

FLEYDO ENGLISH SCHOOL
Reading Challenge

The Accidental Discovery of Penicillin

*A messy desk, a forgotten petri dish, and the accident
that saved more lives than any other discovery in history.*

Level: B1

Skill: Reading

Duration: ~20 min

Age: Teens (11-16)

Topic: True Stories

Event: September 1928

The Article

In September 1928, a Scottish scientist named Alexander Fleming returned to his **laboratory** at St Mary's Hospital in London after a two-week holiday. Fleming was 47 years old, slightly untidy, and studying **Staphylococcus** — a common **bacterium** responsible for boils, sore throats, pneumonia, and sometimes fatal blood poisoning. Before leaving for his holiday, he had been growing **colony**ies of Staphylococcus in **petri dishes** — shallow glass dishes filled with a nutrient jelly that bacteria love to eat. He had left several dishes stacked on a bench near an open window. It was not the most careful laboratory practice. It was, however, about to change the world.

The Messy Dish

When Fleming examined the dishes, most looked exactly as expected — covered in a yellowish film of Staphylococcus bacteria. But one dish was different. A spot of blue-green **mould** — the kind you might find on old bread or forgotten fruit — had landed on the jelly surface, presumably blown in through the open window during his absence. Moulds landing on bacterial cultures was common and usually annoying. Researchers typically threw contaminated dishes away. But Fleming, instead of discarding this one, looked more closely.

What he saw made him stop. Around the **mould**, in a clear circle approximately two centimetres wide, the Staphylococcus bacteria had been killed. Not just inhibited — killed. The **colony**ies nearest to the mould had dissolved completely. It was as if the mould was producing a substance — some kind of invisible weapon — that destroyed bacteria on contact. Fleming picked up the dish and said, according to laboratory legend, the most understated words in the history of science: "That's funny."

Identifying the Killer

Fleming identified the **mould** as *Penicillium notatum* — a common species found in soil, decaying vegetation, and, apparently, the London air outside St Mary's Hospital. He grew more of it in broth, filtered the liquid, and tested it against a range of disease-causing bacteria. The results were extraordinary. The mould juice — which Fleming named "penicillin" — killed Staphylococcus, Streptococcus, the bacteria that caused pneumonia, diphtheria, and meningitis. It did not, however, kill the bacteria responsible for typhoid or influenza. It was selective — a natural **antibiotic** that targeted specific enemies and ignored others.

Crucially, Fleming discovered that penicillin was non-toxic to human tissue. He tested it on white blood cells and found that it killed bacteria without harming the cells. This was revolutionary. The few antibacterial chemicals available at the time — such as carbolic acid and mercury-based treatments — killed bacteria, but they also damaged the patient's own tissue, often causing as much harm as the **infection** they were treating. Penicillin was different. It was, in effect, a magic bullet — a substance that could destroy invading bacteria while leaving the human body unharmed.

The Problem

Fleming published his findings in the British Journal of Experimental Pathology in 1929. The paper was technically precise but cautiously worded. Fleming knew he had discovered something significant, but he faced a problem he could not solve: he could not produce penicillin in sufficient quantities or purity to test it on human patients. The mould produced only tiny amounts of the active **compound**, and Fleming — who was a brilliant observer but not a chemist — lacked the expertise to extract and concentrate it. He made several attempts, all unsuccessful. By the early 1930s, his interest in penicillin had faded. The paper sat in the scientific literature, read by few and acted upon by nobody. The discovery that would eventually save hundreds of millions of lives was, for the moment, forgotten.

Florey and Chain

The story might have ended there — a footnote in medical history, a curiosity that nobody developed — if not for two scientists working at the University of Oxford. Howard Florey was an Australian pathologist — direct, ambitious, and utterly focused on finding practical solutions to infectious disease. Ernst Boris Chain was a German-Jewish biochemist who had fled Nazi Germany in 1933 — brilliant, intense, and skilled in exactly the kind of chemical extraction that Fleming had been unable to perform. In 1938, they began a systematic search of the scientific literature for antibacterial substances. They found Fleming's 1929 paper on penicillin.

