

To What Extent did the Industrialization of Penicillin Affect the Mortality Rate of Ill Allied

Soldiers During World War II?

History HL- Internal Assessment

Discovery Canyon Campus High School

May 2019 Exam

word count: 2091

Section I

Penicillin was introduced in the late 1920s after its effects were discovered by professor Alexander Fleming. Even today, antibiotics play a large role in the maintenance of human health. However, the immediate effects of these drugs seem to hold greater significance during the 20th century, especially during the World War II era; some historians even argue that the introduction of penicillin played a direct role in the Allies' victory. However, the degree of this claim's factuality remains unclear. And so, the question persists: To what extent did the industrialization of penicillin affect the mortality rate of ill Allied soldiers during World War II?

The first examined source is a *New York Times* newspaper article titled "Penicillin Shown to Cure Syphilis" published on December 16, 1949. The author is unknown. Still, the article is valuable because it was published by a reliable source. Although it is a secondary source, its close timing with WWII provides a valuable perspective into the happenings of the 20th century (in contrast to an article written in the present day). Conversely, the same piece of the origin poses limitations; because it was written in 1949, the analysis of the medicine's effects on the war may not be complete. Furthermore, the document is written from a journalist's perspective and so, its value is present in its lack of bias. Still, its limitations rise from the inability to provide an alternate point of view. Because of this, one is unable to determine whether it is completely factual. Finally, the article is valuable in regards to its content because it provides context about both the origins of penicillin *and* its direct effects on World War II, thus supplementing credibility. The content has its limitations because it doesn't provide detailed statistical data that

may be necessary to answer the prompt at hand. Nonetheless, its explicit nature *does* provide insight into the extensivity of the effects.

The second source is a scholarly article which analyzes an extract from Alexander Fleming's laboratory journal describing his experimental results. This secondary source is a historical research narrative written by John S. Mailer, Jr., and Barbara Mason of Northern Illinois University. The lab entry provided in the narrative was published in Volume X, p. 226 of The British Journal of Experimental Pathology in May 1929. This origin is valuable because it contains a primary source within it, subsequently increasing its credibility. The date on which the narrative was written is unknown, but this limitation is aided by the lab entry's value and ability to provide a credible perspective. Though the authors' background is unknown (and therefore the article has the potential to be opinionated), it can be deemed relatively unbiased because it is written by collegiate individuals. Furthermore, in regards to the article's content, it holds value in its ability to quantitatively answer the question at hand. However, limitations are present in its lack of specificity, as it is not written with the context of the Allied forces in WWII.

Section II

World War II marked a turning point not only for war tactics and technological advancements, but also for the pharmaceutical industry. The new medical techniques developed between 1939 and 1945 targeted injuries related to the upbringing of new weaponry. Although penicillin was discovered in the years prior to the war, its industrialization in the early '40s was

extremely beneficial to the Allied forces' mortality rate due to: its ability to fight infections, its superiority over M&B sulfonamides, and its political effects on the Axis powers.

Initially, penicillin was deemed insignificant during the 1930s, as most people were focused on lifting themselves out of the Great Depression rather than adopting the use of this drug. However, once the number of Allied casualties began to rise exponentially, the American government was forced to embrace it on a wide-scale basis and implement its mass production. Soon, British and American scientists expanded penicillin's use out of laboratories and into the battlefields after discovering its ability to treat wounds. According to CNN, World War II resulted in between 50 and 80 million Allied deaths, of which about 25 million were due to war-related diseases (Smith). These diseases were mostly bacterial infections which were often fatal due to the unsanitary environment in which the troops were in. The extent to which penicillin benefited the Allies is elucidated through its effects on two prevalent infections: gangrene and septicemia. Gangrene is a disease in which tissue dies due to the lack of a sufficient blood supply. Because this had become an increasingly fatal disease for the soldiers, supplies of penicillin were sent with the troops making the D-day landings in June of 1944. According to a scholarly journal article published in the US National Library of Medicine, "the use of penicillin to treat gangrene prevented the need for roughly 20 to 30 thousand amputations" (Quinn). Additionally, penicillin was used to prevent septicemia or, blood poisoning. This infection could occur if patients underwent operations with equipment that hadn't been properly sterilized or if they were treated in a hospital where bacteria could be spread easily from person to person. By treating open wounds with penicillin, however, doctors were able to revitalize

