

Science Method

Directions: Please read the following scenarios and evaluate their validity based on what you have learned about the scientific method. Please write your answers on a separate sheet of paper

The Strange Case of Beriberi

In 1887, a strange nerve disease attacked the people in Indonesia, which was known as Dutch East Indies. The disease was beriberi. Symptoms of the disease included weakness and loss of appetite. Victims often died of heart failure. Scientists thought bacteria might be the cause Beriberi. They injected chickens with bacteria from the blood of patients with beriberi. The injected chickens became sick. However, so did a group of chickens **NOT** injected with bacteria.

Dr. Christian Eijkman, one of the scientists studying this disease, made an interesting observation. Before the experiment, all the chickens were fed whole-grain rice leftover from military rations, but during the experiment, the chickens were fed polished rice. From this observation, Eijkman's colleagues were able to determine that the polished rice lacked thiamine (Vitamin B₁), a substance necessary to maintain good health.

1. State the problem.
2. Identify the initial hypothesis.
3. Describe how scientists tested this hypothesis.
4. Did the results of this experiment support their hypothesis? Explain your answer.
5. How does whole-grain rice differ from polished rice?
6. Based on your research of rice and Dr. Eijkman's observation, design a new hypothesis about the possible cause of Beriberi.
7. Describe the function of thiamine in the human body.

The Discovery of Penicillin

In 1928, Sir Alexander Fleming was studying *Staphylococcus* bacteria growing in culture dishes. He noticed that a mold called *Penicillium* was also growing in some of the dishes. A clear area existed around the mold because all the bacteria that had grown in this area had died. In the culture dishes without the mold, no clear areas were present.

Fleming hypothesized that the mold must be producing a chemical that killed the bacteria. He decided to isolate this substance and test it to see if it would kill bacteria. Fleming transferred the mold to a nutrient broth solution. This solution contained all the materials the mold needed to grow. After the mold grew, he removed it from the nutrient broth. Fleming then added the nutrient broth in which the mold had grown to a culture of bacteria. He observed that the bacteria died.

1. State the problem.
2. What was Fleming's hypothesis?
3. Identify the independent and dependent variables.
4. Describe the control of this experiment.
5. List two constants that would be important in this experiment.
6. Did the results support or refute Fleming's hypothesis? Provide support for your answer.
7. Describe the importance of Fleming's experiment to medicine.

Holtsville Stricken with Buggo!

Many people in the small town of Holtsville are stricken with Buggo. Most of the afflicted recover in 2 to 3 weeks. Buggo was identified as bacteria that can be killed in a test tube by antibiotic "X". Antibiotic "X" has also cured monkeys that were infected with Buggo.

Researchers decided to test antibiotic "X" on some of the people in Holtsville. The scientists hypothesized this antibiotic would effectively cure Buggo in humans. They deduced that if they gave patients antibiotic "X", the patients would recover more quickly than those who did not take the antibiotic.

The researchers prepared tablets that contained antibiotic "X" and similar tablets that did NOT contain the antibiotic. The researchers then selected 50 volunteers that had just contracted Buggo and divided them into 2 groups of 25. Patients in group A received the tablet with antibiotic "X". Patients in group B received the placebo.

Twenty people in Group A recovered in 2 days. The other 5 people took the full 2 weeks to recover (normal recovery time). One person in group B recovered in 2 days. The rest of the patients took 2 to 3 weeks to recover.

1. Name two facts that were known before the start of the experiment.
2. State the researchers' hypothesis.
3. Identify 2 deductions related to this experiment. (A deduction is a statement that logically follows the hypothesis. If the hypothesis is correct, then "such and such" should happen. The "such and such" is the deduction.)
4. What are the independent and dependent variables?
5. How do the experimental group and control group differ?
6. Why is it necessary to give Group B a placebo?
7. Describe the data of this experiment.
8. Analyze the data by calculating percentages.
9. What conclusion do you think the researchers made?
10. Why do you think the researchers used a small group instead of using all the sick people in Holtsville?