Chain succeeded where Fleming had failed. Using advanced chemical techniques, he extracted penicillin from the mould broth, purified it, and concentrated it into a form potent enough for medical use. The process was extraordinarily difficult — it required growing enormous quantities of mould in hundreds of bedpans, ceramic vessels, and any other container the Oxford team could find. The **laboratory** resembled a factory crossed with a garden shed. But by 1940, they had enough purified penicillin to begin testing on animals. The results were dramatic. Mice injected with lethal doses of Streptococcus bacteria survived when treated with penicillin. The untreated mice died within hours. The drug worked.

The First Patient

The first human **clinical trial** took place on 12 February 1941. The patient was Albert Alexander, a 43-year-old policeman from Oxford. Alexander had scratched his face on a rose thorn while gardening. The scratch had become infected with both Staphylococcus and Streptococcus bacteria. The **infection** had spread to his eyes, scalp, and lungs. He was dying. His face was swollen with abscesses. **Gangrene** had set in. Doctors had already removed one eye. Nothing they tried could stop the bacteria.

Florey's team injected Alexander with penicillin intravenously. Within twenty-four hours, his temperature dropped. The swelling began to reduce. After five days, he was sitting up in bed, eating, and talking. It was, the doctors said, miraculous. But then the penicillin ran out. The Oxford team had used their entire supply. They tried to recover penicillin from Alexander's urine — the drug passed through the body partly intact — and re-injected it. It

was not enough. Without continued treatment, the **infection** returned. Albert Alexander died on 15 March 1941. He had proved that penicillin worked on humans. He had also proved that the world did not yet have enough of it.

The Race to Mass-Produce

Britain was at war. Thousands of soldiers were dying from infected wounds — **gangrene**, septicaemia, and bacterial pneumonia killed more troops than enemy fire. Penicillin could save them, but only if it could be produced in industrial quantities. British industry, stretched thin by the war effort, could not take on the challenge. In June 1941, Florey and his colleague Norman Heatley flew to the United States to seek help.

The breakthrough came at a government research **laboratory** in Peoria, Illinois. A researcher named Andrew Moyer discovered that growing *Penicillium* in corn steep liquor — a cheap byproduct of corn processing that was abundant in the American Midwest — increased penicillin production by a factor of ten. A laboratory assistant named Mary Hunt found a strain of mould on a rotten cantaloupe melon at a Peoria fruit market that produced two hundred times more penicillin than Fleming's original mould. The strain was called NRRL 1951. It became the ancestor of virtually all penicillin produced worldwide.

By 1944, American pharmaceutical companies were mass-producing penicillin in deep fermentation tanks. Production rose from 21 billion units in the first five months of 1943 to 6.8 trillion units in 1945. By D-Day — 6 June 1944, when Allied forces invaded Normandy — there was enough penicillin to treat every wounded soldier. The **mortality** rate from bacterial **infection** in wounded soldiers dropped from approximately 15 percent in World War I to less than 1 percent in World War II. Penicillin did not win the war. But it kept alive the soldiers who did.

The Nobel Prize and a Warning

In 1945, Fleming, Florey, and Chain were jointly awarded the **Nobel Prize** in Physiology or Medicine. Fleming became a global celebrity — the modest, rumped Scottish scientist who had changed the world by noticing something strange on a dirty dish. He received 25 honorary degrees, 26 medals, 18 prizes, and 13 decorations from governments around the world. He was knighted by King George VI.

But in his Nobel lecture, Fleming issued a warning that was remarkably prescient. He described a scenario in which a patient takes too little penicillin, killing most but not all of the bacteria in their body. The surviving bacteria — the ones most resistant to the drug — multiply and spread. "There is the danger," Fleming said, "that the ignorant man may easily underdose himself, and by exposing his microbes to non-lethal quantities of the drug, make them resistant." He was describing, in 1945, the crisis of **antibiotic** resistance that the world faces today — a crisis in which bacteria are evolving faster than new drugs can be developed, and infections that were once easily curable are becoming deadly again.

The Numbers

It is difficult to overstate the impact of penicillin. Before its discovery, a simple scratch could kill you. A child with an ear infection could develop meningitis and die. Surgery was a gamble — even successful operations frequently led to fatal post-operative infections. Childbirth was dangerous partly because of the risk of bacterial infection. Diseases that are now treated with a five-day course of pills — strep throat, urinary infections, bacterial pneumonia — were death sentences.

