

# The discovery of penicillin by Fleming and its refinement by Florey and Chain

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## **Introduction**

So many innovations have come across before our very eyes as the course of history went on through millions and millions of years. From the first wheel to the new and latest version of the iPhone, so many ideas and discoveries have sprung forth and presented themselves for human utilization. Among those things, one discovery, in particular, has sparked the interest of many including myself: penicillin.

## **What Is Penicillin?**

Even though the discovery of penicillin is quite a remarkable feat in history, it is not familiar to the public. If one is asked to define what penicillin is, they would probably have trouble doing so. Penicillin is a drug that is commonly used to treat bacterial infections by preventing any bacterial growth in the infected area ("Oral Route"). They normally go to the malignant bacteria or germ and destroy its structure in order to keep it from reproducing. It mostly destroys the cell wall (if there is one) first, which is a critical point in destroying a bacterium (Newman). The bacterium's cell wall contains a substance called peptidoglycan in which it helps maintain the cell wall strong (Newman). Not only does it help solidify the bacterium's protective barrier, but it also helps "new-born" bacterium resulted from the reproduction process of bacterium build upon their own protective barriers using such said substance (Newman). By destroying the barrier, the peptidoglycan gets destroyed as well and prevents the bacterium from reproducing and causing more damage to the human body (Newman). However, with the continuous new releases of new medicines, it has been started to be less utilized in

medical locations. (Bradford). The reason for the disuse is because of the resistance that the bacteria has developed overtime towards the medicine, so other medicines are used to kill the bacteria more efficiently (Bradford). Despite these modern setbacks for the once-innovative drug, there is no doubt that without penicillin, these modern medicines would have never appeared.

## **The Origin of Penicillin**

When it comes to inventions, many people believe that the inventors of those inventions have already had something in mind or a goal that led them to create what they had created. Those thoughts and ideas often are thought to be directly related with the invention and were considered with the full intent of creating the end product. However, this not the case with penicillin; it was created purely by chance by a bacteriologist named Alexander Fleming (“ Alexander Fleming”). His discovery led him to win a Nobel Prize and open new medicine pathways that would soon allow us to have the effective modern medicines that we have today (Fleming, “ Nobel Banquet”). How much dedication and expertise were required of a person to discover such a significant thing? In order to see the answer to that, we have to look at some context and make connections. Fleming first worked as a shipping clerk and then enlisted himself, which then led him to go to St. Mary’s Hospital Medical School in 1901 and study medicine (“ Alexander Fleming”). After years of studying, Fleming went to the Royal Army Medical Corps to keep studying under the field of medicine (“ Alexander Fleming”). From there, he found out that lysozymes worked better as cures for war infections than antiseptics, which were used to treat infection for soldiers back then

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before Fleming showed that they were ineffective against bacteria (“Alexander Fleming”; Gotter). Clearly, Fleming was well-educated enough to be able to form such revolutionary medicine that cure many biological tragedies happening in people’s bodies. In his Nobel Lecture, he described the discovery of the mold as a fortunate occurrence (Fleming, “Nobel Lecture”). In his lecture, he reflects and talks about how the concept of making such a medicine appeared to him; he only began testing with the *Penicillium* mold as a chance observation and made no clear intentions that he was going to solely focus on it in order to make a revolutionary medicine (Fleming, “Nobel Lecture”). He also gives credit to his colleagues that have helped him make penicillin better for medical usage (Fleming, “Nobel Lecture”). He later gives background context as to why such a discovery was impactful at the time (Fleming, “Nobel Lecture”). Bacterial antagonism was a concept associated with the reason why the discovery of penicillin was such an accomplishment (Fleming, “Nobel Lecture”). Bacterial antagonism is when microbes are cultivated and utilized to inhibit and prevent other microbes from spreading and reproducing, typically this process is used to eliminate malignant microbes such as bacteria (“What Is Microbial Antagonism?”). Back then, this concept wasn’t put with much thought since the inhibition of microbes seemed like something normal that wasn’t necessary to tamper with (Fleming, “Nobel Lecture”). Fleming states that he was “working on a bacteriological problem that had nothing to do with antagonisms, antiseptics, antibiotics, or molds” and that penicillin was just a small chance observation to such said bacteriological problem (Fleming, “Nobel Lecture”). However, there is no doubt that this small “chance

observation” would soon become a medicine that would save millions of people to come (“Discovery and Development”). In the actual occurrence where penicillin made its first appearance under Fleming’s eyes, the actual mold had contaminated a cultural plate that was full of staphylococci, which made the staphylococci colonies break apart and become translucent (“Antibacterial Action of Cultures”). Fleming was just experimenting with different things in his academic exploration towards the bacteriological problem that Fleming talked about in his Nobel Lecture; the sudden mold that appeared on the staphylococci dish came as an unexpected surprise to Fleming (Fleming, “Nobel Lecture”; “Discovery and Development”).