troops more quickly. This also reduced the treatment time, further preventing the spread of disease between units. In other words, penicillin was beneficial to the Allies because it could be used as a direct form of treatment, thus preventing the loss of limb and/ or the loss of life. Furthermore, another way in which penicillin's ability to fight infection was beneficial to the Allies lied in its ability to reduce the wait time between when a soldier was wounded and when they were seen by a doctor for surgery or treatment. According to history.com, before the industrialization of penicillin, this wait time was about 14 hours (Parker). The necessity for amputation is directly proportional to the amount of time an individual waits before seeking medical attention, as this only makes the body more susceptible to infection. Therefore, the administration of penicillin drastically reduced the probability that the wound would get infected and increased the survival rate of Allied soldiers.

Next, the industrialization of penicillin was extremely beneficial to the Allied forces due to its superiority over the previously-commercialized M&B sulfonamides (known today as Sulfapyridine). These drugs were introduced shortly after the discovery of penicillin in the 1930s. At first, they seemed to be the cure for all diseases and their production was in high demand for roughly 10 years. However, this was due to the fact that there were no testing requirements present at the time and the antibacterial's consequential effects were elucidated in 1937. Because of the lack of clinical research between this time and the onset of World War II, at least 100 people were poisoned with diethylene glycol, a fatal organic compound present in the medication. Although these risks were present, many army doctors continued to treat patients with the sulfa tablets up until the introduction of penicillin. After the elixir sulfanilamide

disaster, the Federal Food, Drug, and Cosmetic Act was passed in 1938. Penicillin, unlike the M&B sulfonamides underwent a series of clinical trials before being approved for use on the battlefield. For example, results published in August 1941 in the medical journal "The Lancet" showed that four of five patients survived their various illnesses after being treated with penicillin. Conclusively, because penicillin superseded the sulfa drugs, its introduction to Allied troops can be deemed beneficial.

Finally, the mass production of penicillin had several political effects on the Axis powers which indirectly resulted in a decrease in the Allied mortality rate. Although penicillin had repeatedly proven to hold potential by 1942, countries like Germany did not seek to develop similar drugs. As previously mentioned, the Allies suffered from many bacterial diseases to which they fought with penicillin. According to the online German newspaper *Der Spiegel*, the Germans also suffered from similar diseases during World War II (Crossland). However, their lack of effort towards the battle against infection indirectly benefited the Allies. A journal article written in November of 1949 stated that "penicillin's immediate impact was to lessen wartime deaths, at least for the United States and its allies. During World War II, the Allies had penicillin in their arsenal of weapons, but Germany and its allies did not" (Hill). The Axis powers *had* begun to use variations of the M&B sulfonamides, but they were not nearly as beneficial as penicillin. As said by scholar-historian Gilbert Shama, Germany never created "a central body to coordinate research and eliminate duplication of effort" (Shama). From an economic perspective, while the Allied powers put tens of millions of dollars towards the industrialization of penicillin, Germany only allocated \$10,000 towards their presumed research on antimicrobial compounds.

From a statistical standpoint, according to a surgeon with the 21st Army Group, “Allied troops suffered from gangrene at a rate of 1.5 cases per thousand and they died about half as often as in the early years of the war. Meanwhile, as penicillin remained scarce, German prisoners mostly received sulfa drugs instead and suffered gangrene at a rate of 20 to 30 per thousand” (Conniff). This decline in German forces benefited the Allies in later battles due to their ability to efficiently treat a broad range of infections with penicillin. In summation, while the Germans’ lack of penicillin did not have a direct effect on the decrease in the Allies’ mortality rate, it provided the Allies with a significant tactical advantage which saved thousands of lives later in the war.

