

A Study of the Scientific Method- The Strange Case of Beriberi

Name(s) _____

Date _____

Class _____

Benchmark:

- **SC.912.L.14.1 – Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.**

Purpose:

- *This story is intended to explain how the scientific method has actually been used to solve scientific problems.*



Background: Case Study of Beriberi Disease

It is 1897 and people are dying in Java, an island in Indonesia or the Dutch East Indies. They all seemed to share the same hideous symptoms beginning with overall muscle weakness, loss of appetite, and eventually they suffered paralysis and eventually death by heart failure. This disease was called beriberi by the indigenous people. This was a word from their native language that meant “I cannot, I cannot.”

Scientists thought the disease might be caused by bacteria. (After all, since the discovery of bacteria, almost all previously unknown diseases were attributed to a bacterial infection.) They decided to prove that a bacterium was the culprit by conducting an experiment. They used chickens as their trial subject. They injected a group of chickens with the blood from a patient who had beriberi and then to prove that the blood carried the “bacterium that caused the disease” they injected another group of chickens with saline or simple salt solution. Well, both groups got beriberi! So back to the starting board they went.

One of the scientists who had been sent to work on this mystery was a Dutch physician and pathologist named Dr. Christiaan Eijkman. One day, as he walked around the hospital compound he observed his surroundings. He noticed that the cook fed every one of the patients the staple diet of the nation polished or white rice. Polished rice is wild, brown rice with the husk or outer layer rubbed off so that its color is white. It was the rice of choice of the middle class of the Indonesian people. He also noticed that the hospital staff fed the chickens (that would eventually be the chicken soup for the patients) wild rice. White rice was more expensive than brown rice, so the chickens were usually fed brown rice. Dr. Eijkman realized that this was an important observation and thought that maybe the wild rice contained something that the white rice did not. So he conducted another experiment. He divided the chickens once again into two separate groups. He fed one group of chickens only white rice and the other group only wild rice. Then he watched and waited.

It turned out that the chickens that had been fed wild rice did not get sick at all, but the chickens that had been fed the polished or white rice became weak, lost their appetite and eventually died from beriberi. Eureka, the case was solved!

As Dr. Eijkman and others continued to research this interesting case, they found that polished rice lacked thiamine, a vitamin necessary for good health. This was actually the first "vital amine" or vitamin to be discovered. It is also called vitamin B1.

We've now known for more than a hundred years that brown rice is more nutritious than white rice. But most Asian cultures associate eating white rice with prosperity and eating brown rice with bad luck. Most rice is still milled or polished, both in Asia and elsewhere. In Europe and America both white rice and brown rice are consumed, but mostly white. In fact, some white rice is chemically fortified to add back the B vitamins. In 1929, Eijkman and Hopkins were awarded the Nobel Prize for Physiology or Medicine for this discovery.

Purpose:

- *This story is intended to explain how the scientific method has actually been used to solve scientific problems.*

Procedure:

1. Fill in the story board with the appropriate descriptions of the steps of the scientific method.

What is the problem?



How did they research the problem?



What is the hypothesis?



Design the experiment for this hypothesis. (Don't forget to designate the control group and the experiment group!)



Did the experiment prove or disprove the hypothesis?



If the experiment *did not* prove what caused Beriberi, what do you have to do next?

If proved, what is the conclusion?



On a separate sheet of paper, write up your new experiment using the lab writing style that your teacher taught you and attach it.