Since 1942, penicillin and the **antibiotics** it inspired have saved an estimated 200 million lives. That number is almost certainly an underestimate. The **revolution** that began with a spot of mould on a forgotten **petri dish** in a London hospital has shaped every aspect of modern medicine — from surgery to cancer treatment to organ transplantation, all of which depend on antibiotics to prevent and treat bacterial **infection**.

Alexander Fleming died on 11 March 1955, at the age of 73, from a heart attack. He was buried in St Paul's Cathedral in London — an honour reserved for the nation's greatest figures. His discovery was an accident. But the curiosity that made him look closely, instead of throwing the dish away, was not an accident. It was the quality that separates a good scientist from a great one — the willingness to notice what others overlook, to ask "why" when others say "so what," and to follow a strange observation wherever it leads, even if nobody else believes it matters. "One sometimes finds what one is not looking for," Fleming once said. It is, perhaps, the most important sentence in the history of medicine.

Vocabulary Cards

Comprehension Quiz

Key Vocabulary

Term	Definition
Bacterium	A tiny living organism, too small to see, that can cause disease (plural: bacteria)
Mould	A type of fungus that grows as a fuzzy coating on damp or decaying material
Petri dish	A shallow, circular glass or plastic dish used in laboratories to grow bacteria
Infection	A condition caused by bacteria or viruses entering and multiplying in the body
Antibiotic	A medicine that kills bacteria or stops them from growing
Contamination	The introduction of an unwanted substance into a clean environment
Laboratory	A room or building equipped for scientific experiments and research
Staphylococcus	A common type of bacterium that can cause skin infections, pneumonia, and blood poisoning
Colony	A visible cluster of bacteria growing together on a surface
Compound	A substance made of two or more chemical elements combined together
Clinical trial	A carefully planned experiment testing a new medicine on human patients
Gangrene	The death and decay of body tissue, usually caused by a loss of blood supply or infection
Mortality	The rate of death in a population; the number of deaths from a particular cause
Nobel Prize	An international award given annually for outstanding achievement in science, literature, or peace
Revolution	A dramatic and far-reaching change in the way something works or is understood

Comprehension Quiz

1. What exactly did Alexander Fleming find when he returned to his laboratory in September 1928?

- A) A new species of bacterium he had never seen before
- B) A petri dish where mould had accidentally grown and killed the Staphylococcus bacteria around it
- C) A chemical formula written by a colleague
- D) A broken test tube containing a mysterious liquid

2. Why did it take over ten years for penicillin to become a usable medicine?

- A) Because Fleming refused to share his discovery
- B) Because Fleming could not produce enough pure penicillin — it required Florey and Chain's work at Oxford to solve the mass production problem
- C) Because the British government banned the research
- D) Because penicillin did not actually work on humans

3. Who was the first human patient treated with penicillin, and what happened?

- A) A soldier in France who recovered completely
- B) Albert Alexander, a policeman with a life-threatening infection — he improved dramatically but died when the supply of penicillin ran out
- C) Winston Churchill, who was cured of pneumonia
- D) A child in a London hospital who had a mild cold

4. How did the United States help solve the penicillin production problem during World War II?

- A) They sent British scientists money
- B) A laboratory in Peoria, Illinois discovered that growing the mould in corn steep liquor massively increased production, and American factories mass-produced it
- C) They invented a completely different antibiotic
- D) They imported penicillin from Australia

5. Why did Fleming warn about the danger of antibiotic resistance in his 1945 Nobel Prize speech?

- A) Because he wanted to sell more penicillin
- B) Because he understood that using too little antibiotic or using it unnecessarily would allow bacteria to evolve and become resistant — a prediction that has come true
- C) Because he thought penicillin was too expensive
- D) Because he did not believe penicillin worked

Answer Key

#	Ans	Question
1	B	What exactly did Alexander Fleming find when he returned to his laboratory in September 1928?
2	B	Why did it take over ten years for penicillin to become a usable medicine?
3	B	Who was the first human patient treated with penicillin, and what happened?
4	B	How did the United States help solve the penicillin production problem during World War II?

#	Ans	Question
5	B	Why did Fleming warn about the danger of antibiotic resistance in his 1945 Nobel Prize speech?

Visit www.fleydo.com for more.