as necessary for energizing the people during the post-war economic growth as well as protecting them from beriberi. Takeda and other companies further developed the science of vitamins, and created the nutrition or energy drinks that are now ubiquitous in pharmacies, convenience stores, station kiosks, and vending machines throughout Japan.[109] Just as rice bran was intended to fuel the soldiers and factory workers who ran the Japanese war machine, vitamins fueled Japanese workers and salary men rebuilding the economy and nation after 1945.

[107] William Johnston, *The Modern Epidemic: A History of Tuberculosis in Japan* (Cambridge, MA: Harvard University Press, 1996), 258-65.
[108] *Takeda hyakuhachijunenshi* (Osaka: Teppan insatsu kabushikigaisha, 1962), 419.
[109] Kitazawa, "Eiyó dorinku to Nihonjin no kokoro," 305-12.

Tables

Table I: Beriberi in the navy, 1878-1886

Year	# of navy personnel	# of kakke sufferers	Incidence rate	# of deaths	Death rate
1878	4528	1485	32.79	32	2.15
1879	5081	1978	38.92	57	2.88
1880	4956	1725	34.81	27	1.57
1881	4641	1163	25.06	30	2.58
1882	4769	1929	40.45	51	2.64
1883	5346	1236	23.12	49	3.96
1884	5638	718	12.74	8	1.11
1885	6918	41	0.59	0	0
1886	8475	3	0.04	0	0

Source: Takaki, "Special Report of the Kakke Patients in the Imperial Japanese Navy from 1878 to 1886," *Takaki Kenkan sensei gyōsekishū*, ed. Matsuda Makoto (Tokyo: Jikeikai ika daigaku, 1993), 62.

Table II: Mori Rintarō's nutritional tests

	Rice	Barley	Western diet
Calorie	2580.75	2227.5	2209.54
count			
Nitrogen	+2.29%	-1.43%	-2.88%
count			

Source: Mori Rintarō, "Heishoku kensa seisekiryakuhō," *Ōgai zenshu* 28, (Tokyo: Iwanami shoten, 1974), 136. This report was submitted on 3/31/1890.

Table III: Beriberi incidence rates in the navy, 1878-1888

Year	**# of cases**	**Incidence rate**	**# of deaths**	**Death rate**
1878	1485	32.79	32	0.707
1879	1978	33.92	57	1.12
1880	1725	34.8	27	0.545
1881	1163	25.05	30	0.646
1882	1929	40.44	51	1.06
1883	1236	25.12	49	0.917
1884	718	12.73	8	0.142
1885	41	0.593	0	0
1886	3	0.035	0	0
1887	0	0	0	0
1888	0	0	0	0

Source: Takaki Kanehiro, "The Preservation of Health Amoungst the Presonnel of the Japanese Navy and Army, Lecture I," *Lancet* 1906: 1369.

Table IV: Sino-Japanese War disease incidence rates

Disease	Patients	Deaths	Death %
Typhoid			
fever	3,805	1,125	30%
Cholera	8,481	5,211	61%
Malaria	10,511	542	5%
Dysentery	11,164	1,611	14%
Influenza	400	4	1%
Beriberi	30,126	1,860	6%
Acute gastric			
intestinal			
catarrh	11,631	1,595	13%
VD	2,416	8	0.30%

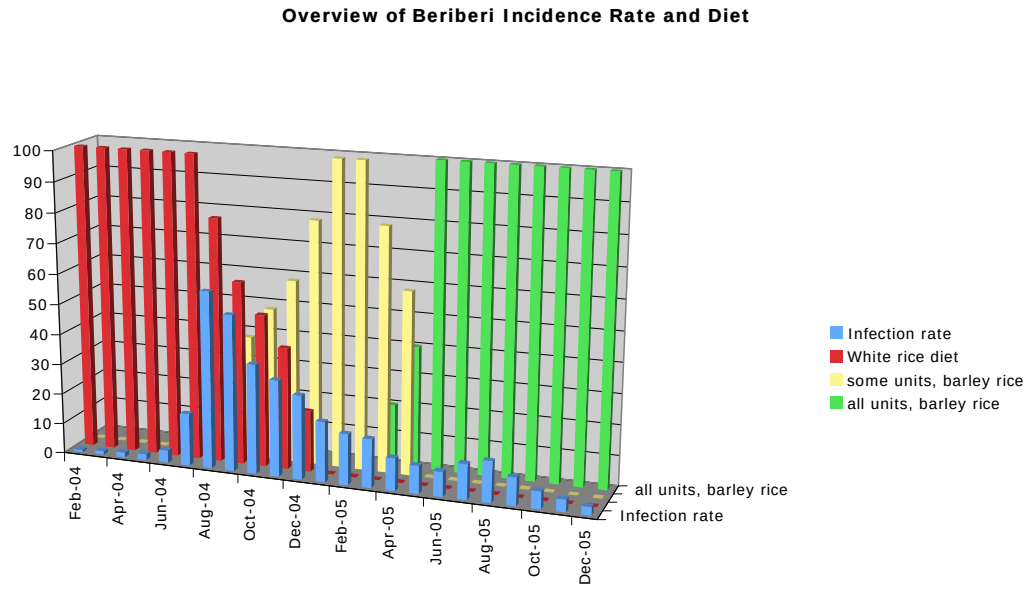
Source: *Meiji nijushichi-hachinen eki rikugun eisei jiseki*, ed. Rikugun eisei jiseki hensan i'inkai (Tokyo: Rikugunshō, 1907), 1-7; Rikugun, Imukyoku, *Medical and Surgical Statistics of the Imperial Japanese Army during the War with China (1894-1895)*, 40-41.

Table V: Beriberi incidence in Taiwan, 1895-1902

Year	# of sick	# of dead	Incidence rate	Death rate
1895	21,087	2,104	90	9.97
1896	14,848		18.56	
1897	2,697	82	17.5	0.5
1898	1,775	50	12.7	0.3
1899	1,249	33	11.3	0.29
1900	896	21	7.3	0.1
1901	111	1	0.9	0.008
1902	53	0	0.48	0

Source: "Taiwan rikugun eisei gaikyo," *Taiwan rikugun gun'i bu* (March), 1905 quoted in Yamashita, *Meijiki ni okeru kakke no rekishi*, 449; "Korera ha nai ga kakke ga ryukō," *Yomiuri shinbun* (7/11/1895): 5; T.K Iku, "Taiwan no eisei ni tsuite," *Jiji shinpō* 4566 (1896): 10.

Table VI: Overview of beriberi incidence rate and diet



Source: Fujii Yoshikazu. "Meiji sanju shichi,-hachinen sen'eki ni okeru kakke ni tsuite," *Rinji kakkebyō chōsakai* (1911): 39.

Table VII: Advertisement for *Orizanin*, *Yomiuri shinbun*, 1923

Source: *Yomiuri shinbun*, (8/8/1923): 1.