## **The Refinement**

Alexander Fleming often gets credited for discovery itself, though it’s also important to recognize another part of the story that brings another aspect of the triumph that penicillin has brought (“The Discovery of Penicillin”). The contributions that Howard W. Florey and Ernst B. Chain brought on forth helped progress penicillin to what it is today as well (“The Discovery Of Penicillin”). Just like Fleming, both Florey and Chain were as well-educated on bacteriology to be able to progress penicillin to be an innovative medicine (“Howard Walter Florey”; “Ernst Boris Chain”). Howard Walter Florey grew up to like science at a very young age; he soon went to get a degree in medicine (“Howard Walter Florey”). He ended up going to St. Peter’s Collegiate School and Adelaide University in which he got a degree in science (“Howard Walter Florey”). He then went more specific in the study of physiology (“Howard Walter Florey”). In Ernst B. Chain’s case, he originally wanted to do music but soon thought a career in science would be more

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rewarding (“ Ernst Boris Chain”). He then went to Friedrich-Wilhelm University and got a degree in chemistry and physiology (“ Ernst Boris Chain”). Penicillin was already discovered by Fleming, though Fleming was having trouble making the mold have an effect on other bacteria (“ The real story behind penicillin”). In order to make the mold work for other bacteria, it needed to be isolated and refined, which was something Fleming couldn’t do at the time (“ The real story behind penicillin”). Luckily, Howard W. Florey, Ernst B. Chain, and many other people were able to find a way to isolate and refine penicillin to make it what we have today (“ The real story behind penicillin”). Without their contributions, penicillin wouldn’t have shown its true potential and made a difference in the medical world.

## **A Legacy Created**

Because Alexander Fleming, Howard W. Florey, Ernst B. Chain, and many other collaborators created and refined such an extraordinary medicine at the time, they were able to win a Nobel Prize for their efforts; the prize was mainly shared among the three main scientists: Alexander Fleming, Howard W. Florey, Ernst B. Chain (“ Nobel Prize For Medicine”). In Fleming’s Nobel Prize speech, he tells about his admiration for those who have won the Nobel Prize, the amount of luck one must have had when discovering something new that was deserving of a Nobel Prize, and how he himself is amazed of the accomplishment that he has done not only for himself by receiving a Nobel Prize but for almost everyone who had been suffering from diseases (Fleming, “ Nobel Banquet”; “ Discovery and Development”). The discovery could be seen as quite a triumph since it has saved millions of lives, especially during World War II, which was around the time where penicillin

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was made and refined (“Discovery and Development”). In the tragedy aspect of the entire situation, soldiers weren’t the only ones suffering from sickness, ordinary people were suffering as well since the world was in a state of chaos at the time; a single paper cut could have sent patients into a panic since medicine wasn’t around much to help alleviate things (“Discovery and Development”). Fortunately, not only did the discovery help cure sicknesses, it helped serve as a pathway for other medicines to be created and was considered to be the first to introduce antibiotics to society (“Discovery and Development”). Through the examination of Fleming and his contributors along with the analysis of what they had done to penicillin, we can confirm that their credibility and integrity is valid enough to determine that penicillin was a success. Furthermore, it turned out to be the first antibiotic and set up a pathway for many other medicines to come and make a medical difference in the world, which sets up quite a legacy for penicillin itself (Newman).

## **Conclusion**

Even though penicillin isn’t used as much anymore as it was used in the past, we can still say that penicillin made the way for other medicines to pop up and cure other people of their diseases, whatever they may be. While it was a tragedy having people die from simple things and penicillin not being used as much, we can still say that it has helped us a lot in the long run. The triumph aspect of it showed that humanity was able to make something innovative that would significantly help humankind later on in regard to health. Thanks to those who have contributed to making the first step to helping everyone be healthier and live longer lives, we are able to improve

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and make new medicines that originate from the steps taken that Alexander and all of his other collaborators have done in order to make humankind a lot better.