

ADVANCEMENT IN MEDICINE – THE DISCOVERY OF PENICILLIN

A. Baah – Sumy State University, group GP 218
N.O. Simonenko – EL Adviser

Penicillin is one of the earliest discovered and widely used antibiotic agents, derived from the *Penicillium* mold. Antibiotics are natural substances that are released by bacteria and fungi into their environment, as a means of inhibiting other organisms - it is chemical warfare on a microscopic scale.

In 1928, Scottish bacteriologist Alexander Fleming made a chance discovery from an already discarded, contaminated petri dish. The mold that had contaminated the experiment turned out to contain a powerful antibiotic, Penicillin. However, though Fleming was credited with the discovery, it was over a decade before someone else turned Penicillin into the “miracle drug for the 20th century”.

Much of Fleming's work focused on the search for a "wonder drug." The concept of bacteria had been around since Antonie van Leeuwenhoek first described it in 1683 but it wasn't until the late 19th century that Louis Pasteur confirmed that bacteria caused diseases. However, though this knowledge was widespread, no one had yet been able to find or manufacture a chemical that could kill harmful bacteria but also not harm the human body.

While sorting through his pile of dishes, Fleming noticed that the particular mold seemed to have killed the *Staphylococcus aureus* that had been growing in the dish. Fleming realized that this mold had potential. He spent several weeks growing more mold and trying to determine the particular substance in the mold that killed the bacteria. After discussing the mold with mycologist C. J. La Touche, they determined the mold to be a *Penicillium* mold. Fleming then called the active antibacterial agent in the mold, Penicillin.

Fleming continued to run numerous experiments to determine the effect of the mold on other harmful bacteria. Surprisingly, the mold killed a large number of them. Fleming then ran further tests and found the mold to be non-toxic.

Could this be the "wonder drug"? To Fleming, it was not. Though he saw its potential, Fleming was not a chemist and thus was

unable to isolate the active antibacterial element, Penicillin, and could not keep the element active long enough to be used in humans.

In 1929, Fleming wrote a paper on his findings, which did not garner any scientific interest.

In 1940, the second year of World War II, two scientists at Oxford University were researching promising projects in bacteriology that could possibly be enhanced or continued with chemistry. Australian Howard Florey and German refugee Ernst Chain began working with Penicillin. Using new chemical techniques, they were able to produce a brown powder that kept its antibacterial power for longer than a few days. They experimented with the powder and found it to be safe.

Needing the new drug immediately for the war front, mass production started quickly. The availability of Penicillin during World War II saved many lives that otherwise would have been lost due to bacterial infections in even minor wounds. Penicillin also treated diphtheria, gangrene, pneumonia, syphilis and tuberculosis.

As production of Penicillin increased, more clinical testing took place to show the power of the drug. In a test of 91 people with a staphylococcal infection, Penicillin reduced the mortality rate from an expected 100% to 40%. Penicillin also dramatically increased the survival rate of soldiers to an astounding 95%. Fleming, Florey, and Chain later received Nobel Prizes for their work with penicillin.

The discovery of penicillin changed the world of medicine enormously. With its development infections that were previously severe and often fatal, like bacterial endocarditis, bacterial meningitis and pneumococcal pneumonia, could be easily treated. Even dating all the way back to World War II and today with the war in Iraq, soldiers experienced injuries that would have been fatal without penicillin and other antibiotics that were developed subsequently.

More than eighty years after its discovery, penicillin is still one of the most widely used antibiotics today. Because penicillin has a limited spectrum of effectiveness, many derivatives have been developed to increase the usefulness of the drug. As time passes, more and more bacteria have developed resistance to the many forms of the antibiotic that are available, and much effort is being put into the research of newer antibiotics that will fight these strains.

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