



It was the mixed rice again.

Four months had passed since the Japanese soldiers of the First Regiment of Imperial Guard first saw such staple in November 1886. Instead of shining white rice, their bowls held some yellowish rice with barley kernels. They heard that soldiers in the Second and Third Regiment had the same rice. Those in the Fourth Regiment, however, were still enjoying white ones. Though missing the old days of chewing a mouthful of gemlike white rice, they found life, in general, hard to complain about. Wearing heavy boots was no longer compulsory during off-hours. Air in the dormitories smelt less sickly thanks to window renovations. Routine training also became less rigorous and ended earlier. Above all, they felt safer with fewer comrades getting sick from beriberi—a disease that might be contagious according to their knowledge (Toki, 1891).

Speedily, soldiers swallowed the mixed rice and returned to training, without noticing their involvement in a yearslong clinical study on beriberi. The brain behind this project was their surgeon general Toki Yorinori, a pivotal pioneer of modernization and institutionalization of medical research and education in Japan. After seeing many soldiers suffering and dying from beriberi at the battlefield of Seinan War (Seinan sensō, a Japanese civil war in 1877), Toki made up his mind to find the reason and cure for the deadly disease. Later appointed to the Imperial Guard, Toki started his experiment.

On Toki's order, rations in the Imperial Guard went through dramatic changes from 1885 to 1890. So did the soldiers' quotidian dietary life. From November of 1885, soldiers in the First Regiment began to have barley rice and bread instead of white rice. Similarly in December 1887, soldiers in

the Fourth Regiment started eating barley rice. Soldiers in the Second and Third Regiment lived through even more unsettled and perhaps confusing five years. After eating barley rice for a year, white rice surprisingly reappeared on their dining tables in early 1887. However, the enjoyable return of white rice was only temporary. In early 1889, their meal was switched to barley rice again (see Table: Toki's experiment on beriberi and diet, 1885-1890).

	First Regiment	Second Regiment	Third Regiment	Fourth Regiment
1885-6	From November 1885 to July 1886: barley rice (30% barley, 70% white rice) for three meals. From August to December 1886: barley rice for two meals and bread for one.	From November 1885 to November 1886: barley rice for three meals (Team No.1: 20% barley and 80% white rice; Team No.2: 30% barley and 70% white rice).	From November 1885 to October 1886: barley rice (30% barley, 70% white rice) for three meals.	White rice for three meals.
1887	From January to December 1887: barley rice (30% barley, 70% white rice) for two meals and bread for one.	White rice for three meals.	White rice for three meals.	From December 1887: barley rice (30% barley, 70% white rice) for three meals.
1888	From April to September 1888: barley rice (30% barley, 70% white rice) for two meals and bread for one.	White rice for three meals.	White rice for three meals.	From January to September 1888: barley rice (30% barley, 70% white rice) for three meals.
1889	From April to September and in December 1889: barley rice (30% barley, 70% white rice) for three meals.	From March to December 1889: barley rice (30% barley, 70% white rice) for three meals.	Team No.1: from February to September and in December, barley rice (30% barley, 70% white rice) for three meals. Team No.2: from February to December 1889, barley rice (30% barley, 70% white rice) for three meals.	From February to October and in December: barley rice (30% barley, 70% white rice) for three meals.
1890	From January to December 1890: barley rice (30% barley, 70% white rice) for three meals.	From January to December 1890: barley rice (30% barley, 70% white rice) for three meals.	From January to December 1890: barley rice (30% barley, 70% white rice) for three meals.	From January to December 1890: barley rice (30% barley, 70% white rice) for three meals.

While changing the rations, Toki recorded the number of beriberi patients in the Imperial Guard. From 1887 to early 1889, numbers of new beriberi patients dropped to one-digit in barley rice eating First Regiment. On the contrary, such number increased a lot in white-rice-eating Second and Third Regiments. Among 87 new beriberi patients in the Second Regiment, two died and sixteen left the Imperial Guard due to the sickness. The Third Regiment had 233 new beriberi patients. Seven of them died and 47 left. The situation in the Second and Third Regiment did not change until early 1889 when Toki fed soldiers barley rice again (see chart 1).