In summation, the industrialization of penicillin was evidently a large factor in reducing the Allies’ mortality rate. Its multifaceted use against deadly battlefield diseases resulted in an efficient recovery for the troops and reduced the number of disease-related deaths. Additionally, its more advanced chemical makeup proved to be more beneficial in treating disease than the previously marketed sulfonamides while its exclusivity put the Allied forces at an advantage against Germany. Therefore, although these were not all direct factors in the drastic increase in survival rate, both the pharmaceutical and political aspects of the “Wonder Drug” held great significance during the second World War.

Section III

This process exposed me to the various strategies historians use to explore questions and to some of the challenges they face. Often, in order to answer complex questions, one must rely heavily on analytical reasoning. Through the investigation, I gained a deeper understanding of the methodology required to write a comprehensive analysis and the limitations that accompany such a paper.

First, because of the specificity associated with my research question, I was not able to find many primary sources. This was a limitation in itself but, more importantly, it shaped the way I conducted the investigation. Historians prefer to use primary sources because such material elucidates past happenings, thus allowing them to draw more accurate inferences--although this makes the process more complicated, it adds more significance to the topic at hand. The secondary sources I used were not preferable due to their lack of detail. Nevertheless, the ones I used to research the effects of penicillin on Allied soldiers during World War II sustained their value. For example, I did not come across many biased articles, as most of them were written by health professionals and adhered to a scientific nature. Additionally, I obtained extracts from newspapers written in the late twentieth century. Although these articles were not written during the time period my question addressed, it provided a different perspective from the ones offered by modern-day analyses. To a historian, it is important to have a multifaceted approach to any given question to avoid any type of bias, whatsoever. For example, if I had only utilized entries from Allied soldiers' journals which discussed their personal opinion on penicillin, I would not have represented the entirety of the topic. So, I used observational data in

addition to anecdotal evidence to provide a balanced argument. Of course, as with any aspect of life, it is impossible to cover each and every perspective, as some are more subjective than others. Thus, historians are inevitably selective when portraying historical knowledge. I was aware of this, but attempted to elude the issue by referencing both Allied and Axis accounts of penicillin use during the war.

Conclusively, the investigation not only provided me with newfound knowledge regarding the medicinal aspects of the Second World War, but it also explicated the approaches historians take when conducting a study and the impediments they may face when doing so.

Works Cited

- Bradley, Jeremy. "Penicillin in WWII." Penicillin, Synonym, classroom.synonym.com/did-invention-penicillin-affect-world-war-ii-8709.html.
- Conniff, Richard. "Penicillin: Wonder Drug of World War II." HistoryNet, 3 July 2017, www.historynet.com/penicillin-wonder-drug-world-war-ii.htm.
- Crossland, David. "Germany Still Locates 40,000 War Casualties a Year - SPIEGEL ONLINE - International." Database of Fallen Soldiers, Spiegel Online, 8 May 2012, www.spiegel.de/international/germany/germany-tracing-its-war-dead-from-world-war-ii-a-832063.html.
- Hill, Charles. "'Penicillin Shown to Cure Syphilis.'" New York Times, 16 Dec. 1949.
- Mailer, John S, and Barbara Mason. "Penicillin: Medicine's Wartime Wonder Drug and Its Production at Peoria, Illinois." Penicillin, Illinois Periodicals Online, www.lib.niu.edu/2001/iht810139.html.
- "Martindale: The Complete Drug Reference." Penicillin Interactions, Medicine Complete, www.medicinescomplete.com/mc/martindale/current/login.htm?uri=https%3A%2F%2Fwww.medicinescomplete.com%2Fmc%2Fmartindale%2Fcurrent%2F1-a16-10-g.htm.
- Parker, Justin. "Penicillin Discovered." History.com, A&E Television Networks, www.history.com/this-day-in-history/penicillin-discovered.
- Quinn, Roswell. "Rethinking Antibiotic Research and Development: World War II and the Penicillin Collaborative." American Journal of Public Health, American Public Health Association, Mar. 2013, www.ncbi.nlm.nih.gov/pmc/articles/PMC3673487/.
- Smith, Marc. "World War II Fast Facts." CNN, Cable News Network, 17 Aug. 2017, www.cnn.com/2013/07/09/world/world-war-ii-fast-facts/index.html.