

## Biography: Christiaan Eijkman

As a debilitating and, sometimes, fatal disease spread across the West Indies in the late nineteenth century, one man was devoting all his efforts to finding a cure for it. This man was Christiaan Eijkman, and the disease was beriberi. Through careful experimentation, including a massive study of over two-hundred-and-eighty thousand prisoners in Javanese prisons, Eijkman managed to find the cure. Using the findings of Eijkman's study, scientists were able to isolate a nutrient called thiamin, also known as vitamin B1. Eijkman had, through his research, formed the basis for understanding the role of vitamins in nutrition, for which he received the Nobel Prize, together with Sir Frederick Hopkins, late in his life.



Christiaan Eijkman was born on August 11, 1858 in the small town of Nijkerk, in The Netherlands. He was the seventh child of Christiaan Eijkman and Johanna Alida Pool. Christiaan's father worked as a headmaster at the local school.

When he was only a few years old, his family relocated to Zaandam, a larger city in the Netherlands. In Zaandam, he began his education at his father's school. He progressed in his studies with ease and passed his university-entrance exams in 1875, at the age of 17.

After high-school graduation, Christiaan chose to attend the Military Medical School at the University of Amsterdam. The government paid for his education on account of his signing up to be an army physician upon graduation. In 1883, Christiaan graduated with his doctorate. That same year, he was married to Aaltje Wigeri van Edema.

Later that year, Christiaan was sent as the military's chief medical officer to the island of Java in the Indies, accompanied by his new wife. There, he worked as an army surgeon for two years. Unfortunately, he contracted a severe case of malaria in 1885 and was forced to take sick leave.

Unable to continue his research in Java during his recovery from malaria, Eijkman began studying a new field of medicine called bacteriology. He worked in Josef Forster's laboratory in Amsterdam and also in Robert Koch's bacteriological laboratory in Berlin, where he stayed for one year. During this time, his wife became ill and died on January 8, 1886, at the age of 27.

Through his connections at Koch's laboratory, he met Cornelis Adrianus Pekelharing and Cornelis Winkler, who were both part of a government committee studying a disease called beriberi that was quickly spreading through the West Indies. Beriberi is a debilitating disease that involves weight loss and

muscle weakness. Patients suffering from beriberi commonly lose their sense of feeling and control of their limbs, often leading to paralysis. In some cases, fluid collects in the legs, taxing the circulatory system, enlarging the heart, and causing heart failure. The disease can be fatal.

Beriberi was increasingly becoming a national security issue for the Netherlands. The mounting incidence of the disease among the soldiers and sailors had already resulted in the Dutch government having to recall a naval flotilla to Sumatra that had been sent there to curb pirate operations against merchant shipping.

In October of 1886, the recently widowed Eijkman, still suffering from malaria, joined the committee, whose task was to find the cause of the disease so that it could be cured, or at least prevented. Once again, Eijkman traveled to the West Indies to work on the beriberi case at the new research institute.

When Pekelharing and Winkler were called to another research site, they requested that the research institute remain open and be made permanent in their absence. Eijkman was named its new director. His acceptance of the position marked the end of his military career. Along with this work, he also became the director of the Javanese Medical School, where he taught physiology and organic chemistry. He also remarried in 1888. With his wife Bertha Julie Louise van der Kemp, he had one son, Pieter Hendrik.

For researching the disease, he used chickens in his experiments, injecting some of them with bacteria thought to cause beriberi, while leaving others untreated. He found that all the chickens, even those not injected, quickly acquired the symptoms of beriberi. He repeated the experiment with different chickens and separated the chickens into individual cages, thinking that this would prevent the infected chick-

ens from infecting the healthy ones. Like the previous experiment, however, all of the chickens exhibited the beriberi symptoms. Confused, he repeated his experiment in a new location to prevent any contamination, but this time, all the chickens recovered, leaving Eijkman even more perplexed.

By watching what the chickens were being fed, he determined that beriberi was linked to diet. When the chickens were fed leftover cooked, polished rice, they suffered from symptoms similar to beriberi in humans. When fed raw, feed-grade rice, the chickens recovered. After weeks of experimentation, Eijkman realized that the polished rice was a factor in causing beriberi, which explained why the disease was so prevalent in Asia, where polished rice was a common staple.

After nine years of experimentation with animals, Eijkman needed some way to test his hypothesis with human cases. Since outbreaks of beriberi were prevalent in prisons, he chose this confined environment for his next investigation and convinced one prison to change the rice being served to the prisoners from cooked, polished rice to unpolished rice. The result was that all of the cases of beriberi were cured. Encouraged by this result and with the help of A. G. Vorderman, the supervisor of the Civil Health Department of Java, Eijkman undertook a massive study in 1895. This study had surveyed nearly two-hundred-and-eighty thousand prisoners by the time it was completed. During the many months of trials, all the cases of beriberi were cured, but, regrettably, in the next year, Eijkman fell ill and returned home again on sick leave before the trials were completed, leaving Vorderman and others to complete the research.

After returning home for good, Eijkman was appointed to the position of professor of public health and forensic medicine at the Institute of Hygiene at the University of Utrecht. He contributed invaluable research to the fields of tropical diseases, and his work was recognized by scientific societies and health care commissions. In 1923, at age 65, Christiaan retired.

Three years later, based on Eijkman's trials and research into beriberi, B. C. P. Jaiisen and W. F. Donath discovered that unpolished rice contained a nutrient they called thiamin (vitamin B1). Unknown to Eijkman, his research had formed the basis for the understanding of the role of vitamins in nutrition.

When Christiaan Eijkman was awarded the Nobel Prize in medicine for his work in understanding beri-

beri in 1929, he was unable to receive the award in person on account of his poor health. He succumbed to his lingering illness one year later, on November 5, 1930.

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