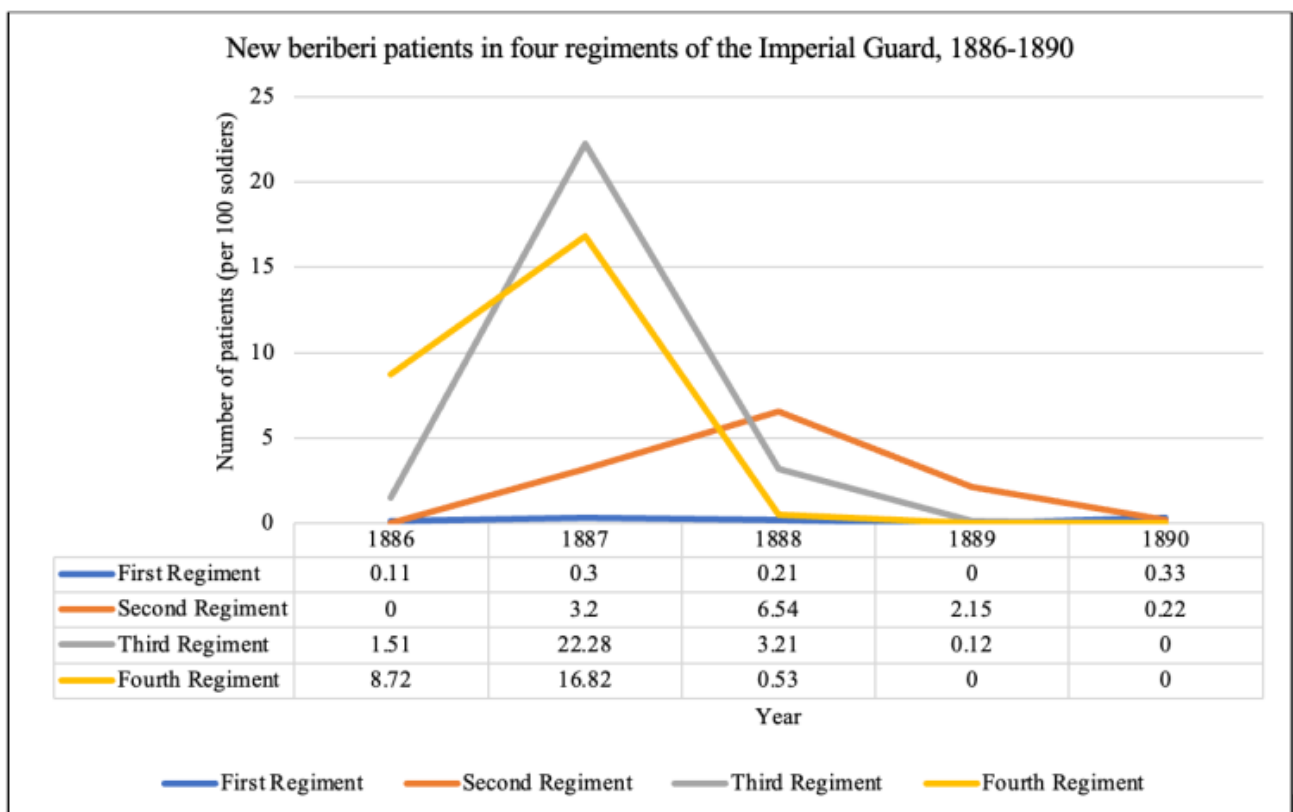


Chart 1: Number of new beriberi patients in the Imperial Guard, 1886-1890

The five-year comparative experiment made Toki a determined supporter of barley rice eating in the military. Data collected by him also indicated a strong correlation between beriberi and diet. Number of new beriberi patients in the Imperial Guard “dropped dramatically” after white-rice diet was partially changed to barley rice after 1886; and the number eventually dropped to one-digit when almost every soldier ate barley rice (see chart 2). Toki believed that his experiment and data had supported the theory that beriberi could be a diet deficiency disease (Bay, 40). He suggested a dietary reform to standardize barley rice eating as cure for beriberi:

There is no established medical theory regarding the cause of beriberi and no consensus reached between opposite opinions. However, if we can humbly discuss about it, reality shows that it's almost doubtless that beriberi is associated with rice eating...We faced criticism when deciding to offer soldiers in the Imperial Guard barley rice. It's also common that people prefer white rice than barley kernels. No regulation is passed to standardize barley rice eating [in the army]. Therefore, new beriberi patients still appear in the Imperial Guard, where soldiers should have been eating barley rice (Toki, 14)

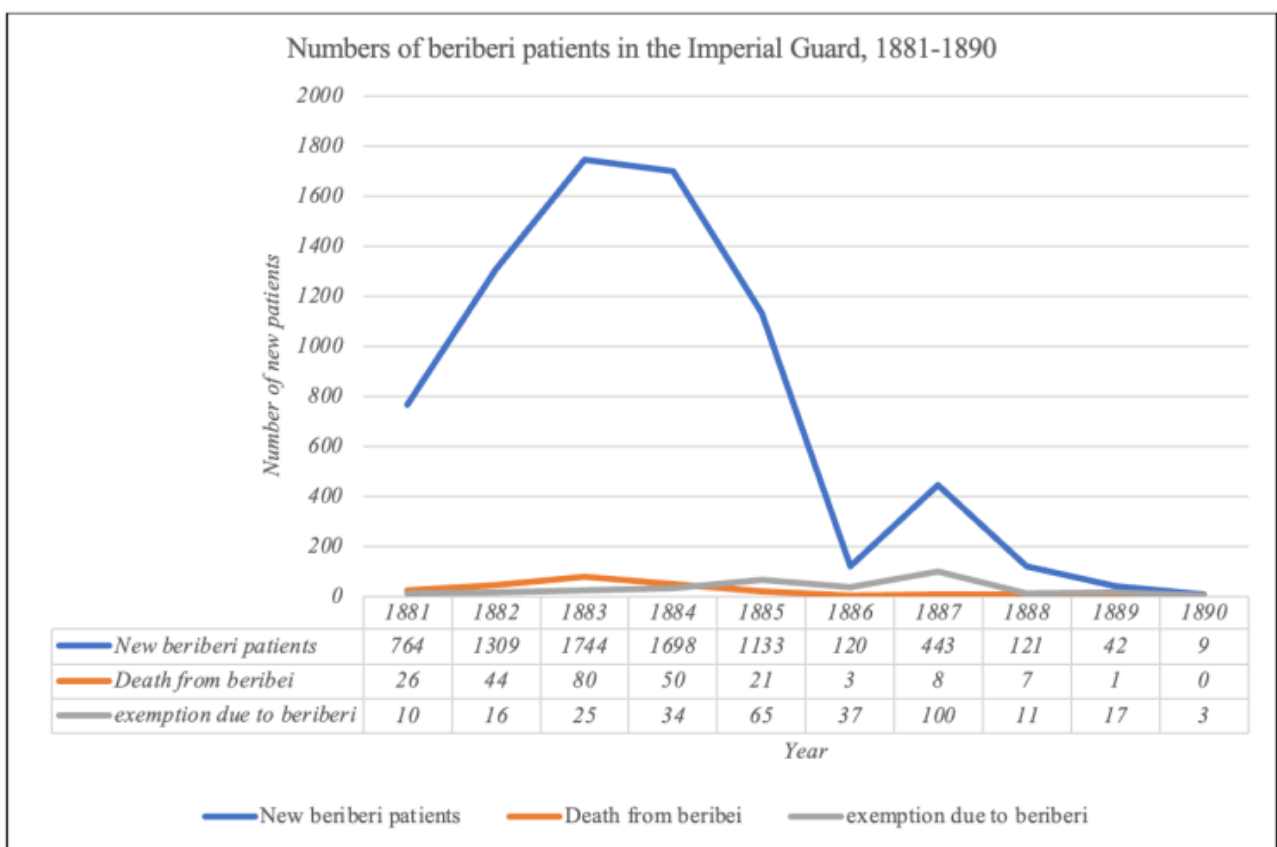


Chart 2: Numbers of beriberi patients in the Imperial Guard, 1881-1890

Toki’s success in treating beriberi in the Imperial Guard presented a challenge to champions of white rice in the army. Eye for eye, tooth for tooth, and experiment for experiment. To fight back in the field of science, white rice defenders chose to conduct an experiment too. In 1889, equipped with knowledge of laboratory research and experimental hygiene, Doctor Mori Rintarō returned to Japan from Germany and began his comparative experiment on soldiers’ diet with pharmacists Ōi Gendō and Iishima Shinkichi. Though not rigorous according to our current principles, this food experiment was “unprecedented” in late 19th century. It was for the first time that lab experiment on food was conducted “on so many people for so many days” in military forces (Ishiguro, 2).

From August to December 1889, nineteen army soldiers were selected to participate in the experiment. Moved from their camps to the army medical school, they were divided into three groups. Each group respectively consumed white-rice diet, mixed-rice diet and western-style diet. From August 12 to 19, soldiers in white-rice diet group had Japanese army's standard diet with white rice, miso, tofu, and fish. From October 15 to 22, soldiers in mixed-rice diet group had rice mixed with barley kernels as staple and the same sides with white-rice diet group. From December 13 to 20, soldiers in western-style diet group ate mainly bread and meat. By analyzing soldiers' daily urine and feces, Mori was able to calculate and compare their calorie intake and nitrogen absorption (see chart 3 and 4). Mori concluded that white-rice diet contained the most calorie and protein and was the most nutritious and optimal choice for army soldiers.

