Discovery of Penicillin

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Penicillin was among the many important medical inventions to occur during the professional reforms of the early twentieth century and before then there was no real effective treatment for infections such as pneumonia and rheumatic fever. Alexander Fleming a Scottish physician and microbiologist and a captain in the Army Medical Corp during World War I was dedicated to the study of natural bacterial action. His focus was on specifically studying the bacterial action of the blood and general area of antiseptics. In the military he was able to continue his studies. At this same time in 1928, while working on the influenza virus he noticed that mold had developed on a staphylococcus culture plate. While trying to grow bacteria on this plate, there seemed to appear a bacteria free circle around the mold. This mold would later be identified as the rare strain of Penicillium Notatum, it was clear that the mold had secreted something that prevented bacteria from growing. Not only was it able to kill off a single kind of bacteria but also a wide range of harmful bacteria such as streptococcus, meningococcus and the diphtheria bacillus. The issue was now extracting the Penicillin from the mold juice which was not as easy as it seemed and proved to be quite difficult. Isolating the actual Penicillin from the mold juice demonstrated to be unstable, although he was unsuccessful in getting the Penicillin into an isolated form, he still published his finding in the British Journal of Experimental Pathology in June 1929. In his findings he gives a thorough walkthrough on how to do the experiment explaining that an agar plate could be used to grow the bacteria with the necessary conditions, like keeping the bacteria in a 37 degrees Celsius environment for 24 hours for the mold to grow. What made it more difficult was that the Penicillin was not perceptible until tested with the bacteria. He even goes further by saying that “staphylococcus is a very suitable microbe on which to test the broth as it hardly lives well in culture, grows rapidly, and is very sensitive to Penicillin.” At the time they did not see the use of Penicillin in the medical field yet, meanwhile it was continued to be studied in the bacteriologist field, keeping interest of Fleming's research ongoing. Other professors tried to purify Penicillin but repeatedly failed and it wasn't until Howard Florey, Ernst Chain and their colleagues at the Sir William Dunn School of Pathology at Oxford University who were able to turn Penicillin, an accidental experiment into a life-saving drug. Their work on the isolation and chemistry of Penicillin didn't begin until 1939, when it would become difficult for scientists to research because of WWII. For the team to successfully carry out a program of animal experiments and clinical trials the team needed to process up to 500 liters of mold filtrate a week. Due to the circumstances that the scientist were in, they grew it in a number of strange culture vessels such as baths, bedpans, milk churns and food tins to save space and for ease of removing. It was not until later that they designed a vessel customized for fermentation, creating a renewed broth beneath the surface of the mold. The fermentation process was looked after by a team of “Penicillin girls”, thus practically converting the Oxford laboratory into a Penicillin factory. Concurrently a biochemist, Norman Heatley focused on extracting Penicillin from huge volumes of filtrate. He did this by extracting it into amyl acetate and then back into water, using a countercurrent system. After hiring another biochemist, he discovered a technique of alumina column chromatography to remove impurities from the Penicillin which

helped step up the production. In 1940, they began to carry out experiments, showing that Penicillin could protect mice against infection from Streptococci. Later, on February 12, 1941, Albert Alexander, became the first recipient of the Oxford penicillin. Alexander had developed a life-threatening infection with huge abscesses affecting his face and lungs after scratching the side of his mouth while pruning roses. They injected penicillin in him and within days he made a remarkable recovery that was stopped short due to the unfortunate circumstance of not having sufficient drugs to continue treating his infection, passing a few days later. Fortunately enough they had better results with following patients and were soon planning to make penicillin available to the British troops on the battlefield.

Similar to many of the things that are often used in people's daily lives, Penicillin was discovered somewhat by accident. The intention of Alexander Fleming was not to create a life-saving drug that would fight infections, he was merely just interested in bacteriology. Fleming was able to stumble upon this mold that grew in his agar culture while cultivating bacteria but from that was able to make much more of it. Rather than seeing it as an experimental oddity he continued to research and recreate this experiment for others to continue researching. Without his research being published by others that were interested in making something of Penicillin, they wouldn't have been able to. Although you can downplay the importance of his discovery, there was more science that went into it rather than just a miracle. Not only was this a groundbreaking discovery but also a great example of how science can be done in more than one way. In chapter 6 of the Scientific Attitude Lee McIntyre describes perfectly the circumstances that a scientist could be in by saying ““We do not need to attribute the discovery, perhaps, to Fleming’s particular genius, but we do not need to attribute it to accident either. No less a giant of medicine than Louis Pasteur once observed that “chance favors the prepared mind.”” Rather than Fleming throwing away his findings because the bacteria would not grow, instead he continued to research his accidental findings and understand what was going on in the Petri dish. Publishing his findings and researching the mold is another great example of the scientific attitude, like Louis Pasteur he noticed patterns in his research to discover something life saving.
Despite the fact that one of the biggest wars to ever happen was taking place right in the middle of the continuation of research and production of Penicillin they were still able to develop a drug that would change the medical field. Science can be done from pure coincidence, but it all relies on the “prepared mind” to investigate further to actually call it scientific like many other scientists have done. The science behind this accidental experiment can be compared to germ theory. Something as small as just washing your hands was previously publicly unknown has now become common knowledge. You are able to stop the spread of bacteria by just sanitizing and cleaning different surfaces. Similar to germs, the bacteria in the plate were conducted by Fleming.

Sources:

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