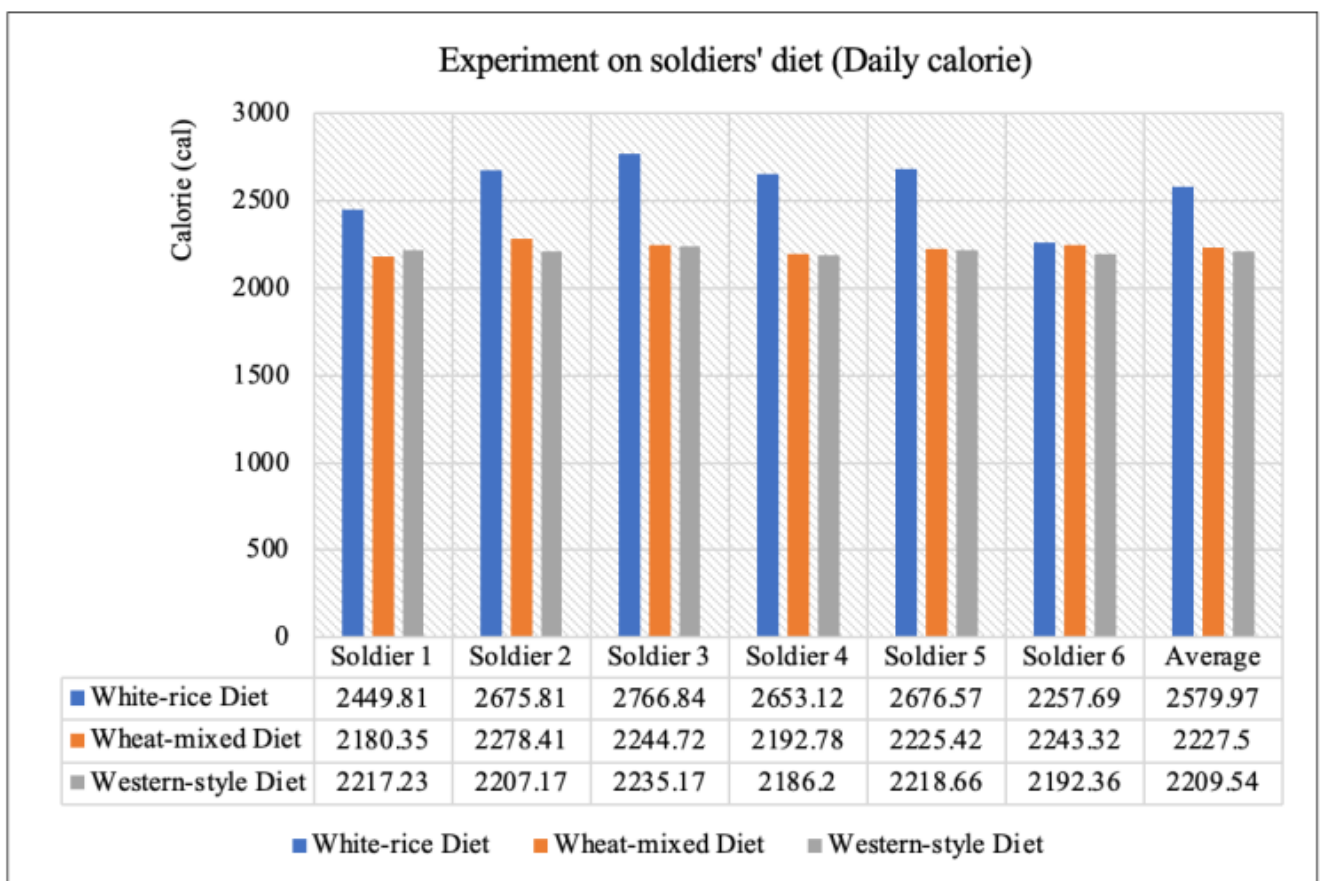


Chart 3: Daily calorie (Mori's experiment, 1889)

Chart 4: Daily nitrogen increase/decrease (Mori's experiment, 1889)

Different from Toki's clinical approach, Mori's experiment has put laboratory at the center. While Toki directly monitored soldiers' health condition, Mori kept his distance from his experimental subjects by analyzing their bodily waste. In the late nineteenth century when laboratory science burgeoned, the medical world in Japan adored Mori's objective and scientific approach and declared him the winner of the rice debate in Japanese army. The absence of patients in Mori's laboratory experiment, however, was lethal. Continuing to have white rice as staple, Japanese army soldiers saw more comrades dying from beriberi than in the battles. During the first Sino-Japanese War (1894-1895), over 30000 soldiers suffered beriberi and 2000 died from it. There was a nearly tenfold increase in the number of beriberi patients during the war with Russia (1904-1905). Approximately 250000 soldiers had beriberi and over 27000 died from it.

Eventually, the heavy losses pressured medical authorities in Japanese army to reinvestigate the relation between diet and beriberi. However, it was not until the discovery of vitamin B that barley rice was acknowledged as a scientifically proven cure for beriberi. Was Mori and white rice defenders' unbending perseverance with laboratory results wrong? How should medical science evaluate clinically effective but unverified treatment in labs for unfamiliar disease? The battle between Toki and Mori ended; but debate on these questions continues.

Note

Featured image: Lombroso, Mugimeshi, December 1, 2011, Wikimedia Commons
(<https://commons.wikimedia.org/wiki/File:Mugimeshi.jpg>)

All tables and charts above are made by author with reference to data collected by Toki and Mori